

# The international transmission of monetary policy: Korea's experience

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## Abstract

Monetary policy shifts in advanced economies are transmitted to emerging market economies (EMEs) through monetary policy responses by EME central banks and changes in cross-border capital flows. The ripple effects, however, depend upon the EMEs' macroeconomic fundamentals and the amount and composition of the portfolio investment funds that have already flowed into them. Since the 2008 global financial crisis, Korea, like other EMEs, has been influenced, directly and indirectly, by the quantitative easing (QE) and quantitative easing tapering (QET) of major advanced economies. This paper discusses the international transmission effects occurring during the transformation to QE and QET, the related monetary policy responses and the challenges ahead, with a focus mainly on Korea's experience.

Keywords: Financial spillovers, capital flows, long-term interest rates, monetary policy challenges

JEL classification: E52, F41

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Monetary policy shifts in advanced economies have been transmitted to emerging market economies (EMEs) via two channels: monetary policy responses by EME central banks, and cross-border capital flows. In the early phase of the global financial crisis, EME central banks, including the Bank of Korea (BOK), lowered their policy rates to counter the sharp economic contraction and the collapse of international trade flows. Such policy responses were affordable in part because of the significant policy space created by major central banks' drastic cuts in policy rates to near zero; as a result, EME central banks were able to lower their own policy rates while maintaining adequate interest rate differentials vis-à-vis advanced economies. Although many EMEs experienced significant capital outflows immediately after the outbreak of the crisis, this would have occurred even if EME policy rates had not been reduced.

Faced with the so-called zero lower bound, major central banks deployed unconventional monetary policies that combined forward guidance on their future monetary policy stances with balance sheet operations. These included the large-scale asset purchases by the US Federal Reserve (the Fed) and the long-term financing operation of the ECB. The increased global liquidity under these policies helped to contain systemic risks and boost investors' appetite for risk, while at the same time flowing into emerging markets in the search for yield. Large EMEs whose macrofinancial fundamentals were relatively strong received significant capital inflows and experienced currency appreciation. As many global banks in advanced economies were forced to deleverage, the bulk of capital flows to EMEs was in the form of portfolio investments, which have been less volatile than banking flows.

The financial spillovers from unconventional monetary policies differed across EMEs, however, depending upon their macrofinancial fundamentals and their policy responses. Some EMEs instituted capital controls to put the brakes on surges in capital inflows and the attendant currency appreciation, while others used macroprudential tools in conjunction with sterilised FX intervention. For some EMEs, where capital inflows were large and accompanied by currency appreciation, domestic credit expanded and asset prices enjoyed buoyancy; at the same time, their external positions worsened, with current account deficits rising. The global financial markets were taken by surprise when the Fed first hinted at its intention to taper off its asset purchases in May 2013. They reacted with substantial asset price corrections even before the tapering began. In both advanced and emerging market economies, stock prices fell while long-term interest rates rose. Some fragile EMEs were hit hard with sharply falling currency values and sudden capital outflows. The global financial markets, however, remained relatively calm when the tapering actually began in 2014, although these fragile EMEs continued to face high financial market volatility.

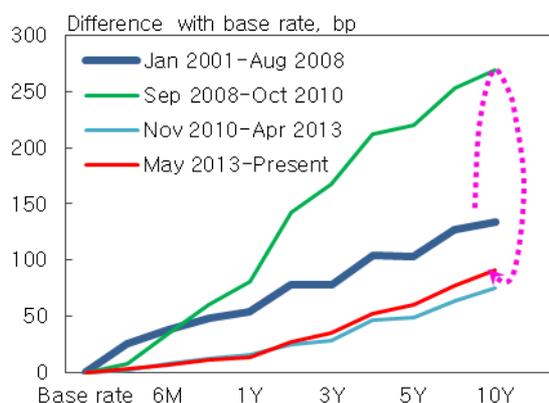
Korea has weathered the global financial crisis and the subsequent debt crises in the euro area relatively well, thanks to its strong fundamentals and adequate policy responses. Nevertheless, it has also been affected by financial spillovers from unconventional monetary policies, and has faced challenges in its conduct of monetary and foreign exchange policies. In what follows, this note summarises Korea's experience in addressing these spillovers and the associated challenges.

