



BANK OF ENGLAND

Speech

Market Functioning

Speech given by

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Introduction

It is a pleasure to be here this evening. The economic and political events of the past twelve months raise many questions. From my vantage point as the head of the Bank of England's Markets Directorate, they reemphasise the need for central banks to understand the structure and functioning of core financial markets. That matters both for our role as guardians of financial stability, and to ensure the effectiveness of our own operations to implement monetary policy. Let me illustrate this with reference to developments in two very different markets.

- i) The first – the sterling FX market – a large, global, highly liquid, and almost continuously traded, market, with a constantly evolving structure. Here, the challenge is to understand how those developments affect the functioning of the market. My focus will be on the lessons about market functioning from two particular episodes last year: the period immediately following the EU referendum and its 'flash crash' a few months later.
- ii) The second market – the sterling corporate bond market – is small, local, and thinly traded, with heterogeneous underlying assets. Here I will explain how our analysis of market structure shaped the design of the Bank's corporate bond purchase scheme, and how the scheme may have affected the functioning of the market.

In both cases our understanding of these markets, informed by market intelligence, analysis and our own experience in previous operations, has been both tested and improved as the Bank has responded to events.

Section 1 – Sterling's headline days during 2016

The foreign exchange markets are core to the broader financial system, processing enormous volumes of transactions and relied upon by a broad range of economic participants from corporates to individuals. The structure of these markets has evolved markedly in recent years, with electronic trading playing an ever greater role, while the amount of balance sheet devoted to this activity by intermediaries has fallen. Benefits of the broader trend towards greater speed and electronification, common across a range of markets, include a reduced cost of transacting – and hence better value for end-users – but these structural changes as a whole have also led some to question whether markets are now less resilient in periods of stress.¹

The value of sterling fell by 17% against the US dollar over 2016², largely as market participants digested the impact of the EU referendum decision on its long-term sustainable level. Although sterling was in the spotlight for much of the year, two key episodes stand out: the sharp adjustment in the exchange rate

¹ These issues are examined in more detail in a Financial Stability Paper released by the Bank in October 2015 which draws together a body of analysis looking across a number of previous events of this nature.

http://www.bankofengland.co.uk/financialstability/Pages/fpc/fspapers/fs_paper34.aspx

² And by 15% on a trade-weighted basis.

immediately after the referendum result, and the so-called flash event in the early (UK) hours of 7 October (**Chart 1**).

Markets displayed resilience in the immediate aftermath of the referendum: the record 11% depreciation of sterling against the US dollar³ that took place over the succeeding two trading days was accompanied by exceptionally high trading volumes (**Chart 2**). The market facilitated an orderly correction in the sterling exchange rate, while enabling individual participants to adjust their portfolios in response to the news, and can therefore be reasonably judged to have functioned effectively. This was aided in no small part by the well-telegraphed nature of the event. Informed by the lesson of the CHF de-peg a year and a half earlier, our market intelligence was that dealers engaged in extensive planning and preparation to cater for the possibility of sharp movements in sterling, including by reducing trading positions, pre-defining trading strategies and risk appetites for a range of scenarios, recalibrating algorithms and engaging in conversation with their clients to manage their expectations.

The contrast with the events of 7 October – less than four months later – could not be stronger. In the early hours of the morning sterling depreciated by around 9% against the US dollar in a matter of seconds, before quickly retracing almost all of the move. Not only did this represent almost unprecedented volatility, but for short periods market depth on key trading platforms all but evaporated. The Amihud measure of liquidity, based on the price impact of individual trades, suggests that there was a notable period at the start of this event where liquidity was markedly poorer than during the events around the referendum (**Chart 3**).⁴

The Bank for International Settlements recently published an exhaustive study of the event drawing on analysis conducted by the Bank of England.⁵ Like many flash events, the sterling moves seemed to have no clear trigger – just unusually large selling flows at a typically quiet period of the trading day. Instead the BIS report characterises the moves as the result of a confluence of factors, including the time of day, significant demand to sell sterling to hedge options positions, the execution of stop-loss orders and the withdrawal of liquidity by both human and automated traders in the face of unexpected volatility. Whilst it is true that this event was over in less time than it would have taken me to buy my regular morning latte, and as the BIS report noted, no systemic financial institutions appear to have incurred material losses, the reality is that our ability to describe how the flash unfolded doesn't mean we can explain why it happened on 7 October.

