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IMF Working Paper

Recent Shifts in Capital Flow Patterns in Korea: An Investor Base Perspective

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Asia and Pacific Department

Recent Shifts in Capital Flow Patterns in Korea: An Investor Base Perspective

Prepared by Niels-Jakob Hansen and Signe Krogstrup¹

Authorized for distribution by Andreas W. Bauer

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Abstract

Korea's cross border capital flows have tended to respond negatively in global risk-off episodes, resulting in volatility in the foreign exchange market and occasional policy responses in the form of foreign exchange interventions. We study the relationship between Korean capital flows and global volatility up to 2018. The response of capital flows during risk-off episodes have become more muted over time, and occasional safe-haven type flows into Korean bond markets have helped counterbalance the tendency for portfolio investors to leave. We describe these changing patterns and relate them to shifts in Korea's domestic investor base. We discuss whether they reflect a sustained shift in the sensitivity of Korea's capital flow pressures to global risk-off episodes, and implications for monetary and exchange rate policies.

JEL Classification Numbers: F32, G11, G20.

Keywords: Korea; Capital flows, Exchange Rate; Flow of Funds.

¹ Nhansen@imf.org and skro@nationalbanken.dk. Signe Krogstrup was an advisor in the IMF's Research Department while writing this paper. The viewpoints and conclusions stated are the responsibility of the individual contributors and do not necessarily reflect the views of Denmark's Nationalbank. The authors thank Sean R. Craig, Tarhan Feyzioglu, Yuko Hashimoto, Joong Beom Shin, Sohrab Rafiq, Dongyeol Lee, Romain Bouis, T. Olafsson, Yizhi Xu, Andreas Bauer, seminar participants at the International Monetary Fund, and the staff at Bank of Korea for helpful comments and discussions. Wenjie Li provided excellent research assistance. All remaining errors are our own.

1 Introduction

1. Korea has historically experienced destabilizing capital outflows during global risk-off episodes but more recently patterns have been changing. Capital outflows from Korea were strong in connection with the Asian and Global Financial Crises, and capital have tended to flow out during other risk-off episodes as well. Capital flow volatility has manifested itself in exchange rate volatility and pressures in foreign currency funding markets. In response, policy actions have often been taken to stabilize markets, including foreign exchange interventions. The authorities have also taken steps to enhance resilience such as measures designed to reduce reliance on wholesale funding.¹ However, the behavior of cross border capital flows during risk-off episodes has been changing in recent years. The volatility of *net* capital flows has declined since 2015, even of the volatility of *gross* flows has increased. Korea also recently experienced safe-haven like capital flows into bond markets in connection with certain global risk-off episodes. Finally, the sensitivity to global risk factors seems to have declined.

2. We assess these changing capital flow patterns from an institutional portfolio risk management perspective. Korea's institutional investor base has increased in size and investors have built up larger foreign asset positions both in gross and net terms. These larger stocks of foreign assets can have implications for capital flows during periods of heightened volatility. Financial institutions manage portfolios to balancing expected return and risk, e.g. through Value-At-Risk (VaR) frameworks. Thus, when the riskiness of an asset in a portfolio increases without its return changing, the portfolio's share of this asset will have to be reduced to keep the riskiness of the portfolio constant. Increased foreign exchange market volatility can thus cause a rebalancing of portfolios away from foreign currency exposures (Krogstrup and Tille [2018]). This can manifest in retrenchment of residents from foreign exposures, by selling foreign assets and buying domestic assets. This will offset foreign investors' similar tendency to retrench out of Korean assets during risk-off events, thereby reducing or even reversing net capital outflows during such episodes.

3. Using flow of funds data, we document changes in Korea's domestic investor base. A portfolio risk management perspective requires balance sheet data divided by institution type, sector, and information on whether positions are domestic or cross border. Available data on cross border capital flows and investment positions are typically not matched with domestic balance sheets, and are not broken down by sectors. Instead, we rely on Korea's flow of funds database that includes a balance sheet breakdown on sectors and instruments. Domestic and cross border

¹See the case study on Korea in IMF [2017].

positions are not explicitly separated in the flow of funds data. However, by relying on issuer information associated with different instruments, we construct a breakdown of sectoral balance sheets by domestic and cross border asset holdings. We use these decompositions to describe how the mix of financial investors involved in cross border intermediation has evolved in Korea, and discuss how changes may be related to capital flow responses to global financial risk conditions.

4. The analysis of the data shows a rise in the size of institutional investors in Korea and their balance sheet exposures to foreign risks. The increase in Korea's net and gross foreign assets has primarily been driven by growth in the foreign positions of the general government (reflecting the government pension fund), investment funds and insurance firms, and, to a lesser extent, depository institutions. Korean institutional investors' role in cross border capital flows has increased, while the cross border positions of non-financial corporations and households have remained broadly constant. We also show that institutional investors have seen higher growth in foreign assets than foreign liabilities, and they have become increasingly net long in foreign assets. The size of the foreign exposure differs across institutional investors.

5. We relate these developments to the sensitivity of cross border capital flows. If the Korean institutional investors manage foreign risks consistently with a Value-At-Risk based approach, these institutions will seek to reduce their net foreign exposure when global risks increase. The foreign exposure in the balance sheets of institutional investors thereby introduces a mechanism driving capital flow responses to changes in global risk sentiment and foreign currency risk. We refer to this tendency as the *foreign exposure mechanism*. Being net long, institutional investors will seek to reallocate their portfolios away from foreign assets or toward foreign funding to reduce the exposure during risk-off.² The resulting capital inflow may help off-set the outflows associated with foreigners retrenching, thereby reducing net capital outflows during risk-off episodes.³ We also consider how the use of off-balance sheet hedging instruments in risk management affects the interpretation of the data on capital flows.

6. Our findings have important policy implications. First, Korea's capital flows may become less destabilizing over time. As Korean institutional investors are increasingly investing abroad, this may reduce, and could eventually reverse, Korea's capital flow sensitivity to global factors, affecting the need for off-setting policy responses. Second, the findings provide motivation for further research on the capital flow implication of financial regulation and policies that

²Hashimoto and Krogstrup [2019] provide cross-country empirical evidence for such a mechanism

³In the extreme, resident driven inflows can more than off-set foreign capital outflows during risk-off episodes, leading to net capital inflows.

may affect the sensitivity of Korea's capital flows to global risk factors.

7. The paper proceeds as follows. Section 2 gives a brief overview of recent patterns in Korea's capital flows and related exchange rate and asset price movements. It considers whether the Korean asset space has behaved more as a safe-haven during recent episodes of spikes in global risk aversion. Section 3 discusses conceptually how the reaction of institutional investors to fluctuations in global volatility affects the observed capital flows. Section 4 presents a method for breaking down Korea's gross asset and liability position by investor types. It uses this data to describe the composition of Korea's foreign and domestic investor base. Finally, Section 5 concludes.

2 Recent Developments in Capital Flows

8. Capital has tended to flow out of Korea during global risk-off episodes. The lower panel in Figure 1 shows the CBOE Volatility Index (VIX) as an indicator of global risk-off sentiment. The shaded areas mark eight episodes of global risk-off events, starting with the Asian Financial Crisis (AFC) and ending with the global trade tensions at the end of 2018. The VIX increased during these episodes, although to different degrees. The upper panel in Figure 1 illustrates how most risk-off episodes are associated with large gross capital flow movements. Gross liability outflows and gross foreign asset flows partly off-set each during some episodes, but not in all. The Asian and Global Financial Crises (AFC and GFC) both saw particularly sharp reversals of gross foreign liabilities flows.⁴ During the GFC, retrenchment of foreign assets by domestic investors partly off-set these large gross liabilities outflows. The mid panel in Figure 1 shows a tendency toward net capital outflows during episodes of heightened risk aversion. Net capital outflows have tended to respond fast to risk-off sentiment. The figure also illustrates that this tendency to net outflows during risk-off periods has tended to become less strong in more recent years. We will discuss this in more detail below.⁵

9. The Korean won has tended to depreciate during risk-off periods. Net capital outflows translate into a net excess supply of Korean won, which has resulted in depreciation pressures on the Korean won during risk events. This risky currency pattern contrasts with typical safe-haven currencies such as the Japanese Yen or the Swiss franc, which tend to appreciate during risk-off. The left hand panel in Figure 2 measures the risk-off behavior of the Korean won

⁴Foreign liabilities outflows from Korea during risk-off have been concentrated in portfolio equity and bank liabilities. Such episodes can also be associated with increased hedging costs, for example reflected in widening deviations from covered interest parity, as we discuss.

⁵A full time series for Korean capital flows is shown in Figure A.1 and Figure A.2

