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**Implications of Negative Interest Rate Policy on
Emerging Markets and Developing Economies**

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Čestné prohlášení:

Prohlašuji, že jsem diplomovou práci na téma Implications of Negative Interest Rate Policy for emerging markets and developing economies vypracovala samostatně a veškerou použitou literaturu a další prameny jsem řádně označila a uvedla v příloženém seznamu.

V Praze dne

Podpis

Abstract:

This paper is focused on effects of negative interest rate policy of central banks in advanced economies on emerging market and developing countries. It has been argued that asset prices in developing economies financial markets are influenced more by the monetary policies of the advanced economies rather than by their own policies and fundamentals. Spillover effect are mostly similar to those of other unconventional monetary policy measures and it is hard to differentiate them as they were implemented together at the same time. This paper examines gross financial flows between the countries exposed to negative interest rates and developing countries. Financial flows were led by the motivation of investors who lost their profit opportunities in domestic markets and trying to search for new profit opportunities in emerging markets. This may harm financial stability of emerging markets.

Key words: negative interest rate policy, emerging markets and developing economies, cross-border capital flows, macroprudential policy

Abstrakt:

Tato diplomová práce se zabývá důsledky politiky záporných úrokových sazeb centrálních bank ve vyspělých zemích na rozvíjející se ekonomiky. Všeobecně se dnes již předpokládá, že ceny na trhu v rozvojových zemích jsou ovlivňovány více monetární politikou vyspělých zemí, než jejich vlastní politikou nebo vývojem makroekonomických veličin země. Nepřímé přeshraniční efekty této politiky zhruba odpovídají efektům dalších nekonvenčních monetárních politik a je těžké jednotlivé efekty od sebe odlišit, jelikož jsou většinou aplikovány současně. Tato práce zkoumá přeshraniční hrubé toky kapitálu mezi ekonomikami, které jsou ovlivněny zápornými úrokovými sazbami, a rozvíjejícími se zeměmi. Přeshraniční investice vzrostly zejména z důvodu, že investoři ztratili investiční příležitosti na domácí půdě a ve snaze o dosažení vyššího zisku přesouvají svůj kapitál do rozvíjejících se zemí. To ovšem může ohrozit finanční stabilitu rozvíjejících se zemí.

Klíčová slova: politika záporných úrokových sazeb, rozvíjející se ekonomiky, přeshraniční toky kapitálu, makroprudenční politika

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Introduction

Over the last decade the world economy has been roiled by the global financial crisis of 2008, the resultant European debt crisis, which led to the advanced economies implementing unconventional monetary policies. Central banks extensively increased their balance sheets by buying various kinds of assets, which has resulted in strong increases in reserves that commercial banks hold at the central bank. However, despite the dramatic increases in the money base, central banks could not achieve their price stability target.

Against the background of continued growth disappointments, depressed inflation expectations, and declining real equilibrium interest rates, a number of central banks introduced negative interest rate policies (NIRP), a new framework for strengthening monetary easing. Instead of paying interest, these central banks are now charging commercial banks for holding their excess reserves. The goal is to stimulate banks to increase their lending activity or to be more active in managing their liquidity.

The NIRP phenomenon started when four central banks of the Eurozone, Switzerland, Sweden, and Denmark, adopted negative interest rates for their deposit facilities from mid-2014 to early 2015. Japan followed in January 2016. Hungary was the first emerging market to introduce negative rates in March 2016.¹ Almost 25 percent of the global economy is affected by negative deposit interest rates by central banks.

The main motivation for the implementation of NIRP by the central banks of the Eurozone, Sweden, Japan and Hungary, was the need to stabilize inflation expectations and to support growth. For example, Sweden, as a small open economy, faced growing risks from a slump in the housing market and deflation caused by a drop in the oil price and global commodity prices. The beneficial effect for Denmark and Switzerland was to relieve pressure on their currencies by reducing capital inflows. The overall effect of NIRP is to reduce market interest rates. This stimulates borrowing,

¹The Central bank of Norway has also lowered its reserve rate below zero but it has not adopted a negative interest rate policy and the Norwegian reserve rate has had little or no influence on market rates. The Bulgarian National Bank and the Central Bank of Bosnia and Herzegovina also have introduced negative policy rates, not as an active monetary policy measure but instead to transmit the ECB's monetary policy, given their currency board arrangements with the euro as the anchor.
Source: central banks, IMF

depreciates the currency, increases exports, and maintains inflation levels, all beneficial to the economy. It also allows continued transmission to all concerned of Central Bank monetary policy, allowing all to work in unison.

Many economists see such a policy action as unprecedented, and believe its effects over time will vary among countries. NIRP shows the resolve of the Central Banks to meet their policy objectives, despite the perceived zero lower bound of usual interest rates. So far, NIRP have facilitated some easing of financial conditions, with limited side effects. There is some evidence of a decline in loan and bond rates following the implementation of NIRPs. Banks profit margins have remained mostly unchanged. And there have not been significant shifts to physical cash. (IMF, 2017)

What are the implications of negative interest rates for emerging markets and developing economies (EMDE)? It has long been argued that asset prices in EMDE financial markets are influenced more by the monetary policies of the advanced economies than by their own policies and fundamentals. NIRP also has consequences for developing economies through channels such as global liquidity, global portfolio rebalancing and global trade.

While the central banks using NIRP have mitigated deteriorating conditions in targeted markets in the developed countries, spillover effects associated with inflows of capital and higher volatility in currency and financial markets are seen in the developing countries. The impact of NIRP on developing economies has varied across countries reflecting the scale of their exposure to developed countries (both in terms of trade and financial linkages), their individual cyclical positions, and the type and scale of response of monetary authorities to capital inflow.

In particular, lower bond yields (resulting from NIRP implemented in the developed countries) cause investors to seek higher, if riskier, returns by investing in EMDEs, boosting growth in the developing countries, if these economies are operating below capacity. On the other hand, such investing can result in an overheating, if the economy is already operating at or above capacity.

Aggressive fiscal and monetary policies were appropriate responses to the recession, but their prolonged use has created serious distortions. According to Mervyn King, a former Bank of England governor, "maintaining interest rates at extraordinarily low levels for years on end has contributed to the rise in asset prices

and the increase in debt. Debt has now reached a level where it is a drag on the willingness to spend and likely to be the trigger for a future crisis.”. The effect of NIRP is to bring forward future spending. King argues that this means there will not be money to invest in the future, which will seriously affect future growth in economies currently relying on NIRP stimulus.

To look closer on effects of NIRP on EMDEs we will analyze the international capital flow between the advanced economies that use negative rates and EMDE countries financially linked to these countries. We will discuss how usage of negative rates and other unconventional monetary policies of advanced economies affects cross-border financial flows. Further, we will try to summarize if the capital flow benefited EMDE countries and how it imply with its financial stability.

The paper is organized as follow. The first section introduce the use of negative interest rates by central bank as unorthodox monetary policy and its transmission to economy. The second section present the countries that applied NIRP. The third section discuss cross-border financial linkages, identifying a measuring vulnerabilities and liquidity risk and macroprudential policy. The fourth section introduces data presented in this paper. The fifth section analyses the cross-border lending in the currencies exposed to negative rates. The last two section are devoted to particular EMDE, Turkey and the Republic of Korea, and spillover effects of NIRP on these countries.

1 Negative Interest Rates

Major central banks cut their policy rates to, or slightly above, zero during the global financial crisis to deal with weak demand and below-target inflation. As zero was then considered the lower bound for policy rates, monetary easing had before then been achieved through other unconventional measures such as asset purchase programs, exchange-rate interventions and credit easing. These policies led to a substantial decline in long-term interest rates, and helped support a slow and uneven recovery in economic activity. However, spare capacity persisted in many advanced economies and both actual and expected inflation were still drifting below official targets (Arteta et al., 2016).

With inflation still below desired targets, and downward pressure on inflation expectations, central banks have implemented unorthodox policies. First came quantitative easing and then negative interest rates. These two policies have similar objectives, but they operate in very different ways. They both aim to reduce the cost of risk and the time value of money. Christian Noyer pointed out the main differences between quantitative easing and negative interest rates: Quantitative easing refers to the practice by which central banks purchase longer-term assets in private markets in order to reduce their supply, raise asset prices and lower yields all along the yield curve below prevailing market rates. Negative interest rates mean that central banks charge a fee on overnight deposits of excess reserves at the central bank. Their aim is not only to lower short-term interest rates further but also suppress short maturity bond yields and push banks to lend.

Christian Noyer argues that quantitative easing and negative interest rates, in a sense, work against each other: “Quantitative easing creates excess liquidity that goes to the central bank in the form of excess reserves. When the central bank charges for excess reserves, commercial banks have to pay the costs. If they increase lending, that very action further increases deposits as borrowers deposit their loan proceeds before they draw them down. If banks do what the central bank wants them to, they end up with more reserves and more costs.”.

A paper by Angrick and Nemoto (2017) point out that negative interest rates are not entirely new. Negative policy rates and negative money market rates have been seen in several economies in the past. What is new is the official announcement of

NIRPs by monetary authorities and the combined application of different measures to push policy rates and nominal interbank rates more substantially and more permanently below zero. These features define NIRPs and distinguish NIRPs from traditional interest rate policy in positive territory.

Central banks use a range of tools to implement monetary policy but normally identify one short-term interest rate as their key policy rate, which can be a refinancing rate, deposit rate, etc.. The interest rate can be described as the price of money, or in investment terms it is the price of liquidity. The key policy rate is known by a number of different terms depending on the country and they allow central banks to affect interbank rates, money market rates, and eventually, it is assumed, retail rates. It is commercial banks, not the central bank, that supply money to the economy. The interbank rate is the rate that ultimately affects other market rates in the economy, across different markets and across the term structure.

NIRPs were implemented on the back of large interbank liquidity balances (“liquidity surplus”²), which were the result of quantitative easing policies (especially in the euro area and Japan) or financial inflows from abroad (Switzerland, for example). In an environment of excess liquidity, market interest rates are no longer determined by the central bank’s refinancing rate but by the deposit facility rate. NIRPs were implemented by lowering the central bank deposit rate into negative territory, followed by downward adjustment of other policy rates, until the interbank overnight rate reached the desired negative level. Lowering interbank and other interest rates encouraged banks to take greater risks and facilitated portfolio rebalancing.

Commercial banks hold deposits at their central bank to settle interbank transactions and to meet legal minimum reserve requirements. For the reasons mentioned above, the banking system in NIRP countries currently holds reserves and other central bank liabilities above required amounts. In the euro area and Switzerland, the liquidity surplus is held as overnight deposits (reserves), whereas in Denmark and Sweden the central banks use a combination of overnight and one week liabilities. In addition, the ECB, DN and SNB all exempt at least part of the reserve holdings from

² Liquidity surplus comprises bank deposits held by the central bank minus the use of the marginal lending facility, as well as liquidity held on the current account above the amount of mandatory reserves.

negative interest rates³. (BECH and MALKHOZOV, 2016)

Some economies have a tiered reserve system, where only a share of the reserves is subject to the negative marginal rate. They introduced such systems together with NIRPs. In other economies, central banks maintain exemption thresholds, and only reserves above these thresholds face the negative deposit rate.

Theoretically, expansionary monetary policy increases the money supply in order to boost private-sector borrowing and consumer spending, to stimulate economic growth, ultimately increasing employment. The ECB economists argue that negative rates are lowering business borrowing cost. Across the NIRP countries, loans from banks to corporations have become less expensive since negative rates were adopted (Olson and Wessel, 2016). Of course, it is difficult to pinpoint how much of the decline was due to negative rates, and how much was caused by other developments in the economy or by other programs run by central banks. NIRP may, however, affect bank profits and encourage excessive risk-taking.

As such, NIRP needs to be handled with care to secure benefits while mitigating risks. Whereas some central banks have reduced their policy rates below - 0.5 percent without any easily discernible financial market distortions, it is unclear whether rates could go much lower or for a protracted period of time, without leading to greater risks of financial market disruptions (Arteta et al., 2016).

When nominal rates become negative, the transmission mechanism of monetary policy to the economy may differ. This may provoke particular banks to do something unusual because they must deal with the downward stickiness of retail deposit rates, which affect their bottom lines. Movement in deposit rates has varied across countries but banks have generally proved reluctant to move to negative rates as retail depositors could switch to cash to avoid paying interest.

³ In Denmark, the central bank offers one-week certificates of deposit funds with a yield currently at – 65 bp. In contrast, overnight demand deposits in the current account earn zero. Both an aggregate limit and individual limits have been set on the amount of funds that can be held in the current accounts. If the aggregate limit is exceeded at the end of the day, then deposits exceeding the individual limits are converted into certificates of deposit. In addition to interest rates, DN has actively varied the current account limits (BECH and MALKHOZOV, 2016).

1.1 Channels of Transmission for NIRP

Effectiveness of NIRP depends on the characteristics of individual economies. Factors such as how banks finance themselves, the prevalence of private pensions, the strength of national currencies, and the use of alternatives to cash, are particularly important. Such variables can determine whether negative interest rates support the general economy by increasing investment or spending or fails to.

Arteta, Kose, Stocker, and Taskin (2016) provide an empirical analysis of the transmission of negative policy rates to other financial variables in the NIRP economies, up to mid-2016, arguing that NIRP has worked analogously to conventional monetary policy easing measures by providing more elasticity and improving funding conditions, although these effects appear less pronounced than after comparable rate cuts in positive territory. The main transmission channels are through the interest rate, bank lending, portfolio rebalancing, and via the exchange rates, which are defined below.

NIRP is expected to be transmitted through **interest rates**. Interbank and other interest rates have fallen with central bank deposit rates. It is unclear whether these effects reflect negative rates as such, or the substantial surplus liquidity associated with other unconventional monetary policies. While unconventional monetary policies brought the short-term interest rates close to zero, long-term interest rates remained far higher. Fukuda (2017) found that after NIRP implementation, long-term and short-term interest rates fell below zero and the gap between them became negligible.

The impact of negative rates on **bank lending** has differed across banks, reflecting their banking models and lending practices. Banks that rely more on customer deposits for funding themselves have been less able to reduce lending rates. These banks are reluctant to pass through negative deposit interest rates to their customers fearing large cash withdrawals. Lending rates have tended to fall more in the banking system, with a higher proportion of variable rate loans, shorter loan maturities, or high levels of competition among banks (IMF, 2016).

Policy rate cuts in positive territory tend to generate a proportional reduction in both lending and deposit rates, thus preserving banks' net interest margins, defined as net interest income relative to average interest-earning assets. Lowering policy rates into negative territory can reduce banks' net interest margin and possibly

significantly affect bank profitability as lending rates for new loans decline and existing (variable rate) loans re-price while deposit rates remain sticky (Fukuda, 2017). If the banks want to cut rates charged to borrowers without squeezing profit margins, they must also cut the interest paid to depositors or find other ways of increasing revenues. Furthermore, to the extent that lower interest rates compress risk premia, they may reduce the demand for credit transformation.

This could lead an economy closer to the liquidity trap, a failure of monetary policy transmission. This is when expansionary monetary policy fails to decrease interest rates and, therefore, fails to increase bank lending. Hence economic growth is not stimulated, which makes monetary policy ineffective.

The portfolio balance channels appear to have operated normally at negative rates. Portfolio rebalancing with negative rates reduces term and credit risk premia, eases financial conditions and supports credit creation and economic activity (Jobst and Lin, 2016). Portfolio rebalancing helps lower firms' general cost of capital via lower term premia on corporate bond yields. Even though the portfolio rebalancing would apply to any reduction of policy rates, its effectiveness might change in an environment of negative interest rates, depending on how lower risk aversion affects investment behavior (Berkmen and Jobst, 2015). Greater risk taking via portfolio rebalancing under NIRP also implies that some safe assets, such as government bonds, will yield lower returns (depending on the maturity term). As safe assets are being removed from the financial system some investors will take more risk to compensate for loss of income. Others might be forced to reduce their risk exposure in response.

Low or negative bond yields in NIRP countries further encourage investors to search for higher yields, both domestically (higher risk and longer maturity assets) and internationally (similar duration but higher returns and higher risk). In particular, lower risk-free interest rates have tended to encourage investors to switch from low yield local government securities to riskier assets such as equities, corporate bonds, property, or foreign assets.

In many cases, the main effect of NIRP is through the **exchange rate** channel. The impact of negative central bank rates on the exchange rate has been mixed. For smaller open economies, negative rates can help discourage capital inflows and reduce exchange rate appreciation pressures (for example in Denmark) in the short

term.

Exchange rates and interest rates are tightly linked in theory through interest parity conditions. According to covered interest parity, forward exchange rates should incorporate the difference in interest rates between two countries, otherwise an arbitrage opportunity would exist. Uncovered interest parity is a speculative condition that expects a difference in interest rates between two countries to be offset by the future expected change in exchange rates between the two countries. This means that when the interest rate differential between two countries is two percent, then the currency of the country with the lower interest rate would be expected to appreciate two percent against the other currency.

However, some analyses revealed that negative nominal interest rates seem to have little effect on observable exchange rate behavior (HAMEED and ROSE, 2017). Given the evidence of the failure of uncovered interest parity, financial strategies have been developed to take advantage of uncovered interest parity deviations. One popular technique is the carry trade strategy.

Carry trade is a trading strategy that attempts to profit from the interest-rate differential between two currencies. It involves borrowing and subsequently selling a low-interest currency to fund the purchase of a higher-yielding currency. Usually, the higher yield currency will also appreciate, which means that the spread trader will end up with the benefit of a positive carry by owning the higher rate currency, and subsequently lending it, while only paying a small borrowing cost in funding the sold currency.

