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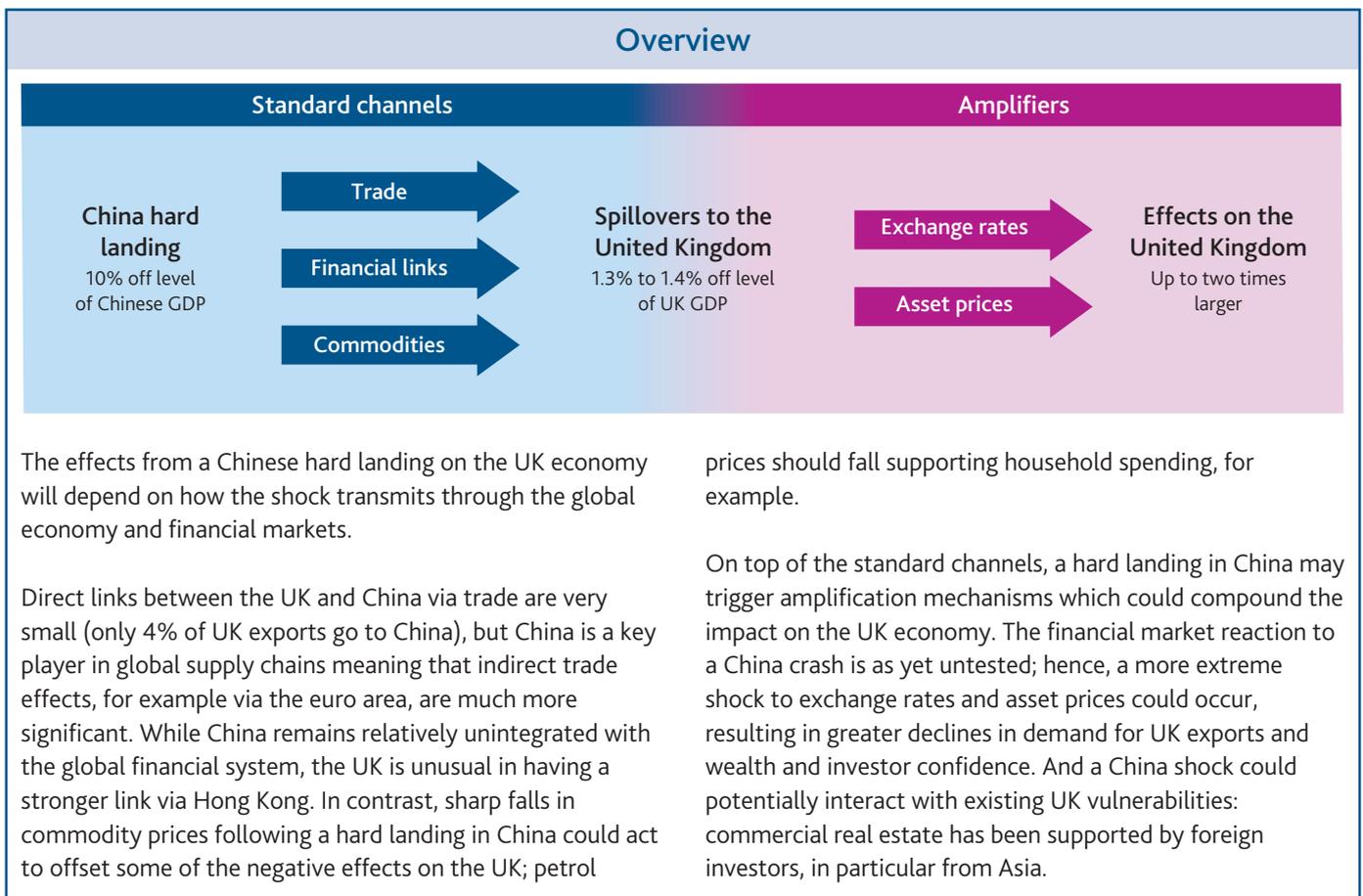
From the Middle Kingdom to the United Kingdom:
spillovers from China



From the Middle Kingdom to the United Kingdom: spillovers from China

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- China's credit boom is one of the largest and longest running ever recorded. Similar credit booms have typically preceded crises in other countries.
- This article provides an updated assessment of how a shock to the Chinese economy could affect the UK economy via standard transmission channels — such as trade and financial linkages. It then considers how amplification mechanisms, which could plausibly operate in the event of a particularly large shock, could further increase the impact on the UK from an economic crisis within China.
- We find that the effects via standard channels from a modest fall in Chinese GDP are larger than our previous estimates, primarily due to China's increasing role in global trade. A more extreme shock which triggers amplification mechanisms — such as a larger financial market reaction — could potentially double the effects from the standard channels alone.