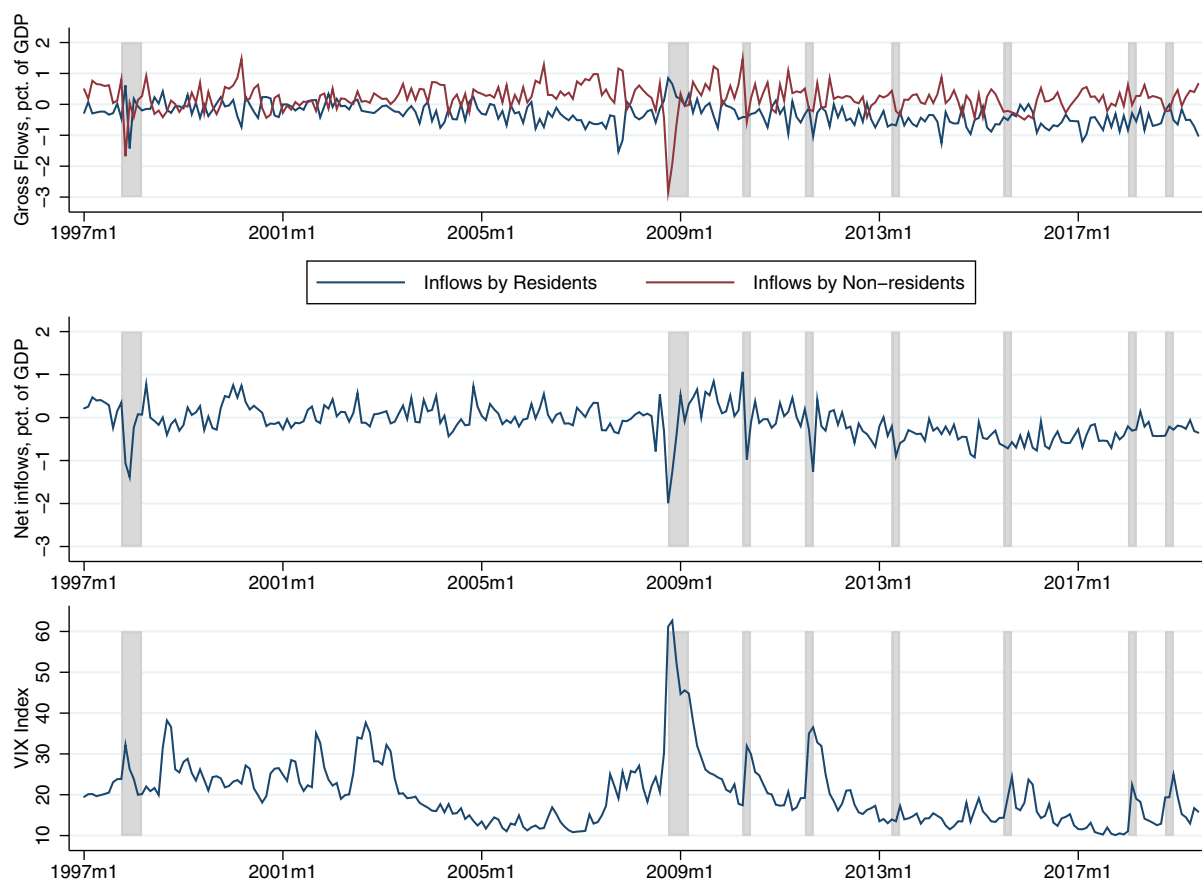


Figure 1: **Capital Flows and the VIX**

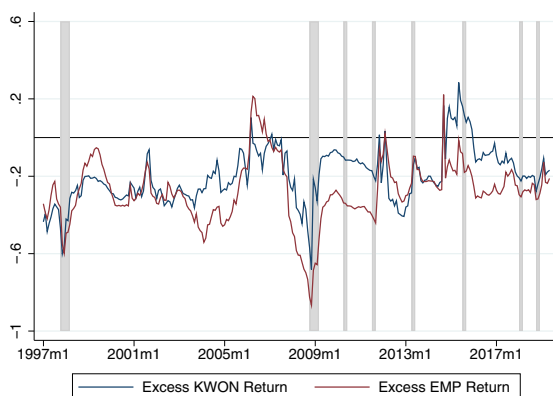
Capital flows are net of reserve flows and financial derivatives. Shaded areas denote global risk-off episodes including the Asian Financial Crisis (AFC) during 1997Q4 and 1998Q1, the Global Financial Crisis (GFC) during 2008Q4 and 2009Q1, the onset of the Greek Crisis (CC) in 2010Q2, the high of the European Debt Crisis (EDC) in 2011Q3, the Taper Tantrum (TT) during 2013 Q2, the China Equity Correction (CEC) episode in 2015 Q3, the Emerging Market strains (EM) episode in 2018Q1 and the Trade Policy Tension (TPT) in 2018 Q4. Source: Balance of Payments and Chicago Board Options Exchange (CBOE).

by depicting two measures of safe haven properties used in the literature (Ranaldo and Soederlind [2010]; Habib and Stracca [2012]).⁶ The blue line depicts the three-year rolling correlation of the VIX with the monthly excess return to holding a won denominated investment in short-term money market instruments relative to a similar investment in USD. Risky currencies are defined as having negative correlations while safe haven currencies have positive correlations. The Figure shows that this correlation has been predominantly negative for the Korean won during the period considered. Occasional short episodes with zero or positive correlations have to some extent been related to authorities' foreign exchange interventions which have supported the Korean won. This is reflected by the red line, which depicts the excess return measure based on a counterfactual exchange rate measure that seeks to capture how the exchange rate would have moved in the absence of official foreign exchange interventions (Goldberg and Krogstrup [2018]).

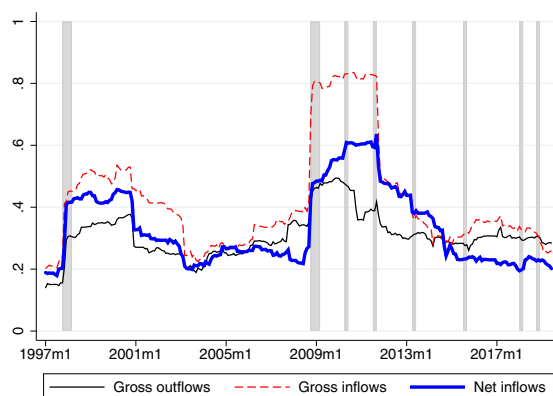
10. Capital flow patterns have been shifting in recent years. Various capital flows indicators point to changing patterns. First, as noted earlier, the net capital flow response to global risk tightening has changed. Figure 3 depicts net and gross and capital flow responses during the eight risk-off episodes identified in Figure 1. The blue bars show that the first six episodes exhibited the traditional net capital outflow pattern, while Korea experienced outright net capital inflows during the two most recent episodes. Moreover, the last three episodes saw gross retrenchment of foreign assets, in contrast to the three episodes immediately following the GFC. Capital flow volatility has also declined since the GFC. The right hand panel in Figure 2 depicts three-year rolling volatilities of monthly gross and net capital flows since 2000, showing that while net capital flow volatility has continued to decline in recent years, gross capital flow volatilities have remained largely constant in the past three years, suggesting that gross flow responses to risk-off events may increasingly be offsetting each other, leading to smaller net flow responses.⁷ Moreover, the correlations of the VIX with the two excess Korean won return indices in left panel of Figure 2 have gradually become less negative. These results are consistent with [Bruno and Shin, 2014] who find that the sensitivity of capital flows into South Korea to global conditions have decreased since 2010. We next discuss these observed shifts from an investor base perspective.

⁶A safe-haven asset is an asset that is expected to retain or increase in value during times of market turbulence. In the safe haven literature, safe haven properties have been measured by the correlation between the excess returns to an asset and a measure of market risk sentiment, often the VIX. In the context of Korean equities and government bonds, we also set the bar high and compute excess returns on these investments relative to a US dollar money market investment. These excess returns can be driven both by increases in the won value of the return and in the currency related excess return. We compute the excess returns on Korean government bonds and Korean stocks in terms of USD investments and follow Habib and Stracca [2012] in computing the correlation of these excess returns with the VIX and with the EMBI (index of EM bond spreads) respectively.

⁷Figure A.3 and Figure A.4 shows the relationship between capital flows and VIX for selected periods of increased volatility.



(a) KWON excess return correlation with the VIX



(b) Gross and Net Capital Flows Volatility

Figure 2: Capital Flow Volatility and Currency Risk Correlations

Shaded areas mark global risk-off episodes as described in the text. Left panel: Excess KWON Return refers to the three-year rolling correlations of the log VIX with the excess return of holding a KWON denominated short-term investment relative to the return on a similar USD investment converted into KWON (the blue line). Excess EMP Return refers to three-year rolling correlation of the log VIX with the counterfactual excess return computed based on the EMP (Goldberg Krogstrup 2018) as a counterfactual exchange rate measure adjusted for policy interventions (the red line). Source: Own calculations based, Bank of Korea, CBOE. Right panel: Three-year rolling standard deviations of monthly capital flows in percent of GDP. Source: Own calculations, Bank of Korea.

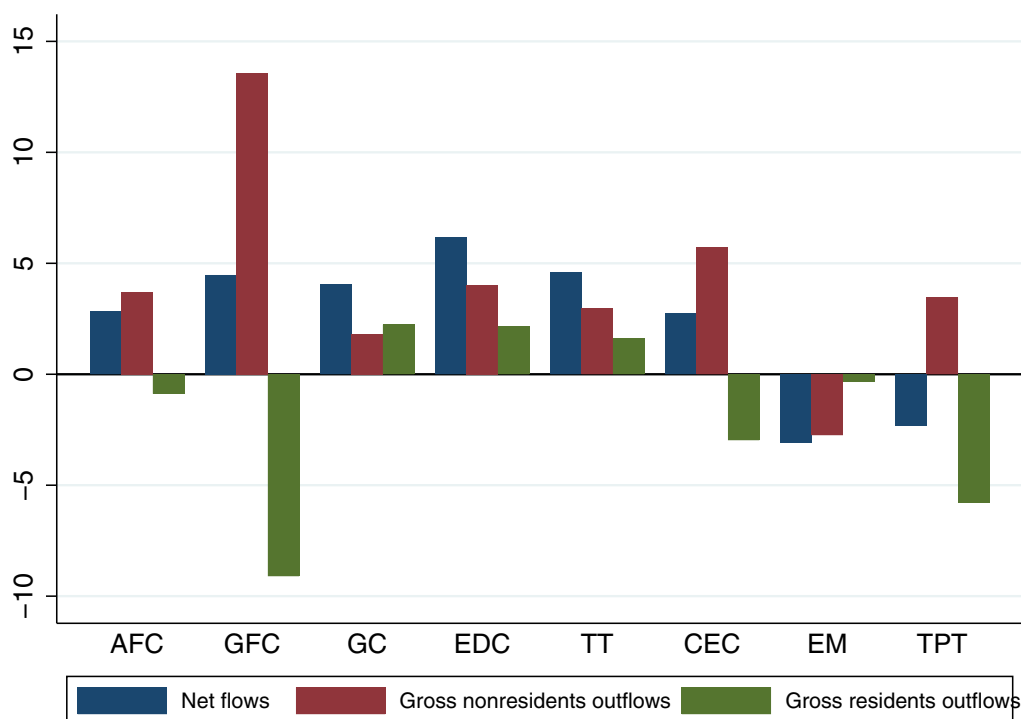


Figure 3: **Korean Capital Flows During Risk-Off Episodes**

Capital flows in percent of GDP, levels during four risk-off episodes relative to their average level in the preceding year. The episodes considered are the Asian Financial Crisis (AFC) during 1997Q4 and 1998Q1, the Global Financial Crisis (GFC) during 2008Q4 and 2009Q1 (relative to 2007), the onset of the Greek Crisis (CC) in 2010Q2, the hight of the European Debt Crisis (EDC) in 2011Q3, the Taper Tantrum (TT) during 2013 Q2, the China Equity Correction (CEC) episode in 2015 Q3, the Emerging Market strains (EM) episode in 2018Q1 and the Trade Policy Tension (TPT) in 2018 Q4 (relative to 2017). Source: Own calculations, Bank of Korea.

3 A Portfolio Risk Management Perspective on Capital Flows

11. Capital flows reflect portfolio adjustments of investors intermediating cross border funds. To explain capital flow responses to global push factors, the literature often focuses on country fundamentals and how foreign investors react to global risk events. An alternative perspective is to consider the domestic drivers of portfolio reallocation. Any cross border capital flow has two counterparts: a domestic and a foreign. Foreign liabilities(assets) flows have a domestic debtor(creditor) and a foreign creditor(debtor). In this paper, we focus on the role of the Korean investor base as the domestic counterpart to cross border capital flows.