## Financial spillovers and co-movements in long-term interest rates

Korea's open and liberalised capital markets have been fertile ground for financial spillovers and synchronised asset price movements. As global liquidity abounds, mainly because of extraordinary monetary easing in advanced economies, as discussed above, international portfolio investment funds have continued to flow into EMEs. Korea's long-term interest rates have consequently plummeted, and the yield curve has flattened since the commencement of the second round of quantitative easing (Figure 1). Moreover, through liquidity and portfolio effects, the co-movements in long-term interest rates between advanced and emerging market economies have in fact strengthened compared to the pre-crisis period, with significantly higher correlations (Figure 2).

Yield curve

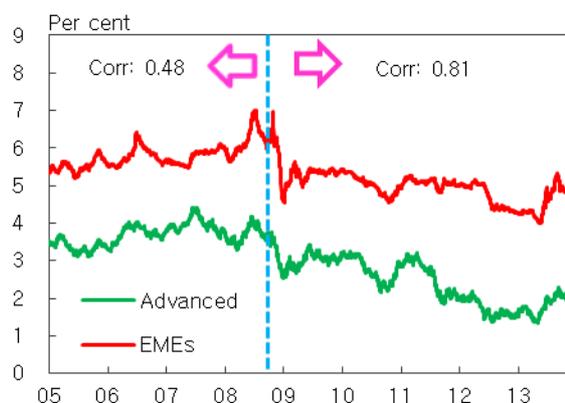
Figure 1



Source: Korea Securities Computing Corporation (KOSCOM).

Long-term interest rates<sup>1</sup> in advanced<sup>2</sup> and emerging market economies<sup>3</sup>

Figure 2



AEs = advanced economies; EMEs = emerging market economies.

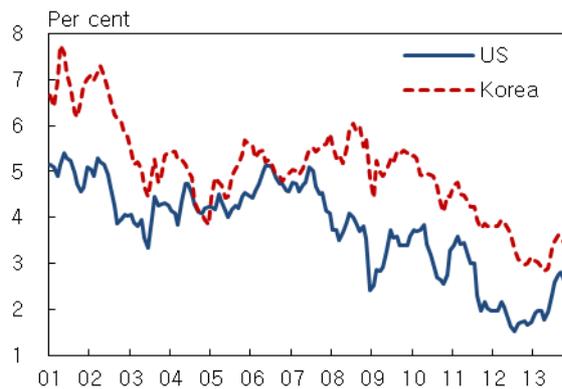
<sup>1</sup> Ten-year treasury bond yields (three-year yields for Korea). <sup>2</sup> Average of the United States, Japan, Germany, the United Kingdom and France. <sup>3</sup> Average of Korea, India, South Africa, Turkey, Chinese Taipei and Thailand.

Source: Bloomberg.

Korea is no exception in this regard. Over the past decade or so, long-term interest rates in Korea have trended broadly in parallel with those of the United States and other advanced economies, with even stronger co-movements since the global financial crisis (Figure 3). For instance, the correlation between 10-year treasury bond yields in Korea and the United States was 0.5 before the crisis, but has jumped to nearly 0.9 in the post-crisis period (Table 1).<sup>2</sup> As a result, the Bank of Korea has often encountered difficulties in controlling financial conditions by changing its policy rate, as long-term rates have tended to be affected more by capital flows and external factors, such as the US monetary policy stance, than by domestic short-term rates. Empirical evidence also supports the growing influence of foreign factors on long-term rates. First, Granger causality test results show that the causality runs unilaterally from US long-term rates to domestic long-term rates, particularly during the post-crisis period (Table 2). Second, formal regression analysis suggests that, during the post-crisis period, US long-term rates have had a significant impact on long-term rates, while domestic and other factors have had less influence than in the pre-crisis period (Table 3).<sup>3</sup>

Long-term interest rates: Korea and the United States<sup>1</sup>

Figure 3



<sup>1</sup> Based on 10-year treasury bond yields.

Sources: Bank of Korea; Federal Reserve; Bloomberg.

<sup>2</sup> The coefficients of correlation between the 10-year treasury bond yields of Korea and those of the United Kingdom, Germany and Japan were 0.4, 0.8 and -0.1 before the crisis, but have all risen to 0.9 in the post-crisis period.

<sup>3</sup> The results are robust to various specification tests. The same results obtain, for instance, if five-year or three-year treasury bond yields are used for the dependent variable, or if a lagged dependent variable is added as an explanatory variable.

