Journal of Economic Integration
Vol. 38, No. 1, March 2023, 1-31
https://doi.org/10.11130/jei.2023.38.1.1

pISSN: 1225-651X eISSN: 1976-5525

# The Determinants of Disaggregated Capital Inflows to Emerging Market Economies: Empirical Evidence from Korea

Sungcheol Kim[1+], and Kyunghun Kim[2]

[1]*Ministry of Economy and Finance, Republic of Korea*
[2]*Hongik University, Republic of Korea*

**Abstract** This paper investigates the key factors in determining disaggregated portfolio investment flows to Korea. I categorize total portfolio investment flows by investor type, such as global banks, investment funds, securities firms, and pension companies. From the structural vector autoregression model with dummy variables, this paper finds that the properties of each institution's capital inflows are quite different. For example, investment funds and securities firm flows are more responsive to stock market index, whereas pension companies are more sensitive to domestic output growth. This implies that the impact of any economic shock on the total foreign capital flows cannot be generalized as the impact on each investment group's capital flow.

**Keywords:** Portfolio flows, Investor type, Push and Pull factors, Korea

*JEL Classifications: C32, F32, F38, G15.*

Received 9 January 2023, Revised 6 February 2023, Accepted 13 February 2023

## I. Introduction

Capital inflows into emerging market economies (EMEs) have increased dramatically since the 1990s, prompting extensive research into the determinants of such inflows. The increase in capital flows has been attributed to changes in global economic conditions, such as emerging countries' economic and political reforms, trade liberalization, changes in capital control policies, and banking supervision. Foreign capital inflows to EMEs multiplied more than tenfold in the 1990s from the 1980s, before the Asian crisis in 1997, as illustrated in Figure A1 of the Appendix. Although they slowed during the late 1990s EME crises, they have increased rapidly since the early 2000s and peaked in 2007, just before the 2008 global financial crisis (GFC). The amount of foreign capital inflows, which decreased at the onset of the 2008 GFC period, have recovered since 2010 and remain high. Not only the size of foreign capital inflows but

**+Corresponding Author:** Sungcheol Kim
Senior Deputy Director, Macroeconomic and Fiscal Research Team, Bank of Korea 67, Sejong-daero, Jung-gu, Seoul, Republic of Korea. E-mail: kimscmosf@korea.kr
**Co-Author:** Kyunghun Kim
Assistant Professor, School of Economics, Hongik University, 94, Wausan-ro, Mapo-gu, Seoul, Republic of Korea. E-mail: khkim@hongik.ac.kr

also their volatility has increased, and their composition has changed. In particular, portfolio flows to EMEs were negative during the 2008 GFC, but turned positive after 2009 as a result of increased global liquidity from expansive monetary policies in developed economies. This is depicted in Panel B of Figure A1 of the Appendix, which describes capital inflows to each regional group. In particular, capital inflows into Asia plummeted significantly during the 2008 GFC, but then sharply increased and accounted for the largest portion of the region's share. These capital inflows are known to benefit recipient countries by supplementing domestic savings, relaxing credit constraints, encouraging physical capital accumulation, and thus accelerating their real growth rates (Obstfeld, Rogoff, and Wren-lewis, 1996; Igan, Kutan, and Mirzae, 2017).[1)]

However, surges in foreign capital flows to EMEs have often reverted to massive outflows, as evidenced by the Mexican crisis, the Asian financial crisis, the Russian financial crisis, and the Brazilian currency crisis in the 1990s, and the 2008 GFC. During the 2008 GFC, most emerging countries' economic crises worsened as foreign financial capital was rapidly retrenched to developed economies. This phenomenon has recently become particularly important again after several years of increases in the US interest rate by the Fed. As a result of capital outflows from emerging economies in 2018, the Turkish lira and the Argentine peso have plummeted by approximately 45% and 50%, respectively, compared to the beginning of the year. In particular, Argentina demanded early payment of IMF US$50 billion bailouts, followed by increasing the size of bailout to US$57.4 billion.[2)] The sudden stop, especially from EMEs, means that external funding is extremely vulnerable to volatile international financial markets. In particular, the sudden capital outflows must be closely observed because they pose a high risk of contagion to other emerging countries (IMF, 2018). As a result, since the 2008 GFC, many emerging market countries have responded to sudden stops and surges in capital inflows with a wide range of macroprudential and capital-flow management policies to establish an economic policy framework to secure the stability and credibility of the flow of funds (Bruno, Shim, and Shin, 2017; Korinek and Sandri, 2016).[3)]

Most literature on capital inflows to emerging economies divides these determinants into two broad categories after the seminal paper of Calvo, Leiderman, and Reinhart (1993): external

1) Meanwhile, as Blanchard, Ostry, Ghosh, and Chamon (2017) point out, the capital inflows from foreign investors may have a contractionary effect on the recipient economy by appreciating the currency, thus reducing net exports for a given policy rate.

2) Since the announcement that the US has doubled tariffs on Turkish steel and aluminum, the value of the Turkish lira has fallen to a record low, falling from 3.79 per dollar at the beginning of the year to 6.95 on August 13, 2018, and the consumer price index rose 24.5% in September. Argentina's central bank raised its policy rate by 15%p to 60% from 45% in July 2018 in the wake of the financial crisis, resulting in a 4.2% drop in the second quarter economic growth rate.

3) According to Korinek and Sandri (2016), capital control is a policy that limits financial transactions between residents and nonresidents, whereas macroprudential policy limits borrowing from residents or nonresidents. Foreign investor quotas and withholding taxes are examples of the former, whereas the LTV cap and bank levy are examples of the latter.

or push factors and domestic or pull factors. External, supply-side, and developed-country factors that influence capital flow supply are referred to as push factors. According to Fernandez- (1996), the surge in voluntary private capital inflows is primarily driven by push factors, particularly low interest rates in the US. Sarno, Tsiakas, and Ulloa (2016) investigate portfolio flows from the US to 55 other countries and find that push factors such as the US output gap account for more than 80% of the volatility in portfolio flows. Forbes and Warnock (2012) and Rey (2016) argue that the Chicago Board Options Exchange Volatility Index (VIX) is a good proxy for global financial conditions and that it dominates capital flow movements.[4)]

In contrast, pull factors indicate the internal, demand-side, and country-specific factors related to economic developments in recipient countries. Many papers show that the explanatory power of a regression equation is very limited when only push factors are included, and R-squared is greatly increased when pull factors of the recipient countries are considered (Forbes and Warnock, 2012; Bruno and Shin, 2015; Cerutti, Claessens, and Ratnovski, 2017a). Based on the panel regression approach, Chuhan, Claessens, and Mamingi (1998) find that capital inflows to seven Asian countries were primarily determined by domestic or pull factors. In contrast, capital inflows to nine Latin American countries were more affected by global or push factors than pull factors. Hern´andez and Vald´es (2001) find that country-specific characteristics of EMEs are primarily responsible for the movement of private capital flows between 1977 and 1997, and that push factors did not have a significant effect on capital inflows. Existing studies also differentiate the role of push and pull factors. For instance, Ghosh, Qureshi, Kim, and Zalduendo (2014) estimate quantile regressions for a sample of fifty-six emerging markets using data from 1980-2011. They find that while global factors, particularly US interest rates and risk aversion, are important in determining the magnitude of surges in flows, pull factors such as capital account openness are important in determining the distribution of such flows to recipient countries.

To effectively respond to volatile capital movement, emerging economies must first understand their investor base and the nature and characteristics of capital inflows from each investor type. This is because, if the factors determining capital inflows from different types of investors are dissimilar, each investor's reaction will differ when there is a shock and a policy is implemented. Investors in financial markets are of different types, and their investment objectives and fund characteristics differ. Hence, the determinants of disaggregated capital inflows are expected to vary. For example, pension companies have long-term debt, whereas securities firms and investment funds have relatively short-term debt, so their behavior may differ.

However, the capital inflows variable used in existing work is primarily capital flows in aggregate, so little is known about whether and how determinants of capital flows differ across

4) In contrast, Cerutti, Claessens, and Rose (2017b) also employ VIX as a proxy variable to analyze the effects of the unobserved global financial cycle on capital flows, but the result shows that the effect of the global financial cycle on the capital flows is minimal.

different types of investors. Cerutti, Claessens, and Puy (2015) argue that "the sensitivity to common dynamics varies significantly across borrower countries, with market structure characteristics, particularly the composition of the foreign investor base (P.1)." They also emphasize the investor composition in the emerging market.[5] Given the potential heterogeneity in capital flows from each investor, we should analyze the determinants of each investor's capital flow separately. Policymakers must understand who is investing in them, how they invest (short-run or long-run), and what determines their investment to implement more efficient and effective macroprudential and capital control policies. For example, if the determinants of major investors are push factors, then the capital controls for domestic returns, such as changing the withholding tax rate, would be less effective.

This paper specifically seeks to answer the following questions: What determines the capital inflows from different types of investors? Who is more responsible for return variables? Who is more dependent on real variables like output growth rate? Which variables should the government pay closer attention to avoid a sudden stop?

To this end, this paper uses monthly capital flows data directly measured by the Korean government, disaggregates the capital inflows to Korea based on the investor's institution, and examines the determinants of each capital movement. This means that the data set in this paper is not a proxy and contains all information about portfolio flows from all institutions, whereas funds-level data used in some literature only cover a subset of capital flows. In addition, monthly data enables high-frequency analysis and the complete data with explanatory variables such as the industrial production index provided monthly. The disadvantage of using low-frequency data, such as annual and quarterly data, is that it is difficult to find short-term shocks and effects of financial markets, as well as rapidly changing investor behavior (Koepke, 2019).

This paper focuses on portfolio investment flows because inflows to stock and bond markets are generally known to be more volatile than other capital flows, such as foreign direct investment (FDI). Furthermore, because Korea has experienced high volatility due to its heavy reliance on international trade and fully liberalized capital market, the results and implications of this paper can be applied to other emerging market countries.[6] For this purpose, I employ portfolio investment flows to Korea to find the key drivers of capital inflows to EMEs since the 2008 GFC.[7] Figure 1 confirms that not only portfolio flows account for the majority of the total

---

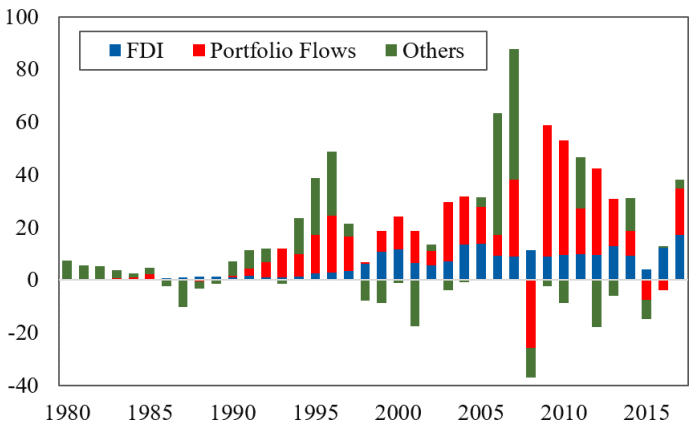
5) The study shows that the structural characteristics of borrowing countries' markets, especially the composition of foreign investors and the level of liquidity, showed a greater influence on the sensitivity to dynamic volatility than the institutional basis of borrowing countries. This study argues that countries relying on international funds and global banks are more sensitive to push factors.

6) According to Chinn and Ito's (2008) measure, as of 2016, the financial market openness index (KAOPEN) of Korea is 2.36, which is at the highest level as in the AEs such as the US. See Chinn and Ito (2008) for more details.

7) There is a debate about whether South Korea is an emerging market economy. Given the size of the economy, including GDP (11th largest as of 2015) and trade volume (7th largest exporter as of 2015), some papers classify South Korea as a developed country. However, South Korea is still classified as an emerging market country

capital inflows to Korea following the 2008 GFC, but also the volatility of portfolio flows is higher than that of other components such as FDI, as mentioned by Eichengreen, Gupta, and Masetti (2018).

