# Quarterly Bulletin

# 2007 Q2 | Volume 47 No. 2





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#### Foreword

Every three months, the Bank of England publishes economic research and market reports in its *Quarterly Bulletin*. This quarter, the *Bulletin* contains articles on: inflation expectations; the measurement of national saving; recent research on investment; and the implications of the structure of national balance sheets.

Monetary policy is likely to be most effective if people understand and support the goal of price stability, as well as the use of interest rates to achieve it. To assess the degree of public awareness, GfK NOP carries out a regular quarterly survey on behalf of the Bank. In *Public attitudes to inflation and interest rates*, Ronnie Driver and Richard Windram investigate possible factors behind the rise in inflation expectations reported in the survey since 2005. They find that expectations are influenced by a number of factors: headline inflation; the inflation rates of highly visible items — such as energy and food; and media discussions of inflation. The article also finds that the public are fairly good at judging prospective movements in interest rates.

Savings help finance domestic investment which generates future income. The level of national saving is important for policymakers as it contains information about future prospects for growth and inflation. In *National saving*, Simon Whitaker asks how much saving the United Kingdom would need to ensure the capital stock rises in line with output. He then goes on to show the answer to that question is sensitive to a variety of measurement issues, to the availability of international capital and to increasing longevity.

Investment is an important component of demand and a determinant of supply and thus of central interest to the MPC. In *Understanding investment better: insights from recent research,* Simon Price examines some recent advances in our understanding of the determinants of investment spending, such as the influence of the cost of capital, the role of adjustment costs, the impact of uncertainty, and the effects of financial constraints.

Financial globalisation brings benefits but also means that countries are now more exposed to foreign macroeconomic and financial shocks. In *Financial globalisation, external balance sheets and economic adjustment*, Chris Kubelec, Bjorn-Erik Orskaug and Misa Tanaka present data on the composition of the national balance sheets of the United Kingdom, United States and Canada and discuss how the composition of assets and liabilities affects the transmission of shocks. By way of illustration, the article then examines the potential impact on UK and US balance sheets of an unwinding of global current account imbalances and the possible associated consequences for demand.

The regular *Markets and operations* article reviews recent developments in global capital markets. Financial prices quickly recovered after the period of turbulence in 2007 Q1. In part, that probably reflected the continued brisk expansion in global economic activity. Against that

backdrop, official interest rates were raised in a number of countries. Despite the associated rise in real interest rates, credit conditions for corporate borrowers remained favourable, with high-yield credit spreads narrowing further and evidence of heightened competition among lenders. The article also reviews the Bank's operations, including the launch of its new debt issuance programme.

This edition of the *Quarterly Bulletin* also includes a review of the work of the London Foreign Exchange Joint Standing Committee in 2006. The Foreign Exchange Joint Standing Committee was established in 1973, under the auspices of the Bank of England, as a forum for bankers and brokers to discuss broad market issues.

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Research work published by the Bank is intended to contribute to debate, and does not necessarily reflect the views of the Bank or of MPC members.

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The speeches contained in the *Bulletin* can be found at www.bankofengland.co.uk/publications/speeches/index.htm

Except where otherwise stated, the source of the data used in charts and tables is the Bank of England or the Office for National Statistics (ONS). All data, apart from financial markets data, are seasonally adjusted.

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# Recent economic and financial developments

# Markets and operations

This article reviews recent developments in global financial markets. It summarises asset price movements in conjunction with market intelligence gathered from market contacts, and evaluates them in the context of the Bank's core purposes. The article also outlines changes in market structures and reviews the Bank's official operations.

#### Global financial markets(1)

#### Overview

Following sharp falls in the prices of risky financial assets in late February, there was a short period of increased financial market volatility that continued into early March. Most asset prices subsequently recovered quickly against the backdrop of a continued robust expansion in the global economy, suggesting that the so-called 'search for yield' remained largely intact.

Monetary accommodation was withdrawn further in some major economies. Towards the end of the period reviewed in this article, market intelligence from the Bank's contacts suggested some uncertainty about the robustness of asset markets looking forward.

#### Recent developments in global capital markets

During the past few months, there were further increases in policy rates by some major central banks. For example, the United Kingdom's Monetary Policy Committee increased Bank Rate by 25 basis points, to 5.5%, on 10 May. The ECB also raised its main refinancing rate by 25 basis points, to 3.75%, on 8 March. The People's Bank of China increased its one-year benchmark lending rate by 18 basis points on 18 May to 6.57%, as well as increasing commercial bank reserve requirements. But the US FOMC maintained its target for the federal funds rate at 5.25%, as it had for the previous eleven consecutive months, and the Bank of Japan left its policy rate unchanged, as it had since February.

Looking ahead, market perceptions of the future path of official rates were revised upwards in the United Kingdom, United States and euro area, but were little changed in Japan (Chart 1). On 25 May, short-term forward interest rates were consistent with further interest rate increases in the United Kingdom and the euro area by the end of 2007. And in Japan, policy rates were expected to rise, albeit very gradually. By contrast, the implied path for dollar rates continued to suggest some expectation that policy rates would be reduced over the next twelve months.



<sup>(</sup>a) Nominal forward rates derived from instruments that settle on the London interbank offered rate. One-day nominal forward rates for sterling, dollar and euro. Three-month nominal forward rates for yen.

(b) Solid lines show nominal forward rates for 25 May 2007. Dashed lines show nominal forward rates for 23 February 2007.

Implied uncertainty about the future path of interest rates, inferred from options prices, picked up in February and March, especially for short-term dollar rates. This coincided with the period of heightened volatility across asset markets. But by the end of May, implied volatilities on short-term interest rates had generally returned to lower levels than those observed at the turn of the year (Chart 2).

The skew of the implied distribution of future short-term interest rates remained relatively unchanged for sterling and the euro (although the latter moved quite sharply toward the end of the period). However, the balance of risks moved further to the downside for US dollar rates (Chart 3).

In foreign exchange markets, the US dollar depreciated further. Indeed, the dollar reached a new low against the euro and a

<sup>(1)</sup> This section focuses on global capital markets. The data cut-off for this section is 25 May 2007.

## Chart 2 International six-month implied volatility from interest rate options



## Chart 3 International six-month skews from interest rate options



Sources: Bank of England and Euronext.liffe

26-year low against sterling during April, although it appreciated slightly against both currencies in May. Since late February, the US dollar effective exchange rate index (ERI) depreciated by around 3% to reach a level about 6% lower than a year ago and around 25% lower than the beginning of 2002. The yen ERI also declined, more than reversing its rise earlier in the year (**Chart 4**).

Long-term interest rates generally increased internationally (Chart 5). But long-term forward breakeven inflation rates, as implied by inflation swaps or the difference between nominal and real yields, changed little (Chart 6). That was consistent with a general pickup in global long-term real forward rates, which have gradually drifted higher since the end of last year (Chart 7).

Other things equal, the increase in international long-term real forward rates might have been associated with lower equity prices via higher discount rates. In fact, most of the major











<sup>(</sup>a) Instantaneous forward rates. Sterling and dollar rates derived from the Bank's government liability curve. Euro rates derived from inflation swap rates. Sterling rates referenced to RPI, dollar rates referenced to CPI and euro-area rates referenced to HICP.

equity indices increased further over recent months, despite the widespread market turbulence in late February and early



### Chart 7 International ten-year real forward interest rates<sup>(a)</sup>



March during which equity markets fell sharply (**Chart 8**). Following that period of global financial market volatility, emerging market equity indices also rose sharply and by more than equity markets in the major economies. The largest increases were in Asia and Latin America. Most notably, the Shanghai Composite index gained over 25%.



Chart 8 International equity indices

After widening during the period of market turbulence in late February, global non-investment grade corporate and emerging market bond spreads narrowed towards their levels observed at the start of the year. In contrast, investment-grade corporate bond spreads remained a little wider than their levels in late February (Chart 9).

There was also a sharp and persistent widening of spreads in some US mortgage markets.<sup>(1)</sup> In particular, spreads on US sub-prime residential mortgage-backed securities (RMBS)



Chart 9 Global corporate bond spreads<sup>(a)</sup>

(a) Option-adjusted spreads

widened sharply during the February turbulence, particularly for lower-rated borrowers (Chart 10). The spike in spreads followed a period of gradual widening since the end of last year. During May, spreads narrowed a little but remained well above levels observed at the end of 2006. Spreads on US commercial mortgage-backed securities (CMBS) also widened sharply in late February, and continued to widen further over subsequent months (Chart 11).





Source: JPMorgan Chase & Co.

(a) Spreads refer to the ABX.HE indices which are comprised of a basket of credit default swaps on 20 RMBS.

#### Key influences on global capital markets

The general pattern of developments across asset markets was, according to market contacts, consistent with a continued robust macroeconomic outlook and a resumption of the so-called 'search for yield'.

(1) For more details, see Section 1 of the Bank's Financial Stability Report, April 2007.

Sources: Bloomberg and Morgan Stanley Capital International Inc. (MSCI).

<sup>(</sup>a) The MSCI Emerging Markets index is a capitalisation-weighted index that monitors the performance of stocks in emerging markets.

## Chart 11 Spreads on a basket of US commercial mortgage-backed securities (CMBS)<sup>(a)</sup>



Source: JPMorgan Chase & Co.

(a) Spreads refer to the CMBX.NA indices which are comprised of a basket of credit default swaps on 25 CMBS.

#### Global economic growth remained strong

Despite the repricing of assets backed by US mortgages, many other asset prices continued to increase robustly. One factor that may have underpinned this has been the continued brisk expansion of the global economy. Although growth slowed recently in the United States, the world's largest economy, economic activity in other regions continued to increase strongly (Chart 12). GDP grew by more than market participants expected in 2007 Q1 in both the United Kingdom and the euro area, maintaining annual rates at close to 3%. Similarly, economic activity in Asia continued to expand rapidly in the first few months of 2007.





(a) Purchasing power parity weighted

Consistent with the relative cyclical positions of the major economies, short-term dollar real interest rates were lower than their levels at the start of the year for most of the period before increasing in late May. In contrast, sterling and euro rates increased steadily over recent months (Chart 13). And as relative interest rates changed, the US dollar depreciated further against other major currencies in real terms before appreciating slightly in May (Chart 14). This depreciation may also be part of a gradual adjustment to global imbalances.<sup>(1)</sup>







Sources: Bloomberg, Consensus Economics and Bank calculations

(a) The real exchange rate is calculated as the ratio of price indices of two economies, expressed

(b) Observation for May 2007 is derived using Consensus forecast of CPI.

Looking ahead, market participants anticipated that the US economy will rebound quite quickly. Indeed, Consensus forecasts indicated that US GDP growth in 2008 will exceed that of a number of other major economies (Chart 15).

However market commentators highlighted significant downside risks to this outlook. For example, the recent problems in the US housing market could lead to a larger and more protracted slowdown in the US economy. This may be consistent with the negative skew to short-term dollar interest rates inferred from options prices, which was around its lowest level since the mid-1980s (Chart 3). Moreover, if the

<sup>(1)</sup> See also the Bank's Financial Stability Report, April 2007, page 13.

downside risks to the US economy were to crystallise, there could be an adverse impact on global growth prospects and, in turn, global asset prices. This might explain why the skews of the implied distribution for both the S&P 500 and the FTSE 100 remained below their long-run averages (Chart 16).



(a) Solid line represents 2007 forecast. Dot represents latest 2008 forecast.





Sources: Chicago Mercantile Exchange, Euronext.liffe and Bank calculations

(a) Implied asymmetry is measured by the skewness of the distribution of returns implied by options prices. A negatively skewed distribution is one for which large negative deviations from the mean are more likely than large positive deviations.

#### Commodity prices picked up again

Reflecting the underlying strength in world demand, commodity prices picked up again, especially industrial metal prices which reached new highs in May (Chart 17). According to market commentators, weaker demand from US residential construction has been more than offset by strong Chinese demand. Similarly, while OECD demand for oil was projected to stay broadly unchanged this year, non-OECD demand was forecast to grow by 3.3%, which has underpinned some strengthening in oil prices.<sup>(1)</sup>



Chart 17 Selected commodity price indices<sup>(a)</sup>

(a) Indices refer to Goldman Sachs Commodity Index (GSCI).

Despite the renewed price pressures in commodity markets, there were few signs that medium-term inflation expectations increased in the major economies. In the United Kingdom, medium-term forward inflation rates were little changed over recent months, but remained higher than at the beginning of 2006 (Chart 18). However, market contacts have not reported any widespread rise in their medium-term inflation expectations. Rather, they have highlighted the recent greater volatility of realised inflation as a possible reason why investors may have revised upwards their required compensation for bearing inflation risk (ie inflation risk premia) which in turn might have contributed to higher sterling forward inflation rates.





Sources: Consensus Economics, ONS and Bank calculations.

(a) RPI inflation forward rates derived from the Bank's government liability curve.
 (b) Consensus Economics surveys average forecasts of RPIX five-to-ten years ahead.

According to the International Energy Agency, Chinese demand for oil grew by 10.1% in January and 12% in February.

#### Market contacts reported continued healthy corporate conditions

The generally robust macro environment appears to have supported corporate earnings and, in turn, international equity prices. In the United States and the United Kingdom, aggregate corporate earnings of quoted companies increased as a proportion of GDP over the past few years, and remained well above their averages since the 1990s (Chart 19). And over recent months, despite the slowdown in US GDP growth, corporate earnings have generally been stronger than market expectations.





Sources: Bloomberg, Bureau of Economic Analysis and ONS

Corporate credit spreads also generally remained narrow and close to historical lows, which, in part at least, reflected continued low levels of defaults (Chart 20). Many market commentators have predicted that default rates will increase in 2007, albeit only modestly. But predictions of an imminent rise in defaults have been proved wrong for some years.

Chart 20 Global high-yield corporate bond spreads and default rates



The continued narrow level of corporate credit spreads has kept the cost of debt finance low for many firms, to some

extent offsetting the upward influence exerted by higher risk-free interest rates. Combined with higher equity prices, this has meant that (by crude measures at least) UK firms' overall cost of finance may have been broadly flat (Chart 21).

Chart 21 Illustrative UK corporate sector cost of finance



<sup>(</sup>a) Conventional government bond yield plus an equity risk premium, estimated using a Gordon growth model for a sample of FTSE All-Share companies.

- (b) Average of pre-tax cost of equity and corporate debt yield, weighted according to average
- Levels of debt and equity liabilities. Including corporate taxes would tend to lower the cost of debt finance. (c) Ten-year conventional government bond yield plus an investment-grade bond spread

Moreover, relative to equity financing, the cost of debt financing has remained low. This may have encouraged firms to increase their level of gearing and supported a pickup in leveraged buyout (LBO) activity internationally (Chart 22).<sup>(1)</sup> Moreover, some very large deals were reportedly in the pipeline.





(1) See also Section 1 of the Bank's Financial Stability Report, April 2007.

#### Investor demand for corporate debt remained high

Demand for corporate debt remained high, perhaps in part related to the high realised returns experienced in recent years. Contacts reported that issuance of senior debt — ie instruments that provide investors with priority claims in the event of default — was particularly strong. As a result, some firms' capital structures might consist of a proportionally smaller subordinated debt cushion protecting senior debt holders in the event of default. The box on pages 196–97 discusses the possibility that these changes may have reduced the prospective recovery rates for senior debt holders.

Despite the possible fall in future recovery rates, risk compensation on loans continued to fall. While a higher proportion of debt financing has raised some firms' leverage over the past few years, in general investors have not demanded extra compensation. In fact, the spread per unit of leverage fell further in Europe in 2007 Q1, although it may have stabilised somewhat in the United States (Chart 23).

Chart 23 Senior secured credit spreads per unit of leverage<sup>(a)(b)</sup>



(a) Based upon average institutional spreads versus average total debt leverage ratios

(b) Quarterly data to 2007 Q1.

 (c) US leverage reflects ratios for Large Corporate Transactions (minimum earnings before interest, taxes, depreciation and amortisation (EBITDA) of US\$50 million).

Alongside narrower spreads, lenders reportedly continued to compete aggressively for business on non-price terms, driving lending standards down further. These include weaker covenants and in particular greater issuance of so-called 'covenant-lite' deals. As explained in the box on page 195, such developments mean that the underlying value of a firm could be allowed to deteriorate for longer before its creditors can intervene. And according to survey evidence — the recent Federal Reserve Senior Loan Officer and ECB Bank Lending surveys — overall corporate credit standards loosened a little further in 2007.

# A sharp repricing occurred in US sub-prime mortgage markets

Recent problems in the US sub-prime mortgage market<sup>(1)</sup> may provide a useful case study of how lax lending behaviour and

deteriorating fundamentals can test the structure of a market that has grown rapidly in benign credit conditions.

Heightened competition between sub-prime originators during 2005 and 2006 in the face of strong demand for assets from end-investors resulted in a weakening of lending standards. However, from mid-late 2006, arrears and delinquencies on US sub-prime loans increased, prompting a gradual widening in spreads on securities backed by US residential mortgages (Chart 10). In early 2007, there was an increase in early payment defaults (EPDs).<sup>(2)</sup> Many of these loans were in the process of being repackaged into RMBS by securities dealers. These EPDs caused the dealers to pass the loans back to the loan originators, the losses on which triggered a wave of failures of these institutions. In turn, investors adjusted their perceptions of the riskiness of the underlying loans, causing a very sharp widening in spreads on securities backed by US sub-prime mortgages in late February.

In addition, some dealers had reportedly sold protection using credit default swaps (CDS) of asset-backed securities (ABS), or indices of such CDS. Although dealers attempted to offset these exposures, some of their hedges may have been imperfect forcing them to close out of their positions, which in turn might have accentuated market moves.

The most obvious impact of the problems in the US sub-prime mortgage markets has been a tightening in credit standards and a re-evaluation of the appropriate level of compensation for the underlying risk of default in associated markets. The latest Federal Reserve Senior Loan Officer Survey suggests, a net balance of 25% of respondents reported tighter lending standards on residential mortgages in 2007 Q1 (Chart 24). In the wake of developments in the US sub-prime RMBS market, rating agencies also identified signs of deterioration in underwriting standards in CMBS markets. This prompted tighter controls on the value of the underlying collateral, and there was a sustained widening of spreads on CMBS (Chart 11).

#### Overall, financial markets shook off the latest shock and the so-called search for yield seemingly continued

Recent events in the US sub-prime market may also have prompted a more widespread reassessment of the underlying risk across credit markets. For example, implied uncertainty about future credit spreads derived from option prices increased and remained higher than earlier in the year, although it has fallen relative to the levels observed during the late February/early March turbulence. Similarly, the implied uncertainty on major equity indices has remained slightly more elevated than earlier in the year (Chart 25).

<sup>(1)</sup> For more details, see *Financial Stability Report*, April 2007, pages 20–24.

<sup>(2)</sup> An EPD occurs when the borrower is in arrears after, or defaults in, the first few months of the loan.

#### Recent developments in loan covenants

This box discusses recent weakening in corporate lending standards in the leveraged loan market via reduced protection from loan covenants. A covenant is a condition that a borrower must comply with as part of the terms of a loan or bond. Hence they give lenders additional credit protection. If the borrower does not act in accordance with covenants, this may be considered a 'technical' default and allows lenders to demand payment (usually in full), although lenders may agree to a waiver or restructuring of the loan.

Covenants can either refer to a firm's financial position, for example, setting a level of allowable leverage (usually debt to earnings ratios), or cover non-financial events, for example, the delivery of financial information or confer veto rights.

Covenants can operate in two ways. Maintenance covenants place restrictions on the borrower to be met on an ongoing (eg quarterly) basis. And incurrence covenants impose conditions should an event such as issuance of a new debt occur.

In the United States, the average number of maintenance covenants attached to US leveraged loans has fallen gradually since 2000 (Chart A). This partly reflects a shift towards so-called 'covenant-lite' deals; a term typically used to describe loans with incurrence-only covenants. In Europe, thus far there have been fewer covenant-lite deals. However, contacts reported a recent small increase in the number of European leveraged loans that included incurrence, rather than maintenance, covenants.

There are also some signs that covenants (either maintenance or incurrence) have become less stringent over recent years, although the data are mixed. For example, according to Standard and Poor's, those lenders financing leveraged buyouts have accepted progressively higher debt to income ratios of companies to whom they lent since 2002 (Chart B). And while this measure fell slightly in the first few months of 2007, projected leverage ratios edged higher, implying there may be less headroom before covenants are triggered. Other US data from the Loan Pricing Corporation, however, do not show financial covenants becoming less stringent.

Market contacts suggest that covenant weakening partly reflects intense competition among lenders, which has led to a general loosening in credit standards. To some extent, this could reflect the ease with which investors can transfer risk to a third party. For example, lenders can package loans and sell them via collateralised loan obligations (CLOs). Alternatively, they could purchase default protection using loan credit default swaps.

#### Chart A Developments in US leveraged loan covenants<sup>(a)</sup>

Average number of maintenance covenants per loan (left-hand scale)<sup>(b)</sup> US covenant-lite issuance (incurrence only) (right-hand scale)



(a) Maintenance covenants data to end-2007 Q1. Covenant-lite issuance data to 15 March 2007.
 (b) Excludes covenant-lite lending.





Source: Standard and Poor's Leveraged Commentary and Data

(a) Earnings before interest, tax, depreciation and amortisation.
(b) Actual level specified in buyout documentation.
(c) S&P estimate of leverage ratio in second year after buyout.

Contacts are divided about the wider implications of covenant weakening and whether it is a cyclical development or more structural. Some suggest that it has not had a material negative impact on firms' credit ratings because covenants play a small part in determining ratings. However, other contacts think covenant weakening, particularly if applied throughout firms' capital structures, could mean lenders have insufficient opportunity to monitor the underlying value of the firm and influence management behaviour. Hence the value of the firm might be allowed to deteriorate for longer before lenders force a restructuring, possibly resulting in lower recovery rates for lenders if the firm defaults on its debt.

# Credit spreads, recovery rates and changes in corporate capital structure

Corporate bond spreads have generally narrowed over recent years and remain low compared with historical levels. At the same time, according to market contacts, firms have shifted their liabilities towards more senior creditors (which have priority claims in the event of default) and away from more junior creditors and equity holders. This box considers whether this change in firms' capital structure may widen credit spreads on senior debt using a simple structural credit model.<sup>(1)</sup>

#### Firms' capital structure and recovery rates

A typical firm's capital structure will be made up of equity and debt. Within this, a firm may issue both senior and subordinated debt, with the latter including mezzanine loans and high-yield bonds. When a firm defaults on its debt, its assets are divided between its creditors. The more senior the creditor, the higher priority claim they have on a firm's assets and hence the higher their expected recovery rate.

Changes in firms' capital structures may affect recovery rates for investors in corporate debt. Recovery rates for senior creditors should, other things being equal, be higher the larger the 'cushion' of subordinated debt holders below them. This is because, in the event of default, there would be a proportionately smaller number of senior debt holders to share the firm's remaining assets. Conversely, an increase in the issuance of senior debt relative to subordinated debt might lead to lower senior debt recovery rates.

In 2006, over 150% of incremental funding required for European leveraged buyouts was provided by senior lenders. This suggests that the proportion of senior debt relative to subordinated (junior) debt and equity increased.

Rating agencies have estimated recovery rates for firms with different capital structures. For example, Moody's found an 89% recovery rate for senior debt with a large subordinated debt cushion (≥40% subordinated debt) but a 52% recovery rate for structures with senior debt only. Likewise, Fitch Ratings suggest that about 60% of unsecured bond (ie subordinated debt) downgrades have been caused by an increase in the size of the secured (ie senior) debt tranche.

#### Recovery rates and corporate bond spreads

A Merton structural credit risk model provides a framework for considering the effect of lower recovery rates on credit spreads. It models the relationship between the value of a firm's equity and debt, where the latter comprises both senior and subordinated debt. The firm's value (ie debt plus equity) is assumed to grow on average at a rate equal to the cost of capital net of dividends and interest payments, but with a normally distributed degree of uncertainty around this central path as shown in **Figure 1**. If at any time the firm's value falls below the face value of the firm's debt, the equity holders default and transfer the firm's value (ie the firm's assets) net of bankruptcy costs, to the debt holders. Essentially, it is assumed that the debt instruments contain protective covenants (that is, terms and conditions attached to the loan, see the box on page 195), which allow lenders to force a default if the value of the firm falls below the face value of its debt.





Cast in this framework, the debt holders' position is akin to holding a risk-free bond, but having sold a put option on the firm to the equity holders with a strike price equal to the face value of the debt. In a similar vein, the firm's equity is like a call option on the firm's assets, also with a strike price equal to the face value of the debt. Using a standard Black-Scholes barrier option pricing formula, it is possible to derive an explicit formula for the price of the risky bond which in turn can be used to estimate the yield differential between a risky bond and a default-free bond (ie the credit spread).

The model was calibrated such that debt to equity ratios, bankruptcy costs, volatility and the risk-free rate were broadly in line with observed average levels. However, as with any simple model it embodies some simplifying assumptions, and the results should therefore only be taken as illustrative. Here, the model is used to characterise a stylised firm that finances itself through senior and subordinated debt and equity. By altering the size of the subordinated debt tranche it is possible to examine the impact of a change in capital structure on recovery rates and spreads.

**Charts A** and **B** show the results. When the subordinated tranche is sufficiently large to absorb all losses and eliminate senior credit risk, the senior tranche's recovery rate reaches 100% and its spread falls to zero. As the size of the

subordinated debt tranche falls, however, the loss given default for senior debt, and the corresponding spread, increases.

Chart A Proportion of subordinated debt and senior debt loss given default



Chart B Proportion of subordinated debt and senior debt implied spreads



**Charts A** and **B** assume that the junior debt issue is fully subordinated to the senior issue (that is, junior debt holders receive nothing in the event of default unless senior debt holders have been fully paid). However, in some circumstances a large number of subordinated debt holders may be able to hold up a restructuring to extract concessions from the senior debt holders. Likewise, contacts have remarked that the documentation of second lien loans — senior debt which ranks below first lien debt and has a junior claim on the firm's assets in the event of bankruptcy — has rarely been tested in a bankruptcy situation, and varies widely from deal to deal. It is not certain that the priority of first lien over second lien loans would be upheld in all cases.

One simple way to examine this issue is to change the assumed proportion of firm assets which accrue to the senior debt holder in the stylised model. **Chart C** shows how the

spreads of the senior and subordinated issues converge as a greater proportion of the firm's assets accrues to the subordinated debt holder. This might suggest that differences in documentation may have a sizable impact on the valuation of both senior and subordinated debt.





As noted above, these model results are purely illustrative. In particular, they assume that corporate bond spreads reflect only the risk of default losses and investors' appetite to bear this risk. In reality, the difference between yields on corporate and government debt also reflects other factors such as liquidity premia.

In addition, the model incorporates a mechanical default mechanism when the firm's value falls below the face value of its debt as specified in the loan covenant. In practice, debt holders may act differently, possibly forcing a default prior to this point, so the presence of more senior debt holders may improve recovery rates.

In summary, the insights from this simple model suggest that an increase in senior, relative to subordinated, debt is likely to lead to lower recovery rates and higher senior credit spreads. This echoes rating agency analysis and is reflected in the cost of protecting senior debt-only issuance. However senior loan spreads have remained narrow, which suggests that some market participants may not have fully accounted for recovery rate risk.

(1) For more details of this model, see Churm and Panigirtzoglou (2005), 'Decomposing credit spreads', *Bank of England Working Paper no. 253*.





(a) The April 2007 survey splits standards for the overall residential market into prime, non-traditional and sub-prime mortgages. The final data point is therefore a weighted average based on some approximate weights (70% prime; 15% non-traditional; and 15% sub-prime).

Chart 25 Implied volatility on US credit default swaps and the S&P 500 inferred from options



(a) The CDX crossover index comprises credit default swaps of 35 equally weighted US entities with an average rating of 8B.
(b) The VIX is an index of volatility in the S&P 500 implied from option prices.

However, any impact on investors' overall appetite for risky assets appears to have been limited. After the brief period of heightened volatility and general risk reduction, asset price movements and information from market contacts suggested that the so-called 'search for yield' resumed despite a pickup in long-term risk-free interest rates. Put another way, while investors may have reassessed the underlying riskiness of particular assets, the market price of risk remained low.

Moreover, in credit markets, there were continued signs of investors moving into lower-rated credits in search of returns. For example, there was a further increase in US syndicated lending, and a higher proportion of deals had low ratings (Chart 26).

Product innovations continued apace as investors sought ways to boost overall returns. For example, there have been several launches of constant proportion debt obligations (see box on page 199) and credit derivative product companies (see page 201).



Chart 26 US B-rated syndicated loan issuance

(a) Total syndicated loans rated AAA to B grade.

corporates(a)

Likewise in equity markets, the volume of initial public offerings (IPOs) continued to rise, especially in emerging market economies (EMEs). And debt issuance by EME corporates also rose strongly in recent months (Chart 27).



Chart 27 Foreign-currency bond issuance by EME

Sources: Dealogic and Bank calculations

(a) Refers to bonds issued in US dollars, euros, yen and sterling. The aggregate series for each region were crudely calculated at constant prices using a weighted average of euro-area, Japanese, UK and US price indices.

(b) Year to May 2000, current prices.

In foreign exchange markets, market contacts have suggested that so-called 'carry trades' were largely reinstated following the period of market turbulence earlier in the year. (In a foreign exchange carry trade, an investor typically borrows in the currency of a country with low interest rates and invests in assets denominated in the currency of another country paying higher rates of interest.)

#### Constant proportion debt obligations

Constant proportion debt obligations (CPDOs) are fixed-income instruments that provide a highly rated, leveraged corporate credit investment. CPDOs have attracted considerable interest by achieving high (AAA) ratings while offering returns significantly higher than other similarly rated assets (up to 200 basis points above Libor).

The first CPDO was launched in August 2006. Market contacts reported that actual and expected issuance contributed to the observed narrowing of credit spreads during 2006 Q4. However, issuance to date has been somewhat below the market's initial expectations. More recently, a new generation of CPDOs, which employ an asset manager to actively manage the portfolio, has been launched. This box describes the mechanics and potential implications of the first generation of index CPDOs.

#### **CPDO** mechanics

A typical CPDO structure uses a special purpose vehicle (SPV) to issue credit-linked notes. The note proceeds are used as collateral to write credit protection on investment-grade credit default swap (CDS) indices. To increase prospective returns, this credit exposure is leveraged.

The amount of leverage used is determined by a dynamic trading rule, which is a function of changes in credit spreads. Leverage is reduced when spreads narrow in order to lock in mark-to-market gains. By contrast, when spreads widen and the CPDO makes losses on its portfolio, leverage is raised to increase risk with the aim of making higher returns in future. The maximum leverage is, however, capped by the terms of the CPDO.

This business model of leveraging up to compensate for poor performance relies on credit spreads fluctuating around a long-run average level and some portion of the credit spread reflecting factors other than default risk (for example a liquidity or other risk premia).<sup>(1)</sup> If credit spreads only compensated investors for expected default losses, a greater exposure to the credit indices would imply higher expected default losses. The CPDO relies on there being additional compensation embodied in the credit spread, in conjunction with a long investment horizon, to generate sufficient returns to meet its liabilities.

The CPDO aims to close the gap between the present value of its liabilities (known as the target bond price) and the value of its credit portfolio (known as the net asset value (NAV)). This objective can leave the CPDO in one of three states (Chart A). First, it can 'cash-in' (Scenario 1). Here, the CPDO has sufficient funds to pay the remaining coupons and the note principal at maturity. On cashing-in, the CPDO sells its credit portfolio, placing the proceeds in a risk-free investment until maturity of its liabilities. Second, the CPDO can 'cash-out' (Scenario 2) if the NAV falls below some threshold (10% of the principal in this example). In this case, the CPDO is wound up before maturity, with investors realising potentially large losses. Third, a CPDO can pay all coupons in full, but not have enough funds to repay the principal in full (Scenario 3).

#### Chart A CPDO net asset value





#### Implications for financial markets

CPDOs combine an offer of high returns with a high credit rating, apparently a 'free lunch' for investors. The high credit rating largely stems from low expected losses from defaults, reflecting the CPDO investing in liquid CDS indices, which 'roll' every six months. At the roll, any credits that have deteriorated are removed from the index and replaced with less risky names. This regular rebalancing means that a CPDO's exposure to default risk is low. But this may not mitigate other risks such as mark-to-market volatility (ie market risk).

The high prospective return reflects CPDOs exposure to jump-to-default events. Indeed, a large and unexpected cluster of defaults could cause the CPDO to 'cash-out', forcing it to sell its portfolio into an already distressed market. In this event, investor losses could be severe. So while the high rating reflects a low expected loss in relatively benign conditions, investors are being compensated for a very small probability of a severe loss.

Otherwise, the leverage rule for CPDOs means that, by selling credit protection when spreads widen (and *vice versa*) they could potentially serve to dampen fluctuations in credit spreads; the opposite to constant proportion portfolio insurance (CPPI). The rule would, though, tend to mean that leverage increased during a period in which credit spreads generally rose.

For more information on the content of credit spreads, see Churm and Panigirtzoglou (2005), 'Decomposing credit spreads', *Bank of England Working Paper no. 253*.

One factor supporting the search for yield has been the large amount of risk capital available in the financial system. More generally, strong growth in the amount of broad money in circulation around the globe has continued to underpin asset markets. Indeed, domestic money growth remained strong in a number of countries, particularly in the United Kingdom, despite the further withdrawal of monetary accommodation (Chart 28). And these domestic monetary measures exclude cross-border money holdings, which reportedly remained strong in some countries. For example, non-residents' holdings of sterling deposits with the UK banking system increased by around 36% in the year to April 2007.





<sup>(</sup>a) Definitions of broad money vary between countries. This chart uses M4 for the United Kingdom, M2 for the United States, M3 for the euro area and M2+CDs for Japan

Financial markets have passed through a series of temporary bouts of volatility (in particular, in May 2005, May/June 2006 and more recently February/March 2007). This possibly provides support for the view that the risk-bearing capacity of the financial system has increased, perhaps due to financial innovation, including the growing use of credit risk transfer markets. These structural developments may have distributed risk more widely. In addition, the proliferation of more speculative investors, such as hedge funds, may in some cases support stable markets. For example, during the latest period of market turbulence in February, contacts reported that some hedge funds were important sources of market liquidity, which helped to stabilise markets.

Taken together, these factors might have justified a fall in the risk premia offered by some risky assets over recent years. For example, falls in credit premia may have been consistent with new instruments and more liquid credit transfer markets meaning that asset prices better match investors' assessment of underlying credit risk.

However, an alternative explanation is that lower levels of risk compensation may reflect an overly optimistic assessment of the likely level of asset market volatility going forward, a view perhaps accentuated by the continuing high levels of liquidity in financial markets. In this scenario, a large and pervasive enough shock might cause asset markets to adjust quite sharply as required risk premia increased. For example, a sharp increase in uncertainty about the macroeconomic outlook, and/or a shift in investors' aversion to risk, might cause an increase in the required compensation for bearing risk across all assets.

Of course, it is not clear what might be the likely trigger for such an adjustment. The continued withdrawal of global monetary accommodation has thus far proceeded smoothly. But recent market intelligence suggested some increased nervousness about the outlook for risky asset prices as global market interest rates have shifted higher. Arguably, the apparent rebalancing of economic growth away from the United States might have helped to lessen the prospect of a disorderly fall in the value of the dollar, although market contacts continued to cite this as a risk. They also pointed to the possibility that the failure of a large leveraged loan deal which left the lead intermediaries with unexpectedly large commitments could prompt a widespread disruption as investors adjusted their positions.

#### Developments in market structure

In the event of a significant disturbance to financial asset markets, there is great uncertainty surrounding how the shock would be transmitted through the financial system. In part, this uncertainty stems from changes in the nature and structure of both markets and financial institutions over the past few years.<sup>(1)</sup> More specifically, innovations to financial instruments have allowed many risks to be distributed to a wider investor base, and hedge funds and special purpose financing vehicles have taken on increasingly important roles as financial intermediaries.

#### Further innovations in tradable loan markets

Tradable credit markets have continued to develop at a rapid pace. The growth of credit default swaps on leveraged loans (LCDS), described in previous *Bulletins*, has led to the development of indices of LCDS, akin to the CDX and iTraxx indices of CDS contracts that reference corporate bonds. These LCDS indices, known as LevX in the European market and LCDX in the US market,<sup>(2)</sup> provide investors with a liquid instrument to take or hedge the credit risk on a diversified portfolio of loans.

One previous impediment to the development of these indices had been the issue of 'cancellability'. In broad terms, there was disagreement among market participants as to whether, when a loan is called, the CDS contract should be cancelled or

<sup>(1)</sup> This point is made in the speech by Paul Tucker on page 310–16 of this Bulletin.

<sup>(2)</sup> The launch of LevX was completed in November 2006; LCDX reprinted was launched in May 2007.

switched to reference another loan (to the same borrower) with similar characteristics. According to market contacts, participants wishing to hedge risks were said to favour the cancelling structure whereas traders were said to prefer non-cancellability. Moreover, conventions differ across jurisdictions with the United States having adopted the non-cancellable format and Europe the alternative cancellable structure.

These differences across jurisdictions, which had been a barrier to liquidity, have been resolved with the launch of the latest versions of the US (LCDX) and European (LevX) indices. Each will have cancellability as an option.

The creation of these indices may lead to tradable tranches of the LCDS indices and, in turn, a market in loan default correlation. Tranches of CDS indices referencing bonds have existed for several years and market contacts have reported that the investor base has widened recently.

#### Credit derivative product companies (CDPCs)

An example of a relatively new class of specialist investor in structured credit instruments are credit derivative product companies (CDPCs). CDPCs typically sell credit protection on low-risk (senior and super senior) tranches of CDOs.<sup>(1)</sup>

Although there are currently only a small number of CDPCs, ratings agencies have been reportedly processing a number of applications for new CDPCs. A top notch rating (AAA) is crucial to the business model of a CDPC as it means it can write protection on large notional values with relatively little capital. In particular, a high rating provides operational benefits as CDPCs do not have to post collateral based on mark-to-market changes in the value of their derivative positions. To obtain high ratings the firms must prove to the rating agency, among other things, the robustness of their proprietary model for determining their capital holdings.

Another characteristic of a CDPC is that it raises 'permanent capital' (ie equity capital, rather than term debt or other liabilities). This is important owing to the typical long horizon of the trading strategy.

#### Permanent capital

Attempting to access 'permanent capital' has led to a rise in the number of specialist investment vehicles and funds listed on stock exchanges. Several hedge funds and private equity firms have recently floated funds.

Accessing permanent capital is appealing to hedge funds because it can facilitate investment in relatively illiquid assets and long-horizon trading strategies without increasing any maturity mismatch between the fund's assets and liabilities. Many hedge funds already limit the risk of being forced to sell illiquid assets following unexpected investor redemptions by specifying 'lock-up periods' during which investors in the fund cannot withdraw money. But, unlike permanent capital, lock-up periods are typically fixed. At the end of the specified period, investors are free to withdraw funds.

As well as allowing fund managers to pursue different investment strategies, listed vehicles may widen the investor base for specific types of risk. More specifically, listed investment vehicles may provide investors with access to asset classes that may otherwise have been unavailable to them. For example, some listed vehicles invest in equity tranches of ABS and CDOs. Exposure to these more esoteric asset classes might otherwise be unobtainable to traditional equity investors.

#### UK real estate investment trusts

Commercial property is another asset class that has been opened up to equity investors in the United Kingdom following the introduction of real estate investment trusts (REITs) in the United Kingdom in January 2007. Similar legislation had been introduced in Japan, France and more recently in Germany. All follow the established US market.

The key advantage for a commercial property company in adopting a REIT structure is the advantageous tax status it affords. REITs are exempt from paying tax on income and capital gains from properties, provided they distribute a minimum 90% of their income as dividends (and meet certain other conditions). This allows the firms to pay out higher dividends, the key motivation for investors in REIT shares.

The establishment of REITs in the United Kingdom is consistent with increased demand for property exposure by institutional investors, such as pension funds, which to date may have been unwilling to invest in property directly owing to the illiquid nature of the asset and considerations related to property management. Indeed, the development has already spurred several investment funds dedicated to UK REIT shares, allowing investors to gain exposure to a diversified portfolio of commercial property assets.

So far, fourteen British commercial property firms with a combined capitalisation of around £35 billion have reportedly made the switch to REIT status. And seven other companies announced that they are actively considering conversion or the launch of a REIT vehicle in 2007.

#### Bank of England official operations

The Bank's balance sheet is managed in accordance with its policy purposes. These relate to the implementation of monetary policy; management of the Bank's foreign currency

The first generation of CDPCs wrote protection on individual corporates, rather than tranches of credit risk.

reserves; provision of banking services to other central banks; provision of payment services for the UK financial system and the wider economy; and management of the Bank's free capital and cash ratio deposits from financial institutions. The key event in the current review period related to the Bank's foreign currency reserves. On 13 March, the Bank successfully launched a \$2 billion three-year bond under its new debt issuance programme. Going forward, the Bank intends to issue annually in a transparent way under this new programme in order to finance its foreign currency reserves.

#### Sterling monetary framework<sup>(1)</sup>

The size of the Bank's balance sheet in aggregate rose modestly over the review period, reflecting a slight rise in notes in circulation and reserves account balances (Table A). On the asset side, the balance sheet temporarily expanded partly owing to £747 million of borrowing in the standing facilities on the final day of the maintenance period that ended on 9 May.

Members of the Bank's reserves scheme chose, on average, to hold slightly lower aggregate target reserves balances than during the previous review period (Chart 28). That was partly attributable to the previous review period spanning the calendar year end, when reserves targets were somewhat higher than the average level chosen since September 2006.

As well as influencing reserves targets, calendar effects can also impact on the level of money market interest rates. As reported in previous Bulletins, the calendar year end and particularly the month end last July seemed to contribute to a widening of the spread between market interest rates and Bank Rate. During the current review period, however, the spread of unsecured market interest rates to Bank Rate was fairly narrow and seemingly unaffected by the quarter end in March (Chart 29). This may reflect an ongoing process of market participants becoming more familiar with the new regime.



Chart 29 Spread to Bank Rate of unsecured sterling overnight interest rates(a)



<sup>(</sup>a) Sterling overnight index average (SONIA) fixing less Bank Rate

The average spread of SONIA to Bank Rate was 5.3 basis points, 2 basis points lower than over the previous review period. The volatility of this spread has also remained around

Table A Simplified version of Bank of England consolidated balance sheet(a)(b)

5

Liabilities	9 May	7 Feb.	Assets	9 May	7 Feb.
Bank note issue	40	38	Short-term sterling reverse repo	31	31
Reserves account balances	18	17	Long-term sterling reverse repo	15	15
Standing facility deposits	0	0	Ways and Means advance to HMG	13	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	11	12	Standing facility assets	1	0
Foreign currency denominated liabilities	11	11	Other sterling-denominated assets	4	4
			Foreign currency denominated assets	16	15
Total <sup>(c)</sup>	80	78	Total <sup>(c)</sup>	80	78

(a) The Bank Charter Act 1844 requires the Bank of England to separate the note issue function from its other activities. Accordingly, the Bank has two balance sheets: for Issue Department and Banking Department. See

 (b) Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures — see the Bank's 2006 Annual Report, pages 36-37.

(c) Figures may not sum to totals due to rounding

(1) This section reviews the period from 8 February to 9 May covering three maintenance periods

#### Chart 28 Aggregate reserves targets

the low levels observed since the launch of the Bank's new sterling monetary framework in May 2006 (Chart 30).

Chart 30 Folded cumulative distribution<sup>(a)</sup> of spread of sterling unsecured overnight interest rate (trade weighted) to Bank Rate

8 February–9 May 2007 9 November 2006–7 February 2007 3 August–8 November 2006 Cumulative frequency, per cent Cumulative frequency, per cent 50 50 40 60 30 70 20 80 10 90 100 0.0 + 0.1 0.5 0.4 0.3 0.2 0.1 0.2 0.3 0.4 0.5 Percentage points Sources: Wholesale Market Brokers' Association and Bank calculations

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.

The volatility of the spread of secured overnight interest rates to Bank Rate also remained narrow and the distribution of executed trades was narrower than those for either of the previous two review periods (**Chart 31**). The March quarter end did not cause significant volatility in secured overnight market interest rates, despite being a high transaction volume day for payments systems and coming just before Easter.

Chart 31 Folded cumulative distribution<sup>(a)</sup> of spread of sterling secured overnight interest rate (trade weighted) to Bank Rate



Sources: BrokerTec and Bank calculations

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale. The current arrangements for monetary policy implementation have now been in place for around one year. As reserves-scheme participants have familiarised themselves with the system, the secured market interest rate has settled close to Bank Rate, having been slightly higher during the second half of 2006 (Chart 32).





(a) ICAP GC overnight repo fixing less Bank Rate.

As in previous review periods, there were one or two days when secured market rates fell relative to Bank Rate. This was most pronounced towards the end of April, when a reported shortage of gilt collateral caused the spread between secured market rates and Bank Rate to widen. Market contacts have suggested that one factor underlying this could be that foreign central banks have diversified into sterling assets recently.<sup>(1)</sup> These institutions may be less active in gilt repo markets than other gilt investors, which in turn may have reduced the availability (or 'float') of some bonds.

Contacts also suggested that shortages of collateral may be more likely at certain times during the equity dividend season. This is because demand for collateral may increase, due to settlement banks making dividend payments from corporates to investors' accounts. This would mean that they needed more intraday liquidity from the Bank, which they borrow against eligible collateral such as gilts. Also, there may be an increase in institutions seeking to borrow equities over dividend payment dates, against which they pledge gilt collateral.

Shortages of gilt collateral can be partially alleviated by the Bank's open market operation (OMO) counterparties substituting eligible euro-denominated collateral for gilts in the Bank's repo operations. A crude measure of the relative

(1) See the box on page 360 of the Winter 2006 Bulletin.

Sources: Wholesale Market Brokers Association and Bank calculations.

cost suggests that euro-denominated collateral was slightly cheaper to deliver relative to gilt collateral compared to the previous review period (Chart 33). To some degree, this was reflected in an increase in the proportion of euro-denominated collateral delivered to the Bank in its OMOs.

Chart 33 Relative cost and use of euro-denominated EEA government securities<sup>(a)</sup>



<sup>(</sup>a) Intraday liquidity represents collateral posted by CHAPS Sterling members in the Bank's Real-Time Gross Settlement payments system. Data not available before 8 September 2006. (b) Cost of euro-denominated collateral relative to sterling-denominated collateral is calculated at the five-day moving average of the difference between the sterling and euro secured-unsecured (one-month) interest rate spread.

Reserves accounts, remunerated at Bank Rate, are designed to create the incentives to produce stable market rates throughout each maintenance period. The ability of individual reserves-scheme members to hold reserves-account balances above (below) target when market rates are below (above) Bank Rate should mean that market rates are drawn towards Bank Rate through a natural process of arbitrage. In aggregate, the Bank aims to provide sufficient liquidity through its OMOs for all reserve account holders, collectively, to meet their chosen reserves targets over the maintenance period.

The Bank publishes lists of reserves-scheme and standing facilities participants on its website. Since the 2007 Q1 *Bulletin*, there have been two changes to the lists of participants in these facilities. First, Egg Banking plc has ceased to be a participant in both schemes, following the completion of its purchase by Citi. Second, N M Rothschild & Sons Ltd has signed up to have access to standing facilities. The number of OMO counterparties has not changed.

Short-term OMOs are conducted on a weekly basis and, if necessary, routinely on the final day of the maintenance period, in order to correct for any excess or deficient reserves relative to the aggregate target. The size of the weekly short-term OMO increased until Easter, falling thereafter as demand for banknotes fell (**Chart 34**). The ratio of bids to the size of each operation (the 'cover ratio') generally fell during the quarter to levels observed in Summer 2006. The weekly OMO held on 17 May, which fell in the maintenance period immediately following the end of the review period for this *Bulletin*, received a slightly lower aggregate value of bids than was on offer in the operation. These funds were offered to, and taken by, the market in the subsequent scheduled OMO.





Several factors may explain lower cover in the Bank's OMOs. The slightly lower level of market rates relative to Bank Rate during the past three months may have made it more attractive for some counterparties to obtain cash from the market, rather than via the Bank's OMOs. Also, when participants perceive a substantial risk that cover will be low, they may tend to bid for lower amounts. Such a strategy would reduce the risk of their receiving more funds than they need and having to source the collateral for their allocation. To some extent, therefore, the expectation of low cover can be self-fulfilling. A similar dynamic would exist were cover expected to be especially high, which might encourage higher bidding. Indeed such behaviour was observed in 2006 Q4. Some contacts have suggested that weeks of low cover have been associated with lower spreads of secured rates to Bank Rate, although it is difficult to test this hypothesis formally owing to the short period for which data are available (Chart 35). Ultimately, the Bank's view on whether lower cover ratios matter depends on any impact on the stability of relevant market interest rates.

Three fine-tuning OMOs were conducted. On 7 March there was a fine-tune operation to drain £1.9 billion of liquidity, which was fully allocated; on 4 April the Bank offered to supply £1.96 billion, of which £784 million was allocated; on 9 May an offer to supply £1.27 billion did not receive offers.

The Bank also conducted monthly long-term repo operations at four different maturities. Each of these were fully covered.

Chart 35 Cover ratio in weekly OMOs versus spread to Bank Rate of secured market interest rates<sup>(a)</sup>



Cover fell slightly at the three-month maturity during this quarter (**Table B**). Yield tails were small or zero in all operations.

#### Table B Long-term repo operations

	Three-month	Six-month	Nine-month	Twelve-month
20 February 2007				
On offer (£ millions)	1,500	750	400	150
Cover	2.08	2.39	1.13	3.13
Weighted average rate <sup>(a)</sup>	5.390	5.508	5.590	5.640
Highest accepted rate <sup>(a)</sup>	5.405	5.515	5.590	5.640
Lowest accepted rate <sup>(a)</sup>	5.380	5.505	5.590	5.640
Tail <sup>(b)</sup> basis points	0.1	0	0	0
20 March 2007				
On offer (£ millions)	1,500	750	400	150
Cover	1.63	2.64	2.25	1.25
Weighted average rate <sup>(a)</sup>	5.4	5.516	5.591	5.630
Highest accepted rate <sup>(a)</sup>	5.405	5.520	5.591	5.630
Lowest accepted rate <sup>(a)</sup>	5.395	5.515	5.591	5.630
Tail <sup>(b)</sup> basis points	0.5	0.1	0	0
17 April 2007				
On offer (£ millions)	1,600	750	400	200
Cover	1.55	2.47	1.69	2.38
Weighted average rate <sup>(a)</sup>	5.512	5.671	5.730	5.800
Highest accepted rate <sup>(a)</sup>	5.527	5.671	5.730	5.800
Lowest accepted rate <sup>(a)</sup>	5.500	5.671	5.730	5.800
Tail <sup>(b)</sup> basis points	1.2	0	0	0

(a) Per cent.

(b) The yield tail measures the difference between the weighted average accepted rate and the lowest accepted rate.

In addition to short and long-term repo operations, the Bank intends to provide longer-term financing to the banking system through purchases, on an outright basis, of gilts and foreign currency bonds (with the cash flows swapped into sterling). The Bank will build up a portfolio of bonds over time broadly to match the maturity profile of gilts in issue. Operations to purchase bonds will buy up to six bonds in three maturity segments using an electronic system. This system will also be used to conduct the Bank's existing open market operations. These plans are outlined in further detail on the Bank's website<sup>(1)</sup> and are expected to be introduced in a phased manner from Autumn 2007.

#### Foreign currency reserves

Reflecting the remit given by the Chancellor of the Exchequer in 1997, the Bank holds its own foreign currency reserves in support of its monetary policy objective. The Monetary Policy Committee can use the Bank's reserves, subject to financial limits agreed by the Bank's Court of Directors, to intervene in the foreign exchange markets, as set out in the Bank of England Act.

The Bank's foreign currency reserves are separate from the UK Government's own foreign exchange reserves, which the Bank manages as the Treasury's agent. In steady state, the Bank currently intends to hold approximately  $\pounds$ 3 billion worth of foreign exchange reserves in highly liquid and creditworthy fixed-income securities.

As announced on 15 December 2006, the Bank will finance its own foreign currency reserves by a regular and highly transparent programme of issuance of foreign-currency denominated bonds. Each issue will be marketed and distributed via a group of banks. The new debt issuance programme has replaced the previous Euro Note programme.

The market risk in the Bank's foreign currency assets and liabilities will be closely matched. This means that any foreign currency intervention would initially open up a foreign currency exposure. Any intervention would be disclosed in the monthly reserves press release, in line with the procedure for Government's own foreign currency reserves.<sup>(2)</sup>

As with the previous Euro Note programme, securities issued under the new debt issuance programme will be under a Trust Deed governed by English Law. The Trust Deed incorporates collective action clauses (CACs) based upon the recommendations put forward by the G10 Working Group on Contractual Clauses in 2003.

The first issue under the new debt issuance programme was announced on 22 February and executed on 12–13 March. The \$2 billion three-year transaction, which was marketed and distributed by Barclays Capital, Citi, Goldman Sachs and JPMorgan, priced at approximately 17 basis points over the US Treasury yield curve and 25 basis points below Libor. The issue attracted orders totalling \$3.2 billion and was sold to investors in Africa, the Americas, Asia, Europe and the Middle East. Public sector institutions, including central banks, were the

<sup>(1)</sup> www.bankofengland.co.uk/markets/money/omo/outright\_purchases.htm.

<sup>(2)</sup> www.bankofengland.co.uk/markets/forex/reserves/published\_reserves.htm.

predominant buyers. The issue represented a successful launch of the new financing programme for the Bank's foreign currency reserves.

#### Facilitating the provision of payments services

Under current arrangements, the Bank holds just over €3 billion of euro-denominated assets to facilitate the United Kingdom's participation in the euro area's TARGET payment system. The €3 billion nominal note maturing on 27 January 2009 and a small proportion of the €2 billion nominal note maturing on 28 January 2008 currently provide the financing for the TARGET assets.

As described in the 2006 Q3 *Bulletin*, the Bank will no longer participate as a direct member when the European System of Central Banks (ESCB) replaces TARGET with TARGET2 in 2008. Any outstanding assets funded by the Notes will temporarily add to the Bank's foreign currency reserves, until the final note matures in January 2009.

#### Capital portfolio

The Bank holds an investment portfolio that is approximately the same size as the Bank's capital and reserves (net of equity holdings, eg in the BIS and ECB, and the Bank's physical assets) together with aggregate cash ratio deposits. Cash ratio deposits (CRDs) are non-interest bearing deposits lodged with the Bank by commercial banks and building societies with eligible sterling liabilities of over £500 million. Institutions that are required to place CRDs are (subject to certain other conditions) eligible to have access to the Bank's reserves scheme and standing facilities.

The Bank's 'free' capital and CRDs are partly invested in a portfolio of sterling-denominated securities. Securities purchased by the Bank for this portfolio are normally held to maturity; nevertheless sales may be made from time to time, reflecting for example, risk management, liquidity management or changes in investment policy.<sup>(1)</sup>

The bond portfolio currently includes around  $\pounds 2$  billion of gilts and  $\pounds 1$  billion of other debt securities. Purchases are generally made each month with purchase details announced in advance on the Bank's wire service pages. Over the current review period, gilt purchases were made in accordance with the announcement on 15 March:  $\pounds 20$  million each in March, April and May.

The remainder of the Bank's capital and reserves are invested in short-term repos, which are conducted as part of the Bank's OMOs.

# Research and analysis

PROMISE

# Public attitudes to inflation and interest rates

By Ronnie Driver of the Bank's Monetary Assessment and Strategy Division and Richard Windram of the Bank's Inflation Report and Bulletin Division.

Since 2001, the Bank of England has published an annual article discussing the results from the survey of public attitudes to inflation carried out by GfK NOP on behalf of the Bank. This article analyses the results of surveys up to February 2007. Given the relevance of inflation expectations to the current inflation outlook, this year's article focuses on the pickup in the general public's inflation expectations between 2005 and 2006, and the factors that may have contributed to that rise. It also considers the interactions with the public's attitudes to interest rates. Responses to other questions in the survey are discussed in the annex.

#### Introduction

In May 1997, the Government gave the Bank of England operational responsibility for setting interest rates to meet its inflation target. The Government's current remit requires the Bank to target an annual inflation rate of 2%, based on the consumer prices index (CPI). The level of interest rates deemed appropriate to meet this target is decided on a monthly basis by the Monetary Policy Committee (MPC).

Monetary policy is likely to be most effective if people understand and support the goal of price stability, as well as the use of interest rates to achieve it. The Bank uses a variety of methods to raise public awareness and to explain the decisions of the MPC. These include: the publication of minutes of the MPC's meetings, the *Inflation Report* and *Quarterly Bulletin*; appearances by MPC members before parliamentary committees; speeches, media interviews and regional visits by MPC members; the work of the Bank's regional Agents; and a range of educational material for schools.

To assess the degree of public awareness, GfK NOP carries out a quarterly survey on behalf of the Bank. This survey includes, among others, questions on the general public's perceptions of inflation over the past year, their expectations for inflation over the next year, and their views on interest rates. This survey provides valuable information that helps the MPC assess the prospects for inflation. The box on page 209 discusses the structure of the survey, the calculation of a measure of inflation expectations and the sampling methodology in more detail. Over the past year, MPC members have discussed the implications of an apparent pickup in inflation expectations between 2005 and 2006. In particular, they have considered the extent to which the rise reflected increases in observed inflation or whether it reflected other factors, such as the observed rates of nominal demand growth or money and asset prices. In their discussions, MPC members have considered a range of measures of inflation expectations — these are discussed further on pages 36-37 of the May 2007 Inflation *Report.* This article examines the behaviour of inflation expectations in the Bank/GfK NOP survey and some of the factors that may influence them, drawing on survey results up to February 2007.<sup>(1)</sup> It also considers the interaction between inflation expectations and the general public's views on interest rates. Responses to other questions in the survey are discussed in the annex.