Correlation with US long-term interest rates<sup>1</sup>

Table 1

	Pre-crisis (Jan 2001–Dec 2008)	Post-crisis (Jan 2009–Aug 2013)
Korea	0.49	0.89
India	0.47	-0.40
Indonesia	-0.28 <sup>2</sup>	0.74
Mexico	0.05 <sup>3</sup>	0.87
South Africa	0.27	0.82

<sup>1</sup> Based on 10-year treasury bond yields. <sup>2</sup> From July 2003 to December 2008. <sup>3</sup> From August 2001 to December 2008.

Sources: Bank of Korea; Federal Reserve; Bloomberg.

Results of Granger causality test (F-statistics)<sup>1</sup>

Table 2

Null hypothesis	Pre-crisis (Jan 2001–Dec 2008)	Post-crisis (Jan 2009–Nov 2013)	Whole period (Jan 2001–Nov 2013)
US interest rates $\Rightarrow$ Korean interest rates	1.20	2.18*	3.28**
Korean interest rates $\Rightarrow$ US interest rates	1.42	1.11	1.05

The symbols \* and \*\* indicate significance levels of 10% and 5%, respectively.

<sup>1</sup> Ten-year treasury bond yields; the lag is 4.

Source: Bank of Korea staff calculations.

Ordinary least squares estimation results: determinants of Korean long-term interest rates<sup>1, 2</sup>

Table 3

	Pre-crisis (Jan 2004–Dec 2008)	Post-crisis (Jan 2009–Oct 2013)	Whole period (Jan 2004–Oct 2013)
Constant term	0.504 (2.613)	8.371*** (1.777)	3.126** (1.406)
Expectations for base rate (R) <sup>3</sup>	0.459*** (0.082)	0.265** (0.110)	0.310*** (0.093)
Inflationary expectations <sup>3</sup>	0.541* (0.320)	-0.074 (0.159)	0.087 (0.186)
Composite leading indicators year-on-year	0.076* (0.041)	0.013** (0.007)	0.021** (0.010)
Real effective exchange rate of Korean won	0.001 (0.013)	-0.074*** (0.016)	-0.027** (0.011)
US 10-year Treasury bond yields	0.056 (0.098)	0.909*** (0.065)	0.760*** (0.100)
Chicago Board Options Exchange Market Volatility Index (VIX)	0.012* (0.007)	0.007 (0.007)	0.020** (0.009)
	N = 60 Adj R <sup>2</sup> = 0.57	N = 58 Adj R <sup>2</sup> = 0.92	N = 118 Adj R <sup>2</sup> = 0.81

The symbols \*, \*\* and \*\*\* indicate significance levels of 10%, 5% and 1%, respectively.

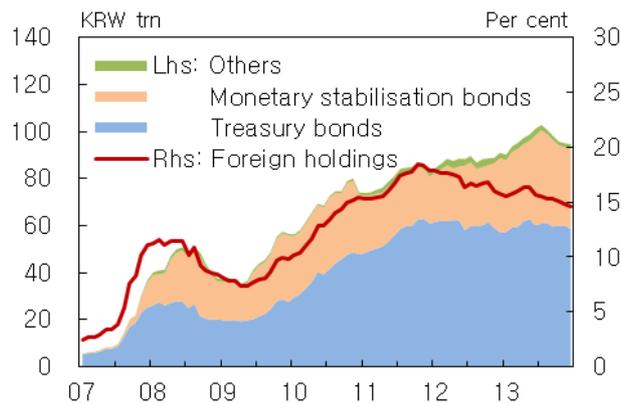
<sup>1</sup> Dependent variable: Korean 10-year treasury bond yields. <sup>2</sup> Figures in brackets are heteroscedasticity and autocorrelation consistent (HAC) standard errors. <sup>3</sup> Public survey data.

Source: Bank of Korea staff calculations.

