Three Essays on Capital Inflows to Emerging Markets

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Abstract

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This dissertation examines the determinants of portfolio inflows to emerging market economies with a special focus on Korea. **Chapter 1**, "The Determinants of Disaggregated Capital Inflows to Korea", studies the key factors in determining portfolio investment flows to Korea from four separate investment groups: global banks, mutual funds, securities companies, and pension companies. I sort the total portfolio investment flows by each investment group such as global banks, mutual funds, securities companies, and pension companies. The US industrial production index, TED spread, and VIX are included as push factors and the Korean industrial production index, Korean bond rate, Korean stock index, and exchange rate are considered as pull factors. From the structural VAR model with dummy variables, this paper finds that portfolio investment flows to Korea are more affected by push factors during the crisis while they are more dependent on pull factors after the crisis. Portfolio investment flows to the stock market are affected mainly by the domestic stock market and global risk appetite while portfolio investment flows to the bond market react more strongly to US output growth and the domestic interest rate. Finally, this paper finds that the properties of capital inflows from each institution are quite different. For example, securities and mutual funds are more responsive to the stock market index, while insurance and pension companies are more sensitive to domestic output growth.

Chapter 2, "The Determinants of Capital Inflows from Each Country", analyzes the

determinants of portfolio flows to Korea using portfolio flows from each economy to Korea as the dependent variable. For the empirical model, the investor country factor was added to the existing push-pull approach, and a panel VAR model was used as the estimation method. The results suggest that investor country factors such as shocks on the interest rate and stock market in the investor country are the most important determinants to portfolio flows from advanced economies (AEs) while pull factors of recipient countries mainly drive the portfolio flows from emerging market economies (EMEs). The impact on the stock market is the dominant factor during the Fed's expansionary monetary policy, while the effects of the interest rate are the most important factor after the end of the QE. The results also show that portfolio flows from AEs respond positively to the impact of the investor country's stock market, while those from EMEs respond negatively. This study supports recent findings that the impact of the drivers on the capital flows is dependent on economic conditions and is time-varying.

Chapter 3, "The International Spillovers of US Monetary Policy on Capital Flows to Emerging Market Economies", studies the impact of the US Fed's monetary policy on portfolio flows to the emerging economies, differentiating across the investor economies and type of flows. This paper also compares the effects of US monetary policy before and after the end of Quantitative Easing (QE). The results show that equity flows were retrenched to the US and AEs in response to the announcement of QE1 while the total impact of the Quantitative Easing increased the capital inflows to the emerging markets from the advanced economies. This chapter also finds that the response of portfolio flows in response to US monetary policy is conditional on the stance of US monetary policy. The findings build a bridge on the recent controversy over determinants of capital inflows by showing that QE has a significant impact on the capital inflows to EMEs, and its effects are related to the business cycle.

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DEDICATION

To my lovely wife, Sarah,
who has never left my side and has made me the luckiest guy in the world

To my adorable daughters, Claire and Emily,
who have been my best cheerleaders through their presence and spirit

A special feeling of gratitude to my loving parents, Dong-Hwa and Younghee,
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Chapter 1

THE DETERMINANTS OF DISAGGREGATED CAPITAL FLOWS TO KOREA

1.1 Introduction

The influx of capital into emerging market economies (EMEs) has increased dramatically since the 1990s, and this has stimulated extensive research on the determinants of such inflows. The increase in capital flows has been attributed to changes in global economic conditions such as the economic and political reforms of emerging countries, trade liberalizations, changes in capital control policies and banking supervision. As shown in Figure 1.1, foreign capital inflows to EMEs multiplied more than tenfold in the 1990s from the 1980s until the Asian crisis in 1997.[1] Although they slowed down during the EMEs' crises in the late 1990s, they have increased rapidly since the early 2000s and peaked in 2007, just prior to the 2008 global financial crisis (GFC). The amount of foreign capital inflows, which decreased at the onset of the 2008 GFC period, has recovered since 2010 and remains at a high level. Not only the size of foreign capital inflows but also their volatility has increased, and their composition has changed. In particular, portfolio flows to EMEs were negative during the 2008 GFC, but become positive after 2009 in these economies due to increasing global liquidity from expansive monetary policies in developed economies. This is also shown in Panel B of Figure 1.1 describing the capital inflows to each regional group. Capital inflows in Asia especially 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 be beneficial to the recipient countries in that they supplement domestic savings and relax

[1]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.

credit constraints, encourage the accumulation of physical capital, and thus accelerate their real growth rates (Obstfeld et al., 1996; Igan et al., 2017).[2]

However, surges of foreign capital flows to EMEs have often reverted to massive outflows, as shown in the Mexican crisis, the Asian financial crisis, the Russian financial crisis, and the Brazilian currency crisis in the 1990s and the 2008 GFC. In particular, during the 2008 GFC, the economic crisis of most emerging countries deepened as foreign financial capital was rapidly retrenched to developed economies. This phenomenon has recently become very important once 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 Argentine peso have plummeted by around 45% and 50%, respectively, compared to the beginning of the year. Argentina, in particular, demanded early payments of IMF USD 50 billion bailouts, followed by increasing the size of bailout to USD 57.4 billion.[3] The sudden stop, especially from EMEs, means that external funding is extremely vulnerable to volatile international financial markets. In particular, the sudden capital outflows need to be more carefully observed in the sense that they have a high risk of contagion to other emerging countries (IMF, 2018). Therefore, many emerging market countries have responded to sudden stops and surges of capital inflows since the 2008 global financial crisis with a wide range of macroprudential and capital-flow management policies in order to establish an economic policy framework to secure the stability and credibility of the flow of funds (Bruno et al., 2017; Korinek and Sandri, 2016).[4]

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[2]On the other hand, as Blanchard et al. (2017) point out, the capital inflows from foreign investors may have the contractionary effect on the recipient economy by appreciating the currency, thus reducing net exports for a given policy rate.

[3]Since the announcement that the US has doubled tariffs on Turkish steel and aluminum, the value of 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, which resulted in a 4.2% drop in the second quarter economic growth rate.

[4]According to Korinek and Sandri (2016), capital control is a policy that restricts financial transactions between residents and non-residents, while the macroprudential policy is to limit borrowing from residents or non-residents. Examples of the former are a quota on foreign investors and withholding tax, and the latter are LTV cap and the levy on bank liabilities.

Most of the literature on capital inflows to emerging economies divides these determinants into two broad categories after the seminal paper of Calvo et al. (1993): external or "push" factors and domestic or "pull" factors. Push factors mean the external, supply-side, and developed country factors that influence the supply of capital flows. They include US interest rates, an output of advanced economies (AEs), and VIX. Fernandez-Arias (1996) finds that the surge of voluntary private capital inflows is mostly driven by push factors, particularly low interest rates in the US. Sarno et al. (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 portfolio flows volatility. Forbes and Warnock (2012) and Rey (2016) use the VIX index as a proxy for the global financial conditions and argue that it dominates the movement of capital flows.[5]

In contrast, pull factors indicate the internal, demand-side, and country-specific factors that relate to economic developments in recipient countries such as an emerging country's GDP, the recipient country's interest rate, local stock returns, and its debt to GDP ratio. While earlier studies have supported the argument that capital inflows to emerging economies are decided predominantly by push factors, especially US interest rates, subsequent studies have shown that pull factors such as domestic growth rates and stock returns are also important factors. In many papers, the explanatory power of regression equation is shown to be 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 et al., 2017a). Based on the panel regression approach, Chuhan et al. (1998) find that capital inflows to seven Asian countries were mainly determined by domestic or pull factors, whereas capital inflows to nine Latin American countries were more affected by global or push factors than pull factors. Hernández and Valdés (2001) find that country-specific characteristics of EMEs are primarily responsible for the movement of pri-

[5]In contrast, Cerutti et al. (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.

vate capital flows between 1977 and 1997, and that push factors did not have a significant effect on capital inflows. There are also existing studies that differentiate the role of push and pull factors. Ghosh et al. (2014) estimate quantile regressions for a sample of fifty six emerging markets using data over 1980–2011 and find that while global factors, especially US interest rates and risk aversion are dominant in determining the magnitude of the surges of flows, pull factors such as capital account openness mainly determine the distribution of such flows to the recipient countries.

Another issue with the existing literature is how to get frequent data on capital flows. The data frequency of existing papers related to the capital inflows to EMEs ranges from weekly to annual data. As for the data on capital inflows, the balance of payment (BOP) announced quarterly and annually for most countries from the IMF are regarded as the key data. The earlier papers mainly employ the IMF BOP data which enables to use the complete data set and find the mid- and long-term trends of the capital inflows and the determinants of them. The use of such low-frequency data, however, has the disadvantage that it is difficult to find short-term shocks and effects of financial markets and rapidly changing investors' behavior (Koepke, 2015). In addition, the empirical result of the research using the low-frequency data cannot be generalized to a short-term period because the characteristics of volatile economic variables in the short term could be canceled out each other in the longer term. Thus, in order to conduct more frequent analysis, the literature uses proxy variables for more frequent data. Calvo et al. (1993) use the joint behavior and the identity existing among the net capital inflow, the current account surplus, and foreign exchange reserves to examine the capital inflows to Latin America. Chuhan et al. (1998) and Sarno et al. (2016) regard the monthly US purchases of non-US long-term securities as capital inflows to emerging markets.

More recent papers rely on the fund-level data provided by the Emerging Portfolio Fund Research Global (EPFR) (Jotikasthira et al., 2012; Lo Duca, 2012; Fratzscher, 2012; Jinjarak et al., 2013; Dahlhaus and Vasishtha, 2014; Gauvin et al., 2014; Li et al., 2018; Ananchotikul and Zhang, 2014).[6] Despite the growing popularity of EPFR data, there are several caveats

[6]EPFR contains funds flow and asset allocation data by more than 16,000 equity funds and 8,000 bond

to keep in mind using fund flows data. First of all, the sample-based fund flows do not cover about 80% of fund flows, nor does it include capital flows from other major investor types such as the global banks, security companies, and pension and insurance companies. Also, the transactions measured from fund flows are conceptually different from those defined in the BOP, which requires the transaction to happen between a resident of a developing country and a non-resident because investment funds and their counterparties can reside in any country in the world. In addition, mutual funds generally maintain cash buffers, meaning that capital inflows to the funds may not immediately result in purchasing the securities. For these reasons, we should be very careful to generalize the results with EPFR funds level data to the movement of whole capital inflows or portfolio inflows to emerging markets.

Some existing papers focus on studying individual countries. While studies of the entire emerging market economies present general factors of the determinants of inflows to the group of EMEs, studies of individual countries enable us to use data measured more precisely and include variables fitted to the individual country according to the characteristics of the country. Çulha et al. (2006) investigate the determinants of capital flows to Turkey over the period of 1992 - 2005 using a structural vector autoregression (structural VAR) model and show that the budget deficit and current account balance have a negative impact on capital inflows. Kumar (2018) investigates the determinants of monthly capital inflows to India by employing a structural VAR model and finds that pull factors are more dominant than push factors. Gossel and Biekpe (2017) examine the drivers of foreign capital inflows to South Africa between 1986 and 2013, and show that pull factors determine portfolio inflows to South Africa. De Vita and Kyaw (2008) find the determinants of five individual countries (Brazil, Mexico, Korea, the Philippines, and South Africa) and show that shocks to foreign output and domestic productivity are dominant forces.

In order for emerging economies to effectively respond to the volatile capital movement,

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funds around the world. EPFR provides data with a variety of frequency such as daily, weekly, and monthly flows and data disaggregated by a country and a region. More information is available at EPFR website (http://www.epfr.com).

it is essential to understand their investor base and the nature and characteristics of capital inflows from the type of each investor. This is because, if the factors determining the capital inflows from different types of investors are dissimilar, the response of each investor will be different when there is a shock and a policy is implemented. Since there are various types of investors in financial markets and their investment objectives and fund characteristics are not equivalent, the determinants of the disaggregated capital inflows are expected to be different. For example, insurance and pension companies have long-term debt, while securities firms and investment funds have relatively short-term debt, so it may be that their behaviors are different.

Some studies have examined whether the relative significance of economic factors differs across time horizons. De Vita and Kyaw (2008) find that the significance of estimated coefficients may be dependent on the time span in analysis. They find that "capital flows from patient investors with long time horizons will not flee at the first change in an economic factor that might augur poorly for the conditions of the developing country hosting the investment (P.306)".[7] In order to take into account the potential heterogeneity among a variety of subcategory in capital inflows, literature attempts to disaggregate total capital inflows by the market and component. Some papers separate the capital flows into the stock market and bond market and find that the determinants are quite different. Cerutti et al. (2015) employ a latent factor model with the IMF BOP data separated according to the standard BOP distinction such as foreign direct investment, portfolio equity flows, portfolio bonds flows, and other investment to banks and other investors to non-banks. Eichengreen et al. (2018) argue that foreign direct investments are mainly determined by pull factors, while portfolio flows are mostly the result of push factors. Avdjiev et al. (2017) investigate the shift of international bank lending and the international debt flows after the 2008 GFC and find that the sensitivity of both flows to US monetary policy has increased considerably, while the responsiveness of international bank flows in response to global risk conditions has

[7]They also show "the shorter the time horizon of investors, the greater and more immediate the effect on capital flows (De Vita and Kyaw (2008) p.306)".

declined significantly.

The capital inflows variable employed in existing work, however, is primarily capital flows in aggregate, thus little is known if and how determinants of capital flows vary across different types of investors. It is only recently that Cerutti et al. (2015) argue "the sensitivity to common dynamics varies significantly across borrower countries, with market structure characteristics, especially the composition of the foreign investor base (P.1)" and underlines the composition of the investor in the emerging market.[8] Considering the potential heterogeneity among capital flows from each investor, we should analyze the determinants of each investor's CF separately. For more efficient and effective macro-prudential and capital control policies, policymakers must understand who is investing in them, how they invest (short-run or long-run investment) and what determines their investment. For example, if the determinants of major investors are push factors, the capital controls for domestic returns such as changing withholding tax rate would be less effective.

Specifically, this paper aims to answer the questions as follows: What determines the capital inflows from each type of investor? Who is more responsible for return variables? Who is more dependent on real variables such as an output growth rate? Which variables should the government watch more carefully in order to prevent the sudden stop? Is the result the same between the stock and bond market after the global financial crisis?

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. The data includes transactions from all investors and have the same standard as IMF BOP data. That means the data set in this paper is not a proxy and includes all information about portfolio flows from all institutions while funds-level data used in some literature only cover a small portion

[8]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 that rely on international funds and global banks have been found that they are more sensitive to push factors.

of capital flows. In addition, using monthly data not only enables high-frequency analysis compared with annual and quarterly data, but also the complete data with explanatory variables such as the industrial production index provided monthly. This paper focuses on portfolio investment flows because portfolio investment inflows such as inflows to stock and bond markets are generally known to be more volatile than other capital flows such as foreign direct investment. Also, because Korea has experienced high volatility due to its heavy dependence on international trade and completely liberalized capital market, the results and implications of this paper can be applied to other emerging market countries.[9] For this purpose, I employ portfolio investment flows to Korea to find the key factors for the capital inflows to EMEs after 2008 GFC.[10] Figure 1.2 confirms not only portfolio flows account for the largest portion of the total capital inflows to Korean after the 2008 GFC, but also the volatility of portfolio flows is higher than that of other components such as FDI as mentioned in Eichengreen et al. (2018).

More importantly, in order to examine the determinants of portfolio investment flows from the different types of investors, this paper sorts the bottom-up data by each investor's institution such as the global bank, mutual funds, security company, and pension and insurance company. Using the structural VAR model, I investigate the extent to which variations in portfolio investment flows are due to various factors across different time horizons. By means of the impulse response function and the forecast error variance decomposition, this paper provides the temporal dynamic effects of the shocks and fundamental determinants of portfolio investment flows.

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[9]According to Chinn and Ito (2008)'s 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.

[10]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), trade volume (7th largest exporter as of 2015), some papers classify South Korea as a developed country. South Korea, however, is still classified as an emerging market country in the Morgan Stanley Capital International (MSCI) index, the most representative index for the stock market performance. Also, Korean bonds are still classified as emerging market bonds in many recent papers (Ahmed et al., 2017; Burger et al., 2017). Therefore, it is reasonable to classify South Korea as an emerging market economy in the analysis of portfolio flows.

This paper makes the following contributions to the literature on the determinants of capital inflows. First, from the structural VAR model with dummy variables and disaggregated portfolio investment flows data, this paper finds portfolio investment flows to the EMEs is more affected by push factors during the GFC while it is more dependent on pull factors after the GFC. Second, using comprehensive data, this paper reaffirms that the determinants of capital flows differ across different markets, namely the stock market and the bond market. Portfolio investment flows to the stock market are affected mainly by the domestic stock market and global risk appetite while portfolio investment flows to the bond market react more strongly to the US output and domestic interest rate. Lastly, but most importantly, this paper finds that the properties of portfolio investment flows from different types of investors are quite different. For example, the security company and the mutual funds are more responsive to the domestic stock market index, while the pension company is more sensitive to the domestic output. Also, when the bond price drops, investors generally sell the EMEs bond whereas the pension company buys more. These findings suggest that emerging economies should closely monitor their creditors and investors in their capital markets to assess their exposures to global push factors. This is not only theoretically important but also has significant policy implications in that it directly affects the efficiency and effectiveness of the macro-prudential policies implemented by most emerging markets concerning the surge and stop of capital inflows since 2008 GFC. To my knowledge, this is the first paper that investigates the determinants of the disaggregated capital inflows by the different types of investors.

The key contribution of this paper is building a bridge the gaps between existing studies. There is still an ongoing debate on the determinants of capital flows to EMEs because literature yields indecisive and even conflicting results on occasions. According to the findings of my research, capital flows to the Korean stock market and capital flows from the mutual fund investor are mostly influenced by push factor which is similar to the findings of Milesi-Ferretti and Tille (2011) and Ananchotikul and Zhang (2014), while capital flows to the Korean bond market and capital flows from the insurance company are driven by pull factors

in line with the results of De Vita and Kyaw (2008) and Fratzscher (2012). This implies that determinants of capital flows may vary depending on the characteristics of the capital flows used in literature.

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

1.2 Data and Methodology

1.2.1 Dependent Variables

In order to find the determinant of capital inflows to EMEs, this paper examines the portfolio investment flows to Korea. Portfolio investment flows mean the net foreign purchases of the domestic securities, or the net changes in Korea's liability of portfolio investment flows to the foreign investors. For the purpose of this study, different kinds of portfolio investment flows are employed as the dependent variables sorted by the market the capital is invested in, and the institutions investing the capital to EMEs. Table 1.1 shows the dependent variables used in this paper. First, total portfolio investment flows is to investigate the overall movement of the foreign portfolio flows. Second, the total capital inflows are disaggregated by the type of securities in order to examine if there is a difference between the determinants of portfolio investment flows to the stock market and the bond market. Lastly, motivated by Cerutti et al. (2015) arguing that the country with the certain institutional investor group such as global bank capital is more sensitive to push factor, I disaggregate total portfolio investment flows by the type of the institution such as the global bank, mutual funds, security company, and pension company. This classification confirms the heterogeneity of behaviors among capital flows from each institution due to their different behaviors and goals of the investment. Also, this break-down is a practical way in that policymakers make a policy

with a targeted group.

Table 1.2 reports a description of the dependent variables. The average monthly portfolio inflows to Korea is 730 billion Korean Won (KRW), which shows capital inflows on average during 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 from the range of the stock flows (KRW 19 trillion) and the coefficient of variation (16.8) which are bigger than those of bond flows. As for each investor, the capital inflows from each investor are positive on average, except for the outflow of funds from securities company. The coefficient of variation of the capital inflows from the insurance companies was the lowest at 1.9, which confirms that it shows the stable movement.

Panel B and D of Figure 1.3 show the cumulative capital flows to Korea. After the 2008 GFC, both the foreign capital into the stock market and the bond market declined, while the former remained at the level of 2007 as a whole, but the latter increased steadily until the announcement of the QE tapering in 2013. In the case of capital flows by each type of investors, all reduced their securities shortly after the 2008 GFC, and banks, insurance companies, and mutual funds increased their capital inflows after 2009, while the size of outstanding of Korean securities held by foreign securities company is lower than before the crisis.

In order to find 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 can be calculated by the amount of transaction divided by the balance. Thus, it indicates how long each investor holds its securities and how much of a portfolio has been replaced. If an investor's turnover ratio is high, it means that the investor has traded securities frequently, so such investor is regarded as a short-term investor. In contrast, if an investor's turnover ratio is low, the investor is regarded as a long-term investor. Table 1.3 shows the turnover ratio of each institutional investor group. The turnover ratio of the security company group is 2.11, 0.22, and 1.75 for the capital inflows to the stock market, bond market, and total market, respectively, which are much higher than those of other investors, so they are considered

short-term investors. Conversely, the turnover ratio of pension company flows is the lowest in the equity market, bond market, and overall market at 0.09, 0.10, and 0.09, respectively, so it is considered a long-term investor.

1.2.2 Explanatory Variables

The shocks of both external and internal factors are considered in order to empirically analyze the determinants of the capital inflows to the emerging market. Table 1.4 provides sources and detailed data descriptions. The series is in monthly frequency spanning January 2008 to June 2016. The economic variables selected in this paper are frequently found to be significant in the existing literature. The explanatory variable is the set of seven macroeconomics 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) captures the global business cycle.[11] TED spread, calculated by the difference between three-month LIBOR and the three-month Treasury bill, is used for the measure of global liquidity.[12] The volatility index, VIX, captures global investors' reaction to uncertainties in the financial markets.

For pull factors, this study includes four variables to capture the domestic economy. Korean industrial production index (KRIND) is employed to capture the domestic business cycle movement. Korean government bond rate (three-year maturity) (KRBOND) is capturing the domestic interest rate and monetary policy. KOSPI, meaning the Korean stock market in-

[11]I am aware that the US industrial production index might have different movement from the global industrial production. However, since many existing studies use the US industrial production index as an index representing the real world economy, this paper also uses the US industrial production index to capture the real world economy for comparison with existing papers. This paper also uses the average industrial production index of the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) countries instead of the US, and the results are reported in the Robustness section.

[12]Existing paper 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 2008 to 2016 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 post-crisis period. Thus, in this paper, TED spread is used instead of federal funds rate as a variable representing global liquidity (Fratzscher, 2012; Cerutti et al., 2015; Chari et al., 2017; Cerutti et al., 2017a).

dex, captures the domestic stock market performance and EXCH, indicating USD to KRW exchange rate, represents the condition of the exchange market. These seven independent variables in this paper cover both domestic and global business cycle fluctuations, liquidity, financial markets, and exchange rate markets, thus are a very comprehensive combination in explaining foreign-fund inflows.[13]

Also, two exogenous dummy variables are included in order to indicate the occurrence of the global crisis during the data period used in this paper. The first dummy is to identify the effect of the 2008 GFC from January 2008 to June 2009. The second one is to indicate the European sovereign debt crisis (ESDC) from April 2010 to June 2012.[14] Both crises have had a great impact on the international economy, especially in the emerging markets financial markets. Two different dummy variables, however, were used for each crisis since the origin of the 2008 GFC is the United States and the origin of ESDC from 2010 is the southern Europe region, there are differences in the nature of the two crises, so the impact of the two crisis on the capital inflows to emerging economies may vary.

1.2.3 Empirical Methodology

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

$$Port_t = f[u_t{}^{USIND}, u_t{}^{TED}, u_t{}^{VIX}, u_t{}^{KRIND}, u_t{}^{KRBOND}, u_t{}^{KOSPI}, u_t{}^{EXCH}, u_t{}^{Port}] \qquad (1.1)$$

[13]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, I limit the number of independent variables to seven.

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

Equation (1.1) means capital flows are a function of the shocks to foreign output (USIND), the global liquidity (TED), global risk appetite (VIX), domestic productivity (KRIND), domestic interest rate (KRBOND), domestic stock market index (KOSPI), and exchange rate (EXCH). Since the structural shocks in equations (1.1) are unobservable, we need identifying assumptions to uncover the underlying structural shocks from the observed data. I use the structural VAR model with the long run restriction to examine the role of explanatory variables in bringing capital flows. The VAR system is modeled as a $a_{ij}(L)$ lag polynomial form as follows:

$$Y_t = \sum_{i=0}^{K} A_i U_{t-i} = A(L)U_t \tag{1.2}$$

where $Y_t = [USIND_t, TED_t, VIX_t, KRIND_t, KRBOND_t, KOSPI_t, EXCH_t, Port_t]'$, $U_t = [u_t{}^{USIND}, u_t{}^{TED}, u_t{}^{VIX}, u_t{}^{KRIND}, u_t{}^{KRBOND}, u_t{}^{KOSPI}, u_t{}^{EXCH}, u_t{}^{Port}]'$, A_i = Matrix of impulse responses of endogenous variable to structural shocks, $A(L) = \sum_{i=0}^{K} A_i L^i = \{a_{ij}(L)\}$ as L lag operator. Appendix A.1 illustrates the details on how to recover the unobserved structural shocks from equation (1.2).

In order to identify the long-term effects of structural impact, I provide some economic structure to the model and imposed long-run restrictions on the contemporaneous matrix A_i based on the theory, stylized facts, and existing literature. The long-run structural shocks are assumed as follows :

1. USIND is ordered first with the expectation that it is not affected by the 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, & Lo Duca, 2013).

3. VIX is ordered after other push factors and before domestic factors.

4. KRIND responds immediately to structural shocks to push variables because Korea is a small open economy.
5. KRBOND reflecting 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 very important because it directly affects the results of the study.[15] Therefore, in order to prevent it from being arbitrarily determined, the order of independent variables should be determined based on economic theory and existing research results. This paper first considered pull factors as more exogenous between pull factors and push factors. This is because, in the case of small open economies such as Korea, domestic variables that constitute pull factors are significantly influenced by external variables. Therefore, USIND, TED, and VIX constitute the first three orders.

Among the push factors, USIND, which is a variable reflecting the global output, is considered to be the most exogenous. This is based on the hypothetical theory that monetary neutrality does not affect monetary indicators in the long term. Next, TED and VIX are considered as the second and third order, respectively. It is considered that TED is more exogenous than VIX, which represents the risk profile of the financial market because global liquidity represented by TED affects the financial market.

Next, in the set of domestic variables, KRIND, capturing the domestic business cycle, is considered most externally among the pull factor variables. Next, KRBOND, which reflects

[15] In general, the ordering of variables in vector auto-regression (VAR) analysis is known to have a significant impact on outcome and the results based on a variable order without a convincing rationale are meaningless (Kilian, 2011). However, some studies employing the structural VAR shows the order of the variables may not affect the analysis result (Lettau et al., 2002). This paper also employs the alternative ordering of the variables and the results are reported in the robustness check.

monetary policy and domestic interest rates, is followed after KRIND. While the ordering of the preceding two variables is clear, there are various studies on the order of the last two variables, the stock price (KOSPI) and the exchange rate (EXCH).[16] Some studies have shown that the direction of influence between two variables varies from one time to another.[17] Therefore, this paper has been studied by changing the order of the exchange rate and the stock price index, and the results are very similar to those of the study where the stock price index is more exogenous.

The long-run restrictions above can be expressed to the equations as follows:

$$USIND_t = a_{11}{U_t}^{USIND} \tag{1.3a}$$

$$TED_t = a_{21}{U_t}^{USIND} + a_{22}{U_t}^{TED} \tag{1.3b}$$

$$VIX_t = a_{31}{U_t}^{USIND} + a_{32}{U_t}^{TED} + a_{33}{U_t}^{VIX} \tag{1.3c}$$

$$KRIND_t = a_{41}{U_t}^{USIND} + a_{42}{U_t}^{TED} + a_{43}{U_t}^{VIX} + a_{44}{U_t}^{KRIND} \tag{1.3d}$$

$$KRBOND_t = a_{51}{U_t}^{USIND} + a_{52}{U_t}^{TED} + a_{53}{U_t}^{VIX} + a_{54}{U_t}^{KRIND} + a_{55}{U_t}^{KRBOND} \tag{1.3e}$$

$$KOSPI_t = a_{61}{U_t}^{USIND} + a_{62}{U_t}^{TED} + a_{63}{U_t}^{VIX} + a_{64}{U_t}^{KRIND} + a_{65}{U_t}^{KRBOND} + a_{66}{U_t}^{KOSPI} \tag{1.3f}$$

$$EXCH_t = a_{71}h{U_t}^{USIND} + a_{72}{U_t}^{TED} + a_{73}{U_t}^{VIX} + a_{74}{U_t}^{KRIND} + a_{75}{U_t}^{KRBOND} + a_{76}{U_t}^{KOSPI} + a_{77}{U_t}^{EXCH} \tag{1.3g}$$

These long-run restrictions can be summarized in matrix form. Equation (5) indicates that the A(1) matrix is a lower triangular matrix:

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[16]There are various papers on whether the exchange rate and stock index are more exogenous. Granger et al. (2000) employ unit root and cointegration models using Asian data and find that the exchange rate Granger cause the stock price in South Korea while the stock price affects the movements of the exchange rate unilaterally. Wong (2017) employs the constant conditional correlation (CCC) or dynamic conditional correlation (DCC) multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) model and finds that the exchange rate generally leads the stock price in Malaysia, Singapore, Korea, and the UK.

[17]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 had a Granger causal effect on stock prices, and also for the opposite way.

$$\begin{bmatrix} USIND_t \\ TED_t \\ VIX_t \\ KRIND_t \\ KRBOND_t \\ KOSPI_t \\ EXCH_t \\ Portfolio_t \end{bmatrix} = \begin{bmatrix} * & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ * & * & 0 & 0 & 0 & 0 & 0 & 0 \\ * & * & * & 0 & 0 & 0 & 0 & 0 \\ * & * & * & * & 0 & 0 & 0 & 0 \\ * & * & * & * & * & 0 & 0 & 0 \\ * & * & * & * & * & * & 0 & 0 \\ * & * & * & * & * & * & * & 0 \\ * & * & * & * & * & * & * & * \end{bmatrix} \begin{bmatrix} {u_t}^{USIND} \\ {u_t}^{TED} \\ {u_t}^{VIX} \\ {u_t}^{KRIND} \\ {u_t}^{KRBOND} \\ {u_t}^{KOSPI} \\ {u_t}^{EXCH} \\ {u_t}^{Portfolio_t} \end{bmatrix} \tag{1.4}$$

It requires twenty-four restrictions, obtained from [8×(7-1)/2] as shown in equation (1.3), in the system of eight variables to identify structural shocks, u_t, from reduced-form.[18]

This model requires all explanatory time series variables to be stationary. Before empirical analysis, I perform the augmented Dickey-Fuller (ADF) unit root test to check the stationarity of the variables. The left panel of Table 1.5 indicates that the null hypothesis about all variables other than VIX cannot be rejected at the 5% significance level. Therefore, I take the month-on-month first-difference to of each variable to obtain the stationary variables while I use the level value of VIX. In addition, multiple model selection criteria are conducted to determine the appropriate number of lags. The structural VAR model is estimated with 4 lags according to the results of the likelihood-ratio (LR) test, the final prediction error (FPE), and Akaike's information criterion (AIC) to capture the model's dynamics.[19]

One may raise an issue on the validity of the model structure. For instance, the portfolio

[18] "One advantage of the approach outlined above is that, by exploiting long-run properties, it 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.

[19] The likelihood-ratio (LR) test, the final prediction error (FPE), and Akaike's information criterion (AIC) shows the optimal length is 4 lags while Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC) report 1 lag-order selection statistics for a series of vector autoregressions of orders. This paper chooses four lags as suggested by the previous three criteria because one lag is insufficient to determine the dynamic nature of this model.

flows may affect the explanatory variables, especially the stock price and the exchange rate. The explanatory variables in the paper, however, are based on strong theoretical base which is verified in the existing articles. Also, according to the bi-variate Granger causality test reported in the Appendix A.2, the null hypothesis that 'lagged values of portfolio flows do not cause each of the explanatory variable' cannot be rejected in most cases.

1.3 Empirical Results

Using the structural VAR model, I produce the forecast error variance decomposition (FEVD) and impulse response function (IRF) to measure the relative impacts of push factors and pull factors on capital flows. The FEVD provides evidence on the relative importance of each shock in affecting portfolio investment flows. The IRF allows us to trace how a one-time shock of each explanatory variable affects current and future changes of values of portfolio investment flows. In order to find key drivers of portfolio investment flows, the set of seven independent variables is used for each of dependent variables. Because each of the seven dependent variables has one FEVD and seven IRFs, seven FEVDs, and forty nine IRFs are generated. I only report the IRFs for the top two key drivers for each dependent variable in the main text. The results are organized as follows: total portfolio flows (the structural VAR with Dummy vs the structural VAR without Dummy), portfolio flows to compare the stock and the bond market, and portfolio investment flows from each of the four investor group.

1.3.1 Total Portfolio Investment Flows

Table 1.6 shows the percentage of the FEVD from each shock in the structural VAR model over the twelve-month horizon, covering the sample period January 2008 to June 2016. The numbers inside the table indicate each explanatory variable's contribution to the variance of portfolio flows in various time horizons. Panel A of Table 1.6 reports the result of the model with the two dummy variable. As for the push factors, the world risk appetite captured by VIX is shown to be the most influential variable. Shocks to VIX explain about 10%

to 15%, whereas shocks to USIND and TED explain around 10% and 2% of the variation in portfolio inflows over the twelve-month horizon, respectively. These results suggest that since the 2008 GFC the shock to the risk appetite has been the most important factor in determining the capital inflows to Korea, in terms of the push factor. As for the pull factors, total portfolio investment inflows are explained mostly by KOSPI index, the domestic stock market performance during the period. It explains about 23% of the forecast error variance in portfolio inflows after one month. On the contrary, shocks to Korea industrial production, domestic interest rate, and the exchange rate of Korea shows only a part of the variance of the capital inflow compared to KOSPI index.

Shocks to pull factors jointly account for nearly 28% in the first month and 37% after 1 year, while push factors jointly account for almost 11% of the variation in portfolio flows in the first month and 27% after 1 year. This finding implies that shocks to domestic factors rather than external factors are relatively more important factors in determining capital flows.

Panel B of Table 1.6 shows the result of variance decomposition from the structural VAR model without two dummy variables. One more interesting finding is that if we don't control the 2008 GFC and 2010 ESDC, then the world output growth rate proxied by the US industrial production index explains 25% of the variance of the total portfolio inflows and appears to be the most important single variable. Shocks to push factors jointly account for nearly 34%, while pull factors jointly account for only 28 % of the variation in portfolio flows in the three months thus push factors jointly explain the total portfolio investment flows more than pull factors which is the opposite result of Panel A of Table 1.6. This finding implies that pull factors are dominant during the normal period while the push factors are more important during the crisis period.

Further interesting insights into portfolio inflows to EMEs can be found through IRFs. Figure 1.4 plots the response of the total portfolio flows to the impact of each explanatory variable. The left graphs and right graphs of each panel show the response and cumulative response, respectively. The shock is one standard deviation shock to each explanatory vari-

able and the unit of the response is the trillion in Korean Won. Panel F of Figure 1.4 indicate the IRF and the cumulative IRF of the total portfolio investment flows by the shock to the Korean stock index which is the most important factor driving total portfolio inflows. An increase in Korean stock market price leads to higher portfolio flows to Korea. Portfolio flows increases right after the shock and normalizes after approximately 1 month. This finding is consistent with the conventional theory on capital movements in that the increase in the return on investment opportunities in the capital recipient countries attracts the influx of capital. Panel C of Figure 1.4 shows the IRF and cumulative IRF from the shock to VIX which is the second dominant determinant. In response to the shock to VIX, total portfolio flows have been net outflows of about 1.6 trillion Korean Won for the first two months, but they have been turned into net inflows from the third month and net cumulative inflows after about five months. That is, an increase in global financial risk causes an immediate and volatile net outflow of portfolio investment, but the effect is limited to short-lived.