12. Portfolio adjustments reflect risk-return considerations. Foreign assets and liabilities offer different risk-return profiles than domestic assets and liabilities. Foreign investments and foreign funding allow investors to diversify risks and optimize returns, but also imply a trade-off between risk, inter alia exchange rate related, and expected returns. In this perspective, investors' portfolio optimization and risk management behaviors have first-order effects on capital flows (Krogstrup and Tille [2018]).

13. Financial institutions adjust portfolios in response to changes in risk perceptions. Krogstrup and Tille [2018] show that if a financial institution is risk averse⁸ and net long in foreign assets it will tend to reduce its foreign exposure when global risks increases. There are several potential explanations for this. First, financial market volatility affects the risks weights and haircuts investors apply in their capital adequacy computations due to regulation (Goldberg et al. [2014], Committee on the Global Financial System [2010]). Second, standard risk management tools used by institutional investors and asset managers, such as VaR constraints, require adjustments of risk exposures as financial market volatility changes (Adrian and Shin [2013], Caballero and Simsek [2018]).

14. Specifically financial institutions that are net long in foreign currency may drive inflows in response to global risk. As we show in Section 4, Korean investors tend to be net long in foreign assets. Following the explanation above such investors are expected to reduce this exposure in response to an increase in global risk. This can be done through three overall channels

- First, investors can repatriate foreign investments, i.e. sell foreign assets and buy domestic assets. This will show up as a resident inflow into domestic assets, and resident outflow from foreign assets.
- Second, investors can increase their foreign funding, so that a higher share of foreign assets are matched by foreign funding. This will show up as a non-resident inflow into domestic assets, and an increase in resident foreign liabilities.
- Third, investors can temporary cover foreign currency risks using derivatives. This channel works off-balance sheet but will manifest itself in a non-resident inflow into domestic assets.

We discuss empirical evidence for the first and second channel in Section 4. The third channel works off-balance sheet, as we discuss in Appendix B. All the described channels are related to

⁸E.g. as manifested in a VaR framework

resident investor behavior, and reflected in gross asset and liability flows. A key insight is thus that non-resident inflows into domestic liabilities can be partly be driven by decisions of domestic investors. The greater the net long positions in foreign currency of resident investors, the stronger can such inflows be. If strong enough, the mechanism can outweigh outflows driven by foreign investor flight, leading to net capital inflows and currency appreciation, as happens in safe haven countries such as Switzerland and Japan.⁹ Below we will refer to this mechanism as the *foreign exposure mechanism*.¹⁰

15. The mix of investors matters for the strength of the foreign exposure mechanism. Different institutions respond differently to foreign risks. Financial firms mainly manage balance sheet risks, while non-financial corporations also take future payments in foreign currency into account in their risk management framework. Thus, the foreign exposure mechanism presented above is likely to be more relevant for financial firms including institutional investors. In the next section we investigate to which extent the recent accumulation of financial assets for Korea has been concentrated among these.

4 Data

16. Investigating the relevance of the foreign exposure mechanism requires sectoral data on asset holdings. Above we explained how the foreign exposure mechanism can cause safe haven flows during periods of global financial volatility. In this section, we investigate if the development of the gross and net asset positions of Korean investors is consistent with this explanation. In particular, we examine the buildup of foreign exposure in the balance sheets of Korea's institutional investors and relate it to sectoral flows during periods of global volatility.

17. Readily available data does not provide a sectoral breakdown on asset holdings. The Financial Account in the Balance of Payment (BOP) and the International Investment Position (IIP) contain information on the stocks and flows of foreign liabilities and foreign assets, divided by investment classes and instruments. While these sources include a breakdown across asset types, they do not contain information on the specific sectors holding the relevant assets.

18. We offer new perspective on sectoral balance sheets in Korea using the granu-

⁹Denmark has also seen such flows episodically Danmarks Nationalbank [2015].

¹⁰Other explanations can work in line with this mechanism during periods of heightened global volatility. For example, domestic investors may experience tightened access to foreign financing thus forcing them to sell foreign assets. Moreover, currency swings may make domestic assets more attractive.

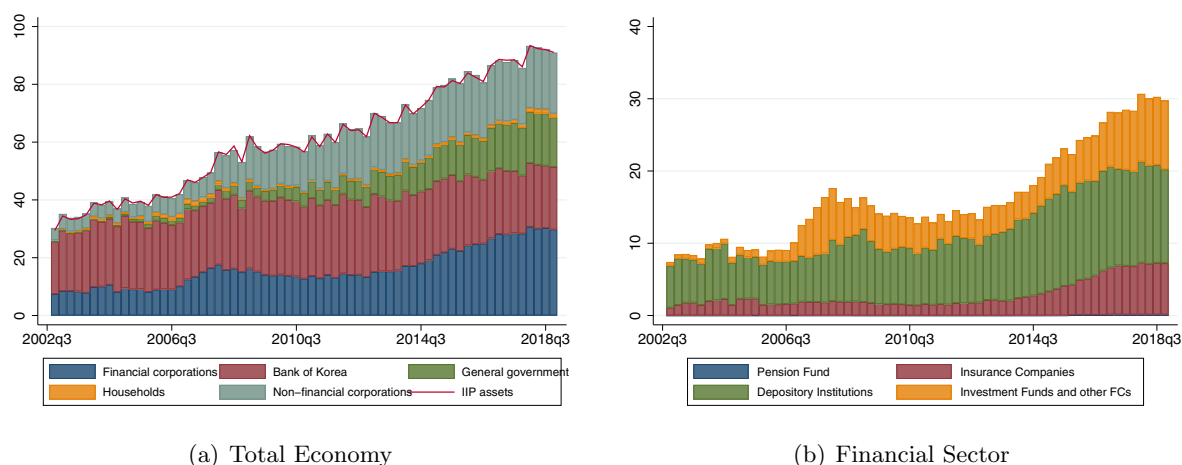


Figure 4: **Gross Foreign Asset Position**

Source: Own calculations, Bank of Korea.

larities in the Flow of Funds (FOF). The FOF provides a breakdown of financial assets and liabilities across institutions and instrument types. Specifically, across most instruments the FOF contains information on whether the instrument is issued by a domestic or foreign counterpart. Using this information, we construct an approximate sectoral breakdown of total assets and liabilities of the Korean economy.¹¹ Figure 4 - 5 shows that our constructed data series matches the total cross border positions of the IIP.

19. Most sectors have seen growing external asset positions since 2002. The aggregate gross asset position of Korea has increased from around 25 percent of GDP in 2002 to around 90 percent of GDP in 2018 (Figure 4). This increase has happened on the back of a high saving rate in Korea and associated high current account surpluses. Our data show that this increase in foreign assets has been seen in most sectors. The general governments external asset position has increased from a negligible level in 2002 to around 20 percent of GDP in 2018, reflecting the buildup of external assets within the National Pension Service (NPS). The gross asset position of non-financial corporations has increased from around 5 percent in 2002 to around 20 percent in 2018, as direct investments have been accumulated abroad. The gross asset position of financial corporations increased from around 8 percent in 2002 to around 30 percent in 2018, as both insurance companies, investment funds, and depository institutions have accumulated assets abroad.

20. The composition of Koreas external liability position has shifted away from financial corporations since 2008. Aggregate foreign liabilities have been broadly stable around

¹¹See Appendix C for more details.

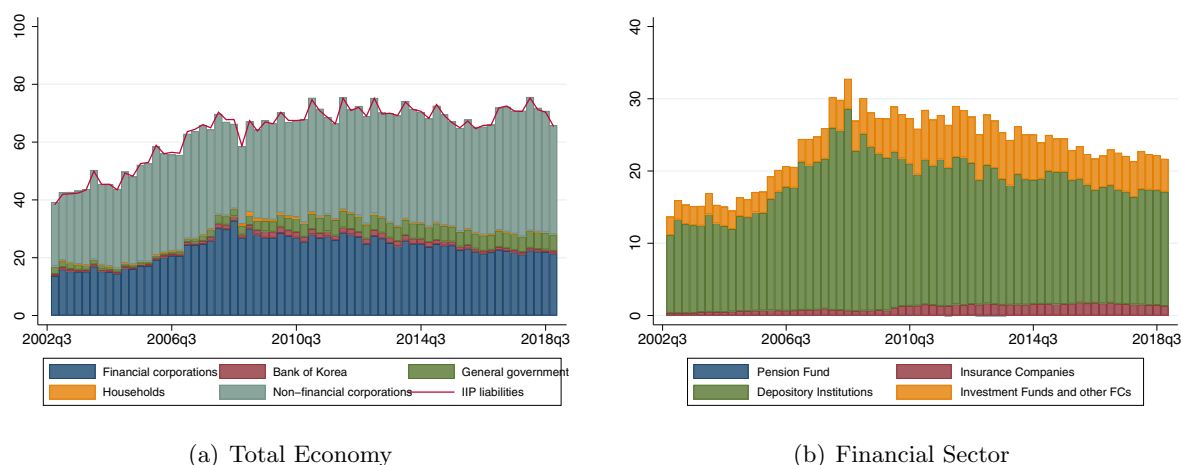


Figure 5: **Gross Foreign Liabilities Position**

Source: Own calculations, Bank of Korea.

60-70 percent of GDP since 2008 after they increased from around 40 percent in 2002 (Figure 5). The increase in liabilities from 2002 to 2008 was driven by an increase in foreign liabilities of financial corporations. Since 2008, the foreign liabilities of financial corporations in percent of GDP have trended down. This happened on the back of policy measures aimed at reducing the reliance on wholesale funding [IMF, 2017]. The decline in foreign liabilities in percent of GDP among financial corporations has been offset by an increase in liabilities of the general government and non-financial corporations.

21. **Net foreign asset positions have turned positive for most sectors.** Korea's aggregate net foreign asset position turned positive in 2014 following a period with increasing assets and declining liabilities. We use the decomposition by sectors to construct the net foreign asset position of sectors in percent of their total assets, a measure we refer as the sectoral net exposure (Figure 6). The sectoral net exposures show that the increase in Korea's net foreign assets is to a large extent reflected in the rise of the net exposure in general government, including through foreign investments in the NPS. For non-financial corporations, the net exposure remains negative but has been broadly stable since 2010. The household sector has generally had a positive net exposure with a brief exception in 2008-10. The financial sector's net exposure as a whole has turned positive, driven by an increase in the foreign asset position and a declining foreign liability position. Within the financial sector, most financial corporations have by 2018 built up positive net asset positions. The exception is the depository corporations, where the net exposure remains negative but has reduced.¹²

¹²Banks are net short in foreign exposure on balance sheet.

