Post-Crisis Changes in the Pattern of Capital Flows

- the Case of Korea[1]

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PRELIMINARY AND INCOMPLETE

Abstract

This paper follows the development of capital flows in Korea in relation with policy practices. It finds three important changes in the patterns of capital flows after the Global Financial Crisis. First, after the introduction of macroprudential policies, the size and volatility of bank external borrowing is curbed while the bank external lending started an increasing trend. Second, residents' outward portfolio investments outpaced foreign portfolio investments on domestic assets after the crisis. The net outflows are closely associated with changes in return differentials between domestic and foreign assets. Third, the continued current account surpluses are saved as private assets held abroad, while it was saved as FX reserves before the crisis. The precautionary function of reserves is now supplemented with currency swap arrangements with major countries. Simple VAR results show the increased resilience of bank overseas borrowing to external shocks, and the increased association of net portfolio inflows with the interest rate differential after the crisis.

Keywords: capital flows, capital flow management policy, macroprudential policy

JEL classifications: F32, F38, G15

[1] The views expressed in this paper are those of the author and should not be interpreted as reflecting the views of the Bank of Korea.

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1. Introduction

In the aftermath of the Asian Financial Crisis, Korea opened its capital account and adopted a new capital flow management framework. The framework was then reworked after Korea experienced large-scale capital outflows during the Global Financial Crisis (GFC). The reform in the capital management policies changed the pattern of capital flows after the crisis. In this paper, we discuss capital flows in Korea and policy responses focusing on the differences before and after the GFC.

The purpose of this paper is twofold. First, it documents capital flows of Korea in the last two decades in relation with policy responses. It highlights the current capital flow management framework of Korea by comparing it with the framework before the GFC. In doing so, it not only describes *de jure* policy changes, but also assesses changes in *de facto* policy practices. Second, we deploy a simple three variable vector autoregression (VAR) analysis to confirm the changed temporal patterns of capital flows with external shocks and return differentials between domestic and foreign assets. Without aiming to evaluate a specific policy reform, we measure whether the capital flows became resilient to external shocks after GFC.

In contrast to previous works that focuses on one or two specific kinds of capital flows or event, this paper provides a comprehensive view of capital flows in and out of Korea. It closely follows the volatility of bank flows, the large shift of portfolio flows, and also the public flows such as reserve accumulation. Analyzing the flows, it differentiates gross inflows with gross outflows. Gross inflow is net purchases of domestic assets by foreign investors, and gross outflow is resident investors' net purchases of foreign assets.

Gazing out the long time window and wide scope of flows, we document important pattern changes in the post-crisis capital flows. First, cross-border bank lending (banking gross outflow) has been increasing significantly after the GFC, while both volatility and size of bank external borrowing (banking gross inflow) decreased, and this is related with the macroprudential

policies introduced after the crisis, focused mainly on the banking flows. Second, net portfolio outflow has been increasing fast after the crisis, and this is related with the changes in return differentials between foreign and domestic assets. The gross outflow is keeping the portfolio gross inflow to continue by supporting foreign exchange demand in the market. Lastly, the pace of reserve accumulation slowed down significantly, and the Bank of Korea increased currency swap arrangement with many different countries. Among the list of findings, decreases in capital inflows through banking sector, and continued foreign portfolio investment inflows together describe Korean experience of *the second phase of global liquidity*, in which other countries are also running. (Shin 2014)

We do simple VAR exercises to assess the changes in the temporal patterns of capital flows related to the first and second findings. The results indicate that the sensitivity of bank external borrowing to external shocks is muted after the crisis. It also shows that net portfolio outflows after crisis are systemically associated with the interest rate differential.

The remainder of this paper is structured as follows. The next section documents capital flows and related policy from 1999 to 2008. Section 3 does the same for the period between 2009 and 2018, and highlight the three pattern changes. Section 4 deploys a simple three variable VAR to compare capital flow responses to external shocks and return differentials. Finally, Section 5 concludes.

2. Capital Flows and Policy Framework before the GFC (1999-2008)

This section reviews capital flows and policy framework before the GFC to make a comparison with what unfolded after the crisis. The capital account is open completely only after the Asian financial crisis in 1997[3], and hence, we review the ten years between the two

[3] Bond market fully opened in Dec. 1997; ceiling on foreign stock investment abolished in May 1998.

crises, from 1999 to 2008.