1.3.2 Portfolio Investment Flows to Disaggregated Market

In this section, I separate the total portfolio investment flows to the stock flows and the bond flows in order to find the potential heterogeneity over the different markets. Table 1.7 presents the result of the FEVD from the structural VAR model for the capital inflows to the stock market and bond market.

Panel A of Table 1.7 suggests that both push- and pull-factors play significant roles in equity flows. At the 1-month horizon, the variance of the capital inflows to the stock market is mostly attributable to the domestic stock market index (27%) and VIX (23%). At the 12-month horizons, KOSPI and VIX maintain the top two most important drivers of the variation in portfolio flows. As the time horizon increases, the effect of KOSPI decreases from 27.4% after 1 month to 17.6% after 12 months while the impact of shocks to VIX maintains around 24%. Following the two variables, KRBOND which represents the domestic monetary policy and interest rate influences the capital inflows to the stock market. KRBOND has been steadily explaining about 10% of the variance of the capital inflows to the stock market

since the second period.

Panel B of Table 1.7 shows the result of the forecast error variance decomposition of the capital inflows to the bond market which is quite different from that of the stock market. The results show that push-factors play more dominant roles in portfolio flow trends than pull-factors as the time horizon increases. For portfolio inflows to the bond market, the role of push-factors jointly explains about 18% in the three-month horizon and 26% in the twelve-month horizon while the overall influence of pull-factors remains 9% in the three-month horizon and 16% in the twelve-month horizon. The top two factors are US industrial production index and Korea bond interest rate. From the three months, the US industrial production and Korean bond rate account for 9% and 7% of the forecasted variance, respectively.

All in all, the results of variance decomposition, in terms of push and pull factors, over the two different securities reveals a quite different picture. The stock market index, KOSPI was the most important determinant in determining the capital movements of the stock market while it explains less than 1% of the capital inflows in the bond market. The financial indices such as VIX and KOSPI are the most important determinant for the stock market, while the domestic bond rate and the domestic real growth rate are dominant to portfolio investment movements over the bond market. The domestic output proxied by Korean industrial production index and USD to Korean Won exchange rate has been reported not to have a significant impact on the capital inflows to the stock market and the bond market.

Figure 1.5 plots the movement of the capital inflows to the stock market in response to the shock to VIX (Panel C) and Korean stock market index (Panel F) which are the two most influential variables driving stock flows. Panel C of Figure 1.5 shows that when there is a negative shock to the risk attitude, 1.4 trillion Korean Won of the foreign capital immediately outflows from the Korean stock market. However, the impact of the capital outflows in response to the shock to VIX is limited to the first month, and the foreign capital are being reintroduced after the second month. Panel F of Figure 1.5 shows an increase in Korean stock market price leads to higher portfolio flows to the stock market in

the short run and the effect will be disappear after 2 months. Foreign capital flows in the stock market are very similar to the determinants of the total portfolio flows. Therefore, we can estimate that the movement of foreign capital in the stock market leads to the total portfolio flows rather than to the movement of foreign bond flows during the analysis period of this paper.

Figure 1.6 describes the response of the capital inflows to the bond market in response to the shock to explanatory variables including the US industrial production (Panel A) and the domestic interest rate (Panel E), the top two key drivers of the capital inflows to the bond market. One standard deviation shock to USIND results in the cumulative capital inflows of 1.3 trillion Korean Won for the first three months. As for the relationship between the interest rate and capital inflows, there are two aspects of the impact of domestic interest rates on the flow of foreign capital in emerging countries.[20] If all other factors remain unchanged, traditionally, the rise in the domestic interest rate will improve the yield of bond investments and serve as a source of foreign capital inflows. On the contrary, if the domestic rate hike is accompanied by other variables such as the economic forecast in the future, the relationship between domestic interest rates and foreign capital inflows is not clear. For example, the foreign capital invested in the bond market may be reallocated to the stock market with an economic boom. Also, if domestic interest rate rises are accompanied by negative domestic negative impacts, inflows of foreign funds may be reduced. Panel E of Figure 1.6 show that the unexpected increase in the domestic interest rate results in capital outflows and it lasts for the seven months. The amount of outflows is 1.3 trillion Korean Won in total for the twelve months. This implies that bond money inflows to South Korea were affected not only by the difference between the domestic and foreign interest rates but also by other

[20]On the contrary, there are studies on the effect of foreign capital inflows on domestic interest rates. Bernanke et al. (2011) and Warnock and Warnock (2009)show that foreign capital inflows lowered long-term US interest rates.

variables.[21]

1.3.3 Portfolio Investment Flows from Each Investor

This section employs the disaggregated portfolio investment flows by each type of institution as the dependent variables in order to examine the determinant of portfolio investment flows sorted by each investment group such as the mutual funds, the global bank, the security company, and the insurance and pension company.[22] Table 1.8 reports the result of the variance decomposition of portfolio investment flows from each type of institutions.

Mutual Funds

Panel A of the table 1.8 indicates that the portfolio flows from the mutual funds are mostly responsive to the domestic stock index (KOSPI) followed by the world risk appetite captured by VIX. Shocks to KOSPI explains nearly 14% to 21%, and shocks to VIX explains 7% to 16%. The longer the time horizon, the smaller the percentage of explanations of KOSPI, while the percentage of explanation by VIX is increasing. The KOSPI and VIX are financial variables that determine the return and volatility of the Korean stock market. The finding that mutual funds depend heavily on these two variables indicates that they mainly respond to the stock market conditions. This confirms once again that the determinants of mutual funds' capital flows are very similar to those of capital inflows to the equity market. Therefore, considering the disaggregated capital inflows by each type of investor, this may imply that the investor group of mutual funds has a great influence on the capital inflows to the stock market movements. The exchange rate, another important variable in determining the return on equity investment in foreign countries, does not have a significant effect on the

[21] Makhetha-Kosi et al. (2016) employ a Vector Error Correction Modelling (VECM) for South African data, and show that the difference in internal and external interest rates did not lead to foreign capital inflows proportional to it, which is attributed to the externalities such as human capital.

[22] In addition to the four institutional investors in the main text, there are other groups such as individual investors and international organizations, but they are excluded from this analysis because they are relatively minimal portion in total foreign portfolio flows to Korea.

movements of mutual funds capital in this analysis.

Next, the impulse response functions in Figure 1.7 shows how these explanatory variables affect the flow of funds in mutual funds over time. Panel C of Figure 1.7 indicates the mutual funds retrench their money by the amount of KRW 500 billion immediately in response to the one standard deviation shock to VIX, but it is reintroduced from the third month, and after six months, the cumulative capital flows will turn into net inflows. As shown in Panel E of Figure 1.7, the impact on KOSPI index result in the capital inflows of the mutual funds by about KRW 1 trillion in the first month, but the impact is almost extinguished from the second month.

Global Banks

Panel B of Table 1.8 reports the result of FEVD of the global banks flows. The key variables dominating the flows of global banks are USIND, EXCH, and KRBOND. This is an entirely different result from the mutual funds flows discussed in the previous section, which implies that the global banks' flows are more affected by macroeconomic variables such as the global output and domestic interest rates rather than volatile financial variables such as the stock price and VIX. These results confirm once again that we need to break down the total portfolio flows and find the determinants of capital flows from each type of investor. It is also important to note that USD to Korean Won exchange rate (EXCH), which is not reported as a significant variable in the overall capital flows analysis, is now reported to be a variable that dominates the capital flows of the global bank investors.

Panel A of Figure 1.8 reports that one standard deviation shock to the world Real GDP proxied by USIND leads to the global bank portfolio inflows of KRW 400 billion to Korea in a month and total portfolio inflows will be around KRW 1 trillion in a year. This confirms that the improved market expectation of the growth prospect pushes the capital to the emerging markets. Panel G of Figure 1.8 indicates the response of the global bank flows to the shock to the exchange rate. It tends to bring about capital outflows from the global bank by KRW 500 billion in a year. Since the increase of exchange rate means the depreciation of KRW,

we can find that when the rate of return decrease, the global bank tends to withdraw its money from the emerging economies.

Securities Company

Panel C of Table 1.8 reports the FEVD of portfolio inflows from securities company. In the case of the securities company, the pull factors have an overwhelming impact on its capital movements relative to the push factors. The pull factors jointly explain the variance of securities company flows up to 51% (9 months) while the push factors explain it about 17% (12 months). In particular, in the average, EXCH is the most important determinant among pull factor, followed by KRBOND and KOSPI. When investing in foreign countries, the sources of the rate of return are the change in the asset price itself and the exchange rate. Therefore, the two most important variables that determine the rate of return for foreign investors are the stock price and the exchange rate for the stock market and the interest rate and the exchange rate for the bond market. The fact that the securities flows are driven by KOSPI, KRBOND, and EXCH means that they put the profitability on the priority for their investment.

Figure 1.9 reports the IRF of securities company flows. Panel E of Figure 1.9 shows that the one standard deviation shock to the domestic interest rate leads to portfolio outflows from securities company by KRW 200 billion for the first month, but after two months, its capital re-inflows and offsets the previous outflows, and it reaches the cumulative inflows after four months. Panel G of Figure 1.9 illustrates the securities company retrenches its money from EMEs in response to the depreciation of the currency of the recipient country by KRW 200 billion in total for 12 months.

Insurance and Pension Company

Panel D of Table 1.8 reports the result of FEVD regarding insurance and pension company. Overall, the pull factors, which are the domestic factor of the recipient countries, have a greater impact than the external push factors. In addition, domestic economic growth, which

is proxied by KRIND, is reported to be more important than the factors of the financial market and the foreign exchange market such as domestic stock price (KOSPI), exchange rate (EXCH), and risk appetite (VIX). This implies that insurance and pension company invests in the emerging market based on the real economic indicators rather than short-term fluctuations in the financial market and foreign exchange market conditions.

Panel D of Figure 1.10 indicates that portfolio investment flows from the insurance and pension company inflows by KRW 100 billion in response to the one standard deviation shock to the domestic output. Panel G of Figure 1.10 illustrates that the unexpected depreciation in Korean Won causes net capital inflows of about KRW 100 billion in the first three months. The effects of these shocks are reported to last only during the first two to three months and then disappeared.

Subconclusion

Overall, this section confirms the starkly different results when capital flows are disaggregated by investors type. That is, the investment behaviors are totally different over various investors. Panel A of the Table 1.8 indicates that KOSPI and VIX dominate the capital flows of the mutual funds while Panel B of the Table 1.8 shows that portfolio investment flows of the global bank are mostly explained by USIND. Panel C and Panel D of Table 1.8 indicate that the domestic stock index and the exchange rate are the dominant factors to portfolio investment flows from the foreign security company while the shock to KRIND and KRBOND are the dominant factors to portfolio investment flows from pension company.

This analysis also confirms the heterogeneity in the behavior of the different institution in response to the equivalent shock. For example, for the shock to USD to Korean Won exchange rate, mutual funds, and securities firms reduce their exposure to Korea, as shown in Figure 1.7 and Figure 1.9, while insurance and pension company purchase more Korean financial assets, as shown in Figure 1.10.

One more interesting finding is about the key drivers for the short-run investor and the long-run investor. In the previous section, the security and pension company are regarded as

the short-run investor and long-run investor, respectively based on the turnover ratio. This means that although both investors are more responsive to the pull-factors, the short-run investors more care about the returns from its investment while the long-run investors are more dependent upon the growth rate.

1.4 Robustness Checks

In this section, four types of robustness checks are provided as follows: 1) determinants of portfolio inflows during sub-period; 2) Alternative measurement of the global output growth; 3) control stock and bond market for the flows from each type of institution; 4) alternative ordering of variables.

1.4.1 Sub-period

Some existing papers analyzed the determinants by dividing the analysis period into two or more subperiods to compare the results before and after important events.[23] I employ the structural VAR model with subsample period (2009:7-2016:6) excluding the 2008 global financial crisis period and compare the results from the model with two dummy variables and the whole period to confirm the determinants of the total portfolio flows during the normal business cycle.[24] Table A.6 reports the result of FEVD of the total portfolio investment flows with the subsample period. There is no significant difference between this results and those from Panel A of Table 1.4. KOSPI and VIX are still the two most dominant variables in the subsample test and pull factors are jointly more dominant than push factors. The difference between the results is the influence of USIND which increases in the subsample analysis. I also employ the model using data during the subsample period to analyze capital inflows to the equity and bond market, and the capital inflows from each type of investor, and the results are very similar to those in the model using two dummy variables.

[23]See Ying and Kim (2001), Fratzscher (2012), Srivastava et al. (2016), Hwa et al. (2017).

[24]Following NBER defining that the recession period due to the 2008 global financial crisis is until June 2009, this paper regards the period from July 2009 as the normal business cycle.

1.4.2 Alternative Measurement of the Global Output Growth

In the main text, this paper employs the US industrial production index to capture the world output growth. Since the index of the US may not represent the global business cycle, I consider the industrial production index of G7 countries (G7IND) as the alternative global output growth indicator. The result of the variance decomposition of the total portfolio investment flows using G7IND is reported in Table 1.10. The most dominant variables are VIX, KRBOND, and KOSPI which are the same as the main text, although the weights of them are different. Pull factors are still more dominant than push factors. Compared to Panel A of Table 1.4, the importance of the real output in the developed country (G7IND) is declined while the effect of VIX and KRBOND increase. Therefore, we can confirm that the overall results are consistent even though we change the variables from the US industrial production index to that of G7 countries.

1.4.3 Control the Stock and Bond Market Flows from Each Type of Institution

The finding that each institution has different key factors might be resulted from the investment behavior to different markets. That is, each institution might have different key factors in the separated market such as the stock market and the bond market. Table A1 in Appendix A.2 shows the result of variance decomposition of the capital inflows from securities company to the separated market (equity and bond). The key drivers of the securities company's flows are VIX and KRBOND in both stock and bond market. Table A2 in the Appendix A.2 shows the results of variance decomposition of the insurance and pension company's portfolio investment flows to the stock and bond market. The stock flows and bond flows from the insurance and pension company have similar key factors in that KRIND and KRBOND are important to both markets. These results confirm the heterogeneity in the determinants of capital inflows across each type of investor and the homogeneity in the key determinants of capital inflows of each investor across the separated market.

1.4.4 Alternative Ordering of Explanatory Variables

For the structural VAR model, the long-run restriction is essential to find the unobserved structural shocks from the data. The ordering of explanatory variables is very important since it is directly related to the long-run restriction. I change the order of TED and VIX after USIND, thus allowing TED to respond instantaneously to the industrial production index and VIX. Table A3 in the Appendix A.2 reports the result of variance decomposition of the total portfolio investment flows with the alternative ordering of the variables. The results confirm VIX and KOSPI are consistently top two important variables for portfolio investment flows to EMEs.

1.5 Conclusion

In this paper, I employ the structural VAR model with dummy variables to find the key drivers of portfolio flows to Korea using directly measured data. Total portfolio flows is pushed according to the model without controlling GFC while it is pooled when we control the crisis period. portfolio flows to Korea is more affected by push factors during the crisis while it is more dependent on pull factor after the crisis. In order to examine the potential heterogeneity among different markets, this paper examines the stock and bond inflows separately and I find that portfolio flows to the stock market is affected mainly by the domestic stock market and global risk appetite while portfolio flows to bond market reacts more strongly to US growth rate and domestic interest rate. This research sorts the total portfolio investment flows by the investment group and find that each group has different key factors. Also, this paper shows that the short-run investor is more responsive to the return on the investment, while the long-run investor is more sensitive to the GDP and the bond rate.

These findings are not only theoretically important but also have significant policy implications in that it directly affects the efficiency and effectiveness of the macro-prudential policies implemented by most emerging markets. To the extent that internal factors are im-

portant, domestic policymakers may have more leverage on capital flows by sound macroeconomic policy. Therefore, to reduce the volatility stock market flows dominated by VIX is more difficult than the bond market flows dominated by domestic bond rate. This result is closely related to the discovery of the existing papers who employ 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. Since bank flows are more dependent on external variables, countries more exposed to global bank flows would be sensitive to push factors as argued in Cerutti et al. (2015).

The implications of these findings to policymakers in EMEs cannot be overstated. EMEs need to acknowledge their investor composition and the drivers for each investment group before designing the specific macro-prudential policies. That is, policymakers in EMEs should pay attention to 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 with the aim of stabilizing their financial markets.

1.6 Tables and Figures

Table 1.1: Dependent Variables

Description	Dependent Variable
Total	Total Portfolio Investment Flows
Disaggregated by Market	Portfolio Investment Flows to the stock market
	Portfolio Investment Flows to the bond market
Disaggregated by Investor	Portfolio Investment Flows from Global Bank
	Portfolio Investment Flows from mutual funds
	Portfolio Investment Flows from Security Company
	Portfolio Investment Flows from Pension Company

Note: This table presents the dependent variables of this paper. Total means the whole capital inflows to Korea during the period. The total capital inflows is divided into capital inflows to the stock market and bond market. Also, Every single investor is classified according to its type of institution such as a global bank, mutual funds, security company, and insurance and pension company.

Table 1.2: Description of Dependent Variables

	Obs	Mean	Median	Max	Min	Range	Std	CV	Skew	Kurt
Total	102	730	588	9,524	-10,468	19,992	4,137	5.7	-0.08	-0.25
Stock	102	200	333	9,212	-10,082	19,294	3,357	16.8	-0.13	-0.24
Bond	102	530	53	6,140	-5,302	11,441	2,137	4.0	-0.20	0.54
Bank	102	238	117	4,807	-3,427	8,234	1,500	6.3	0.22	0.26
Insurance	102	254	194	2,612	-1,026	3,638	479	1.9	1.32	5.20
Securities	102	-278	-242	1,901	-2,392	4,294	900	-3.2	0.02	-0.18
Mutual funds	102	74	68	6,068	-7,674	13,742	2,588	34.9	-0.47	0.54

Note: This table reports a description of the dependent variables. Std and CV denote a standard deviation and a coefficient of variation which is calculated by dividing the standard deviation by the mean, respectively. The unit of mean, median, maximum, minimum, range, and standard deviation is a billion in Korean Won. The data range from January 2008 to June 2016.

Table 1.3: Turnover Ratio of Each Investment Group

Institution Type	Stock	Bond	Total	Characteristics
Securities company	2.11	0.22	1.75	Short-term investor
Bank	0.15	0.15	0.15	
mutual funds	0.14	0.09	0.13	
Insurance company	0.09	0.10	0.09	Long-term investor

Note: This table reports a turnover ratio of the investment group which are classified into a security company, a global bank, a mutual funds, and a pension company. The second and third column represent the turnover ratio of capital inflows from each investment group to the stock market and the bond market, respectively. The fourth column reports the turnover ratio of total capital inflows from each investment group.

Table 1.4: 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. This paper considers three push factors and four pull factors. Push factors are US industrial production index, Ted spread, and the volatility index. Pull factors are Korea industrial production index, the interest rate on Korea 3-year maturity government bond, Korea stock price index, and the exchange rate US dollar to Korean Won. The source of push factors and pull factors is the federal reserve bank of St. Louis and Bank of Korea, respectively.

Table 1.5: Augmented Dickey-Fuller Test

Variable	Level		Differenced	
	statistics	p-value	statistics	p-value
USIND	-1.124	0.706	-4.615***	0.000
TED	-2.787*	0.060	-8.828***	0.000
VIX	-3.245**	0.018	-8.545***	0.000
KRIND	-1.439	0.564	-6.511***	0.000
KRBOND	-0.949	0.771	-5.805***	0.000
KOSPI	-1.891	0.336	-7.276***	0.000
EXCH	-2.633	0.086	-7.255***	0.000

Note: This table reports the results of the Augmented Dickey-Fuller test. $*$, $**$ and $***$ denote significance at the 10%, 5% and 1% level, respectively.

Table 1.6: FEVD of Total Portfolio Investment Flows

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Panel A.	1	0.3	0.7	10.2	0.1	4.4	23.2	0.0
With	2	8.6	1.7	10.8	0.3	12.9	17.9	0.0
Dummy	3	11.3	1.7	10.4	0.5	13.3	16.8	0.9
	4	11.0	2.2	10.4	1.9	13.9	16.3	1.0
	5	10.4	2.0	11.3	4.7	12.9	15.3	2.4
	6	10.2	2.2	14.4	5.2	12.1	14.8	2.8
	7	9.8	2.1	14.6	5.1	11.9	14.2	4.9
	8	9.5	2.5	15.2	5.5	12.3	13.8	4.8
	9	9.4	3.0	15.6	5.5	12.1	13.5	4.8
	10	9.4	3.3	15.4	5.5	12.6	13.3	4.7
	11	9.6	3.5	15.3	5.6	12.8	13.1	4.8
	12	9.5	3.5	15.2	5.6	13.1	13.1	4.8
Panel B.	1	0.8	0.7	10.7	0.1	4.1	21.3	0.0
Without	2	14.6	1.7	11.2	0.2	12.3	15.2	0.0
Dummy	3	22.3	1.7	9.5	0.5	12.6	13.1	1.0
	4	24.6	2.1	9.0	1.6	12.0	12.5	1.0
	5	24.1	2.0	8.7	4.0	11.9	11.9	1.1
	6	23.1	2.1	9.5	4.1	11.7	11.7	3.1
	7	22.2	2.0	9.2	4.0	11.8	11.1	6.5
	8	21.9	2.2	9.3	5.0	12.7	10.7	6.4
	9	21.7	2.4	9.6	4.9	12.6	10.6	6.4
	10	21.6	2.5	9.7	4.9	12.6	10.6	6.3
	11	21.7	2.6	10.0	5.0	12.5	10.5	6.3
	12	21.7	2.6	10.2	5.0	12.5	10.4	6.3

Note: This table reports the result of the FEVD of the total portfolio investment flows. Push factors include the US industrial production index (USIND), Ted spread (TED), and Volatility index of S&P 500 (VIX). Pull factors are the Korean industrial production index (KRIND), interest rate on 3-year Korean treasury bond (KRIND), Korean stock price index (KOSPI), and US dollar to Korean Won exchange rate (EXCH). Panel A and Panel B report the result of the model with the two dummy variables, and without dummy variables, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to June 2016.

Table 1.7: FEVD of Portfolio Investment Flows to Stock and Bond Market

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Panel A.	1	0.0	0.0	23.1	0.0	8.3	27.4	0.1
Stock	2	5.1	3.4	19.2	0.7	12.9	22.2	0.5
market	3	5.0	3.6	20.1	1.0	12.4	21.7	1.8
	4	4.9	3.5	19.9	1.4	14.3	21.0	1.7
	5	4.6	3.2	22.0	3.2	12.9	19.5	2.6
	6	4.4	3.0	24.2	4.3	12.5	18.7	2.4
	7	4.7	2.9	24.2	4.4	12.3	18.4	3.1
	8	4.7	3.1	24.3	4.8	12.5	18.1	3.1
	9	4.7	3.3	24.1	4.8	12.5	18.0	3.1
	10	4.7	3.4	24.1	4.8	12.5	17.8	3.3
	11	4.7	3.3	24.0	5.0	12.6	17.7	3.3
	12	4.8	3.5	23.9	5.0	12.8	17.6	3.3
Panel B.	1	0.0	3.6	2.7	0.9	0.9	0.1	0.2
Bond	2	4.6	3.0	6.7	0.9	3.5	0.3	1.2
market	3	8.7	2.8	6.2	0.8	7.0	0.4	1.1
	4	10.9	4.2	5.8	1.2	6.9	0.3	1.7
	5	10.7	4.1	5.8	1.5	6.8	0.4	2.2
	6	10.4	4.1	6.8	1.5	7.7	0.9	2.5
	7	10.5	3.9	7.5	1.5	8.9	0.9	3.0
	8	10.3	3.9	8.3	1.7	9.3	0.9	3.5
	9	10.1	4.1	9.7	1.7	9.2	0.9	3.6
	10	10.5	4.2	10.0	1.7	9.2	0.9	3.8
	11	10.8	4.3	10.4	1.7	9.1	0.8	3.8
	12	10.9	4.3	10.5	1.8	9.1	0.9	3.8

Note: This table reports the result of the FEVD of the portfolio inflows to the disaggregated market. Push factors include the US industrial production index (USIND), Ted spread (TED), and Volatility index of S&P 500 (VIX). Pull factors are the Korean industrial production index (KRIND), interest rate on 3-year Korean treasury bond (KRIND), Korean stock price index (KOSPI), and US dollar to Korean Won exchange rate (EXCH). Panel A and Panel B report the result of the capital inflows to the stock market, and the bond market, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to June 2016.

Table 1.8: FEVD of Flows from Each Type of Institution

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Panel A.	1	0.3	2.8	7.4	0.1	1.0	21.2	0.3
Mutual	2	5.3	2.9	10.4	0.8	3.8	14.3	0.4
Funds	3	6.9	4.0	9.6	0.7	7.2	17.2	0.5
	4	6.8	4.0	9.9	1.5	7.8	16.8	0.6
	5	6.4	3.8	11.4	3.8	7.3	15.8	1.7
	6	6.2	3.8	13.4	3.7	7.0	16.2	2.2
	7	6.0	3.6	15.5	3.6	6.7	15.5	3.2
	8	5.9	3.6	16.1	3.7	6.9	15.4	3.2
	9	5.9	4.2	16.3	3.7	6.7	15.1	3.1
	10	6.3	5.2	16.0	3.6	6.9	14.6	3.1
	11	6.9	5.4	15.7	3.7	7.1	14.4	3.1
	12	6.9	5.4	15.7	3.7	7.2	14.3	3.1
Panel B.	1	0.0	1.2	1.2	0.4	0.4	0.6	2.2
Bank	2	6.8	3.0	3.4	0.7	4.7	2.2	1.8
	3	8.8	2.8	4.2	0.9	4.6	2.2	4.2
	4	8.8	3.0	4.1	2.6	5.3	2.0	5.0
	5	8.8	3.0	3.9	2.9	5.2	2.0	6.1
	6	8.5	3.1	5.0	3.6	5.0	2.3	6.9
	7	8.5	3.0	4.9	3.5	5.6	2.4	7.5
	8	8.3	3.5	5.0	4.0	6.1	2.3	7.4
	9	8.3	3.6	5.5	4.1	6.1	2.3	7.3
	10	8.5	3.7	5.4	4.1	6.2	2.3	7.3
	11	8.5	3.7	5.6	4.2	6.2	2.3	7.3
	12	8.4	3.7	5.5	4.3	6.3	2.3	7.3

Table 1.8 - *Continued*

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Panel C.	1	1.9	0.5	5.5	0.0	4.3	16.5	9.6
Securities	2	1.6	3.2	6.2	0.3	11.7	13.9	9.6
Company	3	1.5	3.1	8.1	3.3	10.3	14.9	10.4
	4	1.4	2.7	8.1	5.2	17.5	13.0	9.4
	5	1.4	2.5	9.5	4.5	16.5	11.2	16.9
	6	1.9	2.4	10.2	5.6	16.0	10.8	16.9
	7	2.4	2.5	9.9	5.8	15.6	10.4	18.3
	8	2.4	2.7	9.9	5.9	16.2	10.2	18.3
	9	2.5	2.7	9.9	6.1	16.2	10.1	18.3
	10	2.7	2.7	10.4	5.9	16.5	10.1	18.0
	11	2.6	3.1	10.6	5.8	16.6	10.0	18.0
	12	2.8	3.8	10.5	5.8	16.4	9.9	17.9
Panel D.	1	0.8	0.1	1.5	8.0	4.0	0.8	1.1
Insurance	2	1.5	0.2	3.0	7.6	4.9	1.0	2.5
and	3	2.9	0.5	3.1	8.6	6.6	1.5	2.4
Pension	4	3.1	0.5	3.4	10.1	6.5	1.7	2.8
Company	5	3.2	0.6	3.4	9.9	7.7	2.0	2.9
	6	3.2	0.7	3.4	9.9	8.8	2.0	2.8
	7	3.1	0.9	3.3	10.0	8.7	2.2	3.1
	8	3.2	1.1	3.5	10.1	8.8	2.2	3.1
	9	3.2	1.1	3.4	10.0	8.9	2.2	3.7
	10	3.1	1.3	3.5	10.1	9.1	2.3	3.7
	11	3.1	1.3	3.6	10.2	9.1	2.3	3.8
	12	3.1	1.3	3.7	10.2	9.1	2.3	3.8

Note: This table reports the result of the FEVD of the portfolio inflows from each type of investor. Push factors include the US industrial production index, Ted spread, and Volatility index of S&P 500. Pull factors are the Korean industrial production index, interest rate on 3-year Korean treasury bond, Korean stock price index, and US dollar to Korean Won exchange rate. Panel A, B, C, and D reports the result of the portfolio inflows from the mutual funds, global bank, securities company, and insurance and pension company, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the portfolio inflows from each type of investor.

Table 1.9: FEVD of Total Portfolio Investment Flows with Sub-period

Period	Push Factors			Pull Factors			
	USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
1	1.5	2.7	16.9	0.0	0.5	24.0	3.2
2	8.8	2.5	15.6	1.5	11.1	18.5	2.6
3	16.2	2.2	14.1	1.5	11.1	16.5	2.6
4	16.5	2.2	13.6	1.4	13.4	16.0	2.7
5	16.1	2.6	13.4	1.6	13.0	15.9	3.8
6	15.0	3.8	15.2	1.5	12.3	16.6	3.7
7	14.2	4.3	14.5	1.4	11.8	15.8	6.9
8	14.1	4.7	14.3	1.5	12.2	15.6	7.0
9	14.0	6.0	14.0	1.4	12.0	15.2	7.1
10	13.8	5.9	13.9	1.6	11.9	15.4	7.6
11	13.7	5.9	13.8	1.7	11.9	15.5	7.6
12	13.8	5.9	13.7	1.7	11.9	15.4	7.7

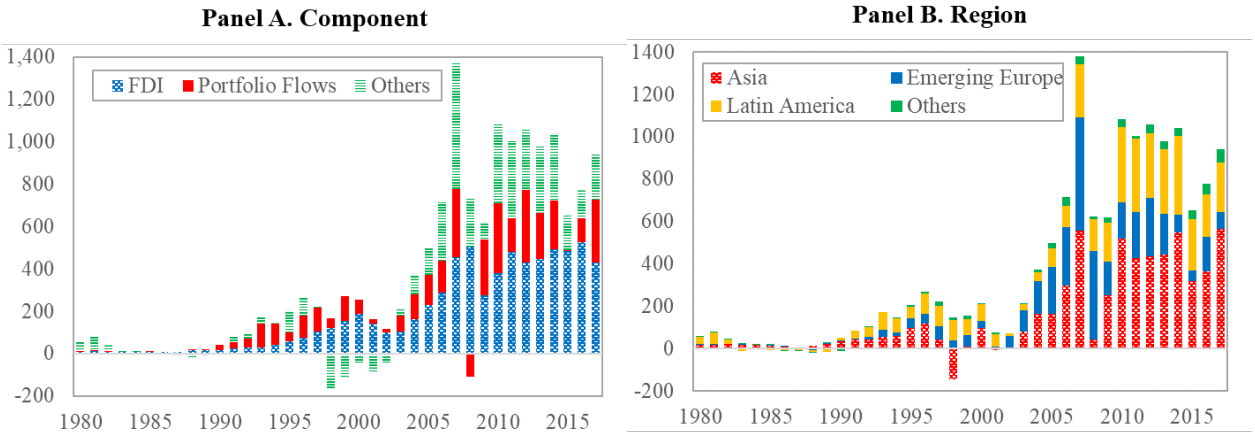
Note: This table reports the result of the FEVD of the total portfolio investment flows with the data excluding the 2008 global financial crisis period. Push factors and pull factors remain the same with the previous models. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from July 2009 to June 2016.

Table 1.10: FEVD of Total Portfolio Investment Flows with G7IND

Period	Push Factors			Pull Factors			
	G7IND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
1	0.1	2.8	13.4	0.4	7.8	18.8	0.4
2	0.7	2.3	12.8	2.7	16.7	15.7	0.5
3	3.2	2.1	15.8	2.6	15.6	14.3	1.3
4	4.5	2.0	15.6	3.8	15.5	13.7	2.1
5	4.3	2.1	16.6	4.5	14.4	12.8	4.0
6	4.2	2.2	18.1	5.9	13.7	12.8	4.2
7	4.2	2.2	17.9	5.8	13.7	12.6	5.4
8	4.2	2.5	18.8	5.8	13.7	12.3	5.4
9	4.1	3.3	18.9	5.6	13.7	12.1	5.2
10	4.1	4.1	18.7	5.5	13.8	11.9	5.2
11	4.1	4.1	18.6	5.6	13.9	11.9	5.2
12	4.6	4.4	18.4	5.5	13.9	11.8	5.2

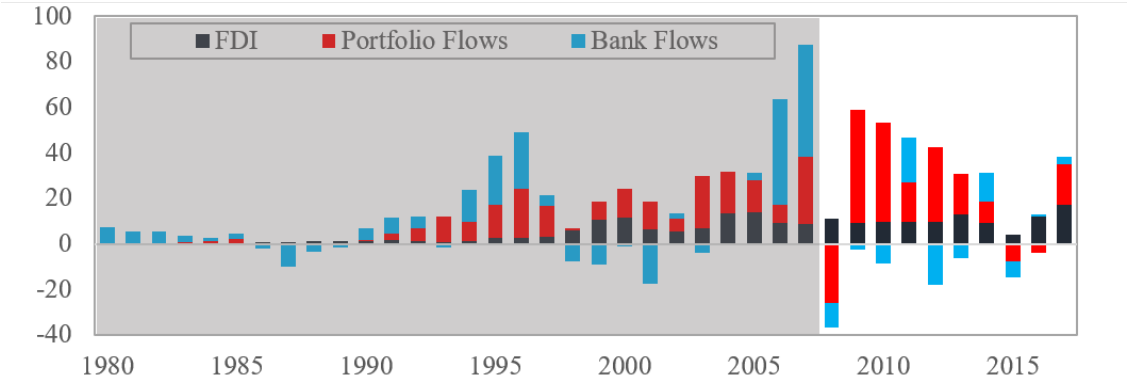
Note: This table reports the result of the FEVD of the total portfolio investment flows with replacing USIND into G7 industrial production index (G7IND). Other push factors and pull factors remain the same. The model includes the two dummy variables representing the crisis period. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to June 2016.