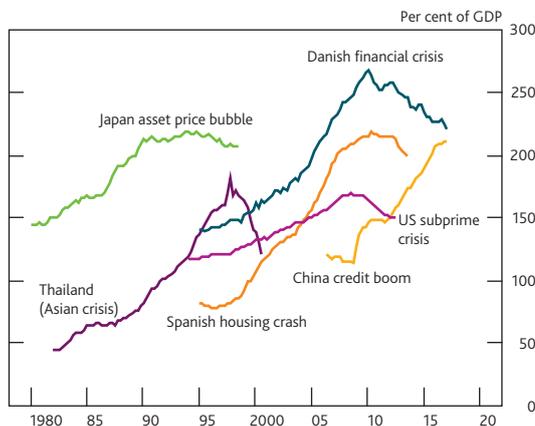
(1) The authors would like to thank: the *Quarterly Bulletin* editors, Katharine Neiss and James Talbot for useful comments; and Shaheen Bhikhu, Scott Simmons and Sameeta Thakrar for providing excellent research assistance.

Introduction

China's economic growth and integration into the global economy has been particularly rapid. China accounted for just 2% of global GDP in 1990, but now makes up 15% of global GDP (in 2017 US dollar terms). Following accession to the World Trade Organisation (WTO) in 2001, China has become the world's largest exporter of goods. And China is a major producer and consumer of commodities.

Such rapid economic growth has, in part, been maintained by an exceptional degree of credit growth ie lending to individuals and businesses. China's credit boom is now one of the largest and longest running ever recorded. Indeed, rapid credit expansions, such as China's, have typically preceded financial crises (Chart 1).

Chart 1 China's credit boom in a historical context^(a)



Sources: BIS total credit statistics and Bank calculations.

(a) Lending to the private non-financial sector at market value as a percentage of GDP, adjusted for breaks.

Credit growth has contributed to the build-up of three interconnected 'pillars of vulnerability' within China:⁽²⁾

- (1) a complex and opaque financial system;
- (2) a heavy reliance on the real estate sector; and
- (3) risks of capital flight at times of stress.

As a result, there remains a risk that Chinese growth could slow more sharply than expected or an economic crisis, commonly termed a 'hard landing', could occur. A hard landing in China would have large ramifications for the world economy and, in turn, the UK economic outlook.

This article provides an updated assessment of how a shock to the Chinese economy could affect the UK economy.⁽³⁾ The first section considers the standard transmission channels that are likely to operate regardless of the size of the China shock — such as trade and financial linkages. China's role in global trade has risen since Bank staff last investigated these links⁽⁴⁾ and we introduce new estimates from our expanded model suite. Although informative, particularly for modest moves in

Chinese growth, these estimates may understate the impact of a hard landing in China. The financial market reaction to a China crisis is as yet untested, for example. The second section therefore considers how amplification mechanisms, which could plausibly operate in the event of a large shock to the Chinese economy, might increase the impact on the UK from an economic crisis within China. Finally, we consider how China's integration into the global financial system could magnify the spillover effects in the future.

Standard transmission channels from a China shock to the rest of the world

Developments in the Chinese economy spill over to the UK and rest of the world through a number of different channels, in particular via: trade, commodities and financial linkages. These channels are likely to operate regardless of the size, or the nature, of the shock to the Chinese economy. In order to think about the overall impact from China to the UK, it is helpful to think about how these channels have developed and how large these channels could be, considering both the UK's direct links to China and its indirect links via other countries and regions. So this section provides an overview of these channels before presenting updated estimates of their combined effects.

Trade channels

The main channel through which a shock to the Chinese economy would affect the UK economy is international trade. Simply put, a fall in China's rate of growth reduces demand for the goods and services produced by UK firms.

The UK has little direct trade exposure to China — only 4% of UK exports go to China. But there are considerable indirect trade links, in particular via the euro area (Chart 2).⁽⁵⁾ China's importance in the global trade network rose rapidly following its accession to the WTO in 2001, and it has continued to rise more recently, even if the pace of integration has slowed notably since 2010. China is deeply embedded in global supply chains which could risk painting a misleading picture of China's importance as a driver of final demand. Almost 20% of China's imports are still used as components within exports to other countries, but this is down from 35% since 2005, reflecting the migration of some low value-added manufacturing to other parts of Asia, for example textile production to Vietnam. This means that, while the pace of trade integration has slowed, the rest of the world continues to become increasingly exposed to China as a source of final demand.⁽⁶⁾

(2) For more details on China's imbalances, see Chapter 2 of Dieppe *et al* (2018b).