After the 1997 crisis, Korea moved to a new position in the impossible trinity, one which was becoming increasingly popular among emerging countries: it opened up its financial markets, let its exchange rate float freely, and introduced inflation targeting. With financial markets being opened up completely, exchange rate flexibility was allowed in order to maintain an autonomous monetary policy.

2.1. Capital inflows after the opening-up

Although the capital account became completely open, capital flows did not greatly complicate domestic liquidity management, and monetary policy focused mainly on inflation and the domestic business cycle. Foreign capital inflows continued after the opening up of the financial markets but were generally manageable until 2005, and they did not create asset price bubbles or excessive credit expansion.(Kim and Yang 2008) The left panel in Figure 1 shows gross capital inflows through portfolio investment and bank borrowing. Until 2005, foreign capital flowed in through portfolio investment but it flowed out through reduction in bank borrowing.

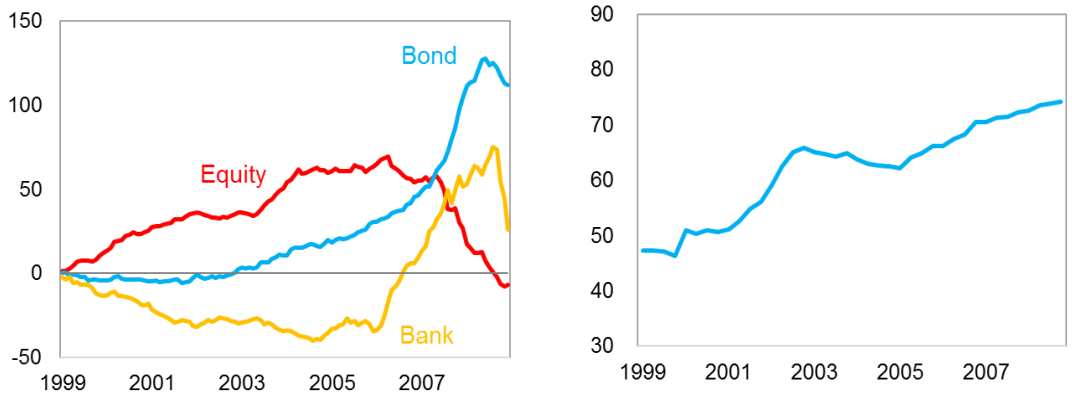

Figure 1. Cumulative gross capital inflows before GFC and household debt to GDP ratio. The flows are cumulative from January 1999. The unit is in billion USD. The household debt to GDP ratio in the right panel is sourced from BIS, and the unit is in percentage.

Household debt increased rapidly in the early 2000s, but this was due not to capital inflows but rather to the business strategies of commercial banks. The right panel in Figure 2 shows the rapid increase in household debt to GDP ratio. Since many firms defaulted on their borrowing from banks during the Asian crisis, the banks now competed aggressively in the household loan market instead. As a response to rising household debt, the government introduced LTV and DTI regulations in September 2002 and August 2005, respectively.

Right before the GFC, Korea experienced a capital surge as it is typical before any currency crisis. Starting from 2006, capital inflows through banks increased significantly along with foreigners' domestic bond investment, each accumulating to near 100 billion dollars immediately before the GFC. The shipbuilding and asset management sectors were in a boom, and major firms in those industry sold forward dollars in large amounts through banks. Taking over the forward dollars, the banks either borrow dollars or engage in buy and sell swap to get dollar funds of the same amount as the forwards, and sell it in the spot market in order to avoid having FX position imbalances.[4] This increased banks' short-term external borrowing and lowered the forward rate, which induced capital inflows through the bond market.

The rapid increases in short-term external borrowing, FX forward transactions and the inflows of foreigners' short-term bond investment all contributed to the FX-related instability during the GFC. Within the four months between the Lehman bankruptcy and end of 2018, banks' external borrowing decreased by 50 billion dollars. (Figure 1) The abrupt forced deleveraging in banking sector triggered a combined currency and banking crisis.

2.2. Exchange rate policy and foreign reserve management

Under the new policy framework, Korea absorbed the impact of external shocks mainly through changes in the exchange rate, which was now allowed to be determined in the market.

[4] Chung, Park and Shin (2014) explain the detail of this.