Figure 1.1: Capital Flows to Emerging Market Economies



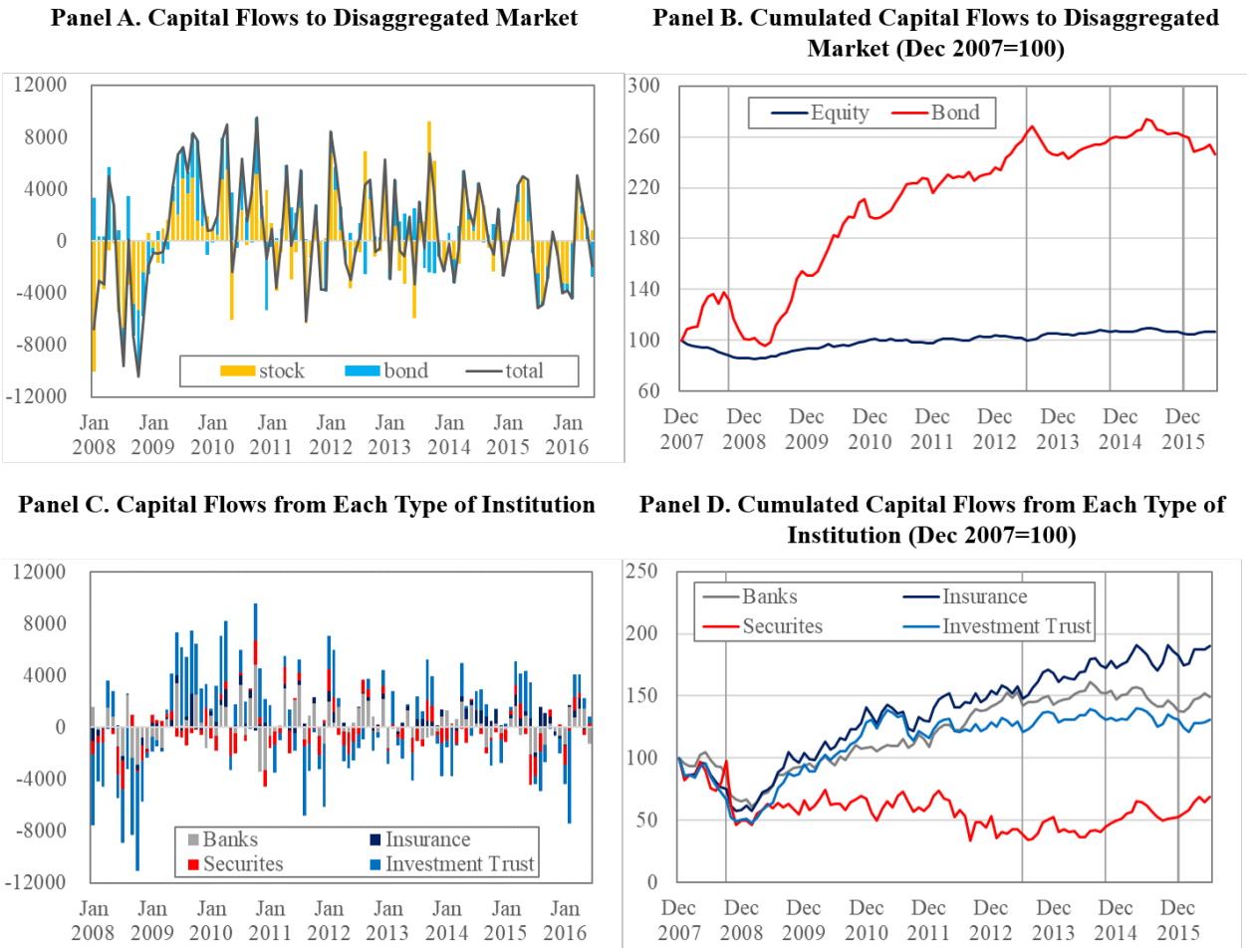
Note: This figure describes the annual capital inflows to emerging market economies based on 25 emerging market economies (see footnote 1 for the listed countries). Panel A shows the three main components (FDI, portfolio flows, and others) of the capital inflows and Panel B shows the destination of the capital. The unit of the vertical axis is billion in US dollar. The data period ranges from 1980 to 2017. The source of the data is IMF international financial statistics.

Figure 1.2: Capital Inflows to Korea



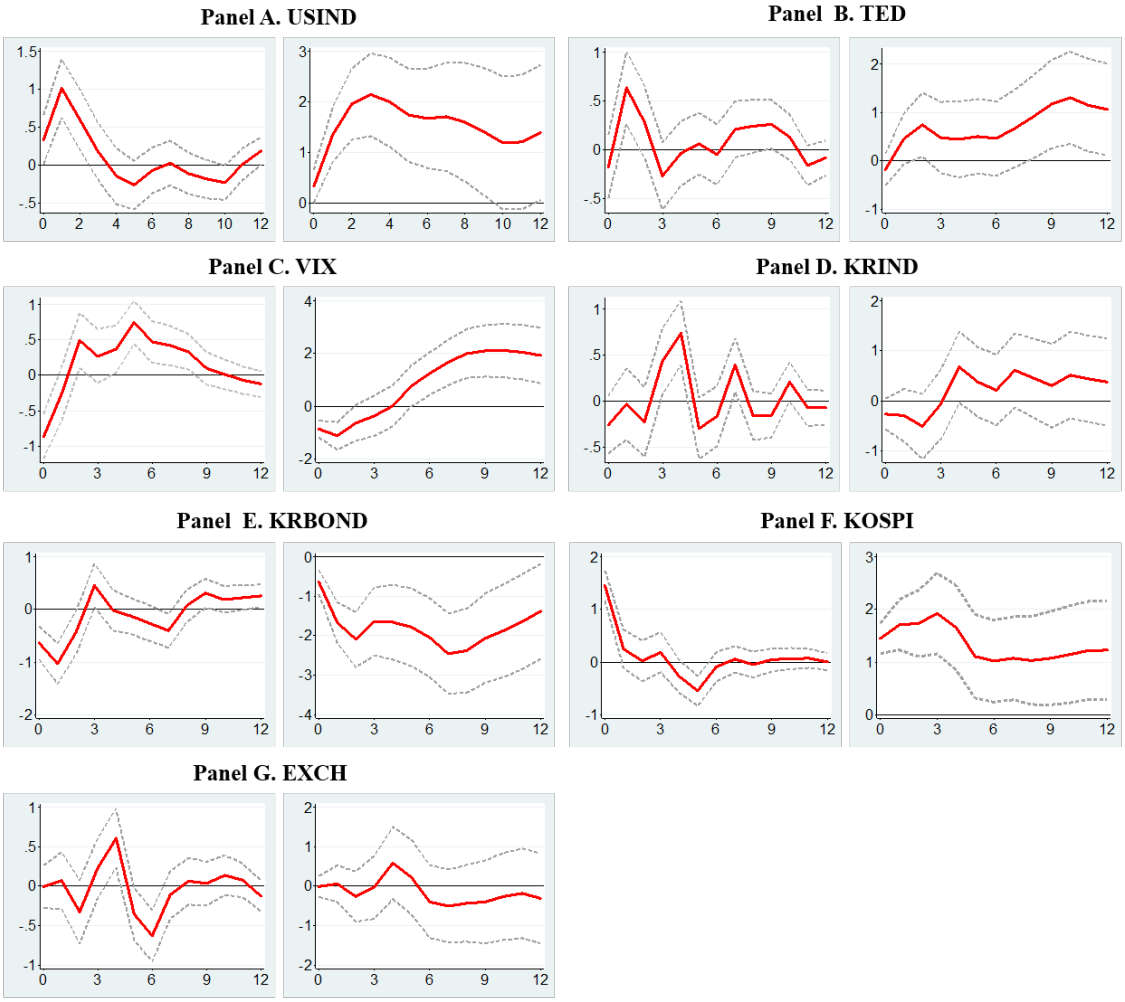
Note: This figure describes the three main components (FDI, portfolio flows, and others) of the annual capital inflows to Korea. The unit of the vertical axis is billion in US dollar. The source of the data is IMF international financial statistics.

Figure 1.3: Capital inflows to the stock and bond market



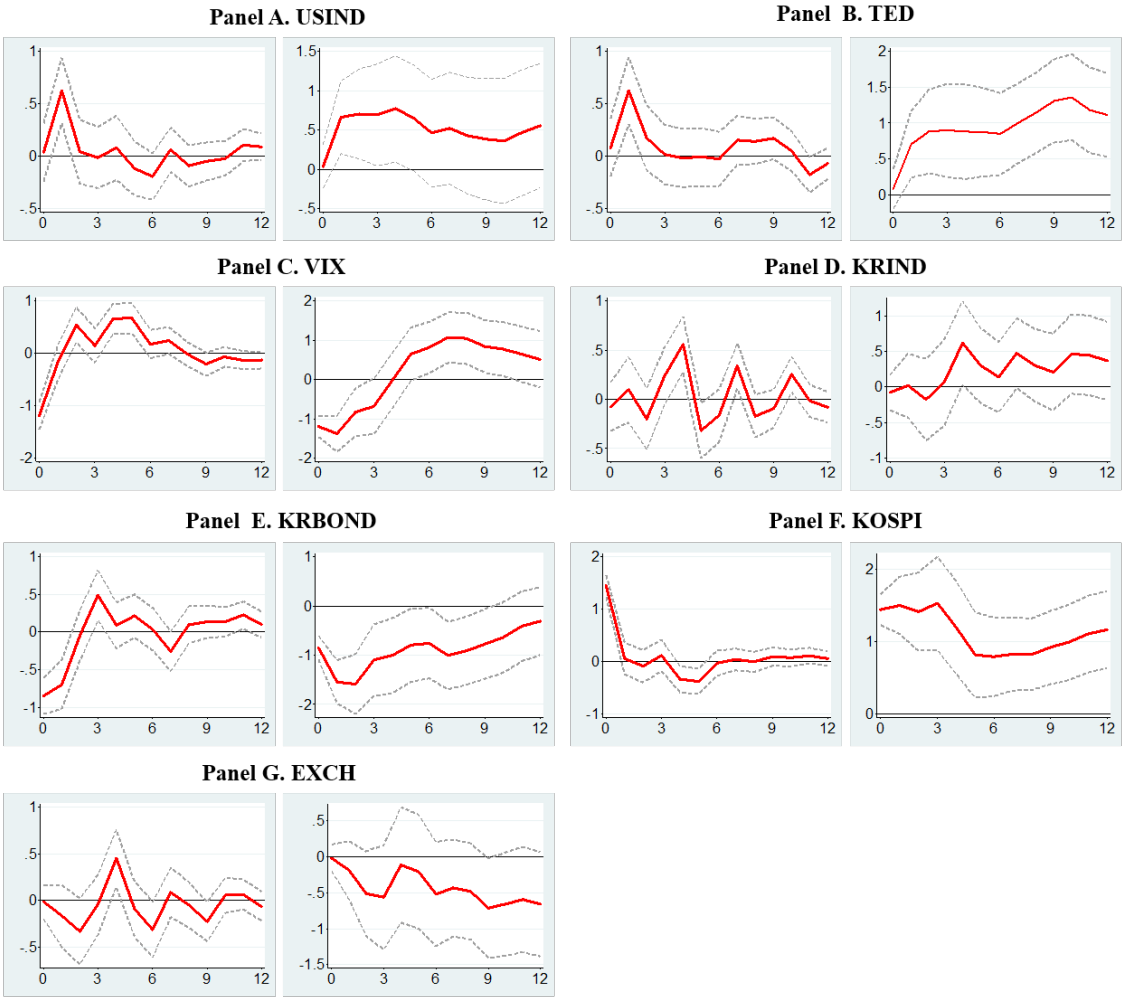
Note: This figure plots the capital inflows to the Korean stock market and the bond market. Panel A and B is regarding the destination of the capital flows while Panel C and D is regarding the source of the capital flows. Panel A plots the capital inflows and outflows to the stock and bond market. Panel B shows the cumulated capital flows to the stock and bond market relative to the end of 2007 (December 2007=100). Panel C and D plots the capital inflows and cumulated capital inflows relative to the end of 2007 (December 2007=100) from each type of institution, respectively. The vertical lines in Panel B and D indicate September 2008 when Lehman Brothers Holdings Inc. go bankruptcy, June 2013 when the Federal Reserve chairman Ben Bernanke announced the QE tapering, October 2014 when the Federal Reserve stops asset purchasing, and December 2015 when the Federal Reserve raises the US interest rate for the first time after 2008 global financial crisis. The unit of the vertical axis of Panel A and C is a billion in Korean Won. The sample period ranges from January 2008 to June 2016.

Figure 1.4: IRF of the Total Portfolio Flows



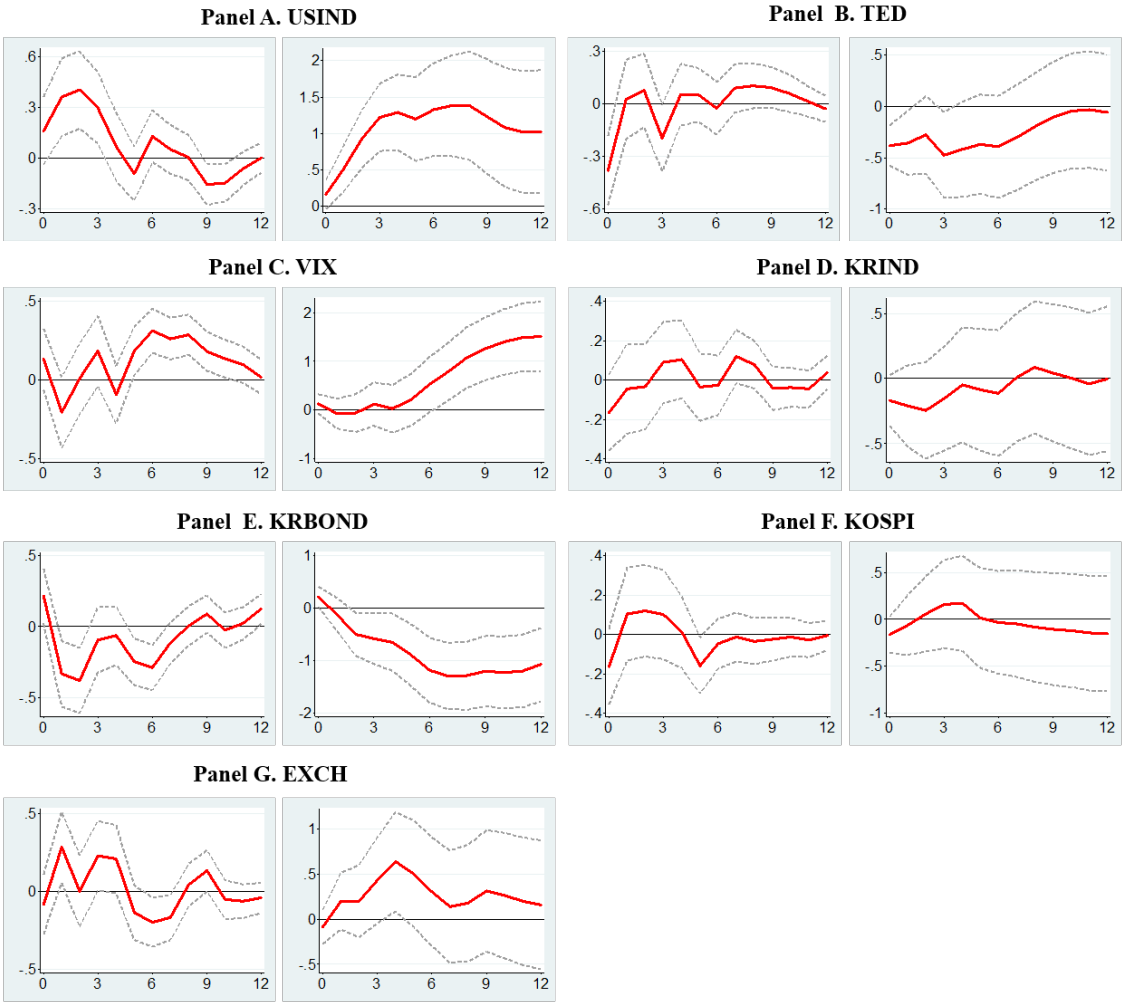
Note: This figure plots the response of the total capital inflows to in response to the shock to explanatory variables. The left graphs and right graphs of each panel shows the response and cumulative response, respectively. The shock is one standard deviation shock to each explanatory variable and the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

Figure 1.5: IRF of Capital Inflows to the Stock Market



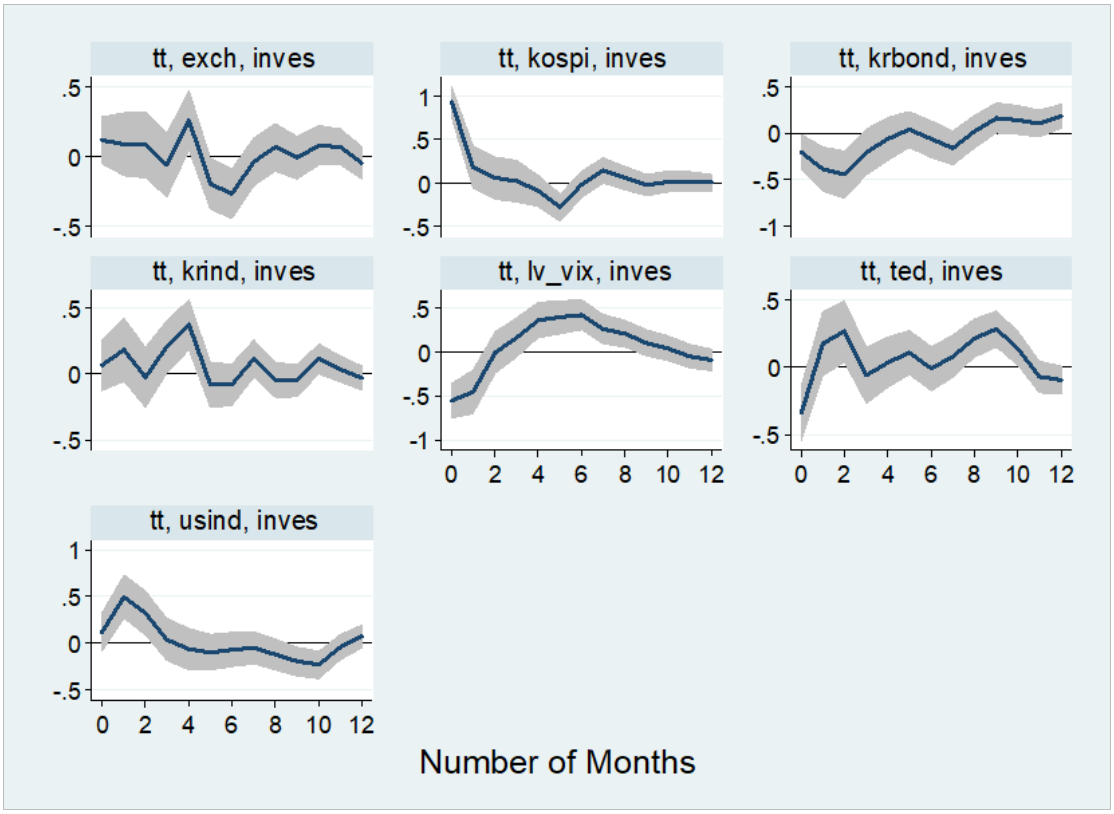
Note: This figure plots the response of the capital inflows to the stock market in response to the shock to explanatory variables. The left graphs and right graphs show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval.

Figure 1.6: IRF of Capital Inflows to the Bond Market



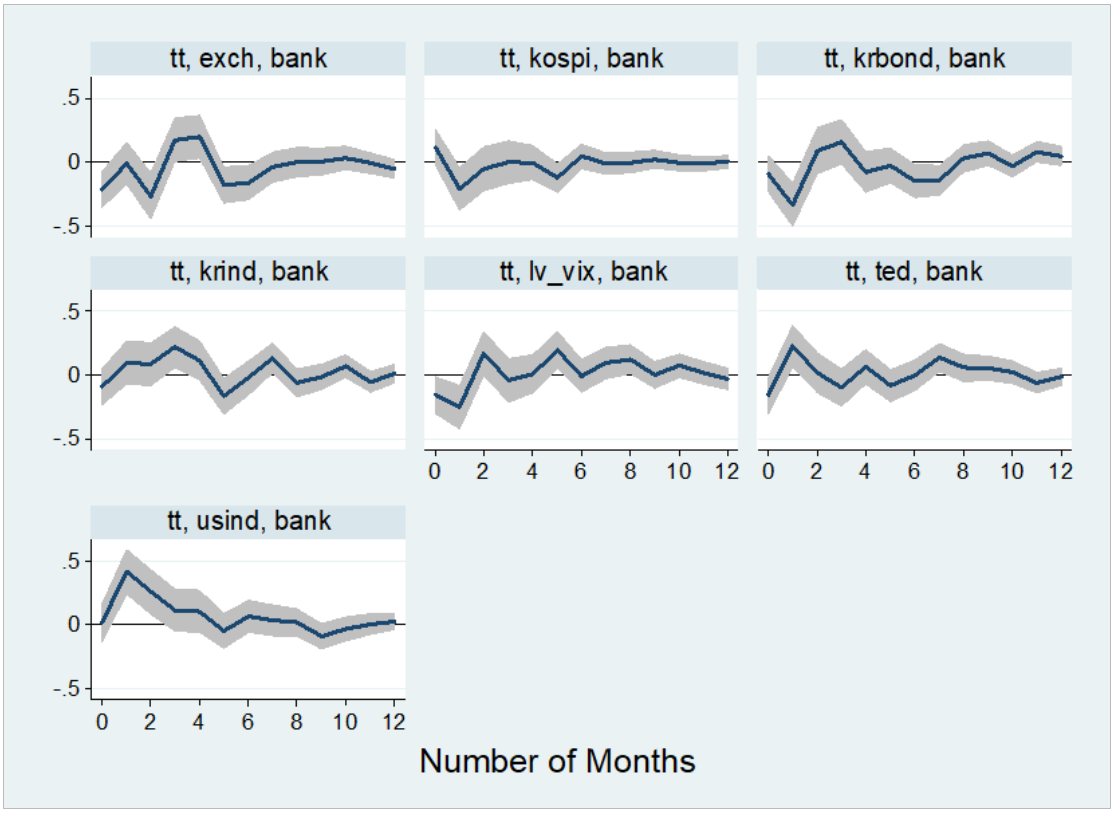
Note: This figure plots the response of the capital inflows to the bond market in response to the shock to explanatory variables. The left graphs and right graphs show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval

Figure 1.7: IRF of Mutual Funds Flows



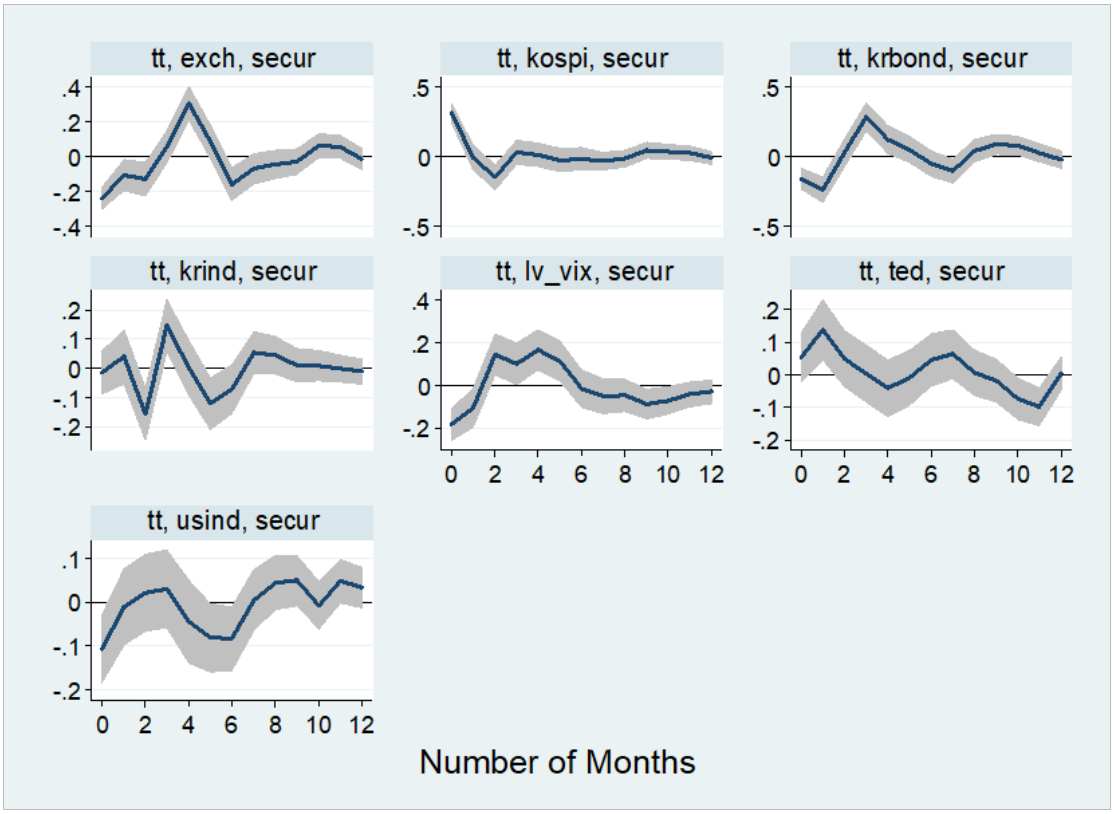
Note: This figure plots the response of the capital inflows of mutual funds in response to the shock to each explanatory variable. The left panels and right panels show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval.

Figure 1.8: IRF of Golbal Bank Flows



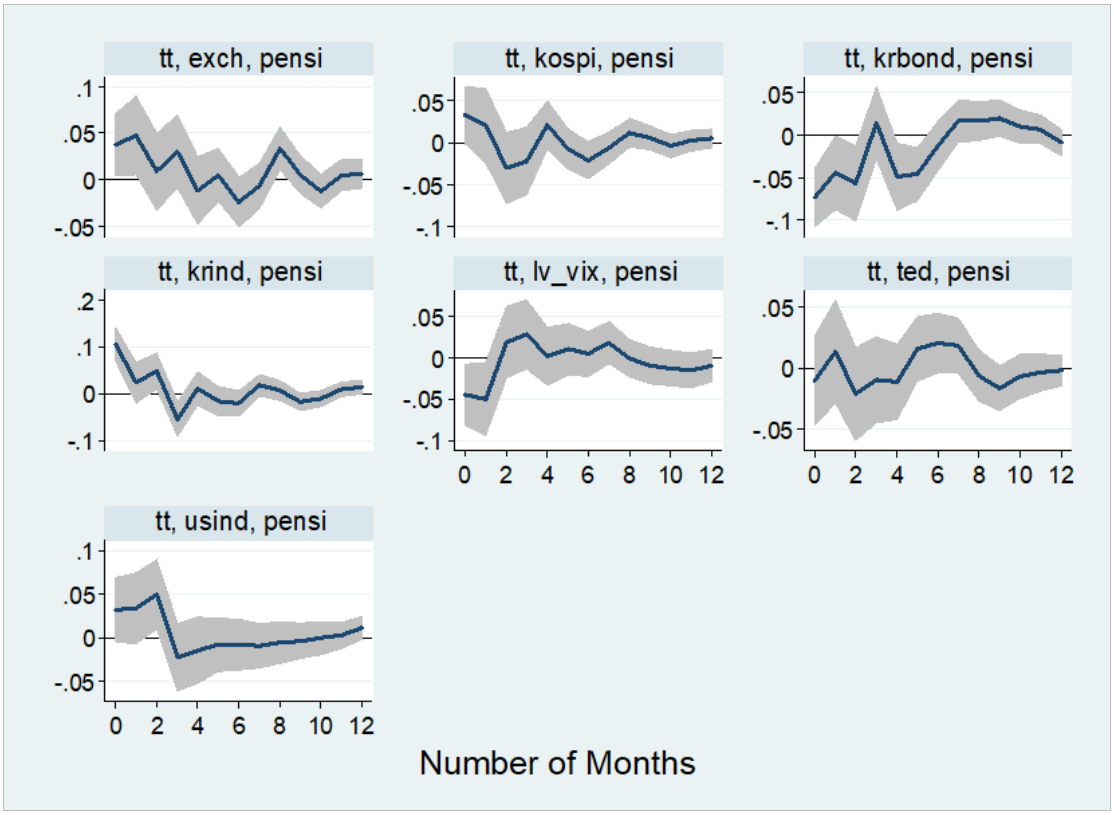
Note: This figure plots the response of the capital inflows of global banks in response to the shock to each explanatory variable. The left panels and right panels show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval.

Figure 1.9: IRF of Securities Company Flows



Note: This figure plots the response of the capital inflows of the securities company in response to the shock to each explanatory variable. The left panels and right panels show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval.

Figure 1.10: IRF of Insurance and Pension Company Flows



Note: This figure plots the response of the capital inflows of insurance and pension company in response to the shock to each explanatory variable. The left panels and right panels show the response and cumulative response, respectively. The shock is one standard deviation shock to each variable and the unit of the response is the trillion in Korean Won. The dotted lines indicate the 68% confidence interval.

Chapter 2

THE DETERMINANTS OF CAPITAL INFLOWS FROM EACH COUNTRY

2.1 Introduction

The 2008 global financial crisis triggered an explosive increase in the volatility of international capital flows and led to policy interventions by emerging countries to reduce that volatility. Research has been actively conducted on the determinants of international capital flows. Existing papers generally take the push-pull factor approach after Calvo et al. (1993). Push factors refer to variables that denote the features of the global or advanced countries which "push out" financial capital from the developed countries to emerging countries. On the contrary, pull factors refer to variables that attract foreign capital to emerging economies.

However, from the perspective of the investor, the specific characteristics of the country to which the investor belongs can also be an important consideration beyond global factors in determining the investor's overseas investment. This is because the liquidity condition of the investor's country can affect the investor's ability to obtain finance for the investment. In addition, financial market fluctuations of the investor country can affect the investor's risk appetite and change the investor's foreign investment. In particular, from the perspective of portfolio theory, the securities markets in emerging economies may act as a complement or substitute to the securities of the investor's home country depending on the stock returns and volatility of investor countries and correlations with other country securities.[1]

The existing literature focusing on country-specific characteristics concentrates primarily on the features of the recipient countries of international capital. They construct panel data

[1]According to the traditional portfolio theorem there are benefits from international diversification if the asset has either low correlation to the existing portfolio or higher rate of average return.

employing capital flows into each economy as dependent variables and global push factors and domestic pull factors of the countries that receive the capital as the explanatory variables. These papers succeed in finding relationships between capital inflows and the characteristics of the recipient country such as economic size and the financial market environment. They also find the determinants of international spillovers of global capital flows. Burger et al. (2018) employ a panel data set of over 50 advanced and emerging countries and show that the recent capital outflows from Asian equity market are temporary while the lower capital inflows to the bond market are persistent. Fratzscher et al. (2017) construct a panel data regression with a country fixed effect and find that US unconventional monetary policy triggered capital inflows to emerging stock markets. Byrne and Fiess (2016) use PANIC (Panel Analysis of Non-stationarity in Idiosyncratic and Common components) approach and find that capital flows are dependent upon domestic structural features such as financial institutions. Fratzscher (2012) employs high-frequency data from EPFR and finds that global factors are the primary drivers to capital flows during the global financial crisis, while domestic factors are the primary drivers after the crisis.[2]

The key contribution of this paper to the existing literature on international capital flows is the consideration of features of the individual investor country that influence capital flows. While most of the research uses capital inflows to various emerging markets, this paper employees capital inflows distinguished by country of origin and constructs a panel data set employing the capital inflows of each economy. In other words, this paper takes the capital inflows from each country as left-hand side variables. Through this classification, it is possible to check the differences in the determinants of capital flows from each country to the emerging countries from each country.

This paper investigates the effect of the investor-country component in the view of the existing push-pull factor approach. To this end, I employ the panel data approach, which

[2]The panel data approach is also frequently employed for testing the effectiveness of the macro-prudential policy. Bruno et al. (2017) find that macroprudential policies helped to stabilize fluctuations of capital inflows to twelve Asian-Pacific countries.

classifies the capital inflows into emerging economies by country of origin and also takes into account investor-country specific factor. This approach makes it possible to introduce investor-country specific factors in addition to the existing push-pull approach. In other words, I divide the traditional push factors by the global push and the investor-country push factor. Thus, the push factor, which is a factor other than the pull factor of the recipient country defined in the existing literature, can be further subdivided into two factors as follows: global factor and investor's country-specific factor. The latter means the factor of the investor country that affects capital inflows to emerging countries. All three factors including pull factor are considered as the determinants of the capital inflows to emerging economies.

For the purpose of this study, the case of Korea is analyzed based on its small open economy and high openness of the financial market. Korea is one of the countries that hardly experienced the Asian financial crisis at the end of the 1990s. In the process of overcoming the crisis Korea improved its financial market system and achieved high capital market openness through the adoption of advanced financial system and continual relaxation of foreign investment regulations.[3] Since the global financial crisis of 2008, Korea has once again experienced an intensified fluctuation of capital inflows due to vulnerabilities to external shocks in a small open economy.[4] Capital flows from various economies, and financial resources have flowed into Korea since the 2000s, partly as a result of the high degree of financial market openness. Also, it is directly influenced by various global factors due to the characteristics of the small open economy and high trade volume. Thus, the study of global capital inflows

[3]The index of the financial market openness of Korea is the highest in the world at the same value as most of the developed economies (Chinn and Ito, 2008).

[4]"vulnerability to capital flow reversals in the banking sector and the associated disruptions to domestic financial conditions. Korea was one of the countries hardest hit in the 1997 Asian financial crisis, and was again at the sharp end of the financial turmoil unleashed after the failure of Lehman Brothers in September 2008." (Bruno and Shin (2014) P.2)
"Using Korean data, we obtain a sizable value for the external finance premium ... Our findings emphasize the importance of financial frictions that magnify the impact of shocks, thereby exacerbating real and financial volatility. These results highlight the role of the latent balance sheet vulnerabilities that are believed to have exacerbated the Korean crisis." (Elekdag et al. (2006) P.239)

into Korea provides important insights for the nature of the various inflows into emerging economies.

This paper provides answers to the following questions: What are the determinants of capital inflows separated by country for the emerging countries? Are investor country factors critical to the international capital flows to emerging economies? If so, how does the macroeconomic variable of the investor's country affect its portfolio investment in emerging economies? Are there any differences between these determinants and their effects on the characteristics of developed countries and developing countries? Is there any difference in the determinant of the capital inflows between before and after the change in the stance of the US monetary policy?

To answer these questions, this paper employs the panel vector autoregression (Panel VAR) analysis. The VAR with the push and pull factors is one of the most generalized models for the analysis used to compare the determinants of capital inflows into emerging markets.[5] It is also desirable to use panel analysis to take into account the capital inflows from each country with various characteristics. Taken together, this paper uses Panel VAR, which is a combination of the two, to find the determinants of the funds flowing from each country into emerging countries. Also, this paper goes one step further by adding the investor country-specific factor, which is a factor of the investor's home country, to the existing general push and pull factor framework.

This paper finds that the investor country-specific factors have a significant influence on investors' inflow and outflow to emerging countries. The most influential variable on the foreign capital flows to the Korean stock market is the stock price index of the investor country. This finding has also been confirmed in foreign capital flows to the Korean bond market. This is the main contribution of my research to the literature since the findings suggest that the source of general push factors pointed out as the determinant of international capital flows in existing papers is investor country's push factors.

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[5]See Bhattarai et al. (2018), De Vita and Kyaw (2008), Ying and Kim (2001), Çulha et al. (2006), De Gregorio et al. (2000).

In terms of the size of the economies of origin of the capital inflows to Korea, the findings show that the determinants of the capital inflows from the advanced countries differ from those of emerging economies. In the case of advanced economies, investors' home country's factors are dominant to their investment to Korea in all cases, while the global or recipient country's factors determine the capital flows from the emerging economies to Korea.