Negative interest rates may cause exchange rates to depreciate by providing incentives for moving capital from one country to another to earn higher rates there. Thus, a widening interest rates differential would put depreciation pressure on the domestic currency. These incentives have only been strengthened by financial capital mobility and financial account openness.

Depreciation of the currency is usually an attractive option for an individual country, but for the world as a whole it can be a zero-sum game resulting in competitive devaluation. The problems of competitive devaluation were illustrated in the Great Depression of the 1930s and is considered a “beggar-thy-neighbor” economic policy. In the economic environment of demand shortage, countries have an incentive

to depreciate their currencies - make their exports cheaper and imports more expensive, which together increases demand for domestically produced goods and services. The problem is that demand comes at the expense of demand for other countries products, thereby impoverishing neighboring nations. This problem was pervasive in the 1930s and has re-emerged with NIRP. (PALLEY,2016)

This problem can be examined through the example of an offshore manufacturing model in which corporations from developed countries either build export production platforms in developing countries or outsource manufacturing to those countries. Developing countries then sell that production in the markets of developed countries. This has accelerated the prevalence of export-led growth whereby developing economies grow by increasing their exports rather than by developing their own domestic markets. Since exchange rates are key to the export-led model, this intensifies policymakers' incentives for competitive devaluation because countries are trapped in a competitive struggle for export markets and new foreign investment.

NIRP may worsen this disposition to monetary policy conflict between countries by increasing the sensitivity of exchange rates to the interest rate policy. Moreover, competitive devaluation does not just shift demand between countries but may also reduce total global demand by creating financial uncertainty, which threatens firms' incentives to invest. Firms will refrain from making costly investments if they think that future exchange rate movements may undermine the competitiveness and profitability of those investments. (PALLEY,2016)

1.2 Effectiveness, Benefits and Risks of NIRP

Effectiveness of NIRP is difficult to parse from other policies as negative interest rates merely represent one type of unconventional monetary policy measure. However, the simultaneous application of interest rate policy and quantity-based asset purchase programs presents nontrivial operational challenges and may adversely affect the interpretation and effectiveness of monetary policy overall (Shirai, 2017).

Basically, NIRPs have two stated goals: to raise inflation, and decrease

appreciation pressures. The euro area, Japan and Sweden adopted NIRPs as an additional measure to combat deflationary pressures, and raise inflation from very low levels. On the other hand, in Denmark the adoption of NIRP was driven by a concern to preserve its exchange rate peg. Switzerland's goal was all of these: to support growth and inflation by reducing the attractiveness of Swiss franc-denominated assets – resist appreciation pressures.

International Monetary Fund (2017) in its policy paper stated that the success of NIRPs relative to these goals has been mixed so far. In Denmark, appreciation pressures on the krona have dissipated and the central bank has reversed its accumulation of foreign currency reserves. In Sweden, the outlook for inflation has markedly improved, probably in part due to NIRPs, though asset purchases by the central bank were likely also instrumental. In Switzerland, deflation is close to being eliminated and appreciation pressures have eased, although the franc remains overvalued. In the euro area, credit conditions have eased and loan growth has turned positive, while the medium-term inflation outlook has improved gradually since the start of NIRPs. In other countries, conclusions are difficult, as the outlook for inflation is uncertain and growth remains subdued. Of course, the counter-factual claim cannot be discounted that inflation and growth could have been even worse in the absence of NIRPs (ECB, 2016).

NIRPs precipitated lower money market and bond yields, though deposit rates mostly remained positive. In order for a NIRP to have an effect on aggregate demand or the exchange rate, the lowering of rates from positive into negative territory would need to affect the interest rates determined in financial markets. Indeed, in all examined markets, the 2-year swap rate (a market determined interest rate) has moved in tandem with the respective central bank policy rate (Credit Suisse Research Institute, 2017).

On the other side, many economists view NIRP much more skeptically, particularly due to its impact on bank profitability (Jobst, 2016; ESRB, 2016; Bech and Malkhozov, 2016). Although some banks in jurisdictions subject to NIRP have been successful at reducing their operational costs by speeding up the adoption of information technology (Nemoto, 2016), observation of declining bank profitability

(ECB, 2016b), in Japan (Fukase, 2016) and Switzerland have given rise to increased concerns over the effectiveness and sustainability of NIRP. In particular, Switzerland been cited as an example of unintended side effects of NIRP because banks there have raised mortgage rates to counteract declining profit margins. (Arteta et al., 2016)

At the international level, the relationship between NIRP and exchange rates has been a major concern. In general, measuring the effect of NIRP on exchange rates is difficult, especially as this is also a period when the general global risk environment has undergone substantial swings. Many other factors influence exchange rates and it is difficult to assess the counterfactual to the introduction of NIRPs. IMF (2017) has studied the evolution of exchange rates across countries after the introduction of NIRPs. In many cases, while there does not appear to be some reduction in exchange rate levels, overall movements in the nominal effective exchange rate appear to have been short-lived.

Interestingly, an analysis by Credit Suisse Research Institute (2017) shows that large central banks seem to be more successful in achieving their currency targets through interest rate policies (including NIRPs) than do small central banks. The Bank of Japan, in particular, had far greater success in weakening the yen against the US dollar since moving to unconventional policies, including negative interest rates, after the financial crisis. The same applies to the European Central Bank.

The evidence presented above suggests that the effects of NIRPs are in principle no different from those of conventional interest rates policies. The question is whether the negative rates may have some qualitatively different effects. Flight into cash is the obvious contractionary effect that could result from implementing a NIRP.

1.3 Limits of NIRP

The use of negative policy rates may have its limits in terms of the extent to which central banks can set rates at negative levels and the length of time they can remain negative.

Negative interest rate policy is suitable for an economy that faces deflationary

spirals and in which the real interest rates are still above the level consistent for price stability and full employment.

When the nominal interest rate on safe assets turns negative, holding cash becomes attractive. Cash has a fixed zero nominal rate of return. Individuals and corporations could increase the use of cash as a store of value as well as a means of payment if interest rates are expected to be substantially negative and for a long time. Also, instead of working balances held at the central bank to cover interbank transactions, banks could hold vault cash for settlements between one another. When rates approach the point at which most agents switch into cash, further cuts will become ineffective.

Nevertheless, there are costs and inefficiencies associated with holding large amounts of cash in the form of banknotes. The costs of storage, insurance, safekeeping and transportation of cash, along with other cost of convenience, determine the effective lower bound of interest. According to some estimates, the current cost of storing cash could range between 0.2 and 1.3 percent, depending in part on the size of available banknotes (Rostagno, et al., 2016). However, the fact that the deposit policy rate has reached -0.4 percent in the euro area, -0.5 percent in Sweden, and -0.75 percent in Denmark and Switzerland without any distortions so far, suggests that the limit might be lower. If interest rates should remain negative for a prolonged period, markets could develop mechanisms to reduce the costs associated with switching to cash.

But perhaps more important than the physical limits as described above, there may also be significant political and social limits to the use of negative nominal interest rates. The public may feel that they are being “taxed” if and when deposit rates increasingly turn negative. As a result, public support for the negative interest rate policy could be weakened.

Another concern is that if policy rates remain negative for too long, there could be increasing spillovers to savers, with negative social consequences, although this is true also of low, positive rates. If low or negative rates persist, they could undermine the viability of life insurers, pensions, and savings vehicles. Low rates make it difficult for insurers to meet guaranteed returns, and with substantial duration mismatches, this will eventually force losses on life insurance policy holders.

Another concern arise about the question how to exit from such an expansionary monetary policy. Central banks need to think of its exit strategy from unconventional monetary policies. We can assume that the central banks would follow the lead of the Federal Reserve (Fed). First reduce the scale of asset purchases, then raise rates and then, very slowly, address the balance sheet. This may prove to be too slow and gradual so the inflationary pressure and economic recovery take on hold.

1.4 Negative Interest Rates and Developing Countries

Another effect of volatile capital flows around the world is that it pushes greater savings onto the global market and the global short-term equilibrium rate falls further. Although NIRP was meant to be an expansionary monetary policy for the local economy, the program also had profound implications for EMDEs. Search for yields in reaction to negative rates in advanced economies affects cross-border capital flows to EMDEs, which appear to be a good investment alternative. EMDEs can potentially gain from exceptionally favorable financing conditions in NIRP countries. However, it can be limited by deterioration of their macroeconomic fundamentals.

Joon-Ho Hahm have written about two opposing views on spillover effects of NIRP on EMDE in an Asian Development Bank working paper (Joon-Ho Hanm, 2018). The first view sees minimal impacts. If any, benefits of these unconventional monetary policies may exceed costs. In other words, small open economies may have benefited from high demand, low-risk premiums, low funding cots, a stable economic and financial environment etc. However, less supportive views suggest that the risk and negative externalities could be potentially large. EMDE may suffer from currency appreciation, external imbalances, and credit and asset market booms associated with huge capital inflows. These effects can be very dynamic and diverse depending on the state of the financial and business cycles of EMDEs as well as foreign exchange regime, extent of macroprudential policies and monetary policies to counter the spillover effect.

Capital flows into EMDE countries are important for several reasons. Unlike richer countries, most EMDEs do not generally have enough internal savings to finance their growth (China is the major exception). Without external financing, they

may not be able to build basic infrastructure like transportation or power generation. More developed countries may need to import capital to build factories to produce goods necessary for both domestic consumption and exports.

Lately, the best years for EMDE credit have been seen as the risk-on environment continues. During calm periods, portfolio investment by investors in advanced countries flows into EMDEs as they are getting more comfortable taking a higher risk (markets are risk-on). Monetary policy of NIRP countries has been very supportive of this. When central banks in the receiving countries resist exchange rate appreciation and buy dollars or euros against domestic currency, they end up investing in medium-term bonds in reserve currencies. In the process, they found themselves (or “sterilize” the expansion of local bank reserves) by issuing safe assets in domestic currency to domestic investors. As a result, their response to risk-on markets tends to put downward pressure on global bond yields, reinforcing the risk-on mode.

Over time, large capital inflows could be associated with rapid credit growth, but what will happen when they stop? When risk is off, the international flow of funds reverses. An implication is that global investors are behaving as if they were replicating a call option on risky EMDE assets. To accommodate global investors, EMDE investors buy back the risky assets when risk is off (providing market liquidity at a time of financial strain) and EMDE central banks sell back safe assets to global investors. However, it has been recognized that EMDE central banks sell remarkably little of their foreign exchange reserves in the face of capital outflows (MCCAULEY, 2012).

When the capital inflow to the country is too fast and central banks do not react at the time, it can result in an unwanted appreciation of its currency. More currency movements affect all aspects of international investing, starting with the basic adjustment of gains for the change in currency value when determining total returns. Changes in currency also affect corporate earnings, the ability to repay debts, and the overall economic health of the country. These consequences are greater for EMDE investments, where currencies are more volatile and countries are more economically dependent on trade. Appreciation also does not favor international trade as it makes exports more expensive relative to foreign competitors. EMDE countries need capital flows to be just right.

Yet the key currency in which EMDE bonds are denominated is the US dollar.

Increasing yield differentials between Europe, Japan and the United States maintain upward pressure on the US dollar.⁴ As EMDE countries are short in US dollars, the US dollar appreciation contributes to a higher cost of debt servicing and broader balance sheet pressure raising credit risks of EMDE countries. As a result, NIRP led to a notable pickup in euro-denominated bond issuances by EMDEs.

All these factors have reduced the relative attractiveness of EMDE assets. While NIRP-type unconventional policies in some advanced economies could have immediate positive effects on EMDE financial conditions, these can suddenly change due to the consequences of these policies on financial stability. In order to be prepared to the exit from this type of monetary policy in advanced economies, EMDEs need to be ready to implement appropriate policy responses, depending on their cyclical positions and available policy room. Several central banks have responded with pro-cyclical tightening of policy and foreign exchange interventions or controls.

⁴ However, the dollar has been strong against all currencies over the few past years, in both developed and emerging markets. Support for the dollar has come from many sources, including the belief that the Federal Reserve (Fed) would begin to raise interest rates in 2015 and that there would be as many as four rate hikes in 2016. As the Fed delayed the start of its rate hike campaign until December 2015, and as predictions for the number of further increases has declined, the dollar has reversed course against most EM currencies. However, the trend of EM currency strength continues and it could last for an extended period (Manchester Investments, Weekly Economic Commentary, April 2016)

2 Overview of the Countries that applied NIRP

Since mid-2014, six central banks have introduced NIRP (Table 1), although only the ECB and BoJ operate in large economies, and the remaining central banks are at least in part influenced by ECB policy.

Motivations for adopting NIRP, and operational implementation, differed across economies. Whereas price stability was a major concern in the euro area and Japan, the exchange rate was a primary factor in other economies. Comprehensive overviews of the operational implementation of NIRPs are given by Bech and Malkhozov (2016) and Jobst and Lin (2016). These authors outline the various measures adopted by central banks around the world to implement negative interest rates and discuss their transmission to the economy on theoretical grounds.

Table 1 Overview of Central Banks with NIRP

Economy	Introduction	FX Regime	Objective	Policy Rates (bps)		
				Lending	Main	Deposit
Denmark	6 Jul 12 – 24 Apr 14, 5 Sep 14	Pegged to euro	Counter inflows and exchange rate pressures	5	0	-65
Euro Zone	5 Jun 14	Free floating, inflation-targeting framework	Price stability and anchor inflation expectation	25	0	-40
Switzerland	18 Dec 14	Free floating	Reduce appreciation and deflationary pressures	50	-	-75
Sweden	12 Feb 15	Free floating, inflation-targeting framework	Price stability and anchor inflation expectation	25	-50	-125
Japan	29 Jan 16	Free floating, inflation-targeting framework	Price stability and anchor inflation expectation	10	0	-10
Hungary	22 Mar 16	Free floating, inflation-targeting framework	Price stability and counter exchange rate pressures	115	90	-5

Source: Central banks

2.1 Denmark

In Denmark, negative rates were adopted to make investment in their currency less attractive, to prevent its overvaluation. The most important objective

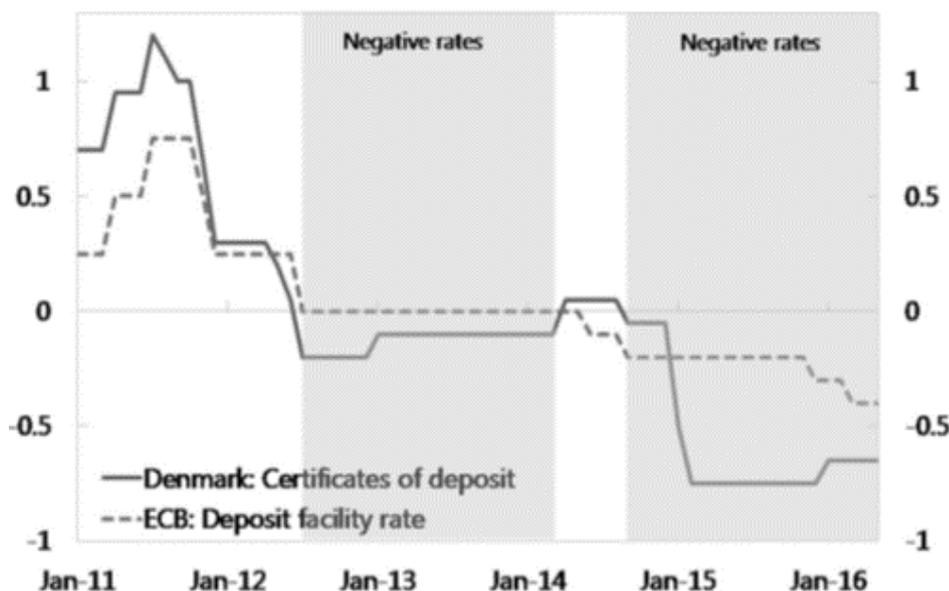
of the monetary policy of The Danmarks Nationalbank (DN) is to keep the value of the krone stable with respect to the euro. Danish market rates are strongly influenced by changes in the central bank's base rate, the lending rate or Udlånsrente.

As a response to deteriorating economic prospects in the Euro area, which triggered massive capital inflows to Denmark, DN cut its policy rate on certificates of deposit to negative territory for the first time in July 2012 (see Picture 1) to -0.2 percent (from 0.05 percent). Since then DN has maintained its negative interest rate into 2017; with a short break when the deposit rate was briefly turned positive during July – September 2014.

Between January and February 2015 the deposit rate hit a record low -0.75 percent (from -0.05 percent) to defend its currency peg against the euro and following the announcement of the ECB's asset purchase program and the Swiss National Bank abandoning its exchange rate floor in mid-January 2015. In March 2015, the DN announced an increase in the current account limit to DKK 145 billion from DKK 37 billion. This reduced the impact on banks by allowing an increased value of deposits they could keep at the central bank without being charged the deposit rate. In January 2016, Denmark raised the deposit rate to -0.65 percent, where it stayed for a longer period.

The ability to pass on negative interest rates to depositors was limited to large corporate customers. Market interest rates tended to track the policy rate, but the transmission was weaker than with positive rates. In addition, lower market rates did not translate into higher lending. Lending volumes continued their decline from a peak in 2009, although the counterfactual is difficult to establish (IMF, 2017).