The Korean exchange rate depreciated by about 10 percent from 1999 to 2001, and thereafter appreciated by around 30 percent until the end of 2007 due to continued current account surplus and foreign capital inflows.

Meanwhile, Korea accumulated foreign exchange reserves to prevent and be prepared for another sudden stop. It also aimed to smooth exchange rate volatility. As a result, the international reserves increased significantly from 20.4 billion dollars (3.7% of GDP) in 1997 to 262.2 billion dollars (23.4% of GDP) in 2007. This was also a result of the BOK and government *leaning against the wind* while the local currency was gaining strength.

The reserve accumulation, however, was funded by the central bank's bond issuance (Monetary Stabilization Bonds), and hence it yielded a negative influence on the BOK's balance sheet. Significant fiscal losses occurred because the funding cost was higher than the interest earned from the reserve assets. The exchange rate appreciation also damaged the book through valuation losses. In addition, there are also critiques that domestic investment could be crowded out by the issuance of sterilization bonds (Lee and Choi 2010, Reinhart et al. 2016, Yun 2018, Hofmann et al. 2019).

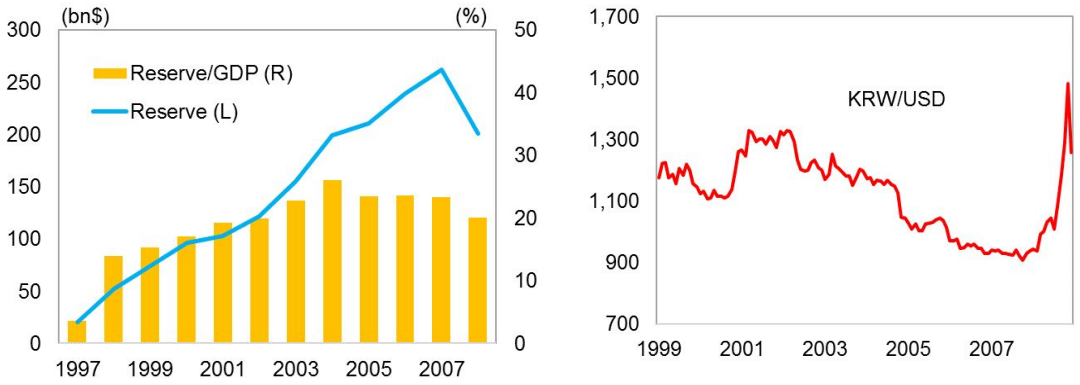

Figure 2. Foreign exchange reserves and exchange rate before the GFC.

3. Post-Crisis Policy Reform and Capital Flows (2009-2018)

Korea recovered fairly well from the GFC, but after going through the GFC and the subsequent quantitative easing in advanced economies, it became obvious that Korea needed to reform its capital flow management policies. Thus, Korea introduced macroprudential policies to curtail the volatility in banking flows, and changed reserve management practices. This section documents three important changes in the pattern of capital flows, and discuss the relation with post-crisis policy changes.

3.1. Cross-border bank flows and macroprudential policies

Korea introduced a series of FX-related macroprudential policies to prevent recurrences of the increases in bank short-term external borrowing and FX forward transactions seen in the immediate pre-crisis period. These policies changed the patterns of both banking gross inflows and outflows. The left panel of Figure 3 shows cumulative flows of cross-border bank lending and borrowing since 1999. First, the bank external lending barely increased until 2007, but it started an increasing trend after the crisis. It reached 100 billion dollars, roughly a quarter of Korea's FX reserves by the end of 2018. On the contrary, bank external borrowing, which exhibited a large swing before the crisis as explained above, did not increase or decrease after the crisis. The volatility is also greatly reduced. Below are the three macroprudential measures related to these changes.

First, FX loans from commercial banks were limited to funds for overseas use or facilities investment starting from August 2007. FX loans for facilities investment funds were also prohibited from July 2010. The regulation curbed banks' foreign exchange funding needs, and hence helped preventing excessive bank external borrowing. But, it also made the banks expand foreign currency lending to non-resident, because the banks face much smaller domestic

demand for foreign currency loans. The middle panel in Figure 3 shows the sum of foreign currency loans made by banks. It resembles the trend of bank external borrowing. Much of the loans after the crisis were made to non-residents.