22. Sectors with larger net foreign exposure have larger inflows under global volatility.

This is consistent with the net foreign exposure mechanism explained above. Figure 7 and 8 show how a larger net foreign exposure correlates positively with sector specific capital inflows to Korea during risk-off events.¹³

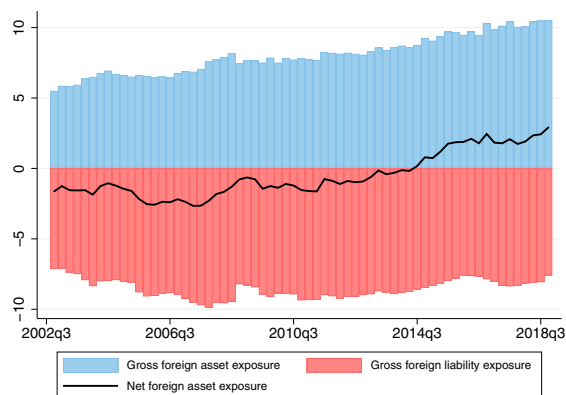
- Figure 7 shows how net capital flows correlate with the *absolute* net foreign exposure across sectors averaged over the recent period of 2015q1-2018q3. Sectors with larger net foreign exposure tend to have net capital flows that respond stronger to changes in global volatility as measured by VIX.
- Figure 8 shows how net capital flows correlate with the *relative* net foreign exposure across sectors and episodes of risk-off events. Again, the correlation is positive. The left panel includes all sectors, while the right panel excludes non-financial corporations and households. The latter sector are less likely to react to changes in global volatility, why the right panel shows a tighter correlation.

The charts show that a larger net foreign asset positions are associated with a larger stabilizing capital inflows during periods of heightened global volatility. This is consistent with the net foreign exposure mechanism explained above.

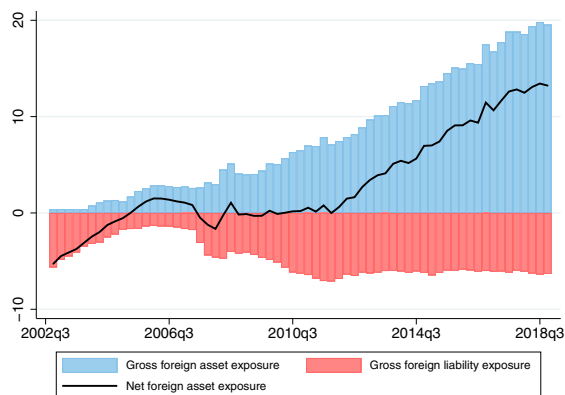
23. The patterns described in this section are consistent with increasingly stabilizing role of Korea's domestic institutional investors through the net foreign exposure mechanism. As described in Section 3, institutional investors holding assets abroad can have incentives to reduce their foreign exposure during periods of increased financial volatility. The aggregate strength of this mechanism would be increasing in (i) the net foreign position of domestic investors to foreign assets, (ii) the extent to which these assets are held by institutional investors. To this end, the developments documented in this section is consistent with a growing stabilizing role of domestic institutional investors. First, Korea has built up a growing foreign asset position, both in gross and net terms. Second, institutional investors within the financial sector (investments funds, insurance companies etc.) and the general government (the NPS) have played an important role in this build up. These patterns are all observed on the FOF balance sheet.

24. Other factors can also help explain the declining sensitivity of Korean capital flows to financial volatility. For example, Bruno and Shin [2014] find evidence that capital flows into Korea became less sensitive after the introduction of macroprudential measures in

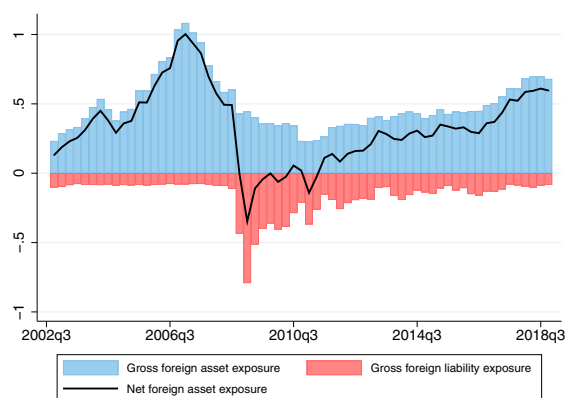
¹³The constructed sector specific flows underlying these Figures are presented in Figure A.5-A.6.



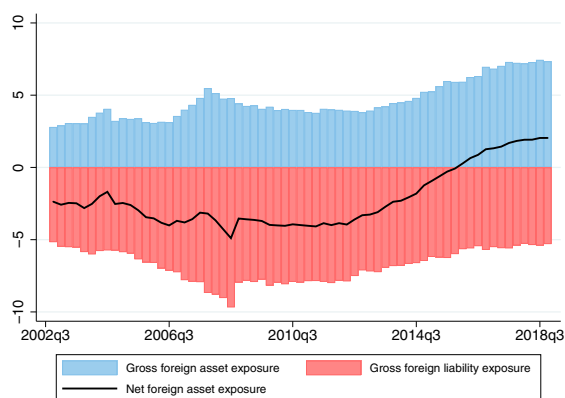
(a) Total Economy



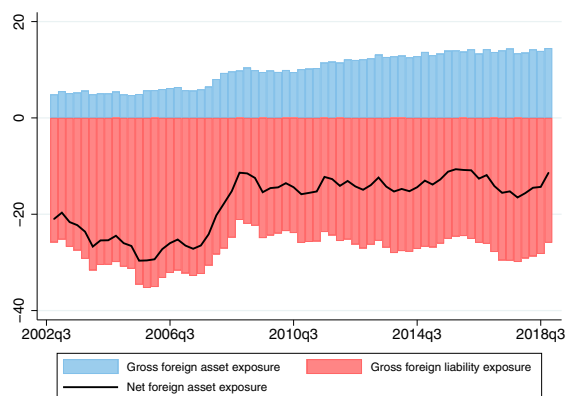
(b) General Government



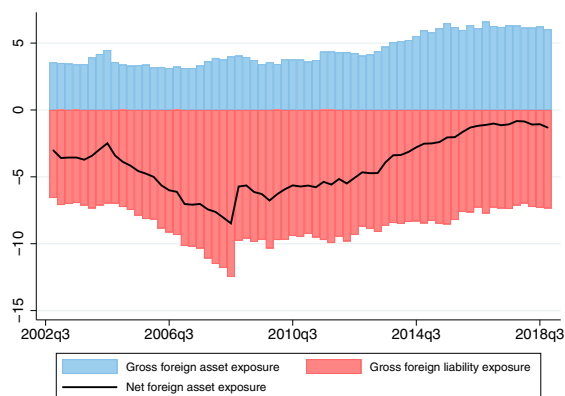
(c) Households



(d) Financial Sector



(e) Non-Financial Sector



(f) Financial Sector, Depository Corporations

Figure 6: **Net foreign asset position of sectors, percent of total assets for each sector**
Source: Own calculations, Bank of Korea.

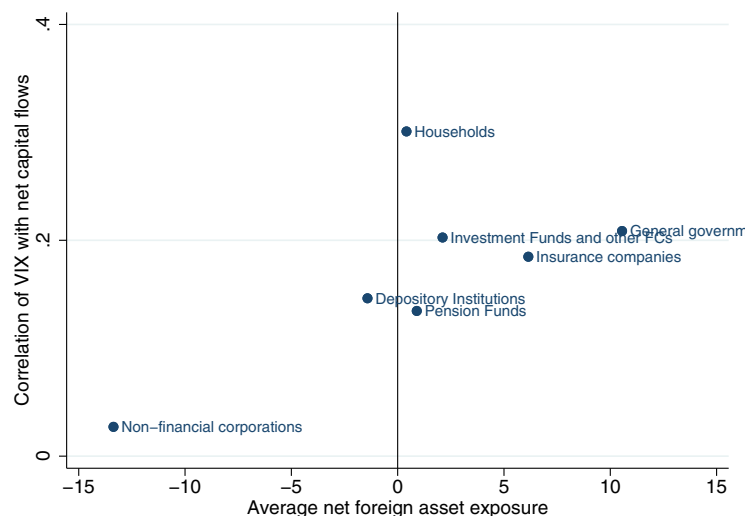


Figure 7: **Correlation between VIX and net capital flows plotted against average net foreign asset exposure**

Correlations and averages are computed for the period 2015q1-2018q3. Correlation of sectoral net capital flows with the VIX are based on constructed sectoral flows based on the FOF.

Sources: Own calculations based on Chicago Board Option Exchange (CBOE), and Bank of Korea.

2010. In Appendix B, we also discuss how use of off balance sheet hedging instruments can potentially help explain inflows during periods of increased financial volatility. Resident investors may reduce foreign exposure through use of off balance sheet hedging as an alternative to selling foreign assets. Such hedging could result in non-resident related inflows if the foreign counter party bank wishes to keep an unchanged net open position.

5 Conclusions

25. **The patterns in Korean capital flows have recently been changing.** Traditionally Korea has experienced destabilizing capital outflows during periods of heightened global volatility. However, the behavior of cross border capital flows during risk-off episodes has been changing in recent years. The volatility in net capital flows has declined since 2015, and Korea also recently experienced safe-haven like capital flows into bond markets during certain global risk-off episodes.

26. **Risk management behavior of a growing domestic investor base can be part of the explanation.** Korea's institutional investor base has increased in size in terms of domestic balance sheets as well as their involvement in cross border financial intermediation. Many investors use Value-At-Risk (VaR) based risk management frameworks. Thus, when the riskiness of an asset in a portfolio increases without its return changing, the portfolio's share of this asset will

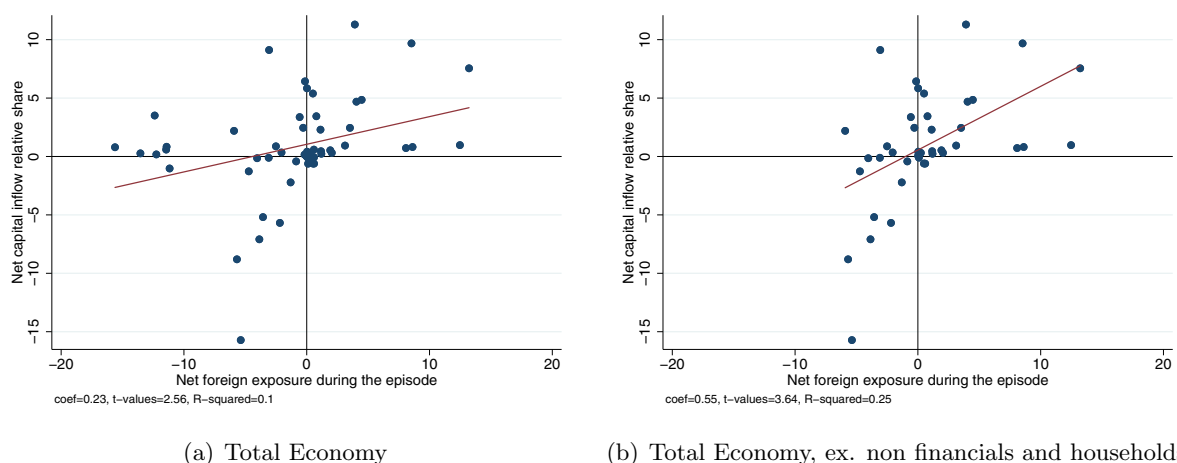


Figure 8: Correlation between net foreign exposure and net capital inflows during risk-off episodes.