Next, this paper compares the determinants of capital inflows into Korea before and after the implementation of QE. The findings show that the shock on the stock market is the most important when the global liquidity expanded from the US QE implementation, whereas the interest rate was the most important in the era of contractionary monetary policy after the end of QE. In the case of investors in developed countries, however, the shocks on the stock market and interest rate of investor countries are the most important variables, while capital flows from emerging economies are more influenced by the recipient country's stock market and global liquidity.

In addition, through IRF analysis, this paper examines the direction in which the investor country-specific factors influence the capital inflows to Korea. In the case of a positive impact on the investor country's stock market, investors in developed countries increase their investment to Korean financial market, while investors in emerging economies reduce their investment to Korea. Also, this study finds that the same variables have a different impact on the capital inflows to emerging economies by the stance of the US monetary policy. In response of the positive shock of the investor country's equity market, investor increased their investment to the Korean stock market before the end of QE, while it results in the net capital outflows from the Korean stock market during the time of global liquidity contraction.

The remainder of the paper is structured as follows: Section 2.2 presents the movement of the country level capital inflows. Section 2.3 describes the explanatory data and empirical framework. Section 2.4 presents the empirical results and Section 2.5 concludes.

2.2 Individual Country-Level Capital Inflows to Korea

This paper employs the data set on portfolio inflows to Korea measured by the Korean financial supervising service (FSS).[6] Since the primary goal of this study is to find the determinants of capital inflows from each investor country, this paper breaks down the monthly capital inflows to Korea by country of origin. Net capital flows are disaggregated by the level of each investment country.

There are about 56 countries which invest in the Korean stock market and about 31 countries in the bond market as of 2018. In terms of economic size, investment is being made not only through major advanced economies but also through various emerging countries and tax haven countries. The numbers of countries that have steadily invested in the Korean stock market and bond market since 2008 are 25 and 17, respectively.[7] Table 2.1 below contains the list of the countries. In terms of economic size, these countries are sorted to the advanced economies and the emerging economies. In addition, this paper compares the timing of the US Quantitative easing (QE) implementation and the end of the QE period to see if there are any changes in the determinants of capital inflows from each group of countries.

Figure 2.2 and Figure 2.3 show the monthly dynamics of capital inflows to Korea since the 2008 global financial crisis. The two vertical lines emphasize key events during the period under consideration: June 2009, indicating the end of the 2008 global financial crisis cited from NBER.[8], and October 2014 when the US Federal Reserve stopped its long-term securities asset purchasing program.

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[6] FSS is an agency that monitors and publishes statistics on foreign capital inflows and outflows in Korea

[7] For this study, I clean the data by dropping countries with low-frequency monthly data and tax haven from the panel data set since they may cause distorted results. The list of dropped countries as follows: Cayman Islands, Chile, Columbia, Cook Islands, Cyprus, Egypt, Ghana, Guernsey, Israel, Jersey, Kazakhstan, Liechtenstein, Macau, Mauritius, Oman, Panama, Papua New Guinea, Samoa, Seychelles, Slovenia, Sri Lanka.

[8] "The Business Cycle Dating Committee of the National Bureau of Economic Research determined that a trough in business activity occurred in the U.S. economy in June 2009. The trough marks the end of the recession that began in December 2007 and the beginning of an expansion." (September 20, 2010, NBER)

First, there are significant divergences in the dynamics of net capital inflows from each economic group from the key events. Figure 2.2 indicates that although the capital flows from AEs were net outflows during the financial crisis, there have been continuous inflows since the end of 2008 global financial crisis, even after the end of QE. On the other hand, the end of QE triggered substantial outflows from EME and tax haven countries. The capital inflows from EMEs have increased at a rapid pace during the QE implement period but declined after the end of QE. Finally, capital from tax haven countries has continued to flow outward since the financial crisis, and its balance fell sharply compared to its balance at the beginning of the global financial crisis[9].

Second, it indicates the stark difference in the capital flows to the stock and bond markets. Panel A of Figure 2.3 indicates the size of the transaction of the stock market is larger than that of the bond market, but the gap between the two is not significant. Panel B of Figure 2.3 shows that although there have been net capital inflows to both the stock market and the bond market after the end of the global financial crisis, the increase in the bond market is much more substantial than that the stock market.

Third, the above two characteristics are visible from the stock market and the bond market. Figure 2.4 shows the volume of capital inflows to each of the stock market and the bond market. Panel B of Figure 2.4 indicates that the capital inflows to the stock market are very similar to the dynamic movements of each economic group in the total capital inflows to Korea reported by Panel B of Figure 2.2. Panel D of 2.4 shows that the amount of capital inflow to the bond market from emerging economies has increased sharply. The capital inflows from tax haven countries increased during the QE period and decreased after the end of QE.

Fourth, the size of capital inflow from the advanced economies is larger than that of emerging economies both in the stock market and the bond market. This is due to the fact

[9]Meanwhile, the European Sovereign Debt Crisis also had a significant impact on the global financial market, but it did not seem to have had a substantial effect on the capital inflows to Korea. From 2010 to 2012, the capital inflows to Korea are steadily increasing in both stock and bond markets and does not change drastically. This goes hand in hand with Fratzscher (2012).

that the economies of the advanced economies are larger than those of emerging countries. In order to consider the economic size of the country, the capital inflows from each country are divided the GDP of the country[10]. Table 2.1 reports the portfolio inflows to Korea from each investor country scaled by the GDP of the investor country[11]. The average of the absolute value of capital inflows to GDP is 0.142 in developed countries, compared with 0.469 in emerging economies, indicating that the ratio of portfolio flows to GDP invested from emerging economies is larger than that of advanced economies.

2.3 Data and Methodology

2.3.1 Data

It is crucial to select variables representing global factors, regional factors, and domestic factors to analyze the determinants of the movement of the capital from each country. Table 2.2 provides a brief description of the variables, summary statistics, and source information. In order to analyze the determinants of capital inflows by the origin of the country, we should choose variables representing the global, regional, and domestic factors. This paper follows variables that are frequently shown to be significantly meaningful in existing documents to select explanatory variables. The explanatory variables are nine explanatory variables considering three variables for each of global, regional, and domestic factor. The set of global shocks consists of TED spread, VIX, and global stock returns captured by the MSCI world stock index. The deterioration of the global credit market due to the lack of liquidity makes it difficult for investors to finance their investment, which will reduce the capital inflows to emerging economies. I used the TED spread to capture the global liquidity situation.

[10]The literature dealing with panel data scales (normalizes) capital flows to economic scale such as GDP and market capitalization to account for fluctuations in capital flows by economic size across countries (IMF, 2011; Fratzscher, 2012; Dahlhaus and Vasishtha, 2014; Byrne and Fiess, 2016; Fratzscher et al., 2017; Bhattarai et al., 2018).

[11]The capital inflows from each investor country scaled by the GDP is calculated as follows:

$$\frac{\text{Capital Inflows to Korea from country i}}{\text{GDP of country i}}$$

The unit of numerator and denominator is million in US dollar, billion in US dollar, respectively.

Increasing uncertainty in the global financial market may cause investors to freeze their investment sentiment and make capital retrenched from emerging economies. VIX is adopted to measure the risk appetite of global financial markets, which is expected to have a negative relationship with the capital inflows to EMEs. The world stock return is calculated using MSCI world index which can affect the capital inflows to emerging economies[12].

As to the investor country-specific push factors, I considered the industrial production index, interest rate, and stock return. The industrial production index (IPI) represents the output of the investor country, and the shocks on IPI are expected to have both positive and negative impact on capital inflows to emerging economies. The increased IPI may cause portfolio reallocation from the foreign asset to the investor's home country. In contrast, it might enhance capital inflows to emerging market when it improves the investor sentiment. The rise in short-term interest rates of the investor's home country may reflect the contractionary monetary policy which will act as a factor to reduce investment abroad. In the case of the equity return of the investor's country, it depends on the relationship between the investor country's asset and the recipient country (Korea)'s asset. It can have a negative relationship if it acts as a substitute for an emerging stock market whereas it has a positive relationship when it serves as a complement.

As to the domestic pull factor, which is the Korean factor, consists of the Korean IPI, Korean interest rate, and stock market return of Korea. Korea's IPI is expected to stimulate capital inflows because it means improving the real economy in emerging economies. If the rise in the interest rate of Korea is based on the monetary policy of the investor countries, it might result in capital outflows from the Korean stock market through the decline in stock prices. On the other hand, in the bond market, the drop in bond prices from the increasing interest rate may lead to the increase in the demand on the bond and further capital inflows to the bond market. The equity price of Korea is expected to have a positive relationship

[12]Some studies use the S&P 500 index as a proxy for global stock prices. Since the US is considered as an individual investor country this paper, I use the MSCI World index as a global stock price variable. The correlation between the two is 0.917.

with the capital inflow, but the rise in the equity price might be a source of cash outflows due to the realization of capital gains. Table 2.3 shows the priors of the expected impact of the shocks to capital flows to Korea. It is not too much to emphasize that this is merely a hypothetical presumption based on the empirical studies of economic theory, and therefore may be different from the analysis of this paper.

The model also includes two dummy variables: GFC and MP. The dummy variable GFC is to separate the effects from the 2008 global financial crisis periods. I also add the dummy variable MP to take into account the impact of macro-prudential policies introduced to Korea after the global financial crisis[13].

Although these nine variables represent different macro shocks, there may be a close correlation between the variables, which may affect the degree of the accuracy of the estimation. The stock returns are especially highly correlated across countries since they are heavily influenced by the global financial market condition. Therefore, to reduce the potential problems, I separate the global (common) factors and the domestic (idiosyncratic) factors from the individual country's stock return through the orthogonalizing individual country stock return and the global stock return. In other words, I regress the individual country level stock return on the global stock return captured by the MSCI world stock index and use the residual as the pure stock return of the single country[14]. Another possible source of correlation between explanatory variables is industrial production index. Figure 2.5 represents the correlation between the industrial production index (IPI) of the major investor countries in Korea. For the regional factor and the domestic factor, the seasonal adjusted monthly growth rate of the industrial production index of each country is used. In the case of IPI of each country, except for Taiwan, correlation with Korea's IPI is less than

[13]Bruno et al. (2017) shows that macroeconomic policies introduced in emerging countries such as Korea was effective to alleviate the volatility of the cross-border flows.

[14]That is, the shock on the individual country's stock price is calculated from the following equation:

$$Stock\ price_t^i = \beta_0 + \beta_1 \times MSCI_t + \epsilon_t^i$$

and the residual is used to capture the individual country's stock return. See Fratzscher (2012) for similar methodology.

0.3, which is generally small. Therefore, in order to minimize the loss of information, I used the level data of the IPI of each country.

Table 2.4 reports the correlation between the explanatory variables. This indicates that the correlations between the nine factors are generally small and moderate except for the five correlations between TED and VIX; VIX and the global stock return; regional IPI and the regional interest rate; the Korean interest rate and regional IPI; and the Korean interest rate and the regional interest rate. However, these values are much lower than high correlation coefficients of 0.8–0.9, which generates the standard of multicollinearity problem, and the variables are not redundant because they stand for the different economic variables[15]. Also, TED, VIX, and interest rates have already been transformed into the first difference value. In addition, the large sample size of the panel data in this research, which is over 1,000, improves the precision of an estimator, thus alleviates the multicollinearity problem that lowers the efficiency of estimation[16].

Another important econometric issue is the endogeneity issue. If the regressors are endogenous, that is, if some of the explanatory variables are affected by the capital inflows to Korea, then the exogeneity assumption of the empirical model below $E(\epsilon|X)=0$ is violated, and the OLS estimator might be biased and inconsistent. Since capital inflows to emerging economies may affect to the explanatory variables, especially to the domestic pull factors, we need to be very careful about it. To this end, this research uses the VAR model in which only time t term is shown on the left side, and the lagged terms are located on the right side, so the dependent variable does not affect independent variables which reduce simultaneity problems[17]. Furthermore, as descried in the next section, I estimate the empirical model

[15]There is no formal cutoff value to evaluate multicollinearity using the correlation coefficient. However, literature generally says the regression might need to be modified if the correlation coefficient is higher than 0.8. For instance, "The simplest and most obvious means of identifying collinearity is an examination of the correlation matrix for the independent variables. The presence of high correlations (generally .90 and higher) is the first indication of substantial collinearity." (Hair, 2006)

[16]The findings of Mason and Perreault Jr (1991) show that large sample size (over 300) and a high R^2 can offset the multicollinearity problems.

[17]For example, let's consider the following two variables case:

using the generalized method of moments (GMM) which resolves the endogeneity problem as well as the country fixed effect issue.

Lastly, I check the panel unit root test to see if the data is stationary in time series because a non-stationary time series data may result in the spurious regression. Table B.1 reports the results of the Levin—Lin-–Chu test and Harris-–Tzavalis test for the determinants variables[18]. The null hypothesis is rejected at the significance level for all variables.

2.3.2 Empirical Methodology

The objective of this paper is to find the determinants of capital inflows from each economies since the 2008 global financial crisis. In order to consider the characteristics of the investor country, I additionally introduce the country-specific push factors in the general push-pull approach so that the model consists of 3 factors of the global push factor, the country-specific push factor and the domestic pull factor and each of them consists of three macro variables. In addition, two dummy variables representing the global financial crisis and the macro-prudential policy were included. I use the panel vector autoregression (Panel VAR) method introduced in Love and Zicchino (2006) and Abrigo and Love (2016) to find the dynamic relations between the capital inflows to Korea and the explanatory variables from each country. Thus, I consider a ten variate Panel VAR with two dummy variables and the country fixed effects as follows:

$$y_t = \beta_{12} z_t + \gamma_{11} y_{t-1} + \gamma_{12} z_{t-1} + \epsilon_{1t}$$
$$z_t = \beta_{21} y_t + \gamma_{21} y_{t-1} + \gamma_{22} z_{t-1} + \epsilon_{2t}$$

Using matrix notation, the above system can be transformed as follows :

$$\begin{bmatrix} 1 & -\beta_{12} \\ -\beta_{21} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix}$$
$$\Rightarrow B X_t = \Gamma X_{t-1} + \epsilon_t$$

Thus, the independent variables which are lagged variables are not affected by the dependent variables.

[18]Levin—Lin-–Chu test is "a procedure utilizing pooled cross-section time series data to test the null hypothesis that each individual time series contains a unit root against the alternative hypothesis that each time series is stationary." (Levin et al. (2002) p.18). Harris-–Tzavalis test has the same null hypothesis as Levin—Lin-–Chu test, but is proper to test relatively short time period data (Harris and Tzavalis (1999)).

$$Y_{i,t} = \beta_1 \times Y_{i,t-1} + \beta_2 \times Y_{i,t-2} + \cdots + \beta_p \times Y_{i,t-p} + \gamma \times X_{i,t} + \alpha_i + \epsilon_{i,t} \tag{2.1}$$

where i = 1,. . . ,N and t = 1,. . . ,T refers to countries and time, respectively; $Y_{i,t} = [y_{i,t}^1 \;\; y_{i,t}^2 \;\; \cdots \;\; y_{i,t}^{k-1} \;\; y_{i,t}^k]'$ is a (k×1) vector of dependent variables; X is a (l×1) a vector of exogenous variables; α_i is a (k×1) vector capturing country-specific fixed effects; $\epsilon_{i,t}$ is a (k×1) vector of idiosyncratic errors. The innovations are assumed to be covariate stationary as follows: $E[\epsilon_{i,t}] = 0$, $E[\epsilon'_{i,t}\epsilon_{i,t}] = \sigma$, and $E[\epsilon'_{i,t}\epsilon_{i,s}] = 0$ for all $t > S$. The $\beta_1, \beta_2, \ldots, \beta_p$ are vectors of parameters to be estimated.

In order to identify the structural shock, I impose a standard Cholesky decomposition of the estimate of the variance-covariance matrix.[19] A global factor is exogenous to all factors in the system, thus ordered first. Considering Korea as a small open economy, investor country's factor is ordered after the global factor and Korea's factor is responsive to other factors. Among variables, the industrial production index (IPI) which is slower-moving variable is exogenous to other variables. Interest rate is modelled as depending on IPI and stock price adjust immediately to IPI and the interest rate. Thus, the vector of endogenous variables, Y_t is defined as follows:

$$\begin{aligned} Y_{i,t} = & [TED_t,\ VIX_t,\ MSCI_t,\ {IPI_t}^i,\ {Interest\ Rate_t}^i,\ {Stock_t}^i, \\ & {IPI_t}^{KR}, {Interest\ Rate_t}^{KR}, {Stock_t}^{KR}, {NCF_t}^i] \end{aligned} \tag{2.2}$$

As mentioned in Nickell (1981), the estimates from the ordinary least squares (OLS) would be biased even with large N with the presence of lagged dependent variables in the right-hand side of the system of equations. In order to improve efficiency of the estimators, this research employs the general method of moments (GMM) introduced in Abrigo and Love (2016). This approach also resolves country fixed effect issues by subtracting individual average from each observation. Equation (1) can be expressed as follows using the first-order difference transform:

[19] This approach is frequently employed in the existing literature such as Miyajima et al. (2014).

$$
\begin{aligned}
Y^*_{i,t} &= \overline{Y}_{i,t} \times \beta + \epsilon^*_{i,t} \\
Y^*_{i,t} &= \begin{bmatrix} y^{1*}_{i,t} & y^{2*}_{i,t} & \cdots & y^{k-1*}_{i,t} & y^{k*}_{i,t} \end{bmatrix}' \\
\overline{Y}_{i,t} &= [Y^*_{i,t-1} \;\; Y^*_{i,t-2} \;\; \cdots \;\; Y^*_{i,t-p-1} \;\; Y^*_{i,t-p} \;\; X^*_{i,t}] \\
\beta &= [\beta_1 \;\; \beta_2 \;\; \cdots \;\; \beta_{p-1} \;\; \beta_p \;\; \gamma]' \\
\epsilon^*_{i,t} &= [\epsilon^{1*}_{i,t} \;\; \epsilon^{2*}_{i,t} \;\; \cdots \;\; \epsilon^{k-1*}_{i,t} \;\; \epsilon^{k*}_{i,t}]'
\end{aligned}
\tag{2.3}
$$

where an asterisk denotes transform of forward orthogonal deviation proposed by Arellano and Bover (1995) as follows[20]:

$$
y^{k*}_{i,t} = (y^k_{i,t} - \overline{y}^k_{i,t}) \sqrt{T_{i,t}/(T_{i,t}+1)} \tag{2.4}
$$

where $T_{i,t}$ is a number of available future observations for panel i at time t, and $\overline{y}^k_{i,t}$ denotes its average. The mean-differencing procedure eliminates the fixed effects that would create biased coefficients.

According to Hansen (1982) the coefficient matrix, β can be estimated through the generalized method of moment (GMM) as follows:

$$
\hat{\beta} = (\overline{Y}'_{i,t} Z \hat{W} Z' \overline{Y}_{i,t})^{-1} (\overline{Y}'_{i,t} Z \hat{W} Z' Y^*_{i,t}) \tag{2.5}
$$

where $\hat{W}$ is a weighting matrix which is chosen to maximize efficiency. Lagged regressor is used as an instrument (Z) to estimate coefficients.

The purpose of this paper using the above PVAR model is to examine the impact of explanatory variables on a dependent variable, the capital inflows, and their contributions to

[20]This transformation "does not share the weaknesses of the first-difference transformation. Instead of using deviations from past realizations, it subtracts the average of all available future observations, thereby minimizing data loss."(Abrigo and Love, 2016) (P.3).

the variance of the capital inflows. The former is obtained by the impact response function (IRF) and the latter by the forecasted-error variance decomposition (FEVD). Appendix B describes steps of how to estimate IRF and FEVD.

2.4 Empirical Results

2.4.1 Determinant of Country-Level Capital Inflows

This paper analyzes the determinants of capital inflows in each market by separating the stock market from the bond market based on the existing literature which points out that there may be differences in the determinants of capital inflows in the stock market and the bond market.[21] Table 2.5 reports the result of forecast error vector decomposition (FEVD) of the global capital inflows to the stock market. Panel A shows the result of the FEVD for the full period. In the case of the stock market, the shock on the investor country's stock price followed by Korea's stock price is the most dominant factor to the total foreign capital inflows. This suggests that if one analyzes the determinants of international capital flows within the traditional push and pull factor approach, the critical factors such as investor country-specific factors might be omitted.

Next, I look into the sub-periods to see if there were any differences in these determinants before and after the end of US unconventional monetary policy.[22] Panel B and Panel C of Table 2.5 indicate the result of FEVD during QE period and after QE, respectively. First, the country-specific push factor is the most important factor during the QE period, and the most important single shock is the shock on the investor country equity market. However, the domestic interest rate and VIX were the most important factors during the post-QE period. This implies that the change in the stance of the US monetary policy has also influenced the

[21]Recent research (e.g. Fratzscher et al. (2017), Cerutti et al. (2015)) as well as a survey on the empirical literature regarding capital inflows to emerging markets (e.g. Koepke (2019)) separates equity flows and bond flows.

[22]The period of unconventional monetary policy is January 2008 to October 2014 when the US Fed stops its large scale asset purchase program. The post-QE period is November 2014 to August 2018. See Chapter 3 for more details on the US unconventional monetary policy.

behaviors and determinants of the cross-country capital movement.

The advantage of the panel data model used in this paper is that it enables us to sort individual countries into various economic groups. I disaggregate the countries investing in Korea into advanced economies (AEs) and emerging economies (EMEs) in order to examine the potential difference between the determinants of capital inflows from the developed countries and those from the emerging countries. Tables 2.6 and 2.7 report the determinants of capital inflows for the entire period and the two sub-periods from AEs and EMEs, respectively, and Table 2.11 shows the average of the FEVD over ten months. Panel B of Table 2.6 (or the first row of Table 2.11) shows that the shock on the AEs' country-specific equity market is the most important factor during the QE period, while Panel C of Table 2.6 (or the second row of Table 2.11) indicates that the shocks on the investor country's interest rate and the global liquidity (captured by TED spread) are the most important factors during the period after the end of QE. In other words, the stock market conditions of the home country are the most critical factor for the investors of the AEs during the US Fed's expansionary monetary policy, while the investor country's monetary policy and the global liquidity influence dominantly on the AEs investor's behavior in the US contractionary monetary policy period after QE. However, the capital from AEs in both sub-periods have in common that they are affected by the investor country-specific factor more than global push or domestic pull factors.

Table 2.7 reports the determinants of capital inflows from the EMEs to the Korean stock market. Panel B of Table 2.7 (or the third row of Table 2.11) indicates that the shock on the domestic stock price is the most important factor to drive EMEs' stock flows during the QE period while Panel C of Table 2.7 (or the fourth row of Table 2.11) represents the shock on the global liquidity is the dominant factor during the post-QE period. In other words, even in the case of EMEs, the determinants of capital inflows to Korea change before and after the end of the QE. However, in all sub-periods, the movements of the capital from EMEs are more driven by the global push factor or domestic pull factor rather than country-specific push factor.

Tables 2.9 and 2.10 show the result of FEVD of bond flows from the advanced economies, and that from emerging economies, respectively. Table 2.12 shows the summary of Tables 2.9 and 2.10. Panel B of Table Table 2.9 (or the first row of Table 2.12) indicates that the shock on the investor country's stock price and interest rate have the most important impact on bond flows from AEs during the QE period. Panel C of Table 2.9 (or the second row of Table 2.12) shows that the investor country's interest rate followed by the domestic interest rate and the TED spread has the greatest influence on capital movements during the post-QE period. The determinants of the capital inflows from EMEs, however, are different as shown in Table 2.10. Panel B of Table 2.10 (or the third row of Table 2.12) shows that shocks on the domestic stock price and VIX have the most significant impact on the capital inflows from EMEs while Panel C of Table 2.10 (or the fourth row of Table 2.12) represents the domestic stock price is the most important factor to EMEs bond flows during the post-QE. These results imply that the country-specific push factors have little impact on capital flows from EMEs.

2.4.2 Impact of Investor Country-specific Factors

In the previous section, I explore the key determinants of each country's capital inflows to Korea. It is natural to ask questions about how these key determinants affect the movement of capital. We can get answers through the impulse response function (IRF). Especially, how the country-specific push factors affect the capital movement is an interesting topic because it is not considered much in the existing paper. I have focused on the IRF of the shock of the interest rate, and stock price because these are found to be key variables from the FEVD. Appendix B contains the IRF results of all investor-country push factor for all markets and investor economies. First, I compare the IRF for the AEs and EMEs to find the possible heterogeneity between them. Figure 2.6 reports how the capital inflows to the Korean stock market from each economy depends on the shock of the investor country's stock price and the interest rate for the full period. Panel A of figure 2.6 shows that the capital inflows from the advanced countries increased in response to the positive shock on the investor country's

stock market, while panel B of figure 2.6 represents that there are net capital outflows from emerging countries. In other words, when the stock market booms, the investors in the developed countries increased their investment to the Korean stock market, but in the case of investors in emerging countries, they reduced their investment to the Korean stock market. These findings indicate that the the Korean equity is a complement to the AEs equity while it is regarded as a substitute to the EMEs equity.

Panel C and Panel G of figure 2.6 show that there are net capital inflows from AEs investors to Korea in response to the positive shock of the investor country's interest rate, which is counter-intuitive while Panel F of figure 2.6 shows the negative relationship as in the existing paper. This seemingly positive relationship between the shock of interest rates in the investor's country and the capital inflows to Korea might be mostly attributed to the counter-cyclical monetary policy.[23] That is, at the beginning of the global financial crisis with significant capital outflows from EMEs, most of the countries cut their policy rates in response to the worldwide recession. This is confirmed by figure 2.8 in that the estimation excluding the global financial crisis period (January 2008–June 2009) shows a negative impact of the interest rate to the stock flows for both AEs and EMEs investors. One more possible explanation is the signaling effect of monetary policy. After the end of QE, the increase in foreign investment due to the anticipation of economic recovery might be greater than the effect of the capital outflows due to the liquidity contraction.

The responses of the capital inflows to the bond market are reported in the lower four panels of figure 2.6. Panel E and panel F indicate that investors from both advanced and emerging countries have been reduced their investments in the Korean bond market during the home countries' stock market boom. Therefore, it seems that the asset allocations in the Korean bond market will take place depending on the investor countries' stock market situation. Panel G shows net capital inflows from developed countries to the Korean bond market when the investor countries' interest rate rise. This suggests that not only the stock

[23]Çulha et al. (2006); Fratzscher (2012) also find similar results.

market but also the bond market, the effects of the anticipated economic boom are greater than the impact of the liquidity decline.

Next, I divide the whole period into two sub-periods during and after QE to examine if there is a change in the impact of each shock dependent on the stance of US monetary policy.[24] Panel A and B of Figure 2.7 report the response of the capital inflows from the developed countries investors into the Korean stock market in response to the shock on the investors' stock market during the two sub-periods. For the QE period in which the liquidity increased in the global market, the capital inflows to Korean stock market has the positive relationship with the shock on the investor's home countries' stock price, but after the end of QE, capital is retrenched to the home country. Panel C and D of Figure 2.7 show that the capital inflows from developed countries to the Korean stock market responded more to the impact on the shock of the investor-specific interest rate in the post-QE period than that in the QE period. The lower four panels of Figure 2-6 show the response of the capital inflows to the Korean bond market to investor's country shocks. The directions of the impacts are similar during the QE and the post-QE periods.

2.5 Robustness Tests

To ensure robustness, this research conducted four types of sensitivity tests, focusing on sub-period, alternative measure for global factors, alternative orderings of variables, and VAR models estimated for individual EMEs separately. First, I estimate the panel VAR by dropping the global financial crisis (GFC) period from January 2008 to June 2009 from the data, and the result is reported in Table 2.14. The main finding is confirmed in that the most important variable for world stock flows and AEs flows is the investor country's stock price during the QE period. It is noteworthy that when GFC period is excluded, the importance of the TED, the investor country's interest rate, and Korea's factors increases

[24]The existing papers such as Almeida et al. (2016), Hjortsoe et al. (2016), Fratzscher et al. (2017), and Caggiano et al. (2017) show that the impact of macroeconomic shocks, especially from the monetary policy, is time variant depending on economic conditions.

for the AEs equity flows as shown in Panel B of Table 2.14. In particular, in the new model, the importance of liquidity variables such as the TED and the interest rate of the investor country increase and the second most important variable is the investor country's interest rate while the Korean stock price is the second dominant variable in the model in the main text.

In another robustness check, I use alternative global variables to capture the global factors. I employ the monetary supply in major advanced economies (US, EU, Japan, and the UK) instead of the Ted spread. The general picture is very similar to the result of the base model as reported in Table 2.15. Next, I estimate the model with alternative ordering since the panel VAR model might be sensitive to the order of variables. I change the ordering of global liquidity captured by the TED spread and global risk appetite captured by VIX. Table 2.16 reports the result with alternative order. Panel A shows that the significance of the investor country's stock price has been further expanded in global international flows. Panel B describes that the investor country's stock price is still the most dominant single variable. One notable point is that the importance of VIX in the alternative model, where VIX is used as a variable in the first order, increases significantly compared to the base model, where VIX is ordered second. This is because VIX reflects the joint effects of VIX and the TED spread on the capital flows in the alternative model.

Next, I additionally include currency's values to the empirical model since the exchange rate might be an important explanatory variable for capital flows to EMEs. The result of the model with values of investor country's currency and Korea's currency is reported in Table 2.17 and Table 2.18. The result confirms the findings of the main text in that AEs flows are mostly affected by investor country's stock market while EMEs flows are dominated by Korea's stock market. It also confirms the investor country's interest rate drives bond flows from AEs, and VIX and Korea's interest rate are dominating bond flows from EMEs.

Lastly, I estimate a structural VAR model with individual investor country to see if the results in Panel VAR are biased due to the correlation between fixed effects and dependent variables. The results from individual countries also close to those in the benchmark results.

2.6 Conclusion

This paper analyzes the movement of the global portfolio flows from the perspective of investors investing in emerging economies. From an investor's point of view, macroeconomic and financial market factors of the economy of the investor's nationality are an essential consideration for their behavior, so I have also considered an investor country-specific factor for the existing push-pull factor approach. To this end, I disaggregate the capital inflows to Korea by the origin country of the capital, and construct the panel data set including macroeconomic and financial market factors for each investor economy. The panel VAR is used to examine the degree of the influence and direction of the shock on the factors to the capital inflows to Korea.

This paper finds that investors' country factors have a significant impact on foreign capital inflows and outflows. The shocks on the stock market and interest rate shocks of investor countries are the most critical variables in most cases of capital inflows to Korea such as before and after the change of the stance of the US monetary policy and stock market bond market. This is shown evidently in the case of the developed countries, while investors in emerging economies are found to be mainly influenced by the factors of recipient pull factor and global liquidity.

This paper also shows that the impact of investor countries' variables depends on the size of the investor's economy and changes in US monetary policy. In response to the impact of the stock market in the investor country, investors in developed countries expanded their investment in Korea, but investors in emerging economies shrank it. This paper also finds that a positive impact of the stock market of the investor's home country leads to an increase in capital inflows to the Korean equity market during the global liquidity expansion period, while they retrench their investment at the time of the global liquidity contraction. Meanwhile, there are net capital outflows in the Korean bond market in response to the positive shocks in the investor country's equity market.

These results contribute to ongoing debates of the determinants of the international

capital flows. A large volume of studies adopting the push-pull factor approach argues that push factors are the more critical factor. The findings of this paper imply that investor country-specific factors determine the flow of foreign funds when the push factor is divided into global factor and investor country factor. This suggests that policymakers in emerging economies should be aware of their major investors investing in each country and should keep an eye on the economic situation of their home economies. A natural extension of this research in the future could be to disaggregate the source of the capital inflows by the country of investors and institutional types of investors together. This might resolve the possible issue such as omitted variable.

2.7 Tables and Figures

Table 2.1: Capital Flows to Korea from Countries

Country	Group	Total portfolio flows		Stock flows		Bond flows	
		Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Australia	ADE	0.095	0.123	0.087	0.070	0.019	0.018
Austria	ADE	0.020	0.027	0.019	0.018	0.042	0.042
Belgium	ADE	0.055	0.102	0.042	0.042	0.067	0.050
Canada	ADE	0.067	0.085	0.067	0.050	0.014	0.018
Denmark	ADE	0.085	0.114	0.086	0.078	0.032	0.033
Finland	ADE	0.032	0.046	0.032	0.033	0.101	0.101
France	ADE	0.162	0.229	0.101	0.101	0.042	0.071
Germany	ADE	0.081	0.145	0.042	0.071	0.207	0.215
Ireland	ADE	0.707	0.918	0.616	0.462	0.009	0.010
Italy	ADE	0.009	0.013	0.009	0.010	0.021	0.026
Japan	ADE	0.024	0.037	0.021	0.026	0.279	0.298
Luxembourg	ADE	7.870	10.238	5.037	4.201	0.159	0.131
Netherlands	ADE	0.175	0.265	0.157	0.190	0.034	0.054
New Zealand	ADE	0.056	0.130	0.034	0.054	0.228	0.201
Norway	ADE	0.357	0.496	0.228	0.201	0.010	0.031
Portugal	ADE	0.010	0.032	0.010	0.031	0.337	0.403
Spain	ADE	0.017	0.034	0.017	0.030	0.109	0.109
Sweden	ADE	0.110	0.153	0.109	0.109	0.208	0.190
Switzerland	ADE	0.400	0.608	0.208	0.190	0.060	0.069
U.K.	ADE	0.305	0.369	0.278	0.230	0.059	0.053
U.S.	ADE	0.068	0.088	0.059	0.053	1.514	1.673
China	EME	0.035	0.037	0.014	0.018	0.086	0.078
Hong Kong	EME	0.825	1.503	0.207	0.215	0.001	0.002
India	EME	0.001	0.002	0.001	0.002	0.616	0.462
Kuwait	EME	0.312	0.452	0.279	0.298	5.037	4.201
Malaysia	EME	0.542	0.832	0.159	0.131	0.157	0.190
Saudi Arabia	EME	0.337	0.526	0.337	0.403	1.040	0.945
Singapore	EME	1.440	1.894	1.040	0.945	0.004	0.007
South Africa	EME	0.065	0.328	0.004	0.007	0.017	0.030
Taiwan	EME	0.106	0.162	0.060	0.069	0.000	0.000
Thailand	EME	1.213	2.060	0.000	0.000	0.215	0.496
U.A.E.	EME	0.248	0.558	0.215	0.496	0.278	0.230
Advanced		0.142	0.201	0.111	0.102	0.170	0.183
Emerging		0.466	0.759	0.211	0.235	0.677	0.604
World		0.257	0.399	0.146	0.149	0.350	0.332

Note: The table indicates the capital inflows to Korea from each investor country scaled by the GDP of each country. Mean is based on the absolute value of the net capital flows to GDP and Standard deviation is calculated using the original net capital flows to GDP. Luxembourg is excluded in the average of the world and advanced economies.