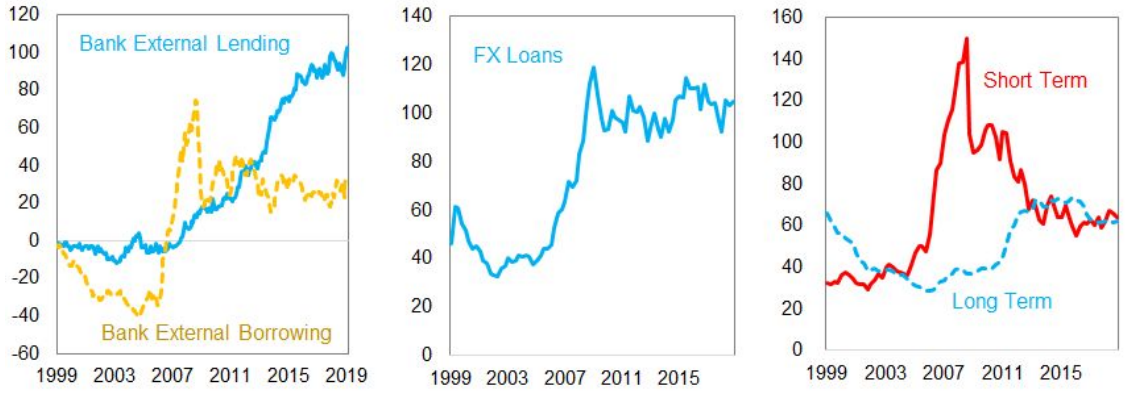

Figure 3. Effect of macroprudential policies. The left panel shows cross-border bank lending and borrowing. Cumulative flows from Jan. 1999. The unit is billion USD. The middle panel presents foreign currency loans made bank banks. The unit is trillion KRW. The right panel divide the stock of bank external debt into short-term and long-term. The unit is billion USD.

Second, in October 2010, ceilings are introduced on the FX derivatives positions of banks to limit FX derivative positions to be some multiples of capital. This measure limited excessive forward transactions and hence, reduced foreign borrowing demand. It also encouraged more capitalization of the banks, and more long-term borrowing of the foreign bank branches since the ceilings are proportional to capital and long-term funding.

Third, in September 2011, a bank levy was introduced for banks' short-term external borrowing. The policy was aimed to lengthen the maturity of banks' foreign borrowing and to reduce volatility of bank borrowing. The levy made short-term borrowing more expensive relative to long-term borrowing. The right panel of Figure 3 hints the effect of bank levy and the leverage cap regulation. After the crisis, banks' short-term borrowing decreased significantly, while long-term borrowing increased.

The macroprudential policies reduced volatility in capital flows, thereby making monetary

policy more autonomous and allowing it to focus on the domestic business cycle. The early assessments of the macroprudential policy are that it enhanced external resilience by reducing the maturity mismatch of banks and the currency mismatch of firms.[5] (Bruno and Shin 2014, Kim 2014)

3.2. Portfolio flows and return differentials

Like other emerging market countries, Korea also experienced capital inflows pushed by abundant global liquidity after crisis. The inflows were mainly through portfolio investment, as the banking flows were well managed by the macroprudential policies. The most notable change in portfolio flow happened to gross outflows, not to gross inflows. As can be seen from the left panel of Figure 4, portfolio gross outflow began to increase fast after 2012. The cumulative outflows reach 350 billion by the end of 2018. This outflow help preventing an asset price bubble or other serious financial imbalances during the period of massive foreign capital inflows. It also helped keeping foreign capital inflows by putting more appreciation pressure on the Korean won.

The outward portfolio investment was driven by the National Pension Service, insurance companies and mutual funds. Their foreign portfolio investment are largely affected by the interest rate differential between Korea and abroad, which started to decline from 2012. In part, it is also a result of the change in accounting standard which gives more incentives to insurance companies to hold more long-term foreign bonds.[6] The right panel of Figure 4 plots interest rate differential as calculated as Korean policy rate minus federal fund rate target, along with net

[5] There are more recent researches pointing out unintended consequences of the macroprudential policies, though. Yun (2019) finds that the increases in long-term bank borrowing is not a fresh new funds coming from foreign banks, but just name changes of former short-term debt from mother banks. Ahn et al. (2019) find that the bank levy made regulatory arbitrage possible since it is easier for foreign bank branches to fund in longer term as they have mother banks overseas.