There are two related effects that appear to explain the strengthened impact of US interest rates on domestic long-term interest rates during the post-crisis period. First, the increased portfolio investment inflows have pushed long-term rates down through liquidity effects. Foreign investors' holdings of domestic bonds, which stood at only 5 trillion won at the end of 2006, have increased rapidly since 2008 to surpass 100 trillion won by mid-2013, with the bulk of this concentrated in treasury bonds and monetary stabilisation bonds issued by the BOK. As a consequence, the foreign share of treasury bond holdings had risen from a mere 3 per cent in early 2007 to 18 per cent by the end of 2011 (Figure 4). Second, the debt maturity structure has changed in favour of yield curve flattening. Faced with large capital inflows driven by abundant global liquidity, the authorities have not only deployed macroprudential tools, but have also undertaken sterilised interventions when the FX market volatility increased significantly. In this process, the BOK has mopped up the liquidity by issuing monetary stabilisation bonds with maturities of up to two years, *ceteris paribus* creating upward pressure on short-term interest rates. As foreign portfolio investment has been concentrated in treasury bonds with maturities of three years or longer, however, long-term interest rates have been subject to downward pressure, resulting in a flattened yield curve.

Foreign investment in Korean bonds

Figure 4



Source: Bank of Korea.

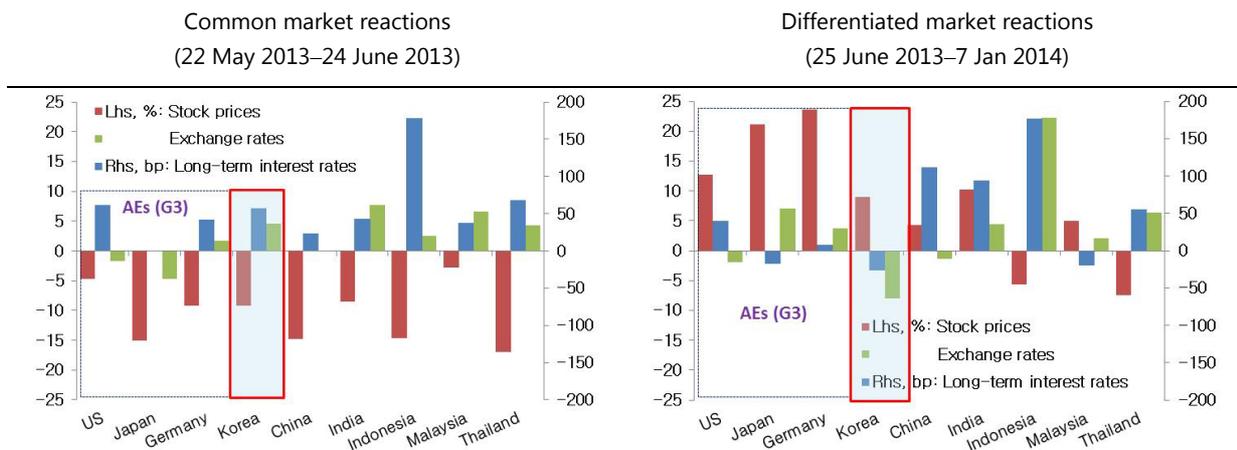
Since May 2013, when the Fed hinted at its intention to taper off its large-scale asset purchases, a second round of financial spillovers has been felt by many EMEs, but in the opposite direction. In May and June 2013, when the global financial market strains were at their (local) peak, all Asian EMEs experienced stock price declines, steep rises in interest rates and currency depreciations. The markets soon began to differentiate among EMEs on the basis of their fundamentals, however, and Korea has benefited from such differentiated reactions (Figure 5). Differentiated market reactions have been observed in terms of capital flows as well. Korea had in the past exhibited higher capital flow volatility than the EME average, perhaps owing to its open and liquid capital markets. Unlike many other EMEs, however, Korea witnessed relatively stable capital flows during the second half of 2013. For example, while many other EMEs were experiencing capital outflows, there were notable inflows of portfolio investment funds to Korea in this period (Figure 6).

Given its strong external position and financial fundamentals, Korea has thus far managed the financial spillovers from the somewhat acute and volatile asset price corrections in the global financial markets relatively well. Although Korea has received

large amounts of bond flows since the global financial crisis, the talk of tapering did not lead to any significant increase in long-term interest rates or in their volatility. Foreign investment in Korean debt securities in 2008–2012 totalled more than US\$ 90 billion, the third largest amount among EMEs after Brazil and Mexico. Between May and August 2013, however, yields on 10-year treasury bonds were, at their peak, only 1 percentage point higher than their end-April level in Korea, while ranging from 2 to 4 percentage points higher for other major EMEs in the G20 (Figure 7). The daily variation in market interest rates was likewise lower for Korea during this period (Figure 8).