#### Why do inflation expectations matter?

In the United Kingdom, the 1970s and, to a lesser extent, the 1980s were characterised by periods of high inflation. In 1981, Geoffrey Howe, then Chancellor of the Exchequer, observed that 'squeezing inflation out from an economy which has become accustomed to higher rates over a period of years cannot be an easy or painless task... the inflation mentality must be eradicated'. So why does this 'inflation mentality' (and inflation expectations in particular) play such an important role?

In bargaining over their nominal pay, employees will be concerned with the purchasing power of their post-tax

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<sup>(1)</sup> Results for the May 2007 survey were published on 14 June.

#### Assessing inflation expectations using the Bank/GfK NOP survey

Inflation expectations are not directly observed. To fill that information gap, in 1999 the Bank commissioned GfK NOP to conduct a regular survey of attitudes to inflation on its behalf. GfK NOP conducts the survey each February, May, August and November. Each survey covers around 2,000 individuals, with an additional 2,000 taking part in a more comprehensive exercise each February. Respondents are asked how they think prices of goods and services in the shops have changed over the past twelve months, and how they expect those prices to change over the next twelve months. Inflation expectations may vary across different people (as well as over time); for example, people will buy different goods and services and so will experience different movements in prices. For that reason, interviewers also collect information about the respondents, such as their age and income.<sup>(1)</sup>

Given uncertainties about future inflation, respondents' expectations will usually take the form of a range. In order to capture this, respondents are shown a series of showcards, each of which describes a range of price changes, and are asked to select which one best summarises their expectations.<sup>(2)</sup>

earnings; that is, the amount of goods and services that they can buy. For a given nominal wage, higher prices reduce real spending power. Wages tend to be set on an infrequent basis, increasing the onus on wage-setters to form a view on future inflation. If inflation is expected to be persistently higher, employees may seek higher nominal wages, which could in turn lead to upward pressure on companies' output prices and, hence, higher consumer prices.

Inflation expectations also affect inflation directly by influencing companies' pricing behaviour. If companies expect general inflation to be higher in the future, they may believe that they can increase their prices without suffering a drop in demand for their output.

Finally, inflation expectations also influence consumption and investment decisions. For a given path of nominal market interest rates, higher expected inflation by households and companies implies lower expected real interest rates. That would tend to make spending more attractive relative to saving. But if nominal market interest rates rise in response to expectations that the MPC will raise Bank Rate to curtail any inflationary pressure, real rates might not actually decline.

Overall, it is essential for the effectiveness of monetary policy that inflation expectations remain anchored to the target. Good estimates of inflation expectations, and understanding what influences them, are therefore important for successful monetary policy. To assess the macroeconomic implications of the survey results, it helps to create a summary measure. This requires an assumption about how individuals' specific expectations are distributed within these ranges. To obtain a specific estimate, individual expectations are assumed to be evenly distributed within each range. However the highest and lowest ranges are open-ended, so the distribution of individuals' specific expectations in these extreme ranges cannot be uniquely defined. This creates difficulty with calculating mean measures of expectations. Instead GfK NOP reports the median outcome, which is unlikely to fall within the extreme ranges.

As with all surveys, the Bank/GfK NOP survey is subject to sampling error.<sup>(3)</sup> The sample is designed and weighted to ensure it is representative of known population data on age, gender, social class and region.

(1) See Lombardelli and Saleheen (2003) for a discussion of the relationship between inflation expectations and demographic factors.

- (2) The showcards used are: 'Go down', 'Not change', 'Up by 1% or less', 'Up by 1% but less than 2%', 'Up by 2% but less than 3%', 'Up by 3% but less than 4%', 'Up by 4% but less than 5%', 'Up by 5% or more', 'No idea'.
- (3) For more information see the 'Survey methodology and notes' available at www.bankofengland.co.uk/statistics/nop/index.htm.

#### How are inflation expectations formed?

Economists usually assume that individuals form their expectations based on all the relevant information (including about the structure of the economy). In other words, they assume that people have 'rational expectations'. But in reality, it is unlikely that expectations are formed quite in this way. Rational expectations 'impute much more knowledge to the agents... than is possessed by an econometrician, who faces estimation and inference problems that the agents... have somehow solved' (Sargent (1993)).

In practice, different households may form their inflation expectations in different ways. Some households may form their expectations based on a structural relationship, such as the trade-off between inflation and unemployment or demand. Others may use an entirely empirical approach. For example, people may adapt their expectations based on their recent memories of inflation data.<sup>(1)</sup> Or they may use other information that they observe to be closely correlated with their experience of inflation. In addition, people may be totally forward looking, totally backward looking or some combination of the two. Some individuals may employ simple rules of thumb when forming their expectations. Others may simply assume that inflation will be equal to the inflation

(1) For example, see Orphanides and Williams (2003).

target set by the Chancellor.<sup>(1)</sup> And the method people use to form their expectations can change over time and over monetary policy regimes.<sup>(2)</sup>

In forming inflation expectations, people's behaviour will be influenced by the opportunity cost of gathering the information needed to make inflation forecasts. People should collect and process information until the cost of an additional piece of information outweighs the benefits of an improved forecast. Expectations are then said to be 'economically rational' (Feige and Pearce (1976)). If the costs of collecting information are high, expectations are more likely to deviate from the full information (rational expectations) benchmark.

Some data are difficult to collect. For example, people may find it costly to obtain information about the structure of the economy (about which there is considerable uncertainty, even among the economics profession). By contrast, other data are relatively easy to collect. For example, most macroeconomic data are readily available from the internet. And dissemination of information by the media can also play a part in reducing the costs associated with gathering information.

The next section uses some of these concepts to look at recent trends in public attitudes to inflation and, in particular, what might help to explain the pickup in inflation expectations between 2005 and 2006.

#### Recent trends in public attitudes to inflation

The Bank/GfK NOP survey asks respondents how they expect 'prices in the shops to change over the next twelve months'. This is designed to reflect a concept of inflation the general public are likely to be familiar with, rather than any specific measure of inflation (such as the CPI inflation rate). Although necessary to gather meaningful information, this can lead to complications when making comparisons with official measures. There may also be significant variation in the way different respondents interpret the question. It is worth noting that, given the question, references to inflation expectations in this article are to the one year ahead horizon, unless otherwise specified.

The Bank typically uses the survey median to summarise the distribution of responses to the questions on public attitudes to inflation (see the box on page 209). **Chart 1** shows that median inflation expectations have been fairly stable over much of the history of the survey. However median expectations picked up at the start of 2006 and have remained elevated since then: expectations were on average 0.5 percentage points higher in 2006 than in 2005, and the February 2007 survey showed that median expectations were unchanged at 2.7%, a series high. So what could have driven the pickup between 2005 and 2006?

Chart 1 Bank/GfK NOP inflation perceptions and expectations<sup>(a)</sup>



As discussed above, one potential explanation is that respondents' expectations of inflation over the next year are closely linked to their perceptions of current inflation. The survey asks respondents how they think the prices of 'goods and services' have changed over the past twelve months. According to the Bank/GfK NOP survey, inflation expectations over the next twelve months have typically followed perceptions of current inflation closely: the correlation between the two since the survey began in 1999 is 0.92.

This correlation is based on the aggregate series and may mask differences at a disaggregated level. Using the February 2007 survey results, **Chart 2** plots each respondent's perception of inflation over the past year against their expectation of inflation over the next year. The width of each bubble corresponds to the proportion of respondents holding that view. So if all respondents report that their perceptions and expectations are the same, then all the bubbles would lie on the 45° line. The chart shows that the largest bubbles do indeed lie on this line: for just over half of the respondents who expressed an opinion on both questions, inflation over the next twelve months was expected to be in the same range as their perception of past inflation. This confirms that, even at a disaggregated level, the majority of households tend to report similar perceptions and expectations of inflation.

The Bank has explored the relationship between inflation expectations and perceptions in previous publications.<sup>(3)</sup> The

<sup>(1)</sup> For example, Brazier et al (2006) present a model in which agents use 'heuristics' to determine their inflation expectations. In some periods agents use an 'inflation target' heuristic, where they expect inflation to be equal to the target. In other periods, they use a 'lagged inflation' heuristic, where their expectation is a function of previous inflation outturns.

<sup>(2)</sup> Erceg and Levin (2003) show that US surveys suggest that people change their inflation expectations in response to monetary policy shifts. Farmer, Waggoner and Zha (2007) show that not only does the current monetary policy regime matter for expectations — the probability that this policy may change in the future is also important.

<sup>(3)</sup> See, for example, Ellis (2006) or pages 24–26 of the November 2005 Inflation Report.

next section discusses why the two may be related in more detail.

Chart 2 Individual views of inflation perceptions and expectations<sup>(a)</sup>



Sources: Bank/GfK NOP survey and Bank calculations

(a) Respondents who answered either question 'No idea' are excluded. As respondents are asked to select from inflation ranges that typically cover one percentage point, some bubbles may be parity obscured.

# Potential links between inflation expectations and inflation perceptions

Following an inflationary shock, inflation may take time to adjust back to the target. The speed of this adjustment will depend upon a number of factors. These include: the persistence of any inflationary shock; the response of monetary policy; and the way in which inflation expectations are formed. Consequently, close correlations between people's perceptions and expectations of inflation, such as seen in the data, are subject to a number of different interpretations.

For example, a one-off increase in the price *level* should only lead to a temporary rise in the *inflation rate*. In this instance, inflation perceptions may pick up by more than inflation expectations, such that a wedge opens up between the two. But if the shock is deemed to be more persistent, perhaps reflecting underlying inflationary pressures in the economy, inflation expectations may also increase, and any wedge with perceptions would be smaller.

In addition, any monetary policy response deemed necessary will take time to have its full effect on inflation. Since the Bank/GfK NOP survey measures inflation expectations over the next twelve months, it may therefore be entirely rational for respondents to expect any perceived deviation of inflation from target to persist over that period.<sup>(1)</sup> In this case, any wedge between people's perceptions and expectations would also be smaller.

And the relationship will also be affected by the time households take to adjust their own expectations towards target. For example, inflation expectations might take time to return to target if it is costly for households to gather the necessary information. But the speed of adjustment will also be influenced by respondents' attitudes to interest rates, including their understanding of the monetary policy framework and the transmission mechanism. The public's attitudes to interest rates are discussed later in the article.

#### Influences on inflation perceptions

If people's expectations are related to their perceptions of current inflation, what factors affect these perceptions? One key driver is likely to be the official data. Another may be the inflation rates of 'high-visibility' items. Finally, discussions in the media could exert an influence on households' attitudes to inflation. This section considers these hypotheses in turn.

#### Correlations with official inflation data

As mentioned previously, the Bank/GfK NOP survey does not ask about people's views on a specific measure of inflation. So **Chart 3** shows the survey median inflation perception alongside a selection of headline inflation rates.<sup>(2)</sup> CPI inflation — the measure targeted by the MPC — increased from 1.8% in March 2006 to 3.1% in March 2007 before falling back to 2.8% in April.<sup>(3)</sup> As discussed in the May 2007 *Inflation Report*, increases in food and energy prices accounted for around half of that rise. But the inflation rates of goods and services besides food and energy have also picked up over the past year. In part that may reflect developments relating to specific components, but it is also consistent with a broader pass-through of higher costs and the strength of demand.<sup>(4)</sup>

The upper panel in **Table A** presents simple correlations between the survey-based measure of inflation perceptions and the data shown in **Chart 3**. Simple correlations say nothing about causal relationships and, given that the survey asks about prices of 'goods and services' rather than the inflation rate as measured by any specific index, it is not clear which measure of inflation should be best correlated with the responses. In addition, these correlations are sensitive to the period over which they are calculated. So any conclusions should be treated with caution. Overall, however, inflation perceptions do appear to have some correlation with the current inflation data.

<sup>(1)</sup> It should be noted that measures of longer-term inflation expectations (such as those derived from financial markets) have also picked up a little since the middle of 2005. But interpreting movements in market-based breakeven inflation rates is not straightforward. For example, they contain an inflation risk premium and are linked to RPI rather than CPI inflation.

<sup>(2)</sup> This analysis uses the consumer prices index (CPI), the retail prices index (RPI) and the retail prices index excluding mortgage interest payments (RPIX). For further discussion on the differences between these measures, see Office for National Statistics (2004).

<sup>(3)</sup> At the time this *Bulletin* went to press, the May 2007 CPI data had not been published.

<sup>(4)</sup> See the box on page 28 of the May 2007 Inflation Report.





Sources: Bank/GfK NOP survey and ONS

(a) Median responses

 Table A Correlations between current inflation and inflation perceptions<sup>(a)</sup>

	CPI	RPI	RPIX
1999–2007	0.53	0.55	0.49
2004–07	0.63	0.26	0.71
2005–07	0.59	0.20	0.66

## Correlations between current inflation and inflation $\ensuremath{\mathsf{expectations}}^{(a)}$

	CPI	RPI	RPIX
1999–2007	0.44	0.51	0.50
2004–07	0.36	0.17	0.58
2005–07	0.54	0.17	0.61
2005-07	0.54	0.17	0.61

Sources: Bank/GfK NOP survey and ONS

(a) Correlations between the median Bank/GfK NOP inflation perceptions/expectations and the average annual inflation rates in the three months prior to the survey month.

As discussed previously, the general public may use information on the official inflation target measure to help form their inflation perceptions. Until December 2003, the target was specified in terms of RPIX inflation but then subsequently changed to CPI inflation. So the correlation between perceptions and CPI inflation might be expected to have increased in recent years. Indeed, this correlation has increased slightly since the inflation target was changed. But perceptions remain most closely correlated with RPIX inflation and this correlation has also increased towards the end of the sample period. So it could be that inflation perceptions have been influenced more in recent years by specific movements in inflation that are common to both CPI and RPIX inflation measures. The correlation of RPI inflation with perceptions of inflation has declined in recent years.

Given the close relationship between inflation expectations and perceptions, it is unsurprising that similar results hold when examining correlations between expectations and current inflation data (see the lower panel in **Table A**). The correlations are slightly lower compared with those based on inflation perceptions; this may reflect the additional degree of uncertainty when forming expectations about future inflation. It may also reflect people's beliefs about the extent to which any movements in actual inflation are expected to persist.

So both inflation perceptions and expectations appear to have a reasonably close relationship with actual inflation data. A key question is whether perceptions and expectations have increased by more or less than would have been expected on the basis of past correlations, given the movements in actual inflation. One way to answer this question is by using simple regression techniques to estimate the relationship between the survey measures of inflation perceptions and expectations and actual inflation. These regressions take the form:

$$\pi_{i,t} = \alpha + \beta \pi_{i,t} + \varepsilon_t \tag{1}$$

where  $\pi_{j,t}$  represents either the Bank/GfK NOP median perception of inflation over the past year or expectation of inflation in the following year,  $\alpha$  is a constant,  $\pi_{i,t}$  is a measure of current inflation, and  $\varepsilon_t$  is an error term. The regressions were run three times each, using the inflation rates of CPI, RPI and RPIX as the explanatory variables.<sup>(1)</sup> The results are shown in **Charts 4** and **5**, where the swathes show the range of fitted values from the regressions.

## Chart 4 Explaining Bank/GfK NOP perceptions with measures of current inflation



Sources: Bank/GfK NOP survey, ONS and Bank calculations

(a) Median responses.
 (b) The range of fitted values shows the difference between the maximum and minimum fitted values from the three regressions (CPI, RPI and RPIX) at each point in time.

The results suggest that, towards the end of the sample period, both perceptions and expectations were higher than would

<sup>(1)</sup> Measures of 'current inflation' are based on the average annual inflation rates in the three months prior to the survey month. The results are fairly robust to using alternative measures of 'current inflation', such as the inflation rate in the same month as the survey is conducted.

have been expected simply by extrapolating from past correlations on the basis of current inflation alone. It is noteworthy that the level of expectations was lower during 2005 than would have been suggested by the average relationship over the past. So the pickup in inflation expectations since then is also larger than can be explained by this simple metric.

## Chart 5 Explaining Bank/GfK NOP expectations with measures of current inflation



#### (a) Median responses.

(b) The range of fitted values shows the difference between the maximum and minimum fitted values from the three regressions (CPI, RPI and RPIX) at each point in time.

Given that the rise in both inflation perceptions and expectations was greater than the past relationship with inflation would suggest, it is likely that other factors have influenced households' responses. One possibility is that medium-term inflation expectations have risen, perhaps reflecting the observed growth rates of nominal demand or money and asset prices. An alternative explanation is that households' perceptions and expectations have been influenced by movements in the prices of a subset of 'high-visibility' purchases or by discussions of inflation in the media. The next section explores these last two explanations in greater detail.

#### Relationship with inflation visibility

The headline rate of CPI inflation can mask a wide dispersion of price changes across different items. Prices of some goods may be falling, while prices of others may be rising more quickly (**Chart 6**). In addition there is likely to be significant variation in the amount and frequency of different households' expenditure on the various goods and services that make up the CPI basket. It may be difficult for consumers to keep track of all these different prices and, hence, accurately judge the current rate of overall inflation.

Given the wide variation in price changes across items, households' perceptions of inflation may be influenced more by movements in the prices of certain 'high-visibility' items. One way of measuring an item's visibility is how important the item is to the consumer. For example, consumers require basic sustenance and heating/lighting for their homes. Consequently, they may be particularly aware of swings in food and gas and electricity prices. When these prices are rising rapidly, households' perceptions of inflation may increase by more than aggregate inflation, which may in turn feed through into higher inflation expectations.

## Chart 6 Distribution<sup>(a)</sup> of price changes of subcomponents of the CPI



(a) The limits of the dark band in the chart are the 35th and 65th percentiles of that distribution. The pair of lighter bands include a further 30% of the items in the basket, so that the entire coloured region includes 60% of the items in the basket.

Food and gas and electricity prices have risen sharply since March 2006, and account for a significant part of the pickup in CPI inflation since then (**Chart 7**).<sup>(1)</sup> And it does appear that inflation expectations have been more highly correlated with food and gas and electricity price inflation than with aggregate CPI inflation over the past couple of years (**Table B**).

## Chart 7 Contributions to the increase in annual CPI inflation since March 2006<sup>(a)</sup>



(a) Contributions to the cumulative increase in annual CPI inflation(b) Includes vehicle fuels and lubricants.

(1) See the box on page 28 of the May 2007 Inflation Report.

	Food and non-alcoholic beverages inflation	Electricity, gas, liquid and solid fuels inflation	CPI inflation
1999–2007	0.12	0.68	0.53
2004–07	0.58	0.75	0.63
2005–07	0.58	0.75	0.59

#### Table B Correlations with inflation perceptions<sup>(a)</sup>

#### Correlations with inflation expectations<sup>(a)</sup>

	Food and non-alcoholic beverages inflation	Electricity, gas, liquid and solid fuels inflation	CPI inflation
1999–2007	0.25	0.54	0.44
2004–07	0.52	0.53	0.36
2005–07	0.58	0.69	0.54

Sources: Bank/GfK NOP survey and ONS

(a) Correlations between the median Bank/GfK NOP inflation perceptions/expectations and the average annual inflation rates in the three months prior to the survey month.

An alternative way of thinking about visibility is the degree to which members of the general public can observe discussions of inflationary pressure in the press and media. For example, more frequent discussions of inflation may increase awareness of inflation among members of the general public. It may also prompt them to reassess their views on a more regular basis, or may increase or improve the information they have available when forming their expectations. Unfortunately, the Bank/GfK NOP survey only goes back to 1999, which is a relatively short time period in which to examine the relationship with media coverage. However, since people's perceptions and expectations of inflation are well correlated with RPIX inflation, this can be used as a proxy for inflation expectations further back.

**Chart 8** shows the relationship between the frequency with which inflation is discussed in a range of UK newspapers, RPIX inflation and median Bank/GfK NOP inflation expectations. The correlation between media coverage and actual RPIX inflation is 0.48 over the period 1988–2007. But the correlation is much better over recent years — it rises to 0.70 over the period 1999–2007, and 0.80 over the period 2003–07. The number of stories about inflation has picked up sharply over the past year, and is only slightly below its 1990 peak. The fact that the timing of the recent increase in media discussions coincides with the pickup in the Bank/GfK NOP measure of expectations suggests that media discussions may have played some role in pushing up households' expectations of future inflation.

However the relationship between media coverage of inflation and inflation expectations is likely to be significantly more complicated than this analysis suggests. For example, greater newspaper coverage increases the amount of information easily available to households, meaning that their inflation expectations may lie closer to a rational expectations benchmark (Carroll (2001)). To the extent that monetary policy is credible, this benchmark should place greater weight on the inflation target, so it is not clear that expectations should automatically rise when media coverage increases.

# **Chart 8** RPIX inflation, Bank/GfK NOP inflation expectations and frequency of media inflation discussions



Sources: © 2007 Factiva, Inc. All rights reserved, Bank/GfK NOP survey and ONS

(a) Based on Factiva data. Newspapers included in the search are the Daily Express, the Daily Mail, the Daily Miror, the Daily Star, The Daily Telegraph, the Financial Times, The Guardian, The Independent, The Independent no Sunday, The Mail on Sunday, the News of the World, The Observer, The People, The Sun, the Sunday Miror, The Sunday Telegraph, The Sunday Times and The Times. The search has been designed to count the number of headlines containing the word "inflation". It has been refined to attempt to exclude headlines referring to non-UK inflation.

In addition, the analysis presented here does not distinguish between articles referring to more or less inflationary pressure. Articles that argue that inflation will remain high are likely to have different implications for inflation expectations than those which argue that inflation is likely to fall sharply. So, while the content and nature of the discussion in the media is likely to be important, more detailed work is required to assess the relationship between media coverage and inflation expectations.

#### Conclusions on inflation expectations

Based on the recent Bank/GfK NOP surveys, inflation expectations remain elevated. The analysis presented so far has discussed how the rise in inflation expectations coincided with increases in people's perceptions of current inflation, which in turn may have been influenced by increases in observed inflation, or the inflation rates of highly visible subcomponents, such as food and gas and electricity prices. In addition, discussions of inflation in the media could have played a role in shaping people's perceptions of current inflation and expectations of future inflation. The MPC has also discussed how expectations may have been influenced by strong observed growth rates of nominal demand, money and asset prices.

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Understanding the likely future path of inflation expectations is essential for successful monetary policy. This path will depend on the persistence of the factors that people perceive to be driving inflation and on the monetary policy response. The wedge that has opened up recently between perceptions and expectations of inflation could be consistent with at least some of the pickup in inflation being perceived as temporary. If this is the case, people's expectations should begin to fall back. But if expectations have been pushed up by other, more persistent, factors, they may take longer to adjust.

In the May 2007 *Inflation Report*, the MPC projected inflation to fall back towards the target as the effect of lower domestic energy price inflation feeds through. But the Committee also placed some weight on the possibility that inflation expectations adjust more slowly, based on underlying strength in growth rates of nominal demand and money. The speed of adjustment will depend in part on the expected and actual monetary policy responses. The remainder of this article examines the interaction between inflation expectations and interest rate expectations.

#### Attitudes to interest rates

The evolution of inflation expectations is likely to depend in part on any expected response of monetary policy. As discussed earlier, the Bank/GfK NOP survey asks about people's inflation expectations over the next twelve months. If people expect monetary policy to respond in a way that will affect inflation over this horizon, then a wedge may open up between people's inflation perceptions and expectations, as has been observed since the end of 2005.

The Bank/GfK NOP survey asks several questions that assess people's views on interest rates and their understanding of the transmission mechanism of monetary policy. The next section discusses: (a) the degree to which people's perceptions and expectations of interest rates track actual movements in retail rates; and (b) the speed with which people expect interest rates to affect inflation. The responses to these questions may provide some insights into the complex relationship between expectations of interest rates and inflation.

# Interest rate perceptions, expectations and movements in retail rates

*Question 5* of the Bank/GfK NOP survey asks respondents 'how would you say interest rates on things such as mortgages, bank loans and savings have changed over the past twelve months?'. Since the start of August 2006, Bank Rate has increased by 1 percentage point. Changes in Bank Rate affect the cost of finance for high street banks, and so affect the prices of their loan and savings products. It is still too early to assess the impact of the 25 basis point increase in Bank Rate in May on retail effective interest rates.<sup>(1)</sup> But as might be expected, most of the 75 basis point rise that occurred between August 2006 and April 2007 was passed through to variable-rate products. But the average overall effective mortgage rate only increased by about half the change in Bank Rate over the same period (**Table C**).<sup>(2)</sup> This partly reflected the increasing prevalence of fixed-rate mortgages over the past few years.

Table C Bank Rate and effective household interest rates

Per cent

	July 2006	April 2007	Change (basis points)
Bank Rate	4.50	5.25	75
Borrowing rates			
Mortgages	5.29	5.65	36
of which:			
Variable	5.46	6.12	66
Fixed	5.06	5.13	7
Unsecured borrowing	9.43	9.82	39
of which:			
Variable <sup>(a)</sup>	9.69	10.44	75
Fixed	9.06	8.94	-12
Deposit rates			
Sight	2.71	3.11	40
Time	4.07	4.81	74

(a) Includes credit card borrowing, overdrafts and variable-rate personal loans.

Consistent with movements in retail rates, the net balance of respondents who perceived that interest rates had increased over the past year rose to +70 in the February 2007 survey (Chart 9). This was driven by a significant increase in the number of respondents who thought interest rates had risen a lot — this proportion rose to 26%, from an average of 12% over 2005 and 2006.

*Question* 6 asks 'how would you expect interest rates to change over the next twelve months?'. The net balance of respondents expecting interest rates to rise has picked up sharply since the trough in the middle of 2005, but has remained relatively steady over the past few quarters **(Chart 9)**.

Over the past couple of years, the perceptions and expectations balances have come together. One possible explanation for this convergence may be that interest rate expectations are increasingly based on people's perceptions of recent movements in interest rates. Indeed the individual data show that, in February 2007, 63% of respondents who expressed an opinion on both questions reported the same interest rate perceptions and expectations. This compares to an average of 44% over the eight surveys between February 2003 and November 2004. But this increased

Effective interest rates measure the average rate paid on the total stock of outstanding balances.

<sup>(2)</sup> See pages 14–15 of the May 2007 Inflation Report.

percentage is also consistent with people believing that recent trends in interest rates will continue.

Chart 9 Bank/GfK NOP interest rate perceptions and expectations



Source: Bank/GfK NOP survey

(a) The net percentage balances are constructed by subtracting the percentage who thought rates had gone/would go down from the percentage who thought they had gone/would go up.

**Chart 9** also shows that, since the inception of the survey in 1999, members of the public have never said, on balance, that they expected interest rates to fall over the following twelve-month period, even during periods of persistent cuts in Bank Rate. But respondents do appear to be good at judging the momentum in interest rate cycles. **Chart 10** shows the net balance of respondents expecting retail interest rates to increase over the next year, alongside the actual percentage point change in effective household borrowing and saving rates over the same period. The correlation between the public's expectations and these measures is high

Chart 10 Bank/GfK NOP interest rate expectations<sup>(a)</sup> and changes in effective household interest rates<sup>(b)</sup>



Sources: Bank/GfK NOP survey and Bank of England

(a) The net percentage balance is constructed by subtracting the percentage who thought rates would go down over the next twelve months from the percentage who thought they would go up.

(b) The annual percentage point changes in effective household interest rates are calculated using averages of the annual changes in the three months before the survey. The series are lagged by four quarters to ensure comparability with the survey measure. (around 0.80). This suggests that on balance, respondents have a reasonably good understanding of the MPC's reaction function and the relationship between Bank Rate and retail rates.

#### The relationship between interest rates and inflation

An important question for analysing the links between interest rate expectations and inflation expectations is the speed with which people believe changes in interest rates can affect inflation. Typical estimates suggest that the maximum effect on inflation from changes in monetary policy occurs after around 18–24 months (see, for example, Harrison *et al* (2005)). But there is considerable uncertainty around this, and some respondents might believe that interest rates affect inflation much more rapidly or more slowly. Alternatively, if people believe that interest rates have no effect on inflation over the next year, then the survey measures of interest rate and inflation expectations should be independent.

*Question* 9 asks respondents to indicate how strongly they agree with the statements: (a) 'a rise in interest rates would make prices in the high street rise more slowly in the short term — say a month or two'; and (b) 'a rise in interest rates would make prices in the high street rise more slowly in the medium term — say a year or two'. On balance, more people thought that higher interest rates will make prices rise more slowly in the medium term than in the short term. In the February 2007 survey, there was an increase in both net balances (Chart 11).





Source: Bank/GfK NOP surv

(a) The net percentage balances are constructed by subtracting the percentage of respondents who disagreed with the statement from the percentage who agreed with it.

# The link between interest rate expectations and inflation expectations

In an inflation-targeting environment with a credible central bank, interest rate expectations and inflation expectations should be closely linked. However this link is likely to be complex and hard to identify.
One hypothesis is that if people expect interest rates to be higher, they might have lower inflation expectations. Alternatively, if people have higher inflation expectations, they may expect interest rates to go up. This highlights the interdependencies between people's inflation expectations and interest rate expectations.

**Chart 12**, which uses the individual-level data to decompose the distribution of people's interest rate expectations by their inflation expectations, shows that there is a higher concentration of people who expect inflation to be higher among those who expect interest rates to rise. This result may support the latter hypothesis. But this could equally be consistent with the first hypothesis: reported inflation expectations may have been even higher had people not factored in a policy response.

Chart 12 Comparing inflation expectations across groups with different interest rate expectations<sup>(a)</sup>



Sources: Bank/GfK NOP survey and Bank calculations

(a) Based on the February 2007 survey. Respondents who answered either question 'No idea' are excluded.

In summary, over the past year the net percentage balance of respondents expecting interest rates to increase over the next twelve months has picked up sharply, although that proportion fell back slightly in the February 2007 survey. Members of the public have always, on balance, expected interest rates to rise. However, respondents are good at judging momentum in interest rate cycles. A higher proportion of people think that higher interest rates will make prices rise more slowly in both the short term and the medium term. The interaction of interest rate expectations and the speed with which changes in interest rates are expected to affect inflation are likely to play a role in influencing inflation expectations. The results in February 2007 show that people with higher interest rate expectations also have higher inflation expectations. But interpreting this empirical finding is difficult, given the interdependencies between the two.

#### Conclusions

Overall, it is essential for the effectiveness of monetary policy that inflation expectations remain anchored to the target. The Bank/GfK NOP survey suggests that the general public's inflation expectations have picked up somewhat since 2005. A key issue for policy is how long households expect that higher inflation to persist, and the extent to which those expectations are built into wages and prices.

In the May 2007 *Inflation Report* the central projection assumes that inflation expectations return to the target over time. But assessing how rapidly this happens under alternative monetary policy settings is complicated by the fact that different households may form their inflation expectations in different ways. This article has investigated some factors that could have contributed to the rise in inflation expectations in the Bank/GfK NOP survey since 2005 in order to understand better how inflation expectations are formed.

One possibility is that expectations are formed mainly on the basis of people's perceptions of current inflation. These in turn may have been influenced by the increases in observed headline inflation, or the inflation rates of highly visible subcomponents, such as food and gas and electricity. In addition, discussion of inflation in the media could also have played a role in shaping people's expectations. As discussed in the May 2007 Inflation Report, the MPC expects CPI inflation to fall back during the remainder of 2007. So if expectations are formed mainly on the basis of these factors, they might fall back as energy price pressures ease. But if expectations are more heavily influenced by observed rates of nominal demand growth, money and asset prices, or remain focused on the recent high inflation outturns, they may move back more slowly. In the May 2007 Inflation Report the MPC placed some weight on this latter possibility. But there remain significant uncertainties in this area.

#### Annex Other economic conditions and attitudes to monetary policy

This annex discusses the responses to the other questions in the survey based on information up to February 2007.

The responses to *Questions 3* and *10* help gauge public support for maintaining low and stable inflation. *Question 3* asks whether Britain's economy would be stronger or weaker as a result of higher inflation. Over time the proportion of people who think that higher inflation would weaken the British economy has been steadily rising: at 56%, the February 2007 reading is the highest in the series. The proportion who thinks higher inflation would make little difference to the economy has declined, while the proportion who thinks the economy would be stronger has remained broadly unchanged since the survey's inception.

*Question 10* asks 'If a choice had to be made, either to raise interest rates to try to keep inflation down; or keep interest rates down and allow prices in the shops to rise faster; which would you prefer?'. In February 2007, 56% of respondents preferred interest rates to be higher compared with only 21% who said they would prefer higher inflation. Those proportions have been broadly unchanged over the past four years. The responses to *Questions 3* and *10* suggest that there is general support for low inflation among the general public.

*Question 4* asks whether people think that the inflation target is too low or too high. In February 2007, 53% of respondents thought that the target was 'about right'. That is down a little from a peak of 62% in May 2005.

*Questions* 7 and 8 ask respondents about their views on what would be best for interest rates. The net balances show that more people think that it would be best for both the economy as a whole, and for them personally, if interest rates were lower (**Chart A1**). Around 40% of respondents in February 2007 reported that it would be best for them personally if interest rates went down, while around 20% reported that they would benefit if rates rose.

The belief that it would be best for people individually if interest rates were lower is possibly associated with the high degree of mortgage-financed owner occupation in the United Kingdom. Around 40% of respondents in February 2007 were mortgagors, and indeed 58% of these people reported it would be best for them if interest rates were lower. A further 18% of mortgagors reported that it would be best for them if rates stayed where they were, and 13% of them said it would make no difference. By contrast those people who own their homes outright may be more likely to have more financial assets than liabilities. In February 2007, 27% of respondents reported that they owned their homes outright, and within that subsample, around 40% reported that it would be best for them if interest rates rose.

Chart A1 Respondents' views on what would be best for interest rates



Source: Bank/GfK NOP survey.

(a) The net percentage balances are constructed by subtracting the percentage who thought it would be best for rates to go down from the percentage who thought it would be best for them to go up.

*Questions 11* and *12* assess whether people are aware of the way monetary policy works in the United Kingdom. *Question 11* asks whether people know which group of people meets to set the level of interest rates. The interviewer does not present respondents with a series of options in this question. The proportion of respondents who offer an answer has been rising slightly in recent years, although around half the respondents still say they do not know. In the February 2007 survey, 36% of respondents answered 'Bank of England', and a further 5% answered 'the MPC'. These two proportions have been almost unchanged throughout the history of the survey.

*Question 12* also asks the general public to identify which group sets interest rates, but in this case the respondents are asked to choose from a series of possible responses. In February 2007, 70% of respondents correctly thought that the Bank of England sets interest rates. But 12% thought rates were set by government ministers, and 11% had no idea. These proportions are also little changed since 2003.

*Question 13* asks 'In fact, the decisions are taken by the Monetary Policy Committee of the Bank of England. Which of these do you think best describes the Monetary Policy Committee?'. In the February 2007 survey, 34% of respondents thought that the MPC is an independent body, partly appointed by the government. The proportion of respondents who thought that the MPC is part of the government fell slightly to 15% while 24% of respondents thought that the MPC is a completely independent body. But 8% still think that the MPC is a government-appointed quango and 21% of respondents have no idea.

*Question 14* asks whether participants are satisfied with the way the Bank of England is doing its job of setting interest rates to control inflation. Over the past few years, the majority of respondents have been satisfied with the Bank, although this majority has fallen a little since the start of 2006 (**Chart A2**). In February 2007, 50% reported they were very satisfied or fairly satisfied, while 13% reported they were fairly dissatisfied or very dissatisfied. The proportion who were neither satisfied nor dissatisfied remained unchanged at 25%. The net balance of respondents who are satisfied with how the Bank is doing its job fell by 6 percentage points in February 2007 to +37, its lowest since May 2000.





Source: Bank/GfK NOP survey

**Chart A3** shows the distribution of responses to this question by age. Respondents who said 'no idea' are excluded from this analysis to account for the possibility that some groups are more likely to express an opinion than others. The results show that it is the youngest age groups that are most dissatisfied with the Bank. This could in part reflect their lifetime inflation experiences: the older age groups will have had greater experience of the problems associated with high inflationary episodes in the past. It is also possible that the younger age groups have more debt (both secured and unsecured) relative to their older counterparts, such that they have been more directly affected by the interest rate increases of 2006 and 2007.





Source: Bank/GfK NOP survey.

(a) Respondents who answered 'No idea' are excluded.

(b) The net percentage balance is calculated by subtracting the percentage of people who were fairly or very dissatisfied from the percentage who were fairly or very satisfied.

#### Public attitudes to inflation

Per cent

	2003				2004				2005			2006					2007
	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.
01 Which of these options best of	lescribe	s how n	rices of	onds ar	nd servia	es have	change	d over ti	ne nast t	welve n	nonths?	,					
Gone down	6	5		4	3	3	3	4	5	5	4	5	З	з	з	з	2
Not changed	11	14	13	12	10	11	11	13	12	14	11	14	9	10	9	8	7
Up by 1% or less	6	7	7	6	7	7	6	6	6	7	6	7	5	5	6	5	5
Up by 1% but less than 2%	12	13	10	10	14	15	16	13	14	17	13	12	10	12	12	11	11
Up by 2% but less than 3%	20	20	19	20	19	21	20	20	20	19	21	19	20	19	20	19	19
Up by 3% but less than 4%	13	11	13	13	13	13	12	12	12	9	13	13	14	13	13	14	16
Up by 4% but less than 5%	7	7	5	6	7	6	8	7	7	7	6	7	9	9	7	9	10
Up by 5% or more	10	9	11	12	11	10	9	11	9	8	9	10	16	16	18	19	17
No idea	14	14	13	18	15	15	15	13	15	15	18	14	14	13	13	13	11
Median	2.4	2.2	2.2	2.5	2.4	2.3	2.3	2.3	2.3	2.0	2.4	2.3	2.8	2.7	2.8	2.9	2.9
Q.2 How much would you expect	t prices i	in the sh	iops ger	nerally to	o change	e over th	ne next t	welve m	ionths?	2	-		-	-	-	-	2
Go down	3	3	4	2	2	2	2	2	3	3	5	4	2	2	2	2	2
Not change	-	10	11	5	/	6	8	8	8	9	8	9	/	/	6	6	6
Up by 1% or less	/	8	9	8	8	9	9	9	9	12	9	9	6	8	9	8	6
Up by 1% but less than 2%	15	18	15	16	1/	1/	18	18	1/	20	18	18	13	15	15	14	14
Up by 2% but less than 3%	20	21	20	20	22	21	23	22	20	20	20	21	21	22	21	21	20
Up by 3% but less than 4%	12	11	11	15	11	12	12	10	12	9	12	10	14	13	13	13	16
Up by 4% but less than 5%	8	6	6	7	7	6	7	7	6	6	6	7	8	7	8	9	9
Up by 5% or more	13	8	9	11	11	12	8	11	8	7	8	10	16	14	14	16	14
No idea	15	15	14	17	14	14	12	14	16	13	15	12	13	13	12	11	12
Median	2.5	2.2	2.2	2.6	2.4	2.4	2.3	2.4	2.2	2.0	2.2	2.2	2.7	2.5	2.5	2.7	2.7
Q.3 If prices started to rise faster	than th	ey do no	ow, do y	ou think	Britain	's econo	my wou	ld									
end up stronger	7	7	7	8	10	8	9	7	8	8	9	8	8	7	8	9	8
or make little difference	22	26	24	24	22	28	27	27	27	27	24	25	23	23	24	21	21
or weaker	53	47	48	48	49	45	47	49	48	49	49	53	54	55	53	55	56
don't know	18	19	21	20	19	19	16	17	18	15	18	14	15	15	15	14	16
O.4 The Government has set an i	nflation	target o	of 2% (2	2.5% unt	il Nove	mber 20	03). Do	vou thi	nk this t	arget							
is too high	21	21	22	23	19	20	23	18	18	17	19	20	21	20	23	22	21
or too low	10	8	9	8	8	10	10	10	9	9	9	10	11	10	11	13	12
or about right	54	55	52	51	57	56	55	57	58	62	56	57	56	57	55	54	53
no idea	15	15	17	18	16	14	13	16	15	13	16	13	12	13	11	12	13
		things	uch ac	mortgog	ac han	loone	and could	aga haya	change	davart	ho post	tu volu o m	a a m tha 2				
Risen a lot	rates on	6		mortgag 7	ges, Darn	13	25	195 Have	15	12 12	10	10	12	10	12	18	26
Risen a little	12	12	11	28	46	47	45	45	43	30	27	29	29	26	43	50	46
Staved about the same	14	20	13	23	16	14	<u>و</u> ب	11	16	23	21	26	29	20	21	13	40 9
Fallen a little	34	31	35	18	10	5	3	5	6	6	21	15	10	9	4	2	2
Fallen a lot	15	12	17	5	3	2	1	1	1	2	2	1	10	1	1	*	*
No idea	19	10	20	18	17	19	16	19	19	19	21	19	19	22	19	16	16
All saving 'risen'	17	19	15	35	54	60	70	64	58	51	37	30	41	36	55	68	72
All saying fisher'	10	13	52	23	12	7	10	6	7	8	23	16	11	10	5	2	2
Net risen	-32	-25	-37	12	/1	53		58	, 51	13	14	23	30	26	50	66	70
	-52	-25	-57	12	41	55	00	50	51	45	14	25	50	20	50	00	70
Q.6 How would you expect inter	est rates	s to char	nge over	r the nex	t twelve	e month	is?										
Rise a lot	8	5	4	15	12	17	19	10	9	8	5	7	9	7	12	16	17
Rise a little	33	33	32	56	57	54	54	47	47	44	29	39	38	41	53	56	51
Stay about the same	28	33	33	11	12	11	11	20	23	24	28	27	28	28	17	13	14
Fall a little	11	10	9	2	3	2	2	4	5	8	17	10	7	4	2	2	3
Fall a lot	2	1	1	*	*	*	*	*	*	*	1	1	*	*	*	*	*
No idea	18	18	20	16	16	16	13	17	17	16	19	17	17	18	15	13	14
All saying 'rise'	41	38	36	71	69	71	73	57	56	52	34	46	47	48	65	72	68
All saying 'fall'	13	11	10	2	3	2	2	4	5	8	18	11	7	4	2	2	3
Net rise	28	27	26	69	66	69	71	53	51	44	16	35	40	44	63	70	65

Per cent

	2003	02 2004 2005									2006			2007			
	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	<u>2007</u> Feb.
Q.7 What do you think would be best for the British economy — for interest rates to go up over the next few months, or to go down, or to stay where they are now, or would it make no difference either way?																	
Goup	17	14	17	22	23	21	20	14	13	11	10	12	11	11	15	14	13
Go down	17	19	15	15	15	17	20	21	21	23	29	26	26	22	24	26	27
Stay where they are	36	40	38	37	36	36	38	39	41	42	34	39	38	41	37	36	36
Make no difference	11	8	10	8	8	9	8	9	8	9	9	9	10	10	10	11	9
No idea	19	19	20	19	18	17	13	16	17	14	19	15	15	16	14	13	15
Q.8 And which would be best for	or you pe	rsonally	, for inte	erest rat	es to												
go up	24	22	23	20	22	19	21	18	19	18	19	19	18	18	19	19	18
go down	29	29	28	30	31	34	37	35	35	39	37	38	36	36	36	41	39
stay where they are	20	22	20	21	20	20	19	18	20	19	17	20	20	21	19	16	17
make no difference	18	19	18	19	19	19	16	21	17	17	19	17	18	18	20	19	19
no idea	10	9	10	10	9	8	7	8	10	7	9	6	8	7	6	5	7
Q.9 How strongly do you agree	with the	followir	ng state	ments?(	a)												
(a) A rise in interest rates would	make pric	es in the	e high sti	eet rise	more slo	wly in th	ne short	term —	say a mo	onth or t	WO						
Agree strongly	2				1				3				3				4
Agree	35				35				33				34				35
Neither	18				19				17				17				17
Disagree	19				20				22				22				20
Disagree strongly	2				1				3				2				3
Don't know	24				23				21				22				22
All agree	37				36				36				37				39
All disagree	21				21				25				24				23
Net agree	16				15				11				13				16
(b) A rise in interest rates would	make pric	es in the	e high st	reet rise	more slo	owly in th	he medi	um term	— say a	year or t	two						
Agree strongly	1				2				3				2				3
Agree	38				37				37				38				39
Neither	18				19				17				17				17
Disagree	16				16				17				18				15
Disagree strongly	1				1				2				2				2
Don't know	25				25				24				24				24
All agree	39				39				40				40				42
All disagree	17				17				19				20				17
Net agree	22				22				21				20				25
Q.10 If a choice had to be made you prefer: <sup>(a)</sup>	e, either to	o raise ir	nterest r	ates to f	ry to ke	ep infla	tion dov	vn; or ke	eep inter	rest rate	s down	and allo	w prices	s in the s	shops to	rise fast	ter, which would
Interest rates to rise	62				57				55				57				56
Prices to rise faster	16				19				20				19				21
No idea	23				24				25				24				23
Q.11 Each month, a group of pe	ople mee	ts to set	Britain	s basic i	nterest	rate leve	el. Do y	ou know	what th	nis group	o is? <sup>(a)</sup>						
Monetary Policy Committee	4				4				4				4				5
Bank of England	35				36				38				36				36
The Government	3				4				3				4				4
The Treasury	1				1				2				1				2
Parliament	*				*				*				*				*
Otner	1				2				2				2				2
	56				54				50				53				50
Q.12 Which of these groups do	you think	sets the	e interes	t rates?	(a)												
Government ministers	12				13				12				14				12
Civil servants	*				1				2				1				1
Bank of England	69				69				70				68				70
High street banks	3				2				2				2				3
European Central Bank	2				3				3				3				2
No idea	13				12				12				12				11

#### Per cent

	2003				2004				2005				2006		2007		
	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.
Q.13 In fact, the decisions are ta	ken by th	ne Mone	tary Po	licy Com	mittee	of the B	ank of E	ngland.	Which o	of these	do you	think be	st descri	ibes the	Moneta	ary Polic	y Committee? <sup>(a)</sup>
Part of the Government	13				13				13				18				15
A quango, wholly appointed by the Government	7				8				7				6				8
An independent body, partly appointed by the Government	36				38				36				37				34
A completely independent body	24				23				25				22				24
No idea	19				18				18				17				21
Q.14 Overall, how satisfied or di	ssatisfie	d are yo	u with t	he way 1	he Bank	of Engl	and is d	oing its j	ob to se	et intere	st rates	in order	to conti	rol infla	tion?		
Very satisfied	8	9	12	10	8	9	8	8	11	13	11	11	10	10	9	9	9
Fairly satisfied	47	46	40	45	46	43	43	44	45	46	45	49	47	44	44	45	41
Neither satisfied nor dissatisfied	24	22	22	22	24	23	24	21	23	21	22	21	23	23	25	25	25
Fairly dissatisfied	7	7	6	6	7	9	10	7	7	6	6	5	6	7	8	8	9
Very dissatisfied	3	2	2	2	3	2	3	3	2	2	2	2	2	3	3	3	4
No idea	11	14	17	15	12	14	12	17	12	12	15	12	12	13	11	11	12
Total satisfied	55	55	52	55	54	52	51	52	56	59	56	60	57	55	53	54	50
Total dissatisfied	10	9	8	8	10	11	13	10	9	8	8	7	8	10	11	11	13
Net satisfied	45	46	44	47	44	41	38	42	47	51	48	53	49	45	42	43	37

Note: \* indicates less than 0.5%. Figures may not add to 100 due to rounding. Sampling error depends on the percentage response and the sample size. For example, given the sample of 3,967 in the February 2007 survey, the sampling error on a 20% response is 0.64.

(a) These questions are only asked in the February survey.

#### References

**Brazier, A, Harrison, R, King, M and Yates, T (2006)**, 'The danger of inflating expectations of macroeconomic stability: heuristic switching in an overlapping generations monetary model', *Bank of England Working Paper no. 303*.

**Carroll, C (2001)**, 'The epidemiology of macroeconomic expectations', *NBER Working Paper no.* 8695.

Ellis, C (2006), 'Public attitudes to inflation', *Bank of England Quarterly Bulletin*, Summer, pages 181–89.

Erceg, C and Levin, A (2003), 'Imperfect credibility and inflation persistence', Journal of Monetary Economics, Vol. 50, pages 915–44.

Farmer, R, Waggoner, D and Zha, T (2007), 'Understanding the New Keynesian model when monetary policy switches regimes', *NBER Working Paper no.* 12965.

Feige, E and Pearce, D (1976), 'Economically rational expectations: are innovations in the rate of inflation independent of innovations in monetary and fiscal policy?', *Journal of Political Economy*, Vol. 84, No. 3, pages 499–522.

Harrison, R, Nikolov, K, Quinn, M, Ramsay, G, Scott, A and Thomas, R (2005), *The Bank of England Quarterly Model*, Bank of England.

Howe, G (1981), 'The fight against inflation', Mais Lecture.

Lombardelli, C and Saleheen, J (2003), 'Public expectations of UK inflation', *Bank of England Quarterly Bulletin*, Autumn, pages 281–90.

Office for National Statistics (2004), 'The new inflation target: the statistical perspective', *Economic Trends*, No. 602, pages 24–46.

**Orphanides, A and Williams, J (2003)**, 'Imperfect knowledge, inflation expectations and monetary policy', *NBER Working Paper no.* 9884.

Sargent, T (1993), Bounded rationality in macroeconomics, Clarendon Press.

## National saving

By Simon Whitaker of the Bank's Structural Economic Analysis Division.

The level of national saving is important for policymakers as it can contain information about future prospects for growth and inflation. This article starts by comparing the current level of saving with a simple benchmark. However, this benchmark ignores important issues such as the relevant measure of saving and capital and the ability to borrow from overseas. The article considers how various measurement issues and economic shocks could allow the level of saving to differ from this benchmark, and also looks at the outlook for national saving in the medium term.

#### Introduction

National saving is the difference between national income and the amount the nation spends on consuming goods and services. So it comprises saving by households, government, and the corporate sector. Saving helps finance domestic investment which generates future income. For the past 20 years, national saving in the United Kingdom has generally been insufficient to finance domestic investment, and so the United Kingdom has been borrowing from overseas, in other words running a current account deficit (Chart 1).

The current level of saving may contain important information for policymakers about future growth in consumption or income, the strength of aggregate demand relative to supply, and so the prospects for inflation. For instance, a low level of current saving may indicate that households expect their income to grow rapidly in the future, or that they are relying on substantial increases in asset prices to provide resources for future consumption. But if those expectations are not fulfilled,

Chart 1 National saving, investment and the current account deficit



consumption would need to moderate to rebuild the level of savings. Corporate and government saving will also potentially affect the decisions households make about their own level of saving by influencing expectations about dividend receipts and future taxes. So this article focuses on national saving and assesses whether national saving might be expected to increase in the medium term, reducing the current account deficit.

In a closed economy the only source of funds for the domestic investment required to maintain the capital stock is national saving. So a very simple benchmark, against which to compare the current level of national saving, is to ask how much national saving the United Kingdom would need to maintain its capital stock, without borrowing from overseas. After calculating this benchmark, the article goes on to consider how various measurement issues and economic shocks could allow the current measured level of saving to differ from this simple benchmark, and explores how the ability to borrow from abroad can affect national saving.

#### A simple saving benchmark

A simple benchmark against which to assess the level of national saving is to ask how much saving is needed to purchase enough capital to keep the capital stock rising in line with output, without borrowing from overseas. With growth in output (Y) of g, a net capital stock (K) depreciating at a rate  $\delta$ , this benchmark gross national saving rate (S/Y) is:

$$\frac{S}{Y} = \frac{K}{Y} \left( g + \delta \right)$$

So the faster the economy grows and the faster the capital stock depreciates, the higher the saving rate would need to be. The latest ONS estimate of the ratio of net capital to annual output is around 2.2, where capital includes assets like buildings (excluding land), vehicles, plant and machinery, and a limited amount of intangible assets such as purchased software. Together with a depreciation rate implicit in the ONS capital stock data of around 5%, and assuming output growth of  $2^{1}/_{2}$ %, that gives a benchmark saving rate of around 17%, around 2 percentage points higher than the current national saving rate of roughly 15% (**Chart 1**). In this simple example, if this saving deficiency persisted, then one of two things would happen. First, the capital-output ratio would decline and hence domestic output would be lower than otherwise. Or, second, domestic capital accumulation would have to be funded by overseas borrowing, implying a higher net interest burden in the future and hence lower national income.

The benchmark calculation takes as given the current level of capital in the economy and calculates how much saving is needed to ensure it rises in line with output. But if the economy had reached the point where the capital stock no longer provided a net return to saving, in other words it had too much capital, then it would make sense for saving to be below this benchmark figure to lower the capital-output ratio to a more productive level. However, because profits comfortably exceed saving, Weale (2005) does not think there is any risk that the United Kingdom has too much capital.

By its nature this simple benchmark calculation ignores important measurement issues, economic shocks, and structural changes in the economy, which affect the interpretation of the level of national saving. The article now goes on to examine these. First, it looks at the measurement of saving, investment and capital. For example, what the impact of broadening out the definition of saving might have, and how a declining relative price of capital might reduce the amount of saving required to maintain the capital stock. Second, it assesses whether saving might be low in response to low long-term interest rates, and increases in asset prices, and sets that in the context of global saving patterns. Third, it discusses reasons why structural changes in the economy may have reduced saving. Fourth, it asks whether we could expect borrowing from overseas, and hence current account deficits, to provide a persistent supplement to national saving. Finally, it looks at what adjustment to national saving might occur in response to rising longevity and the related changes to pension arrangements. Of course several of these factors may have been operating at the same time.

#### Sensitivities around the benchmark

#### The measurement of saving and capital

There has been a persistent decline in the relative price of capital goods over the past 20 years (see Ellis and Groth (2003)). That largely reflects a decline in the relative price of plant and machinery, and in particular computers, because of relatively rapid productivity growth reflecting technical progress. In other words, the amount of saving required to buy a given quantity of capital goods to generate future income has declined. So while the capital-output ratio measured in current prices has tended to decline, the quantity of capital relative to real output has been more stable (Chart 2). If the price of capital goods relative to output continues to decline — and continued technical progress suggests that it should — then the future share of saving in national income required to maintain a given quantity of capital will tend to be lower than suggested by the simple benchmark above. Trends in the relative price of capital goods over the past 20 years suggest that the saving ratio necessary to maintain the same quantity of capital relative to output could fall by around 0.2 percentage points per year.

## Chart 2 Net whole-economy capital-output ratio at current and constant prices<sup>(a)</sup>



(a) Net of depreciation.

Using alternative definitions, the actual amount of saving in the economy may be higher than currently measured in the National Accounts. In theory, any use of resources that reduces current consumption in order to increase it in the future could be included in 'economic' definitions of saving and investment. So spending on things like R&D, training, and software development could be regarded as additions to the stock of productive capital, whereas spending in these areas is currently recorded by the ONS as a cost of production with no lasting value. The vast bulk of the ONS measure of the capital stock consists of physical assets like buildings and plant and machinery. Hall (2001) points to the increase in the market value of corporations relative to official estimates of the replacement cost of their physical capital as evidence that firms have accumulated large amounts of intangible capital (Chart 3).<sup>(1)</sup>

Marrano and Haskel (2006) estimate that inclusion of intangible spending on in-house produced software, scientific

This interpretation relies on various assumptions, for example no change in the degree
of monopoly power, and the absence of speculative bubbles in asset prices.





R&D, other R&D, advertising, market research, human capital, and firm re-organisation, would approximately double the existing ONS measure of business investment.<sup>(1)</sup> In this approach less of corporate income would be treated as being 'consumed' in the production process, so corporate saving would also be higher to the same extent. If this additional corporate saving is included, the national saving rate would rise from around 15% to around 21%, well above the benchmark number of around 17%.

However, as the concept of the capital stock has broadened, the benchmark saving rate to maintain it also needs to be adjusted. Marrano and Haskel have not calculated intangible-adjusted capital stock data for the United Kingdom, but work in the United States by Corrado *et al* (2006), on which they have based their analysis, suggests that including intangibles would raise the US capital stock by around 10%. In addition, Corrado *et al* assume that depreciation rates for intangible capital are much higher than for fixed assets. Given the uncertainty about depreciation rates, and the sensitivity of the calculations to these, it is not clear that the gap of around 2 percentage points between actual and benchmark saving would be much smaller if intangibles were included.

## Changes in asset prices, low long-term interest rates and global saving patterns

The simple benchmark calculation used at the start of this article determines the level of saving required to make sufficient additions to the capital stock for it to rise in line with output, when capital is measured as the stock of productive capital as recorded by the ONS. Spending on intangibles may legitimately represent a form of 'hidden' saving and capital accumulation. But how should capital gains on financial assets, which are claims on the profits earned on capital be considered? Can these capital gains substitute for saving? For instance, household consumption may appear high relative to income (ie the saving ratio is low), but it is less high relative to net financial wealth (**Chart 4**), and is low relative to a measure of wealth that includes housing assets. Typically the changes

### Chart 4 Household consumption to income and wealth ratios









in measured wealth arising from changes in asset prices dwarf the contribution from the flow of saving. But depending on the reason for the increase in asset prices, it might be unwise to attach too much weight to capital gains as a substitute for saving.