Table 2.2: Summary of Determinants

Variable	Definition	Mean	Std Dev	Source
Global Push Factors				
TED	Ted spread, first differentiated, %p	-0.013	0.230	FRED
VIX	Volatility index, First differenciated, standardized, %p	0.000	1.000	FRED
MSCI	Monthly returns on MSCI world index, %	0.002	0.048	Bloomberg
Country-specific Push Factors				
IPI	Industrial production index, standardized, mom, %	0.000	0.414	OECD
Interest Rate	Interest rate on 1-year government bond, first differentiated, %p	-0.025	0.132	Bloomberg
stock_regional	Monthly stock returns on each country, orthog to MSCI world index, %	0.000	0.015	Bloomberg
Domestic Factors				
IPI_KR	Korean industrial production index , standardized, mom, %	0.000	1.000	BOK
i_KR	MSCI world index, monthly % retruns	-0.028	0.178	BOK
Stock_KR	Monthly stock returns on Korea, orthogonalized to MSCI world index, %	0.000	0.032	BOK
Crisis Dummies				
GFC	Global financial crisis dummy			MOEF
MP	Macro-prudental policy dummy			MOEF

Note: The table presents the description of data and the source. The Sample period range from January 2008 to August 2018.

Table 2.3: Expected Impact of Shocks on Portfolio Flows to Emerging Economies

		ADE		EME	
		Equity	Bond	Equity	Bond
Global factor	TED	−	−	−	−
	VIX	−	−?	−	?
	Stock	+?	−	+?	−
Investor country factor	IPI	+	+	−	−
	Interest Rate	−	−?	−	−?
	Stock	+?	+?	−?	−?
Domestic factor	IPI	+	?	+	?
	Interest Rate	−	+	−	+
	Stock	+	?	+	?

Note: The table shows the priors of the expected impact of the shocks to capital flows to the emerging market. It is not too much to emphasize that this is merely a hypothetical presumption based on the empirical studies of economic theory, and therefore may be different from the analysis of this paper. The positive and the negative sign means an increase and a decrease in the net capital inflows, respectively.

Table 2.4: Correlations across Variables

	TED	VIX	MSCI	IPI_investor	i_investor	Stock_investor	IPI_KR	i_KR	Stock_KR
TED	1.000	0.480	-0.216	0.131	0.220	-0.114	0.108	0.322	-0.053
VIX		1.000	-0.687	-0.118	-0.113	-0.188	0.035	0.115	-0.207
MSCI			1.000	0.292	0.171	0.000	0.043	0.199	0.000
$\text{IPI}_{investor}$				1.000	0.561	0.082	0.389	0.621	-0.089
$\text{i}_{investor}$					1.000	0.039	0.295	0.621	0.080
$\text{Stock}_{investor}$						1.000	0.175	-0.078	0.326
IPI_{KR}							1.000	0.338	0.116
i_{KR}								1.000	-0.256
Stock_{KR}									1.000

Note: The table shows the correlations between the explanatory variables. Subscription *investor* and *KR* implies the investor country specific factor and the recipient country (Korea) factor, respectively. The Sample period range from January 2008 to August 2018.

Table 2.5: FEVD of Stock Flows (World)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	1.4	0.4	0.2	1.9	0.4	0.6	3.5	1.2	0.0
Full	2	1.2	1.4	0.2	1.6	0.9	9.3	2.8	0.9	5.7
	3	1.2	1.5	0.2	1.7	1.1	10.8	2.7	0.9	6.3
	4	1.2	1.6	0.3	1.7	1.2	11.1	2.7	0.9	6.5
	5	1.2	1.7	0.3	1.7	1.2	11.3	2.7	0.9	6.5
	6	1.2	1.8	0.3	1.8	1.2	11.3	2.7	0.9	6.5
	7	1.2	1.8	0.3	1.7	1.2	11.3	2.6	0.9	6.5
	8	1.2	1.8	0.3	1.7	1.2	11.3	2.6	0.9	6.5
	9	1.2	1.8	0.3	1.7	1.2	11.3	2.6	0.9	6.5
	10	1.2	1.8	0.3	1.7	1.2	11.3	2.6	0.9	6.5
Panel B	1	0.0	0.6	1.3	0.1	3.2	0.3	0.3	2.6	0.3
QE	2	0.7	0.4	0.9	0.1	2.4	14.8	0.3	2.5	0.5
	3	1.3	0.5	0.9	0.1	2.5	15.1	0.3	2.3	0.5
	4	1.4	1.0	1.0	0.1	2.7	15.1	0.3	2.3	0.5
	5	1.4	1.3	1.0	0.1	2.7	15.1	0.3	2.3	0.5
	6	1.4	1.5	1.0	0.1	2.7	15.0	0.3	2.3	0.5
	7	1.4	1.6	1.0	0.1	2.8	15.0	0.4	2.3	0.5
	8	1.4	1.7	1.0	0.1	2.8	15.0	0.4	2.3	0.5
	9	1.4	1.7	1.1	0.1	2.8	15.0	0.4	2.3	0.5
	10	1.4	1.7	1.1	0.1	2.8	15.0	0.4	2.3	0.6
Panel C	1	6.2	31.6	0.0	0.7	0.7	0.0	1.7	0.7	0.1
Post-QE	2	9.7	20.2	1.1	0.5	2.6	14.5	4.2	6.9	0.3
	3	7.7	16.6	1.1	0.4	2.3	11.6	5.5	20.5	0.3
	4	7.7	15.4	1.6	0.4	2.4	12.9	5.3	22.2	0.3
	5	7.4	18.0	1.7	0.3	2.3	13.5	5.2	21.6	0.4
	6	7.1	17.7	1.7	0.3	2.1	13.2	5.3	24.2	0.4
	7	7.0	17.1	1.7	0.3	2.1	13.1	5.3	25.7	0.8
	8	6.9	16.8	1.9	0.3	2.0	13.3	5.2	25.4	1.5
	9	7.2	16.6	1.9	0.3	2.0	13.2	5.2	25.2	2.2
	10	7.2	16.6	2.0	0.3	2.0	13.0	5.1	24.9	3.0

Note: The table reports the result of the FEVD of the portfolio inflows to the equity market. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.6: FEVD of Stock Flows (Advanced Economies)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	2.6	0.8	1.8	0.4	3.3	2.8	10.1	0.2	0.0
Full	2	1.7	2.1	2.0	0.2	3.4	17.0	6.8	0.1	10.5
	3	1.6	2.1	1.8	0.3	3.9	17.8	6.2	0.2	12.7
	4	1.6	2.3	1.8	0.3	4.5	17.7	6.1	0.2	12.7
	5	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.2	12.9
	6	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.3	13.0
	7	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.3	13.0
	8	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.3	13.0
	9	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.3	13.0
	10	1.7	2.3	1.8	0.3	4.6	17.9	6.0	0.3	13.0
Panel B	1	0.0	5.2	0.2	0.4	4.6	3.2	10.0	2.7	1.5
QE	2	0.0	3.2	0.1	0.2	3.4	27.0	6.1	2.7	6.9
	3	0.3	3.0	0.2	0.3	3.4	29.2	5.7	2.5	6.5
	4	0.3	3.2	0.2	0.3	3.5	29.1	5.6	2.4	6.7
	5	0.3	3.4	0.2	0.3	3.5	29.0	5.5	2.4	6.7
	6	0.3	3.5	0.2	0.3	3.6	28.9	5.5	2.4	6.7
	7	0.3	3.5	0.2	0.3	3.6	28.9	5.5	2.4	6.7
	8	0.3	3.6	0.2	0.3	3.7	28.9	5.5	2.4	6.7
	9	0.3	3.6	0.2	0.3	3.7	28.9	5.5	2.4	6.7
	10	0.3	3.6	0.2	0.3	3.7	28.9	5.5	2.4	6.7
Panel C	1	4.3	1.7	0.9	6.5	0.2	1.5	14.5	2.8	0.6
Post-QE	2	7.9	1.0	1.1	4.0	22.3	0.8	9.3	4.7	1.2
	3	9.9	2.0	1.6	3.4	21.8	1.2	8.4	4.8	1.9
	4	10.2	2.0	2.0	3.3	21.5	1.7	8.0	4.5	2.9
	5	11.2	1.9	2.3	3.1	21.4	1.6	7.7	4.3	3.9
	6	12.3	2.0	2.4	3.0	21.0	1.8	7.4	4.2	4.7
	7	12.3	2.5	2.6	2.9	20.6	2.0	7.2	4.1	5.6
	8	12.4	2.6	2.7	2.8	20.2	2.0	7.0	4.3	6.6
	9	12.9	2.7	2.9	2.7	19.8	2.1	6.9	4.4	7.3
	10	13.0	3.2	2.9	2.7	19.4	2.3	6.7	4.4	7.9

Note: The table reports the result of the FEVD of the portfolio inflows to the equity market from the advanced economies. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.7: FEVD of Stock Flows (Emerging Economies)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Full	2	0.2	1.3	3.9	0.0	0.0	0.1	0.4	0.0	0.5
	3	0.5	1.3	3.8	0.1	0.1	2.3	0.4	0.1	0.8
	4	0.5	1.3	4.1	0.2	0.2	2.3	0.6	0.1	0.8
	5	0.5	1.3	4.0	0.2	0.2	2.8	0.6	0.1	0.8
	6	0.5	1.4	4.1	0.2	0.2	2.8	0.6	0.1	0.9
	7	0.5	1.4	4.1	0.2	0.2	2.8	0.6	0.1	0.9
	8	0.5	1.4	4.1	0.2	0.2	2.8	0.6	0.1	0.9
	9	0.5	1.4	4.1	0.2	0.2	2.8	0.6	0.1	0.9
	10	0.5	1.4	4.1	0.2	0.2	2.8	0.6	0.1	0.9
Panel B	1	2.8	0.0	5.1	0.6	1.4	0.0	1.0	0.6	0.3
QE	2	3.2	0.6	4.4	0.4	1.1	15.1	0.9	0.5	5.9
	3	3.4	0.9	5.4	0.9	1.3	13.7	0.8	0.4	11.5
	4	3.4	0.8	6.4	1.1	1.2	12.6	0.8	0.5	16.7
	5	3.2	0.9	7.3	2.0	1.1	11.5	0.8	0.4	21.2
	6	3.1	0.9	8.6	2.2	1.0	10.5	0.7	0.4	25.7
	7	3.1	0.9	9.4	3.0	0.9	9.5	0.7	0.4	29.7
	8	3.0	0.9	10.4	3.3	0.8	8.6	0.7	0.4	33.7
	9	2.9	0.8	11.3	3.8	0.8	7.8	0.6	0.4	37.2
	10	2.8	0.8	12.1	4.1	0.7	7.0	0.6	0.3	40.6
Panel C	1	0.7	0.1	2.4	3.0	0.0	0.9	2.5	2.2	0.2
Post-QE	2	15.3	2.7	2.9	3.8	0.1	6.2	2.5	1.8	0.4
	3	13.1	2.4	2.5	3.2	0.8	12.5	2.2	9.1	0.4
	4	17.7	2.2	2.3	3.0	0.8	11.8	2.0	8.8	0.8
	5	17.3	2.4	2.5	2.9	0.9	12.1	2.1	9.5	1.4
	6	17.7	2.4	2.4	3.0	0.9	12.2	2.0	9.3	1.7
	7	17.5	2.9	2.4	3.0	0.9	12.3	2.0	9.5	1.9
	8	17.4	3.4	2.5	3.0	0.9	12.3	2.0	9.4	2.2
	9	17.6	3.4	2.5	3.0	0.9	12.3	2.0	9.5	2.3
	10	17.7	3.4	2.5	3.0	0.9	12.3	2.0	9.5	2.3

Note: The table reports the result of the FEVD of the portfolio inflows to the equity market from the emerging economies. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.8: FEVD of Bond Flows (World)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	0.0	0.0	1.0	1.5	3.4	0.7	0.7	9.4	2.1
Full	2	0.5	0.1	1.2	0.8	4.0	26.2	0.4	5.2	14.0
	3	0.5	0.1	1.2	0.8	4.0	26.3	0.4	4.8	17.2
	4	0.5	0.2	1.2	0.8	3.9	27.0	0.4	4.7	16.9
	5	0.6	0.2	1.3	0.8	4.0	26.9	0.5	4.7	16.9
	6	0.6	0.2	1.3	0.8	4.1	26.9	0.5	4.7	17.0
	7	0.6	0.2	1.4	0.8	4.1	26.8	0.5	4.7	17.0
	8	0.6	0.3	1.4	0.8	4.1	26.8	0.5	4.7	17.0
	9	0.6	0.3	1.4	0.8	4.1	26.8	0.5	4.7	17.0
	10	0.6	0.3	1.4	0.8	4.1	26.8	0.5	4.7	17.0
Panel B	1	2.1	0.0	5.9	2.5	5.1	3.5	6.8	9.5	0.8
QE	2	1.1	0.0	4.0	2.2	4.2	30.5	3.3	4.6	16.9
	3	1.0	0.1	4.1	2.7	4.3	31.8	3.0	4.3	16.7
	4	1.0	0.1	4.2	2.8	4.2	32.8	2.9	4.1	17.0
	5	1.0	0.2	4.2	2.9	4.2	33.1	2.9	4.0	17.0
	6	1.0	0.2	4.2	2.9	4.1	33.2	2.9	4.0	17.0
	7	1.0	0.2	4.2	3.0	4.1	33.3	2.9	4.0	17.0
	8	1.0	0.2	4.2	3.0	4.1	33.3	2.9	4.0	17.0
	9	1.0	0.2	4.2	3.0	4.1	33.3	2.9	4.0	17.0
	10	1.0	0.2	4.2	3.0	4.1	33.3	2.9	4.0	17.0
Panel C	1	0.7	10.8	11.2	0.1	0.0	0.4	2.9	8.0	0.1
Post-QE	2	20.4	5.5	5.9	0.4	2.4	3.3	3.5	21.3	4.0
	3	18.3	5.5	5.6	0.3	2.0	2.6	3.4	33.2	4.2
	4	16.4	4.8	5.2	0.3	2.4	8.8	3.4	32.5	4.3
	5	15.3	7.1	5.2	0.3	2.3	8.3	3.4	33.4	4.5
	6	14.5	7.0	4.9	0.3	2.3	8.9	3.4	35.0	4.5
	7	14.0	7.2	4.8	0.3	2.3	9.0	3.5	36.0	4.5
	8	13.6	7.3	4.6	0.3	2.3	9.2	3.4	36.7	4.5
	9	13.3	7.3	4.6	0.3	2.3	9.2	3.5	37.3	4.5
	10	13.2	7.4	4.5	0.3	2.3	9.3	3.5	37.7	4.4

Note: The table reports the result of the FEVD of the portfolio inflows to the bond market. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.9: FEVD of Bond Flows (Advanced Economies)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	2.3	0.5	3.4	0.1	6.9	0.2	0.6	4.2	0.5
Full	2	2.2	0.3	2.8	0.0	14.5	24.0	0.5	2.5	0.6
	3	4.5	0.3	4.1	0.0	15.9	21.7	0.8	2.1	5.5
	4	4.2	0.3	4.3	0.1	14.9	22.3	0.8	2.0	9.0
	5	4.9	0.3	4.9	0.1	14.4	21.5	1.0	1.9	10.3
	6	4.8	0.3	5.1	0.1	14.1	21.2	1.1	1.9	12.0
	7	4.9	0.3	5.3	0.1	13.8	21.0	1.1	1.9	12.8
	8	5.0	0.3	5.4	0.1	13.7	20.8	1.1	1.8	13.4
	9	5.0	0.3	5.4	0.1	13.6	20.7	1.2	1.8	13.8
	10	5.0	0.3	5.5	0.1	13.5	20.6	1.2	1.8	14.1
Panel B	1	0.3	2.7	7.5	10.6	18.4	0.2	0.3	5.1	0.1
QE	2	3.0	1.4	3.6	8.4	16.2	33.8	0.2	2.3	3.8
	3	2.8	1.3	3.9	8.6	15.4	32.5	0.2	2.1	8.8
	4	3.2	1.2	4.8	8.6	14.6	32.8	0.3	2.0	8.9
	5	3.4	1.2	5.3	8.2	14.1	31.5	0.3	1.9	11.4
	6	3.6	1.2	5.8	8.0	13.6	30.7	0.3	1.9	12.8
	7	3.7	1.1	6.3	7.8	13.3	29.9	0.4	1.8	14.3
	8	3.9	1.1	6.7	7.6	12.9	29.1	0.4	1.8	15.6
	9	4.0	1.1	7.0	7.5	12.6	28.5	0.4	1.8	16.7
	10	4.1	1.1	7.3	7.3	12.4	27.9	0.4	1.7	17.7
Panel C	1	1.2	27.8	2.5	6.2	0.3	0.8	6.8	9.5	0.0
Post-QE	2	27.1	11.9	3.3	3.1	18.1	2.2	3.4	9.1	2.7
	3	19.9	12.4	2.5	3.0	23.7	1.6	2.5	17.6	2.6
	4	17.5	10.4	2.7	2.6	29.7	4.7	2.3	15.6	2.4
	5	16.0	12.7	2.5	2.7	29.4	4.3	2.1	16.6	2.6
	6	15.3	11.9	2.5	2.6	31.6	4.8	2.0	16.7	2.6
	7	14.5	12.2	2.3	2.6	32.5	4.6	1.9	17.3	2.6
	8	14.0	11.9	2.3	2.5	33.6	4.8	1.8	17.3	2.6
	9	13.6	12.0	2.2	2.5	34.1	4.7	1.8	17.6	2.6
	10	13.4	11.9	2.2	2.5	34.7	4.8	1.7	17.7	2.6

Note: The table reports the result of the FEVD of the portfolio inflows to the bond market from the advanced economies. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.10: FEVD of Bond Flows (Emerging Economies)

		Push						Pull		
		Golbal			Investor Country			Domestic		
Period		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	2.3	7.9	4.4	0.8	0.3	0.1	1.3	0.0	0.3
Full	2	2.2	7.4	4.0	0.6	0.2	5.6	1.0	0.0	13.1
	3	2.4	7.5	4.1	0.6	0.4	6.6	1.0	0.0	13.3
	4	2.4	7.8	4.1	0.6	0.5	6.6	1.0	0.0	13.2
	5	2.4	8.0	4.1	0.6	0.5	6.6	1.0	0.1	13.2
	6	2.5	8.0	4.1	0.6	0.5	6.6	1.0	0.1	13.2
	7	2.5	8.0	4.1	0.6	0.5	6.6	1.0	0.1	13.2
	8	2.5	8.0	4.1	0.6	0.5	6.7	1.0	0.1	13.2
	9	2.5	8.0	4.1	0.6	0.5	6.7	1.0	0.1	13.2
	10	2.5	8.0	4.1	0.6	0.5	6.7	1.0	0.1	13.2
Panel B	1	4.8	12.7	5.5	0.4	1.0	0.1	0.3	0.0	0.0
QE	2	4.3	11.1	4.8	0.3	0.8	6.8	0.5	0.2	11.9
	3	4.3	10.7	4.8	0.3	1.7	8.1	0.5	0.2	11.6
	4	4.4	10.6	5.0	0.3	1.9	8.2	0.5	0.2	11.7
	5	4.4	10.5	5.0	0.3	1.9	8.5	0.5	0.2	11.7
	6	4.4	10.5	5.0	0.3	1.9	8.6	0.5	0.2	11.7
	7	4.4	10.5	5.0	0.3	1.9	8.7	0.5	0.2	11.8
	8	4.4	10.5	5.0	0.3	1.9	8.7	0.5	0.2	11.8
	9	4.4	10.5	5.0	0.3	1.9	8.8	0.5	0.2	11.8
	10	4.4	10.5	5.0	0.3	1.9	8.8	0.5	0.2	11.8
Panel C	1	2.9	1.2	0.2	0.1	0.2	0.8	1.7	0.8	1.5
Post-QE	2	4.1	1.1	0.3	0.5	0.2	3.8	1.3	4.6	5.3
	3	6.0	1.1	0.7	0.5	0.5	3.1	1.4	6.9	16.5
	4	6.7	1.4	1.3	0.7	0.5	2.6	1.1	7.2	27.8
	5	7.2	2.7	1.7	0.9	0.5	2.1	0.9	7.6	35.2
	6	7.0	3.7	1.9	0.9	0.6	1.8	0.8	8.6	41.0
	7	7.2	4.3	2.1	0.8	0.6	1.5	0.7	10.0	45.3
	8	7.3	4.7	2.4	0.7	0.6	1.2	0.6	11.3	48.9
	9	7.3	5.2	2.5	0.7	0.6	1.0	0.6	12.5	51.5
	10	7.3	5.7	2.6	0.6	0.7	0.8	0.5	13.6	53.3

Note: The table reports the result of the FEVD of the portfolio inflows to the bond market from the emerging economies. The upper panel reports the full period and the middle and lower panel B reports the sub-period of the QE period and post-QE period, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to August 2018.

Table 2.11: Summary of FEVD of Stock Flows

		Push						Pull		
		Golbal			Investor			Domestic		
		TED	VIX	Stock	IPI	i	Stock	IPI	i	Stock
ADE	QE	0.2	3.6	0.2	0.3	3.7	26.2	6.0	2.5	6.2
	PQE	10.6	2.2	2.1	3.4	18.8	1.7	8.3	4.2	4.3
EME	QE	3.1	0.7	8.0	2.1	1.0	9.6	0.8	0.4	22.3
	PQE	15.2	2.5	2.5	3.1	0.7	10.5	2.1	7.9	1.4

Note: The table reports the variables which are shown to be the single most dominant variables to each flows presented in Table 2.5 to Table 2.10.

Table 2.12: Summary of FEVD of Bond Flows

		Push						Pull		
		Golbal			Investor			Domestic		
		TED	VIX	Stock	IPI	i	Stock	IPI	i	Stock
ADE	QE	3.2	1.3	5.8	8.3	14.3	27.7	0.3	2.2	11.0
	PQE	15.3	13.5	2.5	3.0	26.8	3.8	2.6	15.5	2.3
EME	QE	4.4	10.8	5.0	0.3	1.7	7.5	0.5	0.2	10.6
	PQE	6.3	3.1	1.6	0.7	0.5	1.8	1.0	8.3	32.6

Note: The table reports the 10-month average of each variable contribution to the portfolio flows variance reported in Table 2.6 to Table 2.7.

Table 2.13: Summary of Determinants of Capital Flows

Economy	Period	Equity	Bond
World	QE	Regional stock	Regional stock
	Post QE	Domestic interest rate	Domestic interest rate
ADE	QE	Regional stock	Regional stock
	Post QE	Regional interest rate	Regional interest rate
EME	QE	Dometic stock	Dometic stock
	Post QE	Global liquidity	Dometic stock

Note: The table reports the 10-month average of each variable contribution to the portfolio flows variance reported in Table 2.9 to Table 2.10.

Table 2.14: FEVD of Stock Flows (Sub-period)

		Push						Pull		
		Golbal			Regional			Domestic		
		TED	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	0.0	16.5	1.3	0.5	12.7	0.0	1.1	4.6	2.8
World	2	2.2	10.5	2.7	0.3	9.1	27.2	1.3	5.2	2.2
	3	5.9	11.9	2.7	0.3	8.6	25.7	1.2	4.8	2.4
	4	7.4	11.3	2.6	0.4	8.9	24.2	1.2	4.8	5.1
	5	7.2	11.1	2.6	0.4	8.7	26.0	1.2	4.7	5.0
	6	7.2	11.2	2.6	0.4	8.7	26.0	1.2	4.7	5.0
	7	7.3	11.1	2.6	0.4	8.7	25.9	1.2	4.7	5.0
	8	7.4	11.1	2.6	0.4	8.8	25.9	1.2	4.7	5.0
	9	7.4	11.1	2.6	0.4	8.8	25.8	1.2	4.7	5.0
	10	7.4	11.1	2.6	0.4	8.9	25.8	1.2	4.7	5.0
Panel B	1	0.8	2.0	13.4	0.0	3.1	4.0	20.8	1.8	0.3
ADE	2	1.6	1.7	7.7	0.2	5.8	31.2	12.2	4.3	1.3
	3	1.6	1.3	6.4	0.2	14.3	25.0	9.9	6.9	6.5
	4	10.4	1.2	6.1	0.2	12.4	23.0	10.2	7.3	6.3
	5	11.5	1.1	5.5	0.2	11.5	22.5	9.5	7.2	10.1
	6	12.4	1.1	5.4	0.2	11.8	22.0	9.4	7.2	10.1
	7	12.7	1.3	5.3	0.2	11.7	21.6	9.4	7.3	10.5
	8	12.7	1.7	5.2	0.2	11.9	21.7	9.4	7.2	10.3
	9	12.6	1.7	5.2	0.2	12.2	21.5	9.4	7.4	10.4
	10	13.0	1.7	5.2	0.2	12.1	21.7	9.4	7.3	10.3
Panel C	1	0.1	0.0	0.0	0.1	1.0	0.2	0.3	0.0	0.2
EME	2	0.2	2.8	0.2	0.2	0.9	7.4	0.7	0.5	1.5
	3	4.2	2.6	0.7	0.2	0.9	7.5	0.8	0.5	2.5
	4	4.3	2.5	1.2	0.3	0.9	7.5	0.9	1.0	3.2
	5	4.8	2.5	1.2	0.3	0.9	7.6	0.9	1.1	3.3
	6	4.8	2.5	1.2	0.3	0.9	7.6	0.9	1.2	3.5
	7	4.9	2.5	1.2	0.3	0.9	7.6	1.0	1.2	3.5
	8	4.9	2.5	1.2	0.3	0.9	7.7	1.0	1.2	3.5
	9	4.9	2.5	1.2	0.3	0.9	7.7	1.0	1.2	3.5
	10	4.9	2.5	1.2	0.3	0.9	7.7	1.0	1.2	3.5

Note: The table reports the result of the FEVD of equity flows. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The sample period ranges from July 2009 to October 2014.

Table 2.15: FEVD of Stock Flows (Alternative Measurement)

		Push						Pull		
		Golbal			Regional			Domestic		
		MS	VIX	stock	IPI	i	stock	IPI	i	stock
Panel A	1	0.2	0.0	0.0	0.2	2.0	0.2	0.0	0.0	0.1
World	2	0.2	0.2	1.2	0.2	2.1	6.0	0.0	0.1	0.6
	3	1.5	0.3	1.4	0.2	2.5	5.7	0.1	0.1	0.9
	4	1.6	0.4	1.4	0.2	2.4	6.1	0.1	0.1	1.3
	5	1.7	0.7	1.4	0.2	2.4	6.1	0.1	0.1	1.3
	6	1.7	0.8	1.4	0.2	2.4	6.1	0.2	0.2	1.4
	7	1.8	1.0	1.4	0.2	2.4	6.1	0.2	0.2	1.4
	8	1.8	1.1	1.4	0.2	2.5	6.1	0.2	0.2	1.4
	9	1.8	1.2	1.4	0.2	2.5	6.1	0.2	0.2	1.4
	10	1.8	1.3	1.4	0.2	2.6	6.1	0.2	0.2	1.4
Panel B	1	17.9	1.7	0.6	12.0	3.3	1.5	0.3	0.0	0.1
ADE	2	20.6	0.8	0.7	10.2	2.1	22.7	0.2	0.4	6.7
	3	18.3	0.7	1.0	11.4	2.9	26.3	0.2	0.3	8.6
	4	17.4	0.7	0.9	12.0	3.8	27.4	0.6	0.3	8.4
	5	16.8	0.8	1.0	12.2	4.6	27.7	0.6	0.4	8.3
	6	16.5	0.9	1.1	12.3	5.2	27.8	0.6	0.4	8.2
	7	16.3	0.9	1.1	12.4	5.6	27.8	0.6	0.4	8.1
	8	16.2	1.0	1.1	12.4	5.8	27.9	0.6	0.5	8.0
	9	16.1	1.0	1.1	12.4	6.0	27.9	0.6	0.5	8.0
	10	16.0	1.0	1.1	12.5	6.1	27.9	0.6	0.5	8.0
Panel C	1	0.1	0.0	0.6	0.0	1.6	0.0	6.0	0.5	0.0
EME	2	7.6	0.4	4.9	0.1	1.4	13.4	5.1	0.5	0.8
	3	7.4	1.0	4.5	0.1	1.4	13.3	5.0	0.5	4.6
	4	7.3	1.0	4.5	0.1	1.4	13.2	5.1	0.6	5.6
	5	7.3	1.2	4.4	0.1	1.4	13.1	5.1	0.6	6.2
	6	7.2	1.2	4.6	0.2	1.4	13.0	5.2	0.6	6.3
	7	7.2	1.2	4.6	0.2	1.4	13.0	5.2	0.6	6.4
	8	7.2	1.2	4.6	0.2	1.4	13.0	5.2	0.6	6.4
	9	7.2	1.2	4.7	0.2	1.4	13.0	5.2	0.6	6.4
	10	7.2	1.2	4.7	0.2	1.4	13.0	5.2	0.6	6.4

Note: The table reports the result of the FEVD of equity flows. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The sample period ranges from January 2008 to October 2014.

Table 2.16: FEVD of Stock Flows (Alternative Ordering)

		Push						Pull		
		Golbal			Regional			Domestic		
		VIX	TED	stock	IPI	i	stock	IPI	i	stock
Panel A	1	0.6	0.0	1.3	0.1	3.2	0.3	0.3	2.6	0.3
World	2	0.5	0.6	0.9	0.1	2.4	14.8	0.3	2.5	0.5
	3	0.5	1.4	0.9	0.1	2.5	15.1	0.3	2.3	0.5
	4	0.7	1.6	1.0	0.1	2.7	15.1	0.3	2.3	0.5
	5	1.1	1.7	1.0	0.1	2.7	15.1	0.3	2.3	0.5
	6	1.3	1.7	1.0	0.1	2.7	15.0	0.3	2.3	0.5
	7	1.4	1.6	1.0	0.1	2.8	15.0	0.4	2.3	0.5
	8	1.5	1.7	1.0	0.1	2.8	15.0	0.4	2.3	0.5
	9	1.5	1.7	1.1	0.1	2.8	15.0	0.4	2.3	0.5
	10	1.5	1.7	1.1	0.1	2.8	15.0	0.4	2.3	0.6
Panel B	1	4.5	0.7	0.2	0.4	4.6	3.2	10.0	2.7	1.5
ADE	2	2.7	0.5	0.1	0.2	3.4	27.0	6.1	2.7	6.9
	3	2.7	0.6	0.2	0.3	3.4	29.2	5.7	2.5	6.5
	4	2.9	0.6	0.2	0.3	3.5	29.1	5.6	2.4	6.7
	5	3.1	0.6	0.2	0.3	3.5	29.0	5.5	2.4	6.7
	6	3.2	0.6	0.2	0.3	3.6	28.9	5.5	2.4	6.7
	7	3.2	0.6	0.2	0.3	3.6	28.9	5.5	2.4	6.7
	8	3.2	0.6	0.2	0.3	3.7	28.9	5.5	2.4	6.7
	9	3.2	0.6	0.2	0.3	3.7	28.9	5.5	2.4	6.7
	10	3.2	0.7	0.2	0.3	3.7	28.9	5.5	2.4	6.7
Panel C	1	0.6	2.3	5.1	0.6	1.4	0.0	1.0	0.6	0.3
EME	2	0.5	3.3	4.4	0.4	1.1	15.1	0.9	0.5	5.9
	3	0.5	3.7	5.4	0.9	1.3	13.7	0.8	0.4	11.5
	4	0.5	3.7	6.4	1.1	1.2	12.6	0.8	0.5	16.7
	5	0.5	3.7	7.3	2.0	1.1	11.5	0.8	0.4	21.2
	6	0.5	3.5	8.6	2.2	1.0	10.5	0.7	0.4	25.7
	7	0.4	3.5	9.4	3.0	0.9	9.5	0.7	0.4	29.7
	8	0.4	3.4	10.4	3.3	0.8	8.6	0.7	0.4	33.7
	9	0.4	3.4	11.3	3.8	0.8	7.8	0.6	0.4	37.2
	10	0.3	3.3	12.1	4.1	0.7	7.0	0.6	0.3	40.6

Note: The table reports the result of the FEVD of equity flows. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The sample period ranges from January 2008 to October 2014.