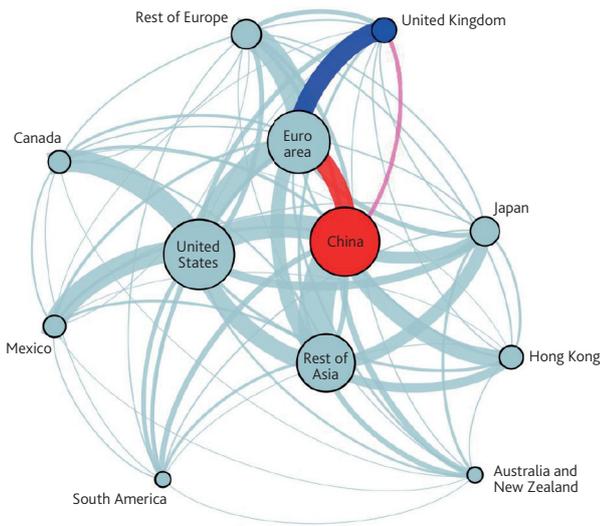
(3) All references to China's economy refer to mainland China. Mainland China and Hong Kong are referred to as 'Greater China' in this article.

(4) See Cesa-Bianchi and Stratford (2016).

(5) Germany is the UK's second biggest export market (11% of our goods exports), slightly behind the US (13%). Germany exports over 50% of the total value of euro-area goods exports to China.

(6) Indeed, Chart 2 now looks similar in either nominal values (shown) or value-added space (available on request).

Chart 2 China's role in the global trade network^(a)



Source: IMF Direction of Trade Statistics.

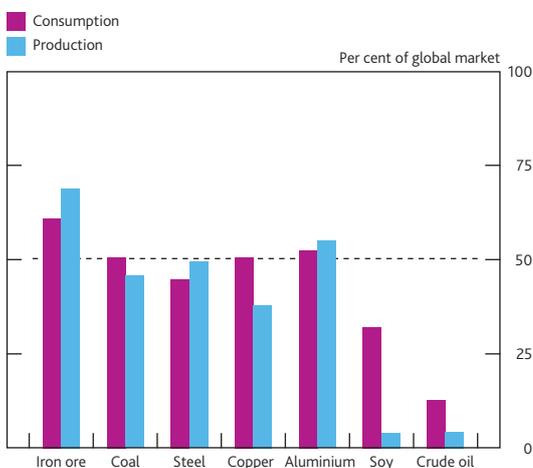
(a) Line thickness is proportional to total goods trade between regions. Circle size is proportional to regions' total goods trade with the other regions shown in the chart. Pink line denotes the UK's direct trade links with China, and the blue and red lines illustrate the UK's indirect links to China via the euro area. Data based on nominal 2017 US dollars.

Commodity markets

China underpins many major commodity markets; hence, a fall in Chinese demand could lead to dramatic falls in some commodity prices.

China accounts for around 40%–50% of coal, steel, copper and aluminium consumption and production, and it is now the second largest consumer of crude oil (**Chart 3**). It is also the world's largest importer of many agricultural commodities, such as soy beans. Estimates by Bank staff and the European Central Bank (ECB) suggest that a 1% decline in Chinese economic activity could reduce oil prices by around 5%, while metals prices could fall by between 5% to 15%.⁽⁷⁾

Chart 3 China's share of global consumption and production of selected commodities



Sources: Bloomberg, CEIC, Thomson Reuters Datastream and Bank calculations.

Falling commodity prices should boost the UK economy, given that the UK is a net importer of these goods. Households and

firms benefit when commodity prices fall; lower petrol prices free up money to spend on other goods, for example, boosting consumption. This would be partly offset by a fall in investment spending by the commodity extraction sector, for example in the North Sea oil fields. But reflecting their relative shares in the economy, the consumption effect typically dominates the investment effect in the UK.

Additional effects via the UK's trading partners will also depend on their balance between consumption and production. The emergence of North American shale oil production has shifted the balance in the US and Canada more towards production. Consumers in the US and Canada would still benefit from falling petrol prices, but the boost to their economies — and in turn their demand for UK exports — would be partly offset as falling investment in shale oil fields would drag on their economies. This implies a slightly less favourable boost to UK trade, as combined the US and Canada account for almost a fifth of UK exports.

Financial channels

Financial channels play an important role in the transmission of international shocks. A previous *Quarterly Bulletin* article found that financial linkages are likely to have accounted for the majority of the impact of world shocks on the United Kingdom since 2007.⁽⁸⁾ Given China's size in the global economy we might expect such spillovers to be significant.

But despite the size of its economy and domestic financial system, China is not very integrated in the global financial system. China's share of global holdings of overseas assets and liabilities remains low at 5% and 3%, respectively. In comparison, the US share of global external assets and liabilities is much higher, at around 18% and 23%, respectively. A network chart of banking links (**Chart 4**) shows a particularly stark difference to **Chart 2's** trade links. Unlike trade links, *most* countries have very limited banking links with China, even indirectly. Overall, low exposure, combined with improved bank capitalisation post-crisis, suggests that a China shock is unlikely to generate large direct financial losses for many countries.