Net capital inflow relative share is the ratio of sector net inflows out of sector asset over the ratio of total economy net inflows out of total economy asset. Net foreign exposure is net foreign exposure for each sector in percent of total asset for each sector. Sectors include general government, households, non-financial corporations, financial corporations, pension fund, insurance companies, depository institutions, investment funds and other FCs. Each dot corresponds to a sector during a specific risk-off episode. The episodes considered are illustrated in Figure 3.

Sources: Own calculations based on Korean Flow of Funds, Bank of Korea.

have to be reduced to keep the riskiness of the portfolio constant. Heightened global volatility can thus cause retrenchment of back to Korean assets, or domestic investor driven increases in foreign funding.

27. The data is consistent with an increasing role for domestic institutional investors in capital flow responses during risk-off episodes. Making novel use of flow of funds data, we have shown that the increase in Korea's net and gross foreign assets is reflected primarily in growth in the foreign positions of general government (reflecting mainly the national pension service), investment funds and insurance firms, and, to a lesser extent, depository institutions (banks). Institutional investors have seen more foreign asset growth than foreign liability growth, and have hence become increasingly net long in foreign assets/exposure.

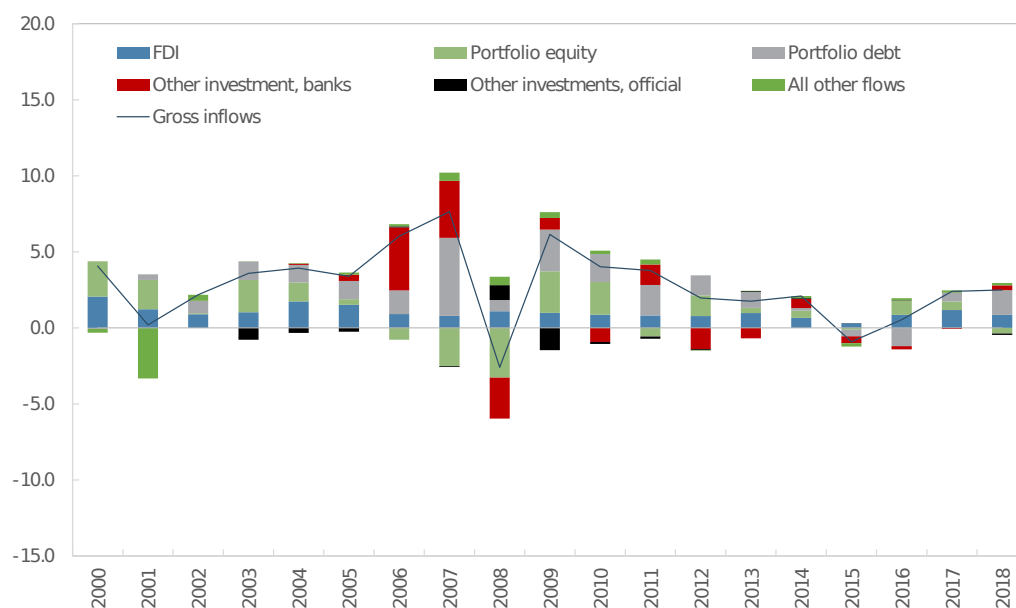
28. The findings highlight the need for more research into interaction of financial regulation and capital flows. With a growing domestic investor base, policies affecting the incentive of financial institutions to manage their risks are increasingly important in understanding capital flows. Such policies are often implemented for prudential reasons, but may have implications for how domestic investors adjust their portfolios in response to global volatility. [Bruno and

Shin, 2014] have studied how capital flows sensitivity is affected by regulation aimed at banks' non-core liabilities.

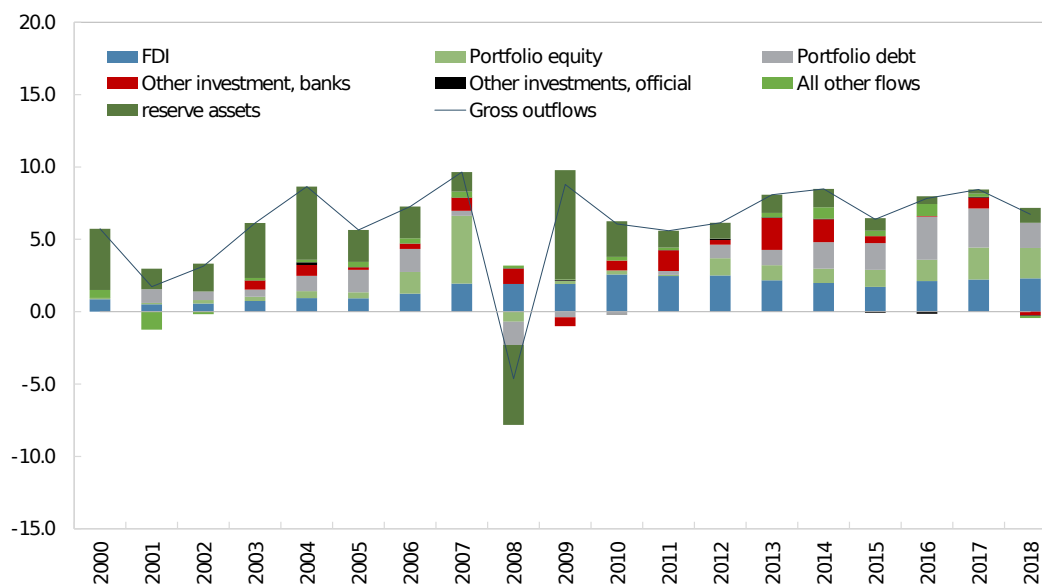
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A Figures



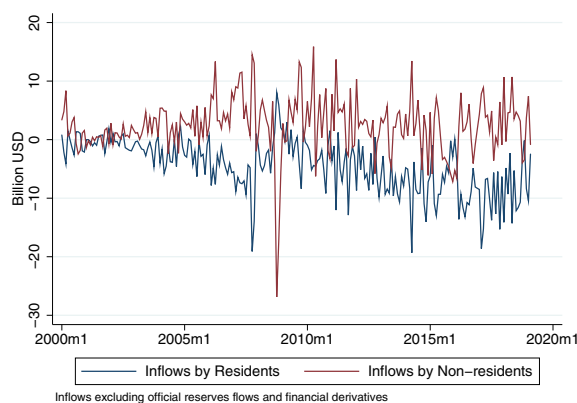
(a) Inflows by non-residents in percent of GDP



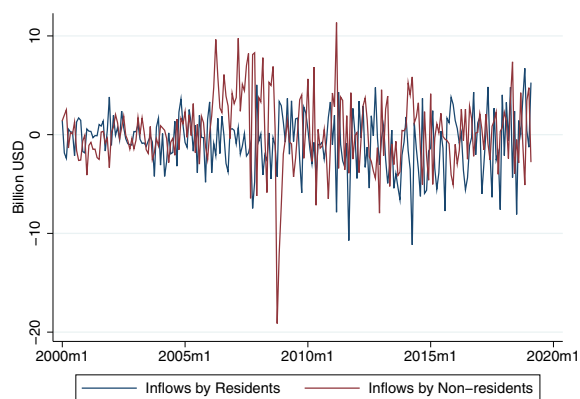
(b) Outflows by residents in percent of GDP

Figure A.1: **Gross Capital Inflows and Outflows**

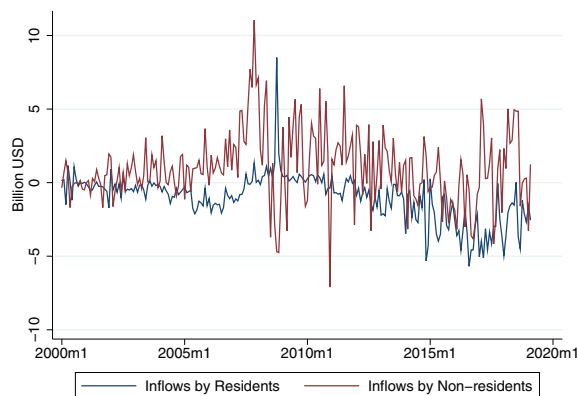
Source: Balance of Payments, Bank of Korea.



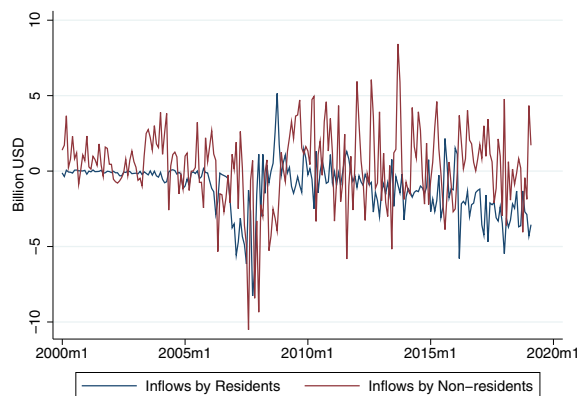
(a) Total flows



(b) Other Investment



(c) Portfolio Debt



(d) Portfolio Equity

Figure A.2: Inflows by Residents and Nonresidents

Source: Balance of Payments. Total flows is the sum flows of direct investment, portfolio investment and other investment. Outflows by residents have been multiplied by -1 to get inflows by residents.