**Figure 1.** Capital inflows to Korea




*Note.* This figure describes the three main components (i.e., foreign direct investment, portfolio flows, and others) of the annual capital inflows to Korea. The unit of the vertical axis is billion in US dollars.
(Source) IMF international financial statistics.

More importantly, to examine the determinants of portfolio investment flows from various types of investors, this paper sorts the bottom-up data by each investor's institution, such as global banks, investment funds, securities firms, and pension companies[8]. Using the structural VAR model, I investigate the extent to which variations in portfolio investment flows are caused by various factors. This paper provides the temporal dynamic effects of the shocks and fundamental determinants of portfolio investment flows through the impulse response function and the forecast error variance decomposition.

This paper makes the following contributions to the literature on the determinants of capital inflows. From the structural VAR model with dummy variables and disaggregated portfolio investment flows data, this paper finds that the properties of portfolio investment flows from different types of investors are quite different. The securities firms and the investment fund flows are more responsive to the domestic stock market index, whereas pension fund flows are more sensitive to domestic bond rates. Furthermore, when the VIX rises, investors typically

in the Morgan Stanley Capital International index, the most representative index for stock market performance. Moreover, Korean bonds are still classified as emerging market bonds in many recent papers (Ahmed, Coulibaly, and Zlate, 2017; Burger, Warnock, and Warnock, 2017). Therefore, it is reasonable to classify South Korea as an emerging market economy in the analysis of portfolio flows.

8) The term "investment funds" and "securities firms" denote "collective investment scheme" and "investment trader and investment broker" in Financial Investment Services And Capital Markets Act, respectively.

sell the EME securities, whereas pension companies buy more. These findings suggest that emerging economies should closely monitor their creditors and capital market investors to assess their exposure to global push factors. This is not only theoretically important but also has significant policy implications because it directly affects the efficiency and effectiveness of the macroprudential policies implemented by most emerging markets in response to the surge and stop of capital inflows since the 2008 GFC. To the best of my knowledge, this is the first paper that investigates the determinants of the disaggregated capital inflows by different types of investors.

The key contribution of this paper is building a bridge to the gaps between existing studies. There is still an ongoing debate on the determinants of capital flows to EMEs because literature occasionally yields indecisive and conflicting results. My research findings reveal that capital flows from mutual fund investors are primarily influenced by the push factors, which is consistent with the findings of Milesi-Ferretti and Tille (2011) and Ananchotikul and Zhang (2014). Meanwhile, capital flows from the pension funds are primarily influenced by pull factors, which is consistent with the findings of De Vita and Kyaw (2008) and Fratzscher (2012). This implies that the determinants of capital flows may vary depending on the characteristics of capital flows used in the literature.

The remainder of the paper is organized as follows. The next section provides a description of the data and variables. The section that follows presents an empirical model of portfolio investment flows and discusses the methodology used. Subsequently, the empirical results and discussions are presented. Finally, this paper briefly summarizes the conclusions and mentions policy implications.

# II. Data and Methodology

## A. Dependent variables

This paper examines portfolio investment flows to Korea to find the determinant of capital inflows to EMEs. Portfolio investment flows are defined as net foreign purchases of domestic securities. The dependent variables in this study are various types of portfolio investment flows sorted by the institutions investing capital in EMEs. Motivated by Cerutti et al.'s (2015) argument that a country with a specific institutional investor group, such as global banks, capital is more sensitive to the push factor, I disaggregate total portfolio investment flows by institution type as follows: global banks, mutual funds, securities companies, and pension companies. This classification confirms the heterogeneity of behaviors among capital flows from each institution as a result of their different investment behaviors and goals. Moreover, this breakdown is practical in that policymakers make a policy with a targeted group.

Table 1 reports a description of the dependent variables. The average monthly portfolio inflow to Korea is 765 billion Korean won (KRW), indicating average capital inflows over the analysis period. When comparing the stock market and the bond market, the variance of the stock flows is greater than that of bond flows as shown by the range of the stock flows and the standard deviation, which are greater than those of bond flows. Except for the outflow of funds from securities firms, capital inflows from each investor are positive on average. The coefficient of variation of the capital inflows from pension companies was the lowest, at 1.9, confirming a stable movement.

**Table 1.** *Description of Dependent Variables*

| | Obs | Mean | Median | Max | Min | Std | Skew | Kurt |
|---|---|---|---|---|---|---|---|---|
| Total | 120 | 765 | 765 | 9,524 | -10,468 | 4,078 | -0.12 | 2.65 |
| Stock market | 120 | 294 | 604 | 9,212 | -10,082 | 3,205 | -0.20 | 3.38 |
| Bond market | 120 | 471 | 535 | 6,140 | -5,302 | 2,173 | -0.14 | 3.26 |
| Investment fund | 120 | 306 | 260 | 7,396 | -7,674 | 2,606 | -0.37 | 3.68 |
| Bank | 120 | -230 | -233 | 3,920 | -3,985 | 1,346 | 0.25 | 3.63 |
| Securities firm | 120 | -243 | -247 | 2,145 | -2,392 | 895 | 0.08 | 3.01 |
| Pension fund | 120 | 201 | 157 | 1,397 | -922 | 387 | 0.33 | 4.01 |

*Note.* This table reports a description of the dependent variables measured monthly. Std denotes a standard deviation. The unit of mean, median, maximum, minimum, and standard deviation is in billion Korean won. The data range from January 2008 to December 2017.

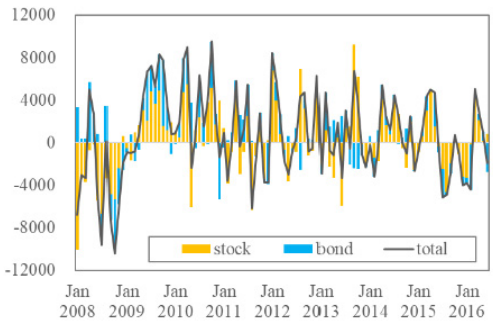
Panels B and D of Figure 2 show the cumulative capital flows to Korea. Following the 2008 GFC, both foreign capital into the stock market and bond market declined, with the former remaining at 2007 levels overall, whereas the latter increased steadily until the announcement of the QE tapering in 2013. In terms of capital flows by investor type, all reduced their securities shortly after the 2008 GFC, and banks, pension funds, and investment funds increased their capital inflows after 2009, whereas the size of Korean securities outstanding held by foreign securities companies is lower than before the crisis.

To determine the characteristics of capital inflows for each type of institution, I calculate the turnover ratio of the capital inflows from each investment group. The turnover ratio is calculated by dividing the amount of transactions by the balance. Thus, it indicates how long each investor has held its securities and how much of a portfolio has been replaced. If an investor's turnover ratio is high, it indicates that the investor has traded securities frequently, implying that the investor is a short-term investor. In contrast, a low turnover ratio indicates that the investor is a long-term investor. Table A1 of the Appendix shows the turnover ratio of each institutional investor group. Securities firms have a turnover ratio of 2.11, 0.22, and 1.75 for capital inflows to the stock market, bond market, and total market, respectively. These values are much higher than those of other investors, indicating that they are short-term investors.

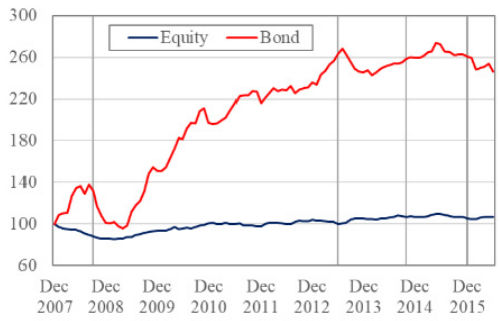
Conversely, the turnover ratio of pension fund flows is the lowest in the equity, bond, and overall markets at 0.09, 0.10, and 0.09, respectively. Therefore, it is considered a long-term investor.

**Figure 2.** Capital inflows to the Korean securities market

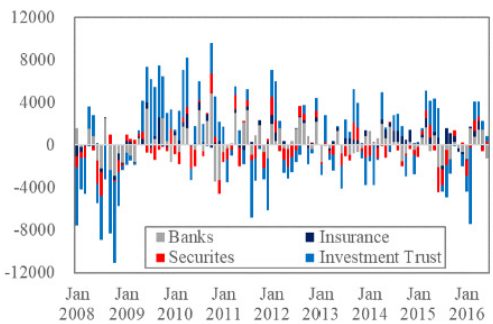
**Panel A.** Capital Flows to Disaggregated Market



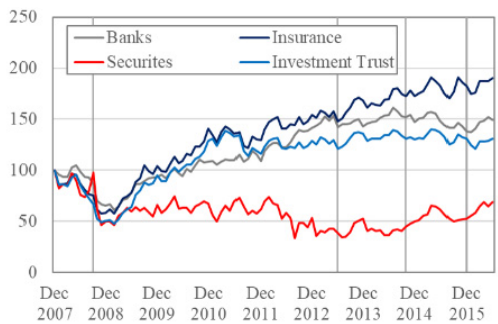

**Panel B.** Cumulated Capital Flows to Disaggregated Market(Dec 2007=100)




**Panel C.** Capital Flows from Each Type of Institution




**Panel D.** Cumulated Caplital Flows from Each Type of Institution (Dec 2007=100)




*Note.* This figure depicts capital inflows into the Korean securities market. The vertical lines in Panels B and D represent September 2008, when Lehman Brothers Holdings Inc. declared bankruptcy; May 2013, when the Federal Reserve Chairman Ben Bernanke announced QE tapering; October 2014, when the Federal Reserve ceases asset purchases; and December 2015, when the Federal Reserve raises US interest rates for the first time since the 2008 global financial crisis. The vertical axis of Panels A and C is measured in billion KRW.

## B. Explanatory variables

The shocks of external and internal factors are considered to empirically analyze the determinants of the capital inflows to the emerging market. Table 2 provides sources and detailed data descriptions. The series has a monthly frequency and runs from January 2008 to December 2017. In the existing literature, the economic variables chosen for this paper are frequently found to be significant. The explanatory variable consists of seven macroeconomic and financial variables, and two dummy variables.

For push factors, this study includes three variables to represent the global economic and financial cycles. The US industrial production index (USIND) is a global business cycle indicato r.[9] TED spread, calculated by the difference between the three-month LIBOR and the three-month Treasury bill, is used for the measure of global liquidity.[10] The volatility index, VIX, captures global investors' reaction to uncertainties in the financial markets.

**Table 2.** *Explanatory Variables*

| Variable | | Description | Capture |
|---|---|---|---|
| Push Factor | USIND | US Industrial Production Index | World Real GDP |
| | TED | TED Spread | Global Liquidity |
| | VIX | Volatility Index | Global Risk Appetite |
| Pull Factor | KRIND | Korea Industrial Production Index | Domestic Real GDP Growth |
| | KRBOND | Korea 3-year Bond Rate | Domestic Bond Interest Rate |
| | KOSPI | Korea Stock Price Index | Return to the Stock Market |
| | EXCH | USD/KRW Exchange Rate | Foreign Exchange Market |

*Note.* This table shows the explanatory variables to examine the determinants of capital inflows. The sources of push factors and pull factors are the OECD, the federal reserve bank of St. Louis, and the Bank of Korea.

For pull factors, this study includes four variables to capture the domestic economy: the Korean industrial production index (KRIND), the Korean government bond rate (KRBOND), the Korean stock market index (KOSPI), and the USD to KRW exchange rate (EXCH). KRIND is used to capture the domestic business cycle. Meanwhile, the three-year maturity KRBOND reflects domestic interest rates and monetary policy. KOSPI measures the performance of the domestic stock market, whereas EXCH represents the condition of the exchange market. This paper's seven independent variables cover both domestic and global business cycle fluctuations, liquidity, financial markets, and exchange rate markets, thus constituting a very comprehensive combination in explaining foreign-fund inflows.[11]

Also included are two exogenous dummy variables to indicate the occurrence of the global

9) I am aware that the US industrial production index might have different movements from global industrial production. However, since many existing studies use the US industrial production index to represent the real-world economy, this paper also uses it to capture the real-world economy for comparison with existing papers. In particular, this paper uses the industrial production index of the total OECD member countries instead of the US, and the results are reported in the Robustness section.