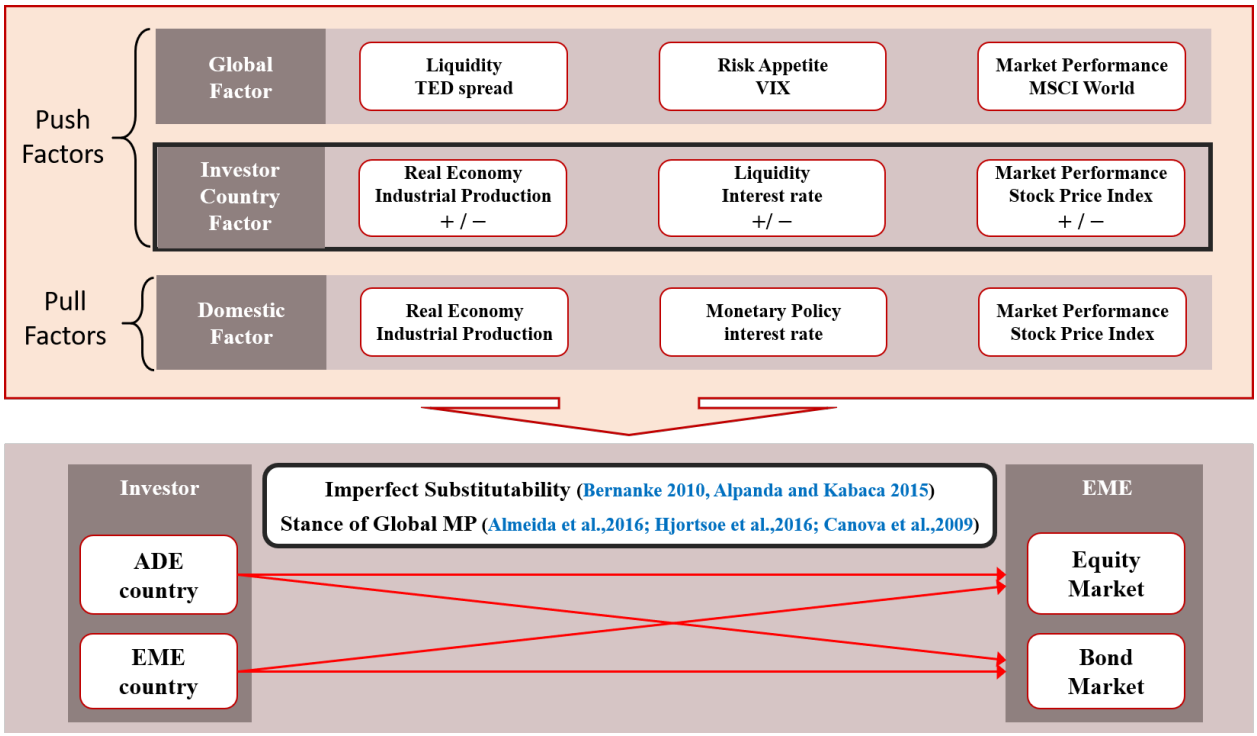
Table 2.17: FEVD of Stock Flows (Including Currency's Value)

		Push							Pull			
		Golbal			Regional				Domestic			
		TED	VIX	MSCI	IPI	i	ret_stock	Cur	IPI	i	ret_stock	Cur
Panel A	1	2.6	2.8	1.8	0.0	11.6	1.7	0.4	0.3	7.7	0.0	1.8
QE ADE	2	2.0	1.7	1.2	0.1	8.3	28.6	0.5	0.2	5.4	7.2	1.2
	3	1.8	1.7	1.3	0.2	7.9	30.0	0.5	0.2	4.8	9.7	1.3
	4	1.9	1.6	1.3	0.3	8.4	29.5	0.5	0.3	4.7	10.1	1.4
	5	1.9	1.7	1.3	0.3	8.3	29.4	0.5	0.3	4.6	10.5	1.5
	6	1.9	1.7	1.3	0.3	8.3	29.3	0.6	0.3	4.6	10.6	1.7
	7	1.9	1.7	1.3	0.3	8.3	29.2	0.6	0.4	4.6	10.6	1.8
	8	1.9	1.7	1.3	0.3	8.3	29.2	0.6	0.4	4.6	10.6	1.8
	9	1.9	1.7	1.3	0.3	8.3	29.1	0.7	0.4	4.6	10.6	1.9
	10	1.9	1.7	1.3	0.3	8.3	29.1	0.7	0.4	4.6	10.7	2.0
Panel B	1	0.7	0.0	0.0	2.1	0.2	0.8	11.1	11.0	1.6	1.8	2.9
PQE ADE	2	6.2	0.0	1.8	1.3	22.3	0.4	7.9	7.9	1.6	0.9	3.7
	3	6.7	2.4	3.7	1.0	22.3	2.9	7.2	6.8	2.3	0.9	4.2
	4	6.2	3.2	4.8	1.1	22.6	2.8	6.8	6.2	3.6	0.8	5.3
	5	6.7	3.0	5.0	1.2	24.0	2.7	6.2	5.9	4.2	1.1	5.9
	6	6.5	2.9	5.0	1.2	24.6	3.2	6.0	5.8	4.1	1.5	6.1
	7	6.4	2.8	5.0	1.3	24.6	3.2	5.9	5.8	4.0	2.1	6.4
	8	6.3	3.0	4.9	1.4	24.3	3.2	5.8	5.8	3.9	3.1	6.6
	9	6.3	3.0	4.8	1.3	23.9	3.1	5.7	5.7	4.5	3.8	6.6
	10	6.5	3.1	4.7	1.3	23.5	3.1	5.7	5.7	4.6	4.4	6.6
Panel C	1	3.0	0.2	1.1	1.0	2.6	0.0	0.1	1.2	0.6	0.5	1.4
QE EME	2	2.7	0.3	1.9	0.9	2.1	15.1	0.6	1.3	0.5	5.3	1.3
	3	2.5	0.7	1.9	0.8	2.1	14.2	0.7	1.2	0.7	9.9	1.5
	4	2.9	0.8	2.5	0.8	2.1	13.8	0.9	1.6	0.8	10.3	1.8
	5	2.8	1.1	2.5	0.9	2.1	13.7	0.8	1.6	0.8	11.6	2.1
	6	2.8	1.1	2.9	0.9	2.1	13.6	1.0	1.7	0.8	11.6	2.4
	7	2.8	1.1	3.0	0.9	2.1	13.6	1.0	1.7	0.8	12.0	2.7
	8	2.8	1.1	3.1	0.9	2.0	13.5	1.0	1.8	0.8	11.9	2.9
	9	2.8	1.1	3.1	0.9	2.0	13.5	1.1	1.8	0.8	12.0	3.2
	10	2.8	1.1	3.2	0.9	2.0	13.4	1.1	1.8	0.8	12.0	3.4
Panel D	1	0.3	0.1	1.8	2.8	0.0	0.6	9.7	0.2	1.1	0.2	0.5
PQE EME	2	9.9	1.9	1.5	3.2	0.0	5.2	7.8	1.2	0.9	1.2	1.2
	3	8.3	1.9	2.0	3.4	0.3	6.8	8.2	1.1	11.0	1.1	1.3
	4	11.5	1.8	1.9	3.8	0.2	6.9	7.6	1.1	10.3	2.4	1.8
	5	10.7	1.8	2.2	3.8	0.2	7.9	7.7	1.2	12.8	2.4	2.0
	6	11.2	1.9	2.2	4.1	0.3	8.3	7.5	1.2	12.6	2.3	2.1
	7	11.0	2.1	2.2	4.1	0.3	8.6	7.7	1.2	13.0	2.5	2.1
	8	11.0	2.3	2.1	4.1	0.4	8.7	7.6	1.2	13.1	2.6	2.1
	9	11.0	2.2	2.1	4.1	0.4	8.7	7.7	1.2	13.2	2.7	2.1
	10	10.9	2.3	2.1	4.1	0.4	8.6	7.6	1.2	13.4	2.9	2.2

Table 2.18: FEVD of Bond Flows (Including Currency's Value)

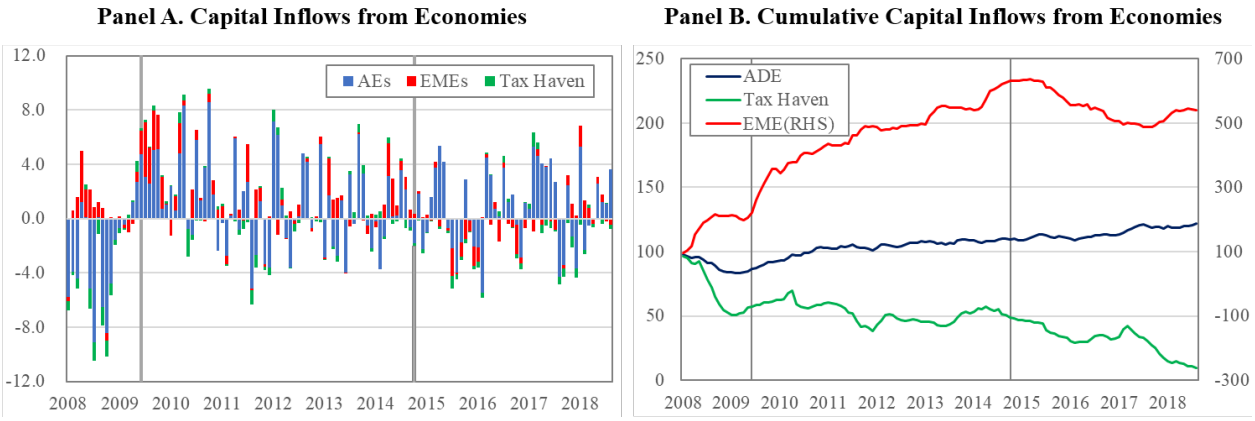
		Push							Pull			
		Golbal			Regional				Domestic			
		TED	VIX	MSCI	IPI	i	ret_stock	Cur	IPI	i	ret_stock	Cur
Panel A	1	0.0	14.6	15.8	3.0	5.1	0.5	0.4	0.3	0.4	0.4	2.6
QE ADE	2	0.0	11.5	11.1	1.8	8.3	31.5	0.5	0.1	0.2	1.3	1.6
	3	0.5	11.2	11.3	1.8	8.8	31.8	0.6	0.2	0.2	2.2	1.5
	4	0.5	11.0	11.0	1.8	8.8	32.5	0.6	0.2	0.2	2.3	1.5
	5	0.5	11.0	11.0	1.8	8.9	32.5	0.6	0.2	0.2	2.3	1.6
	6	0.5	11.0	11.0	1.8	8.9	32.6	0.6	0.2	0.2	2.3	1.6
	7	0.5	11.0	11.0	1.8	8.9	32.6	0.6	0.2	0.2	2.3	1.6
	8	0.5	11.1	11.0	1.8	8.9	32.6	0.6	0.2	0.2	2.3	1.6
	9	0.5	11.1	10.9	1.8	8.9	32.6	0.6	0.2	0.2	2.3	1.6
	10	0.5	11.1	10.9	1.8	8.9	32.6	0.6	0.2	0.2	2.3	1.6
Panel B	1	3.3	37.3	5.6	1.5	0.1	0.5	2.3	3.9	3.2	0.1	2.8
PQE ADE	2	27.8	19.3	2.9	0.9	17.6	1.7	1.0	2.4	6.9	0.4	2.2
	3	20.7	23.7	2.5	1.2	23.0	1.1	0.7	1.8	11.3	0.5	1.7
	4	19.7	20.2	2.1	1.0	29.1	2.4	0.6	1.6	10.8	1.4	1.6
	5	20.1	20.2	1.9	1.1	29.4	2.2	0.6	1.5	10.8	2.0	1.5
	6	19.9	19.2	1.9	1.1	30.1	2.1	0.7	1.4	10.6	3.4	1.4
	7	19.8	18.8	1.8	1.1	29.8	2.1	0.7	1.4	10.4	4.5	1.4
	8	19.5	18.9	1.8	1.0	29.3	2.1	0.7	1.4	10.3	5.4	1.4
	9	19.0	19.3	1.8	1.0	29.0	2.2	0.7	1.3	10.5	5.9	1.4
	10	18.6	19.7	1.8	1.0	29.1	2.3	0.7	1.3	10.7	5.9	1.4
Panel C	1	6.1	12.8	2.8	0.1	0.2	0.2	0.8	0.8	0.1	0.1	1.2
QE EME	2	5.9	10.6	2.3	0.2	0.2	7.8	0.7	1.0	0.1	9.6	1.1
	3	5.8	10.4	2.3	0.3	0.6	8.8	0.7	1.0	0.1	9.4	1.1
	4	5.8	10.5	2.4	0.3	0.8	9.1	0.7	0.9	0.1	9.6	1.2
	5	5.8	10.3	3.0	0.3	0.8	9.2	0.8	1.0	0.1	10.0	1.2
	6	5.8	10.5	3.0	0.3	0.9	9.6	0.8	1.0	0.1	10.1	1.2
	7	5.8	10.4	3.3	0.3	0.9	9.8	0.8	1.0	0.1	10.5	1.2
	8	5.8	10.5	3.4	0.3	1.0	10.0	0.8	1.0	0.1	10.5	1.2
	9	5.7	10.5	3.6	0.3	1.0	10.1	0.8	1.0	0.1	10.9	1.3
	10	5.7	10.6	3.6	0.3	1.0	10.3	0.8	1.0	0.1	10.9	1.2
Panel D	1	1.0	1.0	0.8	0.5	0.0	0.4	0.3	1.8	0.5	0.0	1.0
PQE EME	2	2.7	1.2	0.7	0.4	0.2	0.3	0.3	1.4	8.5	0.8	1.5
	3	3.4	1.8	0.6	0.4	0.2	1.2	0.4	1.4	10.5	1.1	1.7
	4	3.3	2.8	0.6	0.4	0.2	1.6	0.7	1.3	10.3	2.0	1.7
	5	3.2	4.5	0.6	0.4	0.2	2.0	0.9	1.3	10.1	2.5	1.6
	6	3.2	6.2	0.6	0.4	0.2	2.2	1.0	1.2	10.4	2.9	1.6
	7	3.1	8.6	0.6	0.5	0.2	2.4	1.1	1.2	10.8	3.3	1.5
	8	2.9	12.0	0.5	0.5	0.2	2.6	1.1	1.1	11.5	3.8	1.4
	9	2.6	17.2	0.5	0.6	0.2	2.7	1.1	1.0	12.3	4.5	1.3
	10	2.2	24.7	0.4	0.7	0.2	2.8	1.0	0.8	13.3	5.5	1.1

Figure 2.1: Determinants of International Capital Flows



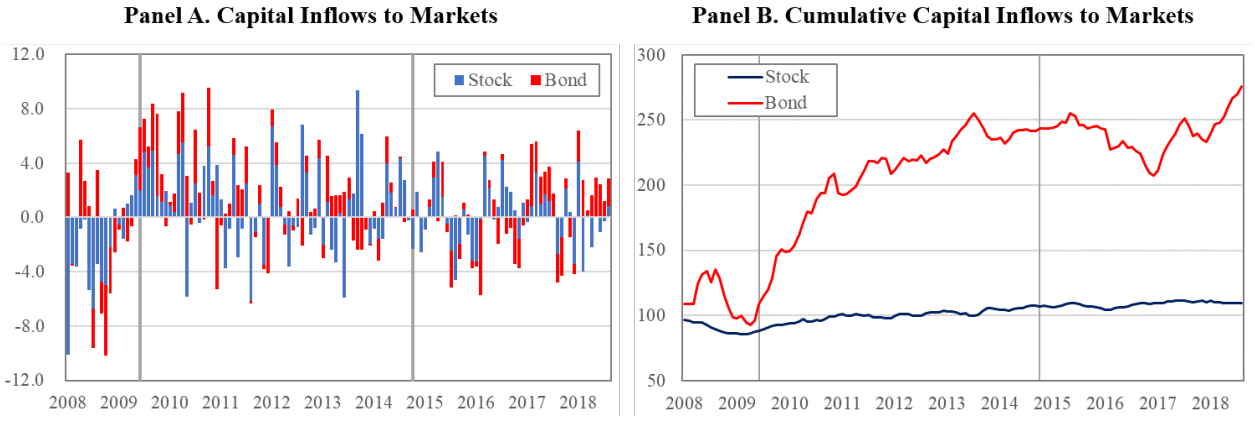
Note: The figure describes the determinants of international capital flows. +, – indicates capital inflows and outflows, respectively.

Figure 2.2: Capital Flows from Economies



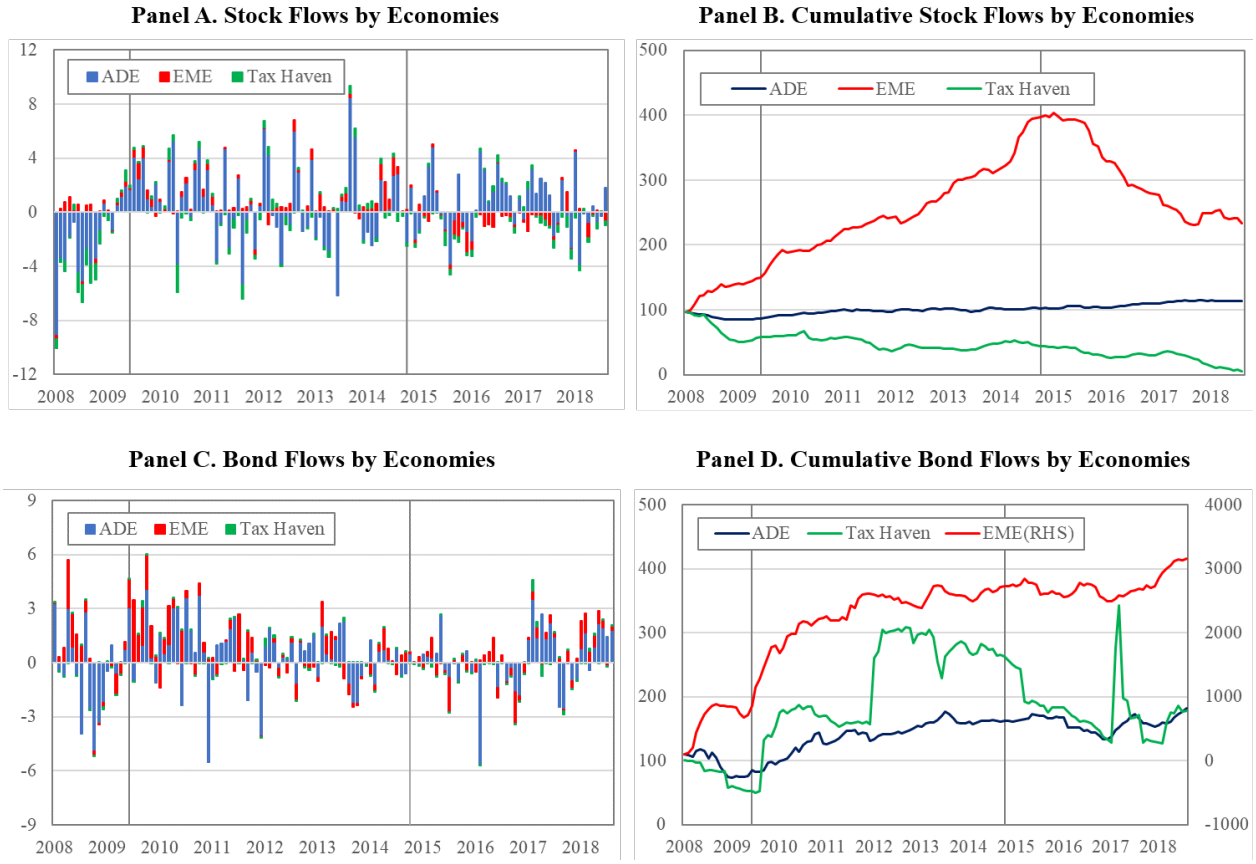
Note: The figure describes the monthly capital inflows to Korea from economies. Panel A shows the amount of capital inflows from each economies and Panel B shows the cumulative capital inflows after 2008. The unit of the vertical axis of Panel A is trillion in Korean Won. The data period ranges from January 2008 to June 2018.

Figure 2.3: Capital Flows to Stock and Bond Market



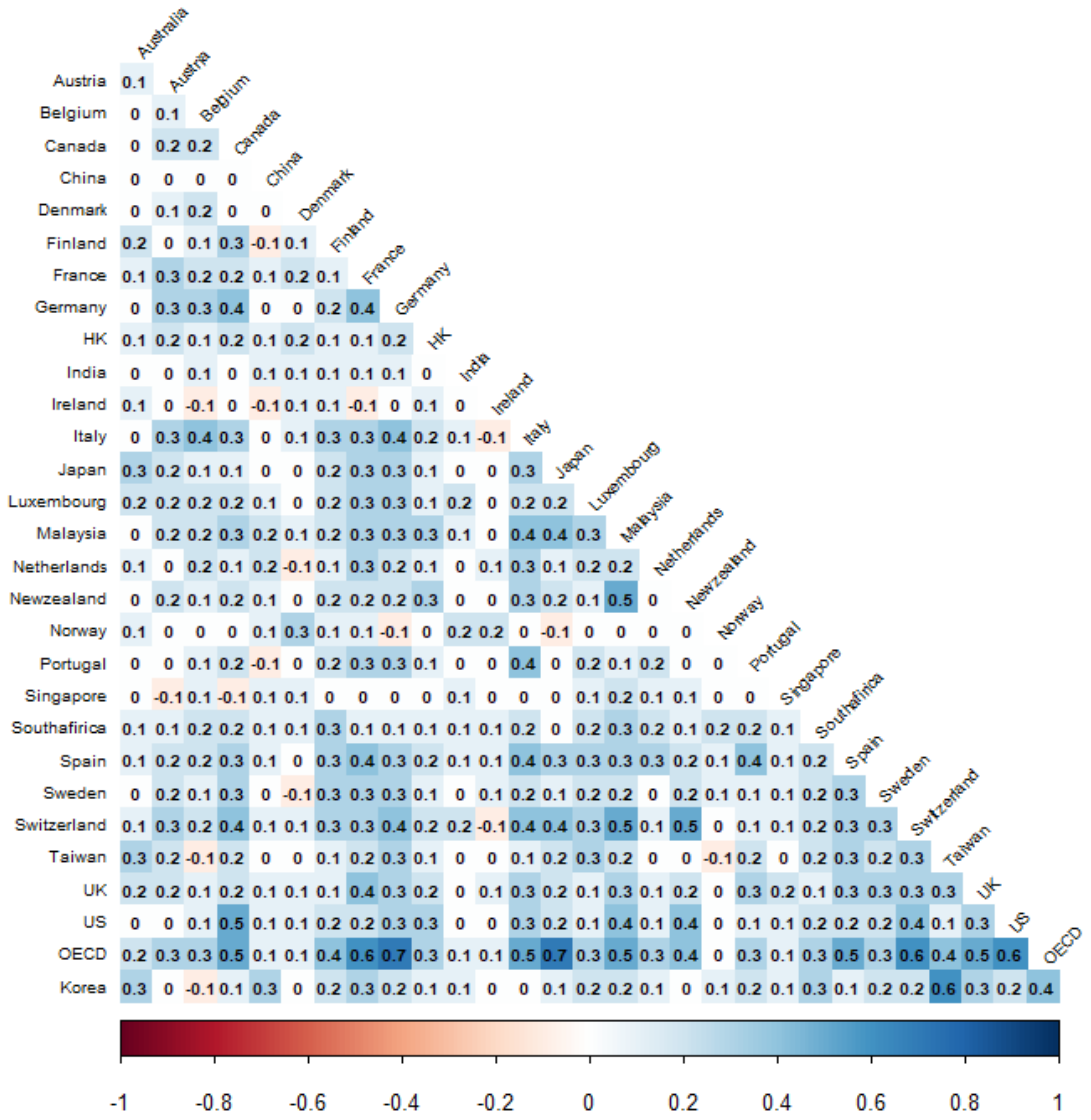
Note: The figure describes the monthly capital inflows to Korea stock and bond market. Panel A shows the amount of capital inflows to each market and Panel B shows the cumulative capital inflows after 2008. The unit of the vertical axis of Panel A is trillion in Korean Won. The data period ranges from January 2008 to June 2018.

Figure 2.4: Capital Inflows from economies to stock and bond market



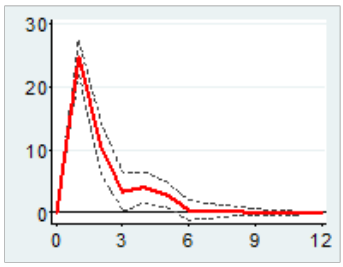
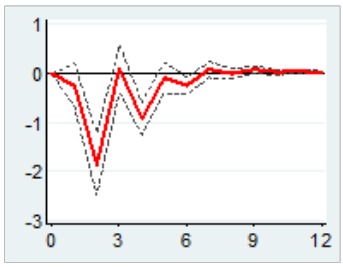
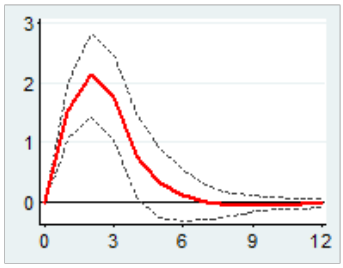
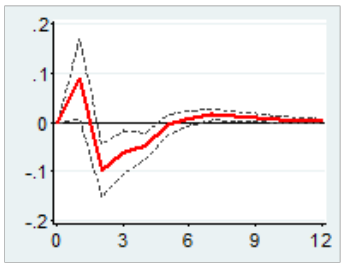
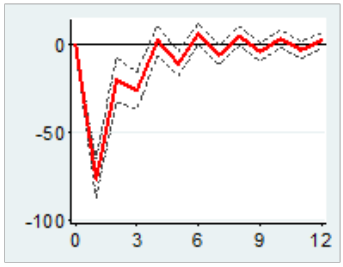
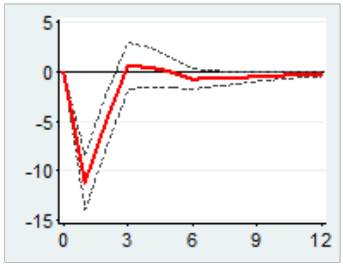
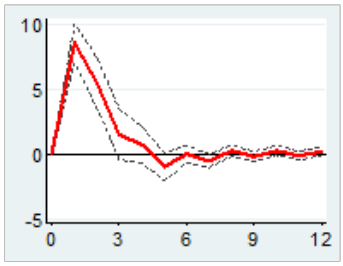
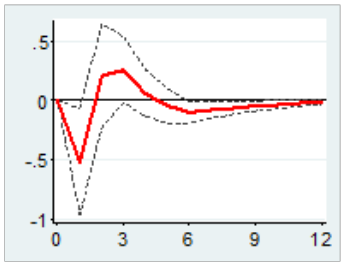
Note: The figure shows the capital inflows and cumulative capital inflows to the stock market and bond market by distinguishing economies. Panel A and C plots the portfolio inflows to stock and bond market, respectively, and the unit of the vertical axis a trillion in Korean Won. Panel B and D plots the cumulative portfolio inflows to stock and bond market respectively, relative to the end of 2007 (December 2007=100). The vertical lines indicate June 2009, the end of 2008 global financial crisis cited from NBER, and October 2014 when the US Federal Reserve stopped its long-term securities asset purchasing program. The sample period ranges from January 2008 to August 2018.

Figure 2.5: Correlation of each country's IPI



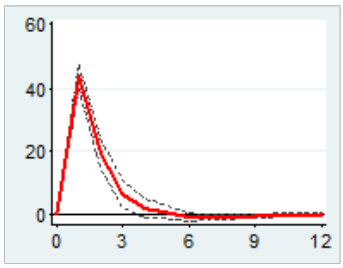
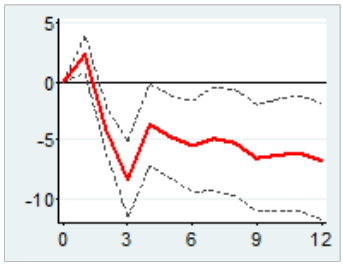
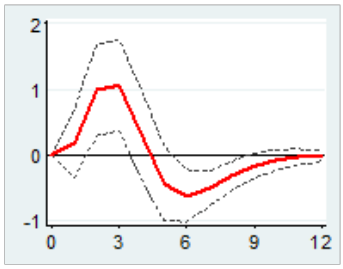
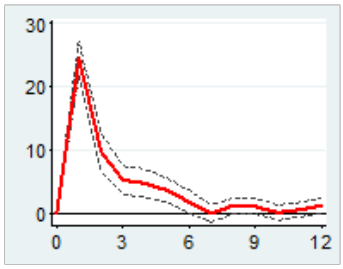
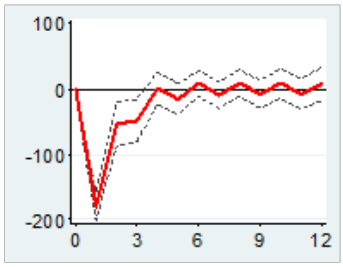
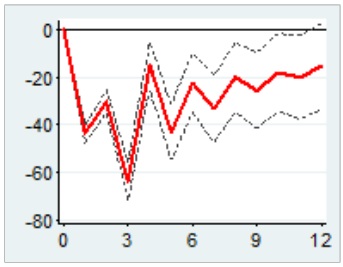
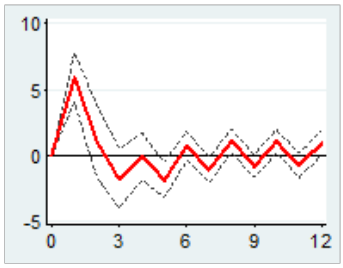
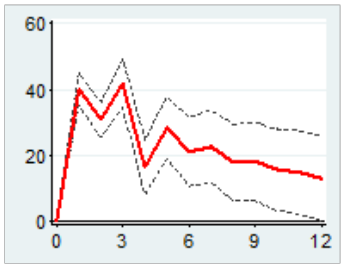
Note : The figure represents the correlation between the industrial production indexes (IPI) of the twenty-seven major investors in Korea during January 2008 to August 2018.

Figure 2.6: Impulse Response Function (ADE vs EME)

Market	Shock	Investor Economy	
		ADE	EME
Capital Inflows to Stock Market	investor stock price	Panel A 	Panel B 
	investor interest rate	Panel C 	Panel D 
Capital Inflows to Bond Market	investor stock price	panel E 	Panel F 
	investor interest rate	panel G 	Panel H 

Note : The figure represents the impulse response function of the capital inflows to Korea from each investor economy in response of the investor country's stock price and interest rate. The dotted lines indicate the 68% confidence interval.

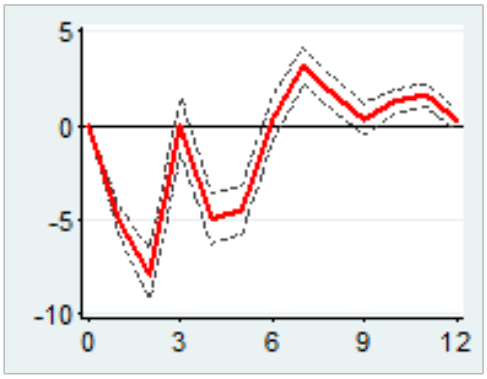
Figure 2.7: Impulse Response Function (QE vs Post QE)

Market	Shock	Investor Economy	
		QE	Post QE
Capital Inflows to Stock Market	investor stock price	Panel A 	Panel B 
	investor interest rate	Panel C 	Panel D 
Capital Inflows to Bond Market	investor stock price	panel E 	Panel F 
	investor interest rate	panel G 	Panel H 

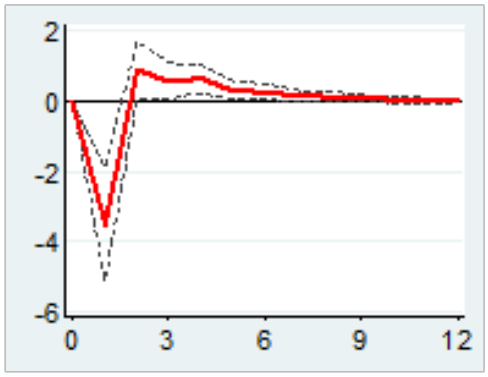
Note : The figure represents the impulse response function of the portfolio flows to Korea in response of the investor country's stock price and interest rate during the sub-period of the QE and post-QE. The dotted lines indicate the 68% confidence interval.

Figure 2.8: Impulse Response Function (excluding GFC)

Panel A. ADE Equity Flows



Panel B. EME Equity Flows



Note : The figure represents the impulse response function of the stock flows to Korea in response of the investor country's interest rate with dropping 2008 global financial crisis period. The dotted lines indicate the 95% confidence interval.

Chapter 3

THE INTERNATIONAL SPILLOVERS OF US MONETARY POLICY ON CAPITAL FLOWS TO EMERGING MARKET ECONOMIES: DURING AND AFTER QUANTITATIVE EASING

3.1 Introduction

Quantitative easing (QE) has been the most important global economic issue since the 2008 global financial crisis triggered by the collapse of the US sub-prime mortgage market. QE refers to the policy of a central bank to provide liquidity directly through the purchase of financial assets such as government bonds when conventional monetary policy such as controlling policy rates is not valid.[1] By purchasing bonds or other assets, the central bank provides liquidity without lowering interest rates. Figure 3.1 describes the assets of the US's Federal Reserve's balance sheets after the 2008 global financial crisis. After the three rounds of QE, the US Fed's assets reached an unprecedented level of $4.5 trillion in October 2014 when QE was concluded, up from $0.8 trillion before the financial crisis.

This non-traditional monetary policy implemented by developed countries including the US, the European Union, the UK, and Japan has dramatically increased global liquidity, and in turn, has sharply increased capital inflows to emerging market economies (EMEs). These inflows have primarily been portfolio flows, which are more volatile than other types of international flows such as foreign direct investment. Such flows may cause overheating of the economy, currency appreciation, and an increase in foreign debt in emerging economies. Notably, a sudden stop might cause serious side effects such as a foreign exchange crisis.

[1]The term "Quantitative Easing" was first used by the Bank of Japan in the early 2000s. At a lecture introducing the new program in January 2009, Fed Chairman Bernanke used the term "Credit Easing" to distinguish it from Japanese style Quantitative Easing.

Naturally, spillovers from this unconventional monetary policy in the US onto emerging economies have become an important issue since the adoption of QE. Most previous studies find that external factors (push factors) are significant determinants of international capital flows to emerging economies. Policymakers in emerging economies have criticized monetary policy in developed economies for creating excessive liquidity and causing the economic turmoil.[2] Controversy over the determinants of capital inflows to emerging markets was reignited by a speech from Federal Reserve Chairman Jerome Powell (2018) arguing that pull factors are the determinants of capital flows in emerging economies rather than US monetary policy.[3]

This paper analyzes the effects of US non-traditional monetary policy on the inflows and outflows of emerging economies by program and by period. The details of US unconventional monetary policy are reported in Table 3.1 and Figure 3.2. The impact of each program in the Fed's unconventional monetary policy on international capital flows may vary because the procedure and transmission mechanism of each strategy is different. This paper answers the following questions: What is the impact of US unconventional monetary policy (UMP) on capital inflows to emerging economies? Does this influence depend on the economic and structural factors of the economy? Does this influence vary by the stance of the US monetary policy or type of security? What is the channel through which US UMP affects capital inflows to EMEs? Does an individual country's direct financial exposure to the US affect the level of impact of US UMP on its investment in emerging economies?

Hannan (2018) surveys the recent literature on capital flows and notes that recent papers pay more attention to the determinants of the component of capital flows and the impact of non-traditional monetary policy on international capital flows. The literature review shows

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[2]Raghuram Rajan, the former Governor of the Bank of India, argued that capital flows into emerging markets are caused by the monetary policy of developed countries. Dilma Rousseff, President of Brazil, suggested the Fed's policy caused a "monetary Tsunami" and so-called "currency war".

[3]"capital flows to EMEs were already very strong before the Global Financial Crisis ... If U.S. monetary policy is not the major determinant ... One prominent factor has been growth differentials ... Another related determinant has been commodity prices." (Jerome H. Powell, 8 May 2018)

pictures of the patterns and characteristics of components of the capital flows. Avdjiev et al. (2018b) disaggregate the quarterly IMF BOP debt flows into banks, corporations, and governments by borrower type and find that the pattern of total capital inflows differs with each borrower. Specifically, banks and corporations in both high-income countries and emerging economies show pro-cyclical borrowing, whereas sovereign borrowing is counter-cyclical. Eichengreen et al. (2018) also use quarterly IMF BOP data from 34 countries and analyze the volatility and determinants of capital flows employing panel regressions. They argue that non-foreign direct investment (FDI) flows are more volatile than FDI flows, and that equity flows are mainly determined by push factors whereas FDI is mostly influenced by pull factors.

The literature also focuses on banking flows and fund flows. Avdjiev et al. (2018a) investigate the international banking flows of five major countries (Korea, Indonesia, Malaysia, Philippines, Thailand) who were impacted by the Asian financial crisis (AFC) and find that it was possible to predict the AFC from the level and growth rate of the ratio of cross-border claims over GDP available from the BIS dataset. Correa et al. (2018) use Locational Banking Statistics, a confidential dataset in BIS, to get bilateral cross-border banking flows. They find that the monetary policy of an investor country is a key determinant of international banking flows and that banking flows are relocated to a safer country in a tightened financial condition. Li et al. (2019) study covariates of a sudden stop in components for monthly fund-level flows in 65 countries using EPFR fund-level data and probit models. Their findings indicate that sudden stops of equity flows in developed countries and bond flows in emerging countries are determined by global factors, while domestic factors play a more important role in bond flows in developed countries. Kang and Kim (2019) investigate the drivers of capital flows to EMEs based on the push-pull factors approach by disaggregating EMEs into four regional subgroups, finding heterogeneity in the determinants of capital flows to regional groups.

The work of Fratzscher et al. (2017) is notable in that its approach deals with QE announcements and the actual interventions separately as the indicators of QE while the liter-

ature commonly uses macro variables as a proxy for the implementation of QE.[4] Fratzscher et al. (2017) differentiate between QE announcements and actual bond purchases and find a heterogeneous response of capital flows during the different rounds of QE. I follow the empirical approach of Fratzscher et al. (2017) since it is useful for following reasons: it enables us to find the impact of the QE announcement to explain the effectiveness of the forward guidance rule working through the signaling channel of the monetary policy.[5] Moreover, as described below, through this approach, this paper examines if there exists heterogeneity in the impact of the actual operations across countries with different levels of exposure to the US, since the actual purchase of the assets directly affects the supply of US liquidity and, in turn, the economies with higher exposure to the US.