Auerbach (1985) argues that if saving is the creation of resources today in order to consume more tomorrow, then the issue of whether capital gains should be thought of as a substitute for saving depends on the source of the gain. If share prices rise because capital has become more productive, reflecting technical progress for example, then future resources available for consumption are expected to be higher and so saving today could legitimately be lower. The simple benchmark example does not allow for any capital-saving technical progress, so this type of technical progress would allow national saving to be below the simple benchmark.

But asset prices may rise for other reasons. If there is a shift in preferences, such as a fall in the rate at which households discount the future, or the compensation they require for risk, then the rate at which future income from capital is discounted will fall, and share prices will rise. But this gain is not associated with any increase in future production or income, and hence resources available for future consumption, so ought not to warrant a decline in the aggregate level of national saving. Some households gain at the expense of others. Those who have already accumulated assets and are nearing retirement enjoy a gain in their equity wealth, so they might reduce their saving.<sup>(2)</sup> But because the return on saving (discount rate) has fallen, *more* saving is needed by younger

<sup>(1)</sup> Improvements in the ONS estimates of software investment are being considered as part of the National Accounts revisions for *Blue Book 2007*, see ONS (2007).

<sup>(2)</sup> In fact even those approaching retirement may not gain. The accumulated assets in a pension fund need at some point to be converted into a flow of future retirement income by purchasing an annuity. If discount rates fall then so will annuity rates, so there may be no increase in these households' pension income following the increase in asset prices.

households to accumulate a given level of wealth. There is in effect a transfer of wealth from future generations, and those who do not yet hold financial assets, to current asset holders.

It is difficult to measure the relative contribution of changes in discount rates and expectations about future productivity to changes in asset prices. Up to 2000, the household saving rate did decline as net financial wealth increased (**Chart 5**), which would have been consistent with an expected increase in productivity growth. But following the sharp correction to equity prices around the turn of the century, there was no subsequent upward adjustment of the household saving ratio, whereas this did occur in the corporate sector. Around that time house price inflation picked up significantly, against a background of low long-term interest rates. It is therefore possible that households saw house price gains as a substitute for saving.

Chart 5 Households' financial wealth, housing assets and saving ratio



Sources: ONS and Bank calculations.

Housing is the largest single asset in the aggregate household portfolio. But housing is very different from other assets because people live in houses. This means that when house prices rise there are losers as well as winners, see Benito *et al* (2006) and Weale (2007). Those planning to 'trade down' to a cheaper home, or sell for the last time, are likely to have more resources available for consumption and can therefore save less. By contrast those renting, intending to buy a home for the first time, or 'trade up', will tend to have fewer resources available for spending on non-housing consumption, and therefore will need to save more. It is therefore unlikely that increases in house prices could allow national saving to remain persistently below the simple benchmark.

If households have misunderstood the implications of higher house prices, and subsequently wish to correct their mistake by increasing their saving, that would pose an upside risk to national saving. The recent prolonged period of low long-term interest rates has also coincided with a broadly based recovery in asset prices. If households have underestimated the extent to which these asset price gains have resulted from lower interest rates, rather than higher expected future income, that might also pose an upside risk to national saving. Low levels of interest rates would have encouraged households to bring consumption from the future to the present, facilitated by borrowing against the increased collateral values in the housing market. Following this intertemporal substitution, weaker growth in consumption and higher saving in the future might be expected as the debt is repaid. But if, in addition, consumption has been boosted because households have overestimated the extent to which asset price gains represent higher future resources available for consumption, then at some point consumption may be further depressed as the 'illusory' saving is reconstituted out of current income, see White (2006).

In assessing risks to the national saving ratio, it is important to understand why real risk-free interest rates have fallen so much. Bernanke (2005) highlights international factors and their role in simultaneously giving rise to low real rates of interest, the low national saving rate in the United States and the current account deficit. Several of those arguments might be applied equally to the United Kingdom. Recent work, for example Caballero (2006) and Caballero et al (2006), explains the United Kingdom's low national saving rate and associated current account deficit as part of a global equilibrium outcome of two forces: (a) potential growth differentials among different regions of the world and (b) differences in these regions' capacity to produce financial claims on that growth in which their residents are willing to invest. The growth in the supply of savings from fast-growing emerging regions of the world, like China, has exceeded their ability to produce high-quality domestic financial assets in which to invest. This excess demand for financial assets has led to a flow of savings to countries like the United Kingdom, reduced global long-term interest rates, raised asset prices, and hence lowered domestic saving in the United Kingdom. The outlook for long-term interest rates and national saving will therefore be partly determined by the prospects for rebalancing of saving around the world.

#### Structural reasons for lower saving

The incentives to bring forward consumption during a period of low interest rates may have been amplified by an easing in credit constraints. Access to credit allows households to smooth their consumption over their lifetime. So an easing of credit constraints would enable today's young households to increase their consumption, and reduce their saving, relative to the behaviour of older households at the same point in their life cycle, when access to credit was more constrained. That will tend to reduce the aggregate saving ratio. While, in the long run, the level of aggregate consumption and saving should return to its previous steady state, it would take a generation before this occurs, as equilibrium is only restored once all households have been able to smooth consumption following the easing of credit constraints. And liberalisation of credit markets is not a once-and-for-all event but a gradual process, prolonging the effects on aggregate saving.<sup>(1)</sup> So the process of financial liberalisation could be a relatively persistent reason for national saving remaining below the simple benchmark.

An increase in credit availability might also have meant that households felt less need to accumulate precautionary savings as a buffer against future adverse shocks. This effect on precautionary saving might be reinforced by greater economic stability. Indeed, Fogli and Perry (2006) argue that low US saving, the large US current account deficit, and a declining net US external asset position are all the result of relatively greater stability in the United States than in the rest of the world. A decline in relative volatility reduces residents' incentive to accumulate precautionary savings. Hence they prefer to consume more now rather than in the future, and they fund this by borrowing from overseas. This results in an equilibrium decline in the net external asset position. The United Kingdom has similarly experienced a significant decline in macroeconomic volatility, see Benati (2005) and the Bank of England's submission to the Treasury Committee (2007), so this might also explain why national saving is currently below the simple benchmark level.

#### **External borrowing constraints**

The article has pointed to several shocks in the United Kingdom and the global economy that might explain why UK national saving is currently below the simple benchmark level, and the United Kingdom is borrowing from overseas. Just as efficient international trade generally leads to trade deficits for some goods or services but a surplus for others — for example the United Kingdom has a surplus in trade in services, but a deficit in trade in goods — the efficient allocation of consumption over time may require a current account deficit. But to what extent could UK national saving be persistently supplemented by borrowing from abroad? In other words, could the United Kingdom continue to run a persistent current account deficit?

The analogue of the saving benchmark calculation would suggest that a sustainable current account deficit would correspond to the net external liability position of the United Kingdom being stable. In any period, the change in the net external liability position is equal to the borrowing from abroad implied by the current account deficit, less any capital gain the United Kingdom may have realised on its net external liabilities. The discussion above has centred on whether capital gains on UK assets might be misinterpreted as a form of saving by domestic residents. But if the value of the United Kingdom's assets held overseas increases by more than its liabilities to the rest of the world, then that would allow the United Kingdom to purchase more resources from overseas. So, as Obstfeld and Rogoff (1994) argue, capital gains from the United Kingdom's net external liabilities could legitimately be thought of as a supplement to conventionally measured national saving.

The problem is that these revaluation effects are currently not fully captured in the official data on the United Kingdom's net international investment position (NIIP) — the official term for net external liabilities. While assets and liabilities in the form of bonds and shares are revalued at market prices, net foreign direct investment (FDI) assets are valued at the initial purchase price rather than their current market value. Unlike shares, FDI assets are not regularly traded in financial markets, so their market values need to be estimated. It is possible to estimate the impact of valuing FDI at market prices by looking at the relative movements in equity prices in the United Kingdom and overseas. Chart 6 shows a measure for the NIIP where this adjustment has been made.<sup>(2)</sup> It indicates, in contrast to the official data, that despite recent persistent net borrowing from abroad, the United Kingdom remains a net external creditor. That is because net borrowing has been offset by net capital gains.





Sources: OECD, ONS, Thomson Datastream and Bank calculations.

The net capital gains partly reflect the fact that the United Kingdom tends to have equity-type investments (direct investment and portfolio equity investment) but debt-type liabilities (debt securities and banking liabilities), see Whitaker (2006). Historically, average capital gains on the former exceed those on the latter, reflecting the equity risk premium. If this continues — and over long periods of time on average it should — then on average there would be upward revaluations of the stock of UK assets relative to UK liabilities. This would allow the United Kingdom to continue borrowing from overseas without increasing its net liabilities.<sup>(3)</sup> And this

For evidence on UK credit conditions see Fernandez-Corugedo and Muellbauer (2006).

<sup>(2)</sup> See the article 'Financial globalisation, external balance sheets and economic adjustment', on pages 244–57 in this *Bulletin*.

<sup>(3)</sup> Kitchen (2006), for example, reports that the United States has also made net capital gains on its net debt position, which similarly have acted to mitigate the impact of cumulative increasing current account deficits.

'sustainable' borrowing from overseas would allow national saving on average to be persistently below the simple benchmark which assumed no borrowing from overseas. Of course, the net capital gains are compensation for the United Kingdom holding assets that are more risky than its liabilities, and there could be prolonged periods of low returns on these risky assets in the future.

#### Pensions and demographics

The simple benchmark level of saving identified at the beginning of the article took no account of demographic shocks, like the current and projected further increase in longevity. Without any change in saving or employment behaviour, ageing implies a reduction in the aggregate employment rate and hence output and consumption per capita.

Some pensions are provided by companies and government in a defined-benefit (DB) form, which means they promise to pay a fraction of working salary during retirement. An increase in longevity means the pension is paid over a longer period, raising its total cost. So in that case, unless the pension schemes are changed, companies and government need to save more. Ultimately households as shareholders of companies and taxpayers will bear that cost, through lower dividends or higher tax payments. And, of course, pension schemes are being changed, with a big shift towards households funding their own private defined-contribution (DC) pensions, where the impact of rising longevity is felt directly. If households with DC pensions intend to retire at the same age, despite increased longevity, they need to save more to accumulate a larger pension pot to support retirement income over a longer period. Ultimately the longevity shock must be met by some combination of increased national saving and later retirement, if post-retirement living standards are not to fall.

Companies with DB pensions have been raising their pension contributions, and because the ONS treats this as household income, this has contributed significantly to the household saving rate (**Chart 7**). There is little suggestion that households have raised their saving rates aside from that contribution being made from employers' pension contributions. Indeed excluding these contributions, households have been dissaving recently.

Of course, the timing of the company response may not be a good indicator of how or when the household sector should respond. In particular, much of the considerable — and quite sudden — adjustment undertaken by companies has been influenced by changes in the solvency requirements for pension funds. Households face no such regulatory forces. Their preference to adjust consumption smoothly suggests a more drawn-out response. Alternatively, the risk is that the lack of any obvious response of household saving reflects a





misunderstanding of the impact of rising longevity, and when better understood the ultimate response of households may be more sudden than otherwise. It depends whether sufficient numbers of households are forward looking and capable of making these saving decisions, or not. The switch from DB to DC schemes could make the cost of increased longevity, for a given working life, more transparent to households, since the contributions they need to make increase.

There has been no increase in government saving to reflect the prospective increase in the cost of providing DB pensions for public sector workers. Unlike the private sector, the government sector operates *unfunded* DB pensions which are financed out of general taxation.<sup>(1)</sup> According to HMT's *Long-term Public Finance Report* (December 2006) spending on pensions for public sector workers is expected to increase from 1.5% of GDP in 2005/06 to around 2% in 2025/26.

Looking at national saving, Chart 1 suggests that overall there has not yet been any significant response to the prospective increase in longevity. What magnitude of adjustment to the national saving rate might be required? Broadbent (2005) estimates the decline in consumption today that would be sufficient to ensure that consumption can grow sustainably at  $2^{1}/_{2}$ % per annum in the future in the face of the expected decline in the aggregate employment rate, based on projections by the Government Actuaries Department, assuming no change in working lives. This gives a demographic saving gap of 3% of GDP. This is in addition to the benchmark saving gap of around 2 percentage points already identified. Of course, there is likely to be some adjustment to labour market participation that would account for some of the adjustment in the saving rate. Broadbent (2005) estimates that a gradual increase of five to six years in retirement ages would be enough to stabilise the aggregate employment rate

That is, current workers fund the pensions of current pensioners. There is no implicit fund being accumulated from which the pension is paid.

at current rates. The participation rate of older workers has already started to rise in recent years.

More formally, Bloom *et al* (2002) show how in a standard life-cycle model in which people choose when to retire, the direct effect of an increase in longevity is to raise national saving rates. A rise in life expectancy increases the fraction of life people choose to spend working, but not by enough to offset the increased need for retirement income. So saving rates rise at every age during the accumulation phase. Empirically, using cross-country data, they estimate a one-year increase in life expectancy (which has occurred in the United Kingdom every eight years or so for the past 40 years) is associated with an increase in the national saving rate of around 0.4 percentage points. But the authors point out that health improvements could in theory increase the length of the working life sufficiently to allow saving rates to fall.

However, it is important to realise that these upward pressures on the national saving rate from increases in longevity, while persistent, will ultimately be transitory. This is a simple consequence of the national saving rate being an aggregation across households, some of whom are accumulating assets and others who are decumulating them. Increases in longevity imply that the new stable age structure has a higher proportion of elderly people. So in the long run, the higher saving rates of the young are offset by greater numbers of elderly who are dissaving. But this balancing effect may take 50 years or more to work through. There is expected to be an age-structure effect on national saving associated with the ageing of a large cohort of individuals born between 1946 and 1964 (the 'baby boomers'). As they age, increasing numbers move into the dissaving part of their lives, which other things equal, could lower the national saving rate. Miles (1999) estimated this could lower the national saving rate by 8 percentage points by 2040, with the decline commencing around 2010, as the baby boomers start retiring in large numbers. However, his model assumes, like the life-cycle model, that household saving rates are highly dependent on age, which at face value is not consistent with microdata.

Summarising the demographic factors, the increase in longevity is likely to put upward pressure on national saving in the medium term. But the impact of this could be masked by the bulge of population entering retirement and running down their savings.

#### Conclusions

The national saving rate is around 2 percentage points below the simple benchmark level required to maintain the capital-output ratio, as measured by the ONS, without borrowing from abroad. That is broadly consistent with the fact that in recent years national saving has been below domestic investment, and so the United Kingdom has been borrowing from overseas and running a current account deficit.

The article has put forward several reasons why national saving could remain below this simple benchmark. One is a declining relative price of capital, which reduces the amount of saving needed to purchase a given quantity of capital. Also, in the context of low long-term interest rates and rising asset prices, sustained by the flow of savings from fast-growing developing countries in search of high-quality investments in developed economies, it may be sensible for the United Kingdom to have brought forward consumption by borrowing from overseas. That intertemporal smoothing will also have been facilitated by credit market liberalisation. Better access to credit and a more stable economic environment may have reduced the amount of precautionary saving by households. And the United Kingdom appears to have been able to run a current account deficit averaging around 2% of GDP over the past 20 years without running down its net international investment position, because of net capital gains on overseas investments. These gains have mitigated the need for the flow of national saving to increase.

If households have overestimated the extent to which increases in asset prices in recent years represent an increase in future resources available for consumption, that might pose an upside risk to national saving. Increases in longevity might also put upward pressure on national saving, though consumption in retirement could instead be supported by longer working lives.

There are huge uncertainties attached to any estimates. While the balance of risks to the national saving ratio over the medium term is probably upwards, the extent of any adjustment is not obviously very large, relative to movements we have seen in the past, and could occur gradually alongside longer working lives.

#### References

Auerbach, A (1985), 'Savings in the US. Some conceptual issues', in Hendershott, P (ed), *The level and composition of household saving*.

**Bank of England (2007)**, 'The Monetary Policy Committee of the Bank of England: ten years on', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 24–38.

**Benati, L (2005)**, 'The inflation-targeting framework from an historical perspective', *Bank of England Quarterly Bulletin*, Summer, pages 160–68.

Benito, A, Thompson, J, Waldron, M and Wood, R (2006), 'House prices and consumer spending', *Bank of England Quarterly Bulletin*, Summer, pages 142–54.

Bernanke, B (2005), 'The global saving glut and the U.S. current account deficit', speech 14 April.

Bloom, D, Canning, D and Graham, B (2002), 'Longevity and life-cycle savings', NBER Working Paper no. 8808.

**Broadbent, B (2005)**, 'How big is the UK savings gap', *UK Economics Analyst*, Goldman Sachs, Issue No. 05/04.

Caballero, R (2006), 'On the macroeconomics of asset shortages', NBER Working Paper no. 12753.

Caballero, R, Farhi, E and Gourinchas, P (2006), 'An equilibrium model of global imbalances and low interest rates', *CEPR Discussion Paper no. 5573*.

Corrado, C, Hulten, C and Sichel, D (2006), 'Intangible capital and economic growth', *NBER Working Paper no.* 11948.

Ellis, C and Groth, C (2003), 'Long-run equilibrium ratios of business investment to output in the United Kingdom', *Bank of England Quarterly Bulletin*, Summer, pages 177–87.

Fernandez-Corugedo, E and Muellbauer, J (2006), 'Consumer credit conditions in the United Kingdom', *Bank of England Working Paper no.* 314.

Fogli, A and Perry, F (2006), 'The "great moderation" and the US external imbalance', *NBER Working Paper no. 12708*.

Hall, R (2001), 'The stock market and capital accumulation', *American Economic Review*, December.

HM Treasury (2006), 'Long-term public finance report', *Pre-Budget Report*, December.

**Kitchen, J (2006)**, 'Sharecroppers or shrewd capitalists? Projections for the US current account, international income flows, and net international debt', *Office of Management and Budget Working Paper*, February.

Marrano, M and Haskel, J (2006), 'How much does the UK invest in intangible assets', Queen Mary, *University of London Working Paper no. 578*.

Miles, D (1999), 'Modelling the impact of demographic change upon the economy', *Economic Journal*, Vol. 109, No. 452, pages 1-36.

**Obstfeld, M and Rogoff, K (1994)**, 'The intertemporal approach to the current account', *NBER Working Paper no. 4893*.

**ONS (2007)**, 'New measures of UK private sector software investment', *Economic and Labour Market Review*, Vol. 1, No. 5, pages 17–28.

Weale, M (2005), 'Are we saving enough?', *NIESR Review No.* 191, January, pages 79–93.

Weale, M (2007), 'Commentary: house price worries', *NIESR Review No. 200*, April, pages 4–6.

Whitaker, S (2006), 'The UK international investment position', Bank of England Quarterly Bulletin, Vol. 46, No. 3, pages 290–96.

White, W (2006), 'Measured wealth, real wealth and the illusion of saving', speech at the Irving Fisher Committee Conference on 'Measuring the financial position of the household sector', Basel, 30–31 August 2006.

## Understanding investment better: insights from recent research

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Motivated by a number of puzzles about the recent behaviour of business investment in the United Kingdom (including the boom in the late 1990s and the prolonged weakness thereafter), this article brings together some of the main results of recent research on investment undertaken by the Bank and puts them into the wider context of the investment literature.

#### Introduction

A key influence on the short-term outlook for inflation, and thus on the decisions of monetary policy makers, is the balance of aggregate demand and supply in the economy. Business investment, currently representing around 60% of total investment, is an important component of both demand and supply.<sup>(1)</sup> Investment, net of depreciation, determines the growth rate of the capital stock — a fundamental driver of supply. On the demand side, business investment currently accounts for around 10% of GDP and the cyclical behaviour of investment makes a substantial contribution to fluctuations in GDP (Chart 1). Over the period 1971–2006, annual business investment growth was around twice as volatile<sup>(2)</sup> as that of household and government consumption, exports, imports and overall GDP. As a result, it is vital for policymakers to understand both long-run trends in investment and its fluctuations during the business cycle. While investment has always been a subject of intense academic research, there has been a renewed research effort over recent years by many people, including Bank staff.

Chart 1 Cyclical behaviour of business investment and GDP



The neoclassical theory (summarised in the box on page 234), is the key to understanding this area. According to that theory, investment is influenced by two main determinants in the long run: planned production levels and the real user cost of capital. Higher planned production levels lead to a rise in the desired capital stock, and thus to a rise in investment. A rise in the user cost of capital (which depends, in part, on the cost of finance) will reduce a firm's desired capital stock and thus lead to lower investment. The effect of this depends on the elasticity of substitution, which measures the ease with which firms can substitute between capital and other factors of production when producing output. Understanding these influences is important for policymakers, because monetary policy can influence investment indirectly via its influence on aggregate demand and directly via the cost of finance.

Neoclassical theory has proved very useful in understanding long-run investment behaviour. The major challenge has been to know what value the elasticity of substitution takes, and that has been the focus of much research, discussed below. But the basic neoclassical model does not completely explain the large short-run fluctuations in investment that are to be seen in the data, and understanding these is also important.<sup>(3)</sup> In the next section, there is a discussion of the ways in which the basic neoclassical theory may be extended. These are then examined in more detail in the rest of the paper.

This article focuses on investment excluding inventories, the latter being another important source of business cycle fluctuations. Inventory investment is discussed in more detail in a previous article; see Elder and Tsoukalas (2006).

<sup>(2)</sup> Measured using the coefficient of variation, the standard deviation of a series relative to its mean.

<sup>(3)</sup> However, it should be noted that investment is very difficult to measure, and it is extremely susceptible to revisions, which can take several years to be finalised. While this is not considered in any depth in this article, it should be borne in mind that interpretations of the more recent data may change over time as the data are revised.

## What may be missing from simple models of investment?

Basic neoclassical theory outlines long-run relationships between the underlying determinants. Long-run developments have been important in explaining investment over longer time periods, especially with respect to the user cost of capital. The user cost (the details of which are spelt out in the box on page 234) can be thought of as the amount that an owner of capital would pay if he or she were renting it, instead of owning it. In the past there was considerable controversy about the precise empirical effect on investment, but there is now more of a consensus, as explained below. **Chart 2** shows the strong trend decline in the user cost over several decades, and also illustrates how important the fall in the relative price of investment has been. Arguably, this largely explains the upward trend in the ratio of business investment to market sector output shown in **Chart 3**.<sup>(1)</sup>



(a) Market sector output is a Bank estimate. The series is described in Churm et al (2006).

Chart 3 Real user cost of capital and ratio of business investment to market sector output



The likely impact of the real user cost on investment depends crucially on the value of the elasticity of substitution. The simple neoclassical model assumes one type of firm and one type of capital; but there might well be wide differences in the elasticity of substitution across firms, industries and over time. While the aggregate elasticity is most important for policy purposes, looking at disaggregated investment data and allowing the elasticity of substitution to differ across assets may improve our understanding of the behaviour of investment. This would be particularly relevant when the relative prices of various types of capital goods are changing, which is precisely what has been happening over the past few years, when the investment goods prices of information, communications and technology (ICT) goods have been in decline. This is discussed in more detail in the next section.

Although the long-run trend in business investment seems fairly well understood, Chart 3 also suggests that deviations in the business-investment ratio from its long-run trend can be large in practice. For example, following a period of very sharp increases in investment between 1995 and 1999, growth in business investment fell back relative to that of market sector output. The investment to output ratio at constant prices fell from nearly 16% in 2000 Q4 to around 14% in 2005. Over the same period, the real user cost of capital continued to fall (although less sharply than over the 1990s), which would have been consistent with a further increase in the investment to output ratio.<sup>(2)</sup> More recently, during 2006, the ratio started to recover again. These deviations suggest there are gaps in the simple model. This is important, because the short-run dynamics of investment are a major influence on the business cycle, and thus affect the appropriate stance of monetary policy. Bank research on this issue has focused on three areas that extend the simple model.

The first relates to the detailed structure of adjustment costs, which delay the adjustment in capital (or investment) to the firm's desired level. The simplest neoclassical model is solely about the capital stock and investment simply occurs to bring capital to a new desired level after a change. But this is not realistic. It implies very large changes in investment flows. So early in the literature, adjustment costs were introduced to explain short-run dynamics in investment. But the specific way in which adjustment costs work can have important macroeconomic implications, as discussed further below.

The second research area relates to uncertainty, which may have an impact on the long run, but is likely to be more relevant for short-run dynamics. Recent years have included several periods of heightened uncertainty; for example,

<sup>(1)</sup> As the fall in the user cost was largely driven by a falling relative price of investment goods, the rise in real demand was offset in nominal terms by lower prices — more than offset, in fact, given the particular value of the elasticity of substitution, so that the ratio of *nominal* spending on investment to output has fallen.

<sup>(2)</sup> The key drivers during the 1990s behind the fall in the real user cost of capital are discussed in more depth in Bakhshi and Thompson (2002).

#### The neoclassical theory of capital

The neoclassical theory of capital (Jorgenson (1963)) predicts that profit-maximising firms will invest in the capital stock until the expected marginal return of a unit of capital equals its marginal cost. Assuming that capital goods are homogeneous, this condition results in a long-run 'steady-state' relationship between the firm's optimal capital stock, its two main determinants (planned production levels and the real user cost of capital), and the elasticity of substitution, as in equation (1). Lower-case letters indicate logarithms, and the absence of a time subscript indicates the long run.

$$k = y + \theta - \sigma r$$
, where  $\theta$  is a constant (1)

Higher planned production levels, *y*, lead to a rise in the desired capital stock, *k*. A higher user cost, *r*, means that the firm's desired capital stock falls, the extent determined by the elasticity of substitution,  $\sigma$ , measuring the ease with which firms can substitute between capital and other factors of production such as labour when producing a given level of output. The real user cost of capital, *r*, is a function of a number of other variables (equation (2)). It increases with the real cost of holding capital rather than selling it and saving the proceeds. It also increases the higher the depreciation rate,  $\delta$ , since the value of fast-depreciating assets falls more rapidly. An increase in the tax rate (net of subsidies) on investment, *T*, also leads to a rise in the cost of capital by making investment goods more expensive relative to other

goods in the economy, as does a rise in the relative price of investment to output,  $P_k/P_y$ . Finally, the real user cost of capital falls with higher expected growth rates of the relative price of investment,  $\pi$ , capturing capital gains.

$$r = \frac{P_k}{P_Y} \left(\rho + \delta - \pi\right) \frac{1}{\left(1 - T\right)}$$
(2)

To arrive at a relationship between investment and its underlying determinants, the neoclassical theory uses the fact that capital in any period is equal to the depreciated amount from the previous period plus gross investment (see equation (3), the capital accumulation relationship).

$$K_{t+1} = (1 - \delta) K_t + I_t$$
(3)

Firms bring the current capital stock back into line with its desired level by adjusting the level of investment, *I*. In the steady state the value of the capital stock is constant (or growing at a constant rate). Using this, and transformed into logarithms, equation (3) implies that equation (4) holds in the long run.

$$i = k + \gamma$$
, where  $\gamma$  is a constant (4)

Equations (1) and (4) combined lead to a long-run relationship between the investment to output ratio and the real user cost of capital (equation (5)).

$$i - y = \theta + \gamma - \sigma r \tag{5}$$

uncertainty associated with 9/11, the tension in the Middle East, and the large rise in oil prices. Since investment is at least partly irreversible, theory suggests that firms should delay investment when uncertainty about future pay-offs from their investment projects is high and this uncertainty is likely to be resolved at some stage in the future.<sup>(1)</sup> Events like 9/11 appear to have affected expectations of future investment growth: surveys taken by Consensus Economics shortly before and after the terrorist attacks in the United States show that the average forecast for UK whole-economy investment growth was revised down from 1.7% to 1.2% in 2001 and from 2.9% to 2.2% in 2002, perhaps because of higher uncertainty.

The third relates to the impact of financial constraints and balance sheet effects on business investment decisions. This is another factor that may help explain the weakness in investment growth during 2002–05, as companies may have been constrained by overly stretched balance sheets and pension fund deficits. The remainder of this article summarises what we and other researchers have found in all these areas, regarding both the long and short runs, and how that has helped us to understand the behaviour of investment.

## The long run: determining the elasticity of substitution

The most relevant elasticity of substitution for the policymaker is arguably that which holds in the long run.<sup>(2)</sup> As discussed further in Ellis and Groth (2003), for an elasticity of substitution below one, sustained falls in the real cost of capital will lead to proportionately small increases in the volume of investment relative to output. An elasticity of substitution of one means that a 1% fall in the real user cost of capital leads to a 1% increase in the investment to output

<sup>(1)</sup> See Dixit (1992) and Pindyck (1991) for introductions to the issues.

<sup>(2)</sup> In the short run, firms may find it hard to adjust the relative proportions of capital and labour, but their choices may widen given more time.

ratio. By contrast, if there were a zero elasticity of substitution no rise in investment volumes would occur when the real cost of capital falls, because firms are not able to substitute between factors of production.

Despite the importance of this elasticity, there has been some controversy about its empirical size. Chirinko (2006) reports a broad range of estimates from the literature, ranging between zero and 1.4. However, those estimates are based on different data sets and different countries. More coherent estimates based on a data set for US firms (see Chirinko *et al* (1999) and (2004)) still suggest a wide range of estimates of the elasticity of substitution, with the variation due to different estimation methods.

A fundamental difficulty is that the data used to estimate the elasticity may be far from the long-run 'steady state' (Chirinko (2006)). If the variation in the real user cost of capital is dominated by transitory movements, firms will expect shocks to the user cost to be quickly reversed and they will not react to such changes. As a result, this may lead to a downward 'bias' in the estimated long-run elasticity of substitution. One way this is dealt with in the literature is by exploiting long-run ('cointegrating') relationships between investment, capital, output and the real user cost of capital. Short-run deviations from the steady states are modelled by including past changes in those variables.

This approach has been widely used. Early empirical studies that tried to explain aggregate business investment within a neoclassical framework used a 'reduced-form' long-run relationship between investment, output and the real user cost of capital (as in equation (5) in the box on page 234), combining the long-run relationship between investment and capital and the determinants of the optimal capital stock. They generally failed to find a robust role for the user cost of capital in the United Kingdom. By contrast, Ellis and Price (2004) found a well-defined value for the critical elasticity. One innovation was that they estimated a model of both long-run relationships outlined in the box (equations (1) and (4)), using capital stock data and a long series for the cost of capital. But the main reason for their success in pinning down the elasticity was that by the time of this work there was a clear long-run trend evident in the user cost. They found a robust relationship between the real user cost of capital and aggregate business capital, with an estimated elasticity of substitution of about 0.45. Notably, that was also consistent with previous estimates for the elasticity of substitution for the United Kingdom obtained using the analogous labour demand relationship.<sup>(1)</sup>

Other approaches have also been adopted in order to avoid the downward bias. For example, Chirinko *et al* (2004) capture steady-state relationships by using time-averaged data over long periods for US firms. Recent work has followed this approach for the United Kingdom; see Barnes *et al* (2007). Additionally, in this work econometric methods are used that allow for differences in the dynamic relationships across firms to provide further evidence on the size of the elasticity of substitution. Their results lie in the region of 0.4, consistent with previous estimates based on aggregate data.

Overall, it can be concluded that recent research in this area provides relatively robust estimates of this aggregate parameter value for the United Kingdom. **Chart 4** compares the investment to output ratio to a calculated long-run equilibrium, given a smoothed series for the user cost and using the value 0.4 for the elasticity of substitution.<sup>(2)</sup> It indicates that given this value for the elasticity of substitution, the broad long-run trend in the ratio seems to be explained by the long-run decline in the real user cost.

Chart 4 Actual and long-run business investment to market sector output ratio



Sources: ONS and Bank calculations

Despite this success at explaining the long-run trend, the assumption of a unique elasticity of substitution may be somewhat simplistic. This elasticity could, for example, be different *ex ante* (before the firm's decisions about how much to invest and how many workers to employ are taken) and *ex post* (once the capital good is installed). In the literature this assumption is known as 'putty clay'. The idea is that firms have a lot of flexibility in the choice of the proportion of capital to other factors in the planning stage (the proportion is soft 'putty') but once installed, there is much less flexibility (the proportion has hardened to 'clay'). It could also differ between different pairs of production factors (eg for capital against skilled labour, unskilled labour and oil) or between plants, firms and assets.

One simplification, that the elasticity is the same across all assets, has been particularly closely examined. The

<sup>(1)</sup> See for example Barrell and Pain (1997) who obtain very similar estimates for the United Kingdom.

<sup>(2)</sup> The long-run real user cost of capital is constructed using a Hodrick-Prescott filter designed to extract a smooth trend. The long-run investment to output ratio is from a simple regression of this ratio on a freely estimated constant and on the long-run user cost with an imposed elasticity of 0.4.

background is that recent research indicates that in the presence of diverging relative investment goods prices across assets, disaggregated models of investment may be superior to aggregate models, even if the elasticity is common across all assets. Tevlin and Whelan (2003) note that the increase in replacement investment associated with compositional changes in the capital stock towards assets with shorter-lives (such as computers) is not captured well by aggregate models. Bakhshi *et al* (2003) show that at the aggregate level, the standard measure of the real user cost of capital is mismeasured when there are trend declines in the relative price of investment goods across assets.

The issue of aggregation is particularly relevant for ICT compared with non-ICT assets, given that their relative prices have been diverging substantially in the past two decades. As shown in **Chart 5**, the relative price of computer investment has fallen much more sharply than that of aggregate (business or whole-economy) investment. The results by Tevlin and Whelan (2003) for the United States and (with rather weaker evidence) Bakhshi *et al* (2003) for the United Kingdom, both suggest that the elasticity of substitution differs between assets subject to rapid falls in relative prices, such as computers, and assets whose relative prices have remained more stable.<sup>(1)</sup> Both papers conclude that disaggregate models of investment can explain at least part of the investment boom of the second half of the 1990s.

Chart 5 Relative price of business, whole-economy and computer investment to GDP



(a) The chart is shown as a log index.

These encouraging results at the country level prompted additional work on whether the disaggregated approach can also better explain the recent investment behaviour in other advanced economies; see McMahon *et al* (2005). For a panel of the G7 countries and Australia, the authors estimate ICT and non-ICT investment equations. Their findings broadly confirm those conducted at the country level: while the estimated elasticity of substitution for aggregate investment and for non-ICT investment is low (between 0.0 and 0.5) and not statistically significant in some countries, the real user cost of capital proves important in determining ICT investment, with a much larger and significant estimated elasticity of 1.3. Out-of-sample forecasts of the disaggregated model of investment for the late 1990s were closer to actual outturns than the predictions by the aggregate investment model.

Further work in this field by Smith (2007) uses UK industry-level investment data. There may be an advantage to be gained from using data from a number of industries over time, as the additional cross-sectional information may improve the empirical estimates. This work finds that, while still being statistically distinct, differences in the elasticity of substitution across assets are smaller than suggested by the previous literature, but that again, the average value of these estimates is substantially less than unity.

In sum, this asset-level research appears better to explain trends in investment over the late 1990s. If more of this investment boom can be explained, this suggests that the 'capital overhang' resulting from it is likely to have been smaller than implied by aggregate models of investment, implying a period of below-average investment to come. The point here is that if high investment had led to installed capital exceeding the optimal level, there would be a period of relatively low investment while the gap between the actual and desired stocks of capital shrank. A question raised by McMahon et al (2005), however, is whether asset-level models can also explain the post-2000 slowdown in investment and the subsequent weakness in investment over 2002–05. Current results suggest that neither aggregate nor disaggregate models can fully explain the slowdown. This indicates that further aspects may be missing from standard models of investment, perhaps regarding the dynamic adjustment of investment in the short to medium term, and it is this which is now examined.

#### Short-run dynamics

#### Adjustment costs

An important feature of the data, omitted in the discussion above, is the relatively slow return of capital to its steady state in response to shocks. After a shift in the desired capital stock, the simple neoclassical model would predict an instantaneous jump in investment to restore capital to its equilibrium value. Instead, lagged responses are observed. To address this, the investment literature long ago introduced adjustment costs that model inertia in the adjustment of capital and lead to long periods where capital is in disequilibrium.<sup>(2)</sup> These can be

It may be that firms may react more strongly to changes in the cost of ICT relative to non-ICT capital because they perceive shocks to ICT prices that result from technological innovations to be of a more permanent nature: see Tevlin and Whelan (2003).

<sup>(2)</sup> See for example Shapiro (1986), or Hamermesh and Pfann (1996) for a survey of the adjustment cost literature. The logical alternative explanation of smooth investment would be that both drivers of the capital stock (the user cost and planned output) invariably move smoothly. But this is not realistic, and does not explain the volatility in investment.

introduced into the neoclassical model by assuming that, in addition to the standard costs of hiring labour and buying or renting capital, firms face costs when the level of capital changes. Such adjustment costs can, for example, take the form of disruption costs related to temporary interruptions to production while installing new machines or moving to new premises. Another example might be the learning and implementation of new technologies that can occur while new investments are made, which thereby involve not only new plant but also new working methods and investment in human capital.<sup>(1)</sup> These costs are generally assumed to rise more rapidly as the rate of adjustment increases, resulting in rapid accumulation of capital being very costly, so that slow and continual capital adjustment is generally preferred.<sup>(2)</sup>

Previous empirical studies in this field, which have mainly focused on the United States, have found evidence of sizable costs to adjusting the level of capital (see Chirinko (1993) for an overview). Recent work by Groth (2005) provides an estimate of the size of capital adjustment costs for the United Kingdom, using industry-level data that cover both manufacturing and services sectors. She finds that the 'half-life' (the period after which 50% of the adjustment to the long run has occurred) of the adjustment in capital following a shock to the user cost of capital is about three years. This is slower than that reported for the United States by Shapiro (1986), but faster than that typically found in the Tobin's Q<sup>(3)</sup> literature, where Summers (1981), for example, finds a half-life of around 20 years (again for US data).

Groth (2005) also looks at a disaggregated set of UK industries and finds that there are significant costs of adjusting non-ICT assets, while there is less evidence of ICT capital adjustment costs.<sup>(4)</sup> The results also indicate that it may be more costly to adjust capital in the services sector than in manufacturing.<sup>(5)</sup> Given the large and increasing share of the services sector in total output, this result could also point to an increase in the importance of aggregate capital adjustment costs over time.

While capital adjustment costs can thus lead to a slow return of capital to its equilibrium following a shock, it has been argued they cannot by themselves explain other features of the observed dynamics of investment and output. One such feature is the 'hump-shaped' response of investment to monetary policy shocks that can be inferred from empirical models: following a monetary tightening, investment falls, with the peak impact occurring only after several quarters, before investment gradually returns to its pre-shock level.<sup>(6)</sup> In order to model this behaviour in macroeconomic models, the recent literature has introduced *investment* rather than *capital* adjustment costs, where there is a cost to changing the level of investment, as opposed to the level of capital. In contrast to capital adjustment costs, investment adjustment costs depend positively on the change in current relative to lagged investment. They can be interpreted as representing the inflexibility in changing the pattern of investment during the planning phase: eg, see Christiano and Todd (1996). For example, once planning permission has been obtained and architectural plans developed, a change in the investment plans would constitute considerable additional costs. Such costs induce inertia in investment itself, causing it to adjust slowly to shocks. When they are present, Christiano, Eichenbaum and Evans (2005) show that a model where prices adjust slowly can generate hump-shaped investment dynamics, consistent with the estimated response of investment to a monetary policy shock.

Against this background, Groth and Khan (2007) establish some evidence regarding the empirical importance of investment adjustment costs. Using industry data for the United States and the United Kingdom, they employ a framework that allows for both types of adjustment costs investment and capital. The authors' findings point to little evidence in favour of investment adjustment costs for the United Kingdom, while capital adjustment costs are significant. For the United States, the results are more mixed: there is some evidence that investment adjustment costs may occur, but the effects are small. They conclude that while investment adjustment costs may appear to improve existing macroeconomic models, there is not really strong evidence for such costs in the disaggregated investment data.

To summarise, adjustment costs can generate a slow return of capital to its steady-state values, and these can apply to either investment or the capital stock. It seems that, especially in the United Kingdom, the evidence favours capital adjustment costs over investment adjustment costs. However, it is the latter that have tended to be introduced into macroeconomic models, where they have sometimes been used to help better explain the response of investment to monetary policy shocks. The implication is that it is necessary to look elsewhere to explain this feature of the data.

<sup>(1)</sup> These would be examples of so-called 'internal adjustment costs', as the costs are internal to the firm. The literature distinguishes between those and 'external adjustment costs'. The latter assume that the firm that invests has to pay a higher price for more capital — the supply curve is upward sloping. However, from a macroeconomic perspective, the distinction between internal and external adjustment costs should not matter.

<sup>(2)</sup> See Hamermesh and Pfann (1996) for a discussion of the effects of various assumptions about the nature of adjustment costs.

<sup>(3)</sup> Tobin's 'Q' theory lays out a theoretical link between investment and expected future profitability of firms, which can be derived from the neoclassical model of investment with adjustment costs. Q is the ratio of a firm's value to the cost of replacing its capital. The theory states that a company should invest when the discounted value of future profits from an extra unit of capital exceeds the cost of acquiring it, which is equivalent to marginal Q being larger than one. Under certain assumptions, this can be approximated by the more easily measured average value of Q.

<sup>(4)</sup> These results differ from earlier results found for the United States cited in Groth (2005). They may reflect mismeasurement due to uncertainty regarding UK software investment and ICT prices.

<sup>(5)</sup> Perhaps contrary to expectations, many service industries are relatively capital-intensive.

<sup>(6)</sup> The method used is generally Structural Vector Autoregressions looking at a small number of macroeconomic variables, where theory is used to identify particular shocks and the dynamic 'impulse responses' of variables to these shocks. See Christiano et al (2005), for example.

#### Investment under uncertainty

A further feature that may lead to short-term movements in investment is changes in uncertainty. **Chart 6**, showing one market-based measure of volatility, suggests that uncertainty can vary widely over time. When making investment decisions, companies face considerable uncertainty regarding future costs and demand. Some aspects of uncertainty — those affecting the rate of return on capital required by financial markets — are implicitly captured in the neoclassical investment theory through their effect on the real user cost of capital, by increasing the required rate of return. But uncertainty can matter for companies' investment decisions beyond this effect.





Sources: Euronext.liffe and Bank calculations.

(a) Option implied volatility. Calculated from the distribution of returns implied by three-month/six-month option prices.

#### The long-run impact of uncertainty

We begin by clarifying what effect uncertainty is expected to have on the long-run capital stock.

If companies wish only to maximise expected (average) profit, then they will not care about risk in itself (are 'risk neutral'); it is only the average return they care about. However, Hartman (1972) showed that, for a given discount rate, in profit-maximising (and hence risk-neutral) competitive firms with constant returns to scale, increased output price uncertainty will increase the optimal capital stock, as long as the capital stock is fixed in the short run — which is surely realistic. This follows if profits are a convex function of prices (ie successive price changes result in more than proportional increases in profits), as they will be under perfect competition. Such a case is illustrated in Chart 7. To understand this, think what would happen if the price at which the firm can sell its output rose, and the firm responded by using exactly the same inputs of labour and capital as before (producing the same quantity of goods). In that case profits would rise in proportion to the rise in price — in other words, in a straight-line relationship, as costs are the same but the price is

higher. But no firm would do this because, although by assumption capital is fixed, firms can hire more labour to produce more to sell at the higher price (and under perfect competition would be able to hire that labour at the same wage), so profits must rise by more than the straight-line benchmark. The more the price rises, the more the firm has this incentive. What may be less obvious is that given this shape of the curve, a widening of the distribution of prices raises expected profits. Essentially, higher prices raise profits by more than lower prices reduce them, as can be seen from the slope of the curve. So on average a wider price range raises profits.<sup>(1)</sup> The chart gives an example of such a mean-preserving change in the distribution of prices, in this case from an equal probability of the price being either 12 or 14, to either 11 or 15 (so the average remains at 13). Although the mean price remains constant, expected profits rise, as indicated by the dotted horizontal lines on the chart. And as the marginal profitability of capital has risen, the optimal quantity of capital stock will increase.

#### Chart 7 Profits as a convex function of prices<sup>(a)</sup>



(a) The chart shows a widening of the distribution of prices from (12, 14) to (11, 15), leaving the mean unchanged at 13. The actual profits at each of the prices are shown by the horizontal solid lines. The dotted horizontal lines show the expected levels of profits corresponding to each pair of prices. Expected profits rise as the distribution widens.

However, the convexity of the profit function may be reduced, and possibly reversed, by introducing imperfect competition (Caballero (1991)). Firms facing a downward-sloping demand curve will then only be able to increase output at the cost of lower prices, so the marginal profit following such a rise, all things being equal, is lower than under perfect competition (when prices are given). Similarly, if the firm faces an upward-sloping supply curve, wages will have to rise if the firm hires more workers, reducing marginal profits. If there are decreasing returns, these tendencies are aggravated, as then marginal productivity will decrease with scale (increasing returns will have the opposite effect). All these factors move the firm's price-profit relationship back towards the straight line, and may even push us beyond it. So there is ambiguity

This is an example of 'Jensen's inequality', which has other applications in economics; for example to do with risk aversion.

about the effect of uncertainty on investment in the long run.<sup>(1)</sup> In the rest of this section the focus is therefore on the impact of uncertainty on the timing of firm's investment decisions as there is less ambiguity in the literature regarding this prediction, and since the empirical literature suggests that this is also where the major impacts on investment lie (see, eg, Bloom *et al* (2007)).

#### Irreversibility and timing of investment

The effects on timing are most marked when investment projects are irreversible, which is a plausible assumption. Once capital is installed, it is not easily uninstalled, and investment also has a low resale value. In the context of the previous section, irreversibility can be interpreted as representing asymmetric adjustment costs, where the cost of reducing the capital stock exceeds the costs of augmenting it. Such a feature is not captured by traditional investment models, which implicitly assume that investment projects are fully reversible. Uncertainty matters because if the decisions of whether or not to invest can be postponed to a later date, when more information about future demand and price outturns are known, firms may be better able to discriminate between profitable and unprofitable investment opportunities. Undertaking the investment destroys this valuable option, where value rises with uncertainty. Thus these models are often referred to as 'real option' models: see Dixit and Pindyck (1994) for a clear and comprehensive introduction. The point is that an immediate investment extinguishes the value of the option to wait, and this lost value should form part of the opportunity cost of investing. The main message is that more uncertainty may lead to delayed investment.

Bloom's (2007) model of firms facing investment irreversibility and adjustment costs examines this incentive to delay investment. He simulates a sharp rise in macroeconomic uncertainty. In the model a temporary slowdown in investment rates can be observed, followed by a rapid rebound, which seems to match the actual data. The empirical prediction of the real option models is thus that investment may occur in 'bursts' following periods of no investment, suggesting that at times, when business investment is below certain threshold levels, it may be unresponsive to the user cost.

Most of the aggregate empirical literature is consistent with a short-run negative effect of uncertainty on investment in the United States and United Kingdom (see Carruth *et al* (2000) for a survey), using a wide range of models and proxies for uncertainty. By contrast, the evidence using disaggregated data (which have largely focused on the United States) is less conclusive, perhaps because there is heterogeneity of effects across industries and firms, as some of the richer models suggest. Nevertheless, firm-level data may be the best way to seek insights into models of irreversible

investment under uncertainty, precisely because of this heterogeneity.

Bloom *et al* (2007) follows this route for the United Kingdom, by looking at the effects of uncertainty (measured as standard deviation of daily stock returns) on investment spending of UK firms between 1972 and 1991. The findings support the predictions from the real options theory that investment responds (in a non-linear fashion) less to demand shocks at higher levels of uncertainty. The size of their estimates suggests that aggregate shocks — like the OPEC oil shocks can seriously reduce the responsiveness of investment to demand in the short run.

Earlier work by Bond and Cummins (2004) had applied this approach to US data, but controlling for the level of expected profitability on investment.<sup>(2)</sup> The authors found that in this sample uncertainty helps explain investment over and above the level of future profitability in the United States, and that investment responds less to demand shocks in the short run when uncertainty is high. Recent work applied this methodology to the United Kingdom, using a firm-level data set of around 650 quoted non-financial companies for the period 1987–2000; see Bond et al (2005). The authors' empirical set-up allows the distinction between temporary effects of uncertainty (measured using the volatility of firm's stock market returns and by the dispersion of Institutional Brokers' Estimate System (IBES) analysts' earnings forecasts) on investment and long-run effects on the capital stock. The estimates are sizable, suggesting that a 10% increase in uncertainty implies a 4.4% reduction in investment rates in the short run. The authors also find that the capital stock falls in the long run if high levels of uncertainty are sustained. However, unlike other studies, they do not find that investment reacts less strongly to demand shocks when uncertainty is high, as predicted by the real options models.<sup>(3)</sup>

As the discussion above has revealed, accounting for uncertainty can have important effects on business investment spending. In particular, it could be a factor in explaining the weakness in business investment during the period 2002–05 inasmuch as a number of the shocks mentioned above may have led to sharp rises in uncertainty. Aggregate measures of uncertainty increased following some of these shocks (Chart 6), although volatility fell back after 2003. There is also some evidence that firm-specific uncertainty has risen since 2000; see Parker (2006).

Uncertainty may also be essential in understanding the sensitivity of investment to monetary policy changes. If the

See Abel and Eberly (1999) and Caballero (1999) for further discussion of some other sources of ambiguity.

<sup>(2)</sup> Controlling for expected profits in this way means that any effects of uncertainty are in addition to the long-run effect of investment explained previously.

<sup>(3)</sup> See references quoted in Bond et al (2005).

channel based on the options theory outlined above is important, then there may be periods of high uncertainty when investment is not sensitive to monetary policy. Alternatively, if the uncertainty effect largely operates via its impact on the level of profitability of firms, then the monetary policy transmission to investment continues to be effective under uncertainty.

#### **Financial constraints**

A large body of the finance literature argues that business investment may also be influenced by cash flow and other balance sheet considerations that are not captured in the basic neoclassical model.<sup>(1)</sup> Firms that face financial constraints usually pay a premium for external sources of finance, and so prefer to use internal funds. As a result, firms may forego investment opportunities when faced with adverse cash flow. Similarly, the pressure experienced by firms with a large financial burden resulting from interest payments on high debt levels may also temporarily depress investment. Financial variables may thus also be relevant in explaining aggregate investment flows.

Bond et al (2004) investigate the importance of cash flows for investment decisions by UK firms. They estimate an equation where the ratio of investment to capital is a function of expected profitability, derived from the Tobin's 'Q' theory. In addition to expected profits, the authors include firms' cash flows in the equation, as the existence of financing constraints would imply that the level of investment also depends on the availability of internal funds. However, the findings indicate that firms' cash flows are only relevant in explaining investment when expected profitability is measured by Tobin's Q. A more direct measure of expected profits based on analysts' earnings forecasts results in cash flows becoming insignificant, suggesting that Tobin's Q does not adequately control for expected profits. Rather than providing evidence of financing constraints, cash flows may provide additional information about expected profitability that is not captured by the simple measure most easily available — the ratio of the firm's market value to the value of the capital stock.

The impact of corporate balance sheet adjustments on investment and financial decisions by UK firms in a broader sense is the topic of a paper by Benito and Young (2002). The authors examine the behaviour of dividends, new equity issuance and investment at the firm level as a function of company financial characteristics, assuming that firms are bound by a budget constraint that links the sources of their funds with their uses. The findings suggest a significant effect of financial pressure, defined as the ratio of interest payments to profits, in reducing investment.

Further evidence on the impact of a specific source of financial pressure — the contributions to company pension schemes — on investment (and dividends) of UK non-financial companies

is provided by Bunn and Trivedi (2005). The advantage of using pension contributions to test this mechanism, is that companies are committed to raising these in line with regulatory requirements when the value of assets or liabilities change, thus providing a source of financial pressure that is independent of the firm's other decisions about its capital structure. The results are consistent with some impact of increased pension contributions in reducing both dividends and investment, although the effect on investment is only just significant.<sup>(2)</sup> Some survey evidence suggesting that the effect was small was given by the Bank's regional Agents in 2006.<sup>(3)</sup> The Agents also reported that small firms were affected more, which is consistent with the idea that the external finance premium is larger for small companies.

So financial constraints faced by firms can depress investment. But were they a factor in explaining the weak investment of 2002–05? **Chart 8** shows that some indicators of financial pressure on firms rose quite sharply after 1999–2000, which may have been a contributing factor in the weakness in investment during 2002–05. But other measures of financial conditions remained buoyant: overall firm liquidity (eg growth in M4 deposits of private non-financial companies) has been relatively high, and the overall cost of capital has been low by historical standards. Consistent with this business investment growth was strong in 2006.<sup>(4)</sup> So if anything, overall financial conditions appear to have supported, rather than constrained, investment growth more recently.



<sup>(</sup>a) Employers' contributions to social insurance schemes such as pensions. These data exclude National Insurance contributions.

<sup>(</sup>b) Private non-financial corporations' debt, net of liquid assets as a percentage of companies' market valuation.

<sup>(</sup>c) Private non-financial corporations' interest payments as a percentage of gross operating surplus excluding the alignment adjustment.

<sup>(1)</sup> See Myers (2001) for a survey of the literature on corporate capital structure.

<sup>(2)</sup> The evidence is weaker than in Rauh (2006) for the United States, which may be accounted for by differences in the quality of measurement of financial pressure used in the papers.

<sup>(3)</sup> Bank of England Inflation Report, August 2006, pages 14-15.

<sup>(4)</sup> Bank of England Inflation Report, May 2007, pages 18 and 20.

#### Conclusions

Some advances have been made in understanding investment in the past decade. First, it is possible to be reasonably confident that the business investment rate in the United Kingdom does not react one-for-one with changes in the real user cost of capital in the long run. Instead, the aggregate elasticity is well below unity, at about 0.4. Given this, broad trends in the business investment to output ratio can be well explained by changes in the real user cost of capital. This judgement is quite different to what would have been concluded two decades ago. At that point there was a scarcity of evidence that the user cost affected investment, thus shedding doubt on a key part of the monetary transmission mechanism. Second, when the prices of investment goods are diverging across assets, such as ICT and non-ICT, disaggregated models of investment may be empirically superior to aggregate models. By being better able to evaluate where investment and capital are relative to their equilibrium values using these long-run models, it is possible to have a better understanding of the sustainability of current investment trends. Third, short-run factors determining investment are vital in explaining the slow return of capital to its equilibrium. The empirical evidence suggests that capital adjustment costs can lead to capital disequilibria persisting over many years in the United Kingdom. Option-based theories have shown that higher uncertainty can lead to short-run adverse effects on investment, while financial constraints can also be relevant.

It should be said that the factors discussed in this paper are probably not sufficient entirely to explain the weakness in business investment during 2002–05. The MPC have highlighted a number of considerations that could have influenced business investment, not all of which have been discussed here.<sup>(1)</sup> One such factor is that there may well be future revisions to the investment data, which is particularly susceptible to revision. So it may be discovered that recent developments differed from what is currently believed. Another data-measurement issue, albeit somewhat more subtle, is that there may be some spending on intangibles investment which is not currently recorded in the official statistics. HMT and the ONS are currently working to create estimates for the United Kingdom. There may also be effects running from globalisation; it is possible, for example, that multinational firms might have decided to allocate more of their investment spending to overseas projects. So no one would claim to have all the answers; but, as should be clear from this article, several of the unresolved issues are now better understood.

Overall, the research described above has substantially improved understanding of recent investment trends, and therefore of the balance between aggregate demand and supply, a key factor behind changes in inflation. To give a concrete example, there was an investment boom during the late 1990s in both the United Kingdom and the United States. In the aftermath, it was suspected that there was a sizable 'capital overhang' requiring a prolonged period of below-average investment. But the disaggregated models of business investment predicted at least part of that boom. This makes it clear how useful such analysis may be for the policymaker. And as another example, the weakness in investment during 2002–05 may partly have been caused by higher uncertainty, perhaps due to volatile energy prices in the latter part of this period (although if so this did not appear in implied stock market volatilities), and perhaps by the change in firms' balance sheets.

See, for example, Minutes of Monetary Policy Committee meeting 11 and 12 January 2006 at www.bankofengland.co.uk/publications/minutes/ mpc/pdf/2006/mpc0601.pdf.

#### References

Abel, A B and Eberly, J C (1999), 'The effects of irreversibility and uncertainty on capital accumulation', *Journal of Monetary Economics*, Vol. 44, pages 339–77.

Bakhshi, H, Oulton, N and Thompson, J (2003), 'Modelling investment when relative prices are trending: theory and evidence for the United Kingdom', *Bank of England Working Paper no.* 189.

Bakhshi, H and Thompson, J (2002), 'Explaining trends in UK business investment', Bank of England Quarterly Bulletin, Spring, pages 33–41.

Barnes, S, Price, S and Sebastia-Barriel, M (2007), 'The elasticity of substitution: evidence from a UK firm-level data set', presented at 2007 AEA Conference, www.aeaweb.org/annual\_mtg\_papers/2007/0105\_1015\_1303.pdf.

**Barrell, R and Pain, N (1997)**, 'Foreign direct investment, technological change, and economic growth within Europe', *Economic Journal*, No. 107, pages 1,770–86.

Benito, A and Young, G (2002), 'Financial pressure and balance sheet adjustment by UK firms', Bank of England Working Paper no. 168.

**Bloom, N (2007)**, 'The impact of uncertainty shocks: a firm-level estimation and a 9/11 simulation', www.stanford.edu/~nbloom/ImpactUncertaintyShocks.pdf.

**Bloom, N, Bond, S and Van Reenen, J (2007)**, 'Uncertainty and investment dynamics', *Review of Economic Studies*, Vol. 74, pages 391–415.

**Bond, S and Cummins, J (2004)**, 'Uncertainty and investment: an empirical investigation using data on analysts' profits forecasts', Board of Governors of the Federal Reserve System, *Finance and Economics Discussion Paper no. 20*.