10) Existing papers commonly use the US federal funds rate to represent global liquidity. However, since the movement of the US federal funds rates was very stable at a low level during the period from 2009 to 2014 as the policy rate was fixed around 0%-0.25% to overcome the 2008 GFC, it is not a useful variable for this paper of the time series of the postcrisis period. Thus, in this paper, TED spread is used instead of the federal funds rate as a variable representing global liquidity (Fratzscher, 2012; Cerutti et al., 2015; Chari, Stedman, and Lundblad, 2017; Cerutti et al., 2017a).

11) Adding more explanatory variables can cause problems such as over-parameterization. The seven variables used in this paper are sufficiently comprehensive to account for the movement of the portfolio flows to EMEs. Therefore, I limit the number of independent variables to seven.

crisis during the data period used in this paper. The first dummy is used to determine the effect of the 2008 GFC from January 2008 to June 2009. The second is to denote the European sovereign debt crisis (ESDC) that lasted from April 2010 to June 2012.[12] Both crises have had a great impact on the international economy, especially in the emerging markets financial markets. However, two different dummy variables were used for each crisis because the origin of the 2008 GFC is the US, and the origin of ESDC from 2010 is the southern Europe region. Because the nature of the two crises differs, the impact of the two crises on capital inflows to emerging economies may vary.

## C. Empirical methodology

To empirically examine determinants of portfolio flows, I employed the structural vector autoregression model. Portfolio flows to Korea (Port) can be modeled using the explanatory variables discussed in the previous section as follows:

$$Port_t = f\,[u_t^{USIND},\ u_t^{T\ ED},\ u_t^{V\ IX},\ u_t^{KRIND},\ u_t^{KRBOND},\ u_t^{KOSPI},\ u_t^{EXCH},\ u_t^{Port}] \tag{1}$$

Equation (1) means capital flows are a function of the shocks to foreign output (USIND), global liquidity (TED), global risk appetite (VIX), domestic productivity (KRIND), domestic interest rate (KRBOND), domestic stock market index (KOSPI), and exchange rate (EXCH). Because the structural shocks in equation (1) are unobservable, we must identify assumptions to deduce the underlying structural shocks from the observed data. I examine the role of explanatory variables in bringing capital flows using the structural VAR model with a long-run restriction. The VAR system is modeled as a $a_{ij}$(L) lag polynomial form as follows:

$$Y_t = \sum_{i=0}^{K} A_i U_{t-i} = A(L)U_t \tag{2}$$

where $Y_t = [USIND_t,\ TED_t,\ V\ IX_t,\ KRIND_t,\ KRBOND_t,\ KOSPI_t,\ EXCH_t,\ Port_t]'$, $U_t = [u_t^{USIND},\ u_t^{T\ ED},\ u_t^{V\ IX},\ u_t^{KRIND},\ u_t^{KRBOND},\ u_t^{KOSPI},\ u_t^{EXCH},\ u_t^{Port}]'$, $A_i$ = Matrix of impulse responses of the endogenous variable to structural shocks, $A(L) = \sum_{i=0}^{K} A_i L^i = \{a_{ij}(L)\}$ as L lag operator. Appendix A shows how to recover the unobservable structural shocks from equation (2).

To identify the long-term effects of structural impact, I gave the model some economic

12) This paper regards April 2010, when the yield on the Greek 10-year Treasury bond rate exceeded 7% of the threshold, as the beginning of the European sovereign debt crisis since the eurozone countries and the IMF approved a bailout for Greece in May 2010. The yield on the Greek 10-year bond had steadily risen since the bailout, reaching 29.24% in February 2012 and 27.82% in June. Since then, it has been on a declining trend, so I considered the period of the European sovereign debt crisis until June 2012.

structure and imposed long-run restrictions on the contemporaneous matrix $A_i$ based on theory, stylized facts, and existing literature. The following long-run structural shocks are assumed:

1. USIND is ranked first because it is expected to be unaffected by global liquidity (TED) and financial market volatility (VIX) in the long run.
2. TED is ordered before the VIX index, following findings of existing studies that the uncertainty variable responds instantaneously to the shocks on the output variable and global liquidity (Bekaert, Hoerova, and Lo Duca, 2013).
3. The VIX is ordered after the other push factors and before the domestic factors.
4. Because Korea is a small open economy, KRIND responds immediately to structural shocks to push variables.
5. KRBOND reflecting the domestic interest rate is assumed to be affected by foreign variables and Korea's growth rate.
6. KOSPI, a forward-looking variable, is assumed to be affected by all variables except for the exchange rate.
7. EXCH is contemporaneously affected by all variables.

In the structural VAR methodology, the order of the independent variables is crucial because it directly affects the results of the study. To identify the long-term effects of structural impact, I gave the model some economic structure and imposed long-run constraints on the contemporaneous matrix $A_i$ based on theory, stylized facts, and existing literature.[13] This paper first looked at push factors as being more exogenous than pull factors. This is because, in the case of small open economies like Korea, domestic variables that serve as pull factors are heavily influenced by external factors. Therefore, USIND, TED, and VIX constitute the first three orders. Among the push factors, USIND, a variable reflecting the global output, is considered the most exogenous based on the theory of the neutrality of money. The TED index comes before the VIX index, which represents the financial market's risk profile.

Next, among the pull factor variables, KRIND, which captures the domestic business cycle, is regarded most externally in the set of domestic variables. Following KRIND is KRBOND, which reflects monetary policy and domestic interest rates. Although the preceding two variables are clearly ordered, there are numerous studies on the order of the last two variables, the stock price (KOSPI) and the exchange rate (EXCH).[14] Some studies have shown that the direction

13) In general, variable ordering in vector autoregression (VAR) analysis is known to have a significant impact on outcome, and results based on variable ordering without a convincing rationale are meaningless (Kilian, 2011). However, some studies using structural VAR show that the order of the variables does not affect the analysis result (Lettau, Ludvigson, and Steindel, 2002). The alternative ordering of the variables is also used in this paper, and the results are reported in the robustness check.

14) Several studies have explored whether the exchange rate and stock index are more exogenous. For example, Granger,

of influence between two variables varies from one time to another.[15] Therefore, this study changed the order of the exchange rate and the stock price index, and the results are very similar to those of the study in which the stock price index is more exogenous.

These long-run restrictions can be summarized in matrix form as follows[16] :

$$\begin{bmatrix} USIND_t \\ TED_t \\ VIX_t \\ KRIND_t \\ KRBOND_t \\ KOSPI_t \\ EXCH_t \\ Portfolio\_flows_t \end{bmatrix} = \begin{bmatrix} * & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ * & * & 0 & 0 & 0 & 0 & 0 & 0 \\ * & * & * & 0 & 0 & 0 & 0 & 0 \\ * & * & * & * & 0 & 0 & 0 & 0 \\ * & * & * & * & * & 0 & 0 & 0 \\ * & * & * & * & * & * & 0 & 0 \\ * & * & * & * & * & * & * & 0 \\ * & * & * & * & * & * & * & * \end{bmatrix} \begin{bmatrix} u_t^{USIND} \\ u_t^{TED} \\ u_t^{VIX} \\ u_t^{KRIND} \\ u_t^{KRBOND} \\ u_t^{KOSPI} \\ u_t^{EXCH} \\ u_t^{Portfolio\_flows} \end{bmatrix} \quad (3)$$

This model requires all explanatory time series variables to be stationary. Table A2 of the Appendix displays the results of the augmented Dickey-Fuller unit root test to check the stationarity of the variables. To obtain the stationary variables, I use the month-on-month first difference of each variable, while employing the level value of TED spread. Multiple model selection criteria are conducted to determine the appropriate number of lags to capture the models' dynamics. The structural VAR model is estimated with three of four lags based on the results of the likelihood-ratio (LR) test, final prediction error (FPE), and Akaike information criterion (AIC) as shown in Table A3 of the Appendix[17].

---

Huangb, and Yang (2000) employ unit root and cointegration models using Asian data and find that the exchange rate Granger causes the stock price in South Korea while the stock price affects the exchange rate movements unilaterally. Wong (2017) employs the constant conditional correlation or dynamic conditional correlation multivariate generalized autoregressive conditional heteroskedasticity model and finds that in Malaysia, Singapore, Korea, and the UK, the exchange rate generally leads the stock price.

15) Inci and Lee (2014) analyze the relationship between stock prices and exchange rates in eight major developed countries (France, Germany, Italy, Switzerland, the UK, the US, Canada, and Japan) and find that exchange rates have a Granger causal effect on stock prices, as well as the opposite.

16) "One advantage of the approach outlined above is that exploiting long-run properties makes fewer arbitrary assumptions to recover structural shocks. The empirical method to find structural shocks that are not observed from observed variables is based on the structural VAR analysis pioneered by Blanchard and Quah (1988)" (De Vita and Kyaw (2008) P.308). It is developed by Ying and Kim (2001) for the study of capital inflows.

17) This paper chooses the optimal lags based on existing criteria. The final prediction error and Akaike information criterion report that the optimal length is 4 lags for total flows, investment funds, banks, and securities firms, and 3 lags for pension fund flows. Although Schwarz Bayesian information criterion and Hannan and Quinn information criterion report a 1 lag-order selection statistic, this paper chooses multiple lags as suggested by the FPE and AIC criteria because a single lag is insufficient to determine the dynamic nature of this model.

# III. Empirical Results

Using the structural VAR model, I generate the forecast error variance decomposition (FEVD) and impulse response function (IRF) to measure the relative impacts of push and pull factors on capital flows. The FEVD demonstrates the relative importance of each shock in affecting portfolio investment flows. We can use the IRF to trace how a one-time shock to each explanatory variable affects current and future changes in the values of portfolio investment flows.

This section examines the determinants of portfolio investment flows sorted by investment group, such as global banks, investment funds, securities firms, and pension companies, using total portfolio investment flows and disaggregated flows by each type of institution as dependent variables.[18] Table 3 shows the result of the variance decomposition of portfolio investment flows from each type of institution.

Panel A of Table 3 reports the result of total portfolio investment flows to Korea. In terms of push factors, the most influential variables are global economic growth captured by USIND and risk appetite captured by the VIX. These results suggest that, in terms of the push factor, the shock to global economic activity and risk appetite has been the most important factor in determining capital inflows to Korea since the 2008 GFC. In terms of pull factors, total portfolio investment inflows are primarily explained by KOSPI performance and Korea's bond rate. They account for approximately 26% of the variance in forecast error in portfolio inflows.

Panel B of Table 3 indicates that the domestic stock index (KOSPI) is the most responsive to portfolio flows from investment funds, followed by global risk appetite as captured by VIX and domestic economic growth as measured by KRIND. Shocks to the KOSPI explain 14-18% of the variance, whereas shocks to the VIX explain nearly 11-16% of the variance. The longer the time horizon, the lower the percentage of explanations for KOSPI and VIX, whereas the percentage of explanations for KRIND is increasing. The finding that investment funds rely heavily on KOSPI and VIX suggests that they primarily respond to stock market conditions.

Panel C of Table 3 reports the result of FEVD of global bank flows. The key variables influencing global bank flows are KRBOND, EXCH, and USIND. It is important to note that EXCH, which is not reported as a dominant variable for total flows, plays a major role in bank flows. This is a completely different result than the investment fund flows, implying that macroeconomic variables such as global output and domestic interest rates have a greater impact on global bank flows than volatile financial variables such as stock price.