Although this paper has borrowed the basic approach of Fratzscher et al. (2017), this paper differs considerably from theirs and builds on existing studies in several prominent ways. First, in this paper I aim to find the spillovers to capital inflows "from each investor economies" to emerging economies. To this end, I employ the capital inflows to Korea "from each investor country" as a dependent variable while the existing literature uses capital inflows to each recipient country from investors from whole countries. That is, this paper focuses on the nationality of the capital while most studies analyze the destination of the capital. In the perspective of the investors, the factors of the home country are also important to their investment decision. With investor country-level data, I include the investor country-specific factors in the empirical model as described in section 3.3. To my knowledge, this is the first research to find heterogeneity among investor countries.

Additionally, this research evaluates the transmission channels of the Fed's unconventional monetary policy to capital flows to EMEs. In the existing literature, the study of the transmission path of US non-traditional monetary policy is mostly through analysis of the term structure of US fixed income assets (Gagnon et al., 2010; Bauer and Rudebusch, 2013;

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[4]See Bowman et al. (2015) Rogers et al. (2014) for changes in government bond yields during a QE shock.

[5]Bauer and Rudebusch (2013) employ a model-free analysis with dynamic term structure models and show that the signaling channel of the Fed's large-scale asset purchase program plays a substantial role.

Bauer and Neely, 2014). Kim (2016) analyzes the international transmission of US monetary policy through business cycle comovement. This study employs capital inflows to examine the international transmission of US unconventional monetary policy.

This paper also differs from the existing literature as regards data and econometric methodology. Inspired by IMF (2011), this paper introduces the investor country's exposure to the US. Also, the empirical model considers macro-prudential policy and capital controls policy adopted by Korea during the QE period. Moreover, this paper covers the period from January 2008 to August 2018, which includes the time of policy normalization as well as the three QE rounds and QE tapering, while Fratzscher et al. (2017) use data from 2008 to 2012, focusing only on the expansionary QE period. Lastly, I use monthly data covering the whole portfolio flows while Fratzscher et al. (2017) employ daily data from EPFR.[6]

This paper is structured as follows: Section 3.2 describes the US Fed's adoption of the unconventional monetary policy; Section 3.3 focus on the QE period and explains the empirical approach to determine the impact of the announcements and implementations of QE. Section 3.4 extends the analysis to the normalization of monetary policy from 2017 and to examine if there is any difference in the impact of the US monetary policy on the emerging economies during and after QE. Section 3.5 covers the conclusion.

3.2 U.S. Fed's Quantitative Easing

3.2.1 Timeline of Quantitative Easing in the US

The conventional monetary policy through open market manipulation is targeting the federal funds rate, which is a very short-term overnight interest rate. If the policy rate is already close to 0%, it is difficult to carry out this policy. As a result, the US Fed started large scale asset purchase programs to buy long-term government bonds and mortgage-backed securities (MBS) in order to reduce long-term interest rates and stabilize the housing market. The monthly purchase of Treasury securities and MBS by the US Fed during and after the 2008

[6]See Chapter 1, Jotikasthira et al. (2012), and Fratzscher (2012) for details of the EPFR data.

global financial crisis (GFC) is described in Panel A of Figure 3.2. Since the 2008 global financial crisis, the Fed has implemented three periods of QE. In December 2008, the Federal Reserve cut its federal funds rate to 0–0.25% and began implementing the first QE period (QE1). Table 3.1 describes the main adoption periods of QE in detail. At the beginning of QE1, the US Federal Reserve bought MBS issued and guaranteed by Fannie Mae, Freddie Mac, and the Federal Home Loan Bank to ease the banks' asset quality deterioration. From March 2009, the Fed also bought long-term Treasury securities worth $300 billion to boost the economy. In QE1, the US Federal Reserve reduced the discount rate to 0% and began paying interest payments on the bank reserve.[7]

The Fed implemented the second round of QE (QE2) between November 2010 and June 2011. During this period, the US Federal Reserve increased its purchases of Treasury securities from $30 billion to $75 billion per month. As concerns about a continuing slowdown in economic growth increased after the end of the QE2, the Fed introduced a maturity extension program so-called "Operation Twist" in September 2011. The Fed used $400 billion from the sale of Treasury securities with maturities of 3 years or less to buy long-term Treasury securities with maturities of 6 to 30 years. Operation Twist was extended once in June 2012 and continued until December of the same year. Thus, in QE2, the US Federal Reserve's asset purchases were shifted to long-term Treasury securities, unlike QE1 that was centered on MBS. While the goal of QE1 was to recover the function of the financial market due to the MBS market collapse, QE2 focused on reducing long-term interest rates.

The Fed's third round of QE (QE3) began in September 2012 and ended in October 2014. In September 2012, the US Federal Reserve decided to buy $400 billion of MBS every month, and in December 2012, it began to purchase $45 billion of long-term treasury securities each month. The Federal Reserve announced that it would continue QE3 until the unemployment rate fell below 6.5% or the inflation rate exceeded 2.5%.

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[7]Although the Fed also purchased the direct obligations of housing-related government-sponsored enterprises (GSEs) - Fannie Mae, Freddie Mac, and the Federal Home Loan Bank - this was nominal compared to the purchase of Treasuries and MBS.

In December 2013, as the unemployment rate declined to 6.7% and the economy showed signs of recovery, the Federal Open Market Committee (FOMC) decided to reduce the size of asset purchases by $10 billion at each meeting in 2014; this is termed QE tapering. At the FOMC meeting in September 2014, the Fed finally announced the end of the QE as of October 2014.

The Fed began normalizing monetary policy in 2015 after the US economy started to show strong signs of recovery. The Fed raised the federal reserve rate for the first time since the GFC in December 2015, and raised it further in December 2016 based on economic conditions such as GDP growth and the employment market. In 2017 and 2018, when it was considered that the economy had entered a full recovery, the Fed raised interest rates a total of seven times: three in 2017 and four in 2018. At the FOMC meeting in September 2017, the Fed announced its intention to normalize monetary policy by reducing both its Treasuries holdings and MBS holdings at a rate of $6 billion a month starting from October 2017.

3.2.2 Transmission Path of Unconventional Monetary Policy

The existing literature commonly refers to the three transmission channels of QE as follows: the portfolio rebalancing path, the liquidity path, and the policy signaling path.[8] Figure 3.3 describes the transmission channels of the Fed's unconventional monetary policy on portfolio flows to emerging economies. The portfolio rebalancing path stems from the participation of the central bank as a buyer of securities in the market. Because the central bank purchases a high volume of certain securities, the demand for them increases and the interest rates of the bonds are sharply reduced. This results in private investors rebalancing their portfolios, since the different securities are substitutes for each other. The liquidity channel means that the central bank participates as a market maker in the securities market, where few transactions due to soaring counter-party risk, thereby allowing the sale to occur, and thus

[8]Fratzscher (2012) describes the "confidence channel", implying the channel by which the Fed may impact the market by providing information about the economic performance.

inducing a decline in interest rates. Lastly, the signaling path relates to the impact on the market expectations of future monetary policy, because the central bank's asset purchases could be interpreted as the future stance on monetary policy by the market. Bauer and Rudebusch (2013) argues that the Fed's bond purchase program had important signaling effects that lowered expected future short-term interest rates.

3.3 Spillovers of US UMP during QE Period

3.3.1 Data Set

This subsection focuses on the spillovers of the US Fed's unconventional monetary policy during the QE period centered on expansionary monetary policy. This study uses investor country level portfolio flows (either stock or bond market) to Korea directly measured by the Financial Supervisory Service (FSS), Korea. The data is monthly and covers the period between January 2008 and October 2014 when the Fed concluded the QE. The sample includes 31 countries which continuously invest in Korea.[9] Table 3.2 describes the list of countries and summary statistics in this paper.[10] I use country level net capital inflows scaled by the period-by-period nominal GDP of each investor country to consider the relative economic size across the investor countries.[11]

This subsection examines the impact of QE announcements and their actual implementation by separating them into large-scale asset purchases (LSAP) programs and liquidity facilities programs on the capital inflows to emerging economies. To this end, I use the variables capturing explanatory QE announcements and actual intervention of LSAP and

[9]Because I use the lagged control variables described below in the model, the period of portfolio flows is 83 months from February 2008 to August 2018.

[10]Most studies in this area exclude offshore countries in the panel data set. This paper uses the FSF-IMF 2000 list as a basis for offshore countries. This paper includes group 1 countries (Hong Kong, Ireland, Luxembourg, Singapore, and Switzerland), which mostly adhere to international standards and are generally viewed with a high quality of supervision. Group 2 (e.g., Malta) and 3 (e.g., the Cayman Islands) are excluded from this research.

[11]The existing literature scales portfolio flows either by total assets under management (AUM) (Fratzscher, 2012) or by GDP of each country (Byrne and Fiess, 2016).

liquidity facilities separately. The details of the US unconventional monetary policy are reported in Table 3.3A. Later, I separate LSAP into the purchase of treasury bonds and the purchase of MBS to find the international channels of monetary policy since they might have different goals and channels of transmission. The details about these indicators in the empirical regression model are described in the next section.

As Powell (2018) stated in his speech on May 2018, other factors than US monetary policy could affect international capital movements in emerging counties.[12] This research controls for factors in the US, the recipient country (Korea), and the investor country that might affect the capital flows to the emerging market. Specifically, I control for US variables such as the lagged yield on the US 1-year Treasury bill, lagged VIX, and the lagged return on the S&P500 index. For the recipient country, the lagged Korea industrial production index (IPI), the lagged yield on the Korean 1-year government bond, the lagged Korea CDS index, and the lagged return on KOSPI are included. Also, I consider policy reactions adopted by the Korean government in response to the financial crisis to alleviate the swings of the capital flows.

Finally, I include the investor country factor to control for the impact of the home country's economic situation on investors' behavior. The lagged IPI, the lagged yield on 1-year government bond, and the lagged return on the stock index of each investor country comprise the controls for the investor country. Table 3.4 provides an overview of the US monetary policy and control variables.

3.3.2 Empirical Methodology

The regression specification is based on a standard dynamic panel data model with country-fixed effects and standard error clustered by country that is robust to heteroscedasticity, and that is estimated separately for different type of flows (stock and bond) and different groups

[12]Nechio et al. (2014) argue that pull factors such as the economic fundamentals of emerging economies, as well as monetary policies in advanced economies (AEs), caused so-called "taper tantrum" in EMEs after the announcement of QE tapering in 2013.

of countries (the US, advanced countries, and emerging economies) as follows:

$$
\begin{aligned}
NCF_{i,t} = \ & \beta_1^j \, {QE_{i,t}}^j + \beta_2^j \, {LSAP_{i,t}}^j + \beta_3 LF_{i,t} + \gamma X_t + \alpha_i + \epsilon_{i,t} \\
{QE_{i,t}}^j &= \psi_{i,t} \times {QE_t}^j \\
{LSAP_{i,t}}^j &= \psi_{i,t} \times {LSAP_t}^j \\
LF_{i,t} &= \psi_{i,t} \times LF_t
\end{aligned}
\tag{3.1}
$$

where subscripts i and t denote country and month, respectively; $NCF_{i,t}$ is portfolio flows (either bond or equity) to Korea expressed as the percentage of GDP of investor country i. Descriptions and summary statistics of variables are reported in Table 3.4. ${QE_t}^j$ is an indicator capturing the US QE announcements according to the different QE rounds (j = 1, 2, 3, taper, and normal) which is described in Section 3.2 in details. ${LSAP_t}^j$ is an explanatory variable capturing the Fed's purchases under the LSAP program while LF_t is a variable capturing the Fed's operation of the liquidity facilities as described in Table 3.1. X_t is a set of control variables which includes lagged yield on the US 1-year Treasury bill, lagged VIX, and the lagged return on the S&P500 index for the benchmark model. X_t additionally considers the lagged IPI of Korea, the lagged 1-year Korean government bond yield, the Korea CDS index, the lagged return on the KOSPI, two dummies capturing the macro-prudential policy and capital control policy adopted by Korea, the lagged IPI of the investor country, the lagged 1-year government bond yield of the investor country, and the lagged return on the stock index of the investor country.[13] α_i captures the country-specific fixed effects.

${QE_t}^1$, ${QE_t}^2$, and ${QE_t}^3$ capture the expansionary announcements regarding QE during each period, namely events from 1 to 4, from 8 to 10, and from 12 to 16 in Table 3.3A. ${QE_t}^{taper}$ captures the Fed's announcement of QE tapering after December 2013, denoted as events 17-19 in Table 3.3A. Note that I separate the overall period of the third QE into

[13]According to the variance inflation factor (VIF) test, multicollinearity which increases the standard errors of coefficients exists within control variables only.

an expansionary QE period and QE tapering period. The announcement of the maturity extension program so-called "Operation Twist", is included in QE_t^3. This is dropped from the subsection for a robustness check. Lastly, QE^{normal} captures the events from 27 to 30 in the table, the announcements regarding balance-sheet normalization described in the next section.

$LSAP_t{}^1$, $LSAP_t{}^2$, $LSAP_t{}^3$, $LSAP_t{}^{taper}$, and $LSAP_t{}^{normal}$ indicate the Fed's purchases under the LSAP program from December 2008 to March 2010, from October 2010 to June 2011, from October 2012 to May 2013, from December 2013 to October 2014, and after September 2017, respectively. LF_t captures the Fed's operation of all liquidity facilities during the first QE period. The purchase indicators are for period 't' because my data set has monthly frequency, whereas Fratzscher et al. (2017) use variables for 't-1' with daily frequency data. The regression model with 't-1' purchase indicator variables is discussed in the robustness check.

It is important to note that the impact of US monetary policy is expected to differ by country according to the level of exposure to the US. For example, countries with high exposure to the US might be more affected by US monetary policy than countries not exposed to the US, so capital inflows to emerging economies from a country with high US exposures are more likely to be affected by US monetary policy than those from a country with lower US exposure. So that the effects of QE are weighted by the direct financial exposure to the US, motivated by IMF (2011), I introduced the individual country's exposure to the US, ψ as follows:

$$\psi_{i,t} = \frac{Liability\ to\ the\ US_{i,t}}{GDP_{i,t}} \tag{3.2}$$

where i,t refers to country i, and time t, respectively[14]; "$Liability\ to\ the\ US_{i,t}$" indicates the

[14]The differences between IMF (2011) and my approach are as follows: (i) This paper looks into the impact of the Fed's non-traditional monetary policies while IMF analyzes the traditional monetary policy; (ii) This research constructs in a different way the direct financial exposure measures to the US; (iii) This paper uses only country i's liabilities to the US focusing on capital inflows from foreign investors while

country i's financial liability to the US, or the amount of country i's financial assets held by US citizens; and "GDP" represents country i's GDP at the year t.

The sources of the numerator, financial obligations to the US (the US' claims on foreigners), are the US Treasury International Capital (TIC) database on bilateral assets and Bertaut and Judson (2014). Since TIC provides financial obligation data only after 2012, I include data spanning January 2008 to December 2011 provided by Bertaut and Judson (2014) which "generate consistent time series of holdings by security type and by country of foreign holder (for U.S. securities) and country of issuer (for U.S. investment in foreign securities)"(P. 1). I then divide the numerator by the economy i's GDP in the same year to derive the weight. The direct financial exposure is a monthly time-varying indicator since "liability to the US" is calculated at a monthly frequency.[15]

Countries with high exposure to the US have additional sensitivity to US monetary policy mainly through two channels: the liquidity channel and the portfolio balance channel. First, increased liquidity in the US due to QE spreads to foreign countries through overseas investment from the US. The capital inflows increase liquidity and lower borrowing costs, resulting in increased investment in emerging countries. Second, if a country is exposed to the US, capital flows from the US will increase asset values, leading to a change in investment in foreign assets and portfolio reallocations. Additionally, portfolio rebalancing can occur due to the imperfect substitution of US and foreign assets. Both of these channels intensify in countries with higher liability exposure to the US. Because the impact of US monetary policy on each country depends on the degree of each country's financial exposure to the US, we should consider that level of US exposure to measure the impact of QE policy on each country.

The announcements and actual operations of the Fed's QE are multiplied by a measure of each economy's direct financial exposure to the US to identify the difference in the effect

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IMF (2011) uses both assets and liabilities.

[15]According to IMF (2011) this approach also addresses the omitted variable issue by distinguishing the effects of common events from US monetary policy which may coincide.

of U.S. monetary policy on the capital flows to highly exposed versus unexposed countries.[16] Table 3.5 reports the list of investor countries and their direct exposure to the US.

3.3.3 Impact of QE announcement

This subsection presents the results of the empirical model focusing on assessing the effectiveness of QE announcements on portfolio flows.

To capture the impact of the QE announcement, the existing literature uses either the change in the market interest rate or a dummy variable.[17] As pointed out by Fratzscher et al. (2017), each QE announcement was heterogeneous in terms of predictability by the market and the details of the purchase. Also, according to the efficient market hypothesis explained in Rogers et al. (2014), if the terms of the QE announcement are not different from market's expectation, it would barely affect the market's behavior. Given this, I use the changes in the yield on the 10-year Treasury note to identify surprises from the QE announcement instead of the dummy variable approach. Rogers et al. (2014) explain that market surprise is reflected very well by the difference in the US 10-year bond captures. QE is broken down by round; that is, the impacts of QE^1, QE^2, QE^3, QE^{taper}, and QE^{normal} are estimated separately. The alternative strategies for measuring the effects of announcements and alternative sets of events and are discussed in the robustness check.

Table 3.6 reports the estimated coefficients of the QE^j_{t-1} variable and QE operation variables under different settings. The details of each set are described in Table 3.6. The results from the different settings described in Columns (1)–(9) show a similar picture to each other, thus confirming the findings. Column (6) in Tables 3.6A to 3.6F reports the result of

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[16] I also regress the model dropping weighting term (investor country's exposure to the US) as follows:

$$NCF_{i,t} = \beta^j_1 QE_t{}^j + \beta^j_2 LSAP_t{}^j + \beta^j_3 LF_t + \gamma X_t + \alpha_i + \epsilon_{i,t} \tag{3.3}$$

The results are reported in Table C.7. Overall, The coefficients are not significant and the R-squared is low compared to the benchmark model.

[17] Gertler and Karadi (2015), Hanson and Stein (2015), Bowman et al. (2015) use the difference in the yield on the US Treasury note as a means to obtain the effects of the QE announcement, whereas Fratzscher et al. (2017) employ a dummy variable approach.

the model with the overall controls regarding the US, recipient country, and each investor country across the type of securities and economies. Table 3.7 summarizes Column (6) in each of Tables 3.6A to 3.6F.

In order to evaluate the impact of each QE announcement, the values of the QE announcement variables need to be considered together with the coefficients since the instrument to capture the shock of the QE announcement also affects the total impact of the QE announcement.[18] Table 3.8 reports the impact of QE announcement calculated by the product of the coefficients and the total change in the yield on the 10-year Treasury note.

The basic model with the US control variables (column (4)) indicates that US equity flows had a negative response to the announcement of QE1, implying that US investors retrenched their investments from Korea to the US. This is in line with the findings of Fratzscher et al. (2017) that QE1 alleviated the credit crunch in the US and stabilized the US financial market. The results of the specifications regarding AEs equity flows indicate that the impact of the QE1 announcements on AEs equity flows is negative, similar to the impact on US equity flows. By contrast, the QE2 and QE3 announcements increased capital inflows to Korea from AEs investors. In response to the QE tapering announcements, AEs equity flows showed capital outflows while AEs bond flows showed capital inflows to Korea, which might imply portfolio rebalancing between the equity and bond markets. EMEs equity flows show a similar but less statistically significant result. EMEs equity flows responded negatively to the announcement of QE1, but positively to the announcements from QE2 to QE tapering. These findings generally confirm that the QE1 announcement triggered portfolio redistribution toward to the investor country from the Korean equity market whereas QE2 and QE3 triggered spillovers to emerging markets.

[18]The values of QE^1, QE^2, QE^3, QE^{taper}, and QE^{normal} are -0.79, +0.27, -0.11, 0.26, and -0.07, respectively.

3.3.4 Impact of QE Operations

This subsection discusses the impact of the Fed's actual implementations of LSAP and the liquidity facilities program, for which I focus on the coefficient of $LSAP_t^j$ and LF_t.[19] The estimated coefficients for net capital inflows from each economy for each security appear in Tables 3.6A to 3.6F. The coefficients of each variable across the different models show similar patterns with few exceptions.[20] Thus, I focus on the column (6) of Table 3.6A to 3.6F which are summarized in Table 3.7.

The fourth column of Table 3.7 shows the US investor's response in bond flows. The coefficient of $LSAP2$ is significantly positive, implying spillovers toward the Korean bond market from the US via a portfolio balancing effect in response of QE2 operations – the Fed's purchase of US Treasuries. The behavior of investors in advanced economies shows a clear pattern. In response to $LSAP1$ and $LSAP2$ portfolio flows are net capital inflows to both the stock and bond markets. By contrast, it is noteworthy that $LSAP_{tapering}$ resulted in net capital outflows from both the stock and bond market implying portfolio rebalancing from EMEs to AEs. The EMEs shows net capital outflows from the Korean bond market in response to $LASP2$ and $LSAP3$, which entailed asset allocation from safe to risky assets during the liquidity expansion. Last, in response to LF, US equity flows, AEs equity flows, and AEs bond flows were retrenched to the home country signifying that the market functioning channel was efficient in achieving capital inflows to the US market.

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[19] As Fratzscher et al. (2017) point out, one potential concern is that the Fed's operations have minimal effect on an efficient market since the Fed announces its operation in advance; thus the efficient market already reflects the available information. However, in a crisis period with high liquidity constraints, the actual purchase will affect the behavior of the market by providing liquidity and alleviating market friction. Moreover, since not every Fed announcement includes all details of its intervention (e.g., the composition of asset classes), the actual purchase still might have an impact on the markets.

[20] As to LF there is a big difference between column (5) and (6) in Table 3.6A when the controls for the investor country is included. As to $LSAP2$ the gap happens between column (6) and (7) in Table 3.6C when the model additionally considers the controls for the macro-prudential policy.

3.3.5 Total Impact of QE policies

This subsection discusses the total effect of Fed's unconventional monetary policy on capital flows to Korea. The findings differ in the significance, size, and sign of the regression coefficients obtained from the regression model estimation which makes it more challenging to determine the overall impact of US UMP. To ascertain the total dynamic impact of US monetary policy, I calculate the estimated cumulative net portfolio flows implied by each QE policy. To this end, the overall effect of each QE round is calculated by multiplying the coefficient of each program in Table 3.7 by the dynamic variable for each round of QE and each investor country's exposure to the US. The estimation excludes variables which are not statistically significant at the 20% level.[21]

Figure 3.4 represents a comparison between the actual cumulative portfolio flows (black line) and the estimated ones (red line), excluding the effect of QE policies. The QE policies increase the equity flows from all types of economies and the bond flows from AEs, while they reduce the bond flows from the US and EMEs. Panel A suggests a negative impact of QE to US investors in both the equity and bond markets during the QE1 period. This implies the Fed's monetary policy was successful during the GFC in that capital was retrenched to the US. Panel C and Panel D show that portfolio flows from AEs were increased by the QE policy in both the equity and bond markets. Panel C also suggests that the cumulative capital flows from AEs to the Korean stock market would have been 5% lower without QE. The impact of QE policy on the equity flows was relatively nominal for EMEs investors (Panel E) and there was a negative impact on bond flows (Panel F).[22]

The quantitative significance of QE 1, 2, and 3 for capital flows to Korea can be judged by comparing the effects of other key factors that have historically been observed. According to the cumulative IRF in Chapter 1, the cumulative impacts of USIND, VIX, domestic

[21]The 20% significance level is also employed by Fratzscher (2012).

[22]The existing literature uses various criteria to define the surge of net capital flows. Reinhart and Reinhart (2008) use the 20th percentile as the cut-off, while Cardarelli et al. (2010) consider 1 standard deviation as the threshold for the surge. More recently, Ghosh et al. (2014) analyze the net flow data of EMEs in 56 countries and define the surge as the top 30th percentile of capital flows.

monetary policy, and domestic stock prices are +0.5, -1.3, -1.0, and +1.4 trillion KRW, respectively. To compare this with the cumulative effects of QE, I calculate its ratio to the Korean equity balance held by foreigners as of October 2008, when the financial crisis was at its peak with the collapse of Lehman Brothers. The volumes are +0.3%, -0,7%, -0.6%, and +0.8%, respectively. This indicates that the quantitative impact of QE 1, 2, and 3 is significant to the Korean stock market.

3.3.6 Transmission Channels of the Fed's Unconventional Monetary Policy

This section evaluates the transmission channels of the Fed's unconventional monetary policy. The existing literature generally analyzes the term premia of US fixed-income securities to compare the signaling channel and the portfolio balance channel.[23] This study attempts to evaluate each channel of the UMP through its impact on capital flows to EMEs. The impact of the QE announcement that is captured by the QE_t^j represents the signaling effect.[24] Next, I separate the LSAP program from the purchase of Treasuries and MBS to distinguish the portfolio balance channel and the market functioning channel. The purpose of buying Treasuries is to promote economic recovery by focusing on macroeconomic variables such as employment and inflation; thus the purchase of Treasuries uses the portfolio balance channel.[25] The acquisition of MBS supports housing markets by reducing costs and increasing

[23]The table below shows the result of existing research on transmission channels of the Fed's UMP.

Channel	Period	Signaling	Portfolio Balance
Gagnon et al. (2011)	Nov 08 – Mar 10	22%	78%
Bauer & Rudebusch (2013)	Nov 08 – Dec 09	40%-50%	50%-60%
Bauer & Neely (2014) Canada	Nov 08 – Dec 09	40%-70%	30%-60%
Bauer & Neely (2014) Japan	Nov 08 – Dec 09	5%-15%	85%-95%

[24]"the LSAP announcements could have led market participants to revise down their expectations for future short-term interest rates ... Such a signaling channel for LSAPs would reduce yields by lowering the average expected short-rate component of long-term rates." (Bauer and Rudebusch, 2013)

[25]"To support a stronger economic recovery and to help ensure that inflation, over time, is at the rate most consistent with its dual mandate, the Committee agreed today to increase policy accommodation by purchasing additional agency mortgage-backed securities at a pace of $40 billion per month." (Sep 13, 2012 FOMC statement)

credit availability, thus demonstrating the market functioning channel.[26] Therefore, actual purchases of Treasuries and actual operations of MBS purchases from the QE3 period represent the portfolio balance channels while MBS^1 and LF capture the market functioning effect.[27] To this end, equation (3.1) is modified as follows:

$$NCF_{i,t} = \beta_1^j \, QE_t{}^j + \beta_2^j \, TS_{i,t}{}^j + \beta_3^j \, MBS_{i,t}{}^j + \beta_4 LF_{i,t} + \gamma X_t + \alpha_i + \epsilon_{i,t} \tag{3.4}$$

where TS and MBS are the US Fed's purchase of Treasury securities and MBS in month t, respectively. All other variables are the same as described in equation (3.1).

Table 3.9 shows results of the estimation. Based on the estimated coefficient, I derive the effect of each channel by multiplying the estimated coefficient and each variable. Table 3.10 reports the size of capital inflows driven by each channel of UMP. For equity flows, the portfolio balance channel (45%) outweighs the signaling effect (31%) and the market functioning effect (23%). For bond flows, the market functioning effect (45%) has a greater impact than the other two channels. Taken together, the portfolio balance effect and the market functioning effect explain 79% of the movement of capital flows, compared to 21% for the signaling effect, which is similar to findings of Gagnon et al. (2010).

3.4 Spillovers of US MP after the end of QE

This section discusses the possible difference of the impact of US monetary policy on the capital flows to EMEs as its stance changes. In the previous section, this research demonstrated role of the Fed's QE on the portfolio flows to EMEs when monetary policy is broadly expansionary before the end of QE. However, after the end of QE, stance of Fed's monetary policy became contractionary. As described above, US monetary policy affects capital

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[26] "Reduce cost and increase availability of credit ... support housing markets and foster improved conditions." (Nov 25, 2008 Fed Press Release)

[27] "Although market functioning appears to have been important at the start of the LSAPs when financial markets were unusually strained, primary long-run effects are associated with the portfolio balance effect." (Gagnon et al., 2010)

flows to emerging economies through diverse channels, and their influence may depend on the stance of the US monetary policy. Therefore, as this stance changes, it would have a different effect on capital inflows to EMEs.[28] This section analyzes if there is any difference between the impact of US monetary policy before and after QE. Both symmetric and asymmetric responses of capital flows to US monetary policy would provide interesting insights.

3.4.1 US monetary policy after QE

The US economy grew by 2.3% in 2017 and by 2.9% in 2018. The unemployment rate was 4.1%, much lower than the target rate of 5.0% and inflation, at 2.1%, was higher than the target rate of 2%. This robust growth of the US economy is driven by the 0% interest rate policy and the unconventional monetary policy, which were introduced after the GFC. The 0% interest rate policy continued until the first interest rate hike in December 2015 after the GFC. As the growth rate slowed in 2016, the Fed raised the interest rate just one time in December 2016, not two or three times as expected, to avoid the so-called "Eckles mistake".[29] As the US economy's recovery strengthened, the Fed raised interest rates three times in 2017 (March, June, and December) and four times in 2018 (March, June, September, and December). Also, at the June 2017 FOMC meeting, the Fed explained its policy normalization in detail and started the balance sheet normalization program in October 2017. As a result, the balance of assets decreased to $4.1 trillion as of December 2018 from $4.5 trillion as of October 2017, down by a maximum of $50 billion each month.[30]

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[28]The literature increasingly finds that the impact of monetary policy is contingent upon the economic condition. Recently, Avdjiev and Hale (2018) find that the effects of the U.S. federal funds rate on international banking flows are dependent upon macroeconomic fundamentals and the stance of monetary policy. See Olivei and Tenreyro (2007) Canova and Gambetti (2009) Hjortsoe et al. (2016) for more research of the asymmetry of the impact of the US monetary policy.

[29]As the economy recovered after the Great Depression, the Fed raised its policy rate, resulting in further recession in the economy. The mistake that prolonged the Great Depression is called the "Eckles mistake" named after the then Fed Chairman.

[30]Meanwhile, as growth in the US economy slowed and global financial market turmoil intensified in 2019, the Fed announced that it would freeze the policy rate in 2019 and stop reducing the size of its assets in September of that year.

3.4.2 Data and Empirical Methodology

Since the focus of this section is to compare the Fed's balance sheet policy before and after the end of QE in 2014, I introduce the US interest rate, the primary US monetary policy tool after post-QE, to the regression model. To test if the same transmission channels work in the era of contractionary monetary policy, I employ a standard dynamic panel data model with country fixed effects, the same as the previous section, but modify the regression as follows:

$$NCF_{i,t} = \beta_1 \left(\psi_{i,t} \times {i_t}^{US}\right) + \beta_2 \times \left(\psi_{i,t} \times LSAP_t\right) + \Gamma^{'} X_{i,t-1} + \alpha_i + \epsilon_{i,t} \tag{3.5}$$

where ${i_t}^{US}$ is the interest rate on the US 1-year T-bill; and other variables are as described in equation (1). I use the change in the yield on the US 1-year T-bill rather than the federal funds rate, as a measure of US monetary policy in the model, because since the "zero interest rate" situation, changes in the market interest rate have more accurately reflected the monetary policy trend.[31] The US Fed has used unconventional monetary policy measures, such as the forward guidance rule and liquidity facilities, since the global financial crisis, so US monetary polzzicy has had impacts even without changes in the federal funds rate. Therefore, this paper uses the 1-year T-bill rate as a variable of monetary policy in the main text.

In addition, the total size of LSAP is included as the explanatory variable since the Fed's purchases of the Treasury securities and MBS after QE are very similar (a correlation of 0.82). I drop the QE announcement variables (QE_t^j) and the purchase of liquidity facilities (LF_t) since they were implemented only for the QE period and the liquidity facilities program was only concerned with the short term interest rate, the effect of the operation would be reflected in the US interest rate.

[31]Recent studies such as Gertler and Karadi (2015) use the one-year government bond rate as the instrument to identify shocks to the US monetary policy. Because it has longer maturity and is risk-free, it is more appropriate than the federal funds rate to determine the overall measure of policy shocks including forward guidance rule.

3.4.3 Empirical Results

The results of the disaggregated flows over the market (equity or bond) and investor economies (AEs or EMEs) are reported in Tables C.3–C.6 in Appendix C. Table 3.11 represents the summary of results from the benchmark model (Columns (2), (4), and (7) of Tables C.3–C.6). The first and second columns in Table 3.11 show the AEs equity flows decline in response to the lowering of the US interest rate during QE1 and the US contractionary monetary policy after the end of QE. Equity flows from AEs also differ in response to the impact of LSAP before and after the QE. During the QE period, AEs equity flows were positively affected by the LSAP program, but after the end of the QE, the decline of the Fed's balance sheet negatively affected AEs equity flows.

Bond flows from AEs were negatively affected by US monetary policy during the QE period as shown in the fifth column of Table 3.11. During the QE period, the Fed's expansionary monetary policy, as evidenced by both the decline in the US interest rate and increase in LSAP, decreased bond flows from AEs which may in turn imply a portfolio reallocation out of the bond market into equities and home countries. The impacts of US monetary policy on AEs bond flows intensified after the end of QE. The time-varying effect of US monetary policy is also found in EMEs bond flows as reported in seventh and eighth columns of Table 3.11. During the QE period, EMEs bond flows were negatively affected by the LSAP operation, whereas they were positively impacted during the Fed's policy normalization. In sum, the results of the QE period are in line with results from the previous section and the existing literature in that the stance of US monetary policy determines the impact of flows.

3.5 Robustness Checks

This paper has robustness checks in different specifications of the model as follow: different control variables; different measurements of QE announcements; and different estimation techniques.

First, I include different control variables as reported in Table 3.6. The basic model

reported in the column (4) of Tables 3.6A–3.6F has control variables for the US only (lagged yield on the 1-year Treasury bill, lagged VIX, and the lagged return on S&P500 index). I progressively add the following control variables to the base model:

Column (5) controls for the recipient country, Korea (lagged Korean IPI, lagged yield on the Korean 1-year government bond, lagged Korea CDS index, and the lagged return on KOSPI);

Column (6) controls for each investor country (lagged IPI of the investor country, lagged yields on 1-year government bond of the investor country, and the lagged return on the stock index of the investor country);

Column (7) Column (6) plus two dummies capturing macro-prudential and capital control policy adopted to Korea;

Column (8) Column (6) plus a lagged dependent variable, ${NCF_{t-1}}^{i}$ to capture the persistence of flows;

Column (9) Column (6) plus total capital flows (equity or bond) to EMEs.

Results from the above are similar for the coefficients of the QE announcements and QE operations, thus indicating that the base model is robust to the inclusion of the additional controls. Some modified results are as follows:

(i) the significant negative impacts of the announcement of QE1 on US equity flows and EMEs equity flows (i.e., net capital outflows from Korea) are weakened or become insignificant as the controls for the investment country and policy variables are included;

(ii) the significant negative impact of liquidity facilities operations on US equity and bond flows (i.e., net capital outflows from Korea) is not robust.

Next, I changed the QE3 variable by dropping the announcement of "Operation Twist" from QE3. Table 3.12 reports the result of this estimation. Compared to the benchmark model reported in Table 3.6A, the coefficient of $QE3$ for AEs equity flows is larger while that

of AEs bond flows decreases. The significance of the $QE3$ variables in the new model is the same as that in the benchmark model. The significance and size of the coefficients for other variables reported in Table 3.12 are very close to those in the benchmark model reported in Table 3.6A. In sum, the overall results are confirmed except the negative impact of $QE3$ on AEs equity flows becomes stronger, with the inverse for AEs bond flows.