[6] IFRS 17 was issued in May 2017 and will be effective from January 2022.

portfolio outflows (gross outflows - gross inflows). It is obvious that the decreasing return rate gap is negatively associated with the portfolio outflows.[7]

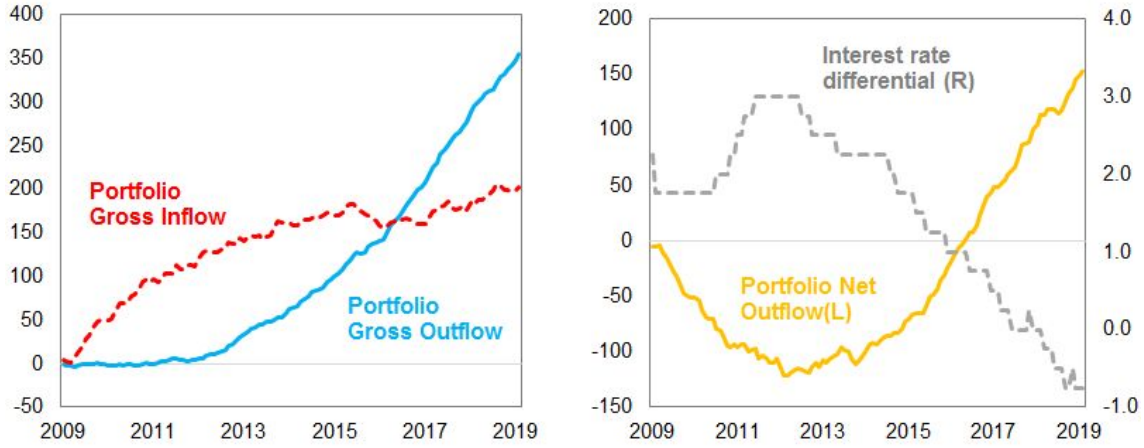

Figure 4. Portfolio flows and the interest rate differential. The flows are in billion USD and cumulative from Jan. 2009. The interest rate differential is defined as BOK base rate - Federal fund rate target upper limit.

3.3. Public and private saving abroad

International reserves proved to be useful during the GFC, but they were also found to have limitations. During the second half of 2008, Korea unloaded roughly a quarter of its accumulated reserves, but it was only after the BOK announced that it had made a swap arrangement with the Fed that the market calmed down. The pace of reserve accumulation apparently slowed down after the crisis. The red lines in left and right panels of Figure 5 show the reserve accumulation (cumulative flows as appeared in the balance of payment) before and after the crisis. After 2010, the slope of reserve flows declined significantly compared to pre-crisis period. Given that the flow include interest accrued on the large stock of reserves, one can infer that FX intervention has been minimal in this period.

While keeping international reserves at a level appropriate for the size of the economy, the BOK has sought to enter into currency swap arrangements with major countries. Swap

[7] Yun and Park (2019) provide more in-depth discussion of this.

arrangements have been made with Canada (November 2017) and also with Switzerland (February 2018) so that global safe-haven currencies can be supplied to the Korean financial market if necessary.

The current account surplus (the blue lines in Figure 5), however, has been continued onward and the size actually increased a lot. Korea has been recording current account surplus without significant reserve accumulation. Current account equals financial account (Net capital outflows), and hence this means the current account surplus has been accumulated as financial assets other than the official FX reserves after the GFC.