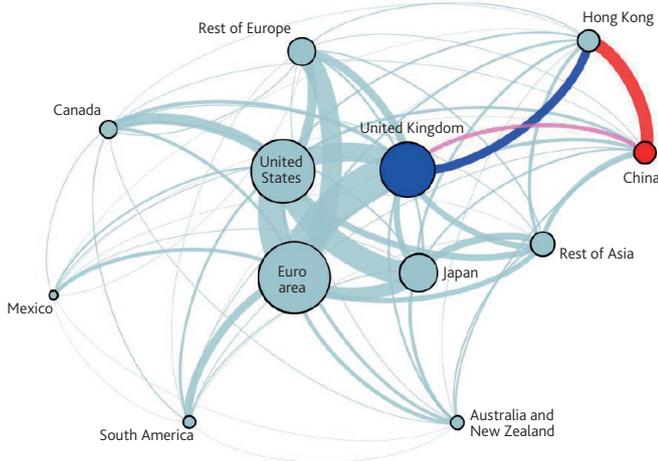
However, unlike *most* countries, the UK is unique in having both sizable direct exposures to mainland China, and indirectly via UK banks' exposures to Hong Kong (**Chart 5**). Together, UK banks' exposures to mainland China and Hong Kong exceed exposures to the US, euro area, Japan and Korea combined, despite the UK economy being a fifteenth of the size of these economies combined.⁽⁹⁾

(7) The ECB's study considers iron ore, copper and aluminium prices (Dieppe *et al* (2018b)).

(8) See Chowla, Quaglietti and Rachel (2014).

(9) The UK's financial exposures to China and Hong Kong have increased substantially relative to 2007, while, in contrast, UK exposures to the US and euro area have more than halved.

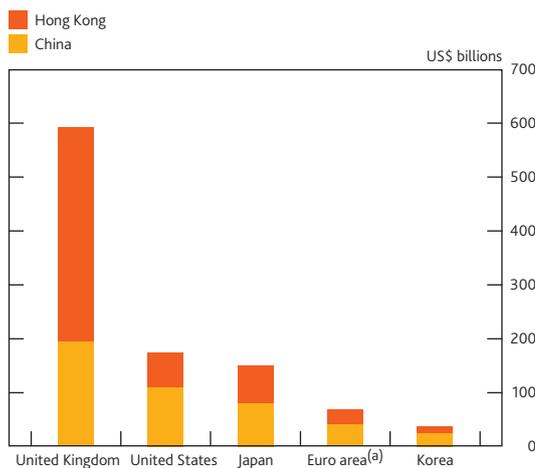
Chart 4 China's role in the global banking system^(a)



Sources: BIS international banking statistics and Bank calculations.

(a) Line thickness is proportional to an average of locational and consolidated banking claims between regions (subject to data availability). A region's circle size is proportional to that region's total claims on the other regions shown in the chart plus their total claims on that region. Pink line denotes the UK's direct banking links with China, and the blue and red lines illustrate the UK's indirect links to China via Hong Kong. Data based on 2017 nominal US dollars.

Chart 5 Country banking links to China and Hong Kong, 2017 snapshot



Sources: BIS consolidated banking statistics and Bank calculations.

(a) Euro area consists of Austria, Belgium, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain.

Bringing together the channels to model spillovers from China to the UK

To quantify how a shock to China might affect the United Kingdom it is important to try and capture the impact from all of the transmission channels, including their indirect effects via other countries.

We have recently updated and expanded our model suite as part of our continued monitoring of the global economy and international risks. To capture the transmission channels outlined above we use our updated Global Vector Autoregressive (GVAR) model and the new ECB-Global (ECB-G) model. The GVAR was used in a previous *Quarterly Bulletin* article assessing spillovers from China,⁽¹⁰⁾ and ECB-G has been developed by the ECB for studying international spillovers.⁽¹¹⁾ An intuitive overview of the models

is provided in the annex. Both models are well suited to estimate spillovers from China to the United Kingdom. Both allow shocks to propagate across the world economy through many channels of interdependence, such as trade and finance, including indirectly via other countries. And both models can be used to study countries' changing importance in the global economy over time.

Our updated and expanded model suite now suggests that spillovers from China to the United Kingdom are likely to be about 50% larger than previously shown in the *Quarterly Bulletin*. Stronger effects in the updated GVAR reflect two changes. First, we have added additional economies to the model, including Hong Kong and Taiwan, which are important trade hubs within Asia. This should capture more of the second-round effects, as the impact on China's close trading partners amplifies the initial shock. Second, China's importance in the global economy has continued to increase over the past few years.