18) In addition to the four institutional investors in the main text, there are other groups such as individual investors and international organizations. However, they are excluded from this analysis because they occupy a relatively minimal portion of total foreign portfolio flows to Korea.

**Table 3.** *FEVD of Flows from Each Type of Institution*

| | Period | Push factors | | | Pull factors | | | |
|---|---|---|---|---|---|---|---|---|
| | | USIND | TED | VIX | KRIND | KRBOND | KOSPI | EXCH |
| **Panel A.** Total flows | 1 | 2.0 | 0.2 | 13.3 | 1.0 | 3.5 | 18.0 | 0.0 |
| | 2 | 8.9 | 0.6 | 15.5 | 4.3 | 13.1 | 13.0 | 0.0 |
| | 3 | 11.0 | 0.7 | 14.2 | 5.5 | 13.2 | 13.3 | 0.5 |
| | 4 | 10.9 | 1.3 | 13.8 | 6.5 | 13.2 | 13.0 | 0.5 |
| | 5 | 10.6 | 1.3 | 13.1 | 9.3 | 12.5 | 13.2 | 2.0 |
| | 6 | 11.9 | 1.5 | 12.6 | 9.2 | 12.0 | 14.1 | 1.9 |
| | 7 | 11.8 | 1.6 | 12.4 | 9.1 | 11.7 | 13.9 | 3.4 |
| | 8 | 11.7 | 1.9 | 12.3 | 9.1 | 11.8 | 13.8 | 3.4 |
| | 9 | 11.8 | 2.5 | 12.1 | 9.0 | 11.8 | 13.7 | 3.6 |
| | 10 | 11.9 | 2.7 | 11.9 | 8.8 | 12.8 | 13.5 | 3.6 |
| | 11 | 12.0 | 2.6 | 11.8 | 8.7 | 13.3 | 13.4 | 3.7 |
| | 12 | 11.9 | 2.6 | 11.7 | 8.7 | 13.9 | 13.3 | 3.7 |
| **Panel B.** Investment fund flows | 1 | 2.3 | 2.8 | 11.4 | 1.7 | 0.0 | 18.0 | 0.1 |
| | 2 | 6.4 | 2.6 | 16.1 | 6.4 | 2.9 | 14.4 | 0.2 |
| | 3 | 7.8 | 3.0 | 15.9 | 8.3 | 5.4 | 13.1 | 0.4 |
| | 4 | 7.5 | 3.0 | 15.6 | 10.2 | 5.8 | 13.0 | 0.4 |
| | 5 | 7.4 | 2.7 | 14.0 | 15.2 | 5.2 | 13.5 | 1.7 |
| | 6 | 8.5 | 2.9 | 13.4 | 14.5 | 5.0 | 15.4 | 1.7 |
| | 7 | 8.9 | 3.1 | 13.4 | 14.3 | 4.9 | 15.3 | 2.2 |
| | 8 | 8.9 | 3.5 | 13.3 | 14.3 | 4.9 | 15.2 | 2.2 |
| | 9 | 9.0 | 4.5 | 12.9 | 13.9 | 5.3 | 14.9 | 2.6 |
| | 10 | 9.3 | 5.0 | 12.5 | 13.4 | 7.2 | 14.6 | 2.6 |
| | 11 | 9.5 | 5.0 | 12.2 | 13.1 | 8.7 | 14.2 | 2.7 |
| | 12 | 9.4 | 4.9 | 12.1 | 13.0 | 9.5 | 14.1 | 2.7 |
| **Panel C.** Bank flows | 1 | 3.7 | 0.1 | 2.6 | 0.2 | 0.6 | 0.4 | 0.3 |
| | 2 | 4.7 | 2.8 | 5.5 | 3.3 | 5.7 | 0.6 | 0.8 |
| | 3 | 6.7 | 2.8 | 5.4 | 3.2 | 6.4 | 0.6 | 0.9 |
| | 4 | 6.5 | 3.3 | 5.4 | 4.3 | 6.8 | 1.0 | 1.5 |
| | 5 | 5.9 | 3.0 | 5.1 | 4.8 | 7.1 | 1.0 | 5.1 |
| | 6 | 7.3 | 2.9 | 5.4 | 5.5 | 6.8 | 1.6 | 4.9 |
| | 7 | 7.1 | 2.9 | 5.4 | 5.3 | 6.8 | 1.6 | 7.1 |
| | 8 | 7.1 | 3.4 | 5.5 | 5.3 | 7.1 | 1.6 | 7.1 |
| | 9 | 7.1 | 3.7 | 5.5 | 5.3 | 7.1 | 1.6 | 7.0 |
| | 10 | 7.1 | 3.6 | 5.5 | 5.2 | 7.3 | 1.6 | 7.0 |
| | 11 | 7.1 | 3.6 | 5.6 | 5.2 | 7.4 | 1.6 | 7.0 |
| | 12 | 7.1 | 3.8 | 5.5 | 5.2 | 8.2 | 1.6 | 6.9 |

**Table 3.** *Continued*

| | Period | Push factors | | | Pull factors | | | |
|---|---|---|---|---|---|---|---|---|
| | | USIND | TED | VIX | KRIND | KRBOND | KOSPI | EXCH |
| **Panel D.** Securities firms | 1 | 0.1 | 2.2 | 8.2 | 0.6 | 4.9 | 10.9 | 3.5 |
| | 2 | 0.3 | 2.6 | 13.0 | 1.2 | 8.7 | 9.7 | 4.2 |
| | 3 | 0.3 | 2.3 | 12.1 | 1.2 | 8.1 | 12.5 | 7.0 |
| | 4 | 0.3 | 2.3 | 12.5 | 1.2 | 12.5 | 11.7 | 6.5 |
| | 5 | 1.1 | 2.1 | 11.4 | 1.9 | 11.3 | 10.5 | 13.4 |
| | 6 | 2.7 | 2.2 | 11.2 | 2.0 | 11.0 | 10.2 | 14.2 |
| | 7 | 3.1 | 2.7 | 11.0 | 2.3 | 11.0 | 10.0 | 14.3 |
| | 8 | 3.2 | 2.9 | 10.8 | 2.3 | 11.0 | 10.0 | 14.3 |
| | 9 | 3.4 | 2.9 | 10.8 | 2.3 | 11.0 | 10.0 | 14.5 |
| | 10 | 3.7 | 3.1 | 10.7 | 2.3 | 11.5 | 9.8 | 14.4 |
| | 11 | 3.7 | 3.4 | 10.7 | 2.3 | 11.7 | 9.7 | 14.4 |
| | 12 | 3.7 | 3.6 | 10.7 | 2.3 | 11.7 | 9.7 | 14.4 |
| **Panel E.** Pension funds | 1 | 2.1 | 2.7 | 0.1 | 0.7 | 3.0 | 0.0 | 0.0 |
| | 2 | 3.4 | 4.1 | 0.5 | 0.6 | 4.4 | 0.0 | 0.4 |
| | 3 | 5.2 | 4.8 | 1.6 | 1.5 | 7.3 | 1.3 | 0.5 |
| | 4 | 5.2 | 5.0 | 2.4 | 2.2 | 7.2 | 1.2 | 0.8 |
| | 5 | 5.0 | 5.2 | 2.7 | 2.1 | 8.4 | 2.1 | 0.9 |
| | 6 | 5.1 | 5.1 | 2.6 | 2.1 | 9.2 | 2.1 | 1.1 |
| | 7 | 5.0 | 5.1 | 3.1 | 2.1 | 9.2 | 2.2 | 1.1 |
| | 8 | 5.0 | 5.0 | 3.6 | 2.1 | 9.3 | 2.2 | 1.1 |
| | 9 | 5.0 | 5.0 | 3.7 | 2.2 | 9.3 | 2.2 | 1.1 |
| | 10 | 5.0 | 5.1 | 3.7 | 2.2 | 9.3 | 2.2 | 1.1 |
| | 11 | 5.0 | 5.1 | 3.8 | 2.2 | 9.2 | 2.2 | 1.1 |
| | 12 | 5.0 | 5.1 | 3.8 | 2.2 | 9.2 | 2.2 | 1.1 |

*Note.* This table shows the result of the forecast error variance decomposition (FEVD) of portfolio inflows from each type of investor. Panel A reports total portfolio flows to Korea, whereas Panels B, C, D, and E report portfolio inflows from investment funds, global banks, securities firms, and pension funds, respectively. The numbers in the table indicate each factor's percent contribution to the portfolio inflows' variance.

Panel D of Table 3 reports the FEVD of portfolio inflows from securities firms. The pull factors have an overwhelming impact on its capital movements relative to the push factors. The pull factors jointly explain up to 38% of the variance in securities company flows (12 months), whereas the push factors explain about 18% (12 months). On average, the most important determinant among the pull factors is EXCH, followed by KRBOND, KOSPI. When investing in foreign countries, the sources of the rate of return are the asset price change and the exchange rate. The fact that KOSPI, KRBOND, and EXCH drive the securities flows means that they put profitability as a priority for their investment.

Panel E of Table 3 reports the FEVD results for pension funds. Overall, the domestic bond rate,

the TED spread, and the US industrial production are said to be more important than financial and foreign exchange market factors. This means that pension companies will invest in the emerging market based on liquidity and real economic indicators rather than short-term fluctuations in the financial market and foreign exchange market conditions. These results once again confirm the necessity to break down the total portfolio flows and find the determinants of capital flows from each type of investor.

IRFs provide additional interesting insights into portfolio inflows to EMEs. Figure 3 plots the total portfolio flow response to the impact of each explanatory variable. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion KRW. Panel F of Figure 3 shows the IRF and the cumulative IRF of the total portfolio investment flows as a result of the shock to the Korean stock index, which is the most important factor driving total portfolio inflows. An increase in the Korean stock market price leads to higher portfolio flows to Korea. Portfolio flows increase immediately following the shock and then return to normal after approximately 1 month. This finding is consistent with the conventional theory on capital movements, which states that an increase in the return on investment opportunities in capital recipient countries attracts the influx of capital. However, they have been converted into net outflows from the second month and net cumulative outflows after about five months. In other words, an increase in the domestic stock index results in an immediate and volatile net inflow of portfolio investment, but the effect is only temporary.

Panel C of Figure 3 shows the IRF and cumulative IRF from the shock to VIX, the second dominant determinant. In response to the shock to VIX, total portfolio flows have been net outflows of about 2 trillion KRW for the first month.

The impulse response functions in Figure 4 then show how explanatory variables affect investment fund flows over time. Panel C of Figure 4 depicts mutual funds immediately retrench their money by KRW 600 billion in response to a one standard deviation shock to VIX. Domestic economic growth clearly has a positive effect on capital inflows for investment funds for four months before it fades in the fifth. As shown in Panel E of Figure 4, the impact on the KOSPI index results in capital inflows of more than KRW 1 trillion from investment funds in the first month, but the impact is very short-lived.