Bond, S, Klemm, A, Newton-Smith, R, Syed, M and Vlieghe, G (2004), 'The roles of expected profitability, Tobin's Q and cash flow in econometric models of company investment', *Bank of England Working Paper no. 222*.

#### Bond, S, Moessner, R, Mumtaz, H and Syed, M (2005), 'Microeconometric evidence on uncertainty and investment', IFS, *mimeo*, www.ifs.org.uk/publications.php?publication\_id=3278.

Bunn, P and Trivedi, K (2005), 'Corporate expenditures and pension contributions: evidence from UK company accounts', *Bank of England Working Paper no.* 276.

Caballero, R J (1991), 'On the sign of the investment-uncertainty relationship', *American Economic Review*, Vol. 81, pages 279–88.

**Caballero, R J (1999)**, 'Aggregate investment', in Taylor, J B and Woodford, M (eds), *Handbook of macroeconomics*, Vol. 1B, Amsterdam, North-Holland.

Carruth, A, Dickerson, A and Henley, A (2000), 'What do we know about investment under uncertainty?', *Journal of Economic Surveys*, Vol. 14, No. 2, pages 119–53.

Chirinko, R S (1993), 'Business fixed investment spending: modeling strategies, empirical results, and policy implications', *Journal of Economic Literature*, Vol. 31, No. 4, pages 1,875–911.

**Chirinko, R S (2006)**, ' $\sigma$ : the long and short of it', prepared for the Goethe University Frankfurt/CES Conference, 'A bright future at the age of 50 — The CES production function in the theory and empirics of economic growth', *mimeo*, Emory University.

Chirinko, R S, Fazzari, S M and Meyer, A P (1999), 'How responsive is business capital formation to its user cost?: An exploration with micro data', *Journal of Public Economics*, Vol. 74, pages 53–80.

Chirinko, R S, Fazzari, S M and Meyer, A P (2004), 'That elusive elasticity: a long-panel approach to estimating the capital-labor substitution elasticity', *CESifo Working Paper no. 1240*.

Christiano, L J, Eichenbaum, M and Evans, C (2005), 'Nominal rigidities and the dynamic effects of a shock to monetary policy', *Journal of Political Economy*, Vol. 113, No. 1, pages 1–45.

**Christiano, L J and Todd, R M (1996)**, 'Time to plan and aggregate fluctuations', *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 20, No. 1, pages 14–27.

Churm, R, Mahajan, S, Maitland-Smith, F, Srinivasan, S, Thomas, R and Tily, G (2006), 'Measuring market sector activity in the United Kingdom', *Bank of England Quarterly Bulletin*, Vol. 46, No. 4, pages 404–14.

Dixit, A K (1992), 'Investment and hysteresis', *Journal of Economic Perspectives*, Vol. 6, No. 1, Winter, pages 107–32.

Dixit, A K and Pindyck, R S (1994), 'Investment under uncertainty', Princeton, Princeton University Press.

**Elder, R and Tsoukalas, J (2006)**, 'Investing in inventories', *Bank of England Quarterly Bulletin*, Summer, pages 155–60.

Ellis, C and Groth, C (2003), 'Long-run equilibrium ratios of business investment to output in the United Kingdom', *Bank of England Quarterly Bulletin*, Summer, pages 177–87.

Ellis, C and Price, S (2004), 'UK business investment and the user cost of capital', *Manchester School*, Vol. 72, pages 72–93.

Groth, C (2005), 'Estimating UK capital adjustment costs', Bank of England Working Paper no. 258.

Groth, C and Khan, H (2007), 'Investment adjustment costs: an empirical assessment', Bank of England Working Paper, forthcoming.

Hamermesh, D S and Pfann, G A (1996), 'Adjustment costs in factor demand', *Journal of Economic Literature*, Vol. 34, No. 3, pages 1,264–92.

Hartman, R (1972), 'The effects of price and cost uncertainty on investment', *Journal of Economic Theory*, Vol. 5, pages 258–66.

Jorgenson, D (1963), 'Capital theory and investment behaviour', *American Economic Review*, Vol. 53, pages 247–56.

McMahon, M, Sterne, G and Thompson, J (2005), 'The role of ICT in the global investment cycle', *Bank of England Working Paper no.* 257.

Myers, S (2001), 'Capital structure', *Journal of Economic Perspectives*, Vol. 15, pages 81–102.

**Parker, M (2006)**, 'Diverging trends in aggregate and firm-level volatility in the UK', *Bank of England, External MPC Unit Discussion Paper No.* 16.

**Pindyck, R S (1991)**, 'Irreversibility, uncertainty and investment', *Journal of Economic Literature*, Vol. 29, pages 1,110–48.

**Rauh, J (2006)**, 'Investment and financing constraints: evidence from the funding of corporate pension plans', *Journal of Finance*, Vol. 61, No. 1, pages 33–71.

Shapiro, M (1986), 'The dynamic demand for capital and labor', *Quarterly Journal of Economics*, Vol. 101, pages 513–42.

Smith, J (2007), 'That elusive elasticity and the ubiquitous bias: is panel data a panacea?', Bank of England Working Paper, forthcoming.

**Summers, L (1981)**, 'Taxation and corporate investment: a q-theory approach', *Brookings Papers on Economic Activity*, Vol. 1, pages 67–140.

Tevlin, S and Whelan, K (2003), 'Explaining the investment boom of the 1990s', *Journal of Money, Credit and Banking*, Vol. 35, pages 1–22.

# Financial globalisation, external balance sheets and economic adjustment

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This article investigates the implications of the size and structure of external balance sheets for the impact of shocks on domestic economies. Increased integration of international financial markets in recent years, coupled with larger international cross-holdings of assets and liabilities, has made the balance sheet channel of transmission of shocks grow in importance. This article constructs detailed decompositions of the balance sheets of the United Kingdom, the United States and Canada. These are used to illustrate what different features of balance sheets imply about the effects on domestic economies from different shocks. Finally, the impact on UK and US external balance sheets from some hypothetical scenarios is examined, and some simple rules of thumb are used to draw out the potential implications for consumption behaviour.

#### Introduction

Global financial markets have become increasingly integrated over the past 20 years, and particularly so in the past decade (Chart 1). As in many countries, the speed of financial integration of the United Kingdom with the rest of the world has outpaced the speed of trade integration. Chart 2 illustrates this, by comparing UK trade flows with UK financial account flows over the past 40 years.

Financial interlinkages between the United Kingdom and the rest of the world are broadly based. **Chart 3** shows the sum of total UK external assets and liabilities at the end of 2004, decomposed by partner country. By this measure, financial links with the European Union (EU) amounted to approximately three times the United Kingdom's gross domestic product (GDP), compared with about one and a half times UK GDP with the United States. Financial links with the rest of the world amounted to over twice UK GDP.

Economic theory suggests that increased financial integration (or financial globalisation) can bring clear benefits. Reductions in the barriers to global capital flows should lead to better resource allocation, as they allow investors to move funds to countries where they expect higher returns. Financial globalisation also offers the facility to smooth domestic consumption over time and reduce exposure to country-specific risks.



(a) Financial integration is defined here as the sum of the total stocks of foreign assets and liabilities (in US dollars) as a percentage of world GDP.

At the same time, increased financial globalisation can also alter the transmission of shocks in the world economy. Financial globalisation means that the income and wealth of domestic residents are less exposed to domestic shocks, but are more exposed to given macroeconomic and financial shocks occurring abroad. For instance, if UK residents hold a large volume of overseas marketable assets, a permanent rise in foreign asset prices can increase UK domestic demand by increasing the value of UK residents' wealth. Conversely, a fall in foreign asset prices might reduce UK domestic demand as the value of net wealth falls.

Chart 1 Financial integration, 1980–2004<sup>(a)</sup>

## Chart 2 UK global integration by balance of payment flows, 1963–2006<sup>(a)</sup>



(a) Financial flows are defined here as the sum of gross capital inflows and outflows (from the financial account of the United Kingdom's balance of payments) as a percentage of UK GDP. Trade flows are defined as the sum of exports and imports as a percentage of UK GDP.





<sup>(</sup>a) Financial integration is defined here as the sum of the total stocks of UK foreign assets and liabilities as a percentage of UK GDP. Foreign direct investment is not adjusted for market values.

To understand how increased financial globalisation can affect the transmission of economic and financial shocks in domestic economies, it is not enough to look at just the aggregate value of the foreign assets and liabilities that a country's households, companies and government hold. The composition of foreign assets and liabilities also affects the way in which domestic and foreign shocks impact the domestic economy. This information is reflected in a country's external balance sheet, which records residents' holdings of foreign assets and liabilities and contains information about their composition.

The recent trends in financial globalisation have meant that it is becoming increasingly important for central banks and other policy-making institutions to consider the information contained in countries' external balance sheets and incorporate it in their macroeconomic analysis. For example, King (2006) has argued that balance sheet analysis should be at the heart of the International Monetary Fund's (IMF) monitoring of the world economy. This article examines how the composition of external balance sheets could potentially affect the impact of various shocks on the domestic economy. It illustrates how the size and structure of balance sheets can influence the types of shocks an economy is most exposed to, using the external balance sheets of the United Kingdom, the United States and Canada as examples. It then goes on to look at the potential impact of shocks on UK and US external balance sheets using a set of hypothetical scenarios.

#### The economics of the external balance sheet

A country's external balance sheet provides a summary of the financial relationship between its domestic residents — consisting of household, business and government sectors — and the rest of the world.

The external balance sheet is influenced by cumulative capital *flows* — consisting of new foreign direct investment (FDI),<sup>(1)</sup> cross-border holdings of equities, bonds, loans and money market instruments. It also takes into account changes in the valuation of existing *stocks* of assets and liabilities — due to changes in market prices or exchange rates. Adding these two components gives the stocks of gross assets and liabilities. The difference between the stocks of assets and liabilities gives a country's net international investment position (NIIP).

An analysis of a country's external balance sheet can reveal information about its exposure to different kinds of risks. The proportion of assets and liabilities consisting of FDI, portfolio equities, bonds, loans or money market instruments, is important because the expected returns of different financial instruments are sensitive to different types of shocks. The geographical location and currency composition of external balance sheets also matter. These reveal something about how shocks in particular parts of the world and to particular currencies may affect a domestic economy through its external asset and liability holdings.

Generally speaking, domestic residents have two related motives for trading financial assets with foreign residents: international risk-sharing and consumption smoothing.

Without international trade in financial instruments, domestic residents can consume and invest only out of domestic income and assets. This income is subject to various risks — some of which are country-specific. Access to global financial markets allows a country's residents to purchase and issue financial instruments that may have different risk-return characteristics compared with those that are available domestically. This trade in financial assets facilitates international risk-sharing, whereby domestic residents can more easily achieve their

Foreign direct investment is defined as an equity holding in a company in excess of 10% of that company's total value.

#### Some evidence on international risk-sharing

This box explains how financial globalisation can improve risk-sharing across countries, and discusses empirical evidence on international risk-sharing in practice.

Access to international financial markets offers the opportunity for domestic residents to trade instruments with a broader range of risk-return combinations than those available domestically. Some investors are willing to accept higher risk for the possibility that returns may be higher, whereas others prefer investments with less risk at the expense of lower expected returns. Economic theory suggests that financial globalisation can improve the welfare of domestic and foreign residents by allowing them to achieve their preferred risk-return combination in their portfolios.

By participating in international financial markets, investors can purchase assets with higher expected returns than may be available in their domestic markets. For example, investors in developed economies can purchase equity stakes in companies in emerging market economies (EMEs) that are experiencing higher (but more volatile) growth than those in their own economy. Although this investment might be risky in comparison to domestic investments, purchases of these equity claims allow investors to capture part of the higher income growth generated by EMEs.

Investors might also use international financial markets to reduce the risks to their income. In the above example, investors from EMEs can reduce the extent of the risks they face by selling equity stakes in their expanding economies to investors from developed economies, and use the proceeds to purchase safer assets (such as government bonds) in developed economies. To the extent that prices of equities in EMEs and government bonds in developed economies do not comove, such a transaction helps to reduce the income risks faced by EME investors.

However, correlations between asset prices can change over time, particularly at times of severe economic or financial shocks. For example, if investors who have borrowed heavily to finance their investments in several markets suffer losses in one market, they may start selling in other markets to obtain liquidity, so that the price falls in one market may spill over to others.<sup>(1)</sup> This raises the possibility that international financial integration may itself increase the comovement of global asset prices (IMF (2007)). Indeed, there is evidence that equity prices in OECD countries have become more correlated over the past 25 years (**Chart A**).

Economic theory suggests that if world financial markets are fully integrated and each country's residents hold

Chart A Index of comovement in OECD equity markets<sup>(a)</sup>



(a) Index calculated as the 60-day rolling common factor between OECD equity indices. A rise indicates an increase in the proportion of movements in different countries' equity markets that occur simultaneously.

internationally diversified asset portfolios, all 'country-specific' variation in consumption would be eliminated. In this case, domestic consumption growth would depend only on global income growth, and growth rates of consumption across countries would be equalised.

However, existing studies suggest that actual risk-sharing is not nearly this extensive in practice (Lewis (1999)), although recent evidence indicates it may be becoming more widespread (eg Sorensen *et al* (2005)). The limited cross-country risk-sharing seen in practice may reflect several factors: (i) global financial integration is still incomplete, with many EMEs still maintaining some capital controls; and (ii) people still have a preference for domestic assets (so-called 'home-bias'), possibly because investors are imperfectly informed about investment opportunities abroad.

See IMF (2007) for recent evidence on financial linkages and spillovers, and Schnabel and Shin (2004) for a theoretical exposition of these intermarket spillovers.

preferred balance between risk and expected return, and insure against unexpected fluctuations in their income. The box on page 246 examines international risk-sharing in greater depth.

Consumption smoothing — through international borrowing and lending — is another motive for international trade in financial instruments. Domestic residents expect some fluctuations in domestic economic growth, but they generally dislike large variations in their consumption. One way to help avoid such fluctuations when domestic income growth is low, is to borrow funds from abroad to finance consumption, in the form of imports.<sup>(1)</sup> All else equal, this will result in a deteriorating current account matched by a fall in the NIIP. When the domestic economy improves, residents can repay their external debt — or purchase foreign assets. This could improve the current account position.

Although international trade in financial instruments is associated with these benefits, it also exposes domestic residents to external shocks which they would not otherwise have been subject to. The analysis presented later in this article looks at the potential impacts of these particular shocks in greater depth.

#### Data issues in external balance sheet analysis

An essential first step in analysing the economic implications of balance sheet structures is to construct data that is as accurate as possible. While extensive data on international financial *flows* are available, data on cross-country *stocks* of assets and liabilities have only recently begun to be collected, and are still largely incomplete.

While most countries now publish their international investment positions, usually these only give breakdowns in terms of broad asset classes, and for most countries these data only cover the relatively recent past. A thorough analysis of the external vulnerabilities also requires information on the geographical and currency decomposition of external assets and liabilities, ideally over many decades. Recently, some progress has been made in data collection, most notably by the IMF. For example, the Co-ordinated Portfolio Investment Survey (CPIS)<sup>(2)</sup> collects international data on the geographical distribution of portfolio assets and liabilities, on an annual basis. Another notable example is work by Lane and Milesi-Ferretti (2006), who construct estimates of gross balance sheet positions by asset class for 145 countries over the period 1970 to 2004. However, neither the CPIS or the work by Lane and Milesi-Ferretti (2006) include currency decompositions.

Another important area in data construction lies in the treatment of FDI. In many countries, FDI is reported at book value, which reflects the value of an asset on the purchase date rather than its market value, which reflects the current price of the asset. Unlike the book-value measure, the market-value

measure of balance sheets reflects valuation changes of assets and liabilities after they were acquired, due to movements in market prices and valuations, including exchange rates. Thus, the market-value measure is likely to capture more accurately the value that can be acquired by selling assets. In the United Kingdom, only the book value of FDI is published in official data.

For this article, market-value estimates of the currency composition of UK external assets and liabilities have been constructed. These data permit an analysis of UK balance sheet structure which can highlight exposure to particular shocks faced by the United Kingdom. The methodology used for producing these data is outlined in the box on page 248.

The constructed data include market-value estimates of UK FDI assets and liabilities. It is clear from **Chart 4** that these differ considerably from the published book-value estimates. A striking implication of these estimates is that, in aggregate,









Domestic residents can also borrow funds at home, but when a country's residents on aggregate want to borrow, then the only way to do this is to make use of international financial markets.

(2) See www.imf.org/external/np/sta/pi/cpis.htm.

## Estimating the market-value currency breakdown of the UK balance sheet

This box explains how the market-value estimate of the UK balance sheet used in this article is constructed.

#### Foreign direct investment

In the *Pink Book*, published by the ONS, UK foreign direct investment assets and liabilities are reported at book value, which reflects the value of an asset at the time of acquisition. Unlike portfolio equities, FDI assets are not regularly traded in financial markets, so that their market values, reflecting the current valuation of the underlying assets, need to be estimated.

In estimating the market value for UK FDI assets and liabilities, Pratten's (1996) panel data study of UK companies was used. Based on Pratten's estimates, it is assumed that in 1991, the market to book value ratio for UK FDI assets was 1.75, and the same ratio for UK FDI liabilities was 1.50. After 1991, the market value of UK FDI assets in a given country, in local currency terms, is assumed to have moved in line with the country's equity market indices. Similarly, the market value of UK FDI liabilities is assumed to have moved in line with the FTSE 100 index.<sup>(1)</sup>

The market-value estimates of FDI assets were then converted into sterling, based on the assumption that the FDI assets in a given country are denominated in the currency of that country. Similarly, all of UK FDI liabilities are assumed to be denominated in sterling. Estimates of the geographical distribution of FDI assets were obtained from the OECD's *International Direct Investment Statistics*. The resulting estimates suggest that in 2005, the market to book value ratios for the United Kingdom's FDI assets and liabilities were 2.09 and 1.65, respectively.

the United Kingdom is estimated to have a *positive* total net asset position equivalent to 25% of UK GDP in 2005, compared to a *negative* net asset position of 13% of GDP if FDI is estimated at book value (Chart 5).

The balance sheet estimates used in this article are based on data that are subject to some uncertainties. Methods of construction can vary considerably from country to country. Furthermore, different agencies sometimes use different data collection methods, causing estimates of a country's external balance sheet position to vary. Although this article takes care to construct as good data as possible, all data are subject to possibly large revisions and uncertainties, and the data in this article are no different. There is, however, great uncertainty surrounding these market-value estimates of UK FDI assets and liabilities, as the actual sales value of FDI assets could have evolved differently from equity markets.<sup>(2)</sup>

#### **Portfolio equities**

Estimates of the market value of total portfolio equity assets and liabilities were obtained from the *Pink Book*. For the currency breakdown, the IMF's Co-ordinated Portfolio Investment Survey (CPIS) data were used to obtain information about the geographical location of UK portfolio equity assets. As in the case of FDI, it is assumed that UK portfolio equity assets held in a given country are denominated in the currency of that country, whereas all UK equity liabilities are assumed to be denominated in sterling.

#### Portfolio debt and other investment

The market-value estimates of total portfolio debt and other investment were obtained from the *Pink Book*. For the currency breakdown, ONS estimates based on the IMF's CPIS data were used.

#### Reserves

The market-value estimates of total reserve assets were obtained from the *Pink Book*. The currency breakdown of reserve assets were estimated using the Bank of England's UK international reserves data.<sup>(3)</sup>

In theory, financial derivatives should also be recorded on the external balance sheet. However, these data are not currently available for the United Kingdom.

## What do we learn from the analysis of balance sheets?

This section illustrates how analysis of the asset composition, regional distribution and currency mix of external balance sheets can help anticipate the response of a country's consumption to particular shocks.

#### The asset and liability composition of balance sheets

A wide range of assets are exchanged internationally. Broadly speaking, statistical agencies distinguish between FDI, portfolio equity, portfolio debt, official foreign exchange reserves, financial derivatives<sup>(1)</sup> and 'other' investment. The impact of shocks on domestic residents can be strongly

Similar methods were used by Gourinchas and Rey (2005) for estimating the market value of US assets and liabilities.

<sup>(2)</sup> Whitaker (2006) has previously highlighted the measurement problems associated with the United Kingdom's NIIP.

<sup>(3)</sup> Available from www.bankofengland.co.uk/statistics/reserves/index.htm.

These instruments can be used by domestic resident to hedge against unfavourable changes in the value of assets and liabilities.

influenced by the type of external assets and liabilities that are held.

The market-value estimates of UK external assets and liabilities constructed for this article, decomposed by asset class, are illustrated in **Charts 6** and **7**. The most striking feature of these charts is the size of UK gross positions relative to UK GDP. UK assets and liabilities amounted to approximately 460% and 435% of UK GDP in 2005, respectively, compared to 90% and 110% in the United States **(Charts 10** and **11)**.





(a) FDI is adjusted for market values.





Sources: OECD, ONS, Thomson Datastream and Bank calculations

(a) FDI is adjusted for market values

Also striking is the very large proportion of 'other' UK assets and liabilities. Data suggest that 'other' liabilities consisted of 70% foreign currency deposits and 30% loans in 2005, and 'other' assets consisted of 76% foreign currency deposits and 24% loans in 2005.<sup>(1)</sup> However, more detailed data on the type and maturity of these deposits and loans are not available.

The large size of UK external balance sheet positions may reflect the international activities of large complex financial institutions (LCFIs) based in the City of London, and as a result, may not reflect UK households' direct exposures. The UK financial sector channels funds from one country to another via banks and other institutions located in the United Kingdom. Changes in the value of these exposures may not have a direct impact on UK consumers other than via their equity holdings in these financial institutions. However, extreme valuation changes in the balance sheets of LCFIs could potentially lead to financial instability, with adverse macroeconomic repercussions. As a result, any balance sheet vulnerabilities of these institutions may also represent vulnerabilities of the domestic economy, albeit of an indirect nature.

The ratio of equity to debt-type assets and liabilities is a key feature of balance sheets. Debt or 'interest-sensitive' assets include short and long-term marketable debt, money market instruments and 'other assets', which include trade credit, bank loans, currency and deposits. Equity-type assets include portfolio equities and FDI. Unlike debt, foreign purchases of domestic equity assets represent the transfer of ownership of private firms abroad.

The asset composition of the external balance sheet in net terms is similar in both the United Kingdom and the United States. External balance sheets in both countries are leveraged: they have net liabilities in debt-type securities, and net assets in equity-type securities (**Chart 8**). For this reason, their behaviour has been likened to that of a venture capitalist or hedge fund:<sup>(2)</sup> borrowing low-risk assets, and using the proceeds to invest in riskier assets with higher expected returns.<sup>(3)</sup>

**Chart 8** also illustrates that the United Kingdom's positive net asset position in 2005 was due to its equity and FDI holdings. As a result, the United Kingdom's NIIP is sensitive to developments in global equity markets. **Chart 9** shows how equity prices around the world rose in the late 1990s and then fell back again from late 2000 onwards. Since 2003, equity prices have recovered. At the same time, as shown in **Chart 5**, the United Kingdom's NIIP at market values rose from a position of broad balance in 1996 to a positive position of approximately 20% of UK GDP in 2000. Thereafter, the UK NIIP returned to approximately zero in 2002. Since 2003, the United Kingdom's NIIP has recovered alongside equity

(2) This comparison has been made by Whitaker (2006) for the United Kingdom, and Gourinchas and Rey (2005) for the United States.

<sup>(1)</sup> ONS Pink Book (2006).

<sup>(3)</sup> Although equity securities are generally thought to be more risky than debt, this is not necessarily true. For example, debt contracts with low credit ratings can be more risky than, say, equity claims on companies with high credit ratings.



Sources: OECD, ONS, Thomson Datastream, US Bureau of Economic Analysis and Bank calculations.

(a) FDI is adjusted for market values.

#### Chart 9 Global equity market trends





markets. This illustrates how the United Kingdom's net external asset position is exposed to variations in global equity prices through its large FDI and portfolio equity asset holdings.

**Charts 10** and **11**, respectively, show the estimated gross asset and liability positions of the United States, measured in market values as a percentage of US GDP. Since the early 1990s, equity-type assets (portfolio equity plus FDI) have made up an increasingly large proportion of US external assets (**Chart 10**). In contrast, equity liabilities formed an increasing proportion of total liabilities up to 2000, but subsequently have broadly remained flat, while foreign purchases of US debt have increased (**Chart 11**).

In late 2000, US equity prices began to fall sharply. If foreigners' claims on the United States had been more heavily weighted to debt rather than equity, the wealth of US households would have had to absorb a greater part of the





Source: US Bureau of Economic Analysis

(a) FDI is adjusted for market values

#### Chart 11 US gross liability position, 1990–2005<sup>(a)</sup>



Source: US Bureau of Economic Analysis

(a) FDI is adjusted for market values.

market fall. But because foreigners had increased their holdings of US equities up to 2000, some of the losses generated from the stock market correction in the United States were distributed abroad. Had global equity prices not fallen alongside US equity prices, the net external wealth of US consumers would have increased. However, during 2001–02 global equity prices did fall. Consequently, the value of US equity assets abroad fell (Chart 10).

#### **Regional distribution**

Concentration of asset holdings in a region on which a country also depends heavily for its export demand means that it will be more exposed to that region's economic cycles than suggested by its trade links alone. If residents do not actively diversify their asset portfolios, strong bilateral trade linkages are likely to be naturally reflected in linkages in asset holdings, as domestic residents receive foreign currency as payment for exported goods (see, for example, Lane and Milesi-Ferretti (2006)).

Chart 12 breaks down the United Kingdom's external asset holdings and trade linkages by geographic area.<sup>(1)</sup> The geographical distribution of its external assets adds to its exposure to the rest of the EU through trade links. If GDP growth in the rest of the EU were to slow sharply, resulting in a fall in import demand, UK export receipts would be reduced. This effect would be amplified if the euro were also to depreciate. At the same time, such developments could also reduce the value of UK holdings of external assets, increasing the impact of developments elsewhere in the EU on the United Kingdom.

Canadian exports are also concentrated in one region, namely the United States (Chart 13). Similarly, the largest single share





(a) FDI is not adjusted for market values



Chart 13 Canadian exports and asset holdings by region, 2005(a)

(a) FDI is not adjusted for market values

of asset holdings is with this area. That increases the likely impact on Canada of a growth slowdown in the United States that is coupled with a Canadian dollar appreciation against the US dollar.

#### **Currency mix**

Exchange rate movements generate nominal capital gains or losses in domestic currency terms when there are cross-border holdings of assets and liabilities that are denominated in different currencies — a so-called 'currency mismatch'. For example, in the past many emerging market economies (EMEs) have issued debt denominated in foreign currency, without holding similarly sized foreign currency assets. This affected the way policymakers could respond to sharp exchange rate movements during the Asian financial crisis in 1997-98 (see, for instance, Goldstein and Turner (2004)).

The experience of Asian EMEs is in contrast to the case of Australia during the Asian crisis. During 1996–98, the Australian dollar depreciated by 20% against the US dollar (Chart 14). But unlike many Asian EMEs, Australia's external liabilities were mostly denominated in domestic currency, so it was able to respond to the fall in its currency by cutting official interest rates. This helped Australia to run a larger current account deficit and achieve a higher GDP growth rate in 1998 than the year before.





Sources: IMF International Financial Statistics and Thomson Datastream

Chart 15 breaks down the United Kingdom's external assets and liabilities (measured in market values) by currency. Like most industrialised economies, the United Kingdom has more liabilities than assets denominated in its own currency, and more assets than liabilities in foreign currencies. Thus, when sterling depreciates against other currencies, the resulting revaluation of external assets and liabilities increases UK NIIP. Conversely, when sterling appreciates against other currencies, the revaluation reduces UK NIIP. This currency mix provides an

(1) Measures of external assets by region are in book-value terms

effective hedge against negative terms of trade shocks: when the depreciation of the domestic currency increases the costs of imports, the higher value of external wealth and income will provide additional sources of financing them. Moreover, the currency diversification of net asset positions implies that an appreciation of sterling against any one currency may not drastically reduce UK NIIP if this is accompanied by a depreciation against other currencies. For example, NIIP would not fall drastically through the revaluation effect even if the dollar depreciated sharply against sterling, as long as the euro appreciated against sterling. As **Chart 16** shows, the United States is in a similar position to the United Kingdom. In the next section, the quantitative implications of this hedging effect are illustrated for both countries.





Sources: Bank calculations based on Bank of England, IMF CPIS, OECD and ONS data. (a) FDI is adjusted for market values.

## $\label{eq:chart16} \begin{array}{l} \mbox{Chart16} \mbox{ US net international investment position by } \\ \mbox{currency}^{(a)} \end{array}$



Sources: Bank calculations based on IMF CPIS, OECD, US Bureau of Economic Analysis and US Treasury data.

## Balance sheet adjustment and the real economy

How important is the balance sheet channel in influencing the real impact of shocks? This section addresses this question by considering specific examples to show the impact on external balance sheets of extreme but unlikely asset price movements.

A complete analysis which incorporates the full range of macroeconomic and financial channels for such an adjustment is not possible with currently available models. Here, the detailed decompositions of UK and US external balance sheets constructed for this article are used to examine revaluation effects for UK and US assets and liabilities. The scenarios analysed are taken from those employed in the April 2007 *Financial Stability Report (FSR)* to assess the possible implications of an unwinding of current 'global imbalances'. These scenarios do not represent forecasts, but merely serve to illustrate possible upper bounds on the impact of balance sheet revaluation on consumption.

The US current account deficit has recently reached record levels, but whether this is a concern is a subject of considerable debate. Observers fall broadly into two camps: those who argue this creates serious risks for global economic and financial stability (for example Cline (2005), Obstfeld and Rogoff (2000, 2004), Roubini and Setser (2004)); and those who argue it is simply a by-product of real and financial globalisation (for example Caballero (2006), Cooper (2005), Dooley *et al* (2003, 2004)). Without taking a view on which of these interpretations is more plausible, it is possible to make a qualified assessment of the possible impact of a sharp rebalancing.

One channel through which the US current account deficit could 'unwind' is via a large depreciation of the US dollar against other currencies. In practice, such a depreciation may occur over a prolonged period. Indeed, the dollar has already fallen by 25% against sterling since the end of 2000. However, a sharp withdrawal of capital from the United States could bring about a rapid dollar depreciation and a sharp fall in equity prices, although in practice this is not very likely. Here, two specific scenarios are considered:<sup>(1)</sup>

(1) Scenario A, in which the dollar depreciates by 30% against the euro and 15% against sterling, while global equity prices (including US and UK equity prices) fall by 20%;

(2) Scenario B, in which the dollar depreciates by 30% against all currencies and global equity prices fall by 20%.

<sup>(</sup>a) FDI is adjusted for market values.

<sup>(1)</sup> In addition to exchange rate and equity price movements, the April 2007 FSR scenarios also incorporate the impact of falling UK and US property prices. The impact of such falls in property prices on external assets and liabilities is not considered here as the proportion of properties owned by non-residents is not readily available.
Scenario A — in which sterling appreciates against the dollar but depreciates against the euro — is designed to illustrate the hedging effect of the currency diversification in the UK balance sheet. Scenario B helps to illustrate the impact of a severe global asset price shock. In both scenarios, the fall in global equity prices is assumed to reduce the market value of both FDI and portfolio equities.

The following analysis complements existing studies by examining balance sheet valuation effects arising from shocks to asset prices, but without linking macroeconomic developments — such as possible paths for net exports, US interest rates and investment income — back to their balance sheet impacts.<sup>(1)</sup> While there are many possible sources for these shocks, and the precise economic impact will depend on these, the exact source is left open here. As such, the analysis presented here should be seen as partial and preliminary.

**Table A** shows the valuation changes in US assets, liabilities and the NIIP under the two scenarios as percentages of US GDP. Under Scenario A, a 20% fall in global equity prices will reduce both US external assets and liabilities. The market value of US external assets falls by 10% of US GDP due to the declines in equity prices outside the United States. The fall in the market value of US external liabilities is a little smaller, at 7% of GDP, since its equity-type liabilities (FDI and portfolio equities) are smaller than its equity-type assets. The net result is a fall in US NIIP amounting to 3% of GDP (**Table A**, row (a)).

## Table A Estimated impact of shocks on US assets and liabilities<sup>(a)</sup>

Per cent of GDP

	Assets	Liabilities	NIIP
Scenario A			
(a) 20% fall in global equity prices	-10	-7	-3
(b) 30% fall in US\$ against the euro and 15% fall in US\$ against UK£	6	1	5
(a) + (b)	-4	-7	3
Scenario B			
(c) 30% fall in US\$ against all currencies	16	1	15
(a) + (c)	6	-6	13

Sources: Bank calculations based on IMF CPIS, Thomson Datastream, US Bureau of Economic Analysis and US Treasury.

(a) Calculations are based on an estimated 2005 balance sheet and the financial account of the US balance of payments in 2006. FDI is adjusted for market values. Numbers may not add up due to rounding.

In addition, currency mismatch between assets and liabilities could potentially affect the vulnerability of a country to exchange rate movements. Since US liabilities are mostly dollar denominated and assets are mostly foreign currency denominated, a fall in the dollar by 30% against the euro and 15% against sterling will increase the value of its assets by more than the value of its liabilities, thus increasing its NIIP by 5% of its GDP (**Table A**, row (b)). In fact, the capital gains generated by these exchange rate movements are larger than the capital losses on US foreign investment produced by a 20% fall in global equity prices, thus increasing US NIIP by 3% of GDP (**Table A**, row (a)+(b)).

Under Scenario B, a 30% fall in the dollar against all other currencies will increase US NIIP by 15% of GDP (**Table A**, row (c)).<sup>(2)</sup> Combined with a 20% fall in global equity prices this would increase its NIIP by 13% of GDP (**Table A**, row (a)+(c)). This illustrates that the US NIIP could rise in the event of shocks involving sharp falls in global equities and the dollar, because most of its liabilities are dollar denominated.

**Table B** illustrates how the same shocks will affect the UK balance sheet. The effect of a global equity price shock on the United Kingdom is qualitatively similar to that on the United States, as both countries hold positive net external asset positions in equity assets: a 20% fall in global equity prices reduces UK NIIP by 11% of GDP (**Table B**, row (a)). The larger UK adjustment reflects the fact that UK residents are estimated to have proportionately more equity-type assets in their portfolios than US residents.

## Table B Estimated impact of shocks on UK assets and liabilities<sup>(a)</sup>

Per cent of GDP

	Assets	Liabilities	NIIP
Scenario A			
(a) 20% fall in global equity prices	-33	-22	-11
(b) 30% fall in US\$ against the euro and 15% fall in US\$ against UK£	8	-2	10
(a) + (b)	-25	-23	-1
Scenario B			
(c) 30% fall in US\$ against all currencies	-48	-40	-8
(a) + (c)	-81	-62	-19

Sources: Bank calculations based on Bank of England, IMF CPIS, OECD, ONS and Thomson Datastream.

(a) Calculations are based on an estimated 2005 balance sheet and the financial account of the UK balance of payments in 2006. FDI is adjusted for market values. Numbers may not add up due to rounding.

Scenario A illustrates the 'hedging' effect of currency diversification on the UK balance sheet. The reduction in UK NIIP due to the depreciation of the dollar against sterling is more than fully offset by the increase in the NIIP due to an appreciation of the euro against sterling, since the United Kingdom's positive net asset position in euro is larger than its net asset position in dollars (**Table B**, row (b)). In fact, the net gains in NIIP through these exchange rate movements are almost as large as the losses to NIIP due to a 20% fall in global equity prices, so that the UK NIIP falls only by 1% of

<sup>(1)</sup> The problem of incorporating detailed balance sheet interlinkages in a global general equilibrium model is currently an area of active research (see, for example, Devereux and Sutherland (2006, 2007); Evans and Hnatkoskva (2005); Kollmann (2006); Engel and Matsumoto (2006); Tille (2005)). But existing studies have yet to reach a consensus over how to address this issue.

<sup>(2)</sup> A 10% fall in the US dollar would increase US NIIP by 5% of its GDP in our simulation, consistent with Gourinchas and Rey's (2005) calculation.

GDP under Scenario A (**Table B**, row (a)+(b)). This illustrates that asset diversification combined with differential movements in exchange rates can potentially mitigate the negative impact of large shocks in the global economy.

Scenario B assumes that the dollar falls by the same amount against all currencies, such that sterling rises against the dollar while remaining constant against all other currencies. The mirror image of the positive effect of the dollar depreciation on the US balance sheet is a negative effect on the combined balance sheets of other countries that hold dollar-denominated assets, including the United Kingdom. The precise impact on any individual country will depend upon the particular currency composition of its assets and liabilities. In the case of the United Kingdom, a 30% depreciation of the dollar against all currencies reduces its NIIP by 8% of GDP (**Table B**, row (c)), as its dollar-denominated assets are larger than its dollar-denominated liabilities. Combined, the global equity and dollar falls under Scenario B reduce the United Kingdom's NIIP by 19% of GDP (**Table B**, row (a)+(c)).

## The implications of external balance sheet structures for the real economy

Although an assessment of the impact of balance sheet adjustments on the real economy is difficult with currently available models, the possible real effects in crude terms can be described using rules of thumb.

The valuation effects considered in this section, if permanent, would have a direct effect on the net wealth of domestic residents. In the long run, changes to wealth can influence the real economy through a number of channels. For example higher wealth is thought to lead directly to increases in consumption (see, for example, Poterba (2000) and Barrell and Davies (2006)). Estimates of the size of this 'wealth effect' vary over time, and depend on a number of factors, including the source of the shock that has caused the change in wealth. However, for a set of industrialised countries, Labhard *et al* (2005) estimate that on average for a 1% increase in wealth, 0.024% will be consumed per year in the long run.<sup>(1)</sup>

Mechanically, because of diversification in external balance sheets, in Scenario A this estimate implies a long-run rise in consumption of 0.1% of GDP per year in the United States, and a negligible impact on UK consumption. In the more severe Scenario B, these estimates imply that the level of consumption could fall by around 0.5% of GDP per year in the United Kingdom, and rise by 0.3% of GDP per year in the United States in the long run, purely because of the revaluation effects.

These calculations assume that the nominal valuation changes in **Tables A** and **B** translate into long-run *real* valuation changes in assets and liabilities, and that no other macroeconomic variable is affected. While these figures provide some crude estimates of the long-run effects of these scenarios, there are many additional factors that need to be taken into account. First, the impact of a given valuation change in the external balance sheet on consumption is likely to depend on the source of the shock which caused it, and that is not considered here. Second, it is important to consider the impact of shocks to the balance sheet on *real* wealth, which is given by nominal wealth deflated by the price of goods in residents' consumption baskets. For example, while equity price shocks directly affect real wealth, shocks to exchange rates lead to both nominal wealth effects and changes in the price of imports and exports. To the extent that UK consumption consists of goods imported from the United States, an appreciation of sterling against the dollar that leads to a fall in UK wealth may also make imports from the United States cheaper, at least partly counteracting any negative impact of changes in asset values on consumption.

Finally, various frictions in the economy can alter the short-run impact of a shock operating through the balance sheet. Depending on the friction involved these can amplify or dampen adjustment to the initial shock. Examples include: credit market frictions (Bernanke *et al* (1999), Aghion *et al* (2001), Krugman (1999), and Cespedes *et al* (2004)); and frictions influencing the speed of exchange rate pass-through.

While these arguments represent important caveats, the message from these simulations is that valuation effects arising from sudden asset price movements have the potential to cause material transfers of wealth between countries, with potentially long-run effects on consumption and economic welfare. However, effective portfolio diversification could provide a powerful mechanism to mitigate the economic impact of sharp asset price movements.

#### Conclusions

As a greater proportion of domestic wealth is allocated to foreign assets, domestic demand is likely to become more strongly influenced by developments abroad, while the influence of domestic factors diminishes. Thus, understanding the transmission mechanism of shocks from abroad through the external balance sheet, and its implications for domestic inflation and financial stability, is increasingly important for both central banks and international economic institutions, such as the IMF. This paper contributes to this effort by constructing market-value estimates of the United Kingdom's external balance sheet, comparing its characteristics with the balance sheets of other countries, and analysing the impact of specific external shocks on the United Kingdom's external assets and liabilities.

For the United States, Fair (2004) estimates that for a permanent 1% increase in wealth, approximately 0.03% will be consumed per year.

Detailed examination of external balance sheets can help authorities understand more fully the nature of external shocks a country is exposed to. Information on the geographic dispersion, currency composition, maturity and type of assets and liabilities, when combined with information on an economy's consumption and production patterns, permit a richer analysis of the likely impact of a wide range of shocks.

Despite recent progress, research on the balance sheet channel of shock transmission mechanism between countries is still at an early stage. In particular, further research is needed to illuminate which economic factors and frictions are most important in determining the speed and magnitude of the transmission mechanism through external balance sheets.

In many cases, greater understanding of these issues is severely hampered by the lack of reliable and timely data. In particular, currency decompositions of external assets and liabilities are not readily available for many countries. Better data therefore appear to be the first step towards piecing together a picture of the impact of financial globalisation on the international transmission mechanism.

The analysis presented in this paper suggests that the net external asset position of the United Kingdom, measured in market values, would deteriorate in response to a large adverse global equity market shock. This is because the United Kingdom holds a large positive net asset position in equity-type assets (FDI and portfolio equities). UK assets are particularly exposed to developments in other European countries, which are also important as its trading partners. However, a large depreciation of a particular currency against sterling should have a limited impact on its NIIP if accompanied by an offsetting appreciation of another major currency against sterling, since the United Kingdom's external assets are relatively well diversified across currencies.

#### References

Aghion, P, Bacchetta, P and Banerjee, A (2001), 'Currency crises and monetary policy in an economy with credit constraints', *European Economic Review*, Vol. 47, pages 1,121–50.

Bank of England (2007), Financial Stability Report, April.

**Barrell, R and Davies, E P (2006)**, 'Financial liberalisation, consumption and wealth in 7 OECD countries', *NIESR Discussion Paper no. 247*.

**Bernanke, B, Gertler, M and Gilchrist, S (1999)**, 'The financial accelerator in a quantitative business cycle framework', *Handbook of macroeconomics*, Amsterdam: North-Holland.

Caballero, R (2006), 'On the macroeconomics of asset shortages', NBER Working Paper no. 12753.

**Cespedes, L, Chang, R and Velasco, A (2004)**, 'Balance sheet and exchange rate policy', *American Economic Review*, Vol. 94, No. 4, pages 1,183–93.

Cline, W (2005), 'The United States as a debtor nation', Peterson Institute for International Economics.

**Cooper, R N (2005)**, 'Living with global imbalances: a contrarian view', *Peterson Institute for International Economics Policy Brief No.* 5–3 (November).

**Devereux, M and Sutherland, A (2006)**, 'Monetary policy and portfolio choice in an open economy macro model', forthcoming, *Journal of the European Economic Association*.

**Devereux**, **M** and **Sutherland**, **A** (2007), 'Country portfolio dynamics', *CEPR Discussion Paper no.* 6208.

Dooley, M, Folkerts-Landau, D and Garber, P (2003), 'An essay on the revived Bretton Woods system', *NBER Working Paper no.* 9971.

**Dooley, M, Folkerts-Landau, D and Garber, P (2004)**, 'The U.S. current account deficit and economic development: collateral for a total return swap', *NBER Working Paper no. 10727*.

Engel, C and Matsumoto, A (2006), 'Portfolio choice in a monetary open-economy DSGE model', *NBER Working Paper no. 12214*.

Evans, M and Hnatkoskva, V (2005), 'International capital flows, returns and world financial integration', *NBER Working Paper no. 11701*.

Fair, R (2004), *Estimating how the macroeconomy works*, Cambridge, Mass.: Harvard University Press.

**Goldstein, M and Turner, P (2004)**, 'Controlling currency mismatches in emerging market economies', Peterson Institute of International Economics.

**Gourinchas, P-O and Rey, H (2005)**, 'From world banker to world venture capitalist: the US external adjustment and the exorbitant privilege', *NBER Working Paper no. 11563*.

**IMF (2007)**, 'Decoupling the train? Spillovers and cycles in the global economy', *World Economic Outlook*, Chapter 4, April.

**King, M (2006)**, 'Reform of the International Monetary Fund', speech at the Indian Council for Research on International Economic Relations (ICRIER) in New Delhi, India.

Kollmann, R (2006), 'International portfolio equilibrium and the current account', *CEPR Discussion Paper no. 5512*.

**Krugman, P (1999)**, 'Balance sheets, the transfer problem, and financial crises', *International Tax and Public Finance*, Vol. 6, pages 459–72.

Labhard, V, Sterne, G and Young, C (2005), 'Wealth and consumption: an assessment of the international evidence', *Bank of England Working Paper no.* 275.

Lane, P and Milesi-Ferretti, G M (2006), 'The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970–2004', *IMF Working Paper no. 06/69*. The data set is available from: www.tcd.ie/iiis/pages/people/planedata.php.

Lewis, K (1999), 'Trying to explain home bias in equities and consumption', *Journal of Economic Literature*, Vol. XXXVII, pages 571–608.

**Obstfeld, M and Rogoff, K (2000)**, 'The six major puzzles in international macroeconomics: is there a common cause?', in Bernanke, B S and Rogoff, K (eds), *NBER Macroeconomics Annual*, Cambridge, Mass.: MIT Press.

**Obstfeld, M and Rogoff, K (2004)**, 'The unsustainable U.S. current account position revisited', *NBER Working Paper no. 10869*.

**Poterba, J (2000)**, 'Stock market wealth and consumption', *The Journal of Economic Perspectives*, Vol. 14, No. 2 (Spring), pages 99–118.

**Pratten, C (1996)**, *The valuation of outward and inward direct investment*, Cambridge University.

Roubini, N and Setser, B (2004), 'The U.S. as a net debtor: the sustainability of the U.S. external imbalances', Stern School of Business, NYU.

Schnabel, I and Shin, H S (2004), 'Liquidity and contagion: the crisis of 1763', *Journal of the European Economic Association*, Vol. 2(6), pages 929–68.

Sorensen, B, Wu, Y, Yosha, O and Zhu, Y (2005), 'Home bias and international risk sharing: twin puzzles separated at birth', *CEPR Discussion Paper no. 5113*.

Tille, C (2005), 'Financial integration and the wealth effect of exchange rate fluctuations', *Federal Reserve Bank of New York Staff Report*, No. 226.

Whitaker, S (2006), 'The UK international investment position', *Bank of England Quarterly Bulletin*, Vol. 46, No. 3, pages 290–96.

### The real exchange rate and quality improvements

#### Summary of Working Paper no. 320 Karen Dury and Özlem Oomen

Much of the literature on the New Open Economy Macroeconomics (NOEM) focuses on technological progress that manifests itself through improvements in productivity, ie increased efficiency in the production of a given range of goods, which is also known as *process innovation*. A common finding in this literature is that a positive productivity shock in the home country tends to depreciate the real exchange rate. This is because a positive domestic productivity shock increases the supply of home relative to foreign goods, which then reduces the relative price of home goods causing a real depreciation. But technological progress can also come about via improvements in the quality of a given range of products, known as product innovation. We might envisage that this type of technological progress in the home country will cause the real exchange rate to appreciate. This is because higher quality goods, in general, can command higher prices, which then tend to increase the relative price of home goods leading to a real appreciation. The simple model presented in this paper aims to take the NOEM literature a step towards modelling this type of technological progress. In particular, we are interested in understanding the theoretical link between quality improvements and real exchange rates.

The real exchange rate is defined as the ratio of the two countries' price indices, expressed in a common currency. But

in a world where goods become obsolete and are replaced due to quality improvements, the relevant real exchange rate is the real exchange rate measured in terms of quality-adjusted prices. In practice, price indices may not (fully) capture the quality improvements in goods, and the real exchange rate may consequently be miscalculated. Here, we examine the impact of quality improvements on two measures of the real exchange rate: the *quality-adjusted* and the *quality-unadjusted* measure. The former measure is calculated using price indices that aggregate prices per quality unit, and hence, by construction, it fully accounts for product quality. The latter measure, on the contrary, is calculated using price indices that aggregate unit prices only, and hence by construction, it fails to account for product quality.

Our analysis shows that a quality improvement can lead to either a depreciation or an appreciation of either measure of the real exchange rate depending on how costs of production are affected by the quality improvement. We also find that the real exchange rate defined in terms of unit prices does not always move in the same direction as the real exchange rate defined in terms of prices per quality unit, illustrating the importance of measuring quality correctly.

## Comparing the pre-settlement risk implications of alternative clearing arrangements

#### Summary of Working Paper no. 321 John P Jackson and Mark J Manning

This paper analyses the risk implications of different arrangements for clearing securities and derivatives markets. In this context clearing refers to the set of procedures in place for calculating the net exposures arising from a set of financial market trades and managing the credit risks arising from these trades in the period prior to their final settlement.

This is a topic of considerable policy interest. For instance, there is a live debate underway in policy and industry circles regarding the potential risk-reduction benefits of centralised clearing arrangements for a broader range of over-the-counter (OTC) derivative products. Another topical issue, particularly in an EU context, is whether significant efficiency gains could be realised by merging several domestic central counterparty clearing houses (CCPs) into a single cross-market entity.

This paper provides an analytical framework for evaluating quantitatively the relative cost and risk implications of a range of clearing methods, covering different constellations of products, trader profiles and market structures. This is done by simulating agents' pre-settlement costs and risks under a range of bilateral and multilateral clearing arrangements. Two metrics for pre-settlement risk are analysed: the magnitude of replacement cost losses; and the distribution of such losses.

Replacement cost risk arises during the period between trade and settlement and reflects the cost to a trader of replacing a trade on which a counterparty has defaulted. Agents can mitigate replacement cost risk by collecting collateral (known as margin) from their trading counterparties during the pre-settlement period; hence a trader (or CCP) will only incur a replacement cost loss if there is a coincidence of events: an adverse change in the underlying contract price in excess of the per-unit value of margin collected from a counterparty, combined with a default by that counterparty. However, the requirement to post margin may impose a significant cost on agents, which in our analysis is quantified and compared across arrangements.

We analyse three distinct clearing and settlement arrangements for futures markets: (i) bilateral clearing; (ii) ring clearing; and (iii) CCP clearing. These may be defined as follows:

 In bilateral clearing, trading agents post margin on the basis of their net bilateral obligations. This remains the typical clearing arrangement for off-exchange and OTC trading, particularly in less standardised products.

- The second approach, ring clearing, is a way of achieving multilateral netting of exposures without requiring a CCP to

become the legal counterparty to all trades. Rather, the original bilateral exposures are extinguished and multilateral net exposures reallocated, according to some pre-determined algorithm, among members of the ring. A ringing arrangement reduces collateral costs, but agents retain some counterparty credit exposure to one another. There are, to our knowledge, no formal ringing arrangements in operation at present, although services for multilateral contract terminations can achieve something similar.

- The final approach analysed, CCP clearing, takes ringing a step further by introducing novation of all trades to a central counterparty; novation refers to the process by which the CCP interposes itself as legal counterparty to both the buy and sell-side of all the trades it clears. In the absence of counterparty default, the CCP has a balanced book and does not, therefore, face any market risk. At the same time, agents are no longer exposed to their original counterparties, instead having a single net exposure in each asset with the CCP. By providing centralised risk management and facilitating anonymous trade, CCP clearing is particularly beneficial in the case of exchange-traded assets, particularly those with long settlement periods, such as derivatives.

We identify two basic sources of replacement cost risk differentials across the arrangements under consideration: netting ratios and margin pooling. We show that replacement cost losses and the opportunity costs from posting collateral under CCP or ring clearing decline as the number of bilateral trading counterparties increases.

In the context of multi-asset clearing, we find that 'margin pooling' is an important effect. This is the benefit derived when an agent's margin payments in respect of multiple positions can be pooled, such that, in the event that the agent defaults, the margin-taker can draw upon any residual margin in the pool (either from profitable, or only modestly loss-making, positions) to cover a margin shortfall arising on any individual position(s). Our simulations show how this effect can vary according to the degree of price and position correlation across assets. Our results imply that a merger of CCPs has the potential to significantly reduce the risks and costs faced by traders.

Finally we allow trader credit quality to vary in order to analyse agents' individual incentives to adopt particular clearing arrangements. We show that restricted access or tiered clearing arrangements, where risky traders are not able to become a member of the CCP but must clear their trades through a more creditworthy agent who is a member, may then emerge naturally.

### An affine macro-factor model of the UK yield curve

#### Summary of Working Paper no. 322 Peter Lildholdt, Nikolaos Panigirtzoglou and Chris Peacock

Understanding which factors drive movements in the term structure of interest rates is of potential interest to policymakers for a number of reasons. For example, the extent to which changes in the short-term policy rate feed through to longer-term yields is important since it represents a key part of the transmission mechanism of monetary policy by affecting the spending, saving and investment behaviour of individuals and firms in the economy. Moreover, the yield curve has been found to be a good predictor of future real activity and inflation. The term structure also contains information about market participants' expectations of the future path of interest rates. But there is strong empirical evidence to suggest that time-varying risk premia drive forward rates away from these expectations. The decomposition of forward rates into expectations of future interest rates and risk premia is one of the key contributions of this paper.

In this paper, we estimate various models of the term structure of interest rates for the United Kingdom, where the underlying factors that drive movements in the term structure have a macroeconomic interpretation. The first factor is an unobserved inflation target, the second factor is annual inflation, and the third factor reflects, among other things, the output gap and monetary policy shocks. We find that the long end of the yield curve is primarily driven by changes in the unobserved inflation target. At shorter maturities, yield curve movements reflect mainly the other two factors.

Our preferred model implies that agents require compensation (ie a risk premium) for risks associated with output gap and inflation shocks but do not require compensation for shocks to the inflation target. This result seems consistent with simple asset pricing models with an assumed representative (homogenous) agent. Our yield curve models can be used to back out a path for an unobserved time-varying inflation target. This path is shown to be closely linked to other measures of long-run inflation expectations, such as those from market-based ten year ahead breakeven inflation rates and long-run Consensus forecasts of inflation.

Time series of risk premia on long forward rates from the preferred yield curve model have declined since the 1970s, which is consistent with perceptions of declining macroeconomic uncertainty or perhaps more efficient macroeconomic stabilisation policies. Model-derived risk premia at short maturities are shown to be highly correlated with survey-based risk premia, which indicates that the model could be useful for the purpose of extracting market-based interest rate expectations. This is comforting because we have not used survey data for estimation or even model selection. As such, it provides support for the estimated models.

## Forecast combination and the Bank of England's suite of statistical forecasting models

#### Summary of Working Paper no. 323 George Kapetanios, Vincent Labhard and Simon Price

Monetary policy at the Bank of England and at many other central banks is forward looking. So it is essential to be able to forecast accurately the future evolution of the economy. Consequently, the Bank of England maintains a large number of models, ranging from the purely statistical to data-free theoretical models, which we call upon to answer not only forecast but also other questions. As part of this general philosophy, the Bank has developed a range of purely statistical forecasting models (referred to hereafter as the 'Suite') which can be used to construct judgement-free statistical forecasts of inflation and output growth and which form one of many inputs into the Monetary Policy Committee's (MPC's) forecast process. This process culminates in the forecast fan charts reported in the Inflation Report which show a range of possible outcomes. These encapsulate the MPC's collective judgement of the prospects for inflation and growth, and are conditioned on specific assumptions, including interest and exchange rates and some exogenous variables, as well as on general views about the future.

We describe the Suite as it stood when it was first created in May 2005. Naturally, this is merely a snapshot, as the Suite continues to evolve; models or model combinations may be added or dropped, and the data continually change. On the evidence of the data and models that we examine in this paper, combinations of statistical forecasts generate good forecasts of the key macroeconomic variables, which can serve as judgement-free benchmarks to compare with the policymaker's projections. Moreover, changes in forecasts as new data arrive provide a summary measure of the relevant news in the data, giving a natural indicator of changing inflationary pressure over the horizons of policy interest.

We use two broad types of models. The first uses only univariate models (using only the variable to be forecast), which capture information solely in the forecast variable's history. Within this broad class we include linear and non-linear models of various types, including ones which may be more robust to some types of structural change. The second comprises multivariate models (including more than one variable), which capture a wider range of information. The data sets here vary in size, the largest using over 60 variables. Here too we include models which may be robust to structural change.

One important issue is the 'attractor', the value to which the forecast tends in the long run. If models fit the data well they will tend to produce a long-run forecast close to the average of the past. In the case of inflation, the monetary regime has changed over the sample period: the recent average inflation rate is substantially lower than over the whole sample period, reflecting the success in meeting the inflation targets in place since 1992. We test for structural breaks in the mean, and then forecast the inflation rate less this mean.

Individual forecasts are then combined to produce a single forecast. Forecast combination has a good track-record of improving forecasts. The combinations we use are a simple average of all the forecasts in the Suite, where all individual forecasts have an equal weight, which has been shown to work well in practice; and our preferred method based on goodness-of-fit, which we have shown may have a superior forecast ability.

This exercise is essentially practical, and success is measured by improved forecasts. Data typically has some obvious short-run cyclical variation that has to be accounted for, but it is often possible to capture this with a simple autoregressive (AR) process (where the model is a combination of past values of the variable being forecast). So we assess the forecasts since Bank independence in 1997 Q2 to 2005 Q1 relative to a benchmark AR forecast. Over our sample the AR forecasts are hard to beat, especially for inflation, with most of the models doing worse for most periods, although two non-linear models do better at most horizons. However, the benchmark combinations can beat the AR at many horizons for both growth and inflation. Thus the Suite appears to be fit for its intended purpose, as a statistical benchmark forming one of many inputs into the MPC's forecast process.