To quantify the total effect from the standard channels we first define a modest shock to China as one that reduces the level of its GDP by 3% after three years, compared to the International Monetary Fund's (IMF's) current forecast. We assume the shock is front-loaded, such that Chinese GDP growth is around 2 percentage points lower in the first year and almost 1 percentage point lower than the IMF forecast in the second year. The updated GVAR and new ECB-G models both suggest that UK GDP could be reduced by around 0.2%–0.3% in the first year following the shock, and by the second year UK GDP would be 0.4%–0.5% lower (**Chart 6**).⁽¹²⁾ The larger peak effects from the ECB-G could be because it allows a wider range of financial spillovers than the GVAR, as well as negative demand effects through commodity producers.

Amplification mechanisms could increase the effects of a China hard landing on the UK

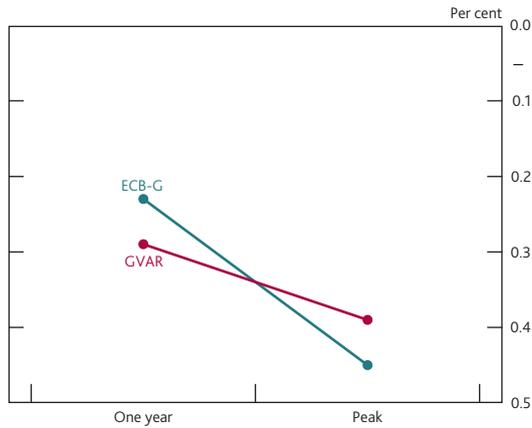
Although informative, these estimates risk understating the impact on the UK if a more severe shock were to occur. Additional amplification mechanisms — such as large foreign exchange or asset price moves — could kick in if China was to suffer a hard landing. Although China's rapid integration into the global economy means that these amplification mechanisms are largely untested, as we discuss below, financial markets do appear to be more sensitive to China news in times of stress.

(10) See Cesa-Bianchi and Stratford (2016).

(11) Dieppe *et al* (2018a) provides a detailed exposition of ECB-G.

(12) For comparison, the same shock would reduce UK GDP by 0.20% in year one and 0.25% in year two in the previous GVAR used in Cesa-Bianchi and Stratford (2016). Within the updated GVAR and ECB-G, similar shocks to US and euro-area GDP would reduce the level of UK GDP by around two and a half times more at peak. These effects are greater because of the UK's larger trade and financial linkages with the US and euro area.

Chart 6 Impact of a negative 3% shock to Chinese GDP on UK GDP after one year and at peak

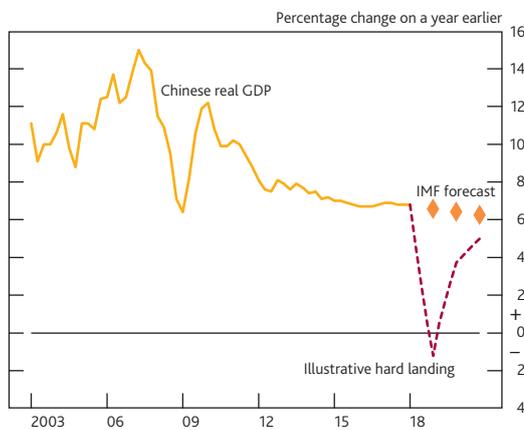


Source: Bank calculations.

An illustrative hard-landing scenario

Chart 7 shows the IMF forecast for Chinese GDP growth, which slows to around 6% per annum over the next three years. We show what might happen if a severe shock were to hit the economy resulting in Chinese GDP growth falling very sharply in the near term. This illustrative scenario is extreme: four-quarter GDP growth drops from around 7% to near -1%. Although growth recovers fairly quickly, the level of Chinese GDP is 10% below the baseline forecast after three years.

Chart 7 An illustrative hard-landing scenario^(a)



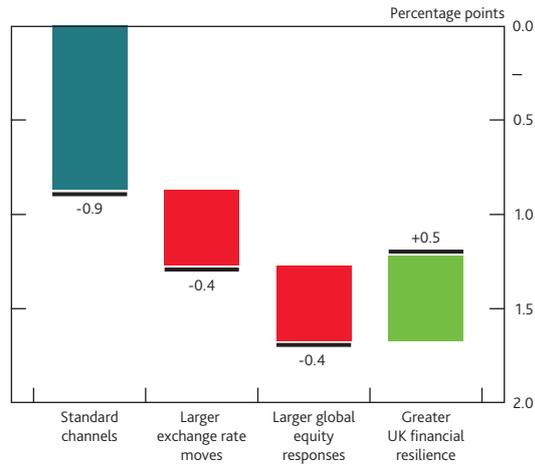
Sources: IMF *World Economic Outlook (WEO)* April 2018 and National Bureau of Statistics of China.