Picture 1 Negative Policy Rates: Denmark and the ECB (in percent)



Source: Haver Analytics

2.2 Euro area

Reflecting persistent downside risk to growth and declining inflation expectations, the ECB first introduced NIRP among other policies intended to achieve its price stability objective. In June 2014 ECB applied a deposit facility rate of -0.1 percent and undertook additional cuts through March 2016 to -0.4 percent. The deposit facility rate is one of the three interest rates the ECB sets every six weeks as part of its monetary policy.⁵ The rate defines the interest banks receive for depositing money with the central bank overnight. Unlike some other central banks, the ECB has not introduced a tiering system to cushion the cost of NIRPs for banks holding excess reserves.

In a March 2016 press release, the ECB communicated that its main motivation for continued rate cuts deep into negative territory was *“to further ease financing conditions, stimulate new credit provision and thereby reinforce the momentum of the euro area’s economic recovery and accelerate the return of inflation to levels*

⁵ There are two other key interest rates: the rate for our main refinancing operations (MROs) and the rate on the marginal lending facility. The MRO rate defines the cost at which banks can borrow from the central bank for a period of one week. If banks need money overnight, they can borrow from the marginal lending facility at a higher rate.

below, but close to, 2 percent” (ECB 2016).

With money market rates tracking the deposit rate in an environment of excess liquidity, the negative rates were quickly transmitted. Moreover, expectation of future money market rates decreased. Lending rates for both corporates and households also decreased, mostly via a reduction in term premia. As a result, credit has expanded modestly (IMF, 2017). Negative rates have also strengthened portfolio rebalancing; an important transmission channel of the ECB’s asset purchase program. On the other hand, inflation expectations have remained subdued.

2.3 Sweden

In the case of Sweden, rate cuts into negative territory in 2014 and earlier were driven by persistently low inflation, with core inflation at 0.5 percent in 2013-14, well below the euro area rates of 1.3 and 0.9 percent in those years. Inflation expectations declined steadily before falling sharply in late 2014. In February 2015, the Swedish Riksbank applied negative rate at its policy interest rate - one week repo rate⁶ of -0.10 percent and started purchasing government bonds and firmly stated its willingness to do more as needed to achieve its inflation target.

This package of measures followed the announcement of the ECB’s QE program in mid-January, which increased the potential for appreciation pressures on the Swedish krona that could have impeded an increase in inflation, reinforcing the need for strong policy action by the Riksbank. Since then the Riksbank has reduced its policy rates many times, in combination with its own asset purchase program of government debt securities, reinvesting maturing bonds and coupons from the QE program (Table 2). In February 2016, the Riksbank reduced the reserve repo rate to the current level of -0.50 percent.

⁶ The Riksbank’s repo rate is the interest rate at which banks can borrow or deposit money for a period of 7 days with the Riksbank. By altering the level of the repo rate the Riksbank can exercise influence over the interest rates that banks apply to loans, mortgages and savings accounts, amongst other things. The repo rate is also a tool for controlling the amount of money in circulation.

Table 2 Monetary Policy Actions of Riksbank since NIRP announcement

Unconventional Monetary Policy Actions		
Date	Repo rate (basis points)	New QE (SEK bn)
Feb-15	-10	10
Mar-15	-25	30
Apr-15		40-50
Jul-15	-35	45
Oct-15		65
Feb-16	-50	
Apr-16		45

Source: Riksbank

A Riksbank press release in 2017 says that economic activity is strong in Sweden and inflation is approaching 2 percent. Nevertheless, the first rate increase is not expected to be made until the middle of 2018.

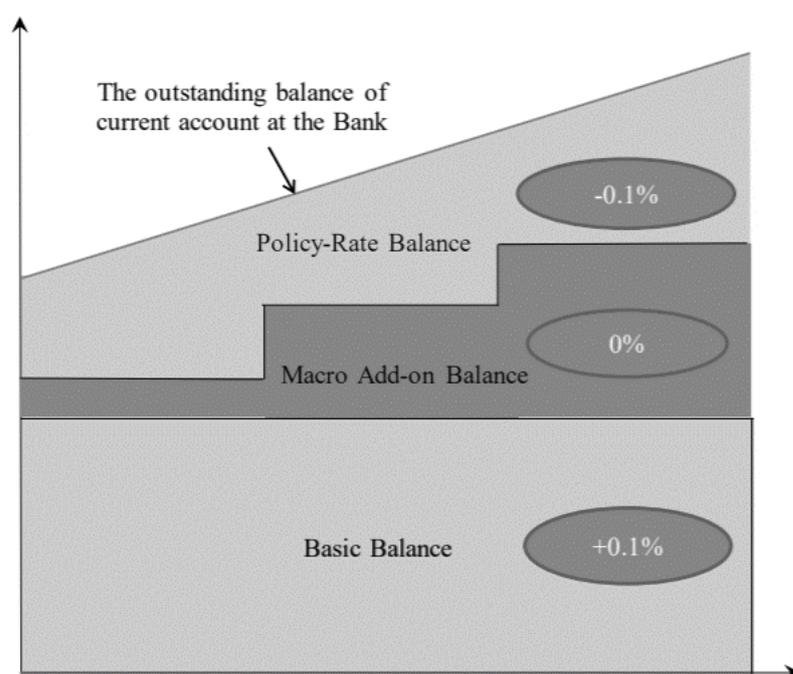
2.4 Japan

At the end of January 2016, the Bank of Japan (BoJ) introduced a negative interest rate on deposit of marginal excess reserves amid a weakening domestic outlook and elevated global uncertainty. By the end of 2015, domestic growth had weakened and headline inflation had fallen significantly due to declining oil prices, spilling over to medium and long-term inflation expectations. The intention was to put downward pressure on short-term interest rates while reinforcing forward guidance, and raise inflation expectations by dispelling concerns that quantitative easing had reached its limits, and reconfirming the Bank's commitment to its inflation target.

BoJ is using the multiple-tiered reserve deposit system (Picture 2) in which the outstanding balance of each financial institution's current account at the central bank will be divided into three tiers, to each of which a positive interest rate, a zero interest rate, or a negative interest rate will be applied, respectively. The first tier, remunerated at 0.1 percent, applies to the average outstanding balance each financial institution held during benchmark reserve maintenance periods starting from January 2015 to December 2015. The second tier, remunerated at 0 percent, is the macro add-

on balance, including required reserves and the reserves equivalent to the amount of the various lending programs. An additional portion will be added to this second tier over time in line with the monetary base target. The third tier, remunerated at -0.1 percent, is the policy rate balance, that is, the residual reserve deposit, which is where additional reserves created by QE will initially go until the second tier is adjusted. The amount in the third tier is expected to remain in the range of ¥10-30 trillion (Jobst and Lin, 2016). To prevent financial institutions from increasing cash holding significantly, any increases in cash holding are deducted from the zero interest rate tiers of the current account balance.

Picture 2 Multiple-tier system by BoJ



Source: BoJ

NIRP helped lower market rates and accelerate portfolio rebalancing. Immediately following the introduction of NIRP, the yield curve shifted down and flattened, with 10-year benchmark yields falling below zero. Transmission to short-term money market rates was almost complete. The interbank funding rate (3-month TIBOR) fell from 17 bps at the beginning of 2016 to 6 bps after the introduction of NIRP. Meanwhile, financial institutions accelerated the rebalancing of their portfolios in search of higher yields. Corporate debt issuance picked up, especially in long

maturities, as firms took advantage of low interest rates.

2.5 Switzerland

Given its role as a safe haven currency, the Swiss franc has been subjected to strong inflow pressures in recent years. The Swiss National Bank's (SNB) most important goals are to safeguard price stability, to prevent high levels of inflation or deflation, and to ensure a climate that is aimed at economic growth. SNB adopted an exchange rate floor against the euro in September 2011, which afforded it three years of relative respite from large capital inflows. With significant appreciation pressure on the franc and an already large SNB balance sheet, the floor was no longer seen as tenable.

On December 2014, SNB announced negative interest rates of -0.25 percent on Swiss franc-denominated sight deposits above a pre-defined threshold which took effect on January 2015. For domestic banks, the threshold was set to 20 times a bank's required reserves as of the reporting period ending November 19, 2014 minus (plus) any increase (decrease) in cash held. The SNB does not charge banks with negative interest rates on their cash deposits below this threshold.

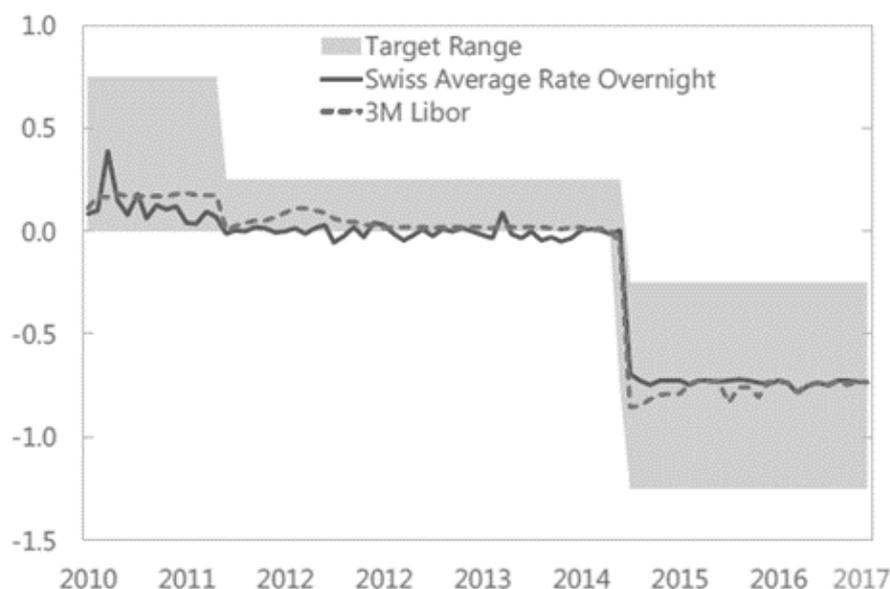
NIRP was adopted to counter appreciation pressures and the exchange rate floor was removed at the same time as it announced a further cut of the central bank deposit rate from -0.25 to -0.75 percent (effective January 2015) less than a month after it announced the cut in the policy rate from 0 to -0.25 percent. Removal of the exchange rate floor led the franc to appreciate by 17 percent against euro, which was reflected by degrees in prices of imported goods and even prices of domestic goods and, thus, deflation.

The NIRPs helped to partly restore the negative interest rate differential with respect to major currencies that prevailed before the introduction of the exchange rate floor, thereby relieving some pressure on the franc. In addition, the SNB purchases foreign currency, periodically buying sizable amounts in response to capital inflow surges, as well as making more frequent purchases of smaller quantities.

SNB's normally target range for the 3 month Libor CHF. This base rate is also

called the reference interest rate and is used by the SNB to guide the level of interest rates in the Swiss money market. Therefore, SNB can use its monetary policy to influence the interest rates for products such as loans, savings and mortgages. The NIRP was transmitted rapidly to market interest rates and the 3-month Libor converged quickly to the policy rate (see Picture 3). Rates on longer-term instruments also decreased.

Picture 3 Swiss Money Market Rates



Source: IMF

2.6 Hungary

Given subdued inflation pressures and a structural liquidity surplus, the Hungarian National Bank (Magyar Nemzeti Bank, MNB) gradually eased its monetary policy stance and introduced unconventional instruments. The main objective of the MNB's monetary policy is to achieve and maintain price stability, or a moderate and stable inflation level, in line with the EU guidelines and international developments. Conventional measures have included a gradual reduction of the policy rate, lowering and narrowing of the interest rate corridor, an effective reduction of reserve requirements, as well as changing the collateral requirements for the MNB's lending facilities.

Effective March 23, 2016, the MNB reduced the policy rate and reduced

the overnight deposit rate from 0.10 to -0.05 percent. The move should help boost inflation by weakening the Hungarian forint. The forint fell by 0.5 percent against the euro following the announcement of NIRP.

Several unconventional monetary policy measures have also been introduced, including supporting SME lending by providing cheap MNB funding for banks to on-lend to SMEs and offering incentives to banks (through interest rate swaps and a special deposit facility) to increase their lending to SMEs; and incentivizing banks to substitute government securities (especially long-term and local currency-denominated) for excess reserves with the MNB.

3 Cross-border Financial Linkages

Cross-border investment has surged over the last few decades. The IMF (2014) reports that debtor and creditor countries have net cross-border positions amounting to 15 percent of global GDP and that many countries have gross stock imbalances of around 50 percent of their GDP (e.g. Turkey at – 50 percent, Germany at +50 percent).

Since the global financial crisis, the gross capital inflow to EMDE countries has risen sharply. Opening the financial account is one of the most powerful reforms a government can undertake, as greater cross-border financial linkages offer major efficiency gains in resource allocation.

Given the growth and size of cross-border positions, it raises risk concerns. Rapid changes in outstanding credit are associated with the build-up of vulnerabilities, with potential implication for financial stability. The IMF (2014) notes that large debtor economies are vulnerable to changes in market sentiment so economies with large net liability positions may become victims of disruptive external financial market conditions.

Net flows are usually measured as the current account balance with a reversed sign, sometimes excluding changes in reserves. Adjiev, Hardy, Kalemli-Ozcan, Serven (2017) documented that gross flows are much larger and more volatile than net flows, tend to be procyclical, and respond systematically to changes in global conditions.

These properties make gross flows first order for financial stability matters.

The formal recognition that cross-border financial linkages were important in the spread of crises has its root in the Asian financial crisis in the late 1990s. Following this crisis, a spate of studies showed how investors evolved their global portfolio decisions in ways that led to capital flows higher than what would be justified from domestic economic fundamentals.⁷ Meaning that even countries with relatively positive economic prospects found themselves subject to rapid and destabilizing capital outflows.

Previous experience with financial crises proves that the vulnerability to external shocks can vary greatly depending on which economic sectors are on the receiving side of capital inflows. For example, in case of the Latin American crises it was sovereign debt, while the private sector debt financed by capital inflows was the key source of instability in the Asian financial crises.

However, cross-border financial integration is much more than capital flows. It also embraces trade linkages, price arbitrage, and risk transfer instruments. In its broadest form, financial integration offers enormous benefits, particularly when it finances efficient resource allocation, stable consumption, and distributes and diversifies risk.

More extensive global financial linkages are changing in ways that cross-border flows have significant implications for monetary policy and financial stability. The monetary policy challenge is that considerable uncertainty exists about the exchange rate channel in monetary policy transmission and that unjustified appreciation in the real effective exchange rate – driven perhaps by global financial market conditions – can cause a misallocation of resources that can inhibit the country's long-term economic potential. (Wheeler, 2015)

Cross border financial linkages make monetary policy difficult for two main reasons. First, though the exchange rate is often the primary transmission channel for monetary policy of some central banks⁸, this channel may be affected more than it should be. Second, and just as difficult, it is often not known what factors are driving

⁷ See Kodres and Pritsker (2002), Yuan (2005)

⁸ This is the case when the central banks takes inflation targeting as its policy and in addition use foreign exchange market intervention or when the central bank use different monetary policy and has the exchange rate as the key targeting indicator (for example People's Bank of China).

the exchange rate and how efficient this transmission channel is.

In an economy with an open financial account, with active arbitrage it is possible to have either a stable exchange rate or an independent monetary policy capable of maintaining price stability.

Many EMDE have experienced an appreciation in their real exchange rate in recent years (IMF, 2015). In a floating exchange rate environment, this lower inflation in the tradable sector increases the real disposable income of many consumers. However, the real exchange rate hikes impose significant adjustment costs for firms when they must exit and re-enter markets because this affects their competitiveness. Appreciation of the real exchange rate also shrinks the product margins of export producers and makes it harder for firms competing against cheaper imports.

Policy makers must decide whether the appreciation in the real effective exchange rate is justified and sustainable. A real effective exchange rate is unjustified when its level is inconsistent with the economic factors (such as commodity prices, economic growth, interest rate differentials, labor productivity growth etc.) that can normally determine its movement during the business cycle. The level of the real effective exchange rate is judged unsustainable when it clearly deviates from its long-run equilibrium. Continued deviation from equilibrium is likely to result in external debt ratios that cannot be managed and leading to resource misallocations that can inhibit the country's long-term growth potential.

Domestic monetary policy and changes in exchange rate regimes can do little to reduce an overvalued real exchange rate. Capital controls are possible, but for countries with an open financial account this is a poor option. An open financial account improves productivity incentives as it alerts domestic producers to be competitive if they wish to attract capital and financing domestically and from offshore.

Although, much is known about the factors that influence exchange rates in theory, empirical links between exchange rates and their driving factors have been difficult to assign. Exchange rates are closely linked to interest rates in theory through uncovered interest arbitrage but, empirically, the connection is weak (BIS, 2015). Internationally, markets adopt risk-on and risk-off strategies that are often linked to expectations of the timing of monetary policy decisions made by central banks

in advanced economies. Capital flows sometimes matter because flights to quality and to more liquid markets are seen, accompanied by large exchange rate movements, when risk and uncertainty increase. However, without a strong empirical understanding of what determines the exchange rate there is large uncertainty regarding the efficiency of the exchange rate transmission channel.

As well, cross-border financial linkages can have important implications for financial stability when large institutions react in a similar manner and herd behavior causes financing flows to amplify financial market shocks. This desperate search for yield across borders has been seen many times before with investors taking on more and more risk and in doing so significantly lowering risk premia. (Wheeler, 2015)

3.1 Identifying and Measuring Vulnerabilities

There are two main approaches to measuring cross-border financial linkages: price-based measures and volume-based measures. The price-based approach examines correlations in asset prices and returns across countries, with cross-border financial linkages captured by the importance of international, regional and global factors in determining financial returns. The volume-based measures derive from the observed data of international financial flows and international investment positions. (Lane, 2014)

For our purposes, we will be focusing on volume-based measures and use bilateral data from the Bank of International Settlements (BIS) on cross-border bank claims. Here, we focus on cross-border holdings of assets and liabilities—if domestic investors are net holders of an asset or currency issued by another country, they will be directly affected by shifts in the value of that asset or currency. International financial flows may affect domestic macroeconomic and financial variables through a variety of mechanisms, in addition to any impact through asset prices.