The events immediately after the referendum and on 7 October paint sharply different pictures about market functioning. As I noted above, the FX market functioned very effectively during the first episode, enabling the sterling exchange rate to act as an important initial shock absorber to the referendum news. But functioning in the second event was poor, with as large a move in sterling but without a fundamental trigger, creating a dearth of liquidity and for a short period of time the absence of a functioning two-way market for sterling.

³ And by 9% on a trade-weighted basis.

⁴ The Amihud measure of price impact calculates the ratio between price moves and volumes traded.

⁵ <http://www.bis.org/pub/mktc09.htm>

The proximity of these events points to a nuanced conclusion about market functioning. Modern, highly electronic markets can facilitate a rapid and orderly reaction to significant news, but resilience might depend importantly on preparation. Moreover, the events of 7 October also highlight the vulnerability of such markets to seemingly unprompted flash price movements. It wasn't the first flash event we've seen in core financial markets, nor the most violent, but it was certainly the closest to home. Combined with the evidence from the US Treasury event of 2014, it suggests growing potential for flash events to occur in core markets, where we might previously have expected the depth of liquidity and breadth of participation to provide some protection against such stresses.

So while recent events fortify my confidence in the ability of core financial markets to process identifiable risks, I equally expect flash moves in the self-same markets to continue to surprise us, even if I cannot hope to predict precisely when or in what instrument or currency pair the next significant flash event will occur.⁶

Section 2 – The Bank of England's corporate bond operations

Of course, the referendum result prompted a lot more than an exchange rate reaction. An important consequence was the MPC's re-evaluation of the likely prospects for the economy and decision in August to take a number of steps to ease monetary conditions. Some of these steps were familiar – reducing Bank Rate and initiating further gilt purchases. Some were more novel – providing term funding to banks in order to support Bank Rate pass-through, and purchasing corporate bonds.⁷

The sterling corporate bond market is relatively small and concentrated in nature, with limited trading in the secondary market. This is obviously true relative to foreign exchange markets, but also relative to the gilt market, which had been the exclusive focus of previous MPC asset purchase decisions. To provide some metrics: the volume of sterling corporate bonds traded in a typical day is less than 5% of that traded in gilts, while typical trade sizes are around £2-5mn and £50mn respectively. Bid-offer spreads for a representative sterling investment grade bond would be around 10bps, whereas for a benchmark 10 year gilt these would generally be less than half a basis point. So a key challenge was to articulate an approach which would be effective in this different context.

An immediate consequence was that the MPC framed its policy decision somewhat differently: it determined to purchase up to £10 billion of corporate bonds over 18 months, whereas for gilts the MPC decided to purchase a fixed total of £60 billion of gilts over a six month period, reflecting not only our ability to purchase more quickly in that market but greater certainty about the achievable pace.

Turning to implementation, the Bank has an inclination to use auction-based mechanisms to implement policy decisions where possible. Auctions cater for wide participation among active participants in the market in question and avoid the Bank having to discriminate actively between counterparties or instruments.

⁶ There was a much smaller (around 1.5%), near-instantaneous and much less remarked-upon spike on 30 December in the euro-US dollar exchange rate.

⁷ See box on page 9 of the Bank's August 2016 *Inflation Report*.
<http://www.bankofengland.co.uk/publications/Pages/inflationreport/2016/aug.aspx>

In auctions we offer to buy across the range of eligible assets the MPC has specified, pre-define the mechanisms we will use to weigh the competitiveness of offers, and then passively respond to the pattern of bids that we receive in any given auction. Our judgement last summer was that the MPC's corporate bond purchase objective would probably also be best achieved using auctions, but that we would need to make a number of changes relative to the pre-existing gilt auction design to cater for the differences in the underlying markets. Let me highlight this by explaining three of the main, mutually reinforcing, changes that we made, informed by auction theory and expert advice.

First, the size of our purchase operations were designed to be flexible, adjusting automatically to reflect the quantity and quality of the offers received. This means the purchase pace can fluctuate to account for seasonality, market conditions and so on. It also encourages greater competition between offers, as some offers are likely to be rejected, even in auctions where there are a smaller total number of offers. By contrast our gilt purchases are made at a pre-announced pace through fixed-size auctions.