### Housing equity as a buffer: evidence from UK households

#### Summary of Working Paper no. 324 Andrew Benito

The links between consumer spending and the housing market have been the focus of much debate. On several occasions in the past, swings in consumption and house prices have coincided. Precisely how to interpret that is by no means clear. One view has it that house prices are an asset price for an essential commodity, shelter, and that they largely reflect macroeconomic conditions with no special role of their own. Another view is that there is an important causal effect of housing in providing collateral for households' borrowing and spending decisions. Previous work by the Bank of England in this area has emphasised both views. Much of the comovement of house prices and consumption is driven by common movements in other variables. But there is likely to have also been a causal effect on consumption from house prices that results from the collateral channel. That reflects the fact that after a rise in house prices, homeowners enjoy capital gains that improve the terms on which they can obtain credit. For those wishing to borrow, that may have implications for their spending. Both of these views downplay the notion that house prices have an aggregate 'wealth effect' on consumption.

In this paper, one stage in that collateral channel is examined in finer detail: the withdrawal of home equity by households that enjoy gains in home equity (often referred to as 'mortgage equity withdrawal'). To look at this, the paper uses data on UK households over the period 1992 to 2003. Most previous analysis of mortgage equity withdrawal has used aggregate data. But aggregate mortgage equity withdrawal data conflate together rather different decisions by distinct groups of households. For example, the decisions by homeowners to actively borrow against the value of their homes are quite different from decisions by last-time sellers. Employing data for large numbers of homeowners and focusing solely on whether they actively borrow against their home equity or not avoids that drawback. In the period examined, the UK housing market went from a depressed state to one of its most remarkable booms. That varied experience, also reflected in the use of housing equity withdrawal, makes it a particularly useful period to examine.

Modelling the decision to withdraw versus retaining equity in the home helps us build up a picture of what influences this decision. This leads to a view that, among other things, housing equity plays the role of a financial buffer, being retained in normal times but drawn upon (and withdrawn) when a temporary, adverse shock has been experienced.

As well as the experience of some adverse financial shock, the findings also indicate that households are more likely to withdraw home equity if they are liquidity constrained, if they hold relatively large amounts of home equity and if they have higher incomes. There is also some evidence that they are more likely to withdraw equity if they face less house price uncertainty. Changes in marital status are particularly important. It is much more common for withdrawn equity to flow into housing investment than into consumption. That suggests the 'collateral channel' should be stronger for housing investment than consumer spending.

An emphasis on housing equity as a buffer is consistent with the view that many households seem to look at their housing equity as an asset that they would be prepared to draw on in an emergency to support their consumption plans. This is important since most homeowners have relatively little cash but relatively large amounts of home equity. The precautionary savings literature has, however, generally emphasised the use of liquid assets as a buffer.

### Inter-industry contagion between UK life insurers and UK banks: an event study

#### Summary of Working Paper no. 325 Marco Stringa and Allan Monks

One of the Bank's core purposes is to detect and reduce threats to the financial system as a whole. The UK banking sector is a cornerstone of the UK financial system. Hence, contagion from one financial sector to the UK banking system may potentially have relevant implications for financial stability.

Over the past decade, correlations between equity price movements of UK banks and life insurers have increased markedly, most likely due to banks' increased involvement in the life insurance market. During the equity market decline between 2001 and 2003, UK life insurers were adversely affected. Consequently, the potential for contagion from the insurance sector to the UK banking sector became an important and much debated issue. This paper uses that period to assess the extent to which events in the life insurance sector have the potential to spillover to the banking system in times of stress.

Previous work at the Bank has identified potential channels by which shocks may be transmitted between sectors. Such interlinkages do not only originate from direct channels — ie counterparty exposures — but also from indirect channels via the impact of adverse and unexpected news on financial markets and consumers' confidence. Although accounting data provide a means to obtain a first estimate of counterparty exposures, they are less useful in measuring the magnitude of indirect channels. This paper aims to capture all three possible channels of contagion by using unexpected changes in equity price movements. In other words, we use equity prices as a tool to gauge the degree of inter-industry contagion from the UK life insurance sector to the UK banking sector.

The paper also uses information on equity trading volumes, in order to detect any significant reactions not captured by

equity prices. For example, when investigating the presence of interlinkages, a mix of positive and negative reactions may lead to misleading conclusions since opposite interpretations of news can offset each other resulting in non-significant changes in equity prices. Therefore, we originally introduce the use of trading volumes to detect any significant reaction not captured by equity prices.

After undertaking a rigorous selection process to identify suitable events that originated in the life insurance sector between 2001 and 2003, we split them into two categories: events that impacted on specific life insurance companies and those that affected the life insurance sector as a whole. The results show that none of the firm-specific disturbances spilled over to the UK banking sector. There was, however, some evidence that elements of the banking system responded to events that affected the life insurance sector as a whole — but these reactions were not uniformly pervasive. On closer inspection of the banking sector, the results show that bancassurers, defined as those banks that have large holdings of life insurance assets, were the only group whose equity prices were significantly affected by disruptions in the UK life insurance sector. These results suggest that the most significant channel for spillover to the banking sector is via UK banks' ownership of life insurers, while indirect channels were not found to be materially significant.

Our study is based upon a relatively recent period, as changes in banks' business models as well as structural changes to the economy may alter the magnitude and nature of interlinkages. Consequently, our analysis employs a relatively small sample. Further research could investigate whether the results presented in this paper can be replicated for other countries.

## Report

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## A review of the work of the London Foreign Exchange Joint Standing Committee in 2006

## This article reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 2006.

The Foreign Exchange Joint Standing Committee (FXJSC — 'the Committee') was established in 1973, under the auspices of the Bank of England, as a forum for banks and brokers to discuss broad market issues. The Committee comprises senior staff from many of the major banks operating in the wholesale foreign exchange market in London, representatives from brokers, the Wholesale Market Brokers' Association (WMBA), the Association of Corporate Treasurers (ACT) — representing corporate users of the foreign exchange market — the British Bankers' Association (BBA) and the Financial Services Authority (FSA). A list of the members of the Committee as at end-2006, can be found at the end of this review.

The Committee met six times during 2006. The main themes of the work programmes of the FXJSC main Committee and its subgroups were: updating the Non-Investment Products Code (NIPs Code); liaison with the UK authorities in clarifying the treatment of foreign exchange instruments under the Markets in Financial Instruments Directive (MiFID); further work on the refining of contingency preparations; and the publication of the Committee's semi-annual survey of turnover in the UK foreign exchange market. Much of this work was progressed by subgroups, in particular those representing operations managers, legal representatives and chief dealers, and other *ad hoc* working groups.

## Non-Investment Products Code and the work of the operations managers subgroup

The NIPs Code is a voluntary code of good market practice drawn up by market practitioners, covering the foreign exchange market in the United Kingdom as well as the markets for wholesale bullion and wholesale deposits. The Code is maintained by the FXJSC, with contributions from the Sterling Money Markets Liaison Group (MMLG) and the Management Committee of the London Bullion Market Association (LBMA) on the relevant sections. In January 2006, the Code was updated and republished for the first time since 2001. Significant changes to its format were made, including making the Code solely available in electronic format on the Bank's website, to facilitate more frequent updates in the future.

During 2006, the operations subgroup, in collaboration with the legal subgroup, worked on preparing further proposed changes for inclusion in the NIPs Code. These changes were developed using several additional working groups. The sections under review to reflect current best practice included those on mandates, confirmations and Standard Settlement Instructions (SSIs).

The confirmations working group developed the section on usage and processing of confirmations and clarified procedures for cancelling confirmations. This section also highlights the use of electronic confirmation, matching and tracking systems as part of market-standard procedures.

The mandates working group reviewed the dealing mandates<sup>(1)</sup> section of the NIPs Code, updating it to take account of developments in electronic trading and clarifying responsibilities and procedures for accepting, rejecting and updating such mandates. Final drafts of both of these sections were completed by the end of the year. In addition to the updated sections on confirmations and mandates produced by the FXJSC, the LBMA contributed an updated version of the section of the NIPs Code covering wholesale spot, forwards and deposits in gold and silver bullion. There were no further changes made during 2006 to the annex on wholesale deposits.

The SSIs working group continued to make progress during 2006 in formulating recommendations for standardisation. An updated version of this section is expected to be finalised in 2007.

A dealing mandate is typically supplied by a corporate client setting out arrangements for dealing with its counterparties eg listing who is authorised at the corporate to deal on its behalf.

Throughout the year, a FXJSC working group on non-deliverable forwards (NDFs)<sup>(1)</sup> co-operated closely with the New York Foreign Exchange Committee (FXC) on helping to produce a new bilateral NDF Master Confirmation Agreement. This was published by the Emerging Markets Traders Association (EMTA) in December 2006. The NDF working group also co-operated closely with the Continuous Linked Settlement (CLS) system to provide market input into the drafting of CLS's protocol for foreign exchange confirmations.

Going forward, it is intended that the Code will be updated on a more regular, routine basis. Suggestions for any future amendments should be made to the Secretariat of the FXJSC at PO Box 546 Threadneedle Street (HO-1), London EC2R 8AH. As now, changes will be made after consultation with associations which endorse the Code, including the Association of Corporate Treasurers, British Bankers' Association, Building Societies Association, Chartered Institute of Public Finance and Accountancy, London Bullion Market Association, London Investment Banking Association and the Wholesale Market Brokers' Association.

## Contingency planning and work of the contingency subgroup

As in other markets, there was significant progress on contingency preparations in 2006, involving collaboration between the FXJSC and its subgroups and other market committees with the aim of further improving financial sector resilience.

The FXJSC main Committee and the operations subgroup participated in the pandemic flu exercise organised by the Tripartite Authorities<sup>(2)</sup> during October and November. Members followed the evolving scenarios over the weeks of the exercise and held a special conference call of the Committee, including the Chair of the operations subgroup, in Week 4 of the exercise. This call discussed the possible impact of a pandemic on the foreign exchange market and, more specifically, the extent to which transaction volumes should be reduced and how quickly that could be managed. The FXJSC main Committee further discussed these issues, and the weekly update of the exercise, at its regular meeting which occurred during Week 5. The views of the FXJSC were passed to the Cross Market Business Continuity Group (CMBCG) which considered the potential impact of a pandemic across markets.<sup>(3)</sup> The exercise highlighted the importance of the resilience of the key infrastructure providers and their interactions.

The contingency subgroup, established in 2005, began to consider individual contingency scenarios, allowing members of the operations subgroup to consider and discuss contingency issues in the foreign exchange market at a granular level, including the FXJSC's own contingency arrangements for individual events. In September 2006, the contingency subgroup, together with the operations subgroup, organised a special meeting to consider a walkthrough of a scenario involving a prolonged outage of the CLS system for the settlement of foreign exchange transactions. The scenario for the meeting was constructed with the help of CLS. Panel members presenting the scenario included the Chairs of the FXJSC main Committee, the operations subgroup and the contingency subgroup, as well as representatives of CLS and FXJSC member firms. The audience comprised of a large number of market participants who were encouraged to participate actively in the debate on contingency arrangements. The meeting highlighted issues such as possible improvements to crisis communication arrangements, to be considered by the operations subgroup, which includes CLS. SWIFT also made presentations to the operations managers on its developments and business continuity planning.

#### Work of the legal subgroup

The legal subgroup was established in 2004 and comprises 18 members offering in-house counsel from many of the major places of the wholesale foreign exchange markets in London. The legal subgroup was very active in 2006, making an invaluable contribution through its provision of legal support to the work of the FXJSC main Committee, operations subgroup and working groups, in particular through advising on and drafting the sections to update the NIPs Code. The legal subgroup also considered the Master NDF confirmation documentation.

In a separate work-stream, the legal subgroup assisted the basis swaps market in preparing and implementing a set of 'fix'<sup>(4)</sup> exchange rates, jointly produced by EBS and Reuters, to provide an alternative option to the 11.00 am page of foreign exchange rates which had been used by the basis swap market as its reference. This publication of indicative rates at 11.00 am had previously been provided by the Bank of England, which ceased publication on 18 December 2006.

## Legal subgroup working group: Markets in Financial Instruments Directive (MiFID)

The MiFID working group, established under the direction of the FXJSC's legal subgroup has provided guidance to the main Committee on MiFID and its impact on the foreign exchange market, particularly its implementation in the United Kingdom and has assisted the market's liaison with HMT and the FSA.

<sup>(1)</sup> NDFs are forward contracts in foreign exchange where one currency is not easily traded. The contract is priced by reference to a particular source for the bilateral exchange rate but is settled entirely in the more freely available currency, usually dollars.

<sup>(2)</sup> HM Treasury, the Financial Services Authority and the Bank of England.

<sup>(3)</sup> Tripartite Authorities' UK Financial Sector Market Wide Exercise 2006 Report can be found at www.fsc.gov.uk/upload/public/Files/36/Financial%20Sector%20Market %20Wide%20Exercise%202006%20Report.pdf.

<sup>(4)</sup> A 'fix' is an indicative market rate published at an agreed time and which is frequently used as a price reference for customers' transactions.

This included drafting a formal response to the HMT consultation on the implementation of MiFID in the United Kingdom and concluded with the publication of the FSA's policy statement, PS 07/5 *Perimeter Guidance relating to MiFID* on the treatment of foreign exchange swaps, forwards and NDFs.

#### Chief Dealers' subgroup

The Chief Dealers' subgroup was established in July 2005 and membership during 2006 reached a total of thirteen chief dealers active in the London foreign exchange market. Meeting quarterly, members discussed conjunctural and structural developments in the foreign exchange market, including the impact of algorithmic trading and MiFID.

#### International co-operation

In October 2006, the Chair and two other Committee representatives attended a special meeting hosted by the New York Foreign Exchange Committee, comprising Chairs and Secretaries of eight foreign exchange committees based in different financial centres (London, Frankfurt for the euro area, Hong Kong, New York, Singapore, Sydney and Toronto). The group discussed topical issues in the foreign exchange market and the work programmes of the committees and highlighted the importance of good communications between the committees.

#### International survey results overview

Thirty banks, drawn from committee members and the most active participants in the London foreign exchange market, contributed to the fourth and fifth semi-annual surveys of foreign exchange turnover in London conducted by the FXJSC.<sup>(1)</sup> The survey showed strong growth in London foreign exchange turnover during 2006. Average daily turnover recorded in the October 2006 survey was \$1,056 billion, some 23% higher than in October 2005, a more modest growth from the year before (Chart 1). Turnover growth recorded by the New York FXC over the same period was 12%. In addition, October 2006 facilitated the first annual comparison of the Singapore FEMC and Canadian FXC surveys, which showed a 17% increase and 5% decrease in turnover respectively.

The FXJSC survey saw a continuation of growth in all products, except outright forwards (Chart 2).

Among the major currencies (**Chart 3**), there was a fall in euro turnover, despite rises in dollar, sterling and yen. Turnover concentration in the top five banks remained steady at 45%, while the number of banks accounting for 95% of turnover fell to 20% from 21% in October 2005 (and 22% in October 2004).

#### Chart 1 Global FX<sup>(a)</sup> daily average turnover



Sources: Canadian Foreign Exchange Committee, London Foreign Exchange Joint Standing Committee, New York Foreign Exchange Committee and Singapore Foreign Exchange Market Committee.

(a) This includes spot, outright forwards, FX swaps, currency swaps and FX options.

#### Chart 2 UK daily average turnover by product



Source: London Foreign Exchange Joint Standing Committee.





Source: London Foreign Exchange Joint Standing Committee

 Turnover survey results are available at the Bank of England website at www.bankofengland.co.uk/markets/forex/fxjsc/fxturnresults070122.pdf.

#### Members of the London Foreign Exchange Joint Standing Committee as at December 2006

Name	Firm/Organisation	
Robert Loewy	Bank of China	Michael Dougla
Ivan Ritossa	Barclays	Bob Jordan
Henri Foch	BNP Paribas	Duncan Lord
Marcus Browning	Citi	Phil Kenworthy
Matthew Spicer	Credit Suisse	Michael Daly
Robert McTamaney	Goldman Sachs	Susan Balogh
Andrew Brown	HSBC	Richard White
Adam Burke	JP Morgan	Colin Perry
Richard Gladwin	Lehman Brothers	Graeme Munro
Paul Blain	Morgan Stanley	Derrick Pearson
Peter Nielsen	Royal Bank of Scotland	Kim Surendran
Marcus Nysten	SEB	Andrew Harvey
Michael Kahn	State Street	Kerry Peacock
Darren Coote	UBS	John Moorhous
Jack Jeffery	EBS	Isabelle Denniga
Phil Weisberg	FXAll	Stephen Smith
James Potter	Tullett Prebon	Elizabeth Swant
David Clark	Wholesale Market Brokers' Association	William Deighte
Brian Welch	Association of Corporate Treasurers	John Whelan
Alex Merriman	British Bankers' Association	Alex Merriman
Leigh Meyer	Chair, operations subgroup	Leigh Meyer (Cł
David Bloom	Chair, legal subgroup	Sumita Ghosh/E
Timothy Rowe	Financial Services Authority	
Paul Fisher (Chair)	Bank of England	
Sumita Ghosh/Benedict King (Secretariat)	Bank of England	

#### Members of the London Foreign Exchange Joint Standing Committee operations subgroup as at December 2006

Name	Firm/Organisation
Michael Douglas	Bank of America
Bob Jordan	Bank of England
Duncan Lord	Barclays
Phil Kenworthy	CLS Services
Michael Daly	Deutsche Bank
Susan Balogh	Goldman Sachs
Richard White	HSBC
Colin Perry	ICAP
Graeme Munro	JP Morgan
Derrick Pearson	Lloyds
Kim Surendran	Mellon Bank
Andrew Harvey	Morgan Stanley
Kerry Peacock	Rabobank
John Moorhouse	Reuters
Isabelle Dennigan	RBS
Stephen Smith	State Street
Elizabeth Swanton	SWIFT
William Deighton	UBS
John Whelan	Association of Foreign Banks
Alex Merriman	British Bankers' Association
Leigh Meyer (Chair)	Citi
Sumita Ghosh/Benedict King (Secretariat)	Bank of England

#### Members of the Chief Dealers' subgroup as at December 2006

Name	Firm/Organisation
Hiroshi Morioka	Bank of Tokyo Mitsubishi UFJ
Danny Wise	Barclays Capital
Justin Newman	Calyon
Bernie Kipping	Commonwealth Bank of Australia
Mike Leighton	Credit Suisse
Angus Greig	Deutsche Bank
Chris Allington	Merrill Lynch
Christopher Nicoll	Morgan Stanley
Roger Hawes	RBS
Mark Iles	Royal Bank of Canada
Chris Freeman	State Street
Chris Kreuter	UBS
Martin Mallett (Chair)	Bank of England

#### Members of the FXJSC legal subgroup as at December 2006

Name	Firm/Organisation
Gaynor Wood	Bank of America
Chris Allen	Barclays Capital
Julia Elliott	Citi
Leonie Miller	Credit Suisse
Yien Hong	Deutsche Bank
Felicity White	HSBC
David Lewis	JP Morgan
Pania Kouris	Lloyds
Daniel Rubin	Morgan Stanley
Alex Bouchier	RBS
Martin Oakley	Reuters
Alistair Clevely	Standard Chartered
Simone Paul	State Street
Kate Binions	UBS
Anne Moore-Williams	Financial Services Authority
David Bloom (Chair)	HSBC
Jacqueline Joyston-Bechal (Secretary)	Bank of England

## Speeches

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## The MPC ten years on<sup>®</sup>

Not long before his untimely death, David Walton invited me to deliver this lecture. Anyone who knew David will be desperately sad not only that he is no longer with us to ask important questions and make us smile at his dry humour, but even more so that he is unable to take his place at the deliberations of the Monetary Policy Committee to which he contributed so much in such a short space of time. David had a wonderfully clear mind, an independence of thought, and was a warm and generous colleague. He is, and will continue to be, deeply missed. David asked me to look back on the experience of the first ten years of life with the MPC and to try to learn from that experience. So, in his memory, that is my aim this evening.

Although the announcement in 1997 of independence for the Bank of England was a bolt from the blue, it was a long time in the making. During the 1970s inflation in the United Kingdom averaged 13% a year and peaked at 27%. Only towards the end of that decade, with first a Labour and then a Conservative Government recognising that the control of inflation was the first step towards any semblance of a coherent macroeconomic policy, did the transition from the Great Inflation to the Great Stability begin. But the first steps were faltering. It took two painful recessions and sterling's exit from the Exchange Rate Mechanism in September 1992 to reach the goal of low inflation. Even then, the long-term commitment of the United Kingdom to low inflation was not fully believed by financial markets. Granting independence to the Bank of England was the dramatic constitutional change that convinced financial markets of the United Kingdom's conversion to stability as the basis of macroeconomic policy.

Next Sunday is the tenth anniversary of the historic announcement on the morning of Tuesday 6 May 1997 that the Bank of England would be granted independence. Although that decision was both unexpected and far-reaching, we had been preparing to implement the manifesto commitment to introduce a monetary policy committee to help the Bank formulate its advice to the Chancellor in the context of the previous regime, in which the Chancellor decided on the level of interest rates following a meeting with the Governor.

On the very day that Gordon Brown and Ed Balls entered the Treasury carrying a draft letter to the Governor setting out proposals for Bank of England independence, the Bank completed a paper for the incoming team setting out proposals for how an advisory committee might operate. It recommended a fixed timetable for meetings between Chancellor and Governor and for the announcement of decisions on interest rates. Many of the recommendations were carried over to the independent MPC that followed. The optimal time for meetings was thought to be the end of the first week of the month, and with minor changes the timetable of a two-day meeting culminating with an immediate announcement of the decision at noon on Thursday was adopted within a couple of weeks. The key difference was that a purely advisory committee would not have published minutes of its own deliberations - only the minutes of the meetings between the Chancellor and Governor would have been made public — and voting was not an agreed feature of such a committee.

My predecessor — Eddie George — was informed of the new and enhanced role for the Bank early on the morning prior to the announcement — a Bank Holiday Monday. Returning from the tennis court, I received a call from Eddie asking me to meet him in the Bank as soon as possible. That was the last I saw of the sun for quite a time. We sat in his office with a sense of excitement that now we really did have a chance to show what the Bank of England and price stability could do for this country. Eddie charged me with the task of preparing ideas on how the new committee — the Monetary Policy Committee would decide and set the level of interest rates, and to draft the speaking note for the very last Chancellor-Governor meeting which was brought forward from Wednesday to 8 am on the Tuesday.

By the next morning when the public announcement was made, a paper was ready setting out the questions that the Bank would have to answer on how the new Committee would operate. We had a script but, at this stage, the cast was incomplete. Only four of the five internal and none of the external members were in place. With the support and hard work of some extraordinarily talented young Bank economists, the new arrangements were designed and put in place in not much more than three weeks. They included the arrangements

<sup>(1)</sup> Lecture delivered on 2 May 2007 to the Society of Business Economists. I am indebted to Alex Brazier, Iain de Weymarn, Richard Harrison, James Proudman, Chris Salmon, Tim Taylor and Ryland Thomas who have worked closely with me on this lecture. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech309.pdf.

for briefing the Committee, the pre-MPC meetings, the format of the decision-making meetings of the MPC, practical matters such as the ordering of a sound system so that, in a break with tradition, it was actually possible to hear what was said in the Bank's older meeting rooms, and rehearsals of the meetings and voting procedures with staff members playing the roles of the MPC members. So short was the time available that some of the dress rehearsals came after the first night of other parts of the policy process. Such was the adrenalin flow that at one rehearsal a row broke out about how a decision would be reached if the Committee split three-ways in equal numbers. Needless to say, such an eventuality has not occurred.<sup>(1)</sup> But all was resolved and the show opened on Wednesday 4 June. At that first meeting the MPC raised interest rates by 25 basis points, as it did at its two subsequent meetings.

A decade is a long time for any show to run. How has it fared? On the face of it UK macroeconomic performance has improved with the creation of the new monetary framework. The MPC arrived on the scene midway through what I have described as the nice (non-inflationary consistently expansionary) decade, and continued into the *not-so-bad* decade.<sup>(2)</sup> Since the MPC was set up economic growth has averaged 2.8% a year — a little above the post-war average rate — and there has not been a single quarter of negative growth. The average deviation of inflation from target has been just minus 0.08 percentage points.

Let me stress that the Committee does not dwell on the past. But an important question for all of us is whether our new-found stability will persist. That is not a new question. On the tenth anniversary of the MPC we should remember that this is also the 50th anniversary of Harold Macmillan's famous claim that we had 'never had it so good'. But let me remind you too of the full text of his remarks. In a speech on economic prospects in July 1957, the former Chancellor of the Exchequer, who had recently become Prime Minister after the resignation of his predecessor following an unsuccessful military excursion in the Middle East, said:

'Indeed, let us be frank about it: most of our people have never had it so good. Go around the country, go to the industrial towns, go to the farms, and you will see a state of prosperity such as we have never had in my lifetime — nor indeed ever in the history of this country. What is beginning to worry some of us is, is it too good to be true? — or perhaps I should say, is it too good to last? … Our constant concern today is, can prices be steadied while at the same time we maintain full employment in an expanding economy? Can we control inflation? This is the problem of our time'.<sup>(3)</sup>

Some of you may think that it is the problem of our time too. CPI inflation has now risen above 3%, the highest rate since the MPC was set up. Although I believe we are better equipped to maintain stability now than 50 years ago, largely because we have a monetary framework based on an inflation target and clearly defined responsibilities for the Bank of England, we should perhaps look in more detail at how the MPC has worked before coming to a final judgement on the likelihood of continued success. First, I want to look at the changes in the behaviour of the UK economy in recent years. How far is the improvement attributable to the MPC? Second, I want to review how the MPC has operated as a decision-making body. Has the process lived up to its billing as the most effective way of reaching technical judgements on the level of Bank Rate? Third, and most important of all, I want to consider the challenges to the MPC for the next ten years. What can we learn from the experience of the first decade that may help us to improve over the next?

#### Changes in the UK economy

In examining the first ten years of the MPC a natural starting point is to ask what has been its impact on the UK economy since 1997. The objective of the MPC is, of course, to meet its inflation target. **Chart 1** shows that since the mid-1990s, inflation in the United Kingdom has been lower than for a generation. And there have been significant changes in the dynamics of inflation since the MPC was set up.<sup>(4)</sup> **Table A** shows the mean, standard deviation and persistence of inflation over various periods. Inflation has been significantly

Chart 1 UK CPI inflation, 1950–2007<sup>(a)</sup>



(a) Monthly data.

(4) Some of these changes in the inflation dynamics date from 1992 when the inflation target was introduced, although the fall in inflation expectations occurred in 1997.

How a decision would be reached in such unlikely circumstances is explained in King (2002a).

<sup>(2)</sup> Not-so-bad is an acronym for the 'not of the same order but also desirable' decade. See King (2004).

<sup>(3)</sup> I am indebted to Professor Peter Hennessy who, in his admirable book Never had it so good: Britain in the 1950s, drew attention to the context of Macmillan's remarks which were made in a speech in Bedford on 20 July 1957.

#### Table A UK inflation dynamics, 1950–2007<sup>(a)</sup>

Period	Mean	Standard deviation	Persistence
January 1950–April 1997	6.1	5.1	0.7
May 1997–March 2007	1.5	0.5	0.5

Sources: ONS and Bank of England calculations.

(a) Inflation data as shown in Chart 1. Persistence measured as correlation between inflation in

December and inflation in the previous December.

lower on average, less variable, and fluctuations in inflation have tended to be less persistent.

More generally, the impact of the MPC is revealed by what I have called the 'Performance' and 'Stability' charts — **Charts 2** and **3**. In terms of average rates of output growth per head and of inflation, **Charts 2a** and **2b** show the relative position of the UK economy among the G7 as a whole both before (taken here to be the period 1950 to 1996) and after (1997–2006) the



creation of the MPC. Ideally, a good performance means that a country would be towards the top right-hand corner of the charts — inflation is plotted on an inverted scale. The average record on growth and inflation over the period 1950–96 (**Chart 2a**) was not good relative to the rest of the G7. Indeed it was arguably the worst. In contrast, after the MPC was set up the United Kingdom performed better than most if not all of the G7 countries. So although changes in the world economy may have proved helpful to achieving lower inflation, the fact that the United Kingdom improved not only its absolute but also its relative performance — moving from last to first in the G7 league table — is encouraging.

The stability charts — 3a and 3b — show the stability of growth and inflation in the G7 countries in the two time periods. In these charts a good performance is to be near the origin of the axes, close to the bottom left-hand corner of the chart. The rather poor performance of the United Kingdom





Sources: GDP per capita data are from national sources, IMF International Financial Statistics, Maddison, A, and OECD. CPI data are from national sources, Global Financial Data and IMF International Financial Statistics. UK CPI data as shown in Chart 1.

(a) Monthly CPI data and annual per capita GDP data

#### Chart 3a G7 inflation and GDP volatility, 1950–96(a)



#### Chart 3b G7 inflation and GDP volatility, 1997–2006<sup>(a)</sup>



Sources: GDP per capita data are from national sources, IMF International Financial Statistics, Maddison, A, and OECD. CPI data are from national sources, Global Financial Data and IMF International Financial Statistics. UK CPI data as shown in Chart 1.

(a) Monthly CPI data and annual per capita GDP data

prior to 1997 is evident, as is the remarkable degree of stability in the United Kingdom relative to the rest of the G7 after that date.

Of course, correlation does not imply causation. And there is little reason to suppose that the MPC is responsible for the higher average growth rate over the past decade. That more likely reflects structural changes in the UK economy, associated with other policy reforms. It is the stability of the UK economy which appears to be the most marked contribution of the MPC. That is a surprise. The conventional wisdom is that, although there is no long-run trade-off between the *levels* of inflation and output growth, there is a trade-off between the stability of inflation and of output growth. Inflation can be kept closer to the target only by larger changes in interest rates and bigger fluctuations in output growth. Policymakers thus face a choice between different combinations of inflation and output growth volatility, which, when plotted on a chart, describe a 'stability possibility frontier'.<sup>(1)</sup> They can choose a point on that frontier depending on the relative importance they place on stabilising inflation and output growth, but they cannot move inside it. That is, they cannot reduce the volatility of both inflation and output growth.

An example of that 'stability possibility frontier' is shown in **Chart 4**. Points B and C represent alternative choices by central banks with different reaction functions, corresponding to the different weights they attach to the costs of volatility in inflation and output. Central bank B tends to bring inflation back to target more slowly than central bank C. So the real surprise is that, over the past decade, we have moved not along the frontier, say from point B to point C, but instead to A. The frontier itself has moved significantly inwards.<sup>(2)</sup> The conventional wisdom has been overturned. Was that the result of luck: an absence of shocks and favourable structural changes in the economy? Or has the new monetary framework itself played a role?

How might the MPC have been lucky over its first decade? First, there might have been unusually few significant

Chart 4 Stability possibility frontier ('the Taylor curve')



economic shocks to which the Committee had to respond. Output and inflation would have been more stable even without a change in the monetary framework. Second, when shocks did occur the economy might itself have responded in a self-regulating manner.

On the first, it is difficult to argue that there have been no major economic shocks since 1997. At the outset, the Committee had to confront the consequences of a 25% rise in the effective exchange rate and the resulting fall in import prices. Between 1996 and 1998 import prices fell by 20% relative to overall consumer prices — the biggest fall over any two-year period since the early 1950s. That was shortly followed by the Asian financial crisis and the Russian default and devaluation in 1998 which led to concerns about the stability of US and other financial markets. Later there was the world IT-led slowdown in late 2000 and 2001, and sharp falls in equity prices. The share of government final consumption in nominal GDP rose by 4 percentage points between 1998 and 2005 — the biggest continuous expansion since 1945 — and the share of taxes in total income rose. More recently, oil prices more than doubled and the labour force expanded by  $1^{1}/_{2}$ % in 2006, a rate exceeded only once in the past 35 years. And the terrorist attacks on September 11 2001, and the wars in Afghanistan and Iraq, added to uncertainty.

So the environment in which the MPC has had to operate has not been without excitement. But did the economy respond to that excitement in a self-regulating way? It is clear from the performance chart that the supply side of the UK economy has undergone substantial change — the average rate of growth of output per head has increased from 2.1% between 1950 and 1996 to 2.4% in the past decade. It could be argued that the structural reforms of recent decades have made the UK economy and, in particular, the labour market, more flexible. Greater flexibility has enabled unemployment (and its natural rate) to fall steadily.

Structural reforms also led to more stable growth of employment and output. If businesses are to stabilise employment in the face of changes in costs, employees must accept fluctuations in the real value of their take-home pay. When import prices fell sharply, employees benefited from rapid growth in real take-home pay. More recently, however, businesses have faced higher energy costs and employees have accepted somewhat weaker growth of real take-home pay.

The acceptance of necessary adjustment in real take-home pay has helped to stabilise employment growth which, over the past decade, has been four times less variable than over the

<sup>(1)</sup> This is known in the academic literature as the 'Taylor Curve'. See Taylor (1979).

<sup>(2)</sup> I have defined the frontier for a given set of monetary policy arrangements technically, for a given distribution of the inflation target. If the frontier is instead defined as corresponding to an optimal policy where the inflation target is believed with certainty then the movement from B to A is a move onto the frontier from a point outside it.



previous five decades. That has shifted the 'stability possibility frontier' faced by the MPC inwards, enabling the MPC to keep inflation more stable than in the past.

Structural improvements in the labour market are, however, unlikely to explain the full improvement in the stability of inflation and output. They cannot explain the low and stable level of inflation expectations. Changes in the yields on government bonds indicate that investors' expectations of inflation over the medium term — and the premium they require to compensate them for the risk of future inflation — have also fallen significantly. **Chart 5** shows the sharp fall in expected inflation that resulted from the actual announcement of independence for the Bank of England in 1997.

It seems to me likely that the new framework for monetary policy has been a key, though not the only, driver in moving the frontier inwards. By eliminating uncertainty about the inflation target and ensuring that the objective of low and stable inflation is well understood and credible, the change in the framework in 1997 helped to anchor expectations of inflation in the medium term. By doing so, it has made it possible for the MPC to keep inflation closer to target with smaller changes in monetary policy, and hence fluctuations in output, than would otherwise have been the case.

The anchoring of inflation expectations has changed the way businesses respond to unexpected shocks. Faced with changes in their costs stemming from, for example, changes in import or energy prices, businesses can respond in two ways, each consistent with the necessary change in employees' real take-home pay. They can pass those cost changes forwards to prices or backwards to money wages. With inflation expectations well anchored to the target, companies have restricted the pass-through of changes in costs to prices. The necessary adjustment of real take-home pay has taken place more through fluctuations in money wages than prices. In short, the behaviour of the UK economy has improved over the past decade, both in terms of its performance and its stability, and that improvement has been more marked in the United Kingdom than in the rest of the G7. Although structural reforms to the economy over several decades have made the economy better able to respond to economic shocks, the new monetary framework has also played a key role. Inflation expectations have been successfully anchored to the target. And that has meant that cost changes have affected wages and profits rather than prices. As a result, inflation and output growth have been remarkably stable.

## The change in monetary policy decision-making

It appears then that the success of the framework in anchoring inflation expectations has played a key role in the economic stability of the past decade. What was it about the framework that accounted for that?

Since its inception, the MPC has met 120 times.<sup>(1)</sup> At those meetings it raised Bank Rate 17 times, lowered it on 17 occasions, and left it unchanged 86 times.<sup>(2)</sup> Bank Rate has varied between 3.5% and 7.5%. The MPC has changed interest rates at just over a quarter (28% in fact) of its monthly meetings. Companies, households, trade unions and financial market participants can see that we change interest rates in response to news about the inflation outlook. That anchors inflation expectations. In the jargon of economists, people understand that we have a 'reaction function' — we react to the economic data in order to keep inflation on track to meet the target.

If the economics profession could agree on a model which described exactly how the economy behaved, then it would be possible to set up a Royal Commission of the country's leading economists to determine the optimal 'reaction function' for the Bank of England to follow. It would specify how interest rates should respond to the unfolding of economic data. It could even be implemented by a computer without any need for a Monetary Policy Committee at all. That sounds quite attractive (especially when you've attended 120 meetings!).

So why don't we set up a Royal Commission? As members of the SBE know only too well, none of us knows the true structure of the economy or all the shocks that might occur. How long do you think it would be before some other economists would argue, undoubtedly persuasively, that their own research had made the findings of the Royal Commission redundant? Who would have thought in 1997 that monetary

Chart 5 UK 20-year government bond yield, 1950–2006<sup>(a)</sup>

Including one emergency meeting following the events of September 11 2001.
 On 20 occasions the MPC has met with fewer than the full complement of nine

<sup>(2)</sup> On 20 occasions the MPC has met with rever than the full complement of nine members. Twelve of those occasions were before the Bank of England Act came in to effect and the ninth member could be appointed. Since June 1998 it has also been short of its full complement on eight occasions.

policy would have to respond to the challenges posed by the largest inflow of migrant labour and the fastest fall in import prices since Harold Macmillan was Prime Minister?

Uncertainty is at the heart of practical monetary policy making. The best that we — as economists — can do is continually to learn about the changing nature of the economy. It is impossible to write down any stable 'reaction function'. Even if we could identify the shocks hitting the economy, judgement as to how we should react to each of them cannot be set in stone. The structure of the economy changes through time as does our knowledge of the way it works. The MPC is there to exercise discretion about how to react to shocks. Central to the design of a framework for monetary policy is our ignorance and uncertainty about how monetary policy works. The MPC is an institutional response to that ignorance.<sup>(1)</sup>

The best way to make technical judgements under uncertainty is by making use of the accumulated wisdom of a committee whose members can pool their knowledge and expertise. This is the motivation behind the MPC and explains its two key features.<sup>(2)</sup>

First, it is a committee of experts who, before making their decision, discuss their interpretation of the economic data and learn from each other.<sup>(3)</sup> Our Wednesday afternoon discussions take the form of a debate, not a series of presentations. And on Thursday mornings when the time comes to go round the table and make a decision, it is common, as, for example, happened at our most recent meeting in April, for members to want to listen to the views of other members before making up their mind which way to vote. That is why no one is forced to cast their vote for a particular level of Bank Rate until they have heard the views of the whole Committee. As a result, there is often some suspense as to the final outcome. In January, for example, when the Committee raised Bank Rate by five votes to four, that outcome looked unlikely when at one stage opinion was four to two for no change with only three people to speak.

The greatest debate among the Committee usually occurs during the quarterly forecast round which often stimulates fresh thinking. So it is perhaps not surprising that this is when many, but by no means all, changes in interest rates are decided — see **Chart 6**. Changes have been twice as frequent in *Inflation Report* months as in other months. But it is changes in economic conditions which are more important in determining the timing of our decisions.

Second, members of the Committee are individually and publicly accountable for their votes. Disagreement among the Committee is inevitable; it is also desirable because it represents the individual judgements of members, rather than an attempt to create a false consensus. It is a source of

## Chart 6 Interest rate changes in *Inflation Report* months, 1997–2007



strength. Over the past ten years, there have been 153 dissenting votes, on average more than one per meeting.

This institutional encouragement of open debate is in contrast to many other central banks. We don't 'do consensus', as one former member put it. Dissent is more frequent than on other central bank committees which publish individual votes, and is not just token. **Table B** reports the proportion of dissenting votes in four central banks during the period since the MPC was set up. Not only is the number of dissenting votes greater on the MPC, the frequency of more substantive disagreement — where one quarter or more of the voters dissented — is markedly greater.

#### Table B Voting and dissent on monetary policy decisions

	Bank of England	Federal Reserve	Riksbank	Bank of Japan
Frequency of meetings	Monthly	Usually 8 per year	7–9 per year <sup>(a)</sup>	14–19 per year
Number of meetings in sample	120	85	77	148
Average number of voters	8.7	10.8	5.8	9.0
Average number of dissenters	1.3	0.3	0.4	1.0
Proportion of meetings with at least one dissenter (per cent)	65	24	32	58
Proportion of meetings where at least one quarter of voters dissented (per cent)	18	0	9	5

Sources: Bank of England, see www.bankofengland.co.uk/monetarypolicy/mpcvoting.xls (May 1997 onwards). Federal Reserve Board, see www.federalreserve.gov/fomc/default.htrm#2007 (February 1997 onwards). Sveriges Riksbank, see www.riksbank.com/templates/YearList.aspx?id=10809 (January 1999 onwards). Bank of Japan, see www.boj.or.jp/en/theme/seisaku/mpm\_unei/giji/index.htm (April 1998 onwards).

(a) There were 19 meetings in 1999, following the granting of independence to the Riksbank in January 1999.

 The role of uncertainty and learning in monetary policy was discussed in my 2005 Mais Lecture. See King (2005).

(2) See, for example, Blinder (2004), Blinder and Morgan (2000) and Lombardelli et al (2005).

(3) The arguments for delegating decisions on interest rates to a committee of experts were discussed in my May 2002 lecture to the Society of Business Economists. See King (2002a). Voting patterns on the MPC reflect the distribution of views about how to interpret the economic data, not a hint about where rates will go. Voting is certainly not used as a signal by the Committee. That is why you can discount claims that disagreements can be used reliably to predict future movements in rates. Sometimes they do, sometimes they don't.

Much of the commentary on the MPC has been subject to what I call the 'small sample' problem. Descriptions of diversity of view within the MPC have ranged from the Committee allegedly acting as 'the North Korean politburo' during periods when most of the votes were unanimous, to the view that it was 'a bunch of squabbling senior common room academics' during an earlier period when split votes predominated. In fact, as Chart 7 shows, there is no obvious pattern over the lifetime of the MPC. There are times when the state of the economy is difficult to read and there are naturally differences of interpretation leading to split votes. Equally, there are times when the nature of the economic shocks is not in dispute and the response of the MPC is agreed by all members. For example, a sequence of nine unanimous decisions starting in the summer of 2004 reflected a shared view within the MPC that Bank Rate at 4% was too low and that some of the monetary stimulus it provided should be withdrawn. Differences of view tell you more about the nature of the uncertainty confronting the MPC than the nature of the MPC itself.



Source: Bank of England, see www.bankofengland.co.uk/monetarypolicy/mpcvoting.xls

Similar arguments apply to the question of whether the MPC has become more or less 'activist'. Large committees can be subject to inertia. At its very first meeting the Committee debated the merits of 'gradualism' in adjusting interest rates. Although the debate attracted some interest, looking back over ten years it is hard to see that it had any practical impact. As Chart 8 shows, there is no obvious persistent trend in the frequency of rate changes over the lifetime of the MPC. Economic conditions have determined the number and





(a) Rate changes counted from June of one year to May of the following year, except in 2006-07, for which data are only available to April 2007

direction of rate changes. There is some indication that the number of changes was lower in the second than in the first five-year period. But that reflected the size and nature of the shocks over the respective periods, and also the building of credibility which meant that market anticipations of future actions allowed the Committee to offset shocks by smaller changes in interest rates. It is striking that the MPC is in the middle of the ranking of the major central banks by the number of interest rate changes a year — see Table C.

#### Table C Average number of interest rate changes per year, June 1997-April 2007

	Average number of rate changes per year		
United Kingdom	3.4	_	
United States	3.9		
Euro area <sup>(a)</sup>	2.1		
Japan	0.7		
Canada	4.4		
Sweden	2.9		
Switzerland <sup>(b)</sup>	2.3		
Australia	2.1		
New Zealand <sup>(c)</sup>	3.5		

Sources: Thomson Datastream and Bank calculations using central bank websites.

(a) Data for Germany before 1999. We have not counted the change in monetary policy regime associated with (b) Data for June 2000–07.
(c) Data for 1999–2007.

My view, therefore, is that it is the economic data which lie behind the debate and decisions of the MPC. Do you agree? To answer that question the Bank of England asked the Society of Business Economists (SBE) to carry out a survey of its members. The aim was to discover what kind of information was of most use to private sector economists in trying to understand the future path of interest rates at different horizons, and how the communications of the MPC were perceived as part of that process. The survey consisted of an

electronic questionnaire sent to 354 members of the SBE. 141 replies were received, a response rate of 40%.<sup>(1)</sup> Over 85% of respondents said that forming a view of interest rate prospects was important to them.

For those of us who have continually argued that the news on interest rates stems from developments in the economy rather than meetings of the MPC, it is heartening that, collectively, you place more weight on economic data than on MPC communications in forming a view of interest rate prospects. Respondents were asked to allocate a total of 100 points across the categories of information in terms of how useful they were in forming such a view. Twice as many points were given to economic data as to MPC communications, especially at the longer horizons — see Chart 9. And the weight on data was divided roughly equally between financial data, official data on real activity, official figures for costs and prices, and business and consumer surveys. So the argument that the MPC responds to developments in the economy has been largely understood. This is welcome news for those of us who wish to be boring.

Chart 9 Factors thought useful in forming an interest rate view



So far I have talked only about the past — the performance of the UK economy and the behaviour of the MPC since 1997. What of the future?

#### Challenges for the next decade

I want to devote the remainder of this lecture to the challenges facing the Monetary Policy Committee over the next ten years. That is not because I see major fault lines in the present arrangements. On the contrary, the careful institutional design that lay behind the construction of the MPC has proved its worth. Nor is it because I share some commentators' boredom with a system that has remained largely unchanged for a decade. After all, in the area of macroeconomic policy, boredom is a good thing. Rather, it is a conviction that to remain successful the MPC must always be engaged in a process of continuous improvement.

The anchoring of inflation expectations has been central to the stability enjoyed by the UK economy over the past decade. The key lesson from economic theory is not to take those expectations for granted — they depend on the actions of the MPC. Inflation expectations have been anchored because the MPC has responded to events that have pushed the outlook for inflation away from target, and households, businesses and financial markets have understood and anticipated our responses.

So the main challenge facing the MPC is to keep doing whatever is necessary to keep inflation on track to meet the target. In modern models of inflation, monetary policy is represented by a 'reaction function' that is sufficient, *in that model*, to pin down inflation and, therefore, inflation expectations. But that just assumes away the challenge facing us. How do we know, in an uncertain and ever-changing world, what precise path of interest rates is necessary to stabilise inflation in the medium term? That raises questions about both what we do and what we say.

## What we do: the role of money and the nominal anchor

Let me start with what we do and how we provide an anchor to the price level in the long run. With a paper currency, expectations that the future price level will remain stable are an article of faith. Such expectations are the basis of the trust without which people will not willingly use paper money. They reflect beliefs about how the central bank will react to events. Given our current arrangements, the anchor for expectations of the future price level is the judgement and character of the men and women who currently, and will in the future, serve on the Monetary Policy Committee. That is a crucial difference between money as a standard of value, where its value is determined by the judgement of a group of experts, and the standards of weights and measures, such as the metre, kilo or second, which are based on objective scientific measurement. I hope that one day the Governor of the Bank of England will be regarded as occupying a position similar to that of the Chief Executive of the National Weights and Measures Laboratory.<sup>(2)</sup> For the time being the value of money will depend upon the discretionary judgements of the MPC.

For those judgements to command respect, it is vital that the Committee demonstrate their determination to react to all signals about the outlook for inflation. It is common — both in

Economist.

<sup>(1)</sup> The full survey is to be published in the next issue of the SBE's journal, the Business

<sup>(2)</sup> At present the Chief Executive is Jeff Llewellyn.

the press and within central banks around the world — for discussion of the inflation outlook to be dominated by an analysis of so-called real changes in the economy such as movements in demand or supply and changes in the relative prices of imports or energy. It is true that, in trying to stabilise inflation in the short term, the MPC will take those events into account. But we know that, beyond the short-term forecasting horizon of up to around three years, inflation has nothing to do with these developments. It is, in the old adage, the result of too much money chasing too few goods.

That is why money growth rates and inflation rates are well correlated across countries and over long time horizons. Many of the great economists of the past from David Hume to Milton Friedman emphasised the link between money and the price level in the long run.

Why, then, does money not play a more prominent role in discussions of the outlook for inflation and monetary policy? Monetary developments can reflect two different causes: changes in the demand for money and changes in the supply of money. They have very different implications for inflation. Movements in the demand for broad money, relative to spending in the economy, reflecting changes in the way different assets and liabilities are used in transactions or shifts in portfolio preferences, have no implications for spending in the economy or the path of inflation. They make the relationship between money growth and inflation unpredictable. That contributed to the poor outcomes when explicit money supply targets were used to guide monetary policy in the late 1970s and early 1980s.

Changes in the supply of broad money, however, will lead to an imbalance in the relationship between money and prices. Either spending and the price level will adjust or the central bank will have to alter its policy rate to eliminate the change in the supply of money.

The practical problem facing all central banks is how to distinguish between shocks to the demand for money and shocks to its supply. After a period of rapid financial innovation during which shocks are predominantly to the demand for money, it is understandable, though unfortunate, if monetary developments are given insufficient attention in the analysis of the inflation outlook.

How should a policymaker respond to developments in money and credit? One approach is to ignore them on the grounds that they contain no incremental information about the outlook for inflation. This approach — which is compatible with many modern models of inflation — may well appear appropriate when money growth is associated with shocks to the demand for money that have few, if any, implications for spending and inflation. Ignoring developments in money and credit would, however, be a mistake when there are shocks to the supply of money.

What can generate such shocks to the supply of money? Modern models of monetary policy tend to be silent on this point. Economic theorists continue to struggle to develop microeconomic underpinnings of the roles of money, both as a medium of exchange and a store of value. This explains why money is often hidden. By construction, models often ignore the role played by banks that extend credit to borrowers and, in the process, create liabilities that serve as money. In those models nominal interest rates are set according to a 'reaction function' that always returns inflation to the target. The implicit assumption is that the supply of money passively and instantly adjusts to that warranted by the demand for money.

In reality, of course, our ignorance about the economy is such that we can never be sure that the level of Bank Rate at any point in time is consistent with bringing inflation back to the target over the medium term. And developments in the banking sector can lead to an expansion of the supply of broad money and credit even while Bank Rate remains constant. It is quite possible, in the real world, for there to be unwarranted money supply shocks — whether stimulus or restraint. The MPC must always be looking for warning signals of this.

The trap is falsely to conclude that, because some economic models contain no explicit reference to it, money cannot be one of those signals. The conventional riposte is that, if monetary policy were set incorrectly, warning signals would also be observed contemporaneously in other indicators such as measures of inflation expectations, demand or interest rates. I would not want to rely on that for three reasons, which together imply that the growth of money and credit may signal *in advance* of other indicators that Bank Rate is set at a level inconsistent with bringing inflation back to the target in the medium term.

First, we do not have good indicators of the expectations of businesses and employees and, in looking at measures of expectations in financial markets, we must be alert to the possibility that those expectations are formed by people falling into the same trap.

Second, the spending of many households and businesses is constrained by the need to use money in transactions and by the availability of credit.<sup>(1)</sup> For these households and businesses, changes in the availability of money and credit lead changes in their spending intentions.

Third, official interest rates are not a sufficient statistic for the array of effective interest rates confronting borrowers and lenders — risk premia which reflect the creditworthiness of the

<sup>(1)</sup> Goodhart (2007).

borrower alter effective interest rates. Since many of those rates are unobservable by the MPC, money, credit and asset prices may contain valuable information about the likely outlook for spending.<sup>(1)</sup>

As **Chart 10** shows, there are times when monetary developments have represented shocks that have affected the supply of money and proved a warning sign of inflationary risks. At other times, its movements have been dominated by changes in the demand for money.





<sup>1950–63,</sup> Capie, F and Webber, A (1995), A monetary history of the United Kingdom, 1870–1982, Volume I: data, sources, methods, Routledge: London and New York; 1964–2006, ONS.

In 1973, for example, broad money growth had picked up sharply but inflation was subdued. Yields on gilts provided no indication that a rise in inflation was expected by financial markets. But the rise in money growth, which looked at first to be another instance of a change in the demand for money, was in fact an increase in supply and led to faster expansion of spending in the economy and, by 1975, higher inflation.

The 1980s illustrate shocks to both money demand and supply. The first part of the decade was a period of large structural change in financial markets. The demand for money rose sharply relative to spending in the economy so, for a time, broad money growth was rapid and inflation was falling. That structural change probably continued into the second half of the decade. But it now seems that there was also some unwarranted expansion of the supply of money. For a time, that shock was disguised as further structural change in the demand for money but, in 1988, inflation began to rise.

It is easy to be wise after the event. And it is never easy to distinguish between demand and supply shocks to money. But that is true for shocks to many economic variables and is no reason to assume that money supply shocks are simply absent. When we look at output data, we routinely ask ourselves the question: is it a demand shock or is it a supply shock? We do not rely on the simple correlation in the past between output and inflation. It was important for the Federal Reserve to identify output movements in the late 1990s as the result of a supply (productivity) shock rather than an increase in demand. The challenge is to carry this level of interrogation and questioning of the data to our analysis of money and credit. We are trying to develop models that help us to distinguish between demand and supply shocks to money and we shall be devoting more resources to this task, including our new Credit Conditions Survey.

#### What we say: central bank communications

In recent years, a great deal has been written about how and why central banks communicate with financial markets and the public more generally. Communications are crucial to a central bank's ability to anchor inflation expectations. Only two questions really matter. What are central banks trying to communicate and to whom?

The first task for a central bank is to communicate the case for price stability in a simple and straightforward way to as wide an audience as possible. With our range of publications, films, the competition for schools *Target 2.0*, and our programme of regular regional visits, the Bank of England invests a good deal of resources in achieving this objective. We also monitor progress using opinion polls and report regularly their findings. Building a large constituency for price stability is an essential part of convincing people that low and stable inflation will be at the heart of macroeconomic policy for the indefinite future. For the MPC, there is the specific task of explaining that by price stability we mean our target of 2% inflation as measured by the CPI.

The second task relates to communication about the reasons for monetary policy decisions to financial markets, households and businesses. No communications strategy can ignore the fact that the Monetary Policy Committee was set up precisely because there is no timeless 'reaction function' to be communicated to the public. It is as important to explain what we don't know as what we do know. We are trying to get across the fruits of our learning about the economy, not a static view of the world. Our aim is to help people understand the thinking behind the Committee's decisions, the various hypotheses that the Committee entertains about the current conjuncture and the data that we shall be examining in order to discriminate among them. That should help people work out how we are likely to react to future data as they come in. And it is why we place importance on the minutes of our monthly meetings and the quarterly *Inflation Report* to convey a full explanation of our thinking.

Explaining our analysis at some length is a richer source of information for markets than code words or statements about the future path of interest rates. Less weight should be placed

(1) See my discussion of money and risk premia in King (2002b).

on the short statements that are published with the announcements of our decisions because such statements, as we have seen elsewhere, run the risk of becoming monetary policy by code word. They do not help markets understand how we are likely to react to future data.

A number of academics have suggested that the MPC publish forecasts for the path of Bank Rate. Several central banks now do so, noticeably the Reserve Bank of New Zealand, the Norges Bank and the Riksbank. Although there is some superficial attraction in such a move, there are four points that suggest the need for caution.

First, what markets need more than anything is not an unconditional forecast of where interest rates might go, but an idea of our contingent response to data as they evolve. That is not easily communicated by a path — even when shown as a fan chart — for future interest rates. It requires a careful reading of the *Inflation Report*, the minutes of our monthly meetings and speeches by members of the MPC.

Second, there is little evidence that financial markets have in fact been particularly uncertain about the yield curve in the United Kingdom. Indeed, a survey of Goldman Sachs traders by their own economists showed that they thought, at longer horizons, interest rates were more predictable in the United Kingdom than in the euro area or United States.<sup>(1)</sup> We are less predictable one month ahead for the very good reason, which I have explained before, that we are unable to pre-announce or signal the results of meetings the outcome of which may sometimes be unclear to MPC members themselves until well into the second day.

Third, a key principle of our present arrangements is that decisions on Bank Rate are taken by majority vote of the members of the MPC. That is possible because they are voting on a single number — today's Bank Rate. But there is no equivalent voting procedure which can map from individual views on an entire future path of interest rates to an overall path in a sensible manner.<sup>(2)</sup> It might, or might not, be possible to find a consensus. But how would that square with making decisions on today's rate by majority voting? The problem illustrates the important principle that communication cannot be divorced from the way decisions are made.

Fourth, the Bank of England has tried extremely hard to ensure that forecasts are seen as probabilistic statements. The Bank of England has been publishing fan charts for inflation and output growth for more than a decade. Yet there are many commentators who still refer only to the central path. It would be extremely dangerous to start publishing fan charts for future interest rates unless we were confident that all commentators would understand the probabilistic nature of such statements. When the Riksbank first published a fan chart for its future policy rate in February this year, an article written by one of the most sophisticated investment banks totally ignored the probabilistic nature of the exercise. Against that background, would we be able to convince the media's huge audiences for personal finance advice that they should not base their decisions on our central projections for interest rates because they will almost certainly not come to pass?

Overall, then, I do not think that a compelling case has yet been made for the MPC to publish a forecast of the path for Bank Rate. But we must certainly provide the information necessary for financial market participants to form their own view as to the likely path of interest rates, and we must always be trying to improve the quality of that information. We shall also keep in close touch with our colleagues in central banks that do publish forecasts of policy rates to see what we can learn from their experience. If we feel that there are net benefits from following their example, then we will do so.

How successful are the MPC's communications to financial markets and business more generally, and should the Committee be considering other changes? The survey of SBE members I have already described is interesting in this respect.

The first, and most striking, result is that, although the survey was conducted in the weeks immediately following our 'surprise' increase in Bank Rate in January, the response overall is very positive. Almost 90% of respondents found communications by the MPC to be either helpful or very helpful. But the interest in the survey lies in the more detailed responses.

There are some important differences in the types of MPC communications that are thought to be useful in forming a view of interest rate prospects at different time horizons. They are summarised in **Chart 11**. At shorter horizons, such as three months, the voting pattern on the MPC, together with the minutes of meetings and the statement published when interest rates change, are thought to be more informative than when forming a view of interest rate prospects over a time horizon of 12 to 18 months. At those longer horizons, it is the judgements contained in the *Inflation Report* that are thought

<sup>(1)</sup> See Goldman Sachs (2006).