Cross-border financial holdings are a crucial “balance sheet” transmission mechanism where international changes (like NIRP) affect the value of financial assets and financial liabilities and simultaneously their profit and costs. These holdings also indicate a market vulnerability to shifts in the funding and liquidity environments

in overseas financial markets. Cross-border bank-related debt flows have been watched closely. Domestic and multinational banks facilitate international debt flows, while financial-sector foreign direct investments have been an important source of equity funding for banking systems in many countries (Lane, 2014).⁹

International financial integration may be beneficial. Current account imbalances that are funded by net international financial flows can support consumption smoothing and efficient allocation of international capital. As well, gross international financial flows provide an important mechanism by which international risk diversification can be implemented. On the other hand, speculative activity may pose risk to the stability of some financial systems if such trades go wrong.

3.2 Liquidity risk and macroprudential policy

Liquidity risk and rollover risk are usually major financial concerns that affect economies, particularly smaller economies, during episodes of financial market contagion. Because of given current yield curves, debt issuance almost everywhere has shifted towards longer-term funding. Liquidity risk is a key concern for countries with large external borrowing needs, especially if investors become nervous, trading volumes begin to thin and some price gapping occurs. Left unabated, liquidity problems can transform into solvency problems.

Macroprudential policies and liquidity management help to financial stability concerns in such circumstances, it can reduce systematic risk in financial markets. Traditionally, macroprudential tools tend to be seen as complementary to monetary policies. But these days, macroprudential tools are seen as instruments to offset the effects of too easy monetary policies as well as other government policies.

Introduction of macroprudential policy requires policy makers to be clear about goals, the duration of the measures, and how such measures might interact with

⁹ In relation to governments, international markets are a source of foreign funding for sovereign debt, while official reserves and the foreign portfolios of sovereign wealth funds are a significant proportion of aggregate foreign assets for many emerging and developing economies. For domestic corporates, international non-bank sources of debt financing (bond markets, alternative loan providers) provide an alternative to bank-based debt, while foreign portfolio investors and foreign direct investors are sources of equity funding.

monetary policy (BIS, 2015). Monetary and macroprudential policies share the common goals of price stability and financial system stability respectively. It is fundamental to match monetary policy and macroprudential policy instruments when the goal is to affect outcomes necessary for the achievement of both policy objectives.

Kim and Mehrotra (2015) of the BIS looked at the effects of macroprudential policies in a VAR set up. Two interesting results are that macroprudential policies do have an effect on credit growth, which was a sort of proxy for financial stability, and also that macroprudential policies affect output and inflation dynamics. Strengthening and tightening macroprudential policies could lead to reduced output growth, which means that macroprudential and monetary policies need to be coordinated carefully when one is contemplating applying both.

The empirical work encompassed by Buch and Goldberg (2017) across a number of countries suggests that the type of macroprudential policy employed together with other factors affect the size of spillovers channeled to credit growth. The effectiveness of domestic macroprudential policies on such a spillover has been studied in Buch and Goldberg (2017), Kang et al. (2017), and Cerutti, Claessens and Laeven (2015, 2017). Most of this literature examines the impact of macroprudential policies on credit growth in domestic and foreign countries. For example, Cerutti, Claessens and Laeven (2017) examine what happens to country B when country A tightens and finds that, in some cases, international banks re-position their market shares by decreasing lending in country A but increasing it in country B. This suggests that country A's macroprudential tightening could have a loosening impact on country B – particularly when country A is a more open economy. Choi, Kodres and Lu (2018) suggest that negative spill overs are offset by the overall positive externalities at the macro level – Country A's crisis probability decreases, which benefits country B.

4 Data

In order to present dataset for our analysis, several publicly available sources are used: BOP and International Investment Position (IPP) statistics of the International Monetary Fund (IMF), Locational Bank Statistic and Consolidated Bank Statistics from BIS, International Debt Securities from BIS, External Debt Statistics of IMF and World Bank and OECD Statistics.

To measure cross-border financial linkages in cross-border lending we are using the enhanced data from BIS international banking statistics on the bilateral cross-border lending. BIS statistics provides the three dimensions:¹⁰

- A) the currency composition of cross-border claims,
- B) the residence of the borrower and
- C) the nationality of the lending banking systems.

The currency composition of lending is the most important pre-condition for the mapping of currency lending networks. Moreover, when only outstanding stocks (but no flows) are reported, it is also necessary to control for the impact of currency fluctuations on changes in the outstanding stocks of cross-border banks claims. Besides the currency composition of cross-border bank lending, we also need to correctly identify both borrowers and lenders to map cross-border lending stocks and flows. To identify borrowers, we need information on their residence. To identify lenders, we need to identify the nationality (i.e. the country of the headquarters) of the lending bank, which is in turn a natural proxy for the decision-making unit of the international bank. (AVDJIEV and TAKATS, 2016)

The BIS compiles two sets of statistics on international banking activity. The Locational Banking Statistics capture outstanding claim and liabilities of internationally active banks located in 44 reporting countries against counterparties residing in more than 200 countries. Banks record their positions on an unconsolidated basis, including intragroup positions between offices of the same banking group. The data are compiled based on the residency principle (same as done for balance of payments). The LBS capture the overwhelming majority of cross-border banking activity. The Locational Banking Statistics reports outstanding stocks, and based

¹⁰ For more detailed description of the enhanced BIS data see Avdjiev et al (2015a).

on them BIS calculates exchange rate and brake adjusted flows.

The second set of banking data is the Consolidated Banking Statistics. This differs from the Locational Banking Statistics in that the positions of banks reporting to the BIS are aggregated by the nationality (rather than by the residence) of the reporting bank. The Consolidated Banking Statistics does provide a borrower breakdown of the Non-Bank Sector into Public and Private. Since there is no currency breakdown available for the Consolidated Banking Statistics, the BIS does not calculate adjusted flows.

To examine vulnerability of the respective country we need to look on gross flows. Gross flows are most commonly describes as net inflows and net outflows. Net inflows are gross liability flows net of repayments. Net outflows are gross asset flows net of disinvestment. These flows can be found in the balance of payment (BOP) statistics, which are based on residency principle. In principle these so called gross flows can be both, positive and negative. By separation of flows into asset and liabilities we are able to interpret liability flows as net inflows from foreigners, and asset flows as the net outflows by domestic agents.

The IMF's BPO data is the broadest dataset available on international capital flows. It includes two main accounts, the current account and the financial account. The current account records transactions from the real side, presenting imports and exports, factor income, and transfer payments. The financial account records transaction from the financial side, capturing the acquisition of financial assets and the incurrence of financial liabilities. In our analysis we will focus on financial account of BOP data. In the current version of the BOP data (BPM6), a positive asset flow represents capital leaving the country on net by domestic residents, while a positive liability flows mean that capital entering the country on net by foreigners. For our presentation we modified the sign of the liability flows.

We also need to present capital flow types (asset classes) and distinguish capital flows by sector in the domestic economy. Capital flow types are generally very well reported in aggregate terms in the BOP data. The term "sector" is used to refer to institutional sectors: general government, banks, other financial corporation and other non-financial corporation (corporates). To split debt securities into sector we use International Debt securities (IDS) statistic.

IDS statistics are constitute of dataset on international bonds issuance and bonds outstanding, by sector and by residence or nationality of the issuer. It means that these debt securities were issued in a market other than that of the country where the borrower resides. This could also mean that the securities are not necessarily held by foreigners, but serves as approximation for external holdings of debt securities.

While the BOP data relies on reporting by national statistical offices, the IDS data are compiled directly on a security by security basis, which can result in much better coverage. The IDS data can also be presented on a residency basis or by the nationality of the issuing institution. See Adjiev, Hardy, Kalemli-Ozcan, Serven (2017) for a more detailed discussion of this issue.

5 Cross-border lending and currency networks

The three major currencies, the US dollar, the euro and the Japanese yen, dominate cross-border lending globally. As of end of 2016, the US dollar-denominated cross-border claims stood at \$13.7 trillion (51% of the global aggregate). The currency with the second highest global share is the euro, accounting for \$ 7.5 trillion (28% of the global aggregate) and the third is the Japanese yen with the outstanding value \$ 1.5 trillion (5% of the global aggregate).

Almost all existing studies examining the impact of the currency composition of international lending flows on cross-border monetary policy spillovers have focused on the US dollar. Avdjiev, Subelyte and Takats (2016) in their study demonstrated that the US dollar network is not unique and that other cross-border bank lending networks respond to monetary policy shocks in a similar way or even symmetrically. That is, the response to an easing shock (such as implementing NIRP) appears to be qualitatively similar to the response to a tightening shock (such as the 2013 Fed taper tantrum examined in Avdjiev and Takats (2016)).

We will look closely on the euro cross-border bank lending network and yen cross-border bank lending network as two major networks exposed to negative rates and which have an impact on global liquidity. The aim is to see how implementation of NIRP and other quantitative easing programs impact the cross-border bank lending and which EMDE countries have high financial linkages with the NIRP countries.

5.1 Potential drives of cross-border lending

Monetary loosening by the central bank should ease financing conditions in the currency both in and outside the country or area. This would tend to lower banks' funding costs. To the extent that lower funding costs in a given currency translate into higher lending, which would stimulate cross-border bank credit.

Share of the currency in cross-border claims could have made an impact through the international risk-taking channel of monetary policy. The euro share was examined in the study by Rey (2015) and Bruno and Shin (2015b), when the euro's

depreciation, triggered by a loosening monetary policy shock, lifted the net worth and the creditworthiness of borrowers with euro liabilities and local currency assets. This, in turn, increased banks' willingness to lend to such borrowers, supporting cross-border bank lending flows.

Another trigger in cross-border lending could be led by hedging demand of institutional investors, who are likely to have been prompted to insure against further currency depreciation as a result of the monetary easing (for example NIRP) announcement.

In this connection it is important to monitor closely the change in the bilateral exchange rate for respective pairs (of the borrower's local currency against the euro or Japanese yen) and its interaction with the currency share variable due to the key role that the exchange rate plays in a couple of the above channels. As well, consider the importance of the lending banking system for the respective borrowing country, that is, the share of cross-border bank claims on borrowing country X from lending banking system Y.

To see an example of financial flow reversal that would occur when the central banks decide to exit from NIRP the case of taper tantrum by Federal Reserve in 2013 can be used. Following the taper announcement the rate of contraction in cross-border bank claims increased considerably. The rebalancing of global portfolios away from EMDE assets resulted in capital outflows and currency depreciations in several EMDE countries. Following the study of Adjiev and Takas (2016), among the groups of borrowing countries, EMDE countries were affected the most and experienced a sharp deceleration in cross-border bank lending of 8.9 percent. Interestingly, during the taper tantrum, lending to non-banks performed worse than interbank lending.

5.2 Cross-border bank lending in the euro

The euro is the second most used currency for cross-border bank lending. There is some evidence that the euro is starting to take on some of the characteristics of the US dollar as a global funding currency (SHIN, 2015). Among euro lenders it is French and German banks that dominate. The share of euro-denominated cross-

border claims varies considerably by borrowing region. For advanced European countries outside the euro area, the euro share in cross-border bank lending (32%) is almost equal to that of the US dollar (35%). Around 20% of the euro-dominated bank claims outside the euro-area flows to EMDE, mostly to Emerging Europe, where the share of euro-denominated claims (40%) exceeds that of US dollar claims (31%).

To illustrate the variation of the euro's shares in bilateral cross-border lending a global "heat map" presented in the September 2016 BIS Quarterly Review (Picture 4) are used. The color of each cell reflects the euro's share of cross-border claims between particular lending banking systems (columns) on a particular borrowing country (rows). Although the majority of global cross-border bank lending is denominated in US dollars, there is a clearly defined euro network comprising the euro area and other advanced economies and emerging Europe. Most of the claims originating from European banks or directed towards (advanced and emerging) European borrowers tend to be denominated in euros.

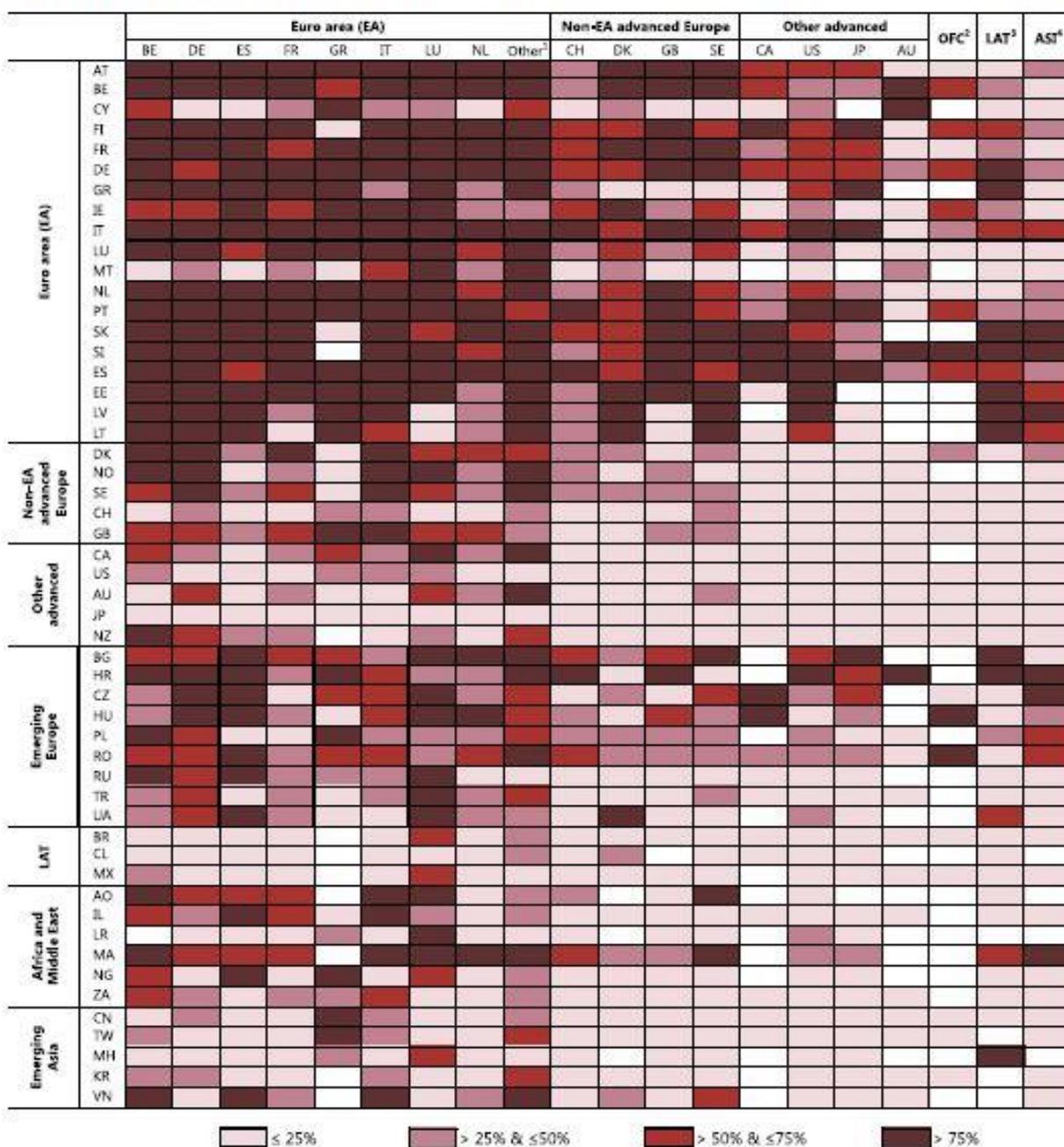
A significant pick up have been seen in cross-border claims following the NIRP announcement and its implication together with other unconventional monetary policies in the second half of 2014. The data described below are summarized in Table 3. As of end 2014, the total credit to non-bank borrowers outside the euro area denominated in euros reached EUR 2,375 billion of which the credit to EMDEs stood at EUR 448 billion. The grow rate of cross-border claims rose considerably during the quarter following the ECB announcement. The growth rate changed from 1.9% in the first quarter 2014 to 5.6 percent and 5.5 percent in the third and fourth quarter 2014. Cross-border claims to EMDEs outside the euro area grew even more by 8.4 percent and 8.1 percent.

Picture 4 Euro's shares in bilateral cross-border lending

Euro's share in cross-border bank lending in Q1 2016

By nationality of lending bank (columns) and residence of borrower (rows), in per cent

Graph 1



ASI = Emerging Asia; LAT = Latin America; OFC = Offshore centres.