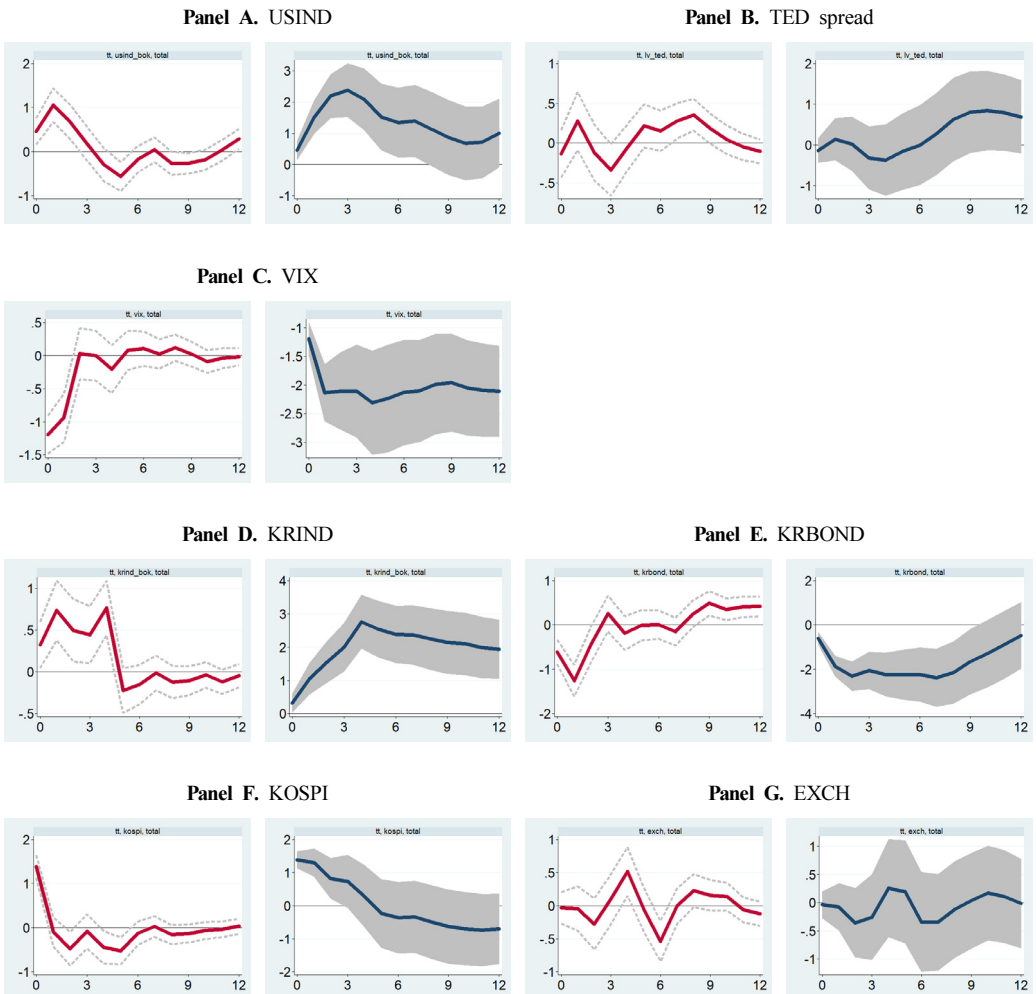
Panel E of Figure 5 shows that in the early stages, bank flows reduce in response to rising bond yields. Panel A of Figure 5 reports that a one standard deviation shock to global real GDP, proxied by USIND, results in global bank portfolio inflows of 300 billion KRW to Korea in a month, with total portfolio inflows of around 400 billion KRW over a year. This confirms that the improved market expectation of growth drives capital to emerging markets. A comparison of Figures 3 and show that the responses of bank flows and investment flows are very similar.

Figure 6 reports the IRF of securities firm flows. Panel E of Figure 6 shows that the one standard deviation shock to the domestic interest rate leads to portfolio outflows from securities

firms by 200 billion KRW for the first month. However, after two months, their capital re-inflows and offsets the previous outflows, and it reaches the cumulative inflows after six months. Panel G of Figure 6 illustrates the securities firms retrenching their money from EMEs in response to the depreciation of the recipient country's currency by KRW 200 billion in total for 12 months.

Panel E of Figure A2 shows that in response to the one standard deviation shock to the local interest rate, portfolio investment flows from pension companies inflow by 300 billion KRW. Panel G of Figure A2 illustrates that the unexpected depreciation of the KRW results in net capital inflows of approximately 100 billion KRW during the first five months.

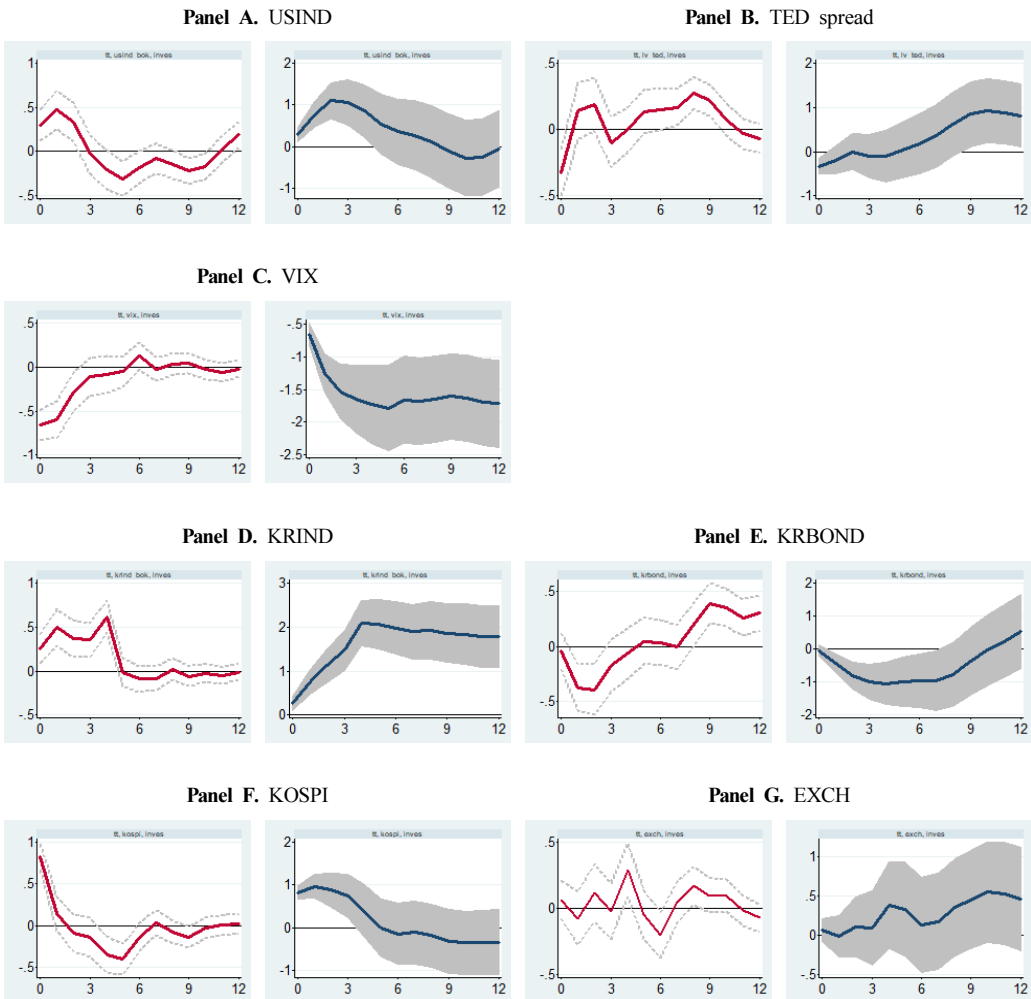
**Figure 3.** The IRF of the total portfolio flows




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables. The left and right graphs in each panel depict the response and cumulative response, respectively. The shock is one standard deviation to each explanatory variable, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

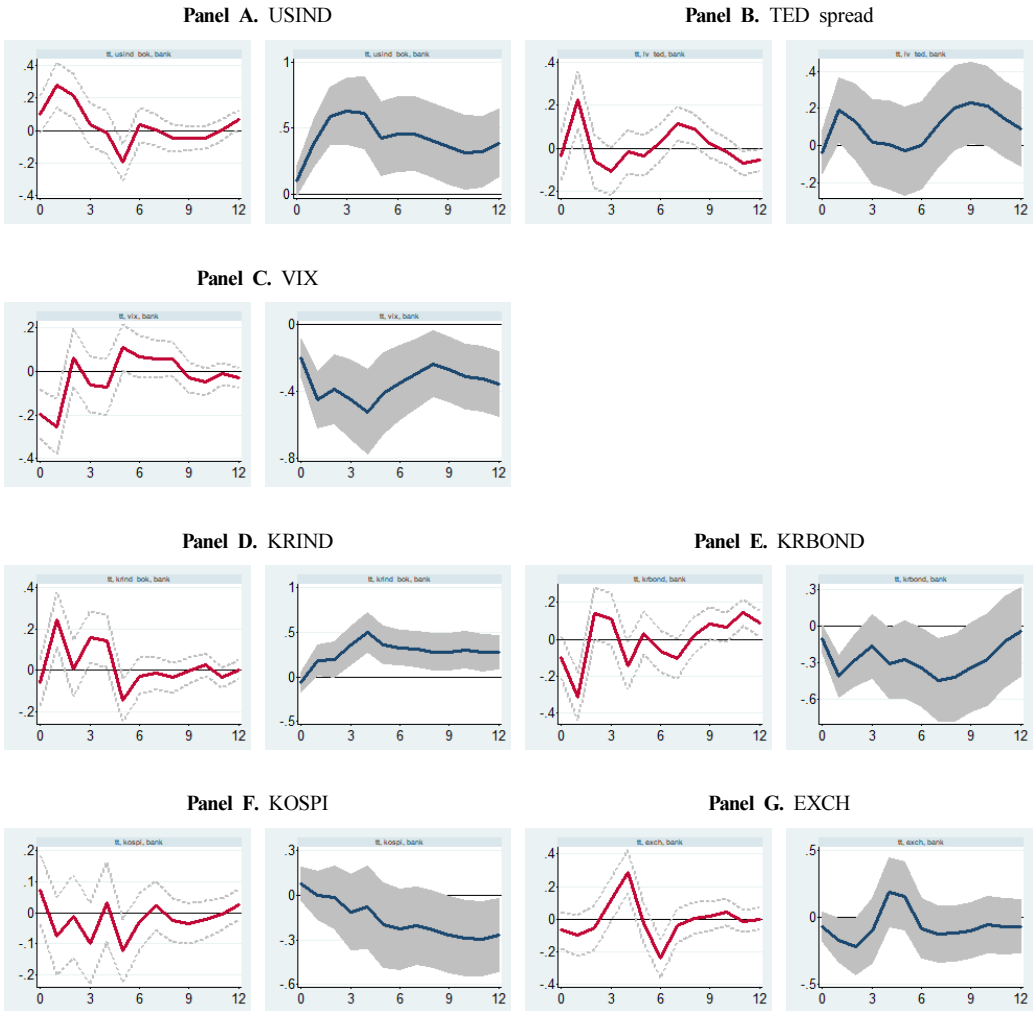
Overall, this section confirms the starkly different results when capital flows are disaggregated by investor type. That is, the investment behaviors are totally different over various investors. Panel B of Table 3 indicates that KOSPI and VIX dominate investment fund capital flows, whereas Panel C of Table 3 shows that USIND explains the majority of portfolio investment flows of the global bank. Panels D and E of Table 3 indicates that the domestic stock index and the exchange rate are the most important factors influencing portfolio investment flows from foreign securities companies, whereas the shock to KRIND and KRBOND are the dominant factors to portfolio investment flows from pension companies.