(a) The red dashed line displays an illustrative scenario in which the level of Chinese GDP is assumed to fall 10% below the IMF forecast after three years.

Considering both models, this illustrative scenario for a Chinese hard landing could reduce the level of UK GDP by 0.9%–1.0% after one year and 1.3%–1.4% at the peak. Since the GVAR and ECB-G are linear models the total effects are roughly three times that shown in **Chart 6** (as we move from a -3% shock to a -10% shock).⁽¹³⁾

We can however use the ECB-G model to explore how large potential amplification and mitigation mechanisms could be in the event of a large shock. In this section we next build up a spectrum of additional effects (**Chart 8**).

Chart 8 Potential amplification and mitigation effects from a China hard landing to the UK, one-year horizon



Source: Bank calculations.

Amplification from foreign exchange markets

Our models may not capture the depreciation of the Chinese currency (the renminbi) that could occur in a China hard landing. Within ECB-G, the Chinese exchange rate is not fully flexible. And more generally our models appear to struggle to capture potential depreciation effects, in part because the renminbi was heavily managed before 2014. It is also plausible that other Asian currencies could also fall, given their large exposures to China, magnifying the effects.⁽¹⁴⁾ Safe-haven capital flows could also contribute to the relative appreciation of advanced-economy (AE) currencies *vis-à-vis* Asia or emerging market economies (EMEs) more generally.

Larger foreign exchange (FX) moves in Asia (relative to AEs), could potentially reduce UK GDP in the first year by an additional 0.4 percentage points (**Chart 8**). The FX estimate shown here is of course quite uncertain and sterling has in the past had a tendency to depreciate against safe-haven currencies — such as the US dollar — during periods of acute global stress. For the UK, a relative depreciation of sterling *vis-à-vis* other AE currencies could therefore dampen the negative effect as UK exports become more competitive compared to safe-haven currencies, even if they lose competitiveness against Asian currencies.

Amplification from equity markets

Global financial markets exhibit substantial time-variation in their responsiveness to Chinese economic developments. For many countries, responsiveness to China will reflect to some extent their exposure to China via trade and commodity markets.⁽¹⁵⁾ But downside Chinese news now appears to

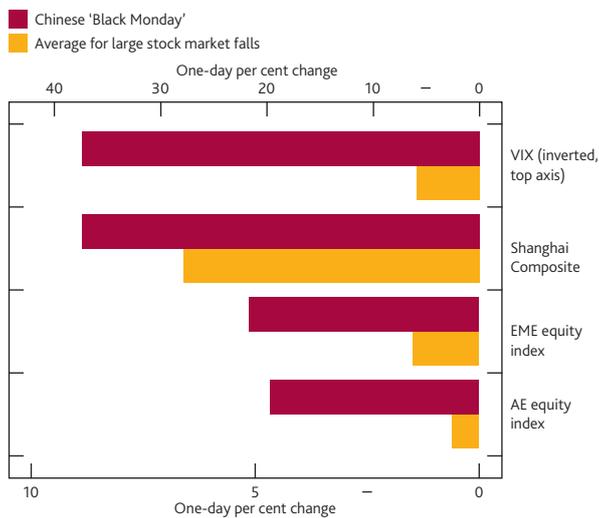
(13) Trade channels, both direct and indirect, likely account for over half the hit to UK GDP, while monetary policy and commodities cushion the effect on the UK somewhat.

(14) After the surprise devaluation of the renminbi on 10 August 2015, other Asian currencies typically depreciated by a similar or larger degree against the dollar. We assume that Hong Kong's currency board arrangement (Linked Exchange Rate System) to the US dollar remains in place.

(15) Mwase *et al* (2016).

matter more than it did previously. For example, on 24 August 2015 (known as China's 'Black Monday') Chinese equities fell by over 8%, erasing gains for the year. The stock market collapse spilled over to equity markets elsewhere too, with AE and EME indices falling by 4%–5% on the day (Chart 9) — this is considerably more than the average reaction to large stock market moves in China, shown by the red bars. And on the same day, the VIX — a measure of financial market uncertainty — surged so much that quotations were suspended in the early trading session. If we add in a larger equity shock to our models — in a similar vein to China's 'Black Monday' — this could knock a further 0.4 percentage points off UK GDP. Hence, the combined effect from more adverse financial market moves could nearly double the effect of a China hard landing on the UK (Chart 8).

Chart 9 Equity market and VIX moves around large Chinese stock market events^(a)



Sources: Bloomberg, Thomson Reuters Datastream and Bank calculations.