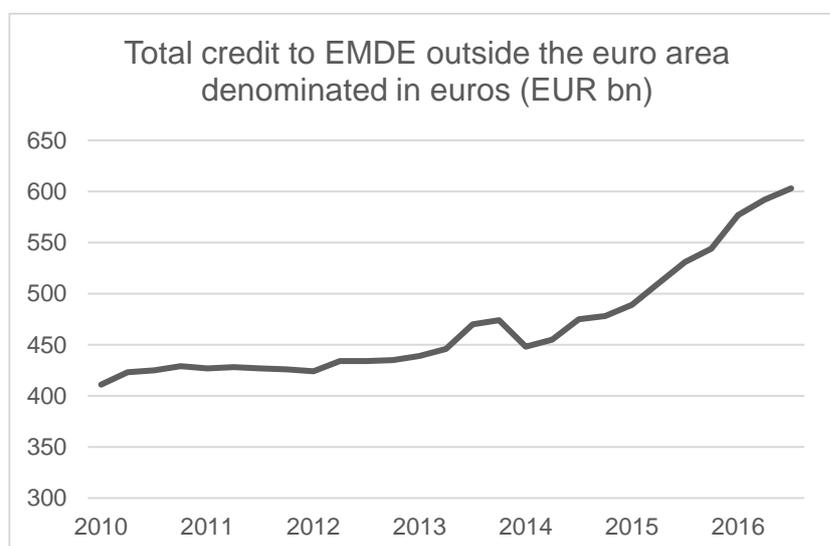
AO = Angola; AT = Austria; AU = Australia; BE = Belgium; BG = Bulgaria; BR = Brazil; CA = Canada; CH = Switzerland; CL = Chile; CN = China; CY = Cyprus; CZ = Czech Republic; DE = Germany; DK = Denmark; EE = Estonia; ES = Spain; FI = Finland; FR = France; GB = United Kingdom; GR = Greece; HR = Croatia; HU = Hungary; IE = Ireland; IL = Israel; IT = Italy; JP = Japan; KR = Korea; LR = Liberia; LT = Lithuania; LV = Latvia; LU = Luxembourg; MA = Morocco; MH = Marshall Islands; MT = Malta; MX = Mexico; NG = Nigeria; NL = Netherlands; NO = Norway; NZ = New Zealand; PL = Poland; PT = Portugal; RO = Romania; RU = Russia; SE = Sweden; SI = Slovenia; SK = Slovakia; TR = Turkey; TW = Chinese Taipei; UA = Ukraine; US = United States; VN = Vietnam; ZA = South Africa.

¹ Austria, Cyprus, Finland, Ireland and Portugal. ² Hong Kong SAR, Panama and Singapore. ³ Brazil, Chile and Mexico. ⁴ Chinese Taipei, India and Korea.

Source: BIS locational banking statistics.

There has been similar pattern in the growth of cross-border lending to EMDEs during 2015, as in the second half of 2014. Rising total credit amount denominated in euros, which flows to EMDE, is shown in the Graph 1. In 2015, the highest percent change of cross-border flow has been reported for Latin American countries, however, the share of euro denominated debt securities and bank loans still relatively low¹¹.

Graph 1 Total credit to EMDE outside the euro area denominated in euros



Source: BIS

The cross-border growth was even stronger in 2016, when ECB undertook additional cuts in its deposit facility rate to – 0.4 percent and continued with quantitative easing policy, the growth rate exceeded 10% annually. There was a notable pick up in flow of cross-border claims to Emerging Asia and Pacific (especially Indonesia) as well as a continuous increase in the flow to Latin America. In the second half of 2016 there was an increase in euro dominated financing to demographically closer EMDEs, Turkey and Russia, who are more established euro borrowers.

Turkey is one of the largest EMDE debtors in euros. During the period of negative rates in Europe Turkey experienced a surge in capital flow. Their total credit in euros rose from EUR 55 billion at the beginning of 2014 to EUR 87 billion at the end of 2016. Besides financial linkages with euro-area countries, Turkey also has strong trade linkages with European countries.

¹¹ 11% of the cross-border claims to EMDE before introduction of NIRP in 2014 and 15% of the cross-border claims to EMDE in the end of 2016 (International banking statistics, BIS)

Table 3 Total credit to non-bank borrowers by currency of denomination 1: Euro

Total credit to non-bank borrowers by currency of denomination 1: Euro						
Bank loans and debt securities issues, by residence of non-bank borrower						
Borrowers	Amount outstanding (EUR bn)			Annual change (%)		
	Q4 14	Q4 15	Q4 16	Q4 14	Q4 15	Q4 16
Borrowers outside the euro area	2367	2542	2823	5.5	6.5	8.3
Of which: EMDE	448	489	577	8.1	5.7	13.4
Africa and Middle East	69	74	80	10.7	5.0	8.7
Saudi Arabia	2	1	1	10.3	-49.9	4.8
South Africa	6	6	7	2.0	3.3	4.1
Emerging Asia and Pacific	64	63	92	34.6	-4.7	45.2
China	13	13	19	62.5	3.8	50.4
Chinese Taipei	1	1	1	-26.0	25.3	-6.8
India	6	6	8	30.2	-5.0	20.6
Indonesia	6	8	14	89.7	28.7	78.3
Korea	7	7	6	27.0	-4.3	-11.6
Malaysia	1	0	0	27.7	-12.3	18.7
Emerging Europe	261	283	317	-0.1	4.3	8.5
Russia	16	32	40	1.7	-8.8	12.5
Turkey	60	76	87	3.2	9.3	52.6
Latin America	54	69	87	12.7	25.4	9.9
Argentina	16	16	19	0.8	-0.8	15.5
Brazil	11	11	10	17.8	7.5	-11.5
Chile	2	4	4	102.2	71.8	-10.7
Mexico	20	30	45	23.6	51.7	18.8

Source: BIS

5.3 Cross-border bank lending in Japanese yen

The yen network is not as large as its dollar and euro counterparts. It mainly comprises lending to Japanese borrowers and mainly by Japanese banks. Roughly half of Japanese banks' claims are denominated in foreign currency. While full data are not available on the currency composition of such borrowing, it is almost certainly primarily in the form of yen and US dollars. There are only a few yen-heavy pairs in which neither the lender nor the borrower is from Japan.

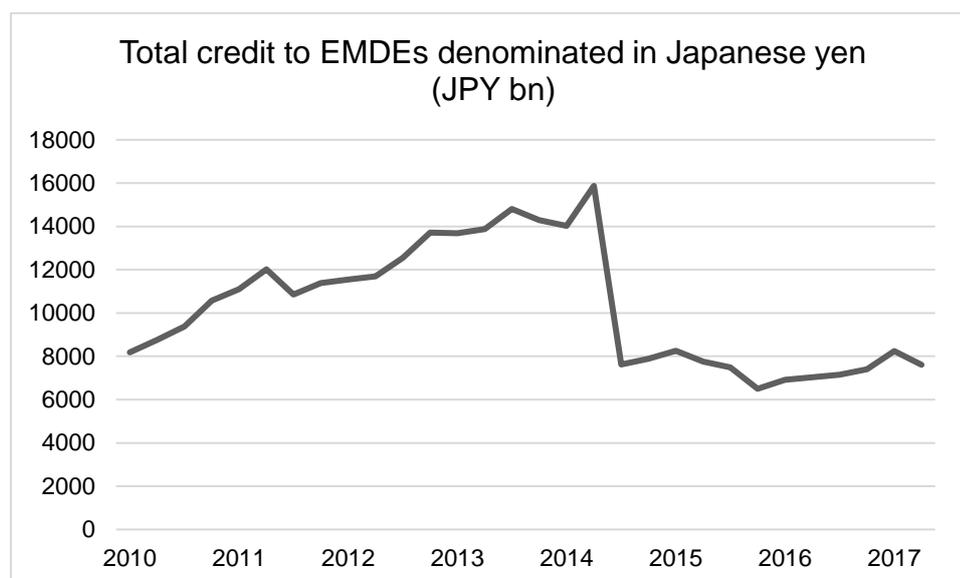
Japan is the world's largest creditor with a focus on the Asia-Pacific area. Several countries in the region are now particularly reliant on Japanese loans among their various international bank borrowings. Most prominent is Thailand, where Japanese lending represents nearly two-thirds of all foreign bank lending. Other Asia-

Pacific countries with a large share of Japanese lending include Australia, the Philippines, South Korea, and Indonesia, each with more than 20 percent of foreign borrowing from Japan (BIS statistics). On the other hand, Japanese lenders are generally more sensitive about ratio of borrowers, so the market may be open only to top companies.

BOJ introduced negative interest rates in January 2016 and as was mentioned previously it reflect almost immediately in interbank funding rate. However, upswing in cross-border lending came later. The data described below are summarized in Table 4. Total credit to non-bank borrowers in Japanese yen reached its bottom in the first quarter of 2016 at JPY 43 trillion, loans and debt securities to EMDE countries stood at JPY 6.4 trillion (15 percent of total). Since then the cross-border lending declined in total, though increased modestly to EMDE countries as is shown in the Graph 3.

One year later in the first quarter of 2017 the total amount of credit to borrowers outside Japan did not change significantly but changed proportionally in borrowers. Credit to EMDEs rose 13.3 percent annually to JPY 7.4 trillion. Many Emerging Asia and Pacific countries benefited from it. One of the top borrowing EMDE country is Indonesia whose debt in JPY rose by 24 percent during this period to JPY 920 billion.

Graph 2 Total credit to EMDEs denominated in Japanese yen (JPY bn)



Source: BIS

Table 4 Total credit to non-bank borrowers by currency of denomination 1: Japanese yen

Total credit to non-bank borrowers by currency of denomination 1: Japanese yen						
Bank loans and debt securities issues, by residence of non-bank borrower						
	Amount outstanding (JPY bn)			Annual change (%)		
	Q4 15	Q1 16	Q1 17	Q4 15	Q1 16	Q1 17
Borrowers outside the euro area	45,113	43,028	42,925	-2.6	-6.6	0.1
Of which: EMDE	7,488	6,499	7,403	-1.6	-17.5	13.3
Africa and Middle East	759	630	684	10.8	0.6	8.5
Saudi Arabia	19	16	18	17.9	-9.9	17.6
South Africa	34	34	33	-1.6	-1.4	-3.3
Emerging Asia and Pacific	4,882	4,063	4,827	-2.3	-23.9	19.0
China	742	501	713	-10.5	-51.5	43.2
Chinese Taipei	289	259	322	-6.8	-13.7	23.9
India	566	463	516	10.3	-21.1	11.5
Indonesia	854	743	920	21.3	-4.9	24.1
Korea	741	708	707	-24.1	-27.1	-0.1
Malaysia	94	77	111	11.7	-28.4	44.2
Emerging Europe	1,048	1,034	1,021	0.2	-0.9	-1.3
Russia	3	4	4	-23.8	-2.4	0.8
Turkey	528	519	531	0.8	-1.8	2.3
Latin America	799	771	872	-9.8	-11.7	7.9
Argentina	21	20	18	3.0	2.7	-10.8
Brazil	51	47	48	-45.8	-53.8	2.5
Chile	3	2	1	-57.0	-71.4	-61.4
Mexico	528	518	667	-8.2	-7.9	21.1

Source: BIS

5.4 Potential explanation

There are several potential explanations for this development in cross-border lending. First, increases in cross-border lending could reflect that a loosening of monetary policy in a given currency typically eases financing conditions in that currency, tending to lower bank's funding costs. Lower lending costs are likely to translate into higher lending in that currency; simultaneously cross-border credit would increase when there is a lack of the investment opportunities in the country. And growth in outstanding amount would naturally depend on the share of lending in that currency.

Second, the result could also be driven by the international risk-taking channel of monetary policy (Rey (2015) and Bruno and Shin (2015a)). When a global funding currency (such as the US dollar or the euro) depreciates, the effect is to increase

the net worth of foreign borrowers (borrowers outside the respective country or currency area) with currency mismatches on their balance sheets. This improves their assumed creditworthiness and lifts cross-border bank lending flows.

The third possible explanation is related to the hedging demands of institutional investors with currency mismatches on their balance sheets (BORIO et al., 2016). When a central bank in charge of a global funding currency X signals an upcoming loosening of its monetary policy stance, the hedging demands of such investors tend to increase (SHIN, 2016). This increase in hedging demand is typically met via FX swaps from internationally active banks, which would sell currency X spot and buy respective currency forward from the institutional investors. The spot transaction would show up as a currency X loan on the balance sheet of the reporting bank. Moreover, if the reporting bank borrows the currency X that it provides in the spot transaction above from another bank located in a different country, this would lead to a further increase in the cross-border interbank lending activity.

The above effect would be present even if the reporting bank is located in the same country as the institutional investor whose hedging demand it accommodates. The borrowing bank would need to borrow the euros from another bank located in a different country, this would still lead in an increase in cross-border interbank claims. Nevertheless, the second and the third possible explanations for the statistical significance of the euro share apply only to borrowers outside the euro area.

6 Turkey

6.1 Turkey in reaction of NIRP

There are studies analyzing the immediate response of financial indicators of Turkey to NIRP announcements of the ECB. The first study on the effects of NIRP on EMDEs is a section in a World Bank study by Arteta et al. (2016), which focus on the movements of financial indicators of Turkey, among other EMDEs, during ECB negative interest rate announcements. An event study showed that the responses of Turkish assets to NIRP announcements were on average consistent with expectations. The nominal effective exchange rate appreciated the most, by 1.6 percent, in connection of the December-2015 and March-2016 ECB further cuts in the negative territory and slightly less so with the Swiss National Bank announcement in January 2016 by 0.6 percent on the day of announcement.

Bond spread declined on average 5.6 percent during the respective NIRP announcements and further cuts by central banks (Arteta et al, 2016). Gunes and Oz (2016) showed in their study using a GARCH (1,1) model that 2-year and 10-year bond returns decreased by 7.9 and 6.5 basis points, in connection with the ECB negative interest rate announcements. A detailed analysis on the exact date of the impact reveals that the volatility in these two indicators fall the day before, on the day, and the day after announcements.

Also, equity prices increased on the day of the announcement, BIST 100 index increasing by 1.7 percent (Gunes and Oz; 2016). This impact on Turkish financial markets is also directionally consistent with estimates for QE policies by major central banks.

Results imply that the NIRP announcements encourage global investors to shift cross-border financial flows from NIRP countries to others, including Turkey, thus helping to calm the Turkish financial market. Increases in short-term capital inflow to Turkey might have transmission channels to the whole economy similar to those of expansionary monetary policies at home, except for a change of the exchange rate, when the exchange rate is expected to appreciate instead of depreciate as it is the case for expansionary monetary policies (for example an interest rate cut).

6.2 Turkey and capital flows

Turkey is one of the emerging countries that depends greatly on international capital inflows. Due to the inadequate domestic savings level the Turkish growth is dependent on external funding. In 2016 the savings rate in Turkey was 24.5 percent, which is very low compared to the average saving rate of 33 percent of the GDP for emerging countries (IMF, 2014a). The average savings rate would also refer to the Turkey's investment rate which was 30.8 percent in 2016. The gap between credits and deposits (credits > deposits) has been increasing in the Turkish banking system and this credit expansion arises from the growth of the bank's non-core liabilities. Cross-border liabilities are key components of the non-core liabilities of the Turkish banking system.

Turkey has experience a number of capital inflow surges in recent years, which have been associated with credit booms and build-up of risk. The authorities have taken a wide range of measures to try to strengthen the resilience of the financial sector in the face of these risks, including by aligning capital with the risk, addressing excessive credit growth, increasing the resilience of borrowers and incentivizing banks to develop less risky funding structures.

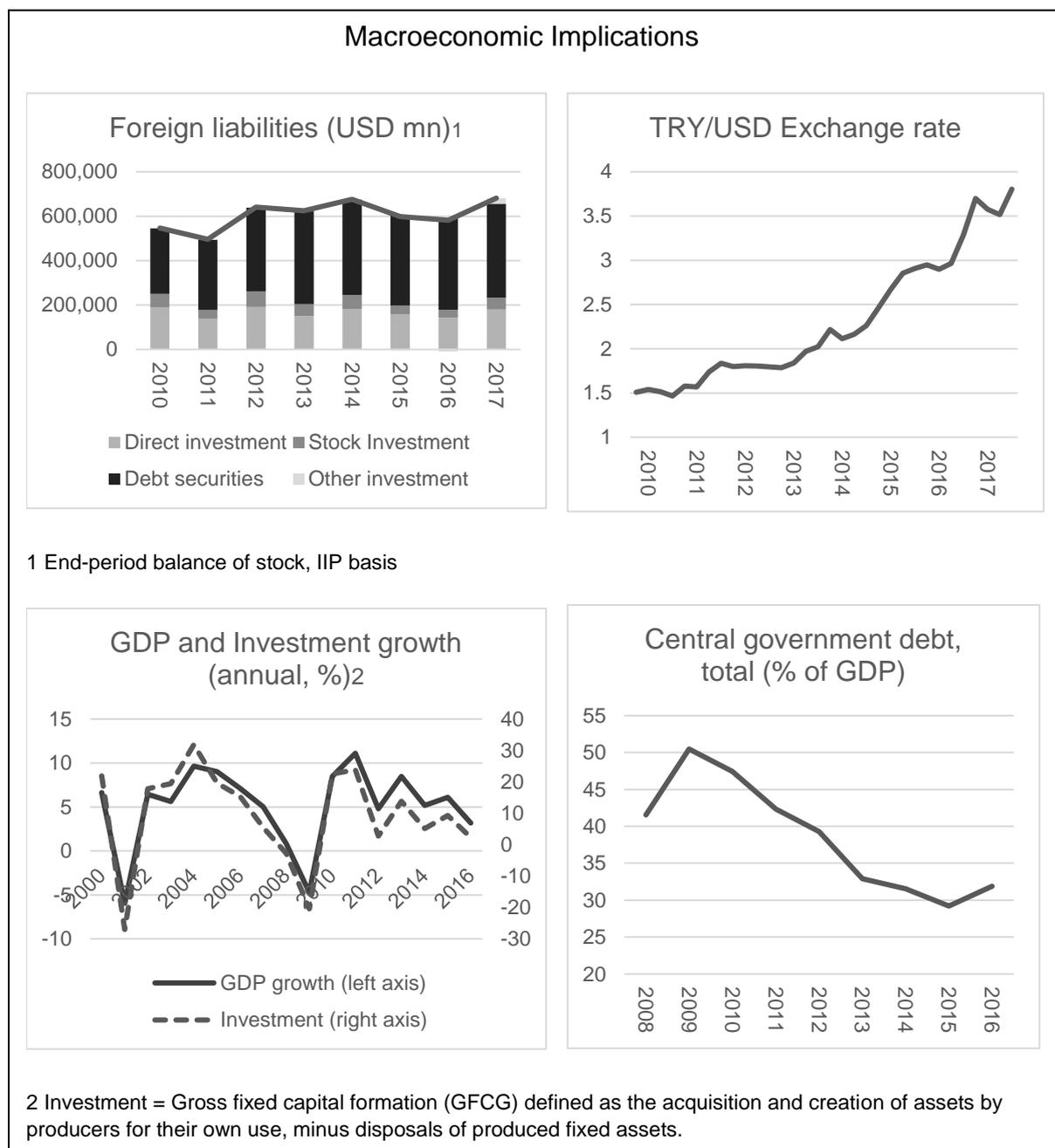
Following the global financial crisis Turkey experienced a high economic growth together with a high investment rate (Graph 3), as aggressive monetary and fiscal policy easing and regulatory tolerance were associated with rapid credit growth and widening current account deficit. A credit supported domestic demand, pushed inflation high and driving the current account deficit to 10 percent of GDP in 2011. From 2012, both demand and growth slowed significantly.