Second, we changed our allocation method within our auctions with the aim of promoting participation and competition. Experience has shown that the competitive nature of the gilt market routinely delivers widespread participation in our auctions.⁸ As the level of competition in the corporate bond market is much lower, a key priority in the design of these operations was to encourage strong participation from market makers. Accordingly we decided to adopt a uniform pricing method for these auctions, in which the Bank pays the same (highest) price for all the accepted offers to sell us a given bond. Our judgement, was that this approach would help incentivise participation and therefore competition, as participants do not need to make firm judgements about the overall market level, but can instead focus on their own valuations. This effect may be particularly important for increasing the likelihood of smaller or less informed market participants taking part. This increased participation should in turn increase the likelihood of the Bank achieving competitive pricing in its purchases. By contrast our gilt auctions allocate on a receive-your-offer ('discriminatory pricing') basis. This works well when broad participation is assured.

Third, the relative value of offers is judged in a different manner in our corporate bond operations. For gilts, we allocate relative to representative market yields at the end of our auctions – this enables participants to accurately anticipate the competitiveness of their offers. If a similar approach had been applied to our corporate bond operations, where there is considerably less certainty around the prevailing executable market price, the Bank would have risked allocating against stale market prices, or prices that could easily be influenced by participants in the auction. Given these considerations, the Bank chose instead to set minimum reserve spreads privately for each bond in the auction, drawing on a range of sources of information.

One factor is the balance of our portfolio relative to the market as a whole, where the MPC was very clear that purchases should be representative of outstanding issuance. The Bank therefore publishes every month a 'sector key', showing the target share of purchases for each sector alongside our current holdings.

⁸ Since the August 2016 decision, cover in these operations has averaged 3.1, with the second operation in August 2016, which received offers slightly below the target level of purchases, standing out as an anomaly.

By adjusting our reserve spreads over time to reflect progress against that sector key, we can make ourselves relatively more willing to buy in sectors where we are underweight, tilting purchases towards those sectors.

Collectively these choices were designed to encourage participation and competition in the auction, ensure that the Bank does not over-pay for bonds but delivers appropriate value for money, and accommodate the likely variable intensity of participation through time.

Impact so far

So if that was the theory, what have the results been?

Most obviously, and even before purchases began, there was a clear and immediate impact on market pricing from the announcement of the August package. Yields on gilts eligible for purchase in the APF fell by 14-18 basis points on the day (**Chart 4**).⁹

In the sterling corporate bond market yields fell by even more, with spreads to gilt yields narrowing by around 20 basis points. Little comparable movement was observed in equivalent US dollar or euro-area markets (**Chart 5**), suggesting this was largely attributable to the Bank's actions. And while only investment grade bonds are eligible for purchase in the APF, spreads on sterling non-investment grade bonds fell by a similar amount (**Chart 6**).

Turning to the corporate bond auctions themselves, participation has been widespread, with nearly 90% of eligible counterparties typically participating and making multiple offers in each auction. This depth of participation has helped ensure competitive allocations, with the Bank accepting only the most attractive offers received.

More tentatively, we think there is evidence that our auctions have provided a boost to secondary market liquidity for sterling corporate bonds more generally. Our contacts, as well as some proprietary data, suggest that the operations provide a liquidity point for the market that can catalyse trading activity. And there is some evidence that the scheme has dampened the volatility of corporate spreads relative to comparable equity and government bonds markets, with corporate bond spreads having remained stable during broader market volatility toward the end of last year.

Turning to the primary market, there was a sharp increase in sterling issuance after the scheme was launched, with total issuance by investment grade UK corporates of almost £10 billion between August and November – considerably higher than the same period in previous years (**Charts 7 & 8**). Market contacts suggest this reflects a combination of the lower cost of issuance and a surge of pent-up supply being brought to market, and we have heard several specific examples of issuance plans being increased in size, targeted at longer maturities, or switched to sterling directly in response to the announcement. This bears similarities

⁹ Gilts with greater than three years to maturity are eligible for purchase in the programme. The 3.75% September 2019 gilt was due to fall below this limit shortly after the announcement, so the impact on its yield was lower than for other bonds.

with the experience for the ECB where a comparable increase in Euro issuance was observed following the announcement of its CPSS scheme in early 2016.