(a) A large Chinese stock market event is defined as a date on which the Shanghai Composite fell by more than 5% and was associated with Chinese news (for a list of dates, see Arslanalp *et al.* (2016)). AE equity index is an average of FTSE 100, S&P 500 and Euro Stoxx 50. EME equity index is MSCI.

Mitigation from a more robust UK banking sector

Post-crisis regulatory reform may mitigate some of the negative effects on the UK economy. Simply put, more robust banks in the UK should absorb some of the negative effects before they reach households and firms.

We illustrate this in ECB-G by assuming that added UK bank resilience could limit the extent to which higher risk premia in financial markets are passed on to interest rates facing borrowers.⁽¹⁶⁾ This could mitigate around 0.5 percentage points of the shock to the UK economy. And to the extent that banks globally are also significantly more robust than the pre-crisis period, this would also further dampen the shock to the UK by reducing the negative effects coming from the UK's main trading partners.

Risks from Chinese investment in UK real estate

Finally, while most of the effects from a China hard landing come indirectly via broad macrofinancial effects, there is one direct channel that poses a risk which we do not model: investment from China in UK property.

Estimates of Chinese investment in UK property are somewhat uncertain, but it appears that investment from Asia has risen notably since 2010 and accounted for over 40% of London commercial real estate purchases in 2017, up from only 6% in 2010.⁽¹⁷⁾ And as flagged in the *Financial Stability Report*, London commercial real estate valuations look stretched.

Overall, it is not clear what the implications of a China hard landing would be: investments could be liquidated, but capital flight from China to the UK may also act as a support, further buoying markets.

China's integration into the global financial system will raise spillover effects in the future

As discussed earlier, China's financial integration has lagged well behind China's integration into the global economy (Chart 10). One reason for this is that China's capital account — which reflects cross-border flows of investment — has been very restricted. For instance, although foreign direct investment inflows have been gradually liberalised since the late 1970s, tight restrictions on portfolio and banking flows have persisted until very recently. And although it has become more open over time, restrictions on China's capital account remain high relative to other G20 countries.

Impact of liberalisation — an illustrative scenario

Over the past few years the Chinese authorities have gradually taken a number of measures to further open up the capital account. Although progress slowed in 2016 in response to capital outflow pressures, Chinese authorities maintain their commitment to further capital account liberalisation in the future.

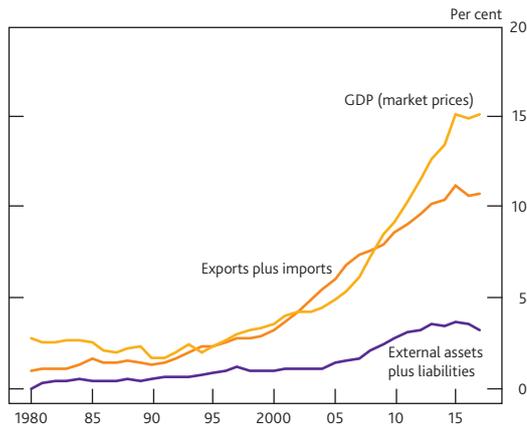
A previous *Quarterly Bulletin* explored the potential impact of full financial liberalisation in China on the global financial system,⁽¹⁸⁾ which will depend on the *speed* and *scale* of capital account opening, and on the future *size* and *composition* of China's external balance sheet.⁽¹⁹⁾ Under a plausible scenario

(16) We model this by stopping rising private sector risk premia from being passed on to borrowers — a reasonably strict, but tractable, modelling assumption. This could also be achieved by the Bank of England using a Term Funding Scheme, which provides funding to banks and building societies at rates close to Bank Rate — it is designed to encourage them to reflect cuts in Bank Rate in the interest rates faced by households and businesses.

(17) Wong (2017), using a variety of sources, shows that more than 10% of Chinese foreign residential real estate investment typically ends up in the UK — worth about £7 billion in 2015.

(18) See Hooley (2013).

(19) The composition of China's external balance sheet is much more heavily weighted to foreign direct investment on the liabilities side and official foreign exchange reserves on the asset side compared to other major economies.

Chart 10 China's international integration, 1980–2017

Sources: IMF *International Financial Statistics*, IMF *WEO* April 2018, Lane and Milesi-Ferretti (2007) and Bank calculations.

in which China's external position converges towards the experience of advanced Asian economies such as South Korea, China's share of global cross-border asset holdings could double by 2025.⁽²⁰⁾

Even under this relatively conservative scenario, this would imply large shifts in portfolio investment. Likewise, cross-border bank lending to, and borrowing from, China, would also increase markedly. Hence, as the Chinese financial system integrates further into the global financial system, the influence and risks from China to the rest of the world will continue to rise. Increasing financial linkages correspondingly within ECB-G suggests that further integration of China's financial system could increase spillovers from a hard landing by a third.⁽²¹⁾

Conclusion

This article answers three questions: first, through what channels could a shock to the Chinese economy affect the UK economy? Second, how large are the spillover effects from China to the UK likely to be? And third, how might a China hard landing amplify the spillovers to the UK?