The Central Bank of the Republic of Turkey (CBRT) introduced inflation targeting in 2006 and since then the inflation target has been met only twice. Inflation expectations have been unachieved and the monetary transmission mechanism undermined. This was due to insufficient monetary policy rate tightening and high exchange rate pass through, which generate inflation volatility in period of lower capital inflows (IMF, 2017).

Policy frameworks have evolved over the past decade as the authorities have developed new tools to help address financial stability risks. From 2010 CBRT began

to incorporate financial stability aspects into the inflation targeting framework. Multiple new instruments were introduced to protect financial stability, achieve a less volatile exchange rate and to gain an additional degree of freedom in setting domestic interest rates. These instruments included reserve requirements as well as a wide interest rate corridor and a highly variable cost of liquidity within the corridor. However, the combined use of reserve requirements and interest rates for both monetary policy and macro prudential purposes was not successful in responding to credit growth and capital flow volatility.

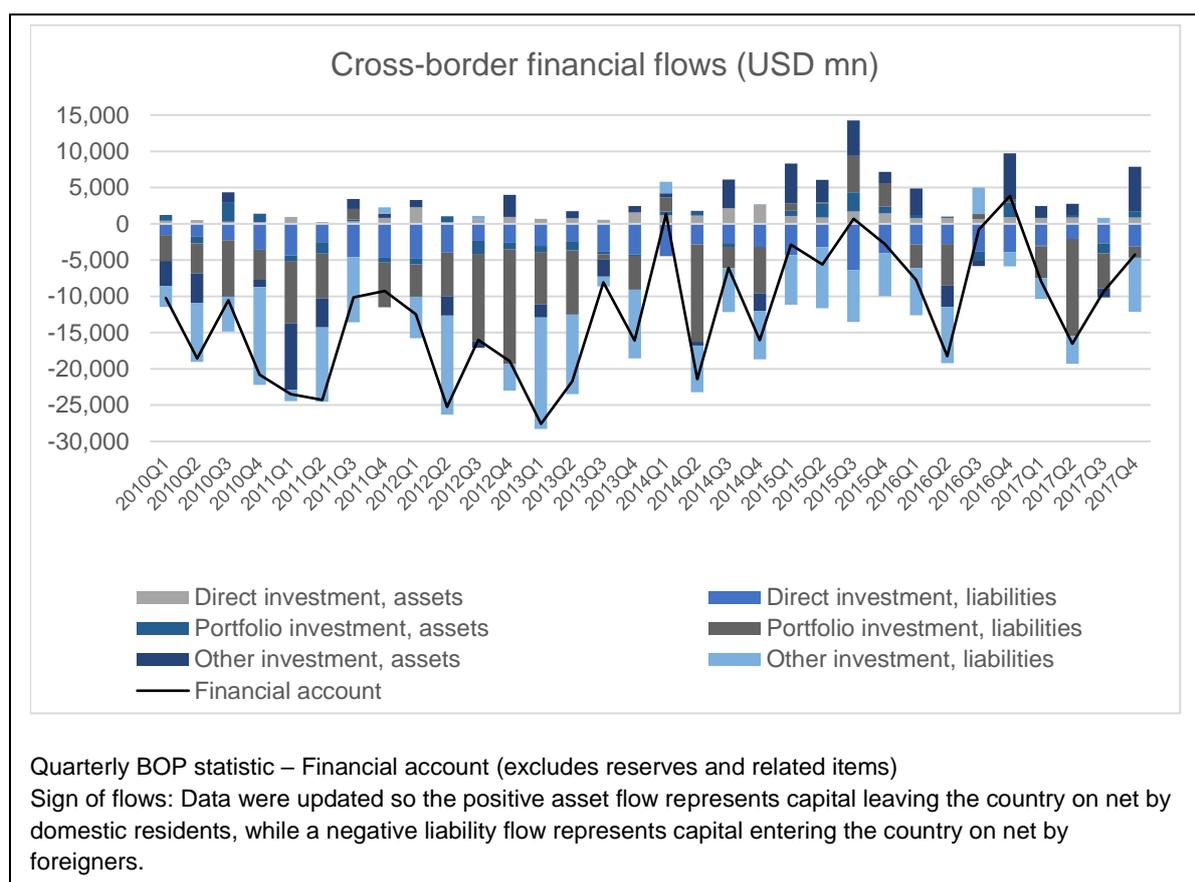
Graph 3 Turkey - Macroeconomic Implications



Source: IMF, BIS, World Bank, OECD

Turkey has faced frequent risk-on/risk-off episodes with consequences for the financial sector. Large external financing needs and short-term funding composition affected market sentiment and increased capital flow volatility, during several episodes, such as the 2011 Euro debt crisis, the 2013 taper tantrum (Graph 4). The financial flows to the country are driven mainly by debt instruments contained in both portfolio investments and other investments. These types of instruments are more volatile compared to direct investment flows. Stock investments present only small part of the financial inflow to the country.

Graph 4 Turkey - Quarterly cross-border financial flows



Source: IMF

In the last quarter of 2011, euro-area related turbulence, and uncertainties over the domestic policy framework, again led to a reversal of capital flows. There was a weakening of funding for local banks (via foreign bank loans to Turkish banks and corporations), foreign direct investment and trade. The CBRT responded by tightening monetary policy considerably, and selling around 15 percent of its FX reserves to defend the lira. Capital inflows remained strong until 2013, but there were further

outflows after 'taper tantrum'.

In early 2014 Fed tapering, loose and opaque monetary policy, and domestic political uncertainty led to a 15 percent exchange rate depreciation (IMF Country Report No. 14/329, 2014). After a period of unsterilized FX intervention, which resulted in a rapid loss of international reserves, the CBRT increased the one-week repo rate by 550 basis points and adjusted its policy framework. In the second quarter Turkey again Turkey again experienced a sharp increase in the portfolio investment inflow, which may have been a result of immediate reaction to the monetary policy easing in Europe. This flow remained for the rest of 2014 and the Turkey's international liabilities reached an historical maximum. This capital surge was offset during 2015 and overall net capital flows declined during the 2014-2016 period. Most of the outflows were in type of portfolio debt. At the end of 2016 Turkey's credit-to-GDP gap stood at 10.3 percent above its long-term trend.

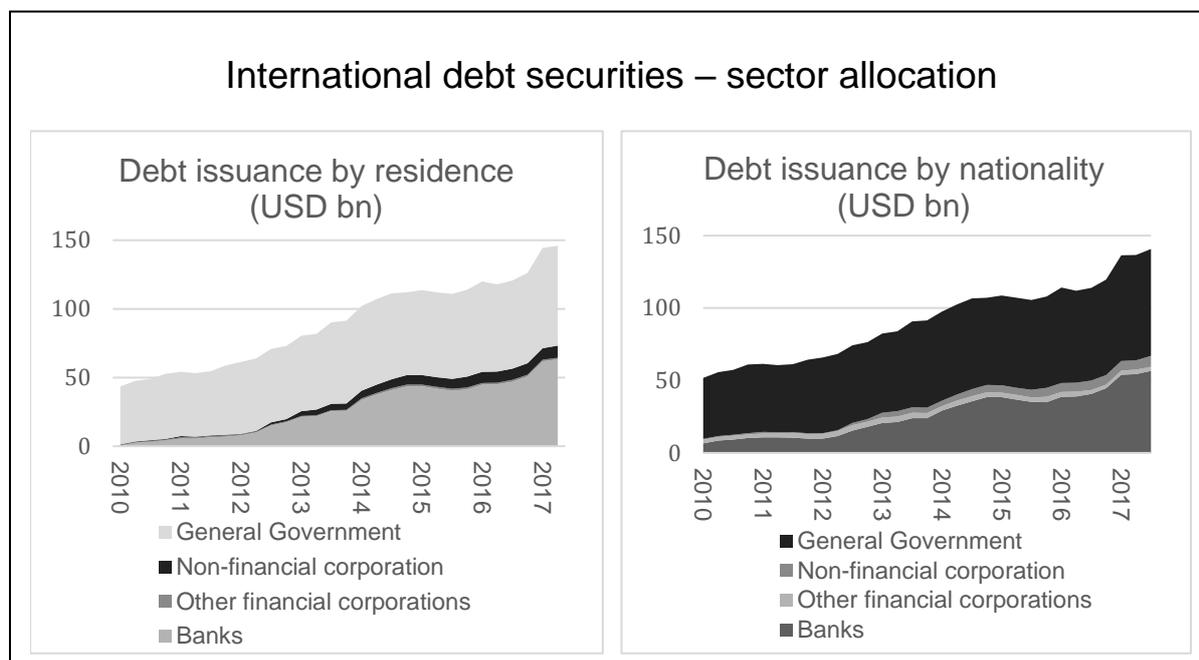
Turkey again managed to attract more investors in 2017 despite the higher current account deficit and GDP growth decline. According to Anadolu Agency, Turkey attracted \$10.83 billion net foreign direct investment, \$7.44 billion of which was equity investment inflow. Direct investment inflow from the European Union amounted to \$4.45 billion, constituting 65.2 percent of the total annual inflow to Turkey. Turkey appears to be more exposed to monetary shock due to the size of its current account deficit and its relatively large and liquid financial markets, which facilitate easier portfolio rebalancing by foreign investors.

Using the International Debt Securities statistic by BIS it is possible to allocate international debt securities to each sector. In Graph 4 Turkish bonds are classified based on the residence of the issuer or the nationality of the issuer. The biggest sector issuing international debt securities is the government. The outstanding amount was 72.7 billion in US dollars, which counts for one third of the total debt securities issued by the Turkish government. Government debt to GDP ratio for Turkey has had a downward trend since 2010 and in 2016 was at 31.8 percent of GDP.

There has been a huge increase in outstanding amounts in the issued debt securities since 2010. The biggest increase is in the issuance of the securities by banks. This increase is slightly larger using the data based on the residence of the issuer than the nationality of the issuer. These non-core liabilities draw more

attention lately due to its important role in signaling financial vulnerability because a large part of non-core liabilities are short term and denominated in foreign currency. As well, recently, the debt securities issued by non-financial corporations to international markets are growing.

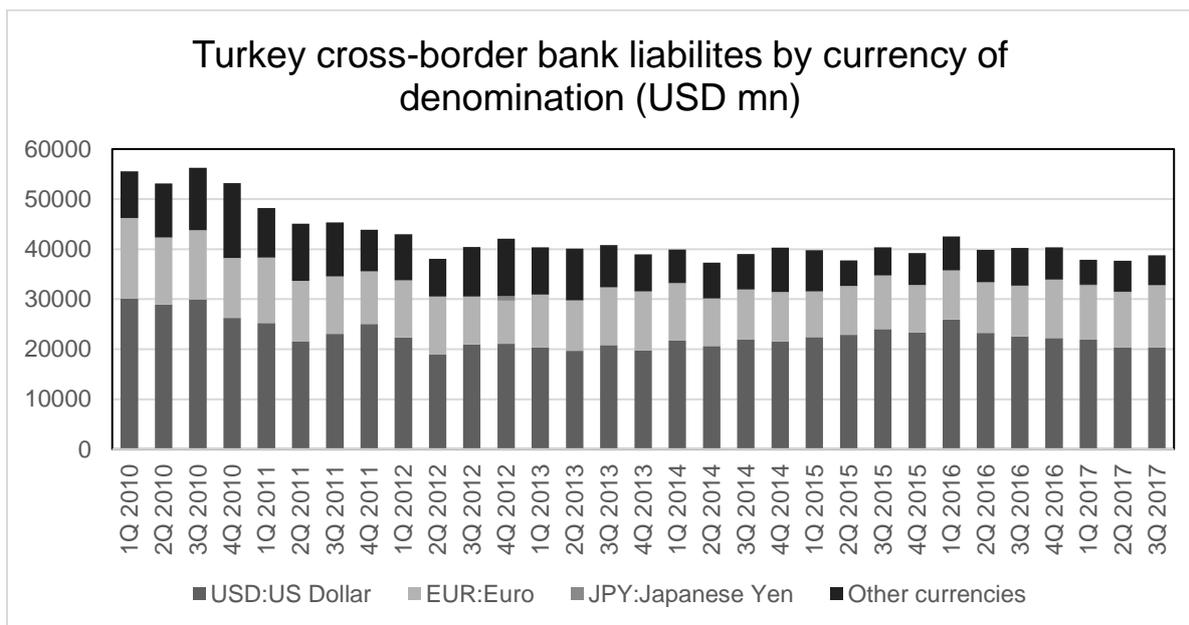
Graph 5 Turkey - International debt securities - sector allocation



Source: BIS

The denomination of the debt securities is also important. Turkey’s private and public sector debt is mostly denominated in Turkish lira. For cross-border bank liabilities the main denomination is in US dollars (53 percent of total). Share of the euro denominated cross-border liabilities dilated in Turkey after easing of policy interest rate in Europe (Graph 5). Cross-border liabilities in euros rose to 32 percent in the third quarter 2017, which in 2014 was 24 percent of the total. This may have been a result of increasing yield differentials between Europe and the United States.

Graph 6 Turkey - cross-border bank liabilities by the currency of denomination



Source: BIS

6.3 Macprudential policy in Turkey

The macroprudential toolkit in Turkey has evolved and expanded over the last decade, with a wide range of tools applied to both borrowers and financial institutions. The key in the design of macroprudential measures was the role of capital inflows in driving macroprudential risks and business cycles. They were closely coordinated with monetary policy in Turkey.

In 2014, the Financial Stability Committee (FSC) was founded. A formal institutional framework for macroprudential policies and measures was adopted to prevent the buildup of excessive leverage and strengthen bank buffers. One of the introduced tools was reserve option mechanism, which was introduced in order to increase the resilience to volatile capital flows and dampen the strong link between capital flows, the exchange rate and credit growth. This reserve option mechanism allows banks to meet part of their reserve requirements on lira liabilities with FX and gold. This facility affects fluctuations in the exchange rate, limiting conversion of FX inflows into bank lending, and incentivizing banks to accumulate FX for a rainy day.

This releases lira, previously locked in the central bank, countering appreciation pressures and limiting conversion of inflows into bank lending.

A second package of macroprudential policy measures was introduced during 2013/2014 as credit growth stood at 32 percent and household leverage had reached over 50 percent of disposable income (IMF, 2017). The measures included introducing further caps, limits and higher risk weights on credit. These measures and others, coupled with a tighter monetary policy stance, successfully restrained credit growth, which has since been declining.

Furthermore, the authorities have taken steps to address risky funding structures. Starting in late 2014 macroprudential measures were introduced to encourage banks to lengthen their maturities and to discourage them from funding their lending via increased short-term cross-border borrowing in foreign currencies. However, more measures may be needed to address risk from unhedged corporate borrowing in foreign currencies. As a first step, the CBRT is initiating a database on firm's international positions (focusing on largest firms that hold nearly 40 percent of total corporate cross-border debt). The aim is to establish the appropriate macroprudential tools to discourage excessive risk by firms.

On the other hand, a number of macroprudential measures were reduced in 2016 to support credit growth. Maturity limits on consumer loans were eased, risk weights on housing loans decreased and provisioning on those loans reduced. However, these actions took place against a backdrop of still high systematic risk.