**Figure 4.** The IRF of investment fund flows




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables. The left and right graphs in each panel depict the response and cumulative response, respectively. The shock is one standard deviation to each explanatory variable, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

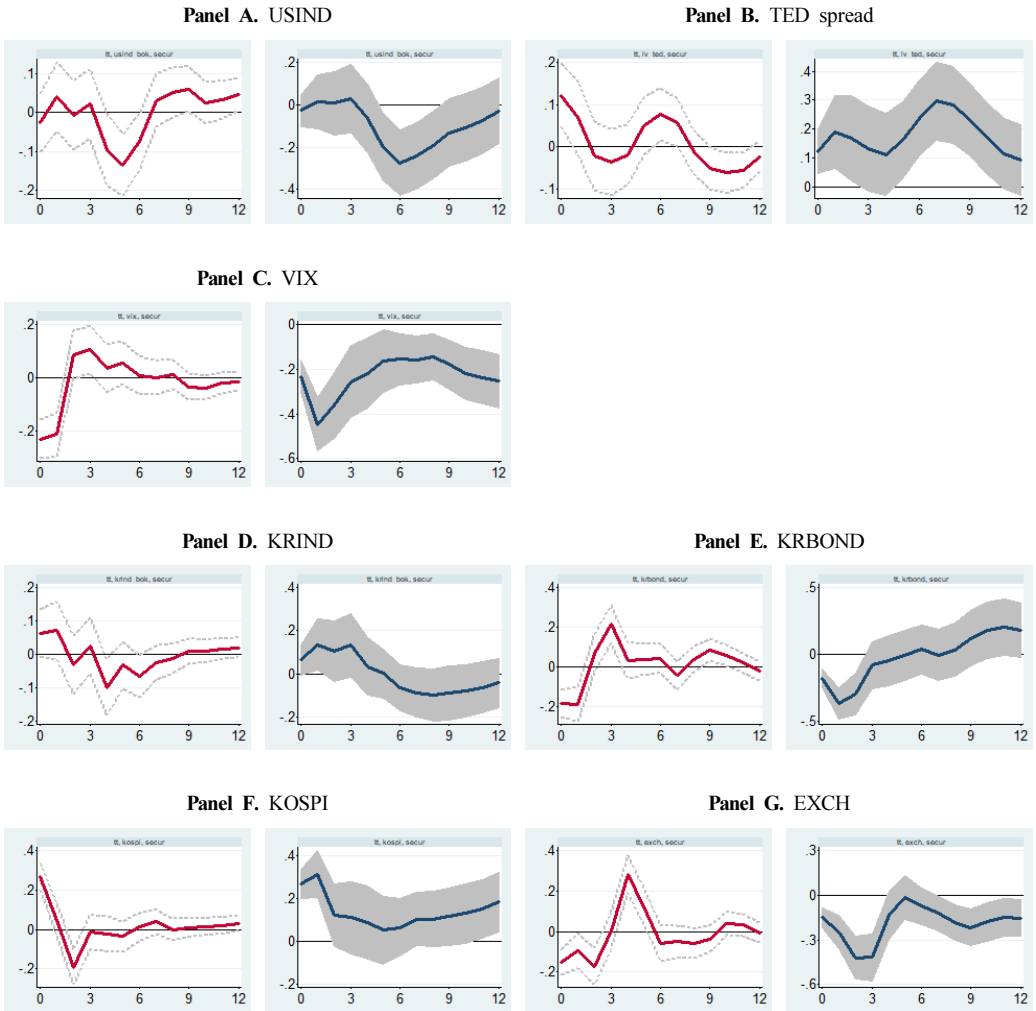
**Figure 5.** The IRF of global bank flows




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

This analysis also confirms the heterogeneity in the responses of the various institutions to the equivalent shock. For example, in response to a shock in the USD/KRW exchange rate, securities firms reduce their exposure to Korea, as shown in Figure. Meanwhile, pension firms purchase more Korean financial assets, as shown in Figure A2. Although the VIX spike causes capital outflows from investment funds, banks, and securities firms, it drives cumulative capital inflows from pension companies.

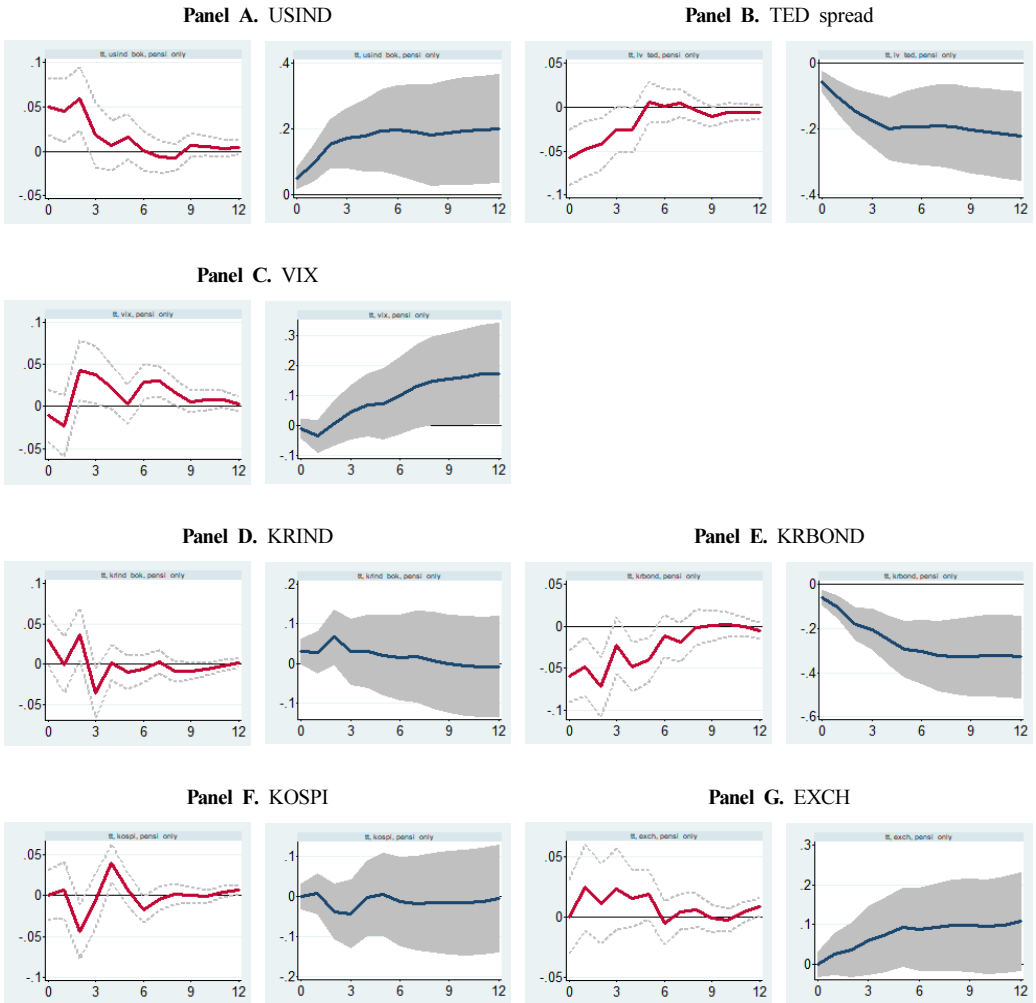
**Figure 6.** The IRF of securities firm flows




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables. The left and right graphs in each panel depict the response and cumulative response, respectively. The shock is one standard deviation shock to each explanatory variable, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

One more interesting finding is about the key drivers for the short-run and long-run investors. In the previous section, the securities firms and the pension fund are regarded as short-run and long-run investors, respectively, based on the turnover ratio. This means that although both investors are more responsive to the pull factors, the short-run investors are more concerned with the rate of return on their investment, whereas long-run investors are more dependent upon the liquidity and growth rate.

**Figure 7.** The IRF of pension fund flows




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

# IV. Robustness Check

Three types of robustness checks are provided in this section: 1) determinants of portfolio inflows during subperiods; 2) alternative measurement of global output growth; and 3) alternative ordering of variables.

Some previous studies analyzed the determinants by dividing the analysis period into two or more subperiods and comparing the results before and after important events.[19] I employ the

structural VAR model with a subsample period (2009:7 to 2017:12) excluding the 2008 GFC period and compare the results of the basic model over the entire period to confirm the determinants of total portfolio flows during the normal business cycle.[20] Panel A of Table 4 shows the FEVD of the total portfolio investment flows over the subsample period. There is no significant difference between these results in that the most dominant variables are still KOSPI, KRBOND, and VIX. The difference between the results is due to the influence of USIND, which decreases in the subsample analysis. I also employ the model using data during the subsample period to analyze capital inflows from each type of investor, and the results are very similar to those of the base model.

**Table 4.** *FEVD of Total Portfolio Investment Flows for Robustness*

| | Period | Push factors | | | Pull factors | | | |
|---|---|---|---|---|---|---|---|---|
| | | USIND | TED | VIX | KRIND | KRBOND | KOSPI | EXCH |
| **Panel A.** Sub-period | 1 | 0.0 | 0.5 | 15.0 | 0.3 | 0.1 | 20.6 | 0.2 |
| | 2 | 4.1 | 0.5 | 16.6 | 3.3 | 12.3 | 15.4 | 0.2 |
| | 3 | 6.0 | 0.7 | 15.5 | 3.4 | 13.8 | 15.5 | 0.2 |
| | 4 | 6.3 | 0.8 | 14.8 | 3.3 | 16.8 | 14.9 | 0.3 |
| | 5 | 5.9 | 1.7 | 14.1 | 4.2 | 15.7 | 15.5 | 2.1 |
| | 6 | 5.7 | 3.3 | 14.0 | 4.0 | 15.5 | 16.9 | 2.1 |
| | 7 | 5.6 | 3.5 | 13.5 | 4.0 | 15.5 | 16.3 | 3.5 |
| | 8 | 5.6 | 3.5 | 14.0 | 4.0 | 15.7 | 16.2 | 3.6 |
| | 9 | 5.8 | 3.5 | 13.9 | 4.0 | 15.8 | 16.3 | 3.7 |
| | 10 | 5.7 | 3.6 | 13.8 | 4.1 | 15.7 | 16.1 | 4.2 |
| | 11 | 5.7 | 3.6 | 13.8 | 4.1 | 15.7 | 16.1 | 4.2 |
| | 12 | 5.7 | 3.6 | 13.7 | 4.1 | 15.7 | 16.1 | 4.4 |
| **Panel B.** OECD production | 1 | 0.1 | 3.3 | 19.0 | 1.2 | 6.4 | 13.6 | 1.1 |
| | 2 | 1.2 | 2.6 | 20.0 | 5.3 | 15.9 | 10.5 | 1.8 |
| | 3 | 6.0 | 2.4 | 18.2 | 5.4 | 15.8 | 9.8 | 2.8 |
| | 4 | 6.0 | 2.4 | 17.8 | 6.7 | 15.5 | 9.6 | 3.0 |
| | 5 | 6.1 | 2.4 | 17.3 | 7.8 | 15.5 | 9.3 | 3.7 |
| | 6 | 6.1 | 2.6 | 17.2 | 7.8 | 15.4 | 9.6 | 3.8 |
| | 7 | 6.2 | 2.6 | 17.1 | 7.9 | 15.3 | 9.5 | 4.1 |
| | 8 | 6.4 | 3.0 | 17.1 | 7.9 | 15.2 | 9.5 | 4.1 |
| | 9 | 6.4 | 3.5 | 17.2 | 7.8 | 15.1 | 9.4 | 4.2 |
| | 10 | 6.5 | 3.8 | 17.1 | 7.8 | 15.3 | 9.3 | 4.2 |
| | 11 | 6.5 | 3.9 | 17.0 | 7.9 | 15.4 | 9.3 | 4.2 |
| | 12 | 6.5 | 3.8 | 16.9 | 8.1 | 15.6 | 9.3 | 4.3 |

19) See Ying and Kim (2001), Fratzscher (2012), Srivastava, Lin, Premachandra, and Roberts (2016), Hwa, Raghavan, and Huey (2017).

20) Following NBER that defines the recession period due to the 2008 global financial crisis to be until June 2009, this paper regards the period from July 2009 as the normal business cycle.