We answer these questions by updating the Bank's Global VAR model, and applying the new ECB-Global model. The updated Global VAR accounts for a richer array of trade links than the version used in a previous *Quarterly Bulletin*. In particular, the updated Global VAR captures important indirect trade links through Hong Kong and Taiwan. The new ECB-Global model explicitly captures additional transmission channels, including financial links and the effects on oil producers. Considered together, our updated and expanded model suite now suggests that spillovers from China to the United Kingdom are likely to be about 50% larger than previously shown in the *Quarterly Bulletin*.

We find that a modest 3% shock to Chinese GDP could reduce the level of UK GDP by 0.4%–0.5%. A large fraction of this reflects indirect trade links. A larger, illustrative 'hard landing' in China that reduces the level of Chinese GDP by 10% could reduce the level of UK GDP by 1.3%–1.4%. But if amplification mechanisms — from exchange rate and asset price moves — are allowed to operate, the hit to UK GDP could potentially be twice the size.

Post-crisis regulatory reform has substantially improved the capitalisation of banks, making them more resilient to economic stress. In that sense, more robust banks may have created a mitigation mechanism to reduce the negative effects on the UK economy. The Bank of England's 2017 annual cyclical scenario stress tests incorporated a China hard landing of a magnitude similar to that shown in the illustrative scenario here, but also included more severe recessions in the US and euro area than are plausible from a China-centric shock alone. Banks were judged to be resilient to this larger global shock.⁽²²⁾

Looking ahead, China's continued integration into the global economy is likely to have important implications for the UK economy and the rest of the world. The UK's indirect trade links with China will probably remain the main transmission channel from China to the UK, but China's continued integration into the global financial system will make the global economy increasingly sensitive to developments in China in the future.

(20) We estimate that holdings could increase from 3% to 7%. The increase in the size of the external balance sheet is assumed to be accompanied by a marked diversification towards private sector flows. And, for comparison, the US international investment position currently accounts for around 15% of the world total, suggesting that financial integration would continue to rise beyond 2025.

(21) Assuming the share of Chinese assets in international portfolios were to double (with an equal offset in holdings of assets from the rest of the world), the additional impact on top of the 'standard channels' of the China hard landing on UK GDP would increase by 0.3 percentage points to 1.2%.

(22) The 2017 stress test shows the UK banking system is resilient to deep simultaneous recessions in the UK and global economies, large falls in asset prices and a separate stress of misconduct costs. The economic scenario in the test is more severe than the global financial crisis. For more details please see: Stress testing the UK banking system: 2017 results; www.bankofengland.co.uk/stress-testing.

Annex

A quick overview of the models

The Global VAR (GVAR) is an empirical model estimated with historical data. It should capture the average spillovers from shocks that have been seen in the past. The model allows shocks to propagate across the world through many channels, including direct and indirect spillovers through trade as well as some asset and commodity price links.

A previous *Quarterly Bulletin* article described GVAR estimates of the spillovers from China to the UK economy. That article also includes a more detailed discussion of the advantages and disadvantages of the GVAR modelling approach. The model is estimated in two steps. First, individual models are built for a large number of economies. In these models, a number of key domestic variables — real GDP, inflation, equity prices, interest rates and the exchange rate — are all affected by each other, as well as by international variables like the oil price, world GDP and world inflation. Second, individual country models are linked with international variables to create a global model for the world economy.

The ECB-Global (ECB-G) model is a rich multi-country model for the euro area, the US, the UK, Japan, China, oil-producing economies, and the rest of the world. Like the GVAR, shocks

can propagate across the world through direct and indirect trade channels in ECB-G. In addition, ECB-G includes more detailed cross-country financial links than the GVAR.

Within ECB-G, core domestic macroeconomic variables, like inflation and GDP, are determined by well-known structural relationships that underpin aggregate demand and aggregate supply in each economy. Trade flows are also accounted for using data on countries' bilateral trade flows. As a consequence, a reduction in one region's GDP (eg China) can spill over to the UK through both the direct trading links between China and the UK, and indirect trading links through third countries (eg trade between China and the euro area and, in turn, trade between the euro area and UK).

The model core is enriched by equations which capture, among other things, the relationships between financial risk premia and the state of the economy. The risk premia are modelled to replicate realistic relationships between asset prices and the state of the economy. For instance, financial risk premia are assumed to increase when economic activity within a country falls. Reflecting international financial links, changes in financial risk premia in one region (eg China) can spill over to the UK within the model. As with the trade links, financial spillovers can be direct or indirect and are determined by regions' international financial exposures.

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