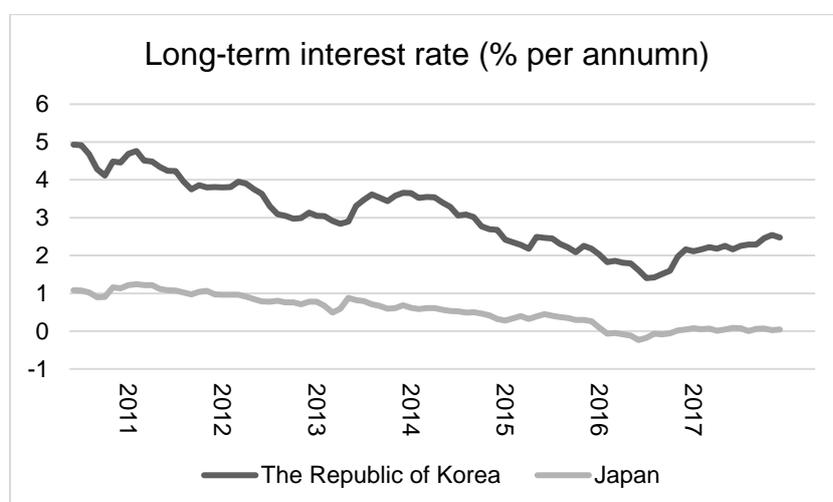
7 The Republic of Korea

7.1 The Republic of Korea in reaction of NIRP

Asian Development Bank Institute (2017) explored the spill over effects that Japan's negative interest rate policy had on Asian financial markets. They found that Japan's long-term interest rate had significant negative effects on Asia stock prices during the NIRP period, these spill over effects caused a significant decline of excess returns in Japan's finance sector. Local financial institutions who lost their profit opportunities in domestic markets searched for a new profit opportunity in emerging Asia after the NIRP was announced. The stock market in the Republic of Korea did not react the same way to a fall in Japan's long-term interest rate. The Republic of Korea is one of the Asian economies that has a developed stock market though their market size is not large enough to have significant reverse causality to Japan's financial variables (Fukuda, 2017).

A fall in Japan's long-term interest rate connected with the announcement of NIRP affected the Republic of Korea's long-term interest rate (see Graph 6). A lower long-term interest rate did persist long and in the second half of 2017 rose to a level even higher than before NIRP announcement.

Graph 7 Japan and the Republic of Korea - long-term interest rate



Source: OECD

The impact of unconventional monetary policies of advance economies on

the Republic of Korea overall seems to have been positive for real economic activity (GDP growth and inflation). However, this positive effect was not significant and dissipated soon, while the negative effect on inflation and the exchange rate seemed to be significant (Joon-Ho Hahm, 2018). Unconventional monetary policies of advanced economies may have led to currency appreciation and decreased import prices and inflation pressure, necessitating accommodative monetary policies in the Republic of Korea.

7.2 The Republic of Korea and capital flows

The Republic of Korea benefits from financial and economic integration with the world economy. The country has had economic growth for nearly fifty years and during that period capital inflows provided valuable funding for the build-up of export-oriented manufacturing companies. As a result, Korea is the world's 11th largest economy and 6th largest exporter (IMF, 2016).

However, Korea has experienced the risks associated with capital flows during the Asian financial crisis in 1997 and has undergone two episodes of foreign currency liquidity shortages. Asian countries turned to outflows, exposing balance sheet vulnerabilities. Similarly, when the recent global financial crisis spread in 2008 from the key financial centres in advanced economies, Korea again experienced foreign currency liquidity shortages as capital flow reversals. To prevent a return of a systematic crisis policy intervention was needed. The intervention, including swap lines from major central banks, proved successful, although the country was on the verge of currency crisis (Olafsson and Petursson, 2011).

External debt increased considerably before the run-up to the 2008 global financial crisis. During this period banks in Korea relied on foreign currency capital to fund their credit growth and hedging operations. Gross inflows are associated with varying levels of risk, depending on the type of flow, the use of financing, and resilience of domestic financial markets and balance sheets to the potential volatility of such flows (Olafsson, 2017). Korea relied on continued access to cross-border funding that was principally risky.

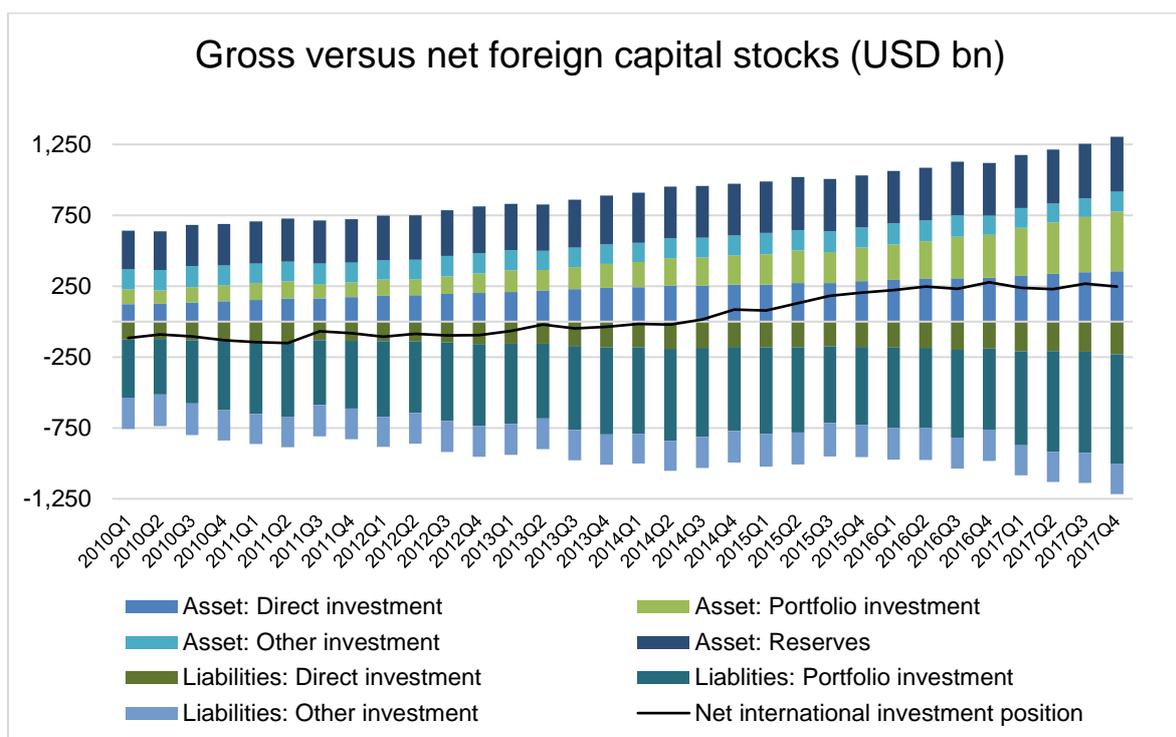
As global liquidity conditions worsened in 2008, market seized up, and a foreign currency liquidity shortage emerged, Korean banks were unable to roll over their short-term FX liabilities. The won depreciated and the CDS premium on Korean government bonds rose considerably. The authorities responded by supporting liquidity in both the won and the US dollar.

On the example of the Republic of Korea can be seen how country, which running sustained current account surpluses, can be vulnerable to loss of foreign funding. The reason can be seen beyond net flows as the size and composition of gross flows. Combination of the surges and then shortages of funding liquidity, and expanding and then overextended sectoral balance sheets played a role in posing financial stability risks.

Before the both difficult episodes, The Republic of Korea had a relatively strong net international investment position, low gross external debt, and a favourable fiscal position. A year before the Asian crisis started the net international investment position was negative by 10 percent of GDP and gross external liabilities were around 31 percent of GDP. During the run-up to the 2008 crisis, however, the country ran sustained surpluses and its foreign reserves were rising. Hence, this experience illustrates that systemic risk can build-up in the context of relative macroeconomic stability and strong external balance sheet.

It is more difficult to identify vulnerabilities arising from the structure of gross cross-border positions. Graph 8 illustrates the rise in gross flows and the large gap between net and gross positions, a consequence of the Republic of Korea's integration with world asset markets. The growth of gross positions is led by higher outstanding amounts of portfolio investments. On the other hand, the net international investment position of the Republic of Korea turned positive from 2014.

Graph 8 The Republic of Korea - Gross versus net foreign capital stocks



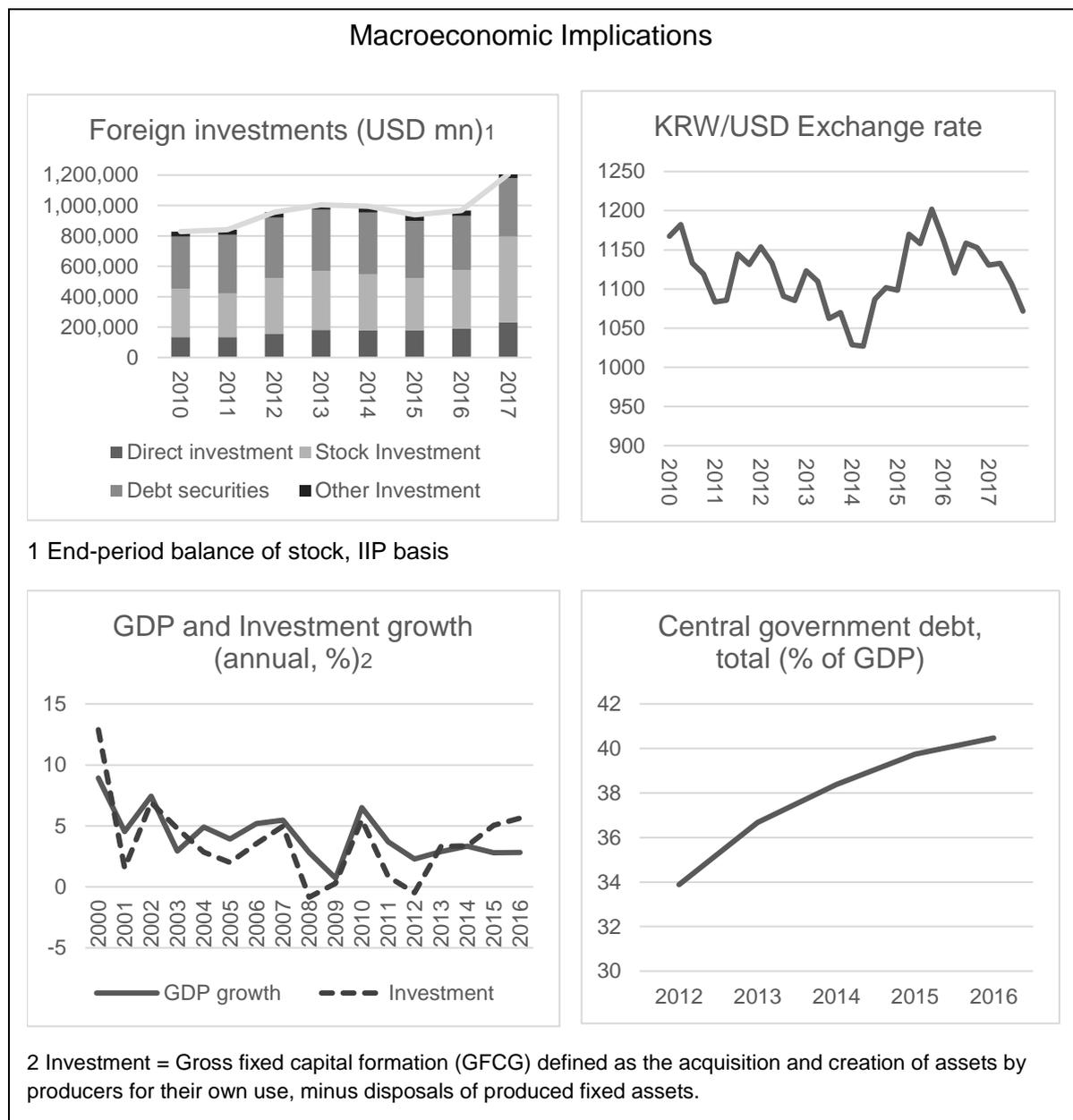
Source: IMF

The post-crisis period has been influenced by quantitative easing of major advanced economies that led to a substantial rise in foreign portfolio investment in the Republic of Korea. While capital inflow through the banking sector was dominant before the global financial crisis, the Graph 9 shows that most of the capital inflow growth after the crisis was in the form of stock and bond investments. This capital inflow was also connected with the Korean won appreciation and negative impact on the Republic of Korea's inflation rate, probably through imported prices.

The structure of flows, and especially equity versus debt, indicates that different kinds of inflows create different vulnerabilities. Foreign direct investment is considered more stable so more desirable. Similar is thought about equity investment (Brunnermeier et al, 2012). It is premised that equity investors facing a bad news (e.g. economic downturn, bad data release) will face losses on their investments if they try to sell, and these losses will be even greater if the local currency depreciates at the same time. Therefore, they will avoid selling. Differently, creditors have no reasons to persist, they will not roll over loans to avoid further losses. Debt is thus procyclical. The great rise in Korea's foreign investment in 2017 was mostly stock investments, Stock investment different than direct investment were growing almost

to 400 billion US dollars by the end of 2017.

Graph 9 The Republic of Korea - Macroeconomic Implications

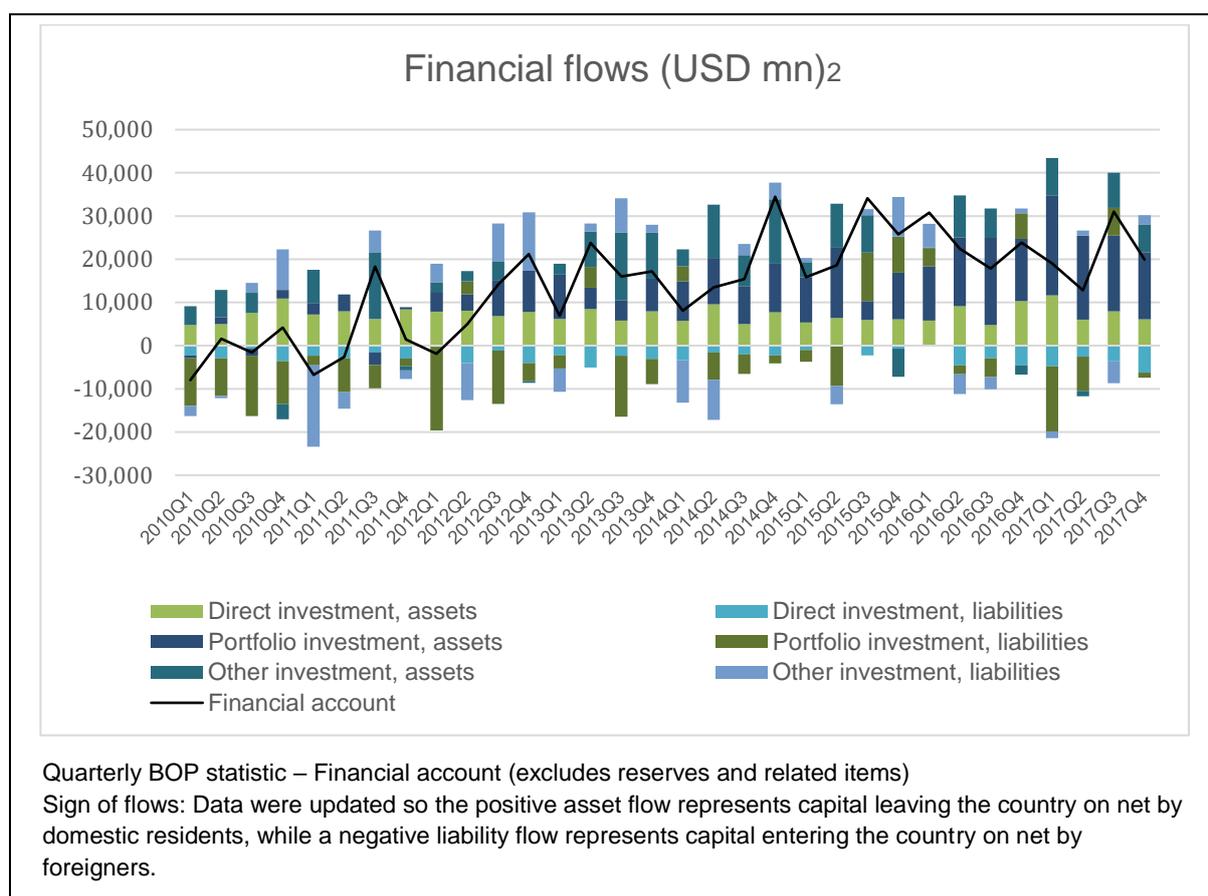


Source: IMF, BIS, World Bank, OECD

The volatility of cross-border capital flows shows (Graph 10) Korean bank reliance on foreign funding. In 2016 the Republic of Korea eased its capital controls, making it easier for foreign investors after challenging hot money inflows occurring since the global financial crisis. In the first half 2017 there were rapid foreign investments inflow to the Republic of Korea, mainly portfolio investments. As seen previously, beginning in 2017, greater cross-border capital flows started leaving Japan

after Japan's NIRP announcement.