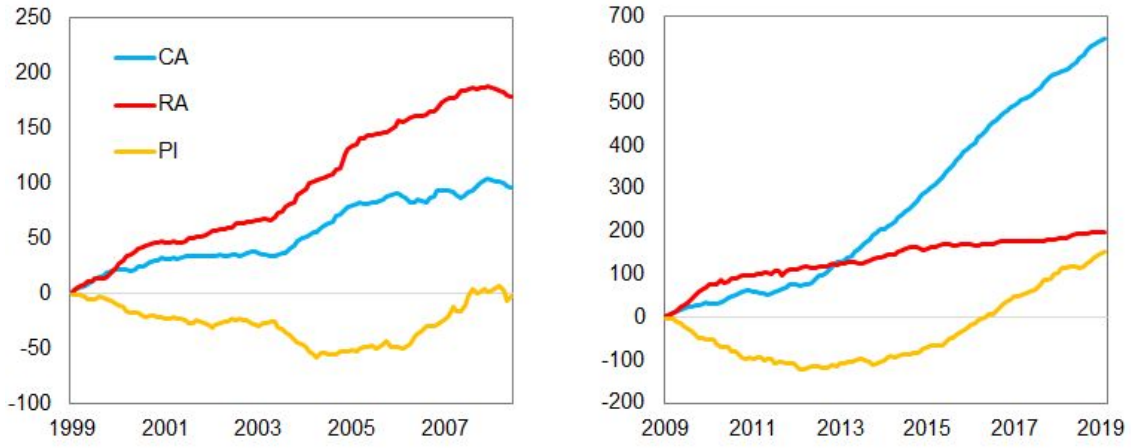

Figure 5. Current account (CA), reserve accumulation (RA), and net portfolio investment (PI, gross outflows - gross inflows) before and after GFC. The unit is billion USD. Left panel shows cumulative flows since January 1999 and the right panel shows it since January 2009.

Balance of payment identity can be re-organised as follows:

Current account = Financial account

= Public outflow + Private outflow

= (Reserve flows + Government flows) + (Net outward direct investment + Net portfolio outflow + Net banking outflow) + etc.

Table 1 shows the cumulative sum of each item in the last equation above over during the period of pre-crisis (1999-2007), crisis (2008-2009) and post-crisis (2019-2018).

	Current Account	Financial Account				
		Public Outflows		Private Outflows		
		Reserve Flows	Gov't (NPS)	Direct Investment	Portfolio Outflows	Banking Outflows
1999-2007	103.6	187.8	17.6	-16.2	-15.9	-44.5
2008-2009	34.8	12.2	-6	16.7	-48.0	29.1
2010-2018	608.4	129.9	131.0	171.9	64.9	82.3

Table 1. Cumulative balance of payment, billion USD.

Current account surplus means saving abroad by the public or/and the private sector. Before the crisis, the rapid growth of reserves absorbed foreign capital coming in through current account surpluses and also private capital inflows. (the negative figures in the private outflows) After the crisis, however, the reserve accumulation almost halted and instead, other types of capital outflow increased significantly. First, the outward direct investment increased a lot and surpassed incoming direct investment, so that the net direct investment recorded 171.9 billion dollars outflows. Second, net private portfolio outflows (64.9 billion USD) and net banking outflows (82.3 billion USD) also increased a lot. These items were net inflows before the crisis. Third, public outflow in the form of the national pension became significant. (131 billion USD) To sum up, current account surpluses were saved abroad in the form of reserves before, but those are saved as private foreign assets after. The public saving of the pre-crisis is now replaced with private saving abroad.

Accumulation of reserves is now substituted with accumulation of private foreign assets and currency swaps. What this change means on the financial stability of the country can only be tested by another sudden stop. Forbes and Warnock (2012), however, observe from

international panel data that sudden stops (sudden outflows by foreigners) and retrenchments (inflows by residents) tend to come together. The accumulated private assets might be redeemed and help the economy when it is hit by external shocks. The swap arrangement and public saving can also be used when the country is in need. Korea relied only on international reserves before the crisis, but now it is equipped with a multilayered financial safety net.

4. Evidence from VARs

In this section, we do a simple recursive VAR analysis on capital inflows. Our interest is focused on the two important findings from the previous section. First, we test how resilient banks' external borrowing is to external shocks, and how it is different before and after the GFC. The macroprudential policies were introduced to curtail the volatility of banking flows and to prevent the disorder of the GFC happening again. Hence, we are interested to know whether the banking gross inflows became less sensitive to external shocks after. I do not attempt to causally evaluate individual policy reform, but instead, I intend to see how influences of external shocks on capital flows changed after the GFC as a result of many changes altogether including the policy reform, and also the global economic environment.

Second, we want to see how portfolio net inflows are associated with the return differential between domestic and foreign assets. After the crisis, the pace of gross portfolio outflows exceeded that of gross portfolio inflows, and hence the net portfolio outflows increased significantly. This happened together with the decrease in return differentials between domestic and foreign assets. Therefore, we want to assess the temporal pattern of return differentials and portfolio flows through the VAR framework. I try to stay in the most parsimonious possible model to avoid overfitting and keep clear understanding of the results.