Stepping back, the big picture is of a discernible impact on the cost of funding for firms and a strong second half of the year for issuance, despite a big uncertainty challenge. The introduction of the CBPS has helped ensure that downside risks following the referendum did not materialise and that the market remained robust in the face of wider market volatility.

In addition to those early successes, one area where the scheme has certainly been effective is the pace of purchases. Last week, and just four months since we started purchases, we passed the half-way mark for these purchases. This is faster than we expected at the outset, perhaps because the auctions have acted to boost secondary market liquidity by more than we had allowed for. So far our approach to setting reserve spreads has also successfully driven the Bank's holdings towards our 'sector key' (**Chart 9**), and I am confident it will continue to enable us to make our purchases in a neutral manner across economic sectors. So while our purchase pace will continue to depend on the nature of the offers we receive, and portfolio matching constraints are likely to become more binding as we near the purchase target, it seems probable that the Bank will be able to complete the purchase programme faster than we thought possible to begin with.

Conclusion

In concluding, I hope my remarks have helped demonstrate that a detailed understanding of market structure is a core part of effective central banking. From the experience of 2016 I'd draw two specific lessons.

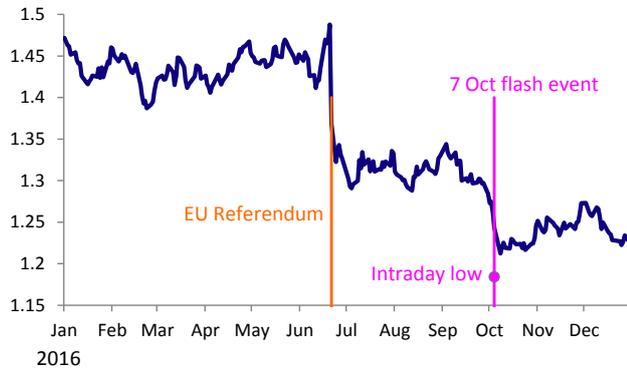
First, so long as central banks design their operations carefully, drawing on study of the relevant market structures, they retain the capability to broaden the range of policy tools at their disposal. The early success of the corporate bond scheme – both in effectively purchasing the bonds and in terms of initial evidence about the transmission to wider economy of those purchases – underscores the continued scope for central banks to innovate when circumstances dictate that need.

Notwithstanding the success of foreign exchange markets in processing the initial referendum news, the second lesson comes from the flash crash. It emphasises that central banks need to deepen their understanding of the features of modern market structures that exacerbate these vulnerabilities and why they seem to be occurring across a broader range of markets. In particular, we need a deeper understanding of the potential for flash events to have longer-lasting consequences than has been the case so far. That would increase the potential systemic costs of flash events and increase the case for some form of public policy response. In the Bank's context that helps explain why the Financial Policy Committee is seeking to examine the potential implications of these developments for financial stability.

I am sure that there are many broader lessons from 2016 that OMFIF will help us all work through, and look forward to benefiting from those insights, but for now, thank you.

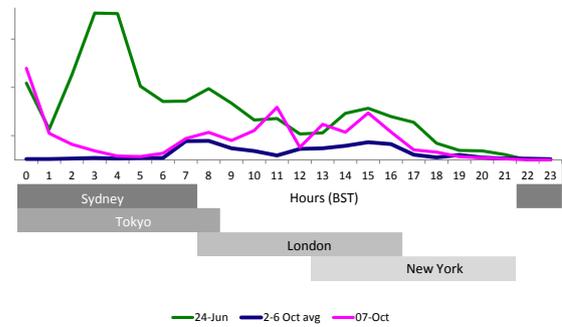
Annex

Chart 1: GBP/USD exchange rate in 2016



Sources: Bloomberg and Bank calculations

Chart 2: Trading volumes in GBP/USD on 24 June and 7 October



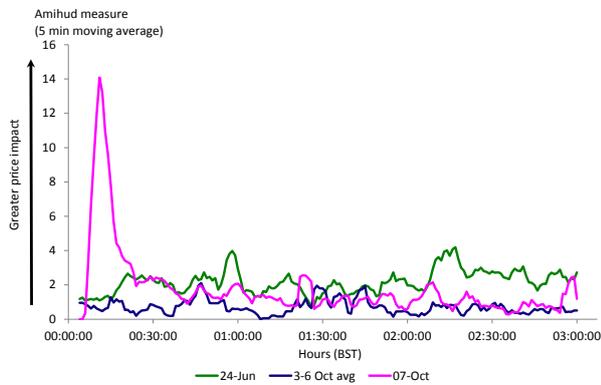
Sample periods are (BST):

- a) 24 June 2016 00:00:02 – 21:59:16
- b) 2 October 2016 18:51:07 – 6 October 23:56:06
- c) 7 October 2016 00:02:10 – 22:01:24.