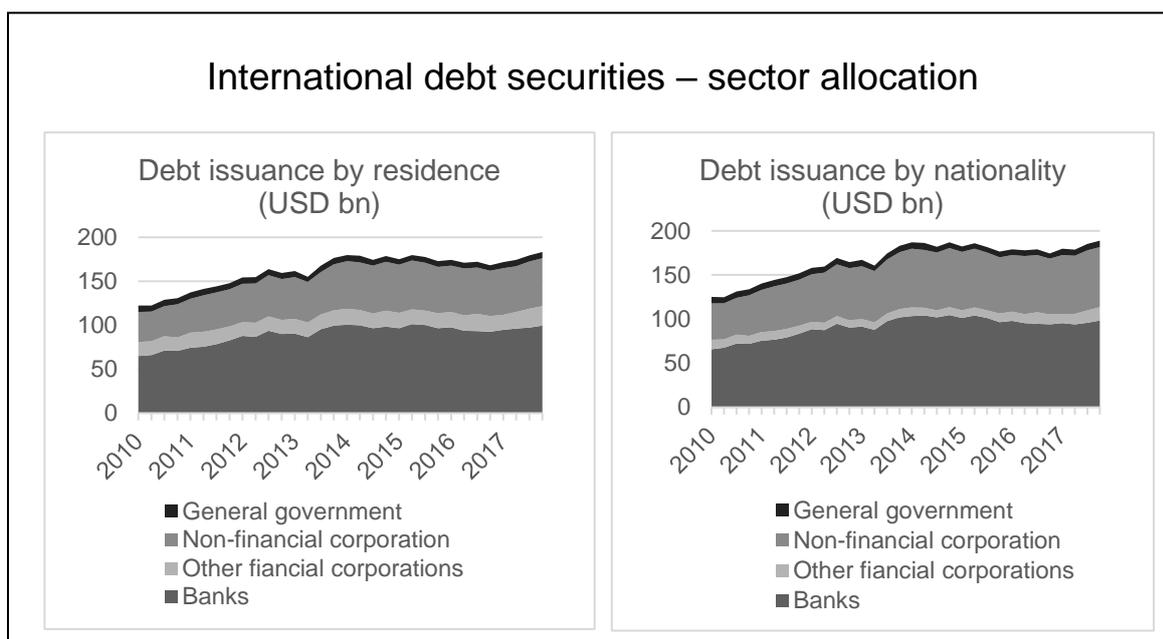
Graph 10 The Republic of Korea - Quarterly cross-border financial flows



Source: IMF

Most of the debt securities in the Republic of Korea are issued in the domestic market. The outstanding amount of Korea's international debt securities stood in 2016 at 168 billion US dollars, around 13 percent of GDP. As revealed Graph 11, international debt securities are issued mainly by banks and non-financial corporations. Study results by Avdjiev and Takats (2016) suggest that cross-border flows vary more in case of interbank lending than lending to non-banks. Therefore, Korean banks need to be careful. General government debt in the Republic of Korea is still below 40 percent and only a very small amount is issued internationally.

Graph 11 The Republic of Korea - International debt securities - sector allocation



Source: BIS

7.3 Macroprudential policy in the Republic of Korea

The authorities in the Republic of Korea had macroprudential measures in place prior to the 2008 global financial crisis. In reaction to the crisis they initiated some initial policy reforms reforms to strengthen supervision at the institutional and system-wide level, in particular foreign exchange risks.

The former liquidity in foreign currency and financing ratios that were in place did not provide a buffer against liquidity shocks. This may have been due to a fact that the ratios did not discriminate between foreign assets in terms of liquidity, with foreign government bonds and unlisted foreign stocks being treated in the same manner. The global financial crisis made clear the vulnerabilities in Korean banks' funding structure. The authorities tried to reduce this source of systemic liquidity risk by strengthening liquidity coverage and financing ratios in 2009. As well, the Financial Supervisory Service in the Republic of Korea introduced minimum financial institutions holdings of safe foreign currency assets and new risk management standards for derivative trading.

In 2010, the authorities announced further macroprudential measures with the focus on both price and quality-based prudential measures, in order to decrease

reliance on external funding and increase resilience. Net external bank funding declined right away aftermath of the global financial crisis, however, resumed in 2010. In the second half 2010, the authorities announced a cap on bank foreign exchange derivative positions relative to their capital. These positions assumed to be responsible for some of the pre-crisis rise in short-term external debt, as US dollar forwards provided to exporters were hedged by borrowing in US dollars. In the end of 2010, the authorities introduced a macroprudential levy on bank non-core foreign currency liabilities. The levy is a price-based measure, which was explicitly introduces in a cautionary manner, to reduce banks' reliance on unstable funding and carry trade flows into Korea going forward (Ministry of Finance, 2010b). The levy is collected in foreign currency and the proceeds can be used for liquidity provision in crisis situations.

More recently additional liquidity measures have been introduced, supported by the IMF. A minimum LCR ratio¹² for commercial banks was set at 80 percent in January 2015 and will be raised by 5 percentage points a year to reach 100 percent in 2019 (Financial Services Commission, 2014). A foreign currency LCR was adopted in 2015 as a monitoring tool, and banks were advised to maintain a ratio of at least 40 percent in 2015 and 50 percent in 2016. A binding 60 percent minimum ratio became effective in 2017 and is expected to be raised gradually to reach 80 percent in 2019 (Financial Services Commission, 2016).

Kim and Lee (2017) found that foreign exchange related macroprudential policies have been effective, with the cap on foreign exchange derivative positions reducing foreign bank branch short-term borrowing in foreign currency, and the levy limiting domestic banks' borrowing in foreign currency. Also, Korea did not feel any pressure during recent weaker capital inflows as the interest differential has narrowed.

The authorities announced a relaxation of some of these measures, including raising the cap on banks derivative positions and allowing for a lower bank levy should there be sudden capital outflows. The IMF has supported that easing but also emphasized appropriate structural and fiscal policies to rebalance the country's external position (IMF, 2016).

¹² Liquidity coverage ratio (LCR) refers to highly liquid assets held by financial institutions to meet short-term obligations. The LCR ratio is designed to ensure that financial institutions have the necessary assets on hand to ride out short-term liquidity disruptions.

Conclusion

A consequence of the aftermath the global financial crisis was that central banks deployed new tools to support recovery and price stability, including quantitative easing and forward guidance. As challenges persisted, some of the monetary authorities introduced NIRPs. This paper explored the potential effects of NIRP on the EMDE countries, which were applied by central banks in advanced economies.

Country study cases suggest that so far NIRP have contributed to easing financial conditions, with no major side effects on banks or market functioning. Negative policy rates are transmitted through to money market rates modestly in much the same way as positive rates are. It also appears that they are transmitted to longer maturity and higher risk rates. However, it is difficult to assess effects of NIRP as negative interest rates were mainly used together with other complementary unconventional monetary policy measures. Further work is needed to analyse the impact of NIRP and compare its effect with other monetary policy instruments.

NIRP is supposed to have a positive effect on EMDE countries, which can gain from favourable financing conditions. On the other hand, NIRP brings some challenges for them. EMDE markets face volatile capital flows, as further tightening in the US and accommodative monetary policies in Europe and Japan are expected, which will need to be dealt with. BIS and various other institutions have focused on, and draw attention to, external borrowing by nonfinancial corporations and the distinction between what shows up in the balance of payments statistics. They note a growing trend in borrowings by EMDE nonfinancial corporations. Cross-border credit to EMDE non-bank borrowers increased following the NIRP implementation in both euro area and Japan. As well, the share of cross-border claims issued in euros increased. The initial concerns of EMDE countries about uncontrollable financial inflows have been compounded by the possibility of disorderly capital flow reversals.

Higher volatility of capital flow should be a concern for macroeconomic and financial stability. When aggregate gross flows are decomposed into their components, foreign direct investment flows are found to be rather steady, whereas portfolio investment (and in particular bond) flows vary greatly, especially with global factors associated with economic conditions in advanced economies.

Prolonged periods of unconventional monetary policies in advanced economies has led to the appreciation of exchange rates (in case of the Republic of Korea) and reduced premiums of long-term interest rates in EMDE countries without significantly boosting external demand for their exports. Trade channels have substantially weakened since the global financial crisis and unconventional monetary policies have not contributed much to real GDP growth (Joon-Ho Hahm, 2018).

On the other hand, currency appreciation has put significant downward pressure on inflation. The central banks faced difficult trade-offs between price stability and financial stability. Accommodative monetary policies to address disinflationary pressure might raise financial stability risk. Macroprudential policies could be a useful defence, but it is difficult to address every channel of potential spill-overs.

Traditionally, macroprudential tools are considered as complementary to monetary policies. In the post-crisis period, macroprudential tools are seen as instruments to offset the effects of lax monetary policies and other government policies. Monetary policy as we know has been overburdened. It is possible that macroprudential tools will overburdened as well.

Macroprudential policy is more desirable than monetary policy for prevention of financial imbalances in open emerging economies, as financial cycles in open emerging economies are often driven by global liquidity conditions. Central banks in EMDE countries have come a long way in their macroprudential strategies as well as in the resiliency of their economies in general since the global financial crisis. However, they still need to be vigilant, especially in the regulatory area.

References

Agarwal R. and Kimball M.S., 2015, 'Breaking Through the Zero Lower Bound', IMF Working Paper No. 15/224, <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Breaking-Through-the-Zero-Lower-Bound-43358>.

Angrick S. and Nemoto N. May 2017, "CENTRAL BANKING BELOW ZERO: THE IMPLEMENTATION OF NEGATIVE INTEREST RATES IN EUROPE AND JAPAN", Asian Development Bank Institute, No 740, <https://www.adb.org/sites/default/files/publication/317926/adbi-wp740.pdf>.

Arteta, C., M. A. Kose, M. Stocker, and T. Taskin, 2016, "Negative Interest Rate Policies: Sources and Implications", World Bank - Policy Research Working Paper 7791, <http://documents.worldbank.org/curated/en/235551470834953672/pdf/WPS7791.pdf>.

Asian Development Bank Institute (ADBI). ADBI Annual Conference 2016: The Implications of Ultra-Low and Negative Interest Rates for Asia. <https://www.adb.org/news/events/adbi-annual-conference-2016-implications-ultra-low-and-negative-interest-rates-asia>.

_____. ADBI Conference 2016 (1 December 2016): Opening Remarks and Keynote Speeches. Video. 1:11:54. Uploaded 13 February 2017. <https://www.youtube.com/watch?v=BKnJS37KbGE&list=PL3GDf1llofbk1UnACS7f1uOiOUKfqJ8b1&index=1>

_____. ADBI Annual Conference 2016 (1 December 2016): Distinguished Speaker Session I: Negative Interest Rates in Advanced Economies. Video. 1:12:25. Uploaded 13 February 2017. <https://www.youtube.com/watch?v=1Hx061hvHrI>.

_____. ADBI Annual Conference 2016 (1 December 2016): Distinguished Speaker Session II: Implications of Ultra-Low and Negative Interest Rates for Monetary Policy and Macprudential Policy in Asia. Video. 1:27:52. Uploaded 14 February 2017. <https://www.youtube.com/watch?v=1xE2LEPE8Qw&list=PL3GDf1llofbk1UnACS7f1uOiOUKfqJ8b1>.

Avdjiev S., Subelyte A., Takáts E., 2016, The ECB's QE and euro cross-border bank lending, BIS Quarterly Review, September 2016, https://www.bis.org/publ/qtrpdf/r_qt1609h.htm.

Avdjiev S., Takáts E., 2016, Monetary policy spillovers and currency networks in cross-border bank lending, BIS Working Paper No. 549, <https://www.bis.org/publ/work549.htm>.

Bank for International Settlements, 2011, "Global Liquidity—Concept, Measurement, and Policy Implications", CGFS Papers 45, Committee on the Global Financial System. <http://www.bis.org/publ/cgfs45.pdf>.

Bank for International Settlements, October 2015, “Cross-border Financial Linkages: Challenges for Monetary Policy and Financial Stability”, BIS Paper No. 82, <https://www.bis.org/publ/bppdf/bispap82.htm>.

Bank for International Settlements, September 2017, “BIS global liquidity indicators: methodology”, https://www.bis.org/statistics/gli/gli_methodology.pdf.

Bank for International Settlements. 2015. 85th Annual Report 1 April 2014–31 March 2015. Basel. June. <https://www.bis.org/publ/arpdf/ar2015e5.pdf>

Bech, M. and A. Malkhozov, 2016. “How Have Central Banks Implemented Negative Policy Rates?”, BIS Quarterly Review, p. 31–44.

Bonds & Loans, 2017, “Negative rates and Emerging Markets: is the rally sustainable?”, <http://www.bondsloans.com/news/article/1165/negative-rates-and-emerging-markets-is-the-ra>.

Brunnermeier et al, September 2012, “Banks and Cross-Border Capital Flows: Policy Challenges and Regulatory Responses”, Committee on International Economic Policy and Reform, <https://www.brookings.edu/wp-content/uploads/2016/06/09-ciepr-banking-capital-flows.pdf>.

Bruno V. and Shin H. S., 2015, "Cross-Border Banking and Global Liquidity," Review of Economic Studies, Oxford University Press, vol. 82(2), p 535-564.

Bruno, V. and Shin H.S., 2013, “Capital Flows, Cross-Border Banking, and Global Liquidity”, NBER Working Paper 19038.

Credit Suisse Research Institute, 2017, The Effects of Negative Interest Rate Policies, <https://www.credit-suisse.com/corporate/en/articles/news-and-expertise/the-effects-of-negative-interest-rate-policies-201703.html>.

Demiralp S., Eisenschmidt J. and Vlassopoulos T., February 2017, “Negative interest rates, excess liquidity and bank business models: Banks’ reaction to unconventional monetary policy in the euro area”, Koc University-TUSIAD Economic Research Forum.

Fic T., October 2013, “The spillover effects of unconventional monetary policies in major developed countries on developing countries”, DESA Working Paper No. 131, http://www.un.org/esa/desa/papers/2013/wp131_2013.pdf.

Foster G.D. and Tom J., 2016, “Are Negative Interest Rates and Quantitative Easing Compatible? An Interview with Christian Noyer”, Gail Fosler Group, <https://www.gailfosler.com/negative-interest-rates-quantitative-easing-compatible-interview-christian-noyer>.

Fukuda S., March 2017, “THE IMPACTS OF JAPAN’S NEGATIVE INTEREST RATE POLICY ON ASIAN FINANCIAL MARKETS”, ABDI Working Paper Series No. 707, <https://www.adb.org/publications/impacts-japan-negative-interest-rate-policy-asian-financial-markets>.

Güneş G.S. and Öz S., December 2016, “RESPONSE OF TURKISH FINANCIAL MARKETS TO NEGATIVE INTEREST RATE ANNOUNCEMENTS OF THE ECB”, Koc University Working Paper 1614, https://eaf.ku.edu.tr/sites/eaf.ku.edu.tr/files/erf_wp_1614.pdf.

Hameed A. and Rose A. K., December 2016, “Exchange Rate Behavior with Negative Interest Rates: Some Early Negative Observations”, <http://faculty.haas.berkeley.edu/arose/NIRP.pdf>.

IMF Policy paper, August 2017 “NEGATIVE INTEREST RATE POLICIES—INITIAL EXPERIENCES AND ASSESSMENTS”, <https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/08/03/pp080317-negative-interest-rate-policies-initial-experiences-and-assessments>.

IMF Policy paper, September 2017. “INCREASING RESILIENCE TO LARGE AND VOLATILE CAPITAL FLOWS: THE ROLE OF MACROPRUDENTIAL POLICIES—CASE STUDIES”, <https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/09/13/pp062117increasing-resilience-macroprudential-policies-case-studies>.

Jobst A. and Lin H., August 2016, “Negative Interest Rate Policy (NIRP): Implications for Monetary Transmission and Bank Profitability in the Euro Area”, IMF Working Paper WP/16/172, <https://www.imf.org/external/pubs/ft/wp/2016/wp16172.pdf>.

Jobst, Andreas A. and Huidan Lin, 2016, “Negative Interest Rate Policy (NIRP): Implications for Monetary Transmission and Bank Profitability,” Euro Area: Selected Issues, IMF Country Report No. 16/220, IMF, p. 53-79.

King M., 2017, The End of Alchemy: Money, Banking, and the Future of the Global Economy, W. W. Norton & Company; 1 edition, ISBN-10: 0393353575.

Lim J.J., Mohapatra S., Stocker M., March 2014, “Tinker, Taper, QE, Bye? The Effect of Quantitative Easing on Financial Flows to Developing Countries”, <https://doi.org/10.1596/1813-9450-6820>.

Mobius M., 2016, “Negative Interest Rates: Not Without Consequences”, <http://emergingmarkets.blog.franklintempleton.com/2016/09/07/negative-interest-rates-not-without-consequences/>.

Moholkar R., 2016, “Why Aren’t Negative Interest Rates Feasible For Developing Economies?”, <https://www.aranca.com/knowledge-library/articles/business-research/why-arent-negative-interest-rates-feasible-for-developing-economies>.

Palley T. I., 2016, Why Negative Interest Rate Policy (NIRP) is Ineffective and Dangerous. http://www.thomaspalley.com/wp-content/uploads/2016/06/negative_interest_rates.pdf.

Shin H.S., 2014, The Second Phase of Global Liquidity and Its Impact on Emerging Economies. In: Chung K., Kim S., Park H., Choi C., Shin H.S. (eds) Volatile Capital Flows in Korea. Palgrave Macmillan, New York.

Tarashev N., Avdjiev S. and Cohen B., August 2016, “International capital flows and financial vulnerabilities in emerging market economies: analysis and data gaps”, BIS, <https://www.bis.org/publ/othp25.htm>.

Viñals J., Gray S. and Eckhold K., 2016, “The Broader View: The Positive Effects of Negative Nominal Interest Rates”, IMF Blog, <https://blogs.imf.org/2016/04/10/the-broader-view-the-positive-effects-of-negative-nominal-interest-rates/>.

World Bank – Global economic prospects, June 2015, “Negative interest rates in Europe: A Glance at Their Causes and Implications”, p. 13 – 19, <http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015b/Global-Economic-Prospect-2015-Negative-interest-rates.pdf>.

World Bank – Global economic prospects, June 2015, “Negative interest rates in Europe: A Glance at Their Causes and Implications”, p. 13 – 19, <http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015b/Global-Economic-Prospect-2015-Negative-interest-rates.pdf>.

Yoshino N., Chantapacdepong P., Angrick S., 2018, The Implications of Ultra-Low and Negative Interest Rates for Asia, Asian Development Bank Institute, ISBN 978-4-89974-096-4, pp 51 – 84.

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