**Table 4.** *Continued*

| | Period | Push factors | | | Pull factors | | | |
|---|---|---|---|---|---|---|---|---|
| | | USIND | TED | VIX | KRIND | KRBOND | EXCH | KOSPI |
| **Panel C.** Alternative order | 1 | 2.0 | 0.2 | 13.3 | 1.0 | 3.5 | 1.2 | 16.8 |
| | 2 | 8.9 | 0.6 | 15.5 | 4.3 | 13.1 | 0.9 | 12.1 |
| | 3 | 11.0 | 0.7 | 14.2 | 5.5 | 13.2 | 1.0 | 12.9 |
| | 4 | 10.9 | 1.3 | 13.8 | 6.5 | 13.2 | 1.0 | 12.5 |
| | 5 | 10.6 | 1.3 | 13.1 | 9.3 | 12.5 | 3.0 | 12.2 |
| | 6 | 11.9 | 1.5 | 12.6 | 9.2 | 12.0 | 2.9 | 13.2 |
| | 7 | 11.8 | 1.6 | 12.4 | 9.1 | 11.7 | 4.1 | 13.2 |
| | 8 | 11.7 | 1.9 | 12.3 | 9.1 | 11.8 | 4.1 | 12.9 |
| | 9 | 11.8 | 2.5 | 12.1 | 9.0 | 11.8 | 4.3 | 12.7 |
| | 10 | 11.9 | 2.7 | 11.9 | 8.8 | 12.8 | 4.4 | 12.7 |
| | 11 | 12.0 | 2.6 | 11.8 | 8.7 | 13.3 | 4.5 | 12.6 |
| | 12 | 11.9 | 2.6 | 11.7 | 8.7 | 13.9 | 4.4 | 12.5 |

*Note.* This table shows the result of the forecast error variance decomposition (FEVD) of total portfolio investment flows. Panel A presents the results of the subperiod model that excludes the 2008 global financial crisis. Panel B reports the FEVD of total portfolio investment flows by substituting the OECD industrial production index for USIND. Panel C displays the FEVD of total portfolio investment flows by reversing the ordering of KOSPI and EXCH. The numbers in the table indicate the percentage contribution of each factor to the variance of the total capital inflows to Korea.

This paper employs the US industrial production index in the main text to capture global output growth. Because the US index may not accurately reflect the global business cycle, I consider the industrial production index of total OECD member countries as the alternative global output growth indicator. Panel B of Table 4 presents the result of the variance decomposition of the total portfolio investment flows using OECD countries' production. The most dominant variables are VIX, KRBOND, and KOSPI, which confirm that the overall results are consistent even when the variables are changed from the US industrial production index to those of whole OECD member countries. Compared to Panel A of Table 4, the importance of the domestic stock index declines while the effects of VIX and KRBOND increase.

The long-run restriction is required for the structural VAR model to find unobserved structural shocks in the data. The ordering of explanatory variables is crucial because it is directly related to the long-run restriction. I change the order of KOSPI and EXCH, allowing KOSPI to respond instantly to exchange rate shocks. Panel C of Table 4 shows the result of the variance decomposition of total portfolio investment flows with alternative variable ordering. The results confirm that the KOSPI, VIX, and KRBOND are the most important variables influencing portfolio investment flows to Korea.

Figures A2, A3, and A4 in the Appendix show the IRF of total inflows for the three cases mentioned above. The responses of the portfolio inflows to Korea to each variable shock are generally equivalent between the base model in Figure 3 and the three a forementioned tests.

# V. Conclusion

This study employs the structural VAR model with dummy variables to find the key drivers of portfolio flows to Korea using directly measured data. This research sorts the investment group's total portfolio flows and finds that each group has different key factors. Furthermore, this paper demonstrates that the short-run investor is more responsive to the return on the investment, whereas the long-run investor is more sensitive to the liquidity and economic growth rate.

These findings are theoretically important and have significant policy implications in that it directly affects the efficiency and effectiveness of the macroprudential policies implemented by most emerging markets. To the extent that internal factors are important, domestic policymakers may have more leverage on capital flows through sound macroeconomic policy. This result is closely related to the findings of the existing papers that employ a structural model and find that the Korean capital outflow mitigation policy was effective (Bruno and Shin, 2014; Bruno et al., 2017). For example, the introduction of withholding tax was successful because it reduced the volatility of securities flows with short-term investor characteristics by mitigating the returns.

The implications of these findings for policymakers in EMEs cannot be overstated. EMEs must acknowledge their investor composition and the drivers for each investment group before designing specific macroprudential policies. That is, policymakers in EMEs should consider who is their major investor, who is more volatile in the shocks, and what determines the movement of capital flows from major investors to design macroprudential policies aimed at stabilizing their financial markets.

# References

Ahmed, S., Coulibaly, B., & Zlate, A. (2017). International financial spillovers to emerging market economies: How important are economic fundamentals? *Journal of International Money and Finance, 76*, 133-152.

Ananchotikul, N., & Zhang, M. L. (2014). *Portfolio Flows, Global Risk Aversion and Asset Prices in Emerging Markets* (Working Paper No. 14-156). International Monetary Fund.

Blanchard, O., Ostry, J. D., Ghosh, A. R., & Chamon, M. (2017). Are capital inflows expansionary or contractionary? theory, policy implications, and some evidence. *IMF Economic Review, 65*(3), 563-585.

Blanchard, O. J., & Quah, D. (1988). The dynamic effects of aggregate demand and supply disturbances. *American Economic Review, 79*(4), 655-673.

Bruno, V., Shim, I., & Shin, H. S. (2017). Comparative assessment of macroprudential policies. *Journal of Financial Stability, 28*, 183-202.

Bruno, V., & Shin, H. S. (2014). Assessing macroprudential policies: case of South Korea. *The Scandinavian*

*Journal of Economics, 116*(1), 128-157.

Bruno, V., & Shin, H. S. (2015). Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics, 71*, 119-132.

Burger, J. D., Warnock, F. E., & Warnock, V. C. (2017). *The effects of us monetary policy on emerging market economies' sovereign and corporate bond markets* (Working Paper, No. 23628), National Bureau of Economic Research.

Calvo, G. A., Leiderman, L., & Reinhart, C. M. (1993). Capital inflows and real exchange rate appreciation in Latin America: the role of external factors. *Staff Papers, 40*(1), 108-151.

Cerutti, E., Claessens, S., & Puy, M. D. (2015). *Push factors and capital flows to emerging markets: why knowing your lender matters more than fundamentals* (Working Paper, No. 15-127). International Monetary Fund.

Cerutti, E., Claessens, S., & Ratnovski, L. (2017a). Global liquidity and cross-border bank flows. *Economic Policy, 32*(89), 81-125.

Cerutti, E., Claessens, S., & Rose, A. K. (2017b). *How important is the global financial cycle? evidence from capital flows* (Working Paper, No. 661). National Bureau of Economic Research.

Chari, A., Stedman, K. D., & Lundblad, C. (2017). *Taper tantrums: Qe, its aftermath and emerging market capital flows* (Working Paper, No. 23474). National Bureau of Economic Research.

Chinn, M. D., & Ito, H. (2008). A new measure of financial openness. *Journal of Comparative Policy Analysis, 10*(3), 309-322.

Chuhan, P., Claessens, S., & Mamingi, N. (1998). Equity and bond flows to Latin America and Asia: the role of global and country factors. *Journal of Development Economics, 55*(2), 439-463.

De Vita, G., & Kyaw, K. S. (2008). Determinants of capital flows to developing countries: a structural var analysis. *Journal of Economic Studies, 35*(4), 304-322.

Eichengreen, B., Gupta, P., & Masetti, O. (2018). Are capital flows fickle? increasingly? and does the answer still depend on type? *Asian Economic Papers, 17*(1), 22-41.

Fernandez-Arias, E. (1996). The new wave of private capital inflows: push or pull? *Journal of Development Economics, 48*(2), 389-418.

Forbes, K. J., & Warnock, F. E. (2012). Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics, 88*(2), 235-251.

Fratzscher, M. (2012). Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics, 88*(2), 341-356.

Ghosh, A. R., Qureshi, M. S., Kim, J. I., & Zalduendo, J. (2014). Surges. *Journal of International Economics, 92*(2), 266-285.

Granger, C. W., Huangb, B.-N., & Yang, C.-W. (2000). A bivariate causality between stock prices and exchange rates: evidence from recent Asian flu. *The Quarterly Review of Economics and Finance, 40*(3), 337-354.

Hern´andez, L. F., & Vald´es, R. O. (2001). What drives contagion: trade, neighborhood, or financial links? *International Review of Financial Analysis, 10*(3), 203-218.

Hwa, T., Raghavan, M., & Huey, T. (2017). *Macro-financial effects of portfolio flows: Malaysia's experience* (Working Paper No. 35/2017). CAMA.

Igan, M. D. O., Kutan, A. M., & Mirzae, A. (2017). *Real effects of capital inflows in emerging markets*. International Monetary Fund.

IMF. (2018). *Global Financial Stability Report, April 2018: A Bumpy Road Ahead*. Washington, DC.: International Monetary Fund.

Inci, A. C., & Lee, B. S. (2014). Dynamic relations between stock returns and exchange rate changes. *European Financial Management, 20*(1), 71-106.

Kilian, L. (2013). *Structural vector autoregressions. In Handbook of research methods and applications in empirical macroeconomics* (pp. 515-554). Edward Elgar Publishing.

Koepke, R. (2019). What drives capital flows to emerging markets? a survey of the empirical literature. *Journal of Economic Surveys, 33*(2), 516-540.

Korinek, A. & Sandri, D. (2016). Capital controls or macroprudential regulation? *Journal of International Economics, 99*, S27-S42.

Lettau, M., Ludvigson, S., & Steindel, C. (2002). Monetary policy transmission through the consumption-wealth channel. *FRBNY Economic Policy Review, 5*, 117-133.

Milesi-Ferretti, G.-M., & Tille, C. (2011). The great retrenchment: international capital flows during the global financial crisis. *Economic Policy, 26*(66), 289-346.

Obstfeld, M., Rogoff, K. S., & Wren-lewis, S. (1996). *Foundations of international macroeconomics* (Vol. 30). Cambridge, MA.: MIT Press.

Rey, H. (2016). International channels of transmission of monetary policy and the mundellian trilemma. *IMF Economic Review, 64*(1), 6-35.

Sarno, L., Tsiakas, I., & Ulloa, B. (2016). What drives international portfolio flows? *Journal of International Money and Finance, 60*, 53-72.

Srivastava, S., Lin, H., Premachandra, I. M., & Roberts, H. (2016). Global risk spillover and the predictability of sovereign CDS spread: International evidence. *International Review of Economics & Finance, 41*, 371-390.

Wong, H. T. (2017). Real exchange rate returns and real stock price returns. *International Review of Economics & Finance, 49*, 340-352.

Ying, Y.-H. & Kim, Y. (2001). An empirical analysis on capital flows: the case of Korea and Mexico. *Southern Economic Journal, 67*(4), 954-968.

# Appendix A. Reduced Form

I first estimate a reduced-form VAR model to recover the structural moving average representation from equation (2) in the main text:

$$B(L)Y_t = V_t \tag{A1}$$

The moving average representation is:

$$Y_t = B(L)^{-1}V_t = C(L)V_t \tag{A2}$$

It follows from the comparison of the structural moving average representation and equations (2) and (A2) that:

$$U_t = A_0^{-1} V_t \tag{A3}$$

where A0 = A(0) is the leading coefficient matrix in A(L)

$C_1$ is obtained as the moving average representation of the reduced form VAR; thus, $A_i^I$ and the structural representations are obtained if $A_0$ is known To find $A_0$, note that

$$A_0 S A_0^I = A_0 A_0^I = \Omega \tag{A4}$$

$$A_1 A_1^I = C_1 \Omega^I C_1 \tag{A5}$$

where S = Var($U_t$), Ω = Var($V_t$) is variance matrix of reduced form model

Because A(1) is a lower triangular matrix due to the long-run restrictions, it follows that A(1) can be obtained as Cholesky decomposition of $C_1 \Omega C_1$

Once A(1) is derived, $A_0$ matrix is finally obtained by:

$$A_0^{-1} = A(1)C(1)^{-1} \tag{A6}$$

# Appendix B. Additional Tables and Figures

**Table B1.** *Turnover Ratio of Each Investment Group*

| Institution Type | Stock | Bond | Total | Characteristics |
|---|---|---|---|---|
| Investment fund | 0.14 | 0.09 | 0.13 | |
| Bank | 0.15 | 0.15 | 0.15 | |
| Securities firm | 2.11 | 0.22 | 1.75 | Short-term investor |
| Pension fund | 0.09 | 0.10 | 0.09 | Long-term investor |

*Note.* This table displays the turnover ratio of the investment group, which is divided into global banks, mutual funds, securities firms, and pension companies. The second and third columns represent the turnover ratio of capital inflows from each investment group to the stock and bond markets, respectively. The fourth column reports the turnover ratio of total capital inflows from each investment group.