Monthly balance of payment data is used. The focus is on banking gross inflows and net

portfolio inflows. The flows were made real by CPI(=100 in 2015). The sample period is from January 1999 to December 2018, but I exclude the GFC period from July 2008 to June 2009. We divide the sample into before-crisis (Jan. 1999 - Jun. 2008) and after-crisis (Jul. 2009 - Dec. 2018), and hence both of them have 114 observations.

For the external shock that would be used to test the resilience of banking gross inflows, I consider the VIX index. It measures the option volatility of S&P 200 index, but it has many other interpretations in the literature. It is a measure of uncertainty, global risk appetite, and also the global financial cycle. Hence, it can be used as a representative index of external shocks. For the proxy of the return differentials of domestic and foreign assets, I use policy rate differential between Korea and U.S. The policy rate affects the return rate of all the other assets, and therefore it would serve as a good proxy for return differentials in various kinds of assets. With these variables, I construct a simple three variable VAR as follows:

$$A(L)\, y_t = \varepsilon_t$$

$$y_t = [Flows_t\ ,\ ID_t\ ,\ VIX_t]'$$

A is a lower triangular matrix, and ε is a vector of orthogonal shocks. $Flows$ is one of the two capital flows, and ID is the interest rate differential.

The ordering of the variables follows the VAR convention. Slow moving variables come first and fast changing market variables come later. The capital flow is a quantity variable cumulated over the period, and hence I place it before the other two price variables. The policy rate gap evolves through periodic decision makings by the central banks, thus it is ordered before the VIX index which changes instantaneously by news. I do four different VARs depending on the two different flows(banking gross inflows, and net portfolio inflows) and two different sample periods (before and after the crisis). Lag order is one following the suggestion of the formal test by SBIC.

Figure 6 shows the responses of capital flows to VIX. The graphs in first column shows responses of before-crisis, and the second column shows after-crisis. The first and second row shows banking gross inflows and net portfolio inflows, respectively. One thing very clear from the graphs is that the sensitivity of bank flows to external shocks muted after GFC. Before the crisis the external borrowing of banks decreased significantly after external shocks like a rise in risk aversion or in uncertainty. After the crisis, however, it does not changes at al. This is likely showing the effectiveness of the macroprudential policies focused mainly on banking flows.

The reason why net portfolio inflows show significant inflows after a VIX shock is that the decrease in gross portfolio outflows is large after the shock. That is, foreign investment to Korean financial market decreases after VIX shock, but Korean overseas investment decreases even further (retrenchment) and the net capital flows become positive after a shock. This is more significant after the crisis, and it seems reasonable considering much larger overseas investment of domestic institutional investors in post-crisis period.

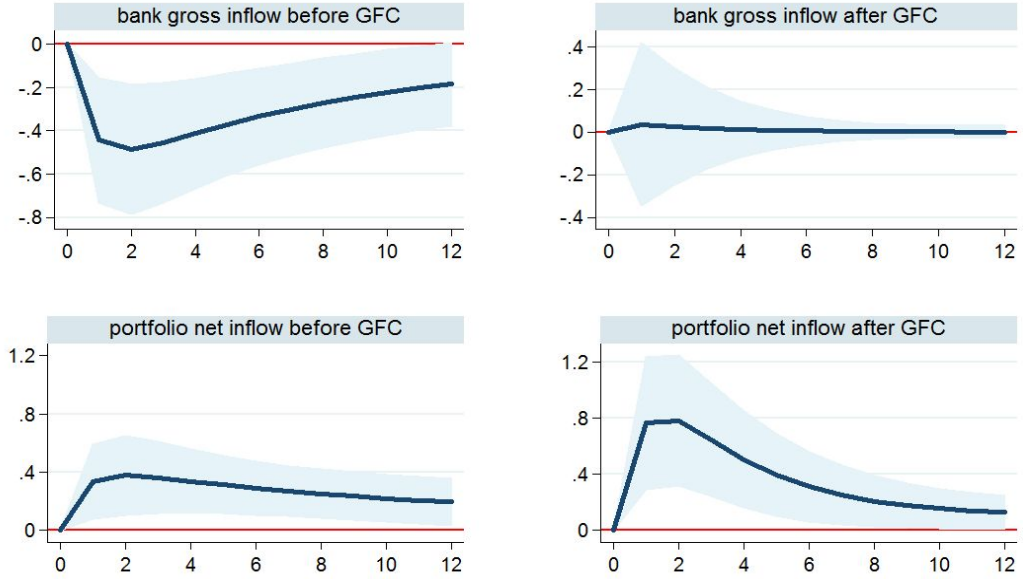

Figure 6. Responses of capital flows to one standard deviation shock in VIX. 90% confidence bands are shown. The standard deviation is 6.3 before GFC(Jan. 1999 - Jun. 2008), and 5.8 after GFC(Jul. 2009 - Dec. 2018). The vertical axis unit is billion USD.