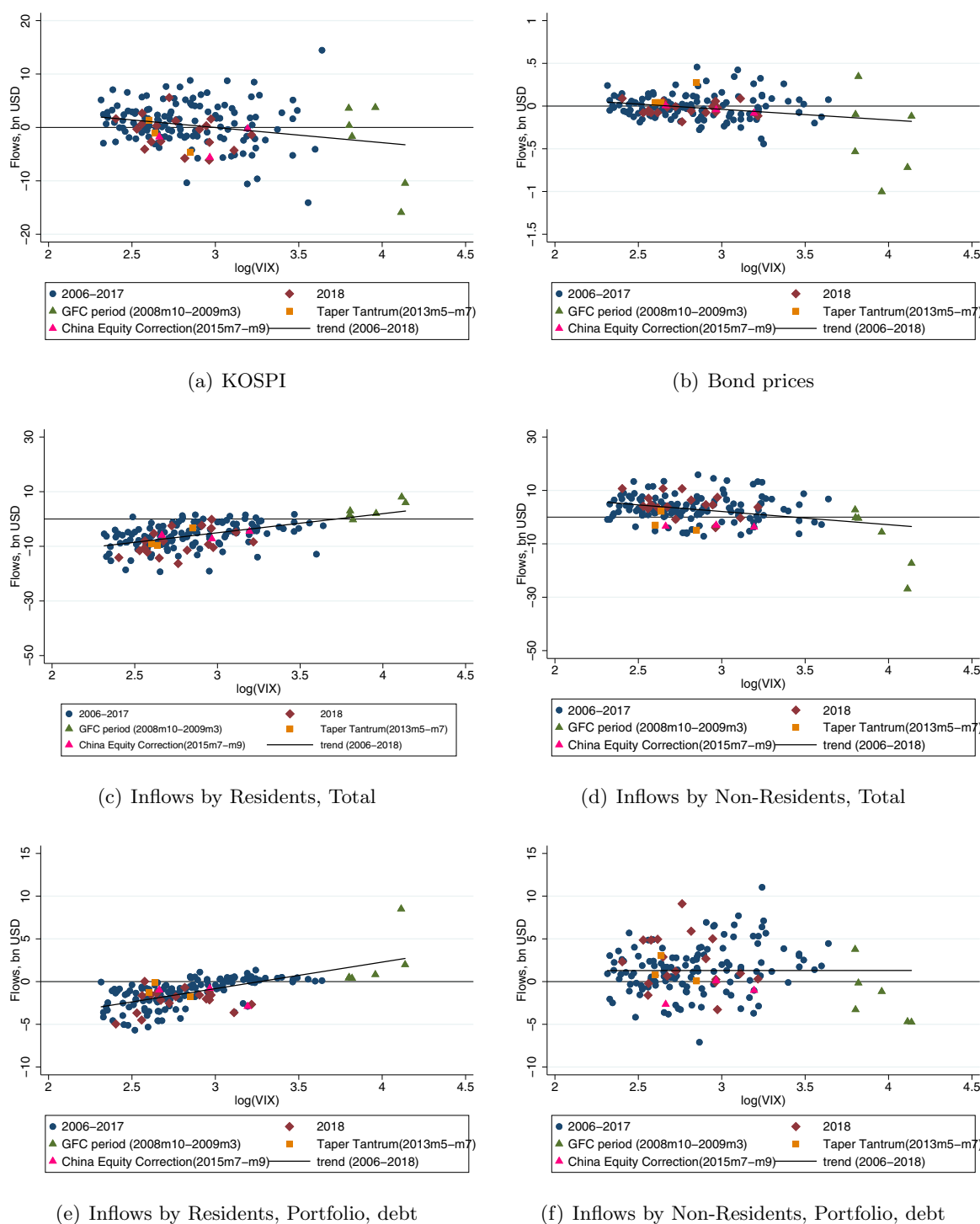


Figure A.3: Cross Plots of Prices and Flows Against Global Volatility

Source: Balance of Payments and Chicago Board Options Exchange (CBOE). The scatter plots are bond and equity prices, BOP flows of categories against the log VIX. Monthly data ranges from 2006 to 2018. Scatter plots in 2018 are brown rhombus, plots in Global Financial Crisis (2008m10–2009m3) are in green triangle, plots in Taper Tantrum (2013m5–2013m7) are in orange square, plots in China Equity Correction (2015m7–2015m9) are in pink triangle, and plot in rest of time periods are in blue circle. The trend (2008–2018) is the fitted line of all scatter plots from 2006 to 2018.

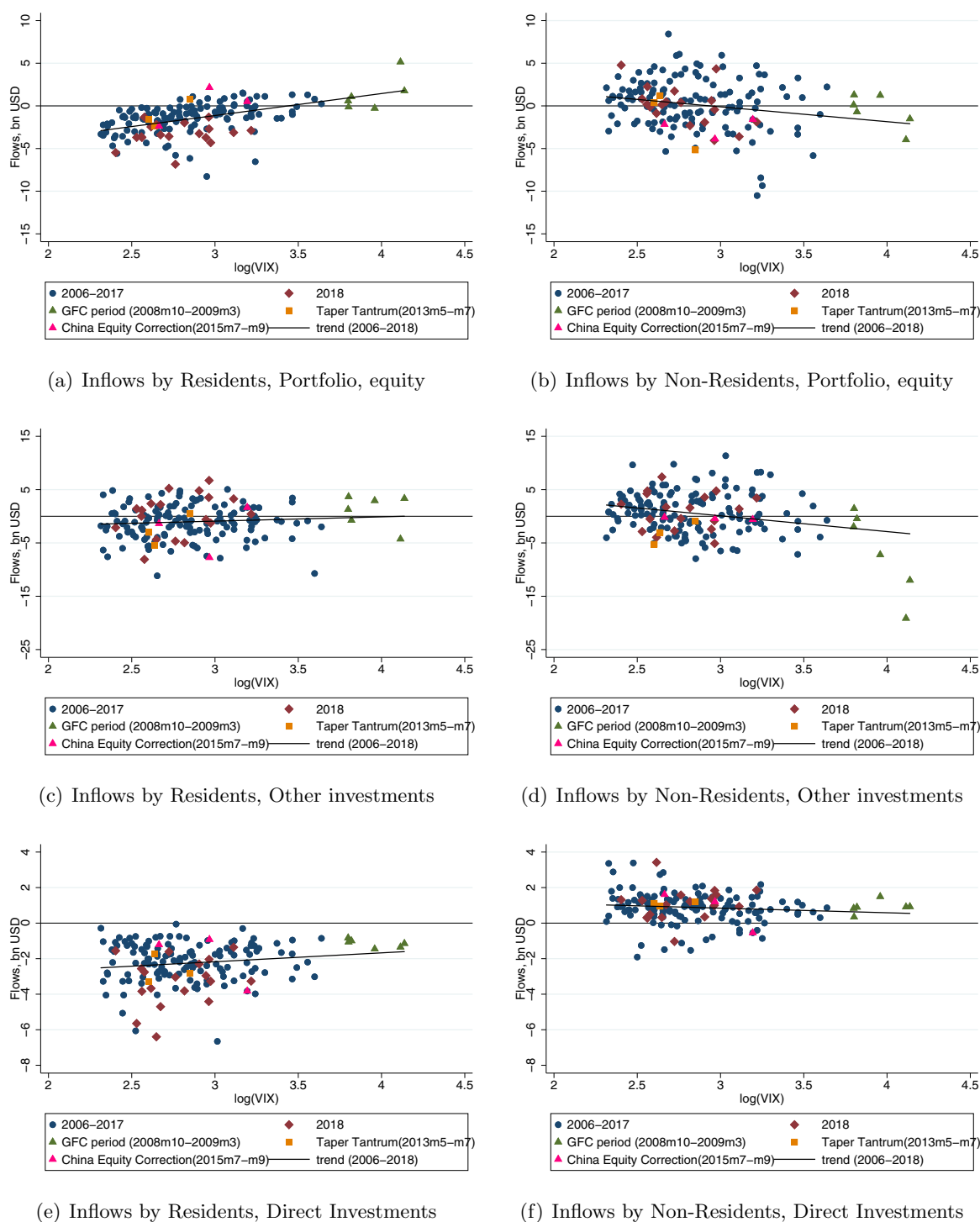


Figure A.4: Cross Plots of Prices and Flows Against Global Volatility

Source: Balance of Payments and Chicago Board Options Exchange (CBOE). The scatter plots are bond and equity prices, BOP flows of categories against the log VIX. Monthly data ranges from 2006 to 2018. Scatter plots in 2018 are brown rhombus, plots in Global Financial Crisis (2008m10-2009m3) are in green triangle, plots in Taper Tantrum (2013m5-2013m7) are in orange square, plots in China Equity Correction (2015m7-2015m9) are in pink triangle, and plot in rest of time periods are in blue circle. The trend (2008-2018) is the fitted line of all scatter plots from 2006 to 2018.

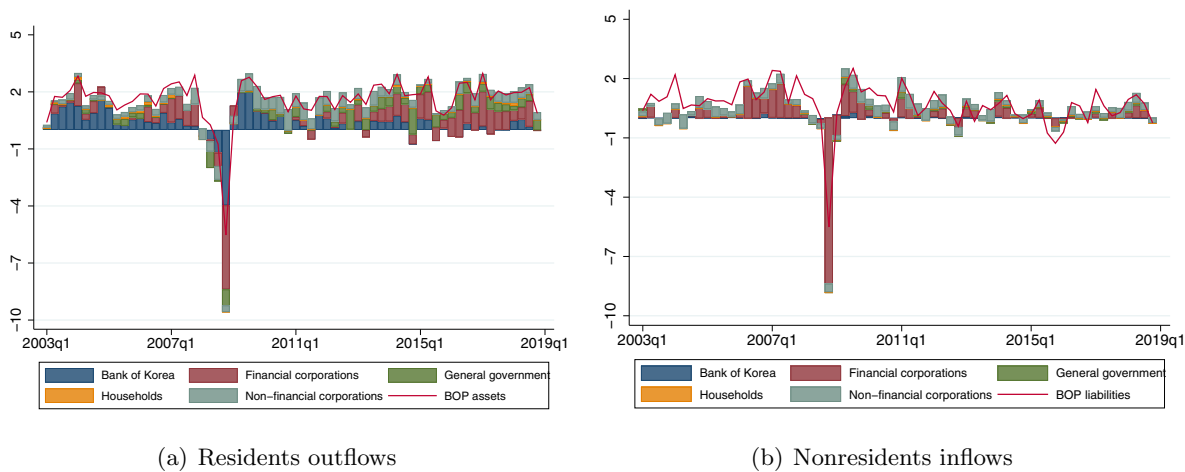


Figure A.5: Breakdown of Foreign Flows by Sector, in percent of GDP

Source: Flow of Funds and International Investment Position. Details about calculating foreign capital flows from Flow of Funds are available in Data Appendix.