**Table B2.** *Augmented Dickey-Fuller Test*

| Variable | Level | | Differenced | |
|---|---|---|---|---|
| | statistics | p-value | statistics | p-value |
| USIND | -0.951 | 0.771 | -7.385*** | 0.000 |
| TED | -3.002** | 0.035 | -10.796*** | 0.000 |
| VIX | -2.566 | 0.100 | -9.129*** | 0.000 |
| KRIND | -1.436 | 0.565 | -9.174*** | 0.000 |
| KRBOND | -1.152 | 0.694 | -8.703*** | 0.000 |
| KOSPI | -1.455 | 0.556 | -8.178*** | 0.000 |
| EXCH | -2.734* | 0.068 | -6.980*** | 0.000 |

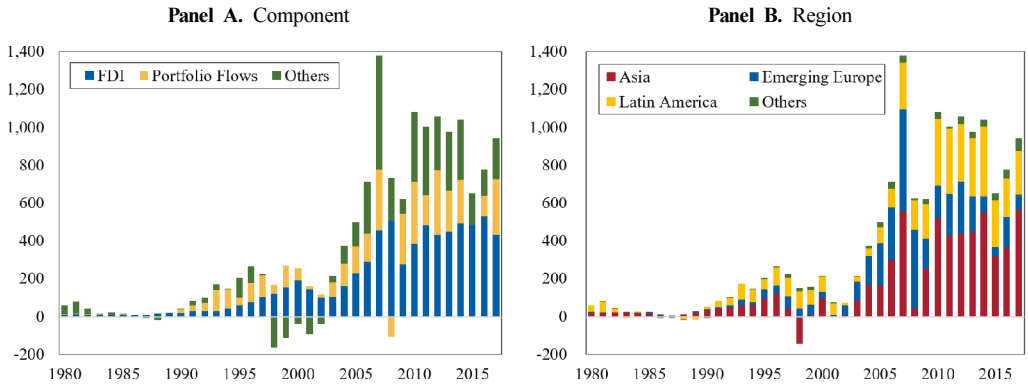
*Note.* *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

**Table B3.** *Lag Order Selections of Structural VAR Model*

| | lag | LR | FPQ | AIC | SIC | HQ |
|---|---|---|---|---|---|---|
| Total Flows | 1 | 438 | 4.3e-07 | 5.36093 | 6.05474* | 7.07006* |
| | 2 | 186.13 | 2.9e-08 | 4.85983 | 6.17035 | 8.08818 |
| | 3 | 148.68 | 1.6e-08 | 4.69013 | 6.61738 | 9.4377 |
| | 4 | 140.35* | 1.5e-08* | 4.58464* | 7.1276 | 10.8504 |
| Pension fund Flows | 1 | 427.49 | 4.8e-10 | 1.24549 | 1.93929* | 2.95461* |
| | 2 | 180.45 | 3.1e-10 | 0.793371 | 2.1039 | 4.02172 |
| | 3 | 132.91 | 3.1e-10* | 0.751082* | 2.67832 | 5.49865 |
| | 4 | 123.28* | 3.5e-10 | 0.791752 | 3.33571 | 7.05854 |

*Note.* This table displays the results of the structural vector autoregressive model's lag order selections. The results of investment funds, banks, and securities firms are similar to the total flows and have been omitted for space reasons. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

**Figure B1.** Capital flows to emerging market economies




*Note.* This figure describes annual capital inflows to emerging market economies for a sample of 25 emerging market economies. Panel A depicts the three main components (FDI, portfolio flows, and others) of capital inflows, while Panel B depicts the capital's destination. The vertical axis unit is billion US dollars. The sample of EMEs includes 25 countries: Argentina, Brazil, Chile, Colombia, Croatia, Czech Republic, Egypt, Greece, Hong Kong, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Turkey, and Venezuela.
(Source) IMF international financial statistics

**Figure B2.** The IRF of the total portfolio flows for subperiod

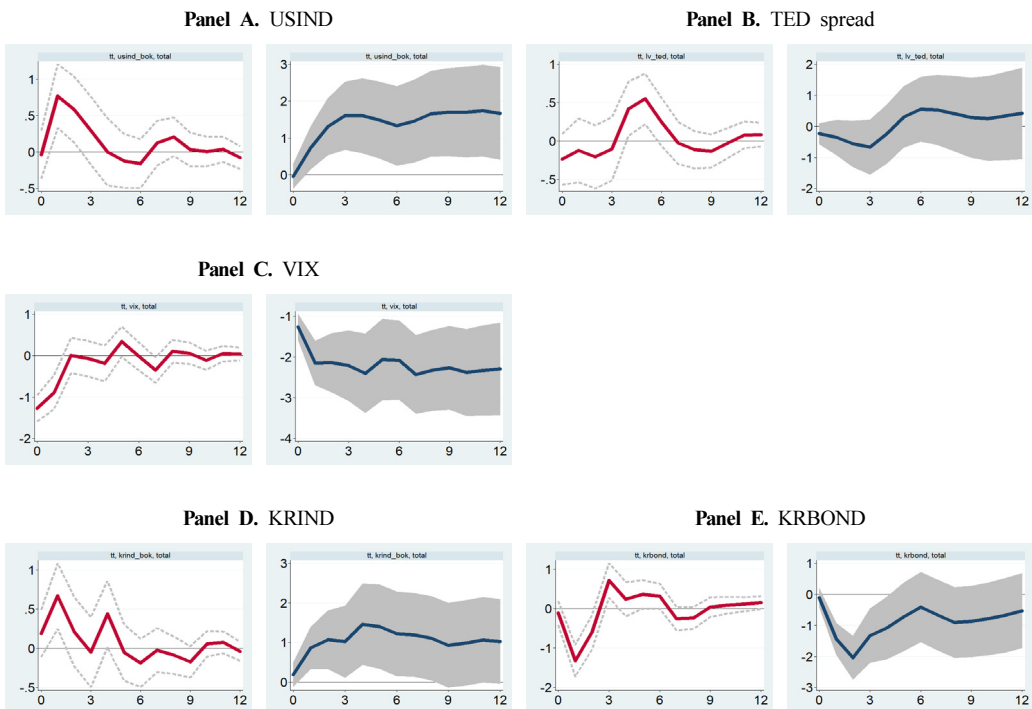
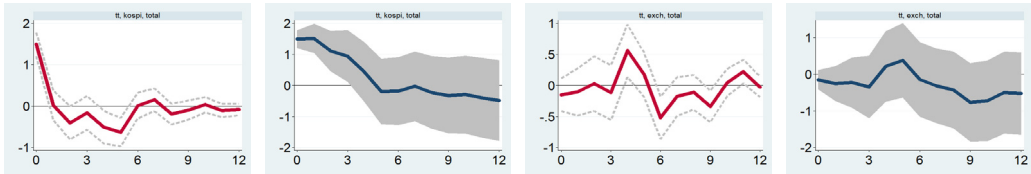


**Figure B2.** Continued

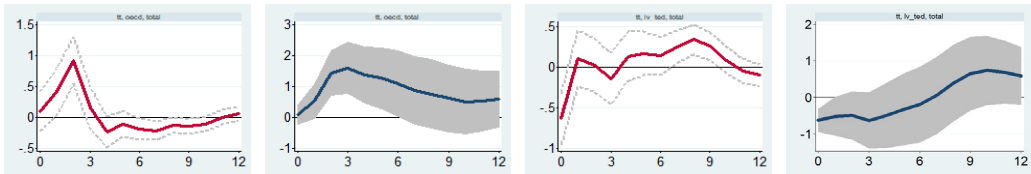
**Panel F.** KOSPI **Panel G.** EXCH



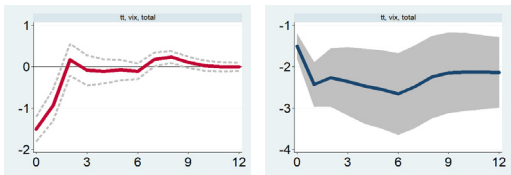
*Note.* This figure plots the response of the total capital inflows to the shock to explanatory variables excluding January 2008 to June 2009. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

**Figure B3.** The IRF of the total portfolio flows with alternative measurement

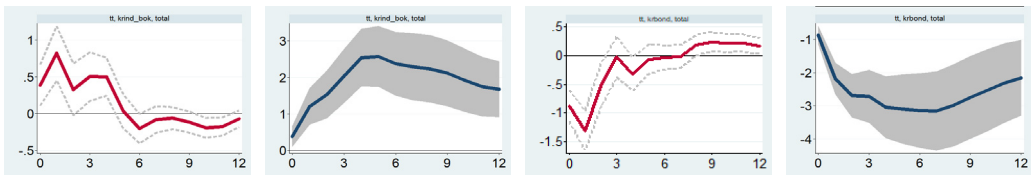
**Panel A.** USIND **Panel B.** TED spread



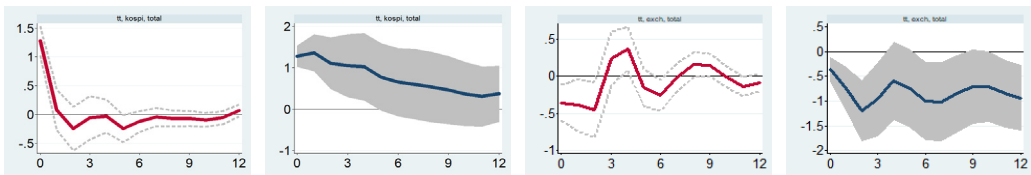
**Panel C.** VIX



**Panel D.** KRIND **Panel E.** KRBOND



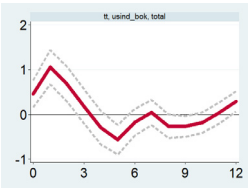
**Panel F.** KOSPI **Panel G.** EXCH



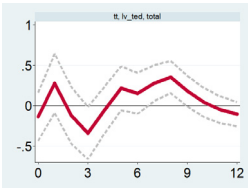
*Note.* This graph depicts the response of total capital inflows to the shock to explanatory variables by replacing the US industrial production with that of all OECD member countries. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.

**Figure B4.** The IRF of the total portfolio flows with alternative ordering

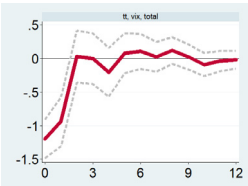
**Panel A.** USIND



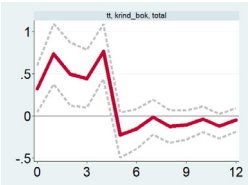

**Panel B.** TED spread



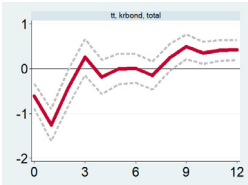

**Panel C.** VIX



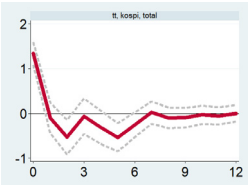

**Panel D.** KRIND



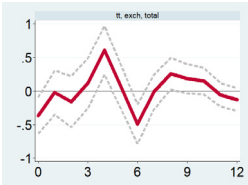

**Panel E.** KRBOND




**Panel F.** KOSPI




**Panel G.** EXCH




*Note.* This figure plots the response of total capital inflows to the shock to explanatory variables by changing the order of KOSPI and EXCH. The left and right graphs in each panel depict the response and cumulative response, respectively. Each explanatory variable receives one standard deviation shock, and the response unit is in trillion Korean won. The dotted lines represent the 68% confidence interval.