<sup>(2)</sup> There are many ways of aggregating individual votes on paths of interest rates, but none is particularly attractive. Svensson (2003) has proposed that each MPC member declares a preferred path for Bank Rate. The collective path is formed by taking the median value of Bank Rate at each date in the future. In general this collective path is not the path preferred by any single MPC member and does not reflect an internally consistent set of views, posing a considerable communications challenge. The least bad idea my staff in the Bank have been able to come up with is one that aims to balance the preferences of all Committee members - that is to maximise the Committee's overall satisfaction with the outcome. To operationalise this, there could be two rounds of voting. In the first, each Committee member would propose a preferred path for interest rates. In the second round, Committee members would vote on the paths proposed by the other members. This vote could be structured in a number of ways, for example: a simple ranking (with transferable votes to break ties); allocating a fixed number of points over the alternative paths (again with transferable votes to resolve ties); or an arrangement like the current one where, after discussion, the Governor proposes a motion which is likely to command a majority. How all this would be communicated to the public I leave as an exercise for the interested reader.



### Chart 11 Forms of communication thought useful in forming an interest rate view<sup>(a)</sup>

(a) One respondent to Question 5A and two to 5B answered 'Don't know', which have been excluded here.

to be more useful. It seems to be that *differences of view* among Committee members are more relevant to assessing near-term interest rate prospects than the MPC's *collective assessment* which carries more weight at longer time horizons.

MPC communications were thought to be helpful in understanding how the MPC interpreted the latest data and also in forming a view as to the prospects for interest rates. Over 60% of respondents thought that the balance of MPC communication was 'about right', although around 20% felt that too much commentary was devoted to the central view of prospects rather than to the balance of risks. Given the emphasis which the MPC places on the fan chart as a means of conveying information about forecasts, it is striking that there is a demand for even more information about the risks surrounding the central projection rather than the central projection itself. There is, perhaps, a lesson here in the need to redress the balance of discussion in the Inflation Report towards the risks and away from the central projection. The view of respondents — largely City economists — in this respect seems to me entirely rational, but in marked contrast to the pressure on us from the press.

Some of the words of respondents to the survey convey the flavour of their views. Several commented on the benefits of more information about the range of views on the Committee. For example, 'MPC members could do more speeches, interviews and meetings to explain their individual views on the macroeconomic outlook'. And 'the key difficulty in framing the communications is that they are clearly meant to convey the views of a group of people rather than one individual. At times when there is a broad consensus this may not be a problem but if there is a difference of views the reports do not always clearly convey the extent of this difference and how many people are in the various camps'. Such comments reflect the inherent difficulty of communications by a committee with individual voting. It is important that everyone understands the distinction between those forms of communication which focus on individual views, such as the minutes, and those which present a collective viewpoint explaining decisions of the Committee as a whole, such as the *Inflation Report*.

As I said in my lecture to this Society five years ago, 'it should be clear that there are both benefits and costs to a group decision-making process. The transparency and accountability of individual views helps to make better decisions. But it also complicates the communication of the decision to a wider audience, whose expectations of inflation matter for economic behaviour. The avoidance of confusion requires some forbearance by individual members of the Committee, and a clear understanding of which forms of communication are appropriate to explain individual views and which forms are suitable for explaining the reasons for a collective decision'. Or, as Alan Blinder has put it in a discussion of individualistic policy-making committees, 'a central bank that speaks with a cacophony of voices may in effect have no voice at all'.

The results of the survey are broadly consistent with the propositions I put forward in my Mansion House speech last year. The inflation target and the MPC's response to data are well understood. Economists in the City know that economic data are the most useful source of information when forming judgements about future interest rates. And the most useful form of communication for economists when thinking about interest rates more than one year ahead is the *Inflation Report*. There is little indication that respondents are looking for publication of an interest rate path — either in the form of a central projection or a fan chart.

But there is room for improvement in the way we communicate. There seems to be an appetite for more information about the way policy actions are linked to economic data and for more forward-looking analysis of risks to the outlook. In other words, we should talk more about what lies behind the fan chart and how we might change our thinking in response to developments in the data. We could, for example, provide more guidance on the sort of data that might influence the Committee's thinking on whether second-round effects from higher oil prices and National Insurance contributions were materialising.

In thinking about its future communications strategy, the Committee is conscious that there are more or less sophisticated audiences to whom it is speaking. Inevitably, that will colour its judgements on how to communicate its thinking. But the results of the survey provide food for thought. And I am very grateful to all those who took the time and trouble to respond.

#### Conclusions

There has been a sea change in the way monetary policy is conducted in the United Kingdom. That is evident in the changing dynamics of inflation and in the stability of the economy more generally. It is not, I believe, credible to dismiss that solely as the result of luck. Our monetary policy regime is firmly based on an explicit target for inflation, a floating exchange rate, and clear institutional arrangements for decisions on interest rates which are decided by majority vote of the Monetary Policy Committee with individual accountability of its members. The MPC operates on a regular and pre-announced decision-making cycle which respects the principle of individual and accountable voting — there is no hiding place on the MPC. All this amounts to a revolution in the way decisions on interest rates are made in this country. As I said to this audience five years ago, 'the MPC has proved to be one of those rare "instantly invented precedents" that seem to have worked'. It is hard now to imagine policy being set any other way.

The crucial achievement of the MPC is to have anchored inflation expectations. But, as the saying goes, we are only as good as our last meeting. We fully recognise that we must keep our eye on the ball if we are to continue to anchor inflation expectations on the 2% target. I have talked tonight about some of the challenges facing the MPC over the next ten years. But there is no more important challenge than keeping inflation and inflation expectations anchored on the target. I have enjoyed the opportunity to look back over the past ten years, but, as the saying continues, the only meeting that matters is the next one.

When Eddie George and I sat in the Governor's office on that sunny Bank Holiday morning in 1997, we knew we had been given an opportunity to change monetary policy for the better. We had to grab it with both hands. That is exactly what the Bank has done.

#### References

**Blinder, A S (2004)**, *The quiet revolution: central banking goes modern*, Yale University Press.

**Blinder, A S and Morgan, R (2000)**, 'Are two heads better than one? An experimental analysis of group vs individual decision making', *NBER Working Paper no.* 7909, September.

Goldman Sachs Economic Research (2006), 'Should the MPC have pre-announced the hike?', UK Economics Analyst, Issue no. 06/09.

**Goodhart, C A E (2007)**, 'Whatever became of the monetary aggregates?', Peston Lecture at Queen Mary College, London.

Hennessy, P (2007), Having it so good: Britain in the fifties, Penguin.

King, MA (2002a), 'The Monetary Policy Committee: five years on', Bank of England Quarterly Bulletin, Summer, pages 219–27.

**King, M A (2002b)**, 'No money, no inflation — the role of money in the economy', *Bank of England Quarterly Bulletin*, Summer, pages 162–77. King, MA (2004), 'Speech at the Eden Project, Cornwall', available at www.bankofengland.co.uk/publications/speeches/2004/ speech229.pdf.

King, MA (2005), 'Monetary policy: practice ahead of theory', Mais Lecture at the Cass Business School, London, *Bank of England Quarterly Bulletin*, Summer, pages 226–36.

Lombardelli, C, Proudman, A J and Talbot, J (2005), 'Committees versus individuals: an experimental analysis of monetary policy decision making', *International Journal of Central Banking*, Vol. 1, No. 1 (May), pages 181–205.

**Svensson, L E O (2003),** 'The inflation forecast and the loss function', in Mizen, P (ed), *Central banking, monetary theory and practice: essays in honour of Charles Goodhart*, London: Edward Elgar.

Taylor, J B (1979), 'Estimation and control of a macroeconomic model with rational expectations', *Econometrica*, Vol. 47, No. 5, pages 1,267–86.

# The City's growth: the crest of a wave or swimming with the stream?

In this speech,<sup>(1)</sup> Sir John Gieve, Deputy Governor for financial stability, discusses what underlies the City of London's rapid growth and, therefore, whether it should be expected to continue. He argues that the economic factors which favour concentration in clusters or hubs in many industries are particularly strong for wholesale finance. London has a number of advantages but its key comparative advantage lies in its concentration of skilled labour and financial know-how both in the financial firms and in the professions which support them. The IT revolution has so far strengthened the pressures for concentration. He concludes that, while financial markets are benefiting from cyclical factors at present, London's position is also benefiting from a persistent economic current which should further enhance its position as a global financial centre in the longer term.

#### Introduction

Over the past few months there has been renewed talk of London overtaking New York as the world's leading financial centre. And it has reflected fears in the United States as much as self congratulation in this country.

We should take some of this with a pinch of salt. Talk of an external threat may be helpful to those building a case for change in the US financial system. The US market remains the biggest in the world by many measures. More fundamentally this is not a zero sum game. Even if London establishes a comparative advantage and gains market share, New York (and Paris and Edinburgh for that matter) can prosper too.

Yet something interesting is going on. The report by McKinseys commissioned by Mayor Bloomberg concluded that 'London is transforming itself into an increasingly sizeable and attractive talent hub for people with ... skills that used to be available only in New York ...' and '... superior conditions for innovation, capital formation, risk management and investment in these markets [derivatives and debt financing] are beginning to emerge (or have already done so) in London, which is building momentum relative to New York'.<sup>(2)</sup>

On this side of the pond too, the growth of financial markets in the City is attracting more attention. While much of that is favourable, we have seen renewed worries that London's prominence and the wealth it attracts and generates may be distorting the broader economy possibly adding to social tensions — that it may be more a cuckoo in the nest than a golden goose.

So the future of the City is a significant issue not just for Londoners but for the development of the wider British economy. And the development of the financial sector is of particular interest to the Bank not just because it is an important part of the economy itself but because it shapes the way that our monetary policy impacts on the wider economy and because of our responsibility with the FSA and Treasury for maintaining the stability of the financial system.

I will be speaking about the impact of the City's rapid growth on the broader economy in coming months but today I want to focus on what underlies that growth and, therefore, to address the question whether we should expect it to be a passing phase or to continue. Is London just on the crest of a wave or is it swimming with a persistent stream?

#### Putting it into perspective

To start with, how important is the City? Is its press profile greater than its real contribution to the economy?

The City's output is hard to measure.<sup>(3)</sup> We know that financial intermediation as a whole accounted for about 8.5% of UK gross value added in 2005. And a recent estimate<sup>(4)</sup> of the professional services supporting financial services accounted for a further 3.6% of economic activity in 2005, giving a total of some 12%. That compares with around 14% of GDP for the UK manufacturing sector and the jobs in financial and

<sup>(1)</sup> Given at the Bank of England to the London Society of Chartered Accountants on 26 March 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech306.pdf.

<sup>(2) &#</sup>x27;Sustaining New York's and the US' Global Financial Services Leadership'. Report by McKinsey & Company to Mayor Michael Bloomberg of New York and Senator Charles Schumer (pages 14 and 54).

<sup>(3)</sup> Indeed the ONS has announced that it will be revising its estimates of the level and composition of GDP to incorporate changes to the measurement and treatment of value added for banks and to take better account of in-house software development.

<sup>(4)</sup> International Financial Services, London. International financial services in the UK, November 2006.

business services taken together have increasingly outnumbered those in manufacturing. And since 1999 financial services and insurance taken together have accounted for over 20% of the United Kingdom's exports of services. So it is clear that the financial sector is an important industry for the United Kingdom.

But financial intermediation covers a great deal more than the City. Retail banking and insurance, like other retail services from restaurants to hairdressing, is widely dispersed across the country. In general one would expect this part of the industry to reflect the size of the population and their wealth. To the extent that the United Kingdom's industry may be relatively efficient and competitive, we may even have fewer people engaged at this end of the business than some other countries. While in 2003 the share of gross value added from financial intermediation was a little higher for the United Kingdom than for France, Japan or Germany (5%, 7% and 4% respectively) there was not that big a gap and the figures for the United States were about the same as the United Kingdom (8.5%).

It is London's position in the wholesale and international markets that is special and it is harder to get a handle on that. A recent estimate put the total number employed in 'City' jobs at around 320,000.<sup>(1)</sup> There are other significant European centres in Paris and Frankfurt and, within the United Kingdom, in Edinburgh for instance. But London is estimated to have 75% of United Kingdom's wholesale financial jobs and to be the largest European centre for wholesale finance with 35% of the jobs (up from 30% in 2000). So by this measure those working in 'City' represent a little more than 1% of the UK workforce. While this is estimated to be twice the equivalent proportion for Germany and three times that of France, we should not get it out of perspective.

#### The economic geography of financial centres

Geographical concentrations, clusters, are common in many industries. In some cases they reflect the availability of raw materials or power sources. Elsewhere the underlying reasons are not so obvious. Watchmaking in Switzerland, films in Hollywood, the high-tech sector of Silicon Valley are all classic examples. But the pattern of geographical hubs is particularly prominent in the financial industry. In most countries, one city has tended to become predominant even if cities such as Chicago and Edinburgh have developed important niches in particular financial services. Over time some of these have become hubs for international finance like New York in the United States, Zurich in Switzerland, Hong Kong and Singapore in Asia and, of course, London in the United Kingdom.

The history of each centre has been shaped by a myriad of factors from empire, the role of guilds, and the proximity of kings and governments. But a number of economic forces have also been at work and are still reinforcing the pattern.<sup>(2)</sup>

First, there are great advantages for both firms and workers from operating in a market with a deep pool of labour with the right skills. Workers know that if their firms fail or shrink they can easily find another job; firms can easily acquire new workers to start up or expand. Second, firms which have expertise in supplying the main industry become established close to the cluster so new front-line firms find the inputs they need on the spot. The 37,000-strong membership of the London Society of Accountants is a good example of this. Third, where specialist firms and highly skilled workers are grouped together the transfer of skills and information can be quicker. Fourth, clustering tends to promote both competition and co-operation. Clusters tend therefore to increase productivity, drive innovation and stimulate the formation of new business. In these ways the clustering helps to create and reinforce the comparative advantage which drives trade.

In the case of the financial industry some additional factors promote clustering. In the past of course there was the physical need to be close to the market places but it appears that the centripetal forces remain strong even in a world of electronic trading and video conferencing. There is a reputational advantage of locating in an established financial centre, which signals you are part of the Premier League. And in wholesale finance where the firms can be both sellers and buyers, business is attracted to liquid markets, in cash and securities. Each firm benefits from a pool of competitors taking different positions.

There are also some centrifugal forces that tend to limit the size of clusters and ultimately drive firms away. The more concentrated the activity, the more vulnerable trade can be to external shocks, whether from earthquakes, wars or taxes. If there are restrictions on the supply of labour, concentration can lead to shortages. And of course clustering can drive up prices of other factors of production. In a successful urban centre, land in particular can become expensive.

#### The history of the City of London

But on balance the history of London's financial sector illustrates how powerful the factors leading towards concentration and clustering have been.

During the 18th and 19th centuries, it was not hard to see why international finance developed in London alongside Britain's pre-eminence as an economic and trading power. The need to

<sup>(1) &#</sup>x27;City type' jobs in London include securities dealing, international banking, corporate finance, derivatives and foreign exchange activity, fund management (including hedge funds), specialist insurance (such as Lloyds) and professional services such as legal, accountancy and consultancy directly supporting other City jobs. They include jobs in Canary Wharf and in the West End as well as those in the Square Mile.

<sup>(2)</sup> See, for example, Fujita, M, Krugman, P and Venables, A J (2001), 'The spatial economy: cities, regions and international trade', MIT.

provide finance for trade stimulated the development of the money markets here, based around commercial bills, and that in turn provided essential liquidity for longer-maturity securities markets.<sup>(1)</sup>

By 1914, while Britain had been overtaken as the world's leading economy, it remained the hub of the international monetary system — the Gold Standard. The United Kingdom had 42% of the world stock of overseas investments and around one third of all the negotiable instruments in the world were traded on the London Stock Exchange. And if London was important to the world, the world was also crucial to London; more than half the value of securities quoted on the London Stock Exchange was accounted for by loans for foreign companies and governments.<sup>(2)</sup>

As an editor of *The Economist* during the period put it: 'It [the City] is the greatest shop, the greatest store, the freest market for commodities, gold and securities, the greatest disposer of capital, the greatest dispenser of credit, but above and beyond, as well as by reason of all these marks of financial and commercial supremacy, it is the world's clearing house'.<sup>(3)</sup>

The benign international environment disappeared with the outbreak of the Great War, and the United Kingdom's political and economic standing in the world fell away steadily through the following 60 years. By 1950, average incomes in the United Kingdom were below those in the United States, and they fell below Germany and France by 1970. The economic dominance of the United States ensured New York's place as the leading financial centre and the American commercial banks became the world's largest. In the 1970s and 1980s the growth of Japan propelled Tokyo up the rankings. And in Britain, the share of foreign securities issuance fell to only 6% in 1961, as against more than half before 1914.

So by the 1970s London was benefiting from few of the factors which had produced its golden period before the first War. It had suffered from the destruction of the wars and the Depression, and from the loss of Empire and protectionist policies at home and abroad, including capital and exchange controls. In a faltering economy trade in government debt had supplanted much of its international business, sterling had declined as an international currency, and the major British merchant banks and brokers had been overtaken by the investment banks in the United States and the universal banks in Europe and Japan. Nonetheless, through all this London remained a leading international financial and banking centre. On some measures, indeed, it retained its position as the leading centre for international finance for all but a few years after the second war.<sup>(4)</sup> It had the critical mass to keep the skillbase and networks to retain the professional trade in many markets. So, even in the 1960s the euro markets developed here

#### The recent growth of the City of London

Over the past 20 years, a number of reforms have improved the environment and helped the City to build on its position. Exchange controls were removed in 1979, facilitating capital flows into and out of the United Kingdom; and Big Bang, in 1986, opened up the Stock Exchange and paved the way for the participation of the leading foreign investment banks in London's market. At the same time the growth of international trade and thus capital flows has brought in more business.

In some of the activities that London has long dominated, its growth in the past ten years has largely reflected the growth of global capital market activity.

In the foreign exchange market, for example, where the London market is and remains the largest in the world, turnover was a bit over 30% of the global total in April 2004, broadly unchanged from 1998. But turnover in London had increased by nearly 20% over the same period — a big increase despite the creation of the euro, which removed the necessity for trading between so many currency pairs. On an even larger scale the United Kingdom's share of cross-border bank lending — which has long been a strength of London's — remained unchanged at around 20% between 1998 and 2006. But over that same period, the market grew by about 150%.

But there are several areas where London's share of business is rising, particularly in new, innovative and technically demanding areas of finance.

London's share of world over-the-counter derivatives business, for example, has risen from around 35% in 2001 to nearly 40% in April 2004. And within that the notional amount of credit derivatives traded in London multiplied by more than 100 between 1997 and 2006. While the United States remains the main centre of the hedge fund sector, at the latest count twelve of the world's largest 50 hedge funds were based in London, as against only three in 2002. London has a share of nearly 80% of the European-based hedge fund market, up from around 70% in 2002. The UK private equity market has been another prominent area of growth recently. UK private equity funds raised in 2005 were over £25 billion, around twice the size of the previous peak in 2001, with the UK private equity industry accounting for over 50% of the total European market.

Michie, R C (1992), 'The City of London: continuity and change, 1850–1990', Macmillan, Basingstoke and London.

<sup>(2)</sup> Cassis, Y (2005), Capitals of capital. A history of international financial centres, 1780–2005, Pictet and Cie, Geneva.

<sup>(3)</sup> Kynaston, D, *The City of London*, Volume II Golden Years 1890–1914.

<sup>(4)</sup> Reed, H (1981), The pre-eminence of international financial centres.
## The drivers of the City's recent growth

In part the City's recent growth reflects — as it did a century ago — a rapid growth in international trade and financial liberalisation. Globalisation has brought an expansion of world imports by 180% since 1990 compared with an 80% increase in world GDP. Progressive upgradings of a number of emerging economies have broadened and deepened international links. Higher savings in the emerging Asian economies, in particular, have combined with demographic change in the West to increase demand for long-term savings instruments and a fall in their yields.<sup>(1)</sup> All these trends taken together have led to a period since 2002 of unusually high returns for holders of many financial assets and the explosive growth in new products and markets.

But what is driving the growth of London in particular? One approach to this question is to ask executives in major financial companies, both in the United Kingdom and abroad, why they choose to locate business here. A number of these surveys have been conducted recently and they show several common factors.<sup>(2)</sup>

London benefits from English as an international language of commerce, and from its time zone, which means the working day overlaps with Asia in the morning and America in the afternoon. London also has well-established financial infrastructure and telecommunication networks.

Many of those surveyed point to the regulatory and legal environment. This is partly a matter of the regulatory style the 'risk-based and proportionate' approach that the Financial Services Authority has adopted based on general principles where possible. It is partly the simplicity of dealing with a single regulator.

English law, which is also the basis for financial services law in the United States, prevails here, with the added advantage that practitioners are less likely actually to invoke the legal system. And what has been called the Wimbledonisation of the UK financial markets — the sale of nearly all the British merchant banks and stockbrokers and the dominance of foreign players — gives confidence to prospective market participants that the competitive environment is genuinely open to all comers. London is also a growing centre for Islamic banking. Finally, London may be benefiting from measures elsewhere; certainly in the years since the Enron and WorldCom scandals, commentators have suggested that the application of the Sarbanes-Oxley legislation to foreign firms listing in New York may have encouraged some firms to list here instead.

But the single most important factor is the first one suggested by economists: London's comparative advantage

lies in its skilled labour and financial know-how both in the financial firms and in the professions which support them.

The free movement of labour within the European Union, and relative openness to immigration by those with specific expertise from outside it, has also meant that employers in the financial sector can access the world labour market. And the relative flexibility of the labour market here in the United Kingdom compared to others in Europe may also be a factor.

That concentration of skilled labour has spurred competition and innovation. We have seen a very striking illustration of this in the past few years with the rapid growth of hedge fund management and private equity firms in London. Many have been established and are staffed by people who acquired their skills and earned their capital at the more established investment banks and fund management firms of the City. Being at the heart of world markets helped them spot the opportunities and assess the competition. Once they struck out on their own, they could draw on a network of former colleagues and contacts for staff, information and expertise.

## Future prospects of the City of London

So what are the prospects of the City of London?

One of the clear lessons from history is that any position can be lost. It is always possible to throw away an advantage by ill-judged decisions. Any widespread operational disruption or fear about security could also be very damaging, which is one reason why we and the other tripartite authorities are spending so much time on improving crisis response and management.

But in the absence of disaster the structural factors I have discussed seem likely to favour further concentration of financial business in the City.

First, the entry of China and India into international markets has been associated with a massive expansion of international trade and finance in relation to overall world GDP. That seems likely to continue and has been a major factor in the growth of London in the past.

Fifteen years ago people worried that developments in information technology would undermine centres like the City of London. When anyone could log on to receive market information and trade in real time, wouldn't traders flee the

Caballero, R (2006), 'On the macroeconomics of asset shortages', NBER Working Paper no. 12753, December.

<sup>(2)</sup> For example, Cook, G A S, Pandit, N R, Beaverstock, J V, Taylor, P J and Pain, K (forthcoming in 2007), 'The role of location in knowledge creation and diffusion: evidence of centripetal and centrifugal forces in the City of London financial services agglomeration', *Environment and Planning A*.

hurley burley and relocate to other, quieter and cheaper financial centres or even out of cities altogether? What seems to have happened is the opposite. The reducing costs of collating information and trading at a distance have led to operations relocating to London and the City becoming an even more important cluster for financial activity. The technology which could have allowed the dispersion of business has instead allowed greater concentration.<sup>(1)</sup>

So whereas in 1997 the largest share of market turnover of Frankfurt's Eurex market came from traders based in Germany (over 80%), the largest share in 2005 came from the United Kingdom (with over 45%). As more assets can be traded remotely, this may further drive the growth of centres like London with large pools of skilled financial workers.

The growth of European capital markets relative to traditional commercial banking should reinforce that process. Historically, European and equity markets have been smaller relative to their economies than in the United States. With around some \$30 trillion in assets, euro-zone financial markets are still significantly smaller than the \$50 trillion in the United States. But Europe is closing the gap. In 2005 the euro-zone's financial stock grew by over 20%, compared with around 6% in the United States. And the euro-zone's financial depth has increased at twice the pace as that of the United States over the past ten years.<sup>(2)</sup> If this gap continues to narrow, I expect this to favour the growth of London as the main centre for Europe's capital markets. The development of capital markets in Asia is further behind still and I would expect to see continued rapid growth in these markets in the next decade.

The rationalisation brought by the single financial market in Europe should push in the same direction. The number of central counterparty (CCPs) clearing houses by ownership has halved in Europe since 1999. And there were over 650 mergers and acquisitions in the EU banking sector between 2001 and 2005, a quarter of which were cross-border within Europe. But the process has some way to go and as the European financial sector becomes more consolidated, and financial institutions become larger and more complex, they tend to become more intensive users of capital markets. The major UK banks' trading book assets, for example, now account for over 30% of their balance sheet assets compared with little over 15% back in 2000.

What of the countervailing — centrifugal pressures? The creation of Canary Wharf, the expansion of office space in the Square Mile and the West End has helped to allow the rapid expansion of recent years. But of course London is an expensive city with high land and labour costs. So we have seen financial firms outsourcing functions like IT support, systems development and HR both within the United Kingdom and Europe and to India. That too seems likely to continue so further growth of trading and management in London may well not lead to proportionate growth in jobs. On current trends we might expect a greater concentration of high-value, high-skill jobs in London.

## Conclusions

So back to my question: wave or persistent stream? The answer is, as you will have spotted, both.

Readers of the Bank's Financial Stability Report (next edition due next month) — or those that have read the financial news - will know that the financial markets have been buoyant recently; in particular the premia for risks in the credit market are very low and profit growth and bonuses have been spectacular. Some of this may well be the crest of a wave. However, for the reasons I have set out this afternoon, London is also benefiting from a longer-lasting and a strong current. We may expect that cycle to turn at some stage — and London will be affected because of its international position. But there are good reasons to expect London to further enhance its position as a global financial centre in the long term. And that will have implications for the rest of the economy and the risks it faces. It will continue to affect the labour market, the housing market, and the distribution of wealth and income. And it will further sharpen the dependence of the British economy on wider international movements in financial markets. I plan to return to these implications in coming months.

# The changing pattern of savings: implications for growth and inflation

In this speech,<sup>(1)</sup> Andrew Sentance,<sup>(2)</sup> a member of the Monetary Policy Committee, discusses the role that savings play in the economy, the changing pattern of savings over the past decade and the implications of these trends for monetary policy. In the United Kingdom, a falling personal savings rate has supported strong consumption growth since the mid-1990s. This has been partly offset by healthy corporate saving — a development common to many countries. Significant imbalances in the distribution of savings and investment across the global economy have also emerged, which lie behind the pattern of current account surpluses and deficits. Looking ahead, these developments point to the need for a rebalancing of demand growth both at home and abroad. In the United Kingdom, a sustained recovery in investment would need to be offset by slower consumption growth if demand pressures are to be kept in check.

I am delighted to be here in Edinburgh this evening, and to have the opportunity to deliver the twelfth RBS Scottish Economics Society Annual Lecture. Scotland has a strong tradition in economics, which I am pleased to say that the Bank of England is recognising by featuring Adam Smith on the new £20 note launched this week. You also have a thriving financial services industry, with Edinburgh now among the leading financial centres in Europe.

Indeed, the financial services sector has recently become the fastest growing part of the Scottish economy, with output and employment up by over 30% during the first half of this decade. It contributes a higher percentage of GDP to the Scottish economy than in any other part of the United Kingdom outside of London and the South East of England.

Banking and fund management form the core of this dynamic financial success story. And underpinning both of these activities is the need for individuals to find a safe and secure home for their savings and for companies to access funds for investment. So this evening I want to look at some significant changes in the pattern of savings — both in the United Kingdom and globally — and to discuss their implications for the management of our economy.

My talk will be divided into three main parts. First, I will look at the role that savings play in the modern economy. Second, I will review the implications of some of the changing trends we have seen over the past decade — a falling UK personal savings rate, a rising company savings rate in many countries, and growing imbalances between savings and investment across the global economy. And I will conclude by discussing what these developments might mean for the judgements made by the Bank of England Monetary Policy Committee.

## The role of savings

Saving occurs when income is not consumed immediately and is set aside for future needs.<sup>(3)</sup> But why do people save? And what role does saving play in the economy?

Economic literature lists eight or nine potential reasons for saving,<sup>(4)</sup> but most of the savings behaviour of UK households can be explained under three broad headings. First, individuals generally wish to smooth consumption over their lifetimes. We benefit from our parents' savings when we are young, and then accumulate assets over our working lives to provide income when we are older. As a result, the savings behaviour of societies should be expected to change as their demographic profile shifts — for example due to an ageing population.

Second, we accumulate money to undertake major purchases and to pay off the debts we have incurred to make them. In the United Kingdom, house purchase is a major factor here. Individuals initially accumulate savings to put down a deposit on a house — and through their working lives they pay off the debt secured on it. Reducing debt is an important form of

<sup>(1)</sup> Given at the Royal Bank of Scotland/Scottish Economics Society Annual Lecture on 15 March 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech304.pdf.

<sup>(2)</sup> I would like to thank Andrew Holder and Ben Westwood for research assistance and invaluable advice. I am also grateful for helpful comments from Kate Barker, Charles Bean, Tim Besley, Alex Bowen, Andrew Hauser, Andrew Wardlow and Simon Whitaker. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

<sup>(3)</sup> Different concepts of income and consumption can therefore generate different measures of saving. In this speech, the definitions used are those published in the UK National Accounts and conventionally used for macroeconomic analysis.

<sup>(4)</sup> Keynes (1936) set out a list of eight motives for saving. A review by Browning and Lusardi (1996) concluded that Keynes' list was comprehensive, but added one more the 'downpayment' motive.

saving, as well as accumulating financial assets. Both require income to exceed current consumption and hence generate a financial surplus.

Third, individuals may want to build up a financial buffer to cushion fluctuations in income, to cover unanticipated expenditures or to be more financially independent. Individuals will tend to smooth their income and expenditure not just over their life cycle but over shorter periods too. Temporary changes in income and wealth are therefore likely to lead to fluctuations in saving, whereas a permanent shift in income or wealth should lead to higher consumption, leaving saving relatively unaffected.

Over time, saving leads to an accumulated stock of assets and **Chart 1** shows the latest position for UK households, alongside the comparable picture a decade ago. Life assurance and pension funds — primarily geared towards providing income in retirement — account for about a third of total UK personal wealth. Another 40% or so is currently accounted for by housing equity. And the remaining quarter is made up of cash, bank and building society deposits (net of borrowing), stocks and shares and other financial assets.



(a) These categories shown net of borrowing.

**Chart 1** also shows that the net wealth of the personal sector has more than doubled since 1995 — from £2.7 trillion to nearly £6 trillion — about seven times personal disposable income. Over 80% of this increase reflects rising asset values — particularly in the housing market.<sup>(1)</sup> Housing wealth is now a much more significant component of the personal sector balance sheet than it was a decade ago, though as I will discuss later it may have different economic effects to the accumulation of financial wealth.

### Savings and investment

From a personal perspective, saving allows financial planning and provides security. In the national economy, it provides a key role in supporting capital investment. Investment is an important influence on both the demand side and the supply side of the economy. On the demand side, it is one of the more variable components of expenditure, with swings in investment contributing significantly to fluctuations in the economic cycle. On the supply side, investment in business assets and infrastructure boosts the productive potential of the economy, supporting rising productivity and living standards.

The saving which supports business and public infrastructure investment is not all generated in the personal sector. Companies also contribute savings by retaining profits and government can generate savings by running a surplus of tax receipts over current expenditure. The national savings effort is a product of the contribution of all three sectors.

**Chart 2** shows the large fluctuations we have seen in these sectoral savings rates over the past four decades — though these shifts can often be offsetting.<sup>(2)</sup> The recent trend has been for the public sector to make a fairly neutral contribution to national saving — with modest fluctuations accounted for by the cycle. Within the private sector, personal savings have been on a declining trend over the past decade. But this has been offset by rising corporate saving.





Note: 2006 estimate based on first three quarters

Companies save money on behalf of shareholders, who are ultimately private individuals or funds acting on their behalf. They are content to allow their wealth to accumulate within the corporate sector because of the equity which is generated by profitable investment. Corporate saving also provides a financial buffer to cushion shocks to demand and costs — such as the recent surge in energy prices. Again, it is in the interest of shareholders for this buffer to exist, rather than for these shocks to threaten the viability of the companies they own.

<sup>(1)</sup> Davey (2001) shows that estimated capital gains on housing and financial assets have been large relative to savings flows.

<sup>(2)</sup> Measurement issues may also contribute to these fluctuations. Saving is measured as a residual between income and expenditure, increasing the potential for measurement error.

**Chart 3** shows the recent savings and fixed investment of private non-financial companies operating in the United Kingdom. In recent years, corporate saving has exceeded the amount needed to finance company investment and I will come back to this issue later.



#### based on first three quarters.

## Changing pattern of UK personal savings

Having sketched out the savings landscape, I now want to talk about some of the changes we have seen within it — starting with UK personal savings.

Personal saving is the difference between household income and consumption. It reflects a complex and very diverse set of decisions, with consumers of different ages at different points in their life cycle. What we observe across the economy as a whole is the net result of these decisions, taking into account borrowing as well as the acquisition of assets. **Chart 4** shows that personal saving peaked in the late 1970s and early 1980s — though the high savings rates of that period were partly driven by the need to offset high inflation.<sup>(1)</sup> More recently, this balance has declined from about 12% of personal disposable income in the early 1990s to about 5% of income at present.

Changes in consumption behaviour associated with movements in the saving ratio can have important macroeconomic consequences. Strong consumer spending and a declining personal saving ratio helped to fuel the late 1980s boom, while the correction which followed in the early 1990s helped to tip the economy into recession. The slowdown in the UK economy in 2005 and its subsequent pickup last year were also associated with swings in the personal saving ratio.

I mentioned earlier that changes in savings behaviour can reflect borrowing and the repayment of debt, as well as the accumulation of financial assets. When we look behind these





Note: Income here defined as total household resources

changes in the UK saving ratio, we see that shifts in borrowing have been a very significant factor.

**Chart 5** decomposes the change in the saving ratio into two elements. On one side of the account is the accumulation of physical and financial assets by households in the form of bank deposits, contributions to pensions and life assurance, and physical investment, mostly in housing. On the other side is the accumulation of financial liabilities, which reflects new borrowing offset by the repayment of existing debt. Borrowing secured against house purchase is the dominant element on this side of the equation. The saving ratio is the combined effect of both these flows — the net amount that households save once account is taken of their additional borrowing.





Note: Data before 1987 adjusted to be consistent with current definitions.

The chart shows that both the asset and liability sides of the savings equation expanded significantly in the late 1990s and the early part of this decade. However, new borrowing has grown more rapidly than the accumulation of assets —

Inflation-adjusted, the current level of the personal saving ratio is much closer to its historical average. The impact of inflation on savings was highlighted in the late 1970s by Taylor and Threadgold (1979). For a more recent discussion, see Davey (2001).

pushing down the overall savings balance until it recovered somewhat in 2005. Changes in borrowing have dominated the movements in the personal saving ratio over the past two decades at least, though as we saw earlier rising asset values have offset increased borrowing and personal wealth has increased.

There is something of a paradox here. When the personal saving ratio was at its highest in the early to mid-1990s, the acquisition of conventional savings vehicles by the personal sector was relatively low. By contrast, the recent high acquisition of financial assets has accompanied a low saving ratio!

This paradox is partly due to the fact that borrowers and savers are different people, and that while some households have been increasing their debts, others have been accumulating assets.<sup>(1)</sup> It also reflects the money multiplier at work — new money lent for house purchase flows back into personal sector accounts and builds up the deposits of banks and building societies. When personal sector borrowing and deposits are both rising rapidly, therefore, there is also likely to be strong growth of broad measures of the money supply — which is something we have also observed over much of the past decade.

As **Chart 6** shows, these more liquid assets are the main swing factor on the asset side of the equation for personal savings. Contributions to life assurance and pension funds are much more stable — though these have been boosted recently by the need for some companies to top up their pension funds.<sup>(2)</sup>



#### Consumption and the housing market

Saving decisions are the mirror image of the decision to consume; if I decide to save more I consume less, and *vice versa*. So it is not surprising that the fall in the personal saving ratio we have observed over the past decade has been associated with strong consumption growth.

**Chart 7** shows that the ten years from 1995 to 2005 saw consumption growth of 3.5% per annum. This has been the strongest period of consumer spending growth over the post-war period, considerably above the historical average of 2.6% growth.<sup>(3)</sup> Some previous periods of strong consumer spending growth, such as the late 1980s, were associated with a significant pickup in inflationary pressures. So why has that not happened this time round?

#### Chart 7 Consumption and GDP growth



A number of factors have helped to prevent the strong consumer growth of the past decade spilling over into inflation. In the late 1990s, the economy took up slack in the labour market, as the unemployment rate was considerably above its long-run equilibrium rate in the mid-1990s. In the first half of this decade, the relative weakness of other components of demand growth — investment and exports helped to offset robust consumer spending. Throughout the period, competitive pressures from global markets and a relatively strong exchange rate have helped to contain inflationary pressures by holding down import prices.

Recently, we have seen some of these pressures becoming less helpful in containing demand and price pressures — with stronger global markets and a recovery in investment boosting demand and more imported inflation coming through from high oil and commodity prices. Looking ahead, therefore, it is likely that more subdued growth in consumer spending will be required to keep inflation in check, at least for a while.

Another striking feature of the period of strong consumption growth we have seen over the past decade is that it has been associated with strongly rising house prices. This has led many people to see the housing market as a key driver of consumption and personal savings decisions.

<sup>(1)</sup> See Bean (2004) and Nickell (2004) for a more detailed discussion

<sup>(2)</sup> Pension fund contributions made by companies on behalf of individuals count as personal savings in the UK National Accounts.

<sup>(3)</sup> The average growth rate prior to 1995 was 2.4%.

As **Chart 8** shows, there is clearly an association between house price inflation and consumer spending growth, but it is quite a loose and variable one. Recent house price inflation has not been as strongly correlated with consumption as in the late 1980s, and consumer spending recovered in the early 1990s against the background of a subdued housing market.



Sources: HBOS, Nationwide and ONS.

Economic theory suggests that if there is a permanent rise in personal wealth, then consumption should also increase. But housing has different properties to other assets — as higher house prices also raise the cost of housing at the same time as wealth is increasing. When house prices rise, people trading up in the housing market are potentially worse off. By contrast, those trading down are better off — and in net terms these effects should balance. So it is not clear that the wealth effect can properly explain the relationship on this slide.

A more likely explanation is that the housing market and consumer behaviour are affected by common economic influences — in particular confidence about future income growth and the level of interest rates.<sup>(1)</sup> When this confidence is strong and or interest rates are low, both consumer expenditure and housing demand will be affected — pushing up house prices. There may also be spillovers into consumption from lending for house purchase and mortgage equity withdrawal.<sup>(2)</sup> Because of these linkages, it makes sense to monitor housing market developments to help understand how changing economic conditions are affecting household consumption behaviour — even though there may be no hard and fast causal link.

#### Corporate savings and investment

I mentioned earlier that personal savings are only part of the overall savings picture. Retained income by companies allows their shareholders to save indirectly by building up equity and a large part of business investment is normally financed from the retained earnings of companies — corporate saving.

It is not only in the United Kingdom that companies are now saving more than they need to finance investment. **Chart 9** shows that this is happening across our peer group of industrialised economies as well. According to the IMF, saving by companies from their operations in the G7 countries exceeded the amount needed to finance business investment in these countries by \$1.3 trillion in 2003 and 2004.



<sup>(</sup>a) G7 excluding Germany/West Germany.

A number of explanations have been put forward for this excess corporate saving.<sup>(3)</sup> It might be a transitional phenomenon, as companies adjust to a world of lower interest rates, lower corporate taxes and falling capital goods prices. Other explanations are linked to the impact of globalisation on company strategy. Companies are choosing to buy existing assets in new markets rather than investing in new assets in their existing markets.

Another line of explanation focuses on the fact that major companies appear to have increased their desired cash holdings and have deliberately paid down debt to increase their ability to withstand shocks. This behaviour might seem rather puzzling when the past decade has also been described as the 'Great Stability', a period of steady growth and low and stable inflation. However, evidence from both the United States and the United Kingdom shows that while this is true at the macro level, at the micro level firms and industries have experienced more volatility over the past decade — as they have had to cope with an increasingly competitive global business climate and the shocks we have seen have affected

(3) See IMF (2006) for a comprehensive review.

See Barker (2005) for a discussion of the impact of low real interest rates on the housing market.

<sup>(2)</sup> See Benito *et al* (2006) for a fuller discussion of the linkages between house prices and consumer spending.

firms and industries very differently.<sup>(1)</sup> This certainly rings true with me, given my recent background in the airline industry, which has seen unprecedented volatility from the global shocks over the past decade.

With these many different explanations, it is unclear whether the shift to excess corporate savings across a range of different countries will be sustained, or whether companies will expand their investment expenditure to absorb higher saving. This may already be happening as there are clear signs of a recovery in business investment in the United Kingdom with official statistics, business surveys and the Bank of England Agents' reports all pointing to strengthening capital spending by firms. Business investment also appears strong elsewhere in Europe and in Asia, and this would also be consistent with the healthy global demand conditions we see at present.

Such a recovery of investment should be welcome — adding to productive capacity and hence supporting rising living standards over the longer term. But if there is not some compensating reduction in other components of demand, there are inflationary risks in the short term — particularly against the background of a strong global economy. This reinforces the view that we may need to see more subdued growth of consumption (public or private) relative to the past decade, to allow a rebalancing of the economy.

## Shifting pattern of global savings

Alongside the changing patterns of personal and corporate savings I have discussed so far, we have also seen significant shifts in the global savings picture.

Like the United Kingdom, **Chart 10** shows that the global savings rate has been on a declining trend in recent decades, with some cyclical fluctuations. The global savings rate as a share of GDP is about 5 percentage points above the United Kingdom, which probably reflects a combination of demographic factors and our better developed financial system — which allows more borrowing to finance consumption.

Global savings — including the contribution of companies and governments as well as personal savings — totalled \$9.7 trillion in 2005 and **Chart 11** shows the geographical sources of that savings pool. The most striking fact is that China contributes 11% of the total — about two thirds of the share of the United States, which is a much richer country. Though China's GDP is about 15% of the US total at market exchange rates, her high savings rate — around 50% of GDP allows her to punch significantly above her weight in the savings world.

#### Chart 10 Global and UK savings



Chart 11 Source of global gross savings 2005



The rise of China as a global savings power has happened over the past two decades and, as **Chart 12** shows, it has been accompanied by a broadly equivalent decline in the US share of global savings. Recent growth in Chinese savings has been mainly generated by rising company and government savings. The savings shares of other regions have seen much smaller swings, though other emerging Asian countries and the Middle East are also now generating a bigger share of global savings than two decades ago.

**Chart 13** shows that these shifts in savings patterns have been reflected in growing current account surpluses and deficits across the global economy, which are the counterpart of savings and investment imbalances. As financial markets are liberalised and become more international, it is not surprising to see such imbalances emerge — as investment is no longer

See Parker (2006) and Comin and Mulani (2004) for recent empirical studies suggesting that despite recent macroeconomic stability, firm-level uncertainty may have increased.



Chart 12 Changes in global savings 1985–2005

Note: Underlying data in current US\$

United States EU4<sup>(a)</sup>

Source: IMF

(a) EU4: United Kingdom, Germany, France and Italy

Japan

China

Emerging

China

Asia excluding East

Middle

constrained by domestic saving and companies and individuals have better access to overseas sources of funds. However, the biggest imbalances suggest a flow of capital from Asia and other emerging markets to the United States - totally in the opposite direction to which we might expect. Countries like China with abundant labour supplies and good investment opportunities might be expected to attract capital from rich countries such as the United States with a high stock of savings, but in fact capital is currently flowing in the reverse direction!

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(a) Fuel exporters group comprises 23 countries, for details see IMF World Economic Outlook September 2006. Underlying data in current US\$

A number of explanations have emerged to explain this somewhat counterintuitive situation.<sup>(1)</sup> One view emphasises the role of risk-averse Asian investors looking for a safe home for their savings and not finding them in their domestic markets. Ben Bernanke, the US Federal Reserve Chairman, has argued that this creates a global savings glut and can also help to explain why long-term interest rates are so low across the

developed world. A more straightforward explanation would be that personal consumption is held down in China by an underdeveloped financial system, the absence of a developed social security system and an artificially low exchange rate, which discourages consumption of imports. At the same time, demand in the United States has been strongly supported by loose monetary policy in the early part of this decade depressing the US savings rate.

These views are not mutually contradictory and both may help to account for the significant current account imbalances which have emerged. Perhaps of more significance is whether an unwinding of these imbalances — if it occurs — is gradual and orderly or disorderly and associated with financial market turbulence. Indeed, worries about a disorderly unwinding of global imbalances may be adding to the recent volatility we have seen in world financial markets.

So far, there is optimism among the international institutions that an orderly unwinding can be achieved — though this may need to be associated with continued dollar weakness and slower US growth, as households there readjust to a more normal level of interest rates. And as long as European and Asian demand remain healthy, a period of more steady US growth should not be too disruptive to UK export and growth prospects.

## Implications for monetary policy

So what are the implications of all this for monetary policy in the United Kingdom? The objective of the Monetary Policy Committee of the Bank of England is to keep consumer price inflation on target at 2%. Over the second half of last year, the inflation rate began to drift upwards away from that target, against the background of strengthening demand at home and abroad. The Committee has taken action with a series of interest rate rises to help keep demand pressures in check and to help ensure inflation returns to target in the future.

Chart 14 shows the assessment from our latest Inflation *Report* on how this might happen — based on the prevailing market expectation of interest rates. The deeper red swathe highlights our central forecast, but the wide fan around it indicates our range of uncertainty. The main factor expected to help bring inflation back down in the short term is the downward impact of energy prices after significant rises in previous years. If these reductions prove more dramatic than our central projection has assumed, they could push inflation significantly below target. On the other hand, the growth of demand could lead to more general upward pressures on

<sup>(1)</sup> See IMF (2005) for a review of these explanations. Bernanke (2005) argues that there is a 'global savings glut' and Caballero (2006) that there is a shortage of suitable assets for investors. See also the contributions of Obstfeld and Rogoff (2005) and Miller and Zhang (2006)

wages and prices, offsetting energy price reductions. That creates a risk that inflation remains above target for longer into the medium term. The judgements of the Monetary Policy Committee on the level of interest rates will depend significantly on how new evidence affects our assessment of this balance of risks.



Source: Bank of England Inflation Report, February 2007.

My discussion today of savings trends is particularly relevant to the demand side of this equation and has highlighted a number of key issues. First, consumers' expenditure has grown strongly over the past decade, supported by a fall in the personal saving ratio and strong asset price growth. The conditions which ensured that such strong consumption growth was compatible with low inflation may not be sustained into the future. Global conditions may not be so benign, and unemployment is now much closer to its equilibrium rate than it was in the mid-1990s when the period of strong consumer growth started — increasing the risk of wage inflation. The sustainable growth of consumer spending going forward is therefore likely to be closer to the historical average of around  $2^{1}/_{2}$ % growth and lower than the recent trend of  $3^{1}/_{2}$ %.

Second, companies have been repairing their balance sheets in recent years and are now in a much stronger position to support higher business investment. This is already being reflected in stronger investment spending in the United Kingdom, other European countries and in Asia. A continued surge in capital investment would require some further restraint in other components of demand — notably consumer spending — if it is to be compatible with low inflation.

Finally, there are risks attached to the emergence of significant global imbalances. In the short term the flow of savings from Asia and other emerging markets appears to have supported the growth in asset values in the United States and other western economies, as investors have sought out safe havens in more stable economies. This asset price inflation has probably helped to support the relatively strong global demand that we have seen over the past few years — and monetary policy needs to take that into account. However, perhaps a bigger worry for the future is a disorderly unwinding of these imbalances, and while this risk exists, we may see periodic bouts of financial market nervousness.

As we discovered in the Asian crisis in the late 1990s, the unwinding of current account imbalances can cause considerable financial turbulence and adversely affect demand prospects — and policymakers need to respond appropriately if such conditions emerge. However, the appropriate response of monetary policy depends on the prevailing demand conditions. There is also the risk of repeating the mistakes of 1987, when loosening of monetary policy in response to falling stock markets was overdone and provided a further boost to the late-1980s demand-led boom.

A common theme to the developments I have discussed today is the need for a rebalancing of the sources of demand growth — at home and abroad. At home, more subdued consumption growth needs to accompany a recovery in investment if demand pressures overall are to be kept in check. Meanwhile growth in the global economy needs to become less dependent on the US consumer, and more strongly supported by demand growth from Europe and Asia. Both at home and abroad, there are encouraging signs that an orderly rebalancing of this sort can occur. But unexpected shocks may also emerge. The Monetary Policy Committee needs to be prepared to respond to both scenarios, with the objective of keeping the UK economy on track to meet the inflation target over the medium term.

#### References

**Barker, K (2005)**, 'The housing market and the wider economy', speech at the Institute for Economic Affairs, State of the Economy Conference, London.

**Bean, C (2004)**, 'Some current issues in UK monetary policy', speech to the Institute of Economic Affairs, London.

Benito, A, Thompson, J, Waldron, M and Wood, R (2006), 'House prices and consumer spending', *Bank of England Quarterly Bulletin*, Summer, pages 142–54.

Bernanke, B (2005), 'The global savings glut and the US current account deficit', Federal Reserve Board speech, April.

**Browning**, M and Lusardi, A (1996), 'Household saving: micro theories and micro facts', *Journal of Economic Literature*, Vol. XXXIV, December, pages 1,797–855.

**Caballero, R (2006)**, 'On the macroeconomics of asset shortages', *NBER Working Paper no. 12753*.

Comin, D and Mulani, S (2004), 'Diverging trends in macro and micro volatility: facts', NBER Working Paper no. 10922.

**Davey, M (2001)**, 'Saving, wealth and consumption', *Bank of England Quarterly Bulletin*, Spring, pages 91–99.

International Monetary Fund (2005), 'Global imbalances: a saving and investment perspective', *World Economic Outlook*, Chapter II, September.

International Monetary Fund (2006), 'Awash with cash: why are corporate savings so high?', *World Economic Outlook*, Chapter IV, April.

Keynes, J M (1936), *The general theory of employment, interest and money*, Cambridge University Press.

Miller, M and Zhang, L (2006), 'Fear and market failure: global imbalances and "self-insurance", CEPR Discussion Paper no. 6000.

Nickell, S (2004), 'Household debt, house prices and consumption growth', speech given at Bloomberg, London.

**Obstfeld**, M and Rogoff, K (2005), 'Global current account imbalances and exchange rate adjustments', *Brookings Papers on Economic Activity*, No. 1, pages 67–146.

**Parker, M (2006)**, 'Diverging trends in aggregate and firm-level volatility in the UK', *External MPC Unit Discussion Paper no.* 16, Bank of England.

Taylor, C and Threadgold, A (1979), "Real" national saving and its sectoral composition', *Bank of England Discussion Paper no. 6*.

# Interest rate changes — too many or too few?

In this speech,<sup>(1)</sup> Kate Barker,<sup>(2)</sup> member of the Bank's Monetary Policy Committee, discusses some issues around the timing of Bank Rate changes; in particular how different types of uncertainty would suggest more, or less, aggressive policy responses to news. She goes on to consider how the MPC has acted over the past ten years, and concludes that overall there is little evidence that the MPC has behaved in a gradualist manner. Looking at individual voting patterns, she observes that on average external MPC members have been a little more active in voting for Bank Rate changes than internal members. Finally, commenting on the present economic situation, she discusses the considerable uncertainties around the outlook for inflation as the effects of the energy cost shock feed through. She suggests that while this type of uncertainty prevails, Bank Rate changes could become a little more frequent.

### Introduction

It is a great pleasure to be here with you tonight. It is now almost ten years since the Bank of England was given independence to set interest rates, and the Monetary Policy Committee (MPC) sprang into being. These ten years have seen many changes in the economy both UK-wide and in the Tees Valley. Here unemployment has fallen from 7.1% to 3.8%, with a rising proportion of people active in the labour market, and rising employment rates. With the chemicals and steel industries enjoying a period of strength, there are encouraging signs of improvement in the trend of value-added per head relative to the rest of the United Kingdom. And regeneration has recently been boosted by the announcement that Middlesbrough is to be the site of a second-tier regional casino, further evidence of greater economic diversity. It's a positive story.

The first ten years of the MPC has supported these positive trends — for the United Kingdom as a whole growth has averaged 2.8%, and inflation, surprisingly, has remained within a 1% range either side of the 2% target. Both inflation and growth have been more stable than the experience of the previous three decades. Ten years is long enough to enable some analysis of issues around the MPC's behaviour, and of whether that behaviour has changed over time. Also, almost six years since I joined the MPC, it's an opportunity to reflect on my own experience of being a policymaker.

I focus here on the question which in an obvious sense is the one which pre-occupies each of us at every meeting — does the news and analysis of the past month add up to a case for changing interest rates? Since the first meeting in June 1997, the MPC has met 119 times, and rates have been changed at 34 of these meetings. The peak of interest rates during the MPC period was 7.5%, reached in June 1998. The low point for interest rates was 3.5%, reached in July 2003, the last in the series of cuts which broadly followed the significant falls in equity markets between 2000 and 2003. Curiously, Bank Rate today, at 5.25%, is now back to that prevailing when I joined the MPC in 2001.

The discussion describes briefly some of the theoretical arguments which have been advanced about the timing of interest rate changes, and about how policy should respond to news. Then I look at how the MPC's actions compare with theoretical models of how monetary policy makers behave, and whether we appear to follow a gradualist approach. In this context, it is also of interest to consider how individual MPC members behave, and finally whether the MPC's behaviour differs from that of other central banks.

I also consider the present economic conjuncture, to what extent this is presenting the MPC with new challenges, and how these questions about the timing of interest rate changes, and policy strategy might apply to today's circumstances.

<sup>(1)</sup> Given at the CBI North East Dinner, Newton Aycliffe, on 20 March 2007. This speech can be found on the Bank's website at unsuble for a default with the string website at (2007/careh 2007 of f).

www.bankofengland.co.uk/publications/speeches/2007/speech305.pdf.
I would like to thank Charlotta Groth and Tracy Wheeler for their great help in preparing this speech; and other colleagues for helpful comments. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

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# The timing of interest rate changes — theoretical considerations

Much external commentary on individual voting behaviour on the MPC seeks to classify us as 'doves' or 'hawks'. But I would certainly reject this. If we were predisposed to be either 'soft' or 'hard' with regard to keeping inflation low, the implication would be that we would be failing to do our job of managing inflation in order to achieve a symmetric target. Interest rate decisions are approached within a shared basic framework which is forward looking — aiming to prevent movements away from the target anticipated around 18–24 months after the interest rate decision. Policy is pre-emptive — looking to move early in the event of a threat to the target, implying that decisions will only reflect recent CPI outturns to the extent that these are judged to contain information about inflation further ahead. Of course, there will be disagreements at a particular time about whether a change in base rates is necessary, either reflecting different judgements about the central forecast for CPI inflation, or about the risks around it.

Disagreements are not always about the economic outlook and the risks, however. They can also arise because of a different view about the appropriate monetary strategy, although the two cannot always be clearly separated. Two aspects of strategy relate to timing: gradualism (which could broadly be described as whether a required move in interest rates should be implemented in stages, rather than all at once) and waiting (which here I will generally use to refer to caution about making a change in direction in the path of interest rates). However, the term waiting might also be used in another sense, to talk about waiting for a particular piece of information, or indeed waiting for the more sophisticated analysis of news which the MPC undertakes during a forecast round.

#### Gradualism

One strand of discussion about monetary policy strategy discusses how uncertainty should affect policymakers' behaviour. In particular, this looks at whether there is a case for making the entire interest rate change judged necessary in response to a given shock immediately, or in several steps.<sup>(1)</sup> A number of arguments have been put forward in favour of a more gradual approach. The key one refers to uncertainty about how much inflation will respond to a given change in interest rates, due to the fact that the parameters of our model of the economy cannot be known with precision. This is frequently referred to as Brainard uncertainty, after his seminal article.<sup>(2)</sup> A second reason for gradualism results from uncertainty about the most recent economic data - the element of noise, relative to news, in early data estimates increases the risk of overreaction to changes in economic conditions.

However, there are other arguments suggesting that gradualism is not always the right approach. Policymakers looking at the conjuncture may be unclear about some aspects of the underlying model of the economy (model uncertainty) — perhaps because it is a period of rapid structural change, or because of the size and nature of the shock which has occurred. In these circumstances, it can be shown that a gradual approach is not always justified.<sup>(3)</sup> Or, the view taken of the balance of risks may be judged to indicate that acting slowly increases the probability of a bad outcome in which inflation moves substantially away from target.

In practice, I have found that the considerations being weighed when taking the monthly interest rate decision are such that I am often balancing concern about overreacting to news (leading to unnecessary economic volatility), against the fear of not responding robustly enough to changing conditions (and so acting too little, too late, necessitating a larger correction at a future date). There are few months which point clearly to a gradualist, or to a more robust, approach.