Figure 7 shows the responses of capital flows to a shock in interest rate differential. We find no systemic association of banking gross inflows with the interest rate differential from this VAR. For the net portfolio inflow, however, we see a clear sign of inflows after a rise in the interest rate gap after crisis. Moreover, the effect seems to be very persistent extending to longer than a year. A 100 basis point increase in the interest rate gap induces 0.1~0.2 billion dollars more inflows every months.

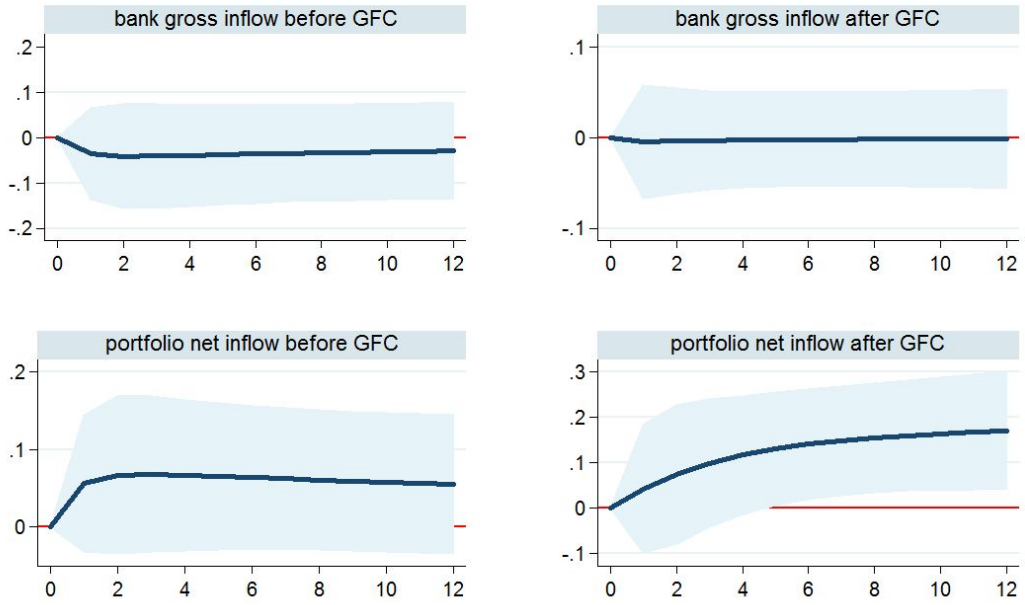

Figure 7. Responses of capital inflows to one standard deviation shock in interest rate differential. 90% confidence bands are shown. The standard deviation is 1.5 before GFC(Jan. 1999 - Jun. 2008), and 1.1 after GFC(Jul. 2009 - Dec. 2018). The vertical axis unit is billion USD.

The VAR results are robust to various changes. I tested increasing the lag order to two, and also tried changing the variable ordering by placing interest rate differential before the flows. The results are qualitatively the same and I do not present those here.

5. Conclusion

This paper is an effort to better understand capital flows in relation with policy practice. It finds that the introduction of macroprudential policies and changed reserve management practice made significant differences in the pattern of capital flows in Korea. Private asset abroad increased while the current account surplus has been continued. Outward portfolio investment increased significantly along with cross-border bank lending. In contrast, the cross-border bank borrowing has been staggering after the crisis and became much less sensitive to external shocks. It seems that the diminishing merit in return of domestic asset contributed to increases in net portfolio outflows after the crisis.

Korea was able to avoid the instability that could have been caused by foreign capital surges and sudden outflows after the GFC thanks to the proper changes in capital management policies. It also contributed to domestic business cycle management by making a room for monetary policy to remain focused on domestic issues as in the traditional inflation-targeting regime. More research is needed on the interaction among macroprudential, foreign exchange and monetary policies to evaluate their effects to capital flows and make the policies more complementary and efficient.

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