Financial market developments: selected Asian EMEs<sup>1, 2</sup>

Figure 5



AEs = advanced economies; G3 = Group of Three (the United States, Germany and Japan).

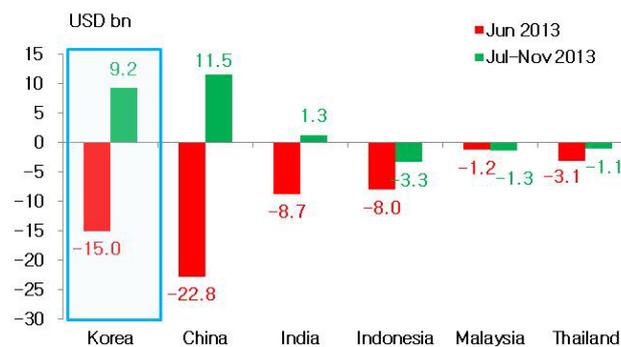
<sup>1</sup> Interest rates: 10-year treasury bond yields for the United States, Japan and Germany; three-year treasury bond yields for Asian EMEs.

<sup>2</sup> Exchange rates: a positive value indicates appreciation; the US Dollar Index was used for the US dollar.

Sources: Bank of Korea staff calculations; Bloomberg.

Portfolio investment in Asian EMEs<sup>1</sup>

Figure 6



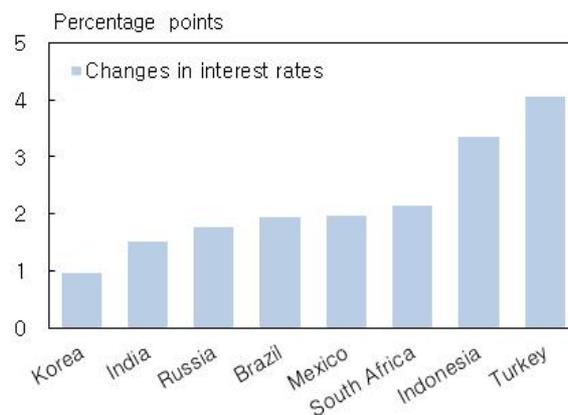
<sup>1</sup> Average monthly volumes.

Sources: Bank of Korea staff calculations; Emerging Portfolio Fund Research (EPFR).

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## Impact of tapering talk on long-term interest rates<sup>1</sup>

Figure 7



<sup>1</sup> Ten-year treasury bond yields compared to end-April 2013, based on record highs from May to August (1 May–2 July for Brazil).

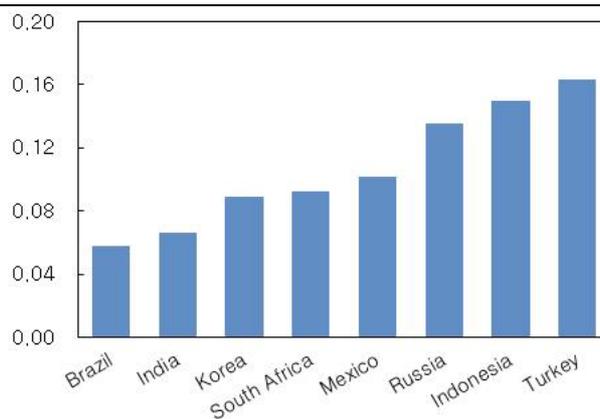
Source: Bloomberg.

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## Volatility of long-term interest rates<sup>1</sup>

(Variation coefficient)

Figure 8



<sup>1</sup> Based on daily interest rates on 10-year treasury bond yields from May to August 2013 (1 May–2 July for Brazil).

Source: Bloomberg.

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## Policy responses

Given the ever growing cross-border financial linkages, the monetary policies of major advanced economies have provided important input to the BOK's policy rate decisions, particularly since the capital account liberalisation in the late 1990s. At the same time, volatile global market conditions, fickle capital flows, and exchange rate volatility have all posed significant challenges to EME monetary policymaking, and the financial linkages have often constrained the monetary policy response to developments in domestic inflation and the business cycle. In 2011, for instance,

when the BOK raised its policy rate to counter rising inflation pressures, long-term interest rates reacted little to this monetary tightening.