#### Waiting

One definition of waiting is caution about making a change in interest rates which reverses the direction of the previous change. An early move back towards tightening after a period of loosening, or *vice versa*, tends to create the impression that the previous set of changes had moved too far, and therefore could be damaging to credibility. Equally, this suggests that clear evidence in support of any change of direction is needed, as the risks attached to a second reversal (concerns about provoking sharp money market movements and public appearance of policy confusion) may increase the cost of a mistake.

In addition, it has been argued<sup>(4)</sup> that too frequent reversals would reduce the ability of Bank Rate changes to affect longer-term interest rates. This ability arises because when the central bank is believed to be pursuing a gradualist policy, then a change of short-term interest rates in a new, upward, direction can gain added traction by altering expectations of interest rates further along the yield curve, tightening monetary conditions further. However, there is a possible contradiction here. If the purpose of changing Bank Rate gradually is to avoid unnecessary volatility, then if the market sees through this tactic to some extent then the risk of undue tightening or loosening remains. (Of course, if a subsequent move in Bank Rate proves unnecessary, then the market will undo some of its shift, and this might be preferable for credibility reasons to a larger change in policy rates which is then partly unwound.)

<sup>(1)</sup> See Batini et al (1999) for a summary of this topic.

<sup>(2)</sup> Brainard (1967).

<sup>(3)</sup> Sargent (1999).

<sup>(4)</sup> Woodford (1999)

In approaching the month-by-month decision on interest rates over the past six years my general approach, in the context of the above discussion, has been consciously to seek to move early in response to indications that future inflation was likely to deviate from the target. This has the clear advantage of enabling future small moves in the same direction if new data suggests this is necessary, and lessens the risk of the need for a sharper change in Bank Rate at a later date. I have therefore tried to put more weight on reducing the risk of a big policy mistake, than on worries over short-term questioning of credibility if policy reversal proves to be needed.<sup>(1)</sup> But this does not mean I have always sought to respond mechanically to deviations from target at around the two-year forecast horizon. The other key factors I have taken into account include the path of the inflation projection over the whole forecast period, and when appropriate, the risk of creating unnecessary volatility in the path of output growth. An example of this was the MPC meeting on 7 and 8 November 2001 when most members favoured a reduction in interest rates of 50 basis points, on the basis that 'a cut [would] underpin confidence domestically, by underlining the Committee's continued readiness to act to support demand in line with achieving the inflation target over the medium term'. One of the arguments against the cut was that 'too large a cut might fuel consumer borrowing growth excessively, weakening household balance sheets and adding to risks for the future...', thus increasing output volatility.

#### Interest rate rules

The above discussion suggests that central bank behaviour might be expected to demonstrate two features — some tendency towards gradualism (making a series of small changes in the same direction in response to a piece of news) and a tendency towards inertia (waiting for longer than might be expected before making a change in interest rates in the opposite direction to that of previous movements). Does the evidence in the United Kingdom with regard to the period in which the MPC has operated, indicate that behaviour conforms to these expectations?

#### **Evidence from Taylor rules**

Gradualism can be assessed by comparing central bank behaviour with the actions which would have resulted from the use of a simple Taylor rule, in which the interest rate responds to movements in inflation and in a measure of the output gap. When this approach is used to model actual central bank behaviour, it is often found necessary to add in the lagged interest rate. The coefficient on this variable is usually close to one, and this is interpreted as evidence of gradualism. However, there are a number of reasons to be cautious about this conclusion. Other factors need to be taken into account — such as the fact that the policymaker uses real-time data, not final, or that there may be variables not included in the model ('unobserved' variables), but which policymakers are also responding to. If these variables are persistent, then the policymakers' response may appear gradual when modelled by a simple Taylor rule.

Estimation of Taylor rules for the United Kingdom, looking at two time periods (1976–96 and a shorter period 1997–2006, since the establishment of MPC independence), gives results which suggest that policy was gradual in both periods. In the MPC period, it took around seven quarters to make half of the optimal policy change and slightly longer for the earlier period. This result is not much changed by using different definitions of the output gap, nor by using real-time data. However, these results are not entirely satisfactory, as there are signs of model misspecification.

And, as argued above, in practice movements in variables other than the inflation rate and output gap will influence interest rate decisions. Following previous work for the United States,<sup>(2)</sup> which allows the interest rate to respond to some (in the Taylor rule) unobserved variables, preliminary results for the United Kingdom suggest much less smoothing than in the simple Taylor rule (less than two quarters to make half of the optimal policy change in the MPC period), and less model misspecification. These results also suggest that the policy rate seemed to move more quickly to its optimum level in the MPC period, compared to the previous 20 years. About half of the variation in this 'unobserved' component can be explained by a measure of movements in the equity risk premium (Chart 1), suggesting that financial market conditions may be at least part of the variables omitted in simple Taylor rules. Further, if revisions to the output gap are also included, then well over half of the variation can be explained. This extension of the simple Taylor rule therefore suggests that there is less evidence of inertia in central bank





(a) Unobservable component derived from an estimated Taylor rule equation that allows for serial correlation in the residual (to capture general misspecification and unobserved variables). Equity risk premia implied by dividend discount model for FTSE 100.

(1) Since 1997 policy reversals have only occurred six times.

(2) Gerlach-Kristen (2004)

decisions, which could be interpreted as suboptimal, than initial work had implied.

#### The inflation forecast and MPC reaction function

A different way to assess this question was also put forward recently by Charles Goodhart.<sup>(1)</sup> This looked at how much the MPC decisions responded to an *ex-ante* forecast, the forecast which he estimates the MPC would have published for inflation at the two-year horizon if interest rates were left unchanged. (The ex-post inflation forecast in this case is the one published in the quarterly Inflation Report. If interest rates are unchanged, the *ex-ante* and *ex-post* forecast are identical.) Perhaps not surprisingly, given that the two-year forecast is generally quite close to the target, he finds that the results here suggest that the MPC has acted aggressively to eliminate predicted deviations from the target. Using the same approach, but over a slightly longer period (1997-2006), a model based on a full policy response to *ex-ante* forecasts for growth and inflation fits the actual interest rate movement quite well (Chart 2), with little evidence of interest rate smoothing at the quarterly frequency.

#### Chart 2 Actual and predicted quarterly interest rate changes<sup>(a)</sup>



(a) Predicted series based on estimation results for forward-looking Taylor rule where policy responds to ex-ante forecasts for inflation and output growth at the two-year horizon.

This is a little different from the results for interest rate gradualism estimated using the simple Taylor rule — but again this may not be surprising, as that rule uses current data, whereas policymakers are forward looking. Taken at face value, this analysis might suggest that the history of MPC decisions implies a swift policy response to news.

However, there is an alternative interpretation of these results, which is that the forecast itself behaves in a gradualist manner. The two-year ex-ante forecasts tend to deviate from target in the same direction for a number of quarters — on average three quarters for the MPC period. From my experience on the MPC, I would suggest a number of possible reasons. One is that the MPC learns over time about the size of the shock. A second is that there is structural change in a model parameter

which the MPC realises only gradually. Third, some pieces of news can be treated in a gradualist way, for example sharp changes in asset prices, so that they do not have their full effect on the forecast unless they prove to be more than just noise in the markets, to prevent the quarterly inflation forecast (and nominal interest rates) being unduly volatile.

#### MPC and activism and waiting

#### Individuals versus whole committee

I suggested that MPC members could be divided into groups according to their degree of activism (how often they voted to change interest rates) rather than the more familiar hawks or doves. One way to assess activism is to consider the probability that a member voted for a change in interest rates, having voted with the majority in the last meeting (in order to exclude serial minority votes for a change). Table A shows the results of the comparison of probabilities for individuals and for the whole MPC, calculated over the period June 1997 to February 2007. On average, with serial minority voting excluded, the mean probability for individuals is not statistically different from that for the whole MPC. There is considerable variation among members, but no sign of any particular skew, with the median probability close to the mean (Chart 3 and Table A). If serial voting is included,

Table A Probability that the MPC and its individual members voted for an interest rate change (are active), June 1997–February 2007

Co	ommittee	Individual	membe	rs			
		Weighted mean <sup>(a)</sup>	Mean	Median	Max.	Min.	
Probability (Active <sub>t</sub> )	0.28	0.34	0.33	0.33	0.61	0.14	
Probability (Active <sub>t</sub>   majority <sub>t-1</sub> ) <sup>(b)</sup>	0.28	0.30	0.30	0.31	0.63	0.12	

Note: Data for individual members include members that have voted at least ten times

(a) The weight given to each individual member in the aggregation of their probabilities is proportional to the number of meetings at which they voted. (b) Shows the probability the individual member was active given that they voted with the majority of the

Committee at the previous meeting.

#### Chart 3 Probability of voting for a change given member was in majority last round



(1) Goodhart (2005)

Steve Nickell, Willem Buiter and Sushil Wadhwani appear to be more active than if it is excluded, as they had long periods of voting for change against the majority.

Over the past ten years there have been four periods in which interest rates were kept unchanged for at least eleven months. In the first of these (March 2000 to January 2001) the proportion of dissenting votes was above the average. However, in the other three this was not the case, suggesting that economic stability, rather than committee inertia, was the reason.

Over the whole period, the MPC has been more activist, measured purely in terms of the frequency of interest rate changes, than were the Chancellors in the period between the ERM crisis and the establishment of the MPC. However, this activity rate has tended to diminish over time. So it would be plausible to attribute this either to a more stable economy, or to greater credibility of the central bank, meaning that smaller and fewer interest rate changes would be required to achieve the inflation target. Some preliminary work looking for economic factors which are related to activity has not produced any clear results, although they suggest that higher past inflation volatility, or greater uncertainty about the one year ahead forecast, are both linked with an increase in policy activism. An alternative explanation is that experience has led to a greater appreciation of the value of waiting (in a study of committee and individual behaviour, Lombardelli et al suggested that the superior results from committee voting were because the committee learnt to be less activist).<sup>(1)</sup>

However, one notable difference among groups of members is that the external members, those appointed to bring outside expertise and who are not permanent bank employees, are more activist than the internals. The probability of voting for a change, having been in the majority in the previous meeting, is around one-in-three for an external member, and somewhat lower for an internal. This difference remains even when allowance is made for the fact that external members typically serve shorter terms, and activity rates tend to decline with time. It is more difficult to account for this aspect of behaviour — and it is fair to point out that it is not true of all individuals. Both the Governors have measured activity rates a little above the average, whereas some of the externals (myself included, despite my activist inclinations) have been less active than the average.

#### Waiting

The most notable characteristic of MPC voting behaviour, at least over the recent past, has been the tendency to change interest rates more frequently during a forecast round. This is observable both for the whole MPC and for individuals, and has become more marked in the 2002–06 period, roughly the second half of the Committee's existence. Looking at the minutes of the policy meetings, waiting for the greater depth of analysis which is possible in a forecast round is sometimes given as a reason for not changing rates. An example can be found in the minutes for 5–6 July 2006: 'But there was still considerable uncertainty about the National Accounts estimates for 2005, which had yet to be balanced. It was difficult to reach firm conclusions about the implications of the revisions for the overall balance of demand and supply until the data had been fully analysed in the context of the *Inflation Report* round'.

However, I would argue that this is not the only reason for the observed behaviour. Experience suggests that while the forecasting round frequently does produce analysis which sheds light on some puzzles, it is just as likely to uncover new uncertainties — indeed the expression 'confused at a higher level' is a pretty good description of how I feel after 23 forecast rounds. A slightly different reason for rate changes occurring more frequently in forecast rounds is that the Committee then has two sorts of news — the regular flow of data news, plus news about the way in which the behaviour of the economy may be changing which is revealed through the regular reconsideration of the performance of the Bank's model. This second sort of news is inevitably more difficult for outsiders to anticipate.

Other arguments for waiting for a month or so to gain greater certainty also need to be used with care. Sometimes there is a specific piece of news expected (for example, news about the January pay round, which accounts for around 20% of the year's private sector settlements, by numbers of employees). This might be a reason for delaying a decision to change interest rates, if other evidence does not produce a clear-cut justification.

A similar argument for delay arises around the time of the annual ONS *Blue Book*, which often contains significant data revisions. But this is perhaps less easy to explain — while it is often used as a reason for waiting in the months just ahead of the *Blue Book*, it could apply to some extent to any month where a decision was taken on data which had not been through at least one *Blue Book* revision, and benefited from the additional information which the ONS have at that stage. So this becomes part of the more general issue around data uncertainty, where the MPC is presently seeking to improve our approach,<sup>(2)</sup> and to strike the right balance by better estimation of how much of the latest information is likely to be noise rather than news.

Overall, I have come to believe that arguments for waiting in this short-term sense can be overemphasised. It is rare for another month's information to produce much further clarity. Only when it is a finely balanced decision, or when there are

<sup>(1)</sup> Lombardelli *et al* (2002).

<sup>(2)</sup> Ashley *et al* (2005).

significant concerns about possible reversals (as discussed earlier) should these factors come into play.

#### Comparisons with other central banks

Several other central banks operate a similar monetary regime, but they all differ from each other in terms of their remit, and their institutional structure. Here, I briefly consider whether these differences also translate into differences in terms of activism. (Although some caution is needed, as neither the sample size, nor the time period, is large enough to draw very firm conclusions.)

Taking a sample of eight central banks, including the Federal Reserve and the European Central Bank, over the ten-year period of the MPC, all have been similarly active in terms of interest changes per year (Table B). This activity rate does not seem to be affected by the committee structure (the Bank of England and the Fed are the only two with individual accountability). All central banks wait longer — on average four times longer - before moving interest rates in the opposite direction to the previous move (ie making a reversal).

A tendency to make a policy change more often alongside a forecast is observable for several other central banks, although this is only statistically significant for the Bank of England, Reserve Bank of Australia and Reserve Bank of Canada. These banks all use their forecast as a key means of communicating about policy, although this is also true of the Reserve Bank of New Zealand, the Riksbank and the Norges Bank, who have much less of a tendency to be more active at meetings linked to a forecast. It does not seem to make a difference in this respect if the forecast is 'owned' by the staff of the bank or by the policymakers.

### The present economic situation

What are the main factors which the MPC is concerned about in the current economic situation, and to what extent might arguments about gradualism and waiting affect our decisions in the coming months? From the perspective of output growth, this seems to be a relatively stable period. Over the recent past, growth has been at around the rate that most current estimates would consider as the United Kingdom's supply potential; the period of weaker quarterly growth in early 2005 has been followed by five guarters of growth around 0.7% or a little stronger. Present survey indicators for output, taken together, give no reason to suppose that this pace is set to slacken. Indeed, the latest (February) CBI survey for manufacturing has the strongest output expectations for twelve years. And while the Chartered Institute of Purchasing and Supply service sector survey output indicator has fallen back a little from its December peak, it remains above the average of the past ten years.

Encouragingly, the outlook for export demand also remains positive — growth in the euro area, the United Kingdom's largest market, was 3.3% in the year to the fourth quarter of 2006, the strongest annual growth rate for six years. And despite growing concerns about household sector indebtedness in the United States, most forecasters still expect growth of over 2.5% for this year, but here we are well aware of the need to be watchful for indicators of a more significant downward risk for consumer spending.

In the February Inflation Report, the MPC's central projection for the United Kingdom was broadly for a continuation of the recent pace of growth. But, as we always point out, there are

#### Table B Comparison of monetary policy activity across different central banks

	New Zealand	Australia	Canada	United States	Euro area	Sweden	Norway	United Kingdom	Mean
Probability (Active per meeting)	0.42	0.20	0.46	0.46	0.22	0.37	0.37	0.28	0.35
Meetings per year	8	11	8	8	12	8	9	12	9.50
Average activity per year	3.45	2.16	3.64	3.87	2.57	3.06	3.29	3.38	3.18
Decision-making process <sup>(a)</sup>	Gov	Maj	Cons	Maj	Cons	Maj	Maj	Maj	
Accountability <sup>(b)</sup>	Gov	Coll	Coll	Ind	Coll	Coll	Coll	Ind	
Members on committee	1	9	6	12	18	6	7	9	8.50
Probability (Active per meeting   forecast)	0.42	0.30	0.66	0.37	0.33	0.40	0.39	0.46	0.42
Probability (Active per meeting   no forecast)	0.42	0.14	0.33	0.44	0.18	0.34	0.36	0.19	0.30
P-value of statistical significance <sup>(c)</sup>	0.96	0.05	0.01	0.56	0.14	0.59	0.84	0.00	
Forecast owner <sup>(d)</sup>	Gov	Comm	Staff	Comm	Staff	Staff	Comm	Comm	
Forecast main tool for policy communication	Y	Υ	Υ	Ν	Ν	Y	Y	Y	
Sample period	02/1997– 02/2007	04/1999– 02/2007	01/1999– 02/2007	02/1997– 02/2007	01/1999– 02/2007	01/1999– 02/2007	01/2001– 02/2007	06/1997– 02/2007	

'Maj' indicates to majority voting, 'Cons' consensus voting and 'Gov' that the Governor has the final decision

'Coll' indicates that accountability is collective and members all defend the majority view, 'Ind' indicates that accountability is individual and members can publicly reveal that they disagreed with the committee's decision A *P-value* less than 0.05 is considered to mean that the probability of being active in a forecast round is significantly higher than that in a non-forecast round.

'Gov' indicates that the Governor owns the forecast, Comm that the committee owns the forecast, and Staff that the central bank's staff own the forecast

risks around this central projection. Since the *Report* was published, there have been several pieces of news which could alter this outlook. Most notably, around the beginning of this month there was a bout of turbulence in the equity markets, with several of the major markets falling by over 5% in a week. At the same time, associated among other factors with concerns over sub-prime mortgage lending in the United States, credit spreads widened for some riskier assets. This movement certainly needs to be put into a longer-term context (**Chart 4**); for example the FTSE All-Share index rose by over 13% in 2006, and had risen a further 3.5% in 2007 prior to this fall. Although it has since remained volatile, at the end of last week (16 March) it was little changed from the level at the time of the previous MPC meeting (7 and 8 March).



However, these financial market events, which seemed to be triggered by a combination of relatively small factors, were a reminder of underlying concerns about the low level of risk premiums implicit in the low level of real long-term interest rates, and in low credit spreads on more risky assets. It has been difficult to understand exactly what factors have been driving these movements, and the associated high levels of asset prices. Consequently, it is not easy to assess the likelihood of a significant change in the risk premia apparently embedded in current valuations, with the associated risk of asset price volatility.

There has also been a more mixed picture for data on UK consumer spending. In 2006, quarterly consumer spending growth was quite volatile, but averaged 0.7% per quarter. Some slowdown in the first quarter of 2007 from the robust growth estimate for the fourth quarter of 2006 was perhaps to be expected, but the first estimate of retail sales for January was nevertheless surprisingly weak. While other indicators, such as business surveys for the retail sector, and indeed the reports of the Bank's Agents, painted a stronger picture, I would put some weight on the ONS data.

Additionally, there are some signs that the pickup in house prices growth through 2006 may be levelling out. As reported by the major lenders, monthly house price growth has continued to be quite strong in January and February. But a less robust picture is suggested by indicators further back in the purchase timeline, such as the new buyer enquiries and price expectations in the survey published by the Royal Institution of Chartered Surveyors. Following three Bank Rate increases since August, some sign of softening from the consumer and in the housing market is not a surprise, however. And as yet these are quite tentative and do not convincingly suggest a more abrupt slowdown than expected.

In any case, while the path of consumer spending will affect overall growth and therefore the likely balance of demand and supply, it is not risks to growth, but to the inflation outlook that are of most concern at present. The path of CPI inflation is set to be quite volatile over the next year or so, and the major question is how this volatile period may affect where inflation settles around 18 months to two years ahead.

Over the next few months, the price cuts recently announced by some major utility companies will take effect, and there may be further reductions in the pipeline. The final scale of this is not yet known, but, combined with the fact that last year domestic utility bills were rising, this may result in quite a sharp fall in the inflation rate, to below target in the most recent central projection. However, there are big uncertainties. Looking back at the period when industrial costs and final inflation were being driven up by rises in oil and gas prices, the overall CPI rose rather less than might have been expected. It is likely that weaker demand conditions in 2005, and perhaps awareness that the MPC remained focused on keeping inflation at target in the medium term, resulted in an environment where firms were cautious about raising prices. One consequence of this would have been downward pressure on profitability as input costs rose.

Given this background, as energy prices fall back and growth in the United Kingdom and abroad is robust, it is perhaps not surprising to find that firms' price expectations have picked up. The CIPS/RBS services output price series, while volatile, has generally been above its ten-year average for the past six months. And as Chart 5 shows, the CBI manufacturing survey indicates price expectations in that sector are also at a high level. Comparing these with the official data for producer prices, price expectations appear to have been unduly strong in the recent past, but of course the official series is affected by recent falls in petroleum product prices. Excluding these, producer prices would show a stronger trend. It may be significant that the recent rise in price expectations is associated with a rise in a (smoothed) series for plant capacity as a constraint on output, also drawn from the CBI survey.

# Chart 5 CBI survey measures of price pressures and producer output prices<sup>(a)</sup>



Sources: CBI Industrial Trends Survey and ONS.

(a) CBI data smoothed. Plant capacity shows the percentage of respondents believing plant capacity will limit output over the following three months. Domestic prices shows the difference between the per cent of respondents believing domestic output prices will rise in the following three months to those believing they will fall. PPIY shows manufacturing output prices excluding excise duties.

While, of course, price expectations are by no means always realised, it seems likely that there is a little more upward inflation pressure in the short term than might have been expected. But this is not easy to interpret. It might for example reflect the fact that the energy price rise and subsequent partial reversal were feeding through into final prices more slowly than the central projection allows for. Or, that firms were taking the opportunity to restore profitability. In these two cases, there might be little implication for CPI further ahead.

But equally this trend might reflect a tighter balance of demand and supply, both domestically and globally, than we think prevails. The evidence on the domestic pressure of demand and supply is mixed. The pickup in unemployment from early 2005 to Autumn 2006 has only been partially reversed and together with subdued wage growth suggests a modest amount of slack in the labour market. However, survey evidence on prices and capacity suggest that firms are perhaps a little above the trend rate of capacity utilisation. Greater pressure of demand on supply would be an upward risk to future CPI, particularly if the period of above target inflation resulted in a rise in inflation expectations among those setting prices.

How does this relate to the earlier discussion of gradualism and waiting? There are certainly some arguments today for gradualism. For example, the historically high level of household debt has resulted in some uncertainty about how the consumer will respond to interest rate changes, and that would support a gradual approach.

But perhaps more importantly, much of our present uncertainty relates to how the UK economy has responded to the volatility in energy prices, and also to how inflation expectations may be formed in these circumstances. The price shocks of the past few years have resulted in a different set of issues for the MPC than the (mostly) demand shocks of earlier in the decade. Our uncertainty may be of the more fundamental kind, about whether our present model of the economy will prove a good guide, and in this case gradualism might be a less appropriate strategy. So interest rates might be expected to be rather responsive to some kinds of news (for example, news about inflation expectations, or pricing behaviour), and the behaviour of the MPC might become more active because of the changing economic circumstances.

The period of financial market turbulence has also highlighted another feature of my time on the MPC. There are some risks which the MPC has frequently discussed over the past six years, such as a disorderly adjustment of the large US current account deficit, or a significant fall in sterling prompted by the United Kingdom's own current account deficit. Other 'big risks' which have surfaced during this period include a sharp fall in the UK housing market, related to worries over rising household debt. The impact on inflation for these risks would come from large movements in financial markets or asset prices, and in my view these developments can only be responded to when they occur. In some cases I have spent all six years waiting for these risks to crystallise — and remain ready to respond if they do.

But obviously not all risks are of that type. In contrast, I have also experienced several periods of concern about significant upward pressure on wages. However, in fact, the past six years have generally seen remarkable stability for earnings, and even in the present wage round, despite taking place against a background of higher inflation, the early indicators are that pay pressures have only picked up a little — although we cannot as yet take this for granted. In this case monetary policy has probably been able to affect the outcome, due to clear understanding among wage bargainers of our commitment to the inflation target, and evidence that policy does respond to inflation risks arising from pay (in either direction).

#### Conclusions

As the MPC approaches its tenth birthday, it is possible to look at how its behaviour in practice measures up against the theoretical account of how monetary policy decisions should be taken, and how committees are likely to behave. In taking a decision each month, the key question is always whether the latest news amounts to a case for change — a question that I find no easier to answer after six years on the MPC than I did at the first meeting. While the news over the month itself can generally be quantified, uncertainty about exactly how this news will affect the economy in coming quarters, and also about the data itself, means that it is not always appropriate to react fully. Empirical work looking back at the MPC's behaviour compared to the predictions from a simple Taylor rule (in which the interest rate responds to movements in inflation and in estimates of the pressure of demand on supply) suggests that the MPC appears to have been only slightly more responsive to news than policymakers in the United Kingdom over the previous 20 years. But an extension of the Taylor rule has been estimated to allow for variables 'unobserved' in the simple rule (such as financial conditions, or real-time data), which are likely to have affected policy decisions. In this case, policy during the past ten years seems to have been substantially less gradual.

Estimates of forward-looking Taylor rules also suggest a less gradual approach, as policy appears to have responded quite aggressively to offset predicted deviations of inflation from target. However, it is possible that this is a little misleading. I consider it likely that the forecast itself can respond to news in a gradual manner — in particular to asset price news which tends to be volatile and where there is a good argument for not responding to every shift in the market. But the general conclusion is that the MPC does not seem to have behaved in a particularly gradualist manner.

Comparisons with other inflation-targeting central banks suggest that two features of MPC behaviour are shared more widely. Policymakers seem to be slow to change policy in a new direction, because of concerns about loss of credibility if there has to be an early reversal of direction. Over the past ten years a sample of eight central banks with similar monetary regimes have waited on average four times as long before making a policy reversal, as before deciding to move interest rates further in the same direction.

Another aspect of behaviour which is similar across the central banks is a tendency to make changes in interest rates more frequently when producing a new forecast, although this has been the most marked in the case of the United Kingdom. However, some behaviours will also change over time (the MPC has tended to become less activist through its ten-year life, but this may partly be due to the changing economic environment), and in this case too much weight should not be put on past patterns of behaviour when making predictions.

A noticeable feature of MPC voting patterns is that external members have been more active on average than internal (although, rather to my surprise, I personally have been relatively inactive). It is difficult to pin down reasons for this, although it would be plausible to suggest that externals will often bring with them different ideas about policy strategy, and that therefore the present mix of members, and turnover of members, is healthy in preventing any tendency towards complacency.

Turning to the present economic situation, it could be summed up as a central projection of robust and rather stable growth. There is a strong outlook for exports, which should be positive news for this region. But there is considerable uncertainty about inflation, both the short-term path and where the inflation rate will settle in the medium term. The main risks to the growth projection are around the outlook for the household sector in the United States, and in the United Kingdom, with worries in both cases around the housing market and high debt levels. However, in the United Kingdom there are so far only tentative indications of weaker consumer spending, or of a softening housing market.

For inflation, while short-term uncertainty is mainly due to the domestic energy market, and may be resolved over the next few months, the medium-term uncertainty is more pervasive. This is related chiefly to how the cost shock from past energy price rises has fed through into final prices, in the United Kingdom and globally, and to uncertainty about what is driving the present indicators of upward pricing pressure in the business surveys. This is a different kind of uncertainty from worries about demand which have been more usual during my time on the MPC, and I suggest that this may prompt a change in observed behaviour towards more frequent interest rate changes. Over the next few months, I will be monitoring these price surveys, and other indicators of inflation expectations, particularly closely.

#### References

Ashley, J, Driver, R, Hayes, S and Jeffery, C (2005), 'Dealing with data uncertainty', *Bank of England Quarterly Bulletin*, Spring, pages 23–29.

Batini, N, Martin, B and Salmon, C (1999), 'Monetary policy and uncertainty', *Bank of England Quarterly Bulletin*, May, pages 183–89.

**Brainard, W (1967)**, 'Uncertainty and the effectiveness of policy', *American Economic Review*, Vol. 57, No. 2, pages 411–25.

Gerlach-Kristen, P (2004), 'Interest-rate smoothing: monetary policy inertia or unobserved variables', *Contributions to Macroeconomics*, Vol. 4, Issue 1.

**Goodhart, C (2005)**, 'The Monetary Policy Committee's reaction function: an exercise in estimation', *Topics in Macroeconomics*, Vol. 5, Issue 1.

Lombardelli, C, Proudman, J and Talbot, J (2002), 'Committee versus individuals: an experimental analysis of monetary policy decision making', *Bank of England Working Paper no. 165*.

**Sargent, T (1999)**, 'Comments on Ball', in Taylor, J (ed), *Monetary policy rules*, Chicago, University of Chicago Press for the NBER.

**Woodford, M (1999)**, 'Optimal monetary policy inertia', *NBER Working Paper no. 7261*.

# A perspective on recent monetary and financial system developments

In this speech,<sup>(1)</sup> Paul Tucker, Executive Director, Markets and Monetary Policy Committee member, considers the risks facing the two elements of monetary stability — price stability and financial stability — after another year in which both were sustained. After explaining his January vote on Bank Rate in the context of the communication of monetary strategy, Mr Tucker characterised monetary conditions as 'edging towards restrictive', which provided the platform needed going forward to restrain inflationary pressures. Turning to financial stability, Mr Tucker contrasts the risks presented by global current account imbalances and compressed risk premia. In a world of what he calls 'vehicular finance' in which risk is transferred — if only contingently — beyond banks, he calls for market practitioners to work to continue to improve *ex-ante* measures, including via documentation and insolvency regimes, to handle periods of stress.

# Global monetary and financial stability

The past year or so has been marked by resilience in both the global economy and the international financial system. World growth has been robust. On average, headline inflation across the industrialised world has remained contained. Capital markets have, so far, weathered the gradual withdrawal of monetary accommodation in much of the G7, and also a series of specific disturbances, without destabilising spillovers. In short, the world has enjoyed a further period of monetary and financial stability. Against that background, banks and dealers have posted fairly remarkable profits, accumulating more capital resources; and the (risk-unadjusted) returns of the fund sector — and so probably for most of you here today — have been healthy.

There are, for sure, wrinkles in this picture, including here in the United Kingdom. But overall it is probably not what most commentators would have expected given that oil prices have more than doubled over recent years. For financial markets, it has surely been important that such a large cost shock has not led to a pronounced rise in global inflation, dislodging medium-term inflation expectations, and so prompting industrialised-country monetary authorities to slam on the brakes. With the build-up of household debt in many countries, and releveraging of parts of the corporate sector, that would not have been a happy prospect.

That, taking the industrialised world as a whole, monetary credibility has been sustained without aggressive policy action may owe something to the reasons for the increases in energy and other commodity prices — namely, the rise of China, India and other Asian economies which, as well as boosting global demand, has also been putting downward pressure on internationally traded goods prices. But, as the Bank has argued before, the way these relative price changes play out in terms of headline consumer price inflation depends on the overall path of aggregate nominal demand. And that in turn owes something to the behaviour of central banks.

The textbook response to a cost shock is supposedly to allow the price level to rise, with the associated temporary pickup in inflation being just that — temporary. In the jargon of central banking, the 'first-round effects should be accommodated' in order to contain output volatility; but any second-round effects on inflation, through wage bargaining and medium-term inflation expectations, should of course be prevented.

What of practice? Well, notwithstanding the rise in inflation in the United Kingdom over the past 18 months, it is moot whether any of the major central banks did in fact fully accommodate the first-round effects of the oil price rise. That the full impact of the rise in costs has not passed through to inflation owes something, I believe, to wariness among central bankers of their being able, given uncertainty about the underlying shocks, to calibrate policy with sufficient precision to bring about such a neat but vitally important distinction between first-round and second-round effects; let alone of their being able to communicate such a strategy to the public, the business community and financial markets. Textbook orthodoxy might perhaps have been more compelling if the rise in energy prices had been both sharp and caused purely by

Given at a Merrill Lynch conference on 26 April 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech308.pdf.

interruptions to, or constraints on, the supply of energy. But when, as over the past couple of years, the rise in costs was partly the consequence of increased global demand, and the price rise drawn out, the wariness in fully accommodating the first-round effects was, I think, tangible, and reasonable.

# UK monetary policy

That has been the backdrop to my own approach to monetary policy over the past year or so. The policy stance has needed to be set and explained in the context of cost shocks and demand conditions, placing a premium on clarity of communication about monetary strategy.<sup>(1)</sup> I have judged that to be a delicate exercise given recent and prospective volatility in headline inflation. This thinking informed my vote against an increase in Bank Rate in January. CPI inflation had risen quite sharply, but was — and, I should say, still is — also expected to fall back quite sharply towards the 2% target. Provided that broadly 'humped' path for inflation materialised over the coming months, the upside risk to medium-term inflation expectations seemed likely to subside. It was not a matter of my wanting to avoid surprising the markets in some narrow sense, which in the greater scheme of things is neither here nor there. Rather, I was concerned that an immediate move might, on balance, cause unnecessary confusion about the Committee's view of the medium-term outlook for inflation and about monetary strategy. In the event, subsequent speeches by colleagues, and the medium-term perspective of the February Inflation Report, helped to keep that genie in the bottle.

In February, I was strongly in favour of widening the width of the *Inflation Report* 'fan chart' for inflation during the coming year, to underline the near-term uncertainty about, and the great difficulty in forecasting, the path of utility prices. It was vital to convey the medium-term prospect, and also that we stand ready to act if the risks warranted it.

More recently, with Bank Rate at 5.25% and a modestly upward-sloping money market curve, I have characterised monetary conditions as 'edging towards restrictive', so long as inflation does as expected fall back in the near term. That has been appropriate given the degree of pricing power apparently emergent in conditions of relatively high capacity utilisation among firms. It has provided the platform needed going forward to restrain inflation pressures, and to maintain anchored inflation expectations, at a time when, understandably, there is public debate about the outlook given that CPI inflation rose above 3% for the first time, triggering an open letter from the Governor, on behalf of the Committee, to the Chancellor.

Looking ahead, my votes, and my approach to communicating our monetary strategy, will depend on balancing the medium-term prospect for demand pressures alongside uncertainties about supply conditions and near-term inflation expectations caused by volatility in energy costs. This will entail making judgements about a whole range of influences, including whether or not residual slack in the labour market might in time, given robust business investment, help to ease capacity constraints; whether or not competitive conditions among retailers will dampen the feed-through of accelerating producer prices into consumer prices; and, most crucially of all, whether wage bargainers and price-setters recognise the absolute determination of the Committee to maintain price stability.

# Risks to the global capital markets

If anchored inflation expectations have so far been maintained, here and elsewhere, two other risks in, and for, the global financial environment continue to preoccupy commentators: current account imbalances; and compressed risk premia, together with an apparently high-risk appetite, in credit markets.

There are, I would suggest, some interesting contrasts between these two risks, which — following the Bank's *Financial Stability Report* — I shall call 'global imbalances' and 'low risk premia'. They can be contrasted in two dimensions: the probability that there is some kind of 'disequilibrium' that needs to correct; and the probability that any such correction, or adjustment, will produce destabilising spillovers in the financial system.

On the first — the probability of adjustment — it is widely agreed by economists that one symptom of global imbalances, the US current account deficit, is unsustainable. It cannot continue indefinitely at the same rate because eventually the United States' external debt-servicing burden would become too great. That there will be adjustment, somehow or other, is therefore viewed by most commentators as near certain. By contrast, while the low risk premia across credit markets are hard to explain, no one can say for certain that they are unsustainable. A number of changes in the environment point towards some sustainable reduction in risk premia: more credible monetary regimes; more flexible labour and product markets, helping economies to adjust to nasty shocks; improved instruments and markets for managing risk; better diversified portfolios. Whether or not that merits the degree of risk premia compression seen over recent years is open to question. For some while now, I have encountered few people in the market who regard credit risk as fairly priced. A distinction is typically drawn — including in the Bank's Financial Stability Reports<sup>(2)</sup> — between a 'fast fuse' risk, in

<sup>(1)</sup> The importance of communication to monetary policy was explored more fully in Tucker, P (2006), 'Reflections on operating inflation targeting', *Bank of England Quarterly Bulletin*, Summer, pages 212–24.

<sup>(2)</sup> See chapter on 'Risks in the international financial system', in Bank of England Financial Stability Review, December 2004, page 50.

which credit is abruptly repriced; and a 'slow fuse' risk, in which cheap credit leads over time to overleveraged borrowers and so to vulnerability to a deterioration in the global economy. As time passes, attention has perhaps been shifting to the longer-fuse risk, given signs of a pickup in aggregate corporate sector leverage and gradual dilution of covenants in loan terms and conditions, most obviously recently in so-called 'covenant-lite' transactions in the leveraged loan market.<sup>(1)</sup> But, in contrast to global imbalances, no one can say with complete conviction that a lower risk premia environment is definitely unsustainable, which may contribute to explaining why few market participants seem prepared to bet on the time or scale of any correction.

In terms of the second dimension — the probability that any adjustment would be disorderly - market practitioners at least seem to regard 'low risk premia' more seriously than 'global imbalances'. Resolution of the problem of global imbalances could come in various ways, not all of which need involve an abrupt correction in asset prices or further movements in nominal exchange rates. For example, the United States might obtain greater competitiveness through a depreciation in the dollar's real value if inflation in China and elsewhere were to be relatively high for a period. But, for my purposes today, the key point is that any correction in asset prices would most obviously be concentrated, at least initially, in the foreign exchange markets and, if associated with a reduced appetite for dollar-denominated assets, plausibly in US Treasury yields too — perhaps amplified by various option-like structures.<sup>(2)</sup> But these are, of course, the deepest, most liquid markets in the world. So while sharp changes would no doubt inflict losses through parts of the financial system, many practitioners seem to regard the market dynamics as manageable. Indeed, when in the Bank's Market Intelligence rounds we explore this issue, the mechanism that elicits most concern is that any consequent macroeconomic slowdown — brought about in the United States by higher risk-free bond yields or in the euro area by exchange rate appreciation — might put pressure on the corporate and household sectors after a period in which credit risk may have been underpriced and so abundantly available. In other words, discussion of 'global imbalances' shades into an exploration of the potential consequences of 'low risk premia'. But more important, the fundamental changes in the structure of credit markets over the past half decade or so have left many practitioners uncertain about the dynamics of any adjustment. Views vary of course, with some seeing the system as clearly more resilient than half a decade ago, but on the whole practitioners seem to be more uncertain about the potential for nasty spillovers from adjustment in 'low risk premia' than in 'global imbalances'.

## Vehicular finance

This uncertainty stems from changes not just in instruments and markets, but also in institutions - ie in the nature and structure of financial intermediaries. This is the age of what I call vehicular finance. The key intermediaries are no longer just banks, securities dealers, insurance companies, mutual funds and pension funds. They include hedge funds of course, but also collateralised debt obligations, specialist monoline financial guarantors, credit derivative product companies, structured investment vehicles, commercial paper conduits, leverage buyout funds — and on and on.<sup>(3)</sup> These vehicles can fit together like Russian dolls. By way of illustration — and, I fear, slipping for a moment into alphabet soup — SIVs may hold monoline-wrapped AAA-tranches of CDOs, which may hold tranches of other CDOs, which hold LBO debt of all types as well as asset-backed securities bundling together household loans. (The diagram may, or may not, help!)

What is going on here? One possible explanation is that capital might be being allocated to wherever its cost is cheapest for a particular desired risk profile. That optimisation involves comparing the capital charges applied by regulators to regulated institutions; and by rating agencies to various types of vehicle (SIVs, CDPCs, CDOs, monolines etc). The 'smart money' seems to be assembling its own portfolio of vehicles, so that it can choose from a menu of where to book transactions. One of the drivers is commonly referred to by practitioners as 'ratings arbitrage'. Another was of course Basel I, which triggered the securitisation of high-quality credits, and for quite a few years fuelled a ballooning of vehicles whose existence depended on commercial banks providing zero-capital-weighted 'liquidity' lines. Basel II will change all of that. Indeed, if central banks are to understand how the global financial system fits together, we will need to fathom the reconfiguration that Basel II prompts, including the potential for risk transfers between banks adopting different steps on the ladder of Standard, Foundation, Advanced approaches that it makes available. For the same underlying reasons, in pursuing their mission, central banks now need to follow developments beyond the big banks, and I am very grateful to the hedge funds, CDO managers and others who contribute to the Bank's market intelligence effort.

See chapter on 'Shocks to the UK financial system', in Bank of England Financial Stability Report, April 2007, page 16.

<sup>(2)</sup> For example, hedging of Power Reverse Dual Currency Notes might in certain circumstances amplify movements in the yen; and hedging of Range Accrual Notes, for which the gamma exposure can flip sign, might amplify yield curve movements. The general question of the potential for dynamic hedging of short option positions to amplify market movements was discussed in Tucker, P (2005), 'Where are the risks?', speech at The Euromoney Global Borrowers and Investors Forum, London, 23 June, Bank of England *Financial Stability Review*, December, pages 73–77.

<sup>(3)</sup> See the Annex for brief explanations.



#### Diagram 1 Interlinkages between leveraging vehicles

(a) ABS: Asset-backed security; RMBS: residential mortgage-backed security; CMBS: commercial mortgage-backed security. (b) NIM: Net interest margin securities are serviced after all other investors in a mortgage securitisation have been paid and then only when there is a sufficient cash buffer to protect other investors against future poor performance of the underlying mortgage pools

# Does any of this matter?

#### The dispersion of risk, and central banking instruments

The dialogue is, of course, largely qualitative. Given the variety of vehicles and their use of risk transfer instruments, it has become commonplace that 'we' no longer know where risk lies. Most often, the 'we' is the official sector, and in particular bank regulators. But 'we' might just as well be the management of banks and dealers.

Some commentators plainly see this as a bad thing. Is it? At least as put, I am not so sure.

In the first place, the transfer of risk has been a consequence of the development of wholesale markets, with reasonably broad participation, in all types of credit risk. Provided liquidity is sustained, that should aid the system's adjustment to shocks. It also means that, while regulators, central banks and other analysts have certainly lost some quantity data, our assessment of credit conditions is enriched by the availability of a wealth of new price signals.

Second, while credit risk transfer markets are new, derivative markets in interest rates, exchange rates and equity prices have existed — on exchange and over the counter — for approaching two decades. We have not known where those risks are for quite a long time.

Third, if we 'no longer know where the risk is', that implies that it has been dispersed beyond the regulated sector. One might think that was a good thing. To take an extreme scenario, if risks were widely and evenly distributed across savings institutions internationally, a very nasty shock causing a sharp fall in asset markets would not obviously destabilise the financial system. It would obviously have macroeconomic consequences, by depleting household wealth and raising the cost of capital for firms. Other things being equal, central banks could respond by adopting an easier path for interest rates than otherwise, in order to maintain aggregate demand broadly in line with aggregate supply, with the objective of keeping inflation in line with explicit or implicit targets. Although the original shock may be nasty, the response would be the routine use of the routine instrument: the price of central bank money. There is no question of a so-called Greenspan (or any other kind of) 'put' here; the focus would be not asset prices, but the outlook for spending in the economy and so inflation.

This is obviously rather different from a similarly nasty shock producing severe disorder in a banking system that was carrying unduly concentrated exposures of some kind. For a central banker, banks matter because their liabilities are used as money, they are at the centre of the payments system, and they carry an associated asset/liability maturity

mismatch.<sup>(1)</sup> Banking system distress is therefore typically characterised by a liquidity run. Faced with that, a central bank's instrument — used, where necessary, in collaboration with its regulatory and finance ministry partners — is to supply the system with an increased quantity of its money, without necessarily changing its price. Given the need to take collateral to protect against risk, and to charge a premium to create the right incentives, establishing a routine framework for such operations without creating moral hazard, remains 'work in progress' for the international central banking community.<sup>(2)</sup>

So it would seem that there is a good deal to welcome in the greater dispersion of risk made possible by modern instruments, markets and institutions.

But there are most certainly qualifications to such an apparently alluring conclusion.

# The banking system's residual risk, stress testing and transparency

The banking system retains risk in a number of ways, both pre and post-risk transfer, and its aggregate balance sheet has in fact expanded considerably.<sup>(3)</sup> Pre-risk transfer, banks and dealers hold, or finance, warehouses of portfolios of loans to households and corporates on their way to securitisation,<sup>(4)</sup> meaning that the banking system can still find itself 'holding the parcel' when the music stops. Post-risk transfer, some risk is contingently retained by virtue of banks and dealers financing the acquisition of risk by hedge funds and others. This entails counterparty credit risk and, taking account of collateral, is akin to writing out of the money put options.

So, for me, the question is not so much 'where is the risk?', as 'in what circumstances could risk flow back to the banking system?'; and 'do banks have enough capital and liquidity to absorb such flows without stress?'.

This is relevant not only to credit risk, but also to transfers of complex market risks. In providing bespoke 'solutions' to their corporate and investment management clients, investment banks accumulate complex market risk exposures that are hedged largely in public, and so relatively 'vanilla' wholesale markets. These hedges are inevitably imperfect. Some of the residual market risk is now occasionally transferred to the fund sector, via for example variance swaps or correlation swaps, transforming market risk into counterparty credit risk — underlining the importance of the work of the industry's Counterparty Risk Management Group in debating and promulgating prudent practices.<sup>(5)</sup>

Other imperfectly hedged risks are retained, leaving intermediaries with so-called 'basis risk' — or, more prosaically, the risk that assumed correlations break down. Put bluntly, if instruments A and B have subtly (or not so subtly) different

characteristics but are nicely correlated for a while, B might be employed as a 'hedge' for A, without the implicit risk exposure turning up in Value-at-Risk (VaR) measures. When a shock hits and the correlation breaks down, the hedge breaks down too, with a double whammy to VaR and so, for regulated firms, to regulatory capital requirements: through higher volatility, and a higher measured exposure. To be clear, this is not the fancy of the ivory tower. As discussed in the Bank's latest *Financial Stability Report*, it was one of the factors contributing to the recent volatility in the market for US sub-prime mortgage securitisations. Indeed, this hazard may conceivably have increased during a period when markets have not been especially volatile.

If investment banking entails warehousing optionality and complex forms of basis risk, it puts a premium on stress testing. Speaking as a policymaker, I would want so-called macro stress tests to be complemented by more fine-grained stress tests in which management explore the exposure to complex risks given their qualitative understanding of their business, and taking into account the possibility of impaired market liquidity. In other words, risk managers need to do 'market intelligence' within their own firms. My sense is that that view is shared by at least some Chief Risk Officers. Greater transparency of such stress testing would not only shed light on the risks retained by the banking system, it might also have a productive effect on incentives — rather as greater transparency has enhanced monetary policy making.

# What happens when the music stops: *ex-ante* preparation for stress

But of course severe stress cannot be ruled out. Central banks and practitioners therefore expend effort thinking about what will happen if and when the music stops.

As the Bank's latest *Financial Stability Report* discusses, the official sector has stepped up its practice exercises of various kinds. The private sector analogue to crisis resolution is the 'workout', in which a company is restructured under the shadow of insolvency. In a world characterised by bank intermediation, workouts typically involved bank syndicates

<sup>(1)</sup> Chaplin, G, Emblow, A and Michael, I (2000), 'Banking system liquidity: developments and issues', Bank of England *Financial Stability Review*, December, pages 93–112.

<sup>(2)</sup> The Bank of England took some steps in this direction as part of the fundamental reforms to its Sterling Monetary Framework market operations in Summer 2006. The role of central banks in accommodating sharp (velocity) shocks to the demand for their money was discussed in Tucker, P (2004), 'Managing the central bank's balance sheet: where monetary policy meets financial stability', lecture to mark the fifteenth anniversary of Lombard Street Research, London, 28 July, Bank of England Quarterly Bulletin, Autumn, pages 359–82.

<sup>(3)</sup> A fuller explanation is in Tucker, P (2006b), 'Macro, asset price, and financial system uncertainties', Roy Bridge Memorial Lecture at the Annual Conference of the ACI — Financial Markets Association, London, 11 December, *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 122–30.

<sup>(4)</sup> The composition of the balance sheets of Large and Complex Banks is discussed at greater length in Tucker, P (2006), *op cit*.

<sup>(5)</sup> Report on 'Towards greater financial stability: a private sector perspective' by the Counterparty Risk Management Policy Group, July 2005.

co-ordinated by a few lead banks. Even country workouts in the early 1980s had that broad shape, albeit with the IMF holding the ring. One might wonder how on earth it would work today, in a world of traded debt, synthetic risk transfer, and vehicular finance. Much thinking remains to be done on this, but a policymaker has to form a preliminary view, just in case the music stops tomorrow. My provisional view is that

some investors in credit risk would find themselves without the skill set to participate in a workout. In a 'covenant-lite' world, they might also find themselves with fewer protections as conditions deteriorated than they would like expost. Unless markets seized up, however, they might be able to crystallise their losses by selling out to funds and bank desks who trade in 'distressed credit'; and they in turn might be able to sell on to funds and banks with specialist workout skills and risk appetites. By such transfers, the end-game co-ordination problems might be reduced. On the way, some hard bargains would be struck, and some participants would no doubt be surprised by their losses.

But this relatively benign scenario is not guaranteed. It depends on markets continuing to function; on the infrastructure holding up through volume surges and stress; on the shadow of the insolvency regimes in various jurisdictions establishing productive incentives; and on lack of uncertainty in the terms and conditions of market contracts.

That last point needs underlining. In today's markets, there is a large premium on *ex-ante* clarity and certainty, as opposed to ex-post negotiation among bankers who know and trust each other. The work required is detailed and largely out of the limelight. But getting clarity around things like 'close-out netting' may make all the difference when the music stops.<sup>(1)</sup> The official community therefore needs to maintain its encouragement and support for private sector initiatives to

standardise and improve documentation. To take just a few examples from what could be a long list, this includes the work of New York's Global Documentation Steering Group; of various market trade associations; and of London's Securities Lending and Repo Committee, which helps co-ordinate the work of different parts of the collateral-financing markets.<sup>(2)</sup>

### Summary

I have travelled from macro to micro. To maintain the two elements of monetary stability - price stability, and financial stability — we need credible and effective institutions.

At the macro end of the spectrum, that above all means credible monetary regimes. The MPC is now ten years old. During that period, inflation expectations have been well anchored to our target. And no one should be in any doubt that the Committee is determined to keep it that way.

But a credible monetary regime does not insulate the economy, or financial markets, against all shocks. Over the coming decade, some currently observable imbalances will plausibly work their way through the system, as the pattern of global saving shifts, asset prices adjust, and we encounter, eventually, a period of corporate defaults. In ten years' time, we may therefore know whether 'global imbalances' and 'low risk premia' were resolved with or without stress; and we may be better informed on whether the changes in the structure of our financial markets help or hinder the preservation of stability. A benign outcome would be more likely if the industry were to maintain its efforts on improving ex-ante measures to handle stress. Managers of hedge funds and other modern investment vehicles, as well as banks, have a clear stake in that work.

<sup>(1)</sup> Close-out netting is a process by which, following a default, open transactions between two parties are terminated, each transaction is valued and, together with any outstanding payments, these are reduced to a single net amount owed by one of the parties to the other. Obtaining legal certainty over recognition of netting across different products and, in particular, with different legal entities with a common group is very important.

<sup>(2)</sup> The Global Documentation Steering Group (GDSG) is an industry group formed in 1999 to implement the documentation-related recommendations of the report of Counterparty Risk Management Policy Group (CRMPG). The primary objective of the committee is to encourage the harmonisation of documentation in standard over-the-counter contracts in order to minimise disparities that can exacerbate market, credit and legal risk. It took the lead in updating the recommendations on documentation issues for the second CRMPG report released in 2005. GDSG is sponsored by, but independent of, the Federal Reserve Bank of New York. The hedge fund community is represented on the GDSG. The Stock Lending and Repo Committee, facilitated and chaired by the Bank of England, provides a forum for practitioners and the authorities to discuss structural (including legal) developments in London-based securities lending and repo markets.

# Annex Vehicles

**CDO: collateralised debt obligation**. Typically, a structured finance product where a SPV issues notes backed by, or referenced to, a portfolio of underlying assets. The notes issued are tranched by seniority into senior, mezzanine and equity. The underlying assets could be corporate bonds, loans or structured finance securities (such as mortgage-backed securities or notes issued by other CDOs), and they might be owned either directly or synthetically via credit default swaps.

**CDO squared:** A CDO invested in CDO tranches, typically mezzanine tranches of synthetic CDOs.

**CDPC:** credit derivative product companies. A highly rated limited purpose company, with permanent capital, that sells credit protection on individual names or synthetic CDO tranches. CDPCs differ from monolines in that they write protection only via credit default swaps. They are in some respects akin to synthetic banks.

**Closed-end fund:** An investment company that issues shares to investors and invests the proceeds in a pool of assets typically stocks and/or bonds. Recently some funds have invested in 'alternative' assets such as hedge funds, private equity and infrastructure, and structured credit. Shares in closed-end funds are traded like other equities. The funds may issue their own debt to obtain leverage. They may also issue different classes of shares with different entitlements to income or capital receipts from the underlying investments. **CP (commercial paper) conduit:** A SPV that issues CP backed by financial assets originated by one or more sellers. They are generally supported by liquidity facilities provided by their sponsor or a third-party bank.

DPC: derivative product company. A bankruptcy-remote structure that houses credit risk from long-dated derivative transactions. They are typically wholly-owned subsidiaries of financial services companies. In general, DPCs sit between their sponsor and an external counterparty in derivative transactions and protect the counterparty from the potential default of the derivative seller (the sponsor).

Monoline insurance companies: Monoline insurance companies provide protection against a specific type of risk (typically credit risk). Originally developed in the 1970s to provide US municipal bond holders with credit guarantees (or 'wraps'), over the past few decades they have diversified into the ABS and CDO markets (particularly the highly rated senior tranches).

**SIV: structured investment vehicle**. A SPV that funds a diversified portfolio of highly rated assets by issuing short-term commercial paper, medium-term notes etc. In general, there is a maturity mismatch between their assets and liabilities. They aim to generate a positive spread between their return on assets and funding costs.

**SPV: special purpose vehicle**. A bankruptcy-remote company created for the sole purpose of acquiring assets or derivative exposures and issuing liabilities linked to these assets. Also known as a special purpose entity.

# Recent developments in the UK economy: the economics of walking about

In this speech,<sup>(1)</sup> Professor David Blanchflower,<sup>(2)</sup> member of the Monetary Policy Committee (MPC), describes the important role empirical data should play when analysing the UK economy. He considers five questions that the latest data pose for economic theory, covering the labour market, firms' pricing decisions and the relationship between money growth and inflation. He concludes that 'walking about' and listening to the views of individuals and companies is important for any economist seeking to understand what is really happening in the economy at any point in time, and invaluable when setting interest rates.

It is a great pleasure to be here today to deliver the second Bernard Corry Memorial Lecture. Bernard was my mentor, friend and inspiration and I miss him greatly. I guess he was the first one to really have believed in me and I think he would have been amused that one of his boys now has an office on Threadneedle Street.

I believe I first met Bernard in 1984. He was the external examiner on my Masters thesis from the University of Wales. He eventually offered me a place at Queen Mary to do a PhD as well as the first CASS scholarship from the ESRC, which involved me spending a lot of time at the Department of Employment with Neil Millward and learning how to work with Workplace Industrial Relations Survey (WIRS) data. I spent a couple of years here and met David, now Lord, Currie and Maurice, now Lord, Peston who had intended to be here to chair this lecture, but he has been unwell and couldn't be here so I wish him a swift recovery. I also recall with some pleasure the three Festschrift volumes for Bernard and Maurice that John Grahl and Sami Daniel organised so well a few years ago, for which I contributed a chapter, as did many of his former students and colleagues. I was particularly upset to learn that Sami Daniel also died earlier this year.

I remember, all those years ago, many hours spent discussing Bernard's passion for economics. Perhaps the biggest thing Bernard ever taught me was to try and understand the low-side risk of any policy prescription, by which I mean always worry about the consequences if you are wrong. I remember him telling me on numerous occasions that I should be concerned about the welfare of the man on the Clapham omnibus. In part this was to ensure that economists did no harm, and also because Bernard never forgot his East End roots and understood that this bus passenger was paying his salary. Bernard always encouraged me to look at the data carefully and to sniff the air. To adopt a more 'investigative' approach, if you like: to put the data before the theory. I like to refer to this as the 'economics of walking about'. He pointed me to the writings of the early American labour economists Paul Douglas; John Dunlop; Clark Kerr; Richard Lester; Lloyd Reynolds; Sumner Slichter and Gregg Lewis. Clark Kerr encapsulated the spirit of these American labour economists when he said 'Labour economics will contribute more by helping to make a sense of reality than by building more castles in the air' (Kerr (1988, page 33)). While the analytical tradition in labour economics is really American, in fact, it extends back to the Webbs in the United Kingdom, as David Metcalf pointed out to me recently. The tradition extends on at the Bank where we have twelve Agents and their staff around the country who stay in touch with businesses to ensure MPC members keep their feet on the ground. We also do frequent trips around the country with the Agents talking to business men and women and I find such trips an invaluable way to find out what is going on. That is particularly important given that most of the quantitative data we receive will get revised and so it is always hard to know where we are today.

I was also heavily influenced by a 1991 paper by Larry Summers, until recently Harvard president. The paper was entitled 'The scientific illusion in empirical macroeconomics', and it seems particularly apposite to me today given my new MPC role. In it Larry wrote:

Bernard Corry Memorial Lecture given at Queen Mary, University of London on 30 May 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech310.pdf.

<sup>(2)</sup> Bruce V Rauner Professor, Dartmouth College, NBER and IZA and member, Monetary Policy Committee, Bank of England. I am most grateful to Roger Kelly and Chris Shadforth for their invaluable assistance. I would also like to thank Kate Barker, John Gieve, Neal Hatch, Andrew Holder, Rachel Lomax, Peter Rodgers and Andrew Sentance for their helpful comments.