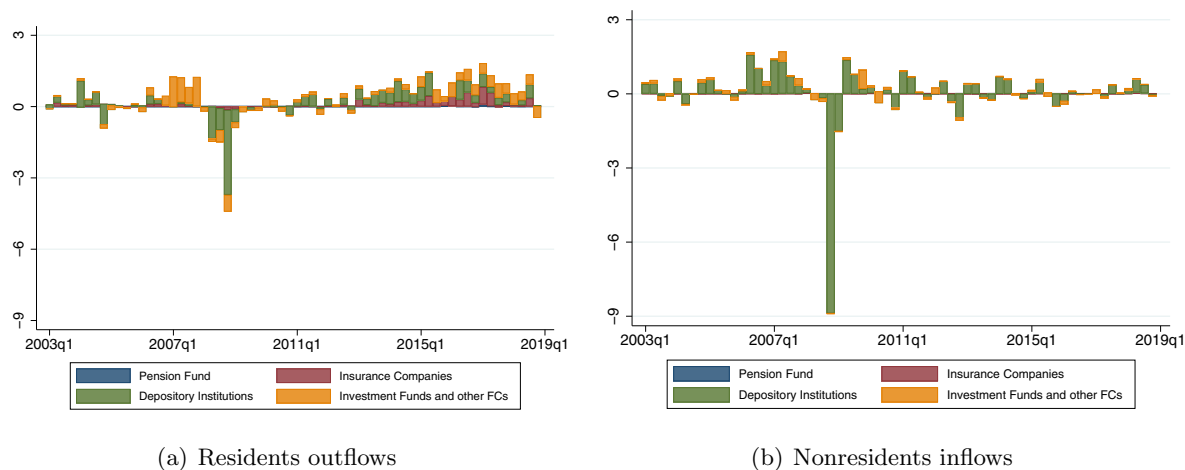
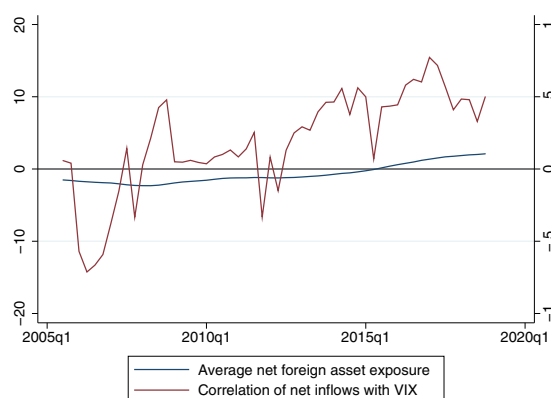
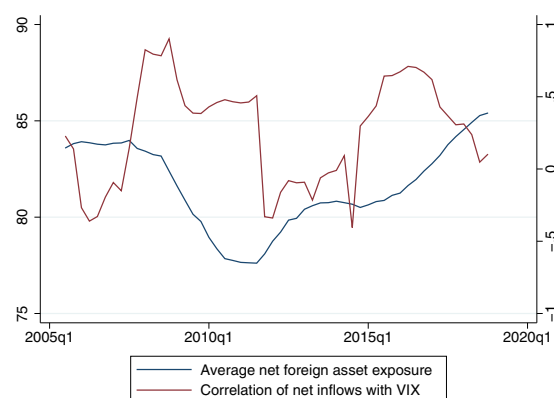


Figure A.6: Breakdown of Foreign Flows by Financial Institutions, in percent of GDP

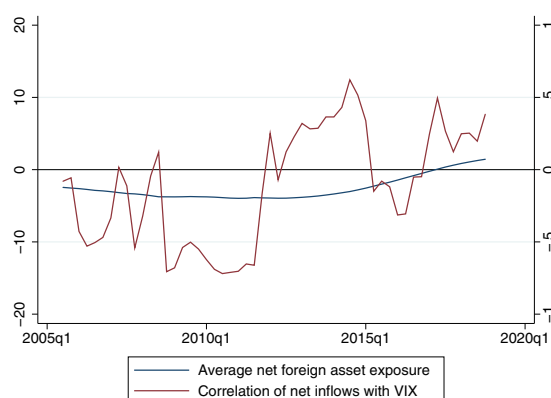
Source: Flow of Funds and International Investment Position. Details about calculating foreign capital flows from Flow of Funds are available in Data Appendix.



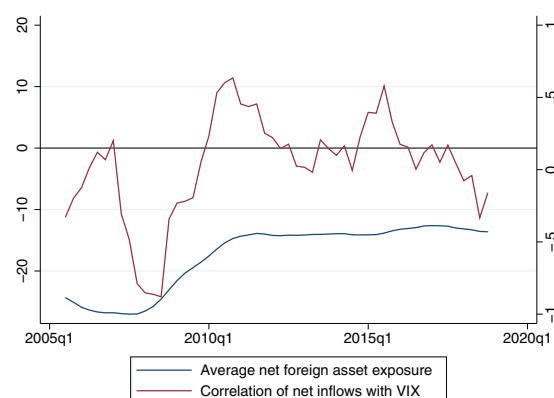
(a) Total sectors



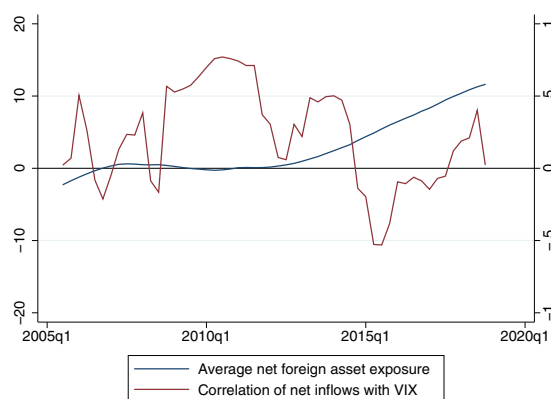
(b) Bank of Korea



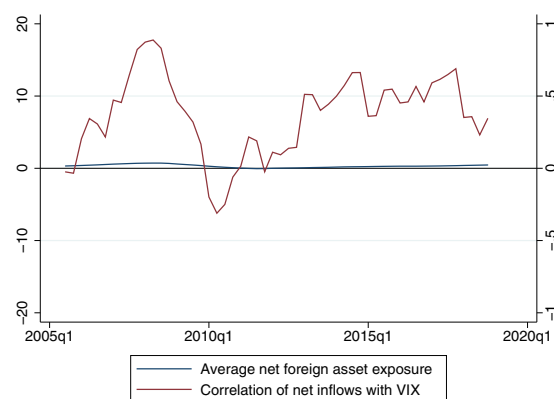
(c) Financial Corporations



(d) Non-financial corporations



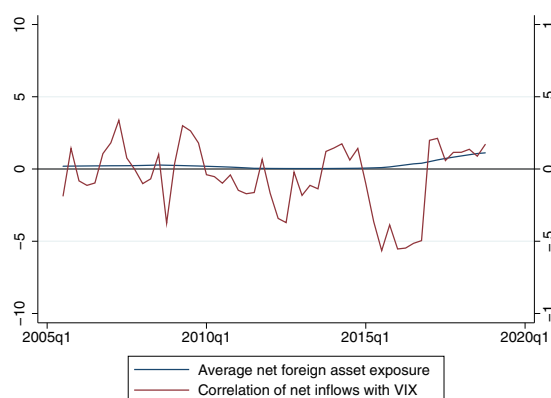
(e) General government



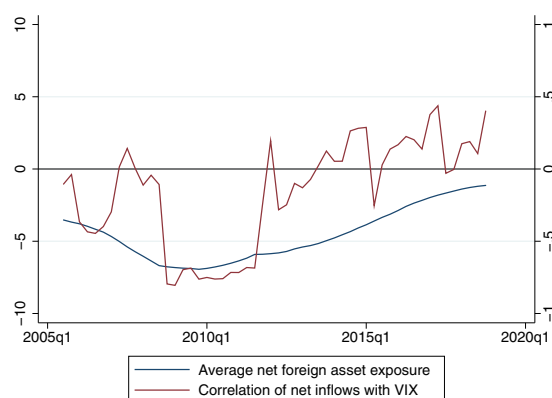
(f) Households

Figure A.7: Rolling correlation of flow with vix

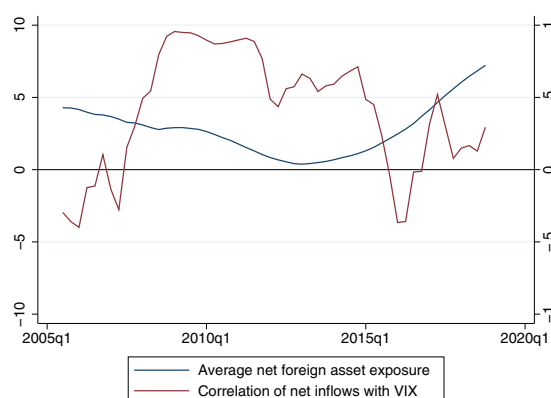
Source: Flow of Funds and Chicago Board Options Exchange (CBOE). Average net foreign asset exposure is on left y axis and correlation of net flows with VIX is on right y axis. Correlation of net inflows with VIX is three-year rolling correlations of the net capital flow by sector with the log VIX. Average net foreign asset exposure is the last three year average of net foreign asset exposure. Details about calculating net capital flows from Flow of Funds and net foreign asset exposure from Flow of Funds are available in Data Appendix.



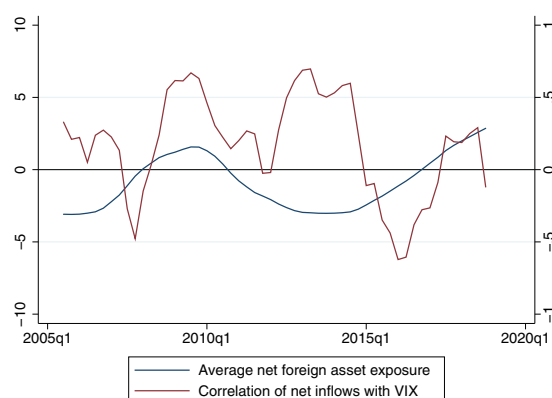
(a) Pension Funds



(b) Depository Institutions



(c) Insurance Companies



(d) Other, Incl. Investment Funds

Figure A.8: Rolling correlation of flow with vix

Source: Flow of Funds and Chicago Board Options Exchange (CBOE). Average net foreign asset exposure is on left y axis and correlation of net flows with VIX is on right y axis. Correlation of net inflows with VIX is three-year rolling correlations of the net capital flow by sector with the log VIX. Average net foreign asset exposure is the last three year average of net foreign asset exposure. Details about calculating net capital flows from Flow of Funds and net foreign asset exposure from Flow of Funds are available in Data Appendix.

B The Role of Off-Balance Sheet Hedging

29. **Resident can also reduce their net exposures through currency derivatives.** Above we explained how increased global volatility can prompt residents to reduce their net foreign exposures thereby triggering capital inflows. However, net exposures can also be reduced through currency derivatives. The mechanism through which this show up in the Balance of Payments statistics is different than what we explained Section 4. As we will explain below, the reduction of resident's net exposure through currency derivatives can manifest in capital inflows of non-residents.