Use of non-interest rate policy instruments during the Lehman crisis

Table 4

Policy goal	Improving interest rate channels	Improving conditions for issuance of bonds with credit risk	Increasing banks' lending capacities	Increasing liquidity supply
Policy instruments	<ul style="list-style-type: none"> <li>– Long-term repurchase operations to facilitate certificate of deposit and commercial paper market transactions</li> <li>– Treasury bond purchases</li> <li>– Adding bank debentures, etc, to securities eligible for open market operations</li> </ul>	<ul style="list-style-type: none"> <li>– Supporting bond market stabilisation fund</li> </ul>	<ul style="list-style-type: none"> <li>– Raising aggregate credit ceiling</li> <li>– Paying interest on reserves</li> <li>– Supporting recapitalisation funds</li> <li>– Increasing scope of lending collateral</li> </ul>	<ul style="list-style-type: none"> <li>– Monetary stabilisation bond redemptions prior to maturity</li> <li>– Increasing scope of financial institutions eligible for open market operations</li> <li>– Easing reserve management</li> </ul>

Source: Bank of Korea.

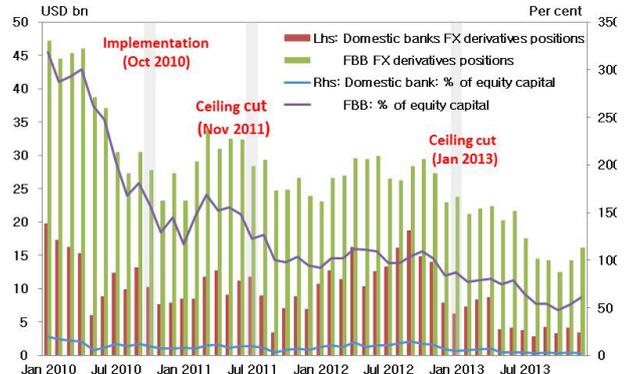
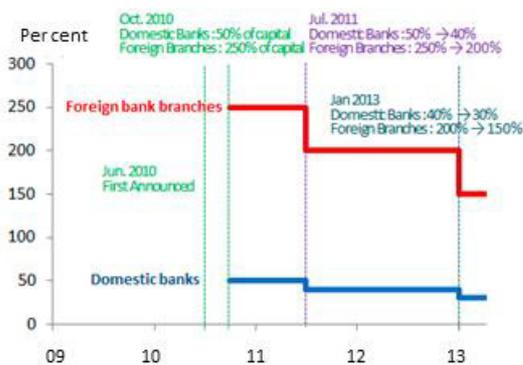
In the early stage of the global financial crisis, the BOK deployed various non-interest rate policies in efforts to stabilise the exchange and interest rates, including the purchase of treasury bonds and liquidity operations targeting a large array of financial institutions (Table 4). Such policies helped to restore the monetary policy transmission channel and to reduce counterparty risks in the interbank markets. The BOK also intervened in the foreign exchange markets to stabilise the exchange rate by auctioning off FX liquidity to both the interbank markets and the FX/currency swap markets.

Macroprudential policy measures: Korea

Figure 9

Cap on banks' FX derivatives positions (as a percentage of equity capital)

Banks' FX derivatives positions



FBB = foreign bank branches.

Source: Bank of Korea.

Aside from keeping its macrofinancial fundamentals in sound condition, Korea empowered its monetary policy with macroprudential and credit policies during the later phase of the global financial crisis. As part of its FX-related macroprudential tools, leverage caps on the FX derivatives positions of banks and a bank levy on non-core FX liabilities were introduced in 2010 and 2011, respectively, and since then have been adjusted flexibly in line with market conditions. Although it may be premature to assess the effectiveness of these two measures, preliminary evaluation<sup>4</sup> suggests that they have been effective in reducing the currency and maturity mismatches on bank balance sheets (Figures 9–10). To be specific, short-term external debt as a share of total external debt and foreign reserves has fallen markedly over the past few years (Figure 11).

Currency and maturity mismatches of domestic banks

Figure 10



<sup>1</sup> FX liabilities minus FX assets. <sup>2</sup> Short-term FX liabilities minus short-term FX assets.