Note: this measure is presented without scale for confidentiality reasons.

Sources: Thomson Reuters and Bank calculations.

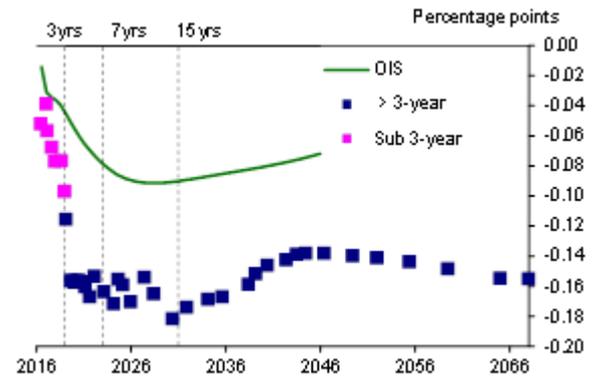
Chart 3: Price impact of individual trades in GBP/USD on 24 June and 7 October^(a)



(a) The Amihud measure of price impact calculates the ratio between price moves and volumes traded.

Sources: Thomson Reuters and Bank calculations.

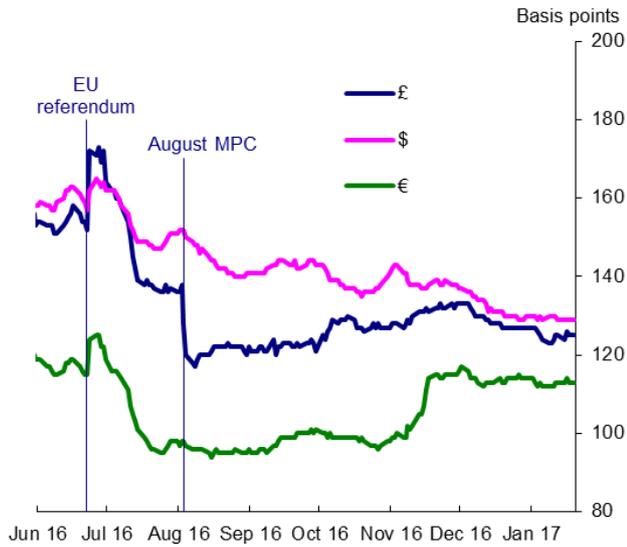
Chart 4: Change in gilt yields-to-maturity and OIS curve on 4 August 2016



Note: The Bank of England does not purchase gilts with maturity below 3-years.

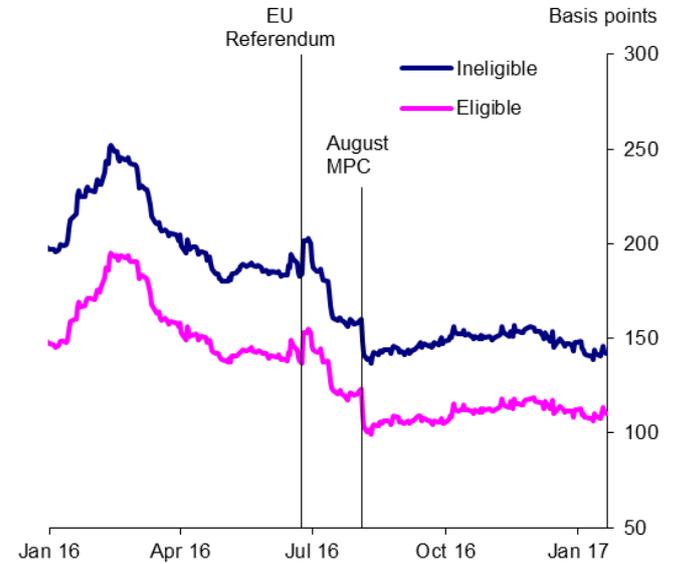
Sources: Bloomberg and Bank calculations