'formal empirical work which..."tries to take models seriously econometrically" has had almost no influence on serious thinking about substantive as opposed to methodological questions. Instead the only empirical research that has influenced thinking about substantive questions has been based on methodological principles directly opposed to those that have become fashionable in recent years. Successful empirical research has been characterized by attempts to gauge the strengths of associations rather than to estimate structural parameters, verbal characterizations of how causal relations might operate rather than explicit mathematical models, and the skilful use of carefully chosen natural experiments rather than sophisticated statistical techniques to achieve identification'. (Summers (1991, page 129).)

#### And later:

'Good empirical evidence tells its story regardless of the precise way in which it is analyzed. In large part it is its simplicity that makes it persuasive. Physicists do not compete to find more elaborate ways to observe falling apples. Instead they have made progress because theory has sought inspiration from a wide range of empirical phenomena.

Macroeconomics could progress in the same way. But progress is unlikely as long as macroeconomists require the armor of a stochastic pseudo-world before doing battle with evidence from the real one'. (Summers (1991, page 146).)

The use of empirical data is the theme I am going to talk about today and hence the subtitle, 'the economics of walking about'. I'm going to discuss some questions I have been examining in my research which are based on what is really going on in the UK economy. Not what should be going on, on a ceteris paribus basis! This is in direct contrast to much of economics that apparently believes the real world is a special case of a special case and uninteresting. In my view economics is not just about understanding mathematics or elegant theoretical models; as Arnold Harberger (1993) noted 'economics is fundamentally an observational discipline'. The research behind this lecture uses many of the tools that Bernard taught me, to analyse the UK economy at the current conjuncture. It has frequently involved searching for patterns in the data. In making my decisions on interest rates month by month I watch the data closely.

I examine five questions:

- 1 Why have unemployment and inactivity increased recently?
- 2 Why has most of the job growth in recent years been in self-employment?

- 3 What has been happening to capacity within firms?
- 4 Why has wage growth been benign recently?
- 5 Why has inflation failed to respond to higher money growth?

# 1 Why have unemployment and inactivity increased recently?

There has been a significant improvement in the level of unemployment prevailing in the United Kingdom not just since 1997, but considerably earlier (**Chart 1**). The most notable feature of the immediate post-war era was of low rates of unemployment — which averaged 2.5% from 1945–75. This situation reversed itself at the end of the 1970s when the unemployment rate rose from 5.3% in June 1979 to 11.9% in June 1984. The unemployment rate declined to 6.9% in June 1990, then increased to a new peak rate of 9.4% in September 1994, and subsequently declined again until September 2005 to 4.7%.





**Table A** sets out the major changes in the composition of the UK labour force for the period 1997–2007 Q1. Most notable is the decline in unemployment, with 300,000 fewer jobless individuals in 2007 Q1 than in 1997. Employment increased by more than 2.5 million over the same period. The unemployment rate thus fell from 7.2% to 5.5% between these years, while both the employment and activity rates rose.

A decline in the unemployment rate has by no means been restricted to the United Kingdom: in the past decade, unemployment rates around the OECD have been lower than in the previous decade (Blanchflower (2007)). This would suggest that part of the explanation for the improvement in UK unemployment could have been the result of global factors. Despite claims to the contrary in the OECD *Jobs Study* and by Layard, Nickell and Jackman (1991) in their unemployment book and elsewhere, rates of unemployment over time and by country, show little or no statistical

	16+ population	Unemployment	OLF	Employment	Employees	Self-employed	
1997	45,497	2,045	17,005	26,448	22,969	3,479	
1998	45,661	1,783	17,164	26,713	23,327	3,386	
1999	45,862	1,759	17,051	27,052	23,741	3,311	
2000	46,107	1,638	17,036	27,434	24,174	3,260	
2001	46,413	1,431	17,291	27,691	24,410	3,281	
2002	46,704	1,533	17,305	27,866	24,526	3,340	
2003	46,995	1,479	17,350	28,166	24,631	3,535	
2004	47,324	1,429	17,485	28,410	24,780	3,630	
2005 Q1	47,650	1,411	17,563	28,676	24,823	3,622	
2005 Q2	47,753	1,433	17,627	28,693	25,063	3,630	
2005 Q3	47,853	1,447	17,611	28,794	25,133	3,661	
2005 Q4	47,946	1,554	17,634	28,758	25,059	3,699	
2006 Q1	48,038	1,599	17,552	28,887	24,966	3,740	
2006 Q2	48,131	1,683	17,518	28,930	25,023	3,719	
2006 Q3	48,224	1,711	17,528	28,986	25,026	3,759	
2006 Q4	48,316	1,687	17,593	29,036	25,039	3,794	
2007 Q1	48,409	1,700	17,728	28,981	24,939	3,839	
Change							
2005 Q1–2007 Q <sup>2</sup>	1 759	289	165	305	116	217	
	1.59%	20.48%	0.94%	1.06%	0.47%	5.99%	
2006 Q1–2007 Q <sup>2</sup>	1 371	101	176	94	-27	99	
	0.77%	6.32%	1.00%	0.33%	-0.11%	2.65%	

#### Table A Recent developments in the UK labour market

Thousands

Sources: ONS and Labour Market Statistics First Release, ONS May 2007

association with conventional measures of institutions and policies (Baker *et al* (2005)). There is also scant association with the deregulations of the 1990s and trends in unemployment. Despite conventional wisdom high unemployment does not seem to be primarily the result of job protection, labour taxes, trade union power or wage inflexibility (Blanchflower (2001)). By contrast, product market, capital market and housing market reforms all seem significant in explaining falling unemployment. However, the most important factors behind the decline in UK unemployment were probably welfare reforms involving reductions in the replacement rate along with tightening of benefit rules (Nickell (2006)).

**Table A** shows that unemployment has trended up since 2005 Q1, and increased by 13,000 in the most recent quarter (2007 Q1). Over the same two-year period, there have also been increases in the numbers of temporary workers saying they couldn't get permanent jobs (+42,000), and numbers of part-time workers saying they couldn't get full-time jobs (+89,000). Set against this is the rather surprising finding that employment has also increased, by 305,000, driven by an increase in the numbers of self-employed (+217,000).<sup>(1)</sup> However, there has also been a dramatic increase in the numbers of individuals who have exited the labour market, so are now classified as inactive or out of the labour force (OLF) — their number has swelled by +135,000 over the last quarter. This is in contrast to the sharp rises in participation observed

between 2004 and 2006, and now looks more consistent with the unemployment data (**Chart 1**). The majority of individuals leaving the labour market have been women, with the largest group of women over retirement age. This looks to me like discouraged workers unable to find work in a loosening labour market. Of course, one quarter does not necessarily indicate a trend, but we should always be on the lookout for significant changes in the data, of which this may be a prelude. The increase in inactivity by age in 2007 Q1 was as follows:

mousanus			
2007 Q1	Men	Women	
Ages 16–17	13	19	
Ages 18–24	-3	23	
Ages 25–34	-5	7	
Ages 35–49	26	15	
Ages 50–64(60)	-1	-8	
Ages 65+(m)/60+(w)	11	40	
All	40	95	

Thousands

In addition, worryingly, the proportion of total unemployment accounted for by those aged under 24 has ticked up over time. For example, in 1997 18–24 year olds constituted 23.9% of the unemployed compared with 30.4% in January-March 2007. Indeed, Quintini *et al* (2007) have noted that over the period 1995–2005 the United Kingdom had the largest increase in the ratio of youth to adult unemployment rates in the OECD

 The number of employees in employment increased by 116,000, while the number of workers in government training schemes and unpaid family members fell by 28,000. (**Chart 2**); the United Kingdom moved from having a ratio below the OECD average in 1995 to being well above it in 2005.<sup>(1)</sup> There is no good explanation for the increase in youth unemployment, however (Blanchflower *et al* (2007)). It does not appear that young workers have been crowded out by immigrants, nor older workers returning to the workplace.





My Masters thesis, which Bernard examined 20-odd years ago, was on the causes and consequences of youth unemployment, and it appears that the same issues remain pertinent today.

# 2 Why has most of the job growth in recent years been in self-employment?

Self-employment as a proportion of the UK workforce is high by international standards (Blanchflower (2000, 2004)). **Chart 3** shows that self-employment rose from around 7% in the late 1970s, peaking at 14.0% in 1991, before easing back slightly during the late 1990s to below 12.0%, and then recovering again. What explains these patterns?

It is apparent from **Chart 3** that the largest increase in the self-employment rate was during the 1980s. During this decade several factors appear to have combined to push the number of self-employed workers higher. First, there was a shift towards service sector industries, which one might assume have lower barriers to entry than manufacturing. Second, the decade was noteworthy for the extent of financial liberalisation that occurred. Loosening liquidity constraints tend to provide a boost to self-employment (Blanchflower and Oswald (1998); Blanchflower, Levine and Zimmerman (2003)). This enabled many latent entrepreneurs access to credit markets, which were previously closed to them.

Chart 3 UK self-employment and unemployment rates



Sources: Employment Gazette (for pre-1992 self-employment data) and ONS

Black *et al* (1996), for example, found that a 10% rise in the value of housing equity increased the number of new firm VAT registrations in the United Kingdom by some 5%. Taylor (2004) found that increases in house prices raised the probability of self-employment entry.

Third, government policy was introduced that actively encouraged workers to become self-employed. An example of these policies was the Enterprise Allowance Scheme (EAS), which ran from 1983 to 1991, paying self-employed workers a supplementary weekly income (of around £40 a week) for up to twelve months. In the twelve months following the scheme's introduction, self-employment rose by 266,000, the largest recorded annual increase of the past 40 years. Campbell and Daly (1992) estimate that one in eight of those that became self-employed during the late 1980s were supported into employment through this scheme.

The subsequent decline in the self-employment rate observed from 1995 resulted from a shift in a large number of workers from self-employment to employment within the construction industry. This reflected work by the Inland Revenue to stop employers treating employees as self-employed workers in order to avoid paying NICs, nor provide benefits, training or observe employment protection laws. While the total number of workers employed in the construction industry remained steady at just over 18 million between 1995 and 2000, the proportion of workers declaring themselves to be self-employed fell from 46% to 33%. By 1997, 200,000 construction workers had reclassified themselves as employees, explaining most of the reduction in self-employment in construction between 1995 and 1997.

In the year September 2002 to September 2003, the number of self-employed increased by 280,000. The largest increase

This is not just a case of adult unemployment falling. The unemployment rate of those aged 16–17 has risen from 19.1% in 2001 to 24.6% in 2006. Source: ONS.

of 120,000 was found in banking, finance and insurance and was dominated by the 35–49 age group, although there were also large increases in the 50–64/59 and 65/60 and over age groups. During this period a number of tax changes were implemented, including: reform of capital gains tax; reducing the rate of corporation tax on smaller companies; the introduction of stakeholder pensions; and the abolition of Advance Corporation Tax.

Over the past couple of years there has been further substantial growth in the numbers of self-employed as well as in the self-employment rate. The numbers of self-employed over the period 2005 Q1 to 2007 Q1 increased by 217,000, accounting for a remarkable 71.1% of the total growth of employment of 305,000 over the period. Moreover, only 37.6% of the additional employee jobs were full-time compared with 61.8% of self-employed jobs. In addition, over the most recent quarter, January-March 2007, the number of employees fell by 100,000 while the number of self-employed grew by 45,000.

At this time it is by no means obvious why self-employment has increased so sharply in recent months. In part, it is because of increased immigration — since immigrants have a higher propensity to be self-employed — alongside moves to self-employment from some older workers who had previously been out of the labour force (Blanchflower and Shadforth (2007)). The rise in self-employment in part likely reflects the lack of employee jobs in a loose labour market.

The recent rise in self-employment could also be consistent with continuing increases in house prices, which have helped to further loosen capital constraints. Chris Shadforth and I have re-examined this relationship for the most recent data. Table B records the results where we regress the log of the self-employment rate, defined by UK region and year on the (log) house price and the log of the regional unemployment rate as well as a full set of year dummies.<sup>(1)</sup> In each of the five columns the house price variable enters significantly positive with or without a lagged dependent variable or with region fixed effects. The self-employment house price elasticity means that a doubling of house prices leads to an increase in the self-employment rate of 15.4%, so the effect isn't small. We take this as evidence of liquidity constraints being relieved as house prices rise - entirely consistent with the findings of Black et al (1996) for an earlier period.

It does not appear that the most recent increase in self-employment (ie over the past two years) has been the result of changes in regulation, tax changes or changes in the minimum wage. It seems unlikely that the current rate of growth in self-employment is sustainable in the long run.

# 3 What has been happening to capacity within firms?

My reading of the labour data is that the market has loosened over the past year or so. The other sort of capacity constraint faced by firms reflects how hard they have to work their incumbent factors of production to meet demand — ie capacity constraints within firms. The sum of capacity within firms and in the labour market is usually called the output gap.

Survey evidence suggests that capacity utilisation within firms is currently above 'normal' levels. **Chart 4** shows that the CBI measure of spare capacity within manufacturing firms has been in excess of its post-1996 average since March 2006. The BCC measures of spare capacity for both manufacturing and service sector firms are also above their post-1996 averages **(Chart 5)**. But these series are volatile. One only has to look back over the past twelve months to see that all three measures have risen and then fallen sharply at times. Looking

Chart 4 CBI measure of capacity utilisation within manufacturing firms







(1) The year dummies are proxying inflation, hence the house price variable should be thought of in real terms; indeed, the results are even stronger (compared with the initial specification in column 1) when the year dummies are replaced with an (insignificant) aggregate price deflator.

		(1)		(2)	(	3)	(4	)	(5	)
Log house prices <sub>t</sub>	.2742	(6.68)	.0431	(1.97)	.2078	(4.33)	.1543	(3.63)	.1383	(5.16)
Log unemployment rate <sub>t</sub>	1298	(2.95)	.0041	(0.19)	0350	(0.83)	0063	(0.17)	.1634	(5.35)
Log self-employment rate <sub>t-1</sub>			.8817	(26.80)			.4078	(7.97)	.6046	(13.10)
Price deflator									0001	(1.20)
East Midlands					0513	(2.98)	0310	(2.03)	0197	(1.20)
London					.0567	(1.45)	.0159	(0.46)	0593	(0.98)
Northern Ireland					.2464	(11.78)	.1644	(7.58)	.0592	(2.02)
North West					1871	(8.51)	1123	(5.18)	1337	(2.61)
Scotland					0770	(4.27)	0489	(3.02)	0621	(4.96)
South East					1846	(9.64)	1159	(6.15)	1226	(2.93)
South West					.0290	(1.27)	.0006	(0.03)	.0196	(5.13)
Wales					.1841	(9.97)	.1020	(5.32)	.0845	(0.83)
West Midlands					.0868	(4.75)	.0521	(3.15)	.0057	(3.54)
Yorks & Humberside					0968	(4.96)	0661	(3.78)	0789	(0.28)
1987	.0418	(0.72)	.1653	(5.63)	.0513	(1.92)	.1037	(4.21)		
1988	0240	(0.41)	.1041	(3.49)	.0174	(0.61)	.0548	(2.11)		
1989	0401	(0.66)	.1365	(4.41)	.0273	(0.86)	.0726	(2.52)		
1990	0517	(0.85)	.0781	(2.55)	.0171	(0.54)	.0409	(1.45)		
1991	0407	(0.68)	.0757	(2.50)	.0103	(0.32)	.0342	(1.20)		
1992	.1326	(2.15)	.2571	(8.28)	.1959	(5.93)	.2200	(7.49)		
1993	.1393	(2.27)	.1040	(3.40)	.1984	(6.04)	.1507	(5.05)		
1994	.1674	(2.80)	.1315	(4.32)	.2085	(6.68)	.1758	(6.08)		
1995	.0665	(1.11)	.0225	(0.76)	.1166	(3.83)	.0683	(2.46)		
1996	.0169	(0.28)	.0699	(2.33)	.0756	(2.43)	.0680	(2.46)		
1997	0605	(0.99)	.0549	(1.78)	.0168	(0.52)	.0294	(1.02)		
1998	1340	(2.13)	.0443	(1.39)	0427	(1.24)	0078	(0.25)		
1999	1755	(2.75)	.0617	(1.88)	0760	(2.11)	0188	(0.58)		
2000	2427	(3.70)	.0457	(1.33)	1272	(3.29)	0548	(1.56)		
2001	2807	(4.17)	.0609	(1.70)	1534	(3.74)	0632	(1.67)		
2002	3228	(4.65)	.0617	(1.66)	1847	(4.07)	0834	(1.99)		
2003	3314	(4.54)	.1012	(2.56)	1762	(3.42)	0645	(1.36)		
2004	3841	(4.99)	.0536	(1.30)	2114	(3.67)	1089	(2.09)		
2005	4021	(5.15)	.0439	(1.04)	2269	(3.79)	1232	(2.28)		
2006	3630	(4.55)	.0940	(2.19)	1902	(2.98)	0831	(1.45)		
Constant	1291	(0.26)	.2684	(1.12)	.3395	(0.60)	2029	(0.40)	7612	(2.29)
Adjusted R <sup>2</sup>	.3688		.8473		.8706		.8995		.8219	
Ν	250		248		250		248		248	

Table B Self-employment rates and house prices (in logs)

T-statistics in parentheses.

Sources: LFS and Nationwide

through these movements, however, it does appear to me that there is evidence that spare capacity within firms has fallen over the past nine to twelve months. In any case, I have trouble understanding what capacity pressures in services actually means, over and above the skilled labour shortages that have been highlighted by the Bank's Agents in their recent surveys. New computers can be bought in an hour; equipment can be rented and work can be farmed out to consultants or sub-contractors. The availability of the internet and fast communications means that workers can work from home if necessary. So, what precisely are the constraints on firms that supposedly are binding in services? I'm not sure. Nevertheless, signs of limited spare capacity may be a concern if they prelude price increases. There is tentative evidence from a number of surveys that some firms have become more confident about pushing through price increases. This may reflect buoyant expectations regarding future demand or simply a delayed pass-through of higher input prices. But the evidence is mixed. For example, the CBI measure of manufacturing firms' expected price increases over the next three months was above its 2006 average in 2007 Q1, but the comparable BCC measure had declined. Furthermore, the surveys have little predictive power for actual output price increases one year ahead; the correlation coefficient for CBI expected prices and output prices twelve months later is 0.56, while the coefficient using BCC expected prices is just 0.09.<sup>(1)</sup> As such, it is difficult to interpret what the data are actually telling us about future inflationary pressures at present, although they do seem to point to an upside risk.

It is hard to reconcile the recent increases in unemployment and inactivity with what is happening within firms. The evidence would seem to support the observed steady increase in labour productivity since 2005, which suggests that firms have been working their workforce and plant more intensively. Strictly, we would expect such an increase in capacity utilisation to result in a tightening of the labour market, and increased pay pressures. Since that has not occurred, I must presume that the weakness in the labour market (however caused) has more than offset the increased constraints within firms.

# 4 Why has wage growth been benign recently?

Consistent with the finding of a loose labour market and increased self-employment, wage growth has been flat or slowing on most measures since late 2004, as indicated in **Chart 6**. The average earnings index and average weekly earnings series excluding bonuses have shown little or no tendency to increase; if anything they have declined slightly over the past twelve months or so. Earnings excluding bonuses, averaged over three months, rose by 3.7% in the year to March 2007, compared with 3.9% in March 2006 and 4.1% in March 2005.

Chart 6 Whole-economy regular pay: AEI versus AWE (three-month average, annual rates)



In contrast, average earnings including bonuses increased at an annual rate of 4.5% in March 2007, compared with 4.0% in 2006 and 4.5% in 2005. However, the pickup in this headline series is confined to the financial services sector. Contrary to the claims of some that bonuses are volatile and should be smoothed through there are much stronger arguments for actually ignoring them entirely as long as they are based on performance and especially so if they are derived from some market risk (see Weitzman (1984) and Blanchflower and Oswald (1987, 1998)); for example, an increase in basic pay of  $\pounds$ 1,000 this year would add to household income in all future years, and has quite different implications from a one-off bonus of  $\pounds$ 1,000.

In any case, the estimates derived both with and without bonuses are likely to be upward biased estimates of wages. The data files used, by definition, exclude the earnings of the self-employed, which, as discussed above, account for 13% of total employment. The files also exclude data from workers in the smallest workplaces, which account for a further 13% or so of the workforce. The wages of these workers are more flexible than other workers in the economy when labour markets loosen (or tighten), that is to say they have a higher wage-unemployment elasticity.

The evidence of benign wage inflation in the official data is confirmed by the Bank's Agents who found that pay awards slowed in April (Agents' Summary of Business Conditions, Bank of England, May 2007).<sup>(2)</sup> It is also consistent with recent evidence provided by IRS in their Pay and Benefits Bulletin, Issue: 663 (18/5/2007). Their provisional analysis of pay settlements collected for the three months to 30 April 2007 revealed a sharp decrease in the IRS measure of pay awards the midpoint in the range of basic pay deals — to 3%.<sup>(3)</sup> This is half a percentage point lower than the 3.5% level at which pay awards have held for the previous three rolling quarters. It is, however, inconsistent with the findings in KPMG's Report on Jobs, 9 May 2007 which found that 'permanent salary inflation was the strongest in nearly seven years in April'. This survey tends not to correlate well with official earnings measures or settlements presumably because it is drawn from a biased sample, only covering workers placed in permanent jobs by some recruitment consultancies.

Some of these publications also highlight the issue of skilled-worker shortages, but this is a fact of life in a dynamic economy. There is a remarkable amount of churning going on in an economy as firms are born and others die (Davis and Haltiwanger (1998)). The question is whether this has become greater than was the case in the past and I see no evidence of this whatsoever, outside Financial Services. Every insurance company would always like five more salesmen who could sell thousands of policies, but that doesn't mean that wages are going to rise. In any case, the occupations that are in short supply and whose wages have risen are included in the wage data.

The CBI data are available from 1975, the BCC data from 1997 Q2. The weaker result obtained using the BCC data may reflect the shorter period over which data are available.

<sup>(2)</sup> www.bankofengland.co.uk/publications/agentssummary/agsum07may.pdf.

<sup>(3)</sup> Wage settlements themselves have limited representativeness given that only 16.6% of private sector employees are union members (Grainger and Crowther (2007)): www.dti.gov.uk/files/file39006.pdf.

So, in my opinion, at this point in time, it appears that wages are the dog that hasn't barked. My view is that wages are not going to increase much any time soon when insider and outsider pressures are low. By that I mean, firms don't have the ability to pay as their profits have been squeezed (insider power is low) and, as I have said previously, there is a good deal of slack in the labour market resulting from increased unemployment and immigration to the United Kingdom (low outsider pressures) (Blanchflower, Oswald and Garrett (1990) and Blanchflower *et al* (2007)).

I have some sense from my regional visits that the fear of unemployment among workers is elevated, although, there is limited data on the issue (see Blanchflower (1991) and Campbell *et al* (2007)). Workers these days seem increasingly aware that they can be replaced by immigrants and/or that their employer can move his or her production facility abroad. This limits workers' bargaining power. These pressures manifest themselves in the recent low settlements figures.

Lower wage inflation and higher unemployment are usually thought of as describing the Phillips curve. However, the time-series results do not provide universal support for the theory. The results of estimated Phillips curve relationships appear to be time-specific, data-specific and/or country-specific. **Chart 7** shows the standard relationship for the United Kingdom. There is evidence of a downward-sloping curve at points during the 1970s and 1980s, but since the 1990s the curve has been flat. In other words, for the past fifteen or so years there has been no trade-off between inflation and unemployment — we have had our cake and eaten it. The Phillips curve does not exist in the UK data, and doesn't appear to hold in many other countries.

Chart 7 UK Phillips curve?



In contrast, the wage curve describes an inverse relationship between the wage rate and the local unemployment rate, where the causality runs from the amount of joblessness to the level of wages. The wage curve is derived from microdata and is concerned with aggregation and missing variable biases. It is very much in the tradition of the economics of walking about. The wage curve is stable across time and countries or regions - the wage curve seems universally described as

 $ln w_t = ln w_{t-1} - 0.1 ln U_t + other terms$ 

where ln w is the log of the real wage, ln U is the log of the unemployment rate in the worker's area, and the other terms control for characteristics of the worker (and t is time, usually years). The equation tells us that the unemployment elasticity of pay is -0.1. A doubling of unemployment is then associated with a drop in real wages of 10%. The wages of the workers in the smallest, usually non-union workplaces who are excluded from the main wage surveys have a much larger wage-unemployment elasticity of around -0.20.

There is no evidence that measures of labour supply enter wage equations (Bartik (2000)). The wage curve is not a supply curve but replaces it (Blanchflower and Oswald (1994, page 12)). As Woodford (1992, page 396) notes, this 'surrogate labor supply curve lies to the left of and is flatter than the true Marshallian labor supply curve'.

Wage curves of this general form have been found in random samples of individuals and establishments in over 40 countries. Sanz-De-Galdeano and Turunen (2006) find a euro-area wage curve over the period 1994–2001. A recent example for the United Kingdom is by Bell, Nickell and Quintini (2002) who use data from the New Earnings Survey for the period 1976–97 and reject a Phillips curve in favour of a wage curve. Their main findings are as follows (Table A, column 1, first-stage panel).<sup>(1)</sup> In all cases controls include region dummies, year dummies and regional trends.

Men  $ln \text{ wage}_t = .730 ln \text{ wage}_{t-1} - .034 ln U_t$ 

Women  $ln \text{ wage}_t = .679 ln \text{ wage}_{t-1} - .030 ln U_t$ 

Solving out the long-run unemployment elasticities for men gives -0.126 and for women -0.093.

The wage curve appears to be an empirical regularity or law, as confirmed by Nijkamp and Poot (2005) in a recent meta-analysis on a sample of 208 wage/unemployment wage curve elasticities from the literature. They conclude that:

'the wage curve is a robust empirical phenomenon... but there is... evidence of publication bias. There is indeed an uncorrected mean estimate of about -0.1 for the elasticity. After controlling for publication bias by means of two different methods, we estimate that the 'true' wage curve

(1) Results are similar using instrumental variables also.
elasticity at the means of study characteristics is about -0.07'.

So why do we find evidence of wage curves, but not Phillips curves? Margo (1993) cites two principal reasons related to the use of microeconomic versus macroeconomic data, the former being typically used for the estimation of wage curves and the latter for Phillips curves. First, less-aggregated data provide many more degrees of freedom than a decade or so of time-series data. And second, he suggests that work at a lower level of aggregation can reveal aspects of human behaviour that lie hidden in the aggregate time series. A number of authors, including myself, have attempted to model the Phillips curve using microdata, controlling for country/region and time fixed effects. When we do, we find that the autoregressive nature of the macroeconomic theory tends to disappear (Blanchflower and Oswald (2005)). These two factors suggest that much macroeconomic data is suspect as it suffers from aggregation biases of uncertain sign and magnitude. Except in isolated specifications, there is not persuasive support for a simple Phillips curve. It seems more sensible to view the data as being characterised by dynamic fluctuations around a long-run stable wage curve.

## 5 Money supply and inflation

Milton Friedman (1971) famously stated that 'Inflation is always and everywhere a monetary phenomenon'. His view, grounded in the Quantity Theory of Money, is that increases in the money supply directly give rise to inflation. This theoretical observation has led some market commentators to question the Bank's interest rate decisions given that M4 has been growing at an annual rate of over 10% since 2005. Have we been ignoring the story being told by monetary aggregates? The short answer is no. The longer answer requires a bit of background information on the controversial relationship between money growth and inflation.

**Chart 8** shows that there is a reasonably strong correlation between the growth of broad money and inflation (CPI) over the long run in the United Kingdom. However, in the short run the correlation is much less clear. As indicated in the table below, for the period 1875–2006, the contemporaneous correlation coefficient was 0.7; breaking down these series into the periods before and after 1972 shows that the correlation remains quite strong. However, if one looks at the data for 1992–2006, it becomes clear that in the shorter term, the correlation weakens, indeed the correlation coefficient for this period is just 0.3.

The weakening of the correlation in recent years has arisen because of fast rates of money growth alongside remarkably stable and low inflation. So what are the explanations for this outcome? Part of the explanation is certainly the recent growth in financial innovation, in other words, the proliferation of instruments which act as substitutes for traditional means

#### Chart 8 Money growth and inflation



	t	<i>t</i> +1	t+2
1875–2006	0.7	0.6	0.5
1875–1971	0.7	0.5	0.3
1972–2006	0.5	0.6	0.7
1992–2006	0.3	0.3	0.3

of exchange. Furthermore, with increased liberalisation of capital markets and the associated free movement of money, the link between domestic monetary aggregates and the real economy has become weaker.

As a result of these issues, it is has become increasingly rare for central banks to assign a prominent role to money in their monetary policy strategies. In the United States, the ex-Governor of the Federal Reserve, Larry Meyer, noted back in 2001 that: 'Money plays no explicit role in today's consensus macro model, and it plays virtually no role in the conduct of monetary policy'. Significantly, in March 2006, the Federal Reserve ceased publication of the M3 monetary aggregate.

One notable exception to this trend is the European Central Bank, but some would argue that this is simply a legacy of its (successful) attempts to import the credibility of the money-targeting Bundesbank. In an important recent paper, with particular focus on the ECB's strategy, Michael Woodford examines a number of leading arguments in favour of assigning an important role to monetary aggregates; he concludes that '...none of these considerations provide a compelling reason to assign a prominent role to monetary aggregates in the conduct of monetary policy'. (Woodford (2006).)

The changes I have mentioned make it difficult to distinguish between supply and demand shocks to money stocks. The days when monetary policy could be conducted using a weather vane are long since passed!<sup>(1)</sup> However, we know that

<sup>(1)</sup> In the Court room of the Bank there is a dial linked to a weather vane on the roof of the building. This was installed in the early 19th century to serve as a highly effective, if primitive tool of monetary policy. An easterly wind would allow ships to sail into London, bringing their goods and resulting in a demand shock. To accommodate this shock, the Bank would increase notes and coin in circulation. The increase in money supply would only cause inflation if it wasn't warranted by an increase in demand.

in advanced economies characterised by financial innovation, money stock movements tend to be dominated by money demand shocks rather than money supply shocks.

Looking more closely at the recent UK data, it is clear that the pickup in M4 growth over the past two years has largely been driven by rapid increases in the deposits held by non-bank financial companies (known as other financial corporations or OFCs). As **Chart 9** shows, this sector is made up of many different businesses, which are likely to use their money holdings in different ways.





Consequently, it is difficult to interpret the likely implications for inflation of the increase in M4 holdings by OFCs. While one could speculate that institutional investors (such as pension funds) and securities dealers could use their increased holdings to purchase other financial or real assets, with inflationary implications, equally the increase could simply reflect a structural or portfolio shift in demand, in which case the inflationary implications would be limited. This difficulty in interpretation is exacerbated in that much of the increase has been from 'Other financial intermediaries'. The demand for money by these companies, ranging from housing credit corporations to special purpose vehicles is not well understood. However, most economists believe that the current rapid rise in money in the economy is really the result of changes in the demand for money, which is consistent with the stable inflation experienced in recent years.

Despite the fact that the money supply is not targeted by the Bank, it is a variable that will continue to be monitored and analysed. Not only does money growth and its impact on liquidity contain important information about future economic developments, it can also play an important role in shaping inflation expectations.

#### Conclusions

Over the course of the past hour I've shown you a number of areas of research that I've been working on to investigate recent developments in the UK economy. In some cases the results I have obtained have been surprising, and not necessarily in line with what theory would tell us.

We saw that there has been an increase in employment over the past couple of years, driven by an increase in self-employment. At the same time, there has been a strong increase in inactivity — mostly discouraged workers unable to find work as the labour market has loosened — and unemployment, particularly among those under the age of 24. It is hard to reconcile this with survey evidence that seems to indicate capacity shortages, and increased labour productivity which suggests firms have been working their workforce and capital more intensively.

The rapid rise in self-employment has also been something of a mystery; it has arisen partly on account of immigration, partly through moves to self-employment from some older workers who had previously been inactive, and possibly partly a result of rising house prices, which have loosened capital constraints. However, we have found no evidence that the commonly held reasons for people to turn to self-employment — changes in regulation, tax changes, or changes in the minimum wage — have been significant. And despite the claims of the doomsayers, wages remain benign, which as far as I am concerned is to be expected, consistent with the loose labour market and increased self-employment.

On the last topic of my research, the relationship between money supply and inflation, we've clearly seen the importance of walking around; the relationship appears to have broken down in recent years, but in the context of financial innovation and capital market liberalisation, we understand why this might be so. As for whether this is important for monetary policy, we have to form our own judgements based on the data.

I hope this has shown you the importance of 'sniffing the air', and putting the data before the theory where this seems warranted. This is of particular relevance in my role as a member of the MPC, where rate-setting decisions must be made on the basis of a wide variety of data, both quantitative and qualitative, and even small developments can have significant implications — such developments have particularly influenced my voting decisions over the past few months. As I said in my *Observer* interview on Sunday, the rationale for my decision to vote for a rate rise last month was to ensure that inflation expectations remain anchored, given rising food prices, recent further increases in oil prices, more robust world growth, and the March inflation outturn.

As you can see, I owe a lot to Bernard Corry. He was a big influence on me, and on the way I conduct my research. And although he first opened my eyes to the importance of the man on the Clapham omnibus, perhaps more importantly he revealed to me the importance of a more basic form of transport — Walking About.

#### References

Baker, D, Glyn, A, Howell, D and Schmitt, J (2005), 'Labor market institutions and unemployment; a critical assessment of the cross-country evidence', in Howell, D R (ed), *Fighting unemployment; the limits of free-market orthodoxy*, Oxford University Press.

Bartik, T (2000), 'Group wage curves', *Working paper*, Upjohn Institute.

Bell, B, Nickell, S and Quintini, G (2002), 'Wage equations, wage curves and all that', *Labour Economics*, Vol. 9, pages 341–60.

**Black, J, De Meza, D and Jeffreys, D (1996)**, 'House prices, the supply of collateral, and the enterprise economy', *Economic Journal*, Vol. 106, January, pages 60–75.

Blanchflower, D G (1991), 'Fear, unemployment and pay flexibility', *Economic Journal*, March, pages 483–96.

Blanchflower, D G (2000), 'Self-employment in OECD countries', *Labour Economics*, Vol. 7, September, pages 471–505.

Blanchflower, D G (2001), 'Unemployment, well-being and wage curves in Eastern and Central Europe', *Journal of Japanese and International Economies*, Vol. 15(4), December, pages 364–402.

Blanchflower, D G (2004), 'Self-employment: more may not be better', Swedish Economic Policy Review, Vol. 11(2), Fall, pages 15–74.

**Blanchflower, D G (2007)**, 'Recent developments in the UK labour market', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 158–72.

Blanchflower, D G, Levine, P and Zimmerman, D (2003), 'Discrimination in the small business credit market', *Review of Economics and Statistics*, Vol. 85(4), November, pages 930–43.

Blanchflower, D G and Oswald, A J (1987), 'Profit sharing: can it work?', Oxford Economic Papers, Vol. 39, pages 1–19. Reprinted in Sinclair, P (ed), Prices, quantities and expectations, Oxford University Press, Oxford.

Blanchflower, D G and Oswald, A J (1994), *The wage curve*, MIT Press, Cambridge, MA.

Blanchflower, D G and Oswald, A J (1998), 'What makes an entrepreneur?', *Journal of Labor Economics*, January, Vol. 16(1), pages 26–60.

Blanchflower, D G and Oswald, A J (2005), 'The wage curve reloaded', *NBER Working Paper no. 11338*.

Blanchflower, D G, Oswald, A J and Garrett, M D (1990), 'Insider power in wage determination', *Economica*, Vol. 57, pages 143–70.

Blanchflower, D G, Saleheen, J and Shadforth, C (2007), 'The impact of the recent migration from Eastern Europe on the UK economy', available at www.bankofengland.co.uk/publications/ speeches/2007/speech297.pdf.

**Blanchflower, D G and Shadforth, C (2007)**, 'Entrepreneurship in the United Kingdom', available at http://ftp.iza.org/dp2818.pdf.

Campbell, D, Carruth, A, Dickerson, A and Green, F (2007), 'Job insecurity and wages', *Economic Journal*, Vol. 117, No. 518, March, pages 544–66.

**Campbell, M and Daly, M (1992)**, 'Self-employment: into the 1990s', *Employment Gazette*, June, pages 269–91.

Capie, F and Webber, A (1985), A monetary history of the United Kingdom, 1870–1982: data, sources, methods, Routledge.

Davis, S and Haltiwanger, J (1998), 'Measuring gross worker and job flows', in Haltiwanger, J, Manser, M E and Topel, R (eds), *Labor statistics measurement issues*, Chicago and London: University of Chicago Press, pages 77–119.

Friedman, M and Schwarz, A (1971), Monetary history of the United States 1867–1960, Princeton University Press.

**Grainger, H and Crowther, M (2007)**, 'Trade union membership, 2006', *Employment Market Analysis and Research*, Department of Trade and Industry.

Harberger, A (1993), 'The search for relevance in economics', *American Economic Review*, Papers and Proceedings, Vol. 83, pages 1–16.

Kerr, C (1988), 'The neo-classical revisionists in labour economics (1940–1960) — R.I.P.', in Kaufman, B E (ed), *How labor markets work. Reflections on theory and practice by John Dunlop, Clark Kerr, Richard Lester and Lloyd Reynolds*, Lexington Books.

Layard, R, Nickell, S and Jackman, R (1991), *Unemployment*, Oxford University Press.

Margo, R A (1993), 'Employment and unemployment in the 1930s', *Journal of Economic Perspectives*, Vol. 7, pages 41–60.

Meyer, L (2001), 'Does money matter?', speech given at the 2001 Homer Jones Memorial Lecture, Washington University, St. Louis, Missouri, 28 March.

Nickell, S (2006), 'Monetary policy, demand and inflation', *Bank of England Quarterly Bulletin*, Spring, pages 95–104.

Nijkamp, P and Poot, J (2005), 'The last word on the wage curve? A meta-analytic assessment', *Journal of Economic Surveys*, Vol. 19, pages 421–50.

O'Donoghue, J, Goulding, L and Allen, G (2004), Consumer price inflation since 1750, available at www.statistics.gov.uk/.

Quintini, G, Martin, J P and Martin, S (2007), 'The changing nature of the school-to-work transition process in OECD countries', *IZA Discussion Paper no. 2582.* 

Sanz-De-Galdeano, A and Turunen, J (2006), 'The euro area wage curve', *Economics Letters*, Vol. 92(1), July, pages 93–98.

**Summers, L H (1991)**, 'The scientific illusion in empirical macroeconomics', *Scandinavian Journal of Economics*, Vol. 93(2), pages 129–48.

**Taylor, M (2004)**, 'Self-employment in Britain: when, who and why?', *Swedish Economic Policy Review*, Vol. 11(2), Fall, pages 141–73.

Weitzman, M L (1984), The share economy, Harvard University Press.

Woodford, M (1992), 'A book review. "Seven schools of macroeconomic thought" by E S Phelps', *Journal of Economic Dynamics and Control*, Vol. 16, pages 391–98.

**Woodford, M (2006)**, 'How important is money in the conduct of monetary policy?', Working paper presented at the Fourth ECB Central Banking Conference, 9–10 November.

# Appendices

PROMISE

# Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

# Recent developments in the UK economy: the economics of walking about

(Reproduced on pages 317–29 of this *Bulletin*.) Bernard Corry Memorial Lecture by David Blanchflower. Given at Queen Mary, University of London on 30 May 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech310.pdf

#### The MPC ten years on

(Reproduced on pages 272–85 of this *Bulletin*.) Lecture by Mervyn King, Governor, to the Society of Business Economists on 2 May 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech309.pdf

# A perspective on recent monetary and financial system developments

(Reproduced on pages 310–16 of this *Bulletin*.) Speech by Paul Tucker at a Merrill Lynch conference for hedge funds on 26 April 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech308.pdf

#### Analytical models of financial stability

Speech by Alastair Clark at the Cass Business School on 28 March 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech307.pdf

# The City's growth: the crest of a wave or swimming with the stream?

(Reproduced on pages 286–90 of this *Bulletin*.) Speech by Sir John Gieve at the Bank of England to the London Society of Chartered Accountants 26 March 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech306.pdf

#### Interest rate changes — too many or too few?

(Reproduced on pages 300–09 of this *Bulletin*.) Speech by Kate Barker at the CBI North East Dinner on 20 March 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech305.pdf

# The changing pattern of savings: implications for growth and inflation

(Reproduced on pages 291–99 of this *Bulletin*.) Speech by Andrew Sentance at the Royal Bank of Scotland/Scottish Economics Society Annual Lecture on 15 March 2007.

www.bankofengland.co.uk/publications/speeches/2007/ speech304.pdf

# Contents of recent Quarterly Bulletins

The articles and speeches that have been published recently in the *Quarterly Bulletin* are listed below. Articles from November 1998 onwards are available on the Bank's website at:

www.bankofengland/publications/quarterlybulletin/index.htm.

## Articles and speeches

Speeches are indicated by (S)

#### Winter 2004

- British household indebtedness and financial stress: a household-level picture
- The new sterling ERI
- Using option prices to measure financial market views about balances of risk to future asset prices
- The foreign exchange and over-the-counter derivatives markets in the United Kingdom
- The external balance sheet of the United Kingdom: recent developments
- Stability and statistics (S)
- Why is inflation so low? (S)
- Monetary policy, data uncertainty and the supply side: living with the statistical fog (S)

#### Spring 2005

- Dealing with data uncertainty
- Indicators of short-term movements in business investment
- Divisia money
- Inside the MPC
- The role of central banks in payment systems oversight
- The Governor's speech to the CBI Dinner in Manchester (S)
- The Governor's speech on the International Monetary System (S)
- Why monetary stability matters to Merseyside (S)
- Monetary policy in an uncertain world (S)
- Why has inflation been so low since 1999? (S)
- The housing market and the wider economy (S)

#### Summer 2005

- The impact of government spending on demand pressure
- How important is housing market activity for durables spending?
- The inflation-targeting framework from an historical perspective
- Monetary policy news and market reaction to the Inflation Report and MPC Minutes
- Addendum to Report on modelling and forecasting at the Bank of England
- Public attitudes to inflation

- Chief Economist Workshop April 2005: exchange rate regimes and capital flows
- Implementing monetary policy: reforms to the Bank of England's operations in the money market
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2004
- Monetary policy: practice ahead of theory The Mais Lecture 2005: speech by the Governor (S)
- Inflation targeting in practice: models, forecasts and hunches (S)
- Monetary policy, stability and structural change (S)
- How much spare capacity is there in the UK economy?
- Communicating monetary policy in practice (S)
- Monetary policy in the United Kingdom the framework and current issues (S)
- A matter of no small interest: real short-term interest rates and inflation since the 1990s (S)

#### Autumn 2005

- Assessing the MPC's fan charts
- Long-run evidence on money growth and inflation
- The determination of UK corporate capital gearing
- Publication of narrow money data: the implications of money market reform
- The Governor's speech at Salts Mill, Bradford (S)
- The Governor's speech at the Mansion House (S)
- Monetary policy making: fact and fiction (S)

#### Winter 2005

- Introducing the Agents' scores
- Do financial markets react to Bank of England communication?
- Financial stability, monetary stability and public policy
- Share prices and the value of workers
- Stabilising short-term interest rates
- The Governor's speech to the CBI North East annual dinner (S)
- UK monetary policy: the international context (S)
- Economic stability and the business climate (S)
- Challenging times for monetary policy (S)
- Monetary policy challenges facing a new MPC member (S)

#### Spring 2006

- New information from inflation swaps and index-linked bonds
- The distribution of assets, income and liabilities across UK households: results from the 2005 NMG Research survey
- Understanding the term structure of swap spreads
- The information content of aggregate data on financial futures positions

- The forward market for oil
- The Governor's speech in Ashford, Kent (S)
- Reform of the International Monetary Fund (S)
- Global financial imbalances (S)
- Monetary policy, demand and inflation (S)
- Has oil lost the capacity to shock? (S)

#### Summer 2006

- House prices and consumer spending
- Investing in inventories
- Cost-benefit analysis of monetary and financial statistics
- Public attitudes to inflation
- The Centre for Central Banking Studies
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2005
- Uncertainty, the implementation of monetary policy, and the management of risk (S)
- Reflections on operating inflation targeting (S)
- Cost pressures and the UK inflation outlook (S)
- The UK current account deficit and all that (S)
- A shift in the balance of risks (S)
- What do we now know about currency unions? (S)

#### 2006 Q3

- The UK international investment position
- Costs of sovereign default
- UK export performance by industry
- The Governor's speech in Edinburgh, Scotland (S)
- The Governor's speech at the Mansion House (S)
- Stability and change (S)
- Financial system risks in the United Kingdom (S)

#### 2006 Q4

- The economic characteristics of immigrants and their impact on supply
- Recent developments in sterling inflation-linked markets
- The state of British household finances: results from the 2006 NMG Research survey
- Measuring market sector activity in the United Kingdom
- The Governor's speech at the Great Hall, Winchester (S)
- Trusting in money: from Kirkcaldy to the MPC (S)
- The Governor's speech to the Black Country business awards dinner (S)
- International monetary stability can the IMF make a difference? (S)
- The puzzle of UK business investment (S)
- Hedge funds and financial stability (S)
- Practical issues in preparing for cross-border financial crises
  (S)
- Reflections on my first four votes on the MPC (S)

- Prudential regulation, risk management and systemic stability (S)
- Globalisation and inflation (S)

#### 2007 Q1

- The Monetary Policy Committee of the Bank of England: ten years on
- The macroeconomic impact of globalisation: theory and evidence
- The macroeconomic impact of international migration
- Potential employment in the UK economy
- The role of household debt and balance sheets in the monetary transmission mechanism
- Gauging capacity pressures within businesses
- Through the looking glass: reform of the international institutions (S)
- The Governor's speech to the Birmingham Chamber of Commerce Annual Banquet (S)
- Perspectives on current monetary policy (S)
- The MPC comes of age (S)
- Pricing for perfection (S)
- Risks to the commercial property market and financial stability (S)
- Macro, asset price, and financial system uncertainties (S)
- The impact of the recent migration from Eastern Europe on the UK economy (S)
- Inflation and the supply side of the UK economy (S)
- Inflation and the service sector (S)
- Recent developments in the UK labour market (S)

#### 2007 Q2

- Public attitudes to inflation and interest rates
- National saving
- Understanding investment better: insights from recent research
- Financial globalisation, external balance sheets and economic adjustment
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2006
- The MPC ten years on (S)
- The City's growth: the crest of a wave or swimming with the stream? (S)
- The changing pattern of savings: implications for growth and inflation (S)
- Interest rate changes too many or too few? (S)
- A perspective on recent monetary and financial system developments (S)
- Recent developments in the UK economy: the economics of walking about (S)

# Bank of England publications

The Bank of England publishes information on all aspects of its work in many formats. Listed below are some of the main Bank of England publications. For a full list, please refer to our website:

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#### Working papers

An up-to-date list of working papers is maintained on the Bank of England's website at:

www.bankofengland.co.uk/publications/workingpapers/ index.htm

where abstracts of all papers may be found. Papers published since January 1997 are available in full, in portable document format (PDF).

No. 290 UK monetary regimes and macroeconomic stylised facts (March 2006) *Luca Benati* 

No. 291 Affine term structure models for the foreign exchange risk premium (March 2006) Luca Benati

No. 292 Switching costs in the market for personal current accounts: some evidence for the United Kingdom (March 2006) *Céline Gondat-Larralde and Erlend Nier* 

No. 293 Resolving banking crises — an analysis of policy options (March 2006) *Misa Tanaka and Glenn Hoggarth* 

No. 294 How does the down-payment constraint affect the UK housing market? (March 2006) Andrew Benito

No. 295 Productivity growth, adjustment costs and variable factor utilisation: the UK case (April 2006) *Charlotta Groth, Soledad Nuñez and Sylaja Srinivasan* 

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No. 307 Fiscal rules for debt sustainability in emerging markets: the impact of volatility and default risk (September 2006) Adrian Penalver and Gregory Thwaites

No. 308 Optimal emerging market fiscal policy when trend output growth is unobserved (September 2006) *Gregory Thwaites* 

No. 309 Fundamental inflation uncertainty (October 2006) Charlotta Groth, Jarkko Jääskelä and Paolo Surico No. 310 Returns to equity, investment and Q: evidence from the United Kingdom (October 2006) Simon Price and Christoph Schleicher

No. 311 The yen real exchange rate may be stationary after all: evidence from non-linear unit root tests (October 2006) *Georgios Chortareas and George Kapetanios* 

No. 312 Exchange rate pass-through into UK import prices (November 2006) *Haroon Mumtaz, Özlem Oomen and Jian Wang* 

No. 313 Bank capital channels in the monetary transmission mechanism (November 2006) *Bojan Markovic* 

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No. 316 Financial infrastructure and corporate governance (December 2006) *Helen Allen, Grigoria Christodoulou and Stephen Millard* 

No. 317 Corporate debt and financial balance sheet adjustment: a comparison of the United States, the United Kingdom, France and Germany (December 2006) *Peter Gibbard and Ibrahim Stevens* 

No. 318 Does Asia's choice of exchange rate regime affect Europe's exposure to US shocks? (February 2007) *Bojan Markovic and Laura Povoledo* 

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No. 321 Comparing the pre-settlement risk implications of alternative clearing arrangements (April 2007) *John P Jackson and Mark J Manning* 

No. 322 An affine macro-factor model of the UK yield curve (April 2007) *Peter Lildholdt, Nikolaos Panigirtzoglou and Chris Peacock* 

No. 323 Forecast combination and the Bank of England's suite of statistical forecasting models (May 2007) *George Kapetanios, Vincent Labhard and Simon Price* 

No. 324 Housing equity as a buffer: evidence from UK households (May 2007) Andrew Benito

No. 325 Inter-industry contagion between UK life insurers and UK banks: an event study (May 2007) Marco Stringa and Allan Monks

#### **External MPC Unit discussion papers**

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's website at:

www.bankofengland.co.uk/publications/other/ externalmpcpapers/index.htm.

The following paper has been published recently:

No. 17 The impact of the recent migration from Eastern Europe on the UK economy (April 2007) David G Blanchflower, Jumana Saleheen and Chris Shadforth

#### Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles.

*Bankstats* is published on a monthly basis, free of charge, on the Bank's website at:

#### www.bankofengland.co.uk/statistics/ms/current/index.htm.

Following user consultation, printed editions of *Bankstats*, which were previously published twice a year in January and July, have been discontinued since July 2006.

Further details are available from: Lucy Crighton, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 5353; fax 020 7601 3208; email lucy.crighton@bankofengland.co.uk.

Articles that have been published in recent issues of *Monetary and Financial Statistics* can also be found on the Bank's website at:

www.bankofengland.co.uk/statistics/ms/articles.htm.

## Financial Stability Report

The *Financial Stability Report* is published twice a year in April and October. Its purpose is to encourage informed debate on financial stability; survey potential risks to financial stability; and analyse ways to promote and maintain a stable financial system. The Bank of England intends this publication to be read by those who are responsible for, or have interest in, maintaining and promoting financial stability at a national or international level. It is of especial interest to policymakers in the United Kingdom and abroad; international financial institutions; academics; journalists; market infrastructure providers; and financial market participants. It is available at a charge, from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at:

www.bankofengland.co.uk/publications/fsr/index.htm.

#### Payment Systems Oversight Report

The Payment Systems Oversight Report provides an account of how the Bank is discharging its responsibility for oversight of UK payment systems. Published annually, the Oversight Report sets out the Bank's assessment of key systems against the benchmark standards for payment system risk management provided by the internationally adopted Core Principles for Systemically Important Payment Systems, as well as current issues and priorities in reducing systemic risk in payment systems. Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/psor/index.htm.

#### Handbooks in central banking

The series of *Handbooks in central banking* provide concise, balanced and accessible overviews of key central banking topics. The *Handbooks* have been developed from study

materials, research and training carried out by the Bank's Centre for Central Banking Studies (CCBS). The *Handbooks* are therefore targeted primarily at central bankers, but are likely to be of interest to all those interested in the various technical and analytical aspects of central banking. The series also includes Lecture and Research publications, which are aimed at the more specialist reader. All the *Handbooks* are available via the Bank's website at:

www.bankofengland.co.uk/education/ccbs/handbooks/ index.htm.

## The framework for the Bank of England's operations in the sterling money markets (the 'Red Book')

The 'Red Book' describes the Bank of England's framework for its operations in the sterling money markets, which is designed to implement the interest rate decisions of the Monetary Policy Committee (MPC) while meeting the liquidity needs, and so contributing to the stability of, the banking system as a whole. It also sets out the Bank's specific objectives for the framework, and how it delivers those objectives. The framework was introduced in May 2006. The 'Red Book' is available at:

www.bankofengland.co.uk/markets/money/publications/ redbookfeb07.pdf.

## The Bank of England Quarterly Model

The Bank of England Quarterly Model, published in January 2005, contains details of the new macroeconomic model developed for use in preparing the Monetary Policy Committee's quarterly economic projections, together with a commentary on the motivation for the new model and the economic modelling approaches underlying it. The price of the book is £10.

www.bankofengland.co.uk/publications/other/beqm/ index.htm.

# *Cost-benefit analysis of monetary and financial statistics*

The handbook describes a cost-benefit analysis (CBA) framework that has been developed within the Bank to ensure a fair balance between the benefits derived from good-quality statistics and the costs that are borne by reporting banks.

Although CBA is a well-established approach in other contexts, it has not often been applied to statistical provision, so techniques have had to be adapted for application to the Bank's monetary and financial statistics. The handbook also discusses how the application of CBA has enabled cuts in both the amount and the complexity of information that is required from reporting banks.

www.bankofengland.co.uk/statistics/about/cba.htm.

## Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's website at:

#### www.bankofengland.co.uk/publications/quarterlybulletin/ index.htm.

Individual articles from May 1994 are also available at the same address.

The *Bulletin* is also available from National Archive Publishing Company: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, PO Box 998, Ann Arbor, Michigan 48106–0998, United States of America; customers from all other countries should apply to The Quorum, Barnwell Road, Cambridge, CB5 8SW, telephone 01223 215512.

An index of the *Quarterly Bulletin* is also available to customers free of charge. It is produced annually, and lists alphabetically terms used in the *Bulletin* and articles written by named authors. It is also available at:

www.bankofengland.co.uk/publications/quarterlybulletin/ contentsandindex.htm.

Bound volumes of the *Quarterly Bulletin* (in reprint form for the period 1960–85) can be obtained from Schmidt Periodicals GmbH, Ortsteil Dettendorf, D-83075 Bad Feilnbach, Germany, at a price of  $\leq 105$  per volume or  $\leq 2,510$  per set.

## Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation over the following two years. The *Inflation Report* is available at:

www.bankofengland.co.uk/publications/inflationreport/ index.htm.

The *Report* starts with an overview of economic developments; this is followed by five sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- · analysis of costs and prices; and
- assessment of the medium-term inflation prospects and risks.

## **Publication dates**

Copies of the *Quarterly Bulletin, Inflation Report* and *Financial Stability Report* can be bought separately, or as combined packages for a discounted rate. Current prices are shown overleaf. Publication dates for 2007 are as follows:

#### Quarterly Bulletin

Q1	19 March
Q2	18 June
Q3	24 Septembe
Q4	17 December

#### Inflation Report

February	14 February
May	16 May
August	8 August
November	14 Novembei

#### Financial Stability Report

26 April 25 October

## Quarterly Bulletin, Inflation Report and Financial Stability Report subscription details

Copies of the *Quarterly Bulletin (QB), Inflation Report (IR) and Financial Stability Report (FSR)* can be bought separately, or as combined packages for a discounted rate. Subscriptions for a full year are also available at a discount. The prices are set out below:

Destination	2007						
	<i>QB, FSR</i> and <i>IR</i> package	QB and IR package	IR and FSR package	<i>QB</i> only	<i>IR</i> only	<i>FSR</i> only	
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Students/schools (concessionary rate UK only)	£10.50	£9.00	£4.50	£7.00	£3.50	£1.75	
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Letter service	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50	
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Air mail	£50.00	£43.00	£21.50	£34.00	£17.00	£8.50	

(1) Subscribers who wish to collect their copy (copies) of the Bulletin, Inflation Report and/or Financial Stability Report may make arrangements to do so by writing to the address given below. Copies will be available to personal callers at the Bank from 10.30 am on the day of issue and from 8.30 am on the following day.

Readers who wish to become **regular subscribers**, or who wish to purchase single copies, should send to the Bank, at the address given below, the appropriate remittance, payable to the Bank of England, together with full address details, including the name or position of recipients in companies or institutions. If you wish to pay by **Visa**, **MasterCard**, **Maestro** or **Delta**, please telephone +44 (0)2076014030. Existing subscribers will be invited to renew their subscriptions automatically. Copies can also be obtained over the counter at the Bank's front entrance.

The **concessionary** rates for the *Quarterly Bulletin*, *Inflation Report* and *Financial Stability Report* are noted above in *italics*. Academics at UK institutions of further and higher education are entitled to a concessionary rate. They should apply on their institution's notepaper, giving details of their current post. **Students and secondary schools** in the United Kingdom are also entitled to a concessionary rate. Requests for concessionary copies should be accompanied by an explanatory letter; students should provide details of their course and the institution at which they are studying.

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone +44 (0)20 7601 4030; fax +44 (0)20 7601 3298; email mapublications@bankofengland.co.uk or fsrenquiries@bankofengland.co.uk.

General enquiries about the Bank of England should be made to +44 (0)20 7601 4878. The Bank of England's website is at www.bankofengland.co.uk.

Issued by the Bank of England Publications Group.

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