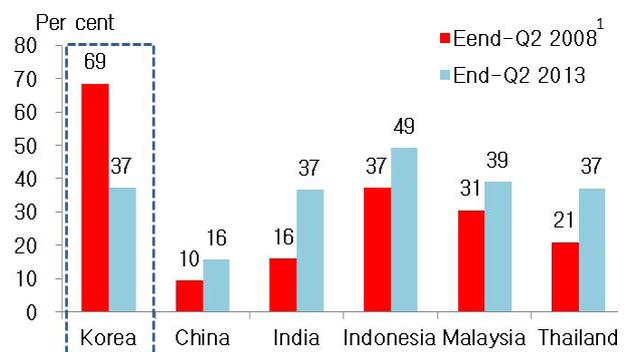
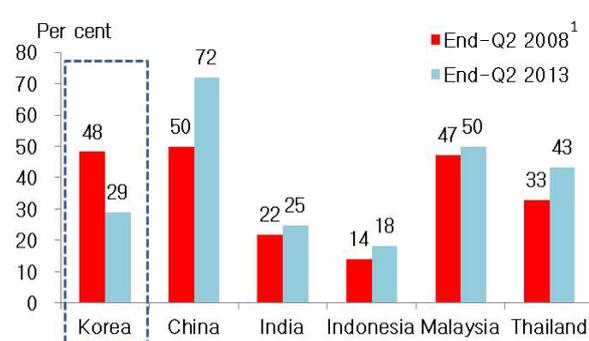
Source: Bank of Korea staff calculations.

External debt: selected Asian EMEs

Figure 11

Ratio of short-term external debt to total external debt

Ratio of short-term external debt to foreign exchange reserves



<sup>1</sup> For China, end-Q4 2008.

Sources: Bank of Korea staff calculations; IMF, *International Financial Statistics* and Special Data Dissemination Standard.

<sup>4</sup> Choi (2013).

## Policy challenges

From now on, the monetary policies of EMEs will continue to face challenges related to financial spillovers and the global transition to a “new normal”. The key challenges for Korea and other financially open EMEs can be summarised as follows.

First, unsynchronised exits by major advanced economies from their extraordinary monetary easing would be likely to create exchange rate volatility among key reserve currencies, which would in turn have significant implications for international trade and investment. A continued and large depreciation of the Japanese yen could harm Korea’s competitiveness in global markets. Higher exchange rate volatility among the key currencies would add more uncertainty to the investment decisions of firms. Last, but by no means least, the financial spillovers from US monetary tightening – ie hikes in the federal fund rates – could be far more adverse than those resulting from tapering. Monetary policy would therefore need to be well calibrated in order to strike the right balance between financial stability and economic recovery.

Second, EMEs operating under inflation targeting regimes may have to prepare for the risk of global secular stagnation and disinflation, if not deflation. Persistently lower global inflation will pass through to persistently lower domestic inflation. Under these circumstances, EME central banks may need to reconsider the suitability of their inflation targets. Similarly, the risk of secular stagnation would have profound implications for the natural rate of interest or the long-run equilibrium real interest rate. And even if the risk of secular stagnation is ruled out, there are good reasons to believe that the long-run equilibrium real interest rate will be at a lower level than in the past, eg owing to changes in prudential regulations and financial market infrastructure. If so, returning to the pre-crisis norm would be unduly contractionary.

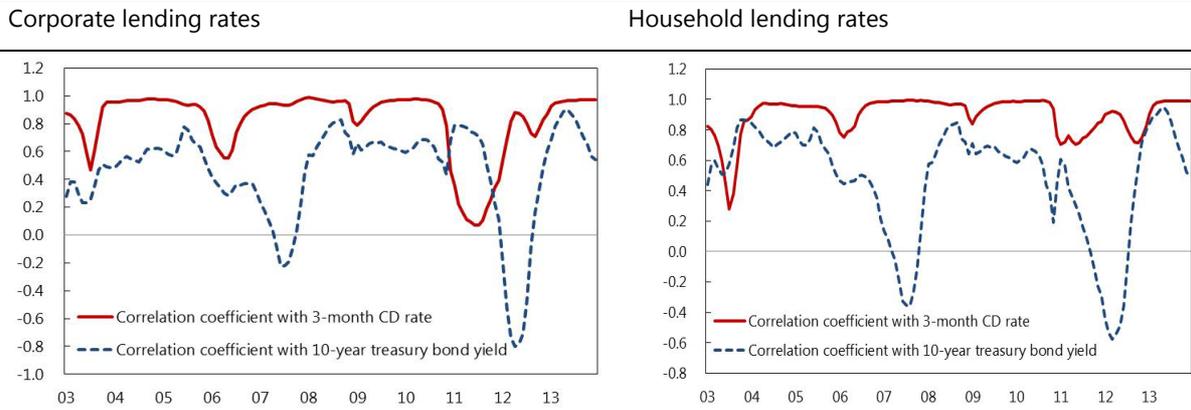
Third, EME central banks may be forced to expand the scope of their monetary policies, thus risking their independence. Since the crisis, central bank mandates have in fact been expanded in many countries to include financial stability and/or growth and employment. Moreover, unconventional monetary policies and forward guidance have been used to manage virtually the entire yield curve, rather than just its short end. While extraordinary circumstances (eg hitting the zero lower bound or impairment of the monetary transmission channels) may offer some justification for such yield curve management, the information content of asset prices can be distorted or degraded as a result. Nevertheless, EME central banks may go beyond adjusting their policy rates and opt to manage the longer end of the yield curve as part of their policy responses to financial spillovers.