Chart 5: Investment grade, non-financial bond spreads



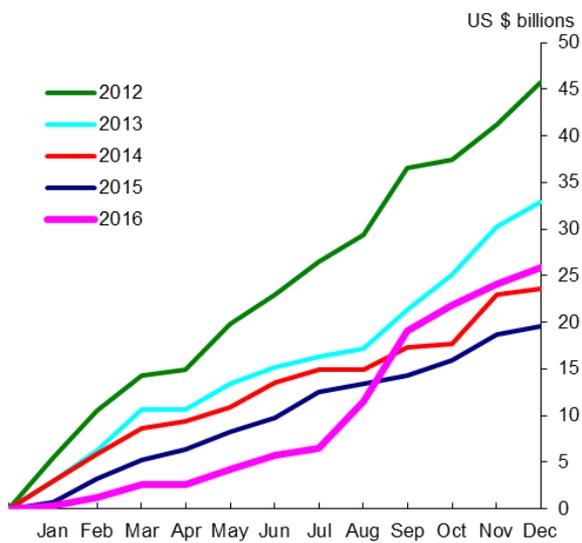
Sources: Bank of America Merrill Lynch, Bloomberg and Bank calculations

Chart 6: Sterling investment grade non-financial bond spreads, split by eligible and ineligible securities



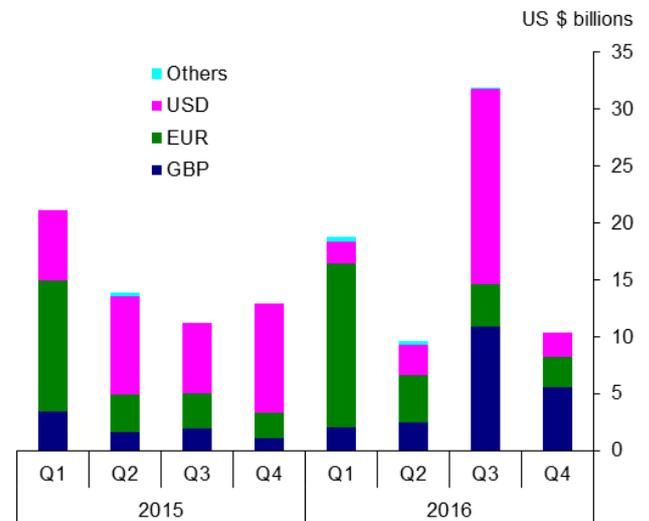
Sources: Bank of America Merrill Lynch, Bloomberg and Bank calculations

Chart 7: Sterling investment grade corporate bond issuance



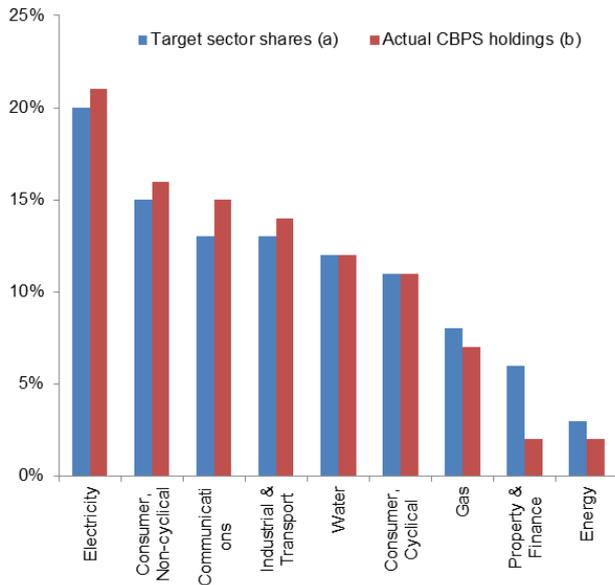
Sources: Dealogic and Bank calculations

Chart 8: Investment grade bond issuance by UK private, non-financial corporates (PNFCs)



Sources: Dealogic and Bank calculations

Chart 9: CBPS portfolio relative to sector key



(a) As at 5 January 2017

(b) As at CoB 4 January 2017

Source: Bank calculations