30. **The Korean market for foreign exchange derivatives is large.** In 2017, the average daily turnover of derivatives related to the Korean won was USD 31 billion. This is 166 percent of the daily turnover of spot transactions involving Korean won and approximately 1 percent of the world market turnover in derivatives (Table 1). Within the derivative market, FX swaps account for the largest market (64 percent), while forwards accounts for the second largest market (34 percent). Currency swaps and options accounts for less than 4 percent of the market.

Table 1: Foreign Exchange Turnover in Korea, daily average, USD billions

	2011	2012	2013	2014	2015	2016	2017
Spot	19.1	18.0	18.3	17.5	20.0	19.4	19.6
Derivatives Total	27.7	27.4	27.9	27.7	28.5	29.0	31.0
Forwards	7.5	6.6	7.1	7.6	8.3	9.6	10.1
FX swaps	19.2	19.8	19.6	19.0	19.2	18.4	19.8
Currency Swaps	0.8	0.7	0.8	0.8	0.8	0.8	0.9
Currency Options	0.3	0.3	0.4	0.3	0.2	0.2	0.2
Total	46.8	45.4	46.1	45.3	48.4	48.4	50.6

Source: Bank of Korea.

31. **Forwards in Korean won are mainly non-deliverables and traded off-shore.** An important feature of the Korean forward market is the dominant role of non-deliverables forwards (NDFs).¹⁴ These make up around 63 percent of the total turnover in the forward market (Table 2). The large NDF market is explained by the fact that the Korean won has not been internationalized, while the NDF market allows settling of contracts without direct handling of the Korean currency. As a result, 76 percent of the NDF market is traded off-shore (Table 2).

¹⁴An NDF is a forward transaction where the difference between the contracted rate and the spot rate on the due date is settled in US dollars without delivery of the whole contracted principal.

Table 2: Trade Location and Deliverability of Forwards, average daily turnover, million USD, April 2016

	DF	NDF	Total
Onshore	14,454	7,357	21,811
Offshore	2,985	22,718	25,703
Total	17,439	30,075	47,515

Source: [McCauley and Shu, 2016].

32. The Korean demand for foreign currency derivatives originates from ex- and importers as well as asset managers. Korean exporters are exposed to currency risk as they receive payments for final goods in foreign currency while input costs mainly are in local currency. Korean importers are exposed to currency risk for the opposite reason. Historically, Korean firms have been net-selling foreign currency in the forward market given the countrys trade surplus. At the same time, Korean asset managers have been building up asset positions in foreign currency, as shown in Section 4. Some of those positions are hedged through derivatives, and asset managers can use derivatives to reduce exposures temporarily in response to an increase in global financial volatility.

33. Supplying forwards can cause banks to generate capital inflows to Korea. When a Korean bank signs a forward or swap with a client it effectively assumes the foreign exchange rate risk. The bank can offset this risk in two ways (Figure B.9).

- It can sign an offsetting forward (or swap) with a foreign bank branch. This will transfer the currency exposure to the foreign counterparty, which in turn can cover this exposure by buying Korean won against foreign currency in the spot market and placing the proceed in Korean bonds.
- The Korean bank can borrow foreign currency. This would require the bank to deliver foreign currency at maturity of the loan, thus offsetting the risk from receipt of foreign currency against Korean won.

In both cases the hedging operation initiated by a domestic client results in a non-resident inflow of capital. In the first case, the non-resident inflow is into the Korean bond market.

34. This mechanism may help explain capital inflow from non-residents during periods of heightened financial volatility. The Korean gross foreign asset position in end-2018 was USD 1520.5 billion. Of this, roughly USD 879 billions can be assumed to be held by institutional investors, the national pension fund and financial institutions (Table 3). As a purely

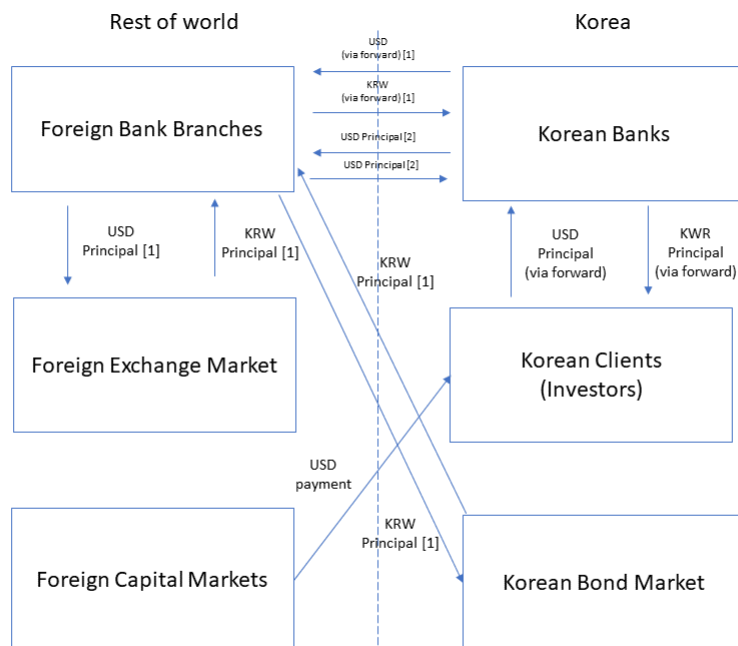


Figure B.9: **Hedging and Capital Flows**

stylized example, assume these investors decided to hedge additional 1 percent of total foreign assets, and foreign branches keep their net open position unchanged. The resulting non-resident inflow into the Korean loans and bonds would be USD 8.8 billion. Conversely, foreign investors hold USD 667 billion in Korean debt and equities. If they also reduce this exposure by 1 percent, a negative inflow (or positive outflow) of USD 6.7 billion would result. This would less than outweigh the inflow generated by residents.

Table 3: Simulated in- and outflows to 1 pp increase in hedging, USD billions

	Gross position	Simulated inflows	
		bn USD	pct GDP
Residents			
General government, inc. pension fund	329	3.3	0.2
Financial institutions, ex. BoK	550.0	5.5	0.3
Non-Residents			
Portfolio, debt	230.0	-2.3	-0.1
Portfolio, equity	437.0	-4.4	-0.3
Total		2.1	0.1

Source: Korean Balance of Payment and staff simulations.

C Data

C.1 Construction of Cross Border Stocks and Flows by Sectors

This appendix describes the Flow of Funds (FOF) data for Korea provided by the Bank of Korea, and how we have used these data to construct series for cross border stocks and flows divided on sectors.

The FOF comes in a stock version comparable to the International Investment Position (IIP); and a flow version comparable to the Balance of Payments (BOP). The FOF is based on the SNA 2008 methodology for the most recent period (2008q4-2018q3) and the SNA 1993 methodology for the earlier period (2002q4-2013q4). We combine SNA 1993 data (2002q4-2008q3) and SNA 2008 data (2008q4-2018q3) to calculate foreign position and flow sectoral data for a longer time horizon, but note that there is a structural break in our series in 2008q4.

The FOF divides total balance sheets of domestic residents in Korea by types of institutions and by instruments. The sectoral breakdown contains five main sectors, of which the financial sector is broken down further by types of financial institutions:¹⁵

Table 4: Sectoral Breakdown of the Flow of Funds

Total Domestic Economy, of which:
General government
Bank of Korea
Households
Non-Financial Corporations
Financial Corporations, of which:
Depository Institutions (banks)
Insurance Corporations
Pension Funds
Investment Funds and Other Financial Institutions
Rest of the World

The FOF does not provide an outright breakdown by domestic and foreign counterparties, and hence does not directly allow for an identification of cross border positions. However, the instrument breakdown in the FOF contains partial information about the nationality of the issuer, which we make use of for constructing cross border flows and positions. Table 5 gives the categories within the instrument breakdown that we associate with foreign counterparties.

On the asset side, the two categories of Currency and Deposits and Loans and Trade Credits

¹⁵In the category of FOF, Bank of Korea is under the category of financial corporations. To show capital flows of BOK more clearly, we separate the BOK from financial corporations.

Table 5: External instruments under each sector

Gold and SDRs
Currency and Deposits (cross foreign issuers)
External securities (debt securities issued by foreigners)
Loans external components (cross border component)
Equity and Investment Fund Shares Issued by nonresidents
Trade Credit external components
Foreign Direct Investment
Other foreign Claims and Debts

do not have information allowing us to assign a portion to foreign or cross border items. For these instruments, we use an approximation. We estimate the foreign asset share of these items as the ratio of the amount in these instruments held on the liabilities side by the Rest of the World, divided by the total amount held on the asset side by the total domestic economy. We cannot construct shares specific to sectors, and instead apply these economy wide shares too all sectors. This introduces some imprecision in the estimates. However, on the asset side, below 5% of total foreign positions are in categories that cannot be assigned to foreign counterparties, and hence, the potential inaccuracy introduced by the approximation is small.

On the liabilities side, assigning instruments to domestic and foreign counterparties is more difficult, as instruments are labelled according to issuer, rather than according to creditor. In addition to the two categories unassigned on the asset side, we estimate foreign counterparty shares for short and long term debentures, long term government bonds, long-term corporate bonds and equity. We estimate the foreign liabilities share of all these instruments as the ratio of the amount in these instruments held on the asset side by the Rest of the World, divided by the total amount held on the liabilities side by the total domestic economy. About half of total foreign liabilities positions are in categories that cannot be assigned to foreign counterparties, and hence, the potential inaccuracy introduced by this approximation is larger than for the asset side.

Using economy wide approximated shares of foreign liabilities across sectors is particularly problematic for flows, as the portfolio adjustment behavior driving the response to shocks, and hence flows, is likely to differ a lot across sectors. For these reasons, we rely mainly on stock measures in this paper.

Finally, the FOF instrument breakdown also contains the category of financial derivatives, but these are defined differently from the IIP/BOP. Notably, the FOF does not allow us to divide derivatives positions by foreign counterparties or currency denomination. In addition, all three databases define derivatives positions in terms of their market value position or change (e.g. mark-to-market in the case of flows) which is not directly comparable to on-balance sheet flow

and positions data. For example, a new forward or swap contract will often be priced such that its initial market value is zero, despite having a large notional amount. As soon as market prices start moving, the value of the derivative will fall or grow, but this change in the value is not comparable to an on-balance sheet stock position. We hence exclude financial derivatives from the FOF data in our construction of cross border stocks and flows.

Net flows are constructed as gross liabilities inflows minus gross asset outflows. Because the instrument categories under the SNA 2008 and the SNA 1993 methodologies do not overlap one-for-one, it should be kept in mind that there is a structural break in the constructed series in 2008q4.