EME central banks may also be tempted to manage the yield curve because of the segmented corporate funding structure, whereby large firms fund mainly through capital markets, while small and medium-sized companies depend heavily on bank lending. In Korea, and perhaps many other Asian EMEs, short-term interest rates have accounted for an important part of monetary policy transmission to the real economy through their impact on bank lending rates. A large portion of the bank lending that goes to small and medium-sized firms and households has been offered at variable interest rates, and also at relatively short maturities (of, say, one year or less). Indeed, bank lending rates have tended to move in closer alignment with short-term (three-month) than with long-term (10-year) treasury bond rates (Figure 12). Moreover, short-term debt makes up a large share of total corporate

debt (Figure 13).<sup>5</sup> Long-term interest rates, in contrast, matter more for large firms, whose primary sources of funding are capital markets. In consequence, the entire yield curve would probably become significant for corporate funding and investment.

Bank lending rates and market interest rates: correlations<sup>1</sup>

Figure 12



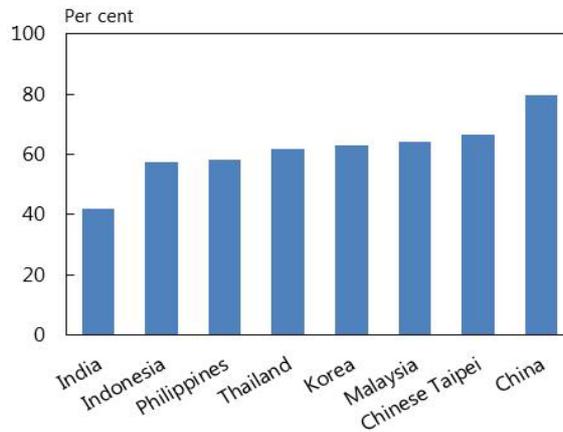
<sup>1</sup> Moving correlation coefficients over the preceding two years (24 months).

Source: Bank of Korea.

### Short-term corporate debt

As a percentage of total corporate debt

Figure 13



Source: IMF (2011).

Lastly, but no less importantly, FX reserve management would pose increasingly more complex challenges to EME central banks. Total FX reserves have risen continuously since the global financial crisis, reaching US\$ 7.5 trillion in June 2013, compared to US\$ 4.9 trillion at end-2008. This is partly a result of the policy efforts of EME central banks to mitigate the complications arising from the surges in capital inflows associated with the unconventional monetary policies undertaken in

<sup>5</sup> IMF (2011).

advanced economies. On the central bank balance sheet, a large stockpile of FX reserves is typically matched by large domestic liabilities. This creates considerable currency mismatches and also causes great financial costs to central banks, given the positive domestic/overseas interest rate differentials. But large levels of FX reserves also bring financial benefits to the national economy as a whole, by offering greater financial stability and reducing the costs of external borrowing by the private sector. While the opportunity costs of holding large levels of FX reserves should therefore be compared to the financial stability benefits at the national level, central banks may assume most of these costs.

Easier and more predictable access to the global financial safety nets would probably be a short-term solution that could benefit both emerging and advanced market economies. An ultimate long-run solution would be the internationalization of EME currencies so that EMEs can borrow from global markets in their own currencies. To that end, EME central banks can act collectively to increase the global demand for their currencies for trade and investment purposes. Along this line of argument, the BOK has been active in arranging bilateral local currency swap facilities with other EME central banks. Such swap arrangements can be used to support trade settlement in local currencies and to help reduce excessive dependence on the US dollar.

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