Last, I estimate the benchmark regression with a different econometric methodology. The panel regression in the main text is estimated by standard errors clustered by country to control heteroskedasticity and autocorrelation. For the robustness check, I instead use the bootstrapping standard error to estimate the model. Table 3.13 reports the results of the bootstrapping which confirms the results of the benchmark models in the main text. I also estimate the model using the Driscoll-Kraay standard errors to control cross-sectional dependence (Hoechle, 2007) as shown in Table 3.14. In this model, the response of US equity flows to the QE1 and QE2 announcements becomes more significant while the negative impacts of LSAP3 on AEs bond flows weaken. These results support the portfolio rebalancing effect of QE1 towards the US and rebalancing towards EMEs in response to QE2 and QE3.

3.6 Conclusion

This paper studies the international spillovers of US monetary policy on portfolio investment flows from different types of economies. For this purpose, I sort the portfolio flows to Korea by investor country and add the macroeconomic variables of each investor country to the control variables with global and domestic factors. I estimate the panel regression with the country fixed effect and clustered standard error. Focusing on the QE period, the model includes the variable capturing the QE announcement and the purchase under the LSAP and liquidity facilities program.

The results confirm the heterogeneity of the impact of the different QE rounds. Equity flows were retrenched to the US and AEs in response to the announcement of QE1 during the recession, whereas the announcement of QE2 and QE tapering triggered the spillovers from the US and advanced countries toward emerging markets during the economic recovery

period. These findings build a bridge on recent controversies by showing that QE has a significant impact on capital inflows to EMEs and that its effect is related to the business cycle.

This paper finds that the operations of QE1, QE2, and QE3 prompted capital inflows to Korea (both equity and bond market) from AEs while the liquidity facilities and QE operations during QE tapering period had a negative impact on AEs flows. This finding shows the international spillover of the Fed's unconventional monetary policy to international capital flows is mainly transmitted through the portfolio balance channel.

This research also analyzes if the channel of the US monetary policy depends on its stance by expanding the data span to include the Fed's balance sheet normalization after QE. The impact of US monetary policy on AEs equity flows and EMEs bond flows was felt in the opposite directions between the QE and post-QE periods. The findings confirm the time dependency of the response of the portfolio flows in response to US monetary policy.

The findings contribute to the recent debate reignited by the Fed chairman Powell over the determinants of the massive capital inflows to EMEs in that the Fed's unconventional monetary policy was a key determinant of capital inflows in emerging economies at the beginning of the 2010s. In particular, as Fratzscher et al. (2017) pointed out, QE expands the pro-cyclicality of capital inflows into EMEs. Since these spillovers may cause financial crises in emerging economies as shown in some recent cases, the US Fed should strengthen monetary policy coordination with other countries and promote monetary policy gradually and predictably, while emerging economies try to minimize the side effects through macro-prudential policy.

3.7 Tables and Figures

Table 3.1: US Fed's Unconventional Monetary Policy

Measure	Start	End	Description
Large-Scale Asset Purchase Program			
QE1	Nov 2008	Mar 2010	Purchase Long term Treasury $300 bil, Agency bond $200 bil, and MBS $1,250 bil
QE2	Nov 2010	Jun 2011	Purchase Treasury securities $600 bil
			ABS and MBS $247 bil matured
Operation Twist	Sep 2011	Dec 2012	Purchase long-term and sell short-term by $667 bil
QE3	Sep 2012	Dec 2012	Purchase MBS $40 bil monthly
	Jan 2013	Dec 2013	Purchase MBS $40 bil and Long term Treasury $45 bil monthly
– $QE_{tapering}$	Dec 2013	Oct 2014	Reduce the purchase amount by $10 bil at each of FOMC
			Fed announces the end of LSAP in Oct 2014
Credit Extended through Federal Reserve Liquidity Facilities			
Term Auction Credit	Dec 2007	Aug 2010	Introduce an auction system that supplies short-term liquidity to lower inter-bank lending rates
Commercial Paper Funding Facility	Jul 2008	Jan 2010	Purchase three-month commercial papers from eligible issuers to address financial strains
Central Bank Liquidity Swaps	Dec 2007	Jan 2014	Construct Dollar Liquidity Swap Lines with sixteen countries and Foreign-Currency Liquidity Swap Lines with five countries to provide liquidity to the US institutions
Term Asset-Backed Securities Loan Facility	Nov 2008	Jun 2010	Provide liquidity to household and small businesses by supporting the Issuance of ABS

Note: The table reports the unconventional monetary policy adopted by the US Fed. The table reports four biggest liquidity facilities. Term securities landing facility, Primary dealer credit facility, Money market investing funding facility are implemented mainly during the period of QE1.

Table 3.2: Summary Statistics for the Dependent Variables

Variable	Description	Source	Group	No. of count.	No. of Obs.	Mean	SD	Max.	Min.
Portfolio stcok flows	Net capital inflows to the stock market from each investor country scaled by GDP of the investor country	IMF FSS Korea	US	1	127	0.0077	0.0807	0.1800	-0.2090
			AEs (exclude US)	16	2,032	0.0190	1.7783	15.4820	-19.6940
			EMEs	9	1,143	0.0855	0.5337	3.9940	-2.8420
Portfolio bond flows	Net capital inflows to the bond market from each investor country scaled by GDP of the investor country	IMF FSS Korea	US	1	127	0.0109	0.0347	0.0975	-0.1393
			AEs (exclude US)	10	1,270	0.1778	2.5718	29.5866	-21.6561
			EMEs	6	762	0.1087	1.4632	9.3316	-9.1295

Note: Sample period is February 2008 to December 2014, monthly data.
Advanced countries for stock flows include 16 countries as follows: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK.
Emerging countries for stock flows include 9 countries as follows: China, Hong Kong, India, Kuwait, Malaysia, Saudi Arabia, Singapore, South Africa, Taiwan, UAE.
Advanced countries for bond flows include 10 countries as follows: Australia, Canada, France, Germany, Ireland, Japan, Luxembourg, Netherlands, Switzerland, UK.
Emerging countries for bond flows include 6 countries as follows: China, HK, Malaysia, Singapore, Taiwan, Thailand.

Table 3.3A: Key QE Announcement (Based on Bhattarai et al. (2016)

No.	Program	Date	Description
1	QE1	25/11/2008	Fed announces Long term Securities Asset Purchase
2	QE1	16/12/2008	FOMC announces the extending of QE to the Treasury securities
3	QE1	28/01/2009	Fed considers extending QE
4	QE1	18/03/2009	Fed announces $300 bil Treasuries, additional $750 bil MBS and $100 bil Agency bond
5	QE1	12/08/2009	Fed announces QE1 will be concluded in October
6	QE1	23/09/2009	Fed announces the purchase of MBS and agency debt will be finished in the first quarter of 2010
7	QE1	31/03/2010	QE1 terminated
8	QE2	27/08/2010	Bernanke hints at QE2 in Jackson Hole Speech
9	QE2	15/10/2010	Bernanke repeats that Fed is ready to further QE
10	QE2	03/11/2010	Fed announces QE2, purchasing $600 bil of Treasury securities at a rate of $75 bil per month
11	QE2	22/06/2011	QE2 finishes
12	OT	21/09/2011	Operation Twist announced (selling short-term bonds and reinvesting it to buy long-term bonds)
13	OT	20/06/2012	Fed extends Operation Twist to the end of 2012
14	QE3	22/08/2012	FOMC members comment additional monetary accommodation
15	QE3	13/09/2012	Fed announces QE3, purchasing $40 bil of MBS per month
16	QE3	12/12/2012	Fed expands QE3 by adding $45 bil of long-term Treasury securities
17	QE taper	22/05/2013	Bernanke stated in Congress that Fed may taper its securities purchase
18	QE taper	19/06/2013	Bernanke announces the discussion of QE tapering based on the continued positive economic data
19	QE taper	18/12/2013	Fed announces the beginning of tapering by $10 bil ($85 bil $\rightarrow$ $75 bil) in January 2014
20	QE taper	29/01/2014	Fed reduces bond purchase by $10bil ($75 bil $\rightarrow$ $65 bil)
21	QE taper	19/03/2014	Fed reduces bond purchase by $10bil ($65 bil $\rightarrow$ $55 bil)
22	QE taper	30/04/2014	Fed reduces bond purchase by $10bil ($55 bil $\rightarrow$ $45 bil)
23	QE taper	18/06/2014	Fed reduces bond purchase by $10bil ($45 bil $\rightarrow$ $35 bil)
24	QE taper	30/07/2014	Fed reduces bond purchase by $10bil ($35 bil $\rightarrow$ $25 bil)
25	QE taper	16/09/2014	Fed reduces bond purchase by $10bil ($25 bil $\rightarrow$ $15 bil) and announces the end of QE in October
26	QE taper	29/10/2014	Fed decides to conclude its asset purchase program
27	QE normal	05/04/2017	FOMC minutes released; policymakers reaffirmed approach to balance sheet normalization)
28	QE normal	24/05/2017	Fed discusses a specific plan on balance sheet normalization
29	QE normal	14/06/2017	Fed states principles and plans about balance sheet normalization program
30	QE normal	20/09/2017	Fed announces the start of the balance sheet normalization program

Table 3.3B: Portfolio Flows to Korea on the Month After QE Announcement

			Equity			Bond		
No.	Program	Date	US	ADE	EME	US	ADE	EME
1	QE1	25/11/2008	-0.040	0.203	0.265	-0.003	0.177	-0.189
2	QE1	16/12/2008	-0.015	-0.004	0.137	-0.001	-0.034	0.458
3	QE1	28/01/2009	-0.016	-0.079	-0.050	0.051	0.289	0.638
4	QE1	18/03/2009	0.024	0.419	-0.257	-0.002	0.011	-0.187
5	QE1	12/08/2009	0.064	0.196	0.101	0.021	0.491	1.029
6	QE1	23/09/2009	0.023	0.309	0.219	0.098	1.441	1.506
7	QE1	31/03/2010	0.180	0.589	0.000	0.012	1.519	0.113
8	QE2	27/08/2010	0.024	0.634	0.310	-0.026	0.276	-0.457
9	QE2	15/10/2010	0.102	0.488	0.069	0.063	1.327	-0.181
10	QE2	03/11/2010	0.097	0.296	0.190	0.031	0.111	-2.420
11	QE2	22/06/2011	0.030	0.048	0.025	-0.004	0.080	1.294
12	OT	21/09/2011	0.013	-0.393	0.255	0.044	0.248	0.077
13	OT	20/06/2012	-0.006	-0.124	0.101	-0.019	0.031	-0.018
14	QE3	22/08/2012	0.013	0.323	0.136	0.016	0.053	-0.076
15	QE3	13/09/2012	-0.079	-0.208	0.115	0.017	-0.063	-0.162
16	QE3	12/12/2012	-0.066	0.127	-0.197	-0.002	-0.200	-0.648
17	QE tapering	22/05/2013	-0.108	-0.405	-0.039	0.050	1.663	-0.106
18	QE tapering	19/06/2013	0.072	-0.255	0.431	0.036	0.583	-0.348
19	QE tapering	18/12/2013	0.016	-0.678	0.182	0.017	-0.015	0.005
20	QE tapering	29/01/2014	-0.051	-0.680	0.249	-0.082	-0.412	-0.048
21	QE tapering	19/03/2014	0.067	0.615	0.335	-0.001	-0.498	0.202
22	QE tapering	30/04/2014	0.010	0.170	0.596	0.015	-0.146	0.343
23	QE tapering	18/06/2014	0.081	0.201	0.075	0.033	-0.023	-0.267
24	QE tapering	30/07/2014	0.045	0.628	-0.040	-0.015	-0.559	0.250
25	QE tapering	16/09/2014	-0.020	-0.587	0.124	-0.014	0.029	0.101
26	QE tapering	29/10/2014	0.046	-0.003	0.221	-0.003	0.010	-0.299
27	QE normalization	05/04/2017	0.091	0.092	-0.042	0.006	0.007	0.116
28	QE normalization	24/05/2017	0.021	0.012	-0.052	0.014	0.012	0.012
29	QE normalization	14/06/2017	0.043	-0.035	0.024	-0.016	0.070	-0.126
30	QE normalization	20/09/2017	0.050	-0.057	0.021	0.001	0.528	0.064

Note: The table shows the average of the net capital flows from investor countries to Korea scaled by the GDP of the each investor country. Date refers to the date conducting the key QE announcements.

Table 3.4: Variables Description

Variable	Definition	Mean	Std Dev	Source
US Monetary Policy				
QE	Dummy variable, equals 1 on the month with an expansionary announcement			FED
LSAP	Monthly change in the balance of US Treasury bond and MBS, mom, US trillion	0.078	0.036	FRED
TS	Monthly change in the balance of US Treasury bond, mom, US trillion	0.040	0.033	FRED
MBS	Monthly change in the balance of MBS, mom, US trillion	0.038	0.038	FRED
LF	Monthly change in the balance of all liqudity facilitie, mom, US trillion	0.252	0.246	FED
Controls				
Global Variable				
VIX	Volatility index, First differenciated, standardized, %p	0.000	1.000	FRED
MSCI	Monthly returns on MSCI world index, %	0.002	0.048	MSCI
IPI_OECD	Industrial production index, standardized, mom, %			OECD
Regional Variable				
IPI	Industrial production index, standardized, mom, %	0.000	0.414	OECD
Interest Rate	Interest rate on 1-year government bond, first differentiated, %p	-0.025	0.132	Bloomberg
stock_regional	Monthly stock returns on each country, orthog to MSCI world index, %	0.000	0.015	Bloomberg
Domestic Variable				
IPI_KR	Korean industrial production index , standardized, mom, %	0.000	1.000	BOK
i_KR	MSCI world index, monthly % retruns	-0.028	0.178	BOK
CDS_KR	Credit Default Swap rate, mothly difference, Orthogonalized by VIX	0.000		Bloomberg
Stock_KR	Monthly stock returns on Korea, orthogonalized to MSCI world index, %	0.000	0.032	BOK
Crisis Dummy				
MP	Macro-prudential policy implemented in Korea			MOEF
CC	Capital control policy implemented in Korea			MOEF

Note: TIC denotes Treasury International Capital (TIC) System of US department of the treasury. MOEF denotes the ministry of economy and finance, Korea. BOK denotes Bank of Korea.

Table 3.5: Direct Exposure to the US

Country	Exposure to US	Country	Exposure to US
Luxembourg	1.836	Norway	0.116
Switzerland	0.567	Malaysia	0.102
Hong Kong	0.450	Belgium	0.102
Canada	0.414	Germany	0.092
UK	0.390	New Zealand	0.081
Netherlands	0.384	Spain	0.081
Singapore	0.272	Thailand	0.060
South Africa	0.209	India	0.050
Taiwan	0.209	Italy	0.046
Sweden	0.199	Austria	0.043
Australia	0.196	Kuwait	0.041
Denmark	0.188	Portugal	0.040
Ireland	0.164	UAE	0.021
France	0.151	China	0.013
Finland	0.144	Saudi Arabia	0.000
Japan	0.123		

Note: The table reports the average of the economy's exposure to the US between January 2008 to August 2018. The economy's exposure to the US is calculated as follows:

$$\psi_{i,t} = \frac{Liability\ to\ the\ US_{i,t}}{GDP_{i,t}}$$

The sources of data are Treasury International Capital (TIC) System and IMF WEO.

Table 3.6: Model Summary and Regression Result

Table 3.6A–F reports the estimated coefficients of the following regression:

$$NCF_{i,t} = \beta_{1,j} \times QE^{j}_{t-1} + \beta_{2,j}(\psi_{i,t} \times LSAP^{j}_{t}) + \beta_{3,j}(\psi_{i,t} \times LF_t) + \gamma X_t + \alpha_i + \epsilon_{i,t} \qquad (3.1)$$

where $NCF_{i,t}$ is portfolio flows (either equity or bond) to Korea from country i as percentage of the GDP in country i on month t (Table 2.1 and Table 3.3 reports the summary statistics); the regression is separately estimated for three groups of countries the US, advanced economies (ADE), and emerging economies (EME); QE^{j}_{t-1} is a dummy variable equal to 1 on a subset of the QE announcements listed in Table 3.2, disaggregated by the each of QE rounds (j = 1,2,3, and tapering)*; $LSAP^{j}_{t-1}$ are the amount of Fed's purchase of Treasury securities and mortgage-backed securities in month t-1†; LF_{t-1} captures Fed's operation of the all liquidity facilities during QE1 period. ψ_i is the exposure to the US as describes in subsection 3.3.3 and reported in Table 3.4. X_t is a set of control variables which includes variables of the US, investor country, recipient country (Korea), and the dummies to capture the macro-prudential policy and capital control policy implemented in Korea. Table 3.5 describes the control variables. α_i captures the country-specific fixed effects.

List of estimated models in Table 3.6A–F:

- (*i*) Column (1) 'No purchases, No Controls': only QE announcement dummies
- (*ii*) Column (2) 'No purchases' US Controls: only QE announcement dummies and US control variables (lagged yield on the US 1 year Treasury bill, lagged VIX, and the lagged return on S&P500 index)
- (*iii*) Column (3) 'Purchases, No Controls': only QE announcement dummies, purchase of LSAP (LSAP) and purchase of Liquidity Facilities (LF)
- (*iv*) Column (4) 'Purchases, US Controls': QE announcement dummies, LSAP, LF, and US control variables
- (*v*) Column (5) 'Additional controls A': Column (4) plus the domestic control variables (lagged Korea IPI, lagged yield on the Korean 1 year government bond, lagged Korea CDS index, and the lagged return on KOSPI)
- (*vi*) Column (6) 'Additional controls B': Column (5) plus investor country control variables (lagged IPI of Investor country, lagged yields on 1 year government bond of investor country, and the lagged return on the stock index of investor country)
- (*vii*) Column (7) 'Additional controls C': Column (6) plus two dummies capturing macro-prudential policy and capital control policy adopted to Korea
- (*viii*) Column (8) 'Additional controls D':Column (6) plus lagged dependent variable, NCF_{t-1}
- (*ix*) Column (9) 'Additional controls E': Column (6) plus controls for total flows (equity of bond) to EMEs

Table 3.6A: Dependent Variable: Equity Flows (US)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	-.0604	1.6542***	1.4724**	2.0850***	2.0006***	2.0006***	1.3595*	.7785	1.7547***
	(.4256)	(.4696)	(.6789)	(.5771)	(.6955)	(.6955)	(.7295)	(.5301)	(.6234)
QE2	4.6293	3.9024*	2.7269*	2.5944**	1.7777	1.7777	2.6174	1.0306	-2.0369
	(3.1427)	(2.0504)	(1.4784)	(1.2224)	(1.7749)	(1.7749)	(2.2102)	(1.1167)	(1.6303)
QE3	-2.6433	-2.3000	-3.3852	-1.8559	-1.6714	-1.6714	-1.5036	-3.7180	-.3857
	(2.1500)	(3.5268)	(2.9745)	(3.5089)	(3.8153)	(3.8153)	(3.7993)	(4.0497)	(4.4927)
QE_{taper}	.1053	-1.7858	-1.9579	-1.3227	-1.1019	-1.1019	-1.2370	2.5038	2.5671
	(5.1581)	(6.0646)	(5.9694)	(6.4592)	(6.9281)	(6.9281)	(7.0028)	(6.7379)	(4.4534)
QE_{normal}	-7.5692	-8.4561	-7.2793	-9.5829	-8.2859	-8.2859	-8.2595	-4.2927	-7.4394
	(6.2816)	(7.2032)	(6.6457)	(9.9472)	(9.5804)	(9.5804)	(9.3425)	(7.8747)	(7.7320)
LSAP1			.2126	.0918	-.0210	-.0210	-.5625	.0836	-.0721
			(.1688)	(.1505)	(.2012)	(.2012)	(.3561)	(.1918)	(.1958)
LSAP2			.6761***	.4325**	.3367	.3367	.4488	.1578	.4135*
			(.2107)	(.1994)	(.2247)	(.2247)	(.2979)	(.2589)	(.2123)
LSAP3			.2440	-.0281	-.0424	-.0424	-.0274	-.0824	-.1790
			(.3272)	(.3625)	(.3656)	(.3656)	(.3686)	(.2877)	(.3452)
$LSAP_{taper}$			.2190	-.1028	-.1147	-.1147	-.0821	-.1399	-.2571
			(.2163)	(.2042)	(.2132)	(.2132)	(.2205)	(.2207)	(.1627)
$LSAP_{normal}$			-1.7429***	-3.6703***	-3.6793***	-3.6793***	-3.6848***	-2.4149***	-3.9424***
			(.3251)	(.8812)	(.8326)	(.8326)	(.8281)	(.7550)	(.8435)
LF			-.2721***	-.1445**	-.1831***	-.1831***	-.1856***	-.0770	-.1238**
			(.0631)	(.0579)	(.0564)	(.0564)	(.0569)	(.0615)	(.0495)
Obs.	127							126	
Countries	1								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6B: Dependent Variable: Equity Flows (Advanced Economies)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	-.0718***	-.0636***	.0420***	.0349**	.0438**	.0462**	.0524***	.0203	.0446**
	(.0182)	(.0128)	(.0128)	(.0153)	(.0156)	(.0161)	(.0146)	(.0117)	(.0155)
QE2	.2758***	.2765***	.2827***	.2878***	.2845***	.2850***	.2927***	.2548***	.2579***
	(.0528)	(.0536)	(.0511)	(.0526)	(.0521)	(.0527)	(.0548)	(.0502)	(.0420)
QE3	.0555***	.0532***	.0478**	.0439**	.0426**	.0431*	.0493**	-.0508***	.0513*
	(.0177)	(.0166)	(.0179)	(.0188)	(.0184)	(.0215)	(.0207)	(.0084)	(.0249)
QE_{taper}	-.2392***	-.2456***	-.2318***	-.2298***	-.2247***	-.2232***	-.2235***	-.1897***	-.1970***
	(.0526)	(.0543)	(.0466)	(.0453)	(.0435)	(.0433)	(.0434)	(.0407)	(.0328)
QE_{normal}	-.2704***	-.2779***	-.2775***	-.2711***	-.2552***	-.2569***	-.2583***	-.2078**	-.2513***
	(.0815)	(.0855)	(.0835)	(.0855)	(.0807)	(.0827)	(.0819)	(.0714)	(.0799)
LSAP1			.0152***	.0164***	.0170***	.0172***	.0197***	.0109***	.0168***
			(.0032)	(.0030)	(.0024)	(.0025)	(.0015)	(.0018)	(.0023)
LSAP2			-.0009	-.0014*	-.0014*	-.0012	.0003	-.0049***	-.0005
			(.0010)	(.0007)	(.0007)	(.0007)	(.0011)	(.0005)	(.0009)
LSAP3			.0013***	.0006	.0009	.0009	.0004	.0003	.0002
			(.0003)	(.0007)	(.0006)	(.0005)	(.0006)	(.0004)	(.0009)
$LSAP_{taper}$			-.0113***	-.0124***	-.0121***	-.0122***	-.0127***	-.0067***	-.0129***
			(.0031)	(.0036)	(.0034)	(.0035)	(.0036)	(.0023)	(.0038)
$LSAP_{normal}$			.0190***	.0205***	.0205***	.0211***	.0200***	.0164***	.0205***
			(.0043)	(.0026)	(.0028)	(.0033)	(.0032)	(.0036)	(.0031)
LF			-.0171***	-.0167***	-.0170***	-.0169***	-.0172***	-.0118***	-.0163***
			(.0054)	(.0050)	(.0051)	(.0050)	(.0050)	(.0039)	(.0048)
Obs.	2032							2016	
Countries	16								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6c: Dependent Variable: Equity Flows (Emerging Economies)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	.0313	.0394	.0003	.0095	.0041	.0013	-.0018	.0113	.0005
	(.0423)	(.0379)	(.0016)	(.0059)	(.0056)	(.0071)	(.0085)	(.0075)	(.0075)
QE2	.0840*	.0718**	.0774**	.0599**	.0569***	.0561**	.0585**	.0579**	.0374**
	(.0388)	(.0288)	(.0299)	(.0179)	(.0165)	(.0196)	(.0222)	(.0217)	(.0158)
QE3	-.1186	-.1000	-.1060	-.0870	-.0914	-.0823	-.0845	-.0650	-.0774
	(.0941)	(.0786)	(.0864)	(.0702)	(.0768)	(.0734)	(.0743)	(.0559)	(.0705)
QE_{taper}	.0883	.0941	.1128	.1080	.1048	.1051	.1051	.1093	.1225
	(.1008)	(.1037)	(.1156)	(.1108)	(.1091)	(.1071)	(.1073)	(.1148)	(.1165)
QE_{normal}	-.0045	-.0127	-.0005	-.0160	-.0279	-.0263	-.0251	-.0242	-.0234
	(.0555)	(.0552)	(.0532)	(.0593)	(.0680)	(.0667)	(.0661)	(.0637)	(.0657)
LSAP1			-.0016	-.0036	-.0029	-.0030	-.0048	-.0016	-.0033
			(.0032)	(.0040)	(.0032)	(.0036)	(.0056)	(.0022)	(.0037)
LSAP2			.0014	.0020	.0019	.0019	.0022	.0017	.0022
			(.0024)	(.0031)	(.0033)	(.0032)	(.0038)	(.0033)	(.0034)
LSAP3			-.0032	-.0024	-.0024	-.0025	-.0024	-.0027	-.0030
			(.0022)	(.0016)	(.0015)	(.0015)	(.0015)	(.0017)	(.0018)
$LSAP_{taper}$			-.0014	-.0001	-.0003	-.0006	-.0005	-.0005	-.0010
			(.0018)	(.0023)	(.0021)	(.0021)	(.0021)	(.0019)	(.0019)
$LSAP_{normal}$			-.0171	-.0268	-.0280	-.0280	-.0278	-.0285	-.0282
			(.0130)	(.0204)	(.0218)	(.0221)	(.0222)	(.0251)	(.0221)
LF			.0063	.0056	.0057	.0058	.0058	.0056	.0061
			(.0075)	(.0068)	(.0071)	(.0070)	(.0070)	(.0069)	(.0072)
Obs.	1143							1134	
Countries	9								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6D: Dependent Variable: Bond Flows (US)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	.2214	.6538*	.9370***	1.0210**	.8493**	.8493**	.6292	.9229**	.8177**
	(.2156)	(.3392)	(.3088)	(.3966)	(.3955)	(.3955)	(.4011)	(.3950)	(.3933)
QE2	.4711	.1729	-.1733	-.0377	.4477	.4477	-1.7969	-.3018	-.0422
	(2.1806)	(1.9799)	(1.6357)	(1.6376)	(1.6435)	(1.6435)	(1.6720)	(1.4646)	(1.6327)
QE3	-3.0357**	-2.8315**	-3.3016**	-3.2877**	-2.8577	-2.8577	-3.5662	-3.2092**	-2.6926
	(1.2695)	(1.3167)	(1.2846)	(1.5832)	(1.8182)	(1.8182)	(2.4461)	(1.4500)	(1.8571)
QE_{taper}	3.7051***	3.2130***	3.2191**	3.3397***	3.1175**	3.1175**	2.9891**	2.8778**	3.5887**
	(.8181)	(.7403)	(1.2573)	(1.1919)	(1.2760)	(1.2760)	(1.3303)	(1.3771)	(1.5964)
QE_{normal}	1.6303**	1.6136*	1.6479**	1.4016*	.7492	.7492	.4903	1.0163	.8580
	(.7326)	(.8503)	(.7383)	(.7592)	(.9273)	(.9273)	(1.1008)	(.7202)	(1.0324)
LSAP1			.2430***	.2391**	.1705	.1705	.1147	.1182	.1639
			(.0664)	(.1001)	(.1315)	(.1315)	(.1371)	(.1285)	(.1311)
LSAP2			.2290***	.1969*	.2089*	.2089*	-.1899	.1432	.2188*
			(.0854)	(.0996)	(.1251)	(.1251)	(.1727)	(.1240)	(.1265)
LSAP3			.0874	.0545	.0328	.0328	.1080	-.0003	.0153
			(.1165)	(.1282)	(.1315)	(.1315)	(.1290)	(.1293)	(.1298)
$LSAP_{taper}$			-.1635	-.2013	-.2083	-.2083	-.1114	-.2006	-.2266
			(.1632)	(.1704)	(.1738)	(.1738)	(.1781)	(.1880)	(.1729)
$LSAP_{normal}$			-.1057	-.3011	-.2548	-.2548	-.1291	-.4954	-.2886
			(.2982)	(.3694)	(.3701)	(.3701)	(.3815)	(.3841)	(.3582)
LF			-.0143	.0061	.0197	.0197	.0355	.0139	.0273
			(.0207)	(.0303)	(.0276)	(.0276)	(.0267)	(.0299)	(.0299)
Obs.	127							126	
Countries	1								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6E: Dependent Variable: Bond Flows (Advanced Economies)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	.0033*	.0260*	.0792***	.0780**	.0781***	.0827**	.0787***	.0788***	.0829**
	(.0015)	(.0137)	(.0201)	(.0273)	(.0240)	(.0259)	(.0181)	(.0233)	(.0261)
QE2	.1730***	.1801***	.1117***	.1179***	.1294***	.1295***	.1277***	.0137	.1320***
	(.0396)	(.0417)	(.0219)	(.0242)	(.0311)	(.0313)	(.0167)	(.0143)	(.0332)
QE3	-.0733***	-.0803***	-.0639***	-.0700***	-.0645***	-.0648***	-.0677***	-.0225***	-.0655***
	(.0192)	(.0207)	(.0188)	(.0195)	(.0113)	(.0072)	(.0154)	(.0038)	(.0076)
QE_{taper}	.3368***	.3435***	.4078***	.4098***	.4088***	.4081***	.4083***	.3285***	.4056***
	(.0778)	(.0808)	(.0957)	(.0971)	(.0941)	(.0941)	(.0944)	(.0800)	(.0924)
QE_{normal}	.0957**	.0896***	.0988***	.1032***	.0992***	.1068***	.1082***	.1421***	.1063***
	(.0304)	(.0254)	(.0299)	(.0271)	(.0232)	(.0249)	(.0252)	(.0312)	(.0245)
LSAP1			.0136**	.0142***	.0152***	.0153***	.0133***	.0095***	.0154***
			(.0049)	(.0043)	(.0030)	(.0030)	(.0013)	(.0020)	(.0031)
LSAP2			.0211**	.0207**	.0219**	.0217***	.0214***	.0172**	.0217***
			(.0070)	(.0067)	(.0068)	(.0065)	(.0036)	(.0056)	(.0064)
LSAP3			-.0024***	-.0028***	-.0030***	-.0030**	-.0028***	-.0044***	-.0030**
			(.0006)	(.0007)	(.0009)	(.0011)	(.0007)	(.0013)	(.0010)
$LSAP_{taper}$			-.0485***	-.0489***	-.0490***	-.0488***	-.0487***	-.0361***	-.0488***
			(.0129)	(.0128)	(.0129)	(.0127)	(.0120)	(.0101)	(.0126)
$LSAP_{normal}$			-.0033*	-.0007	.0002	-.0012	-.0007	.0007	-.0011
			(.0015)	(.0017)	(.0019)	(.0019)	(.0027)	(.0011)	(.0018)
LF			-.0083***	-.0079***	-.0071***	-.0074***	-.0073***	-.0066***	-.0075***
			(.0017)	(.0015)	(.0013)	(.0016)	(.0012)	(.0015)	(.0016)
Obs.	1270							1260	
Countries	10								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.6F: Dependent Variable: Bond Flows (Emerging Economies)

	(1) No Purchase No Controls	(2) No Purchase US Controls	(3) Purchase No Controls	(4) Purchase US Controls	(5) Additional Controls A	(6) Additional Controls B	(7) Additional Controls C	(8) Additional Controls D	(9) Additional Controls E
QE1	.0035	.0597	.0387	.0774	.0638	.0656	.0411	.0145	.0638
	(.0217)	(.0457)	(.0282)	(.0597)	(.0401)	(.0390)	(.0257)	(.0182)	(.0380)
QE2	-.3399***	-.3018***	-.2879***	-.2510***	-.2517***	-.2570***	-.2801***	-.2863***	-.3010***
	(.0399)	(.0444)	(.0287)	(.0327)	(.0411)	(.0373)	(.0596)	(.0422)	(.0411)
QE3	-.1608	-.1974**	-.0476	-.0954	-.1348	-.1458	-.1754	-.2395**	-.1332
	(.0969)	(.0738)	(.0860)	(.0680)	(.0939)	(.0885)	(.0895)	(.0862)	(.0882)
QE_{taper}	-.0638	-.0186	.0998	.1109	.1285	.1138	.1132	.0929	.1577
	(.0742)	(.0634)	(.0969)	(.0938)	(.0962)	(.1018)	(.0995)	(.0902)	(.0837)
QE_{normal}	.0810	.0850	.1043	.1103	.1067	.1032	.1024	.1205	.1097
	(.1415)	(.1541)	(.1370)	(.1486)	(.1441)	(.1380)	(.1358)	(.0825)	(.1412)
LSAP1			.0056	.0029	.0058	.0061	-.0055	-.0024	.0053
			(.0077)	(.0065)	(.0053)	(.0051)	(.0109)	(.0091)	(.0052)
LSAP2			-.0195**	-.0196**	-.0171**	-.0162**	-.0197*	-.0117	-.0154*
			(.0050)	(.0050)	(.0053)	(.0056)	(.0092)	(.0059)	(.0063)
LSAP3			-.0255***	-.0229**	-.0209*	-.0197*	-.0176	-.0168	-.0210*
			(.0047)	(.0082)	(.0093)	(.0097)	(.0097)	(.0087)	(.0088)
$LSAP_{taper}$			-.0026	.0021	.0036	.0048	.0071	.0043	.0036
			(.0066)	(.0112)	(.0114)	(.0121)	(.0122)	(.0094)	(.0110)
$LSAP_{normal}$			-.0040	.0247	.0220	.0265	.0288	.0324	.0256
			(.0186)	(.0300)	(.0266)	(.0298)	(.0281)	(.0223)	(.0293)
LF			-.0014	-.0018	-.0005	.0003	.0009	-.0034	.0011
			(.0073)	(.0080)	(.0072)	(.0072)	(.0069)	(.0100)	(.0067)
Obs.	762							756	
Countries	6								
Controls		US		US	US	US	US	US	US
					KR	KR	KR	KR	KR
						Investor	Investor	Investor	Investor
							Policy	Lagged NCF	EME flows

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.7: Estimated Coefficients for the Benchmark Regression

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
QE1	2.0006***	.0462**	.0013	.8493**	.0827**	.0656
	(.6955)	(.0161)	(.0071)	(.3955)	(.0259)	(.0390)
QE2	1.7777	.2850***	.0561**	.4477	.1295***	-.2570***
	(1.7749)	(.0527)	(.0196)	(1.6435)	(.0313)	(.0373)
QE3	-1.6714	-.0508*	-.0823	-2.8577	-.0648***	-.1458
	(3.8153)	(.0215)	(.0734)	(1.8182)	(.0072)	(.0885)
QE_{taper}	-1.1019	-.2232***	.1051	3.1175**	.4081***	.1138
	(6.9281)	(.0433)	(.1071)	(1.2760)	(.0941)	(.1018)
QE_{normal}	-8.2859	-.2569***	-.0263	.7492	.1068***	.1032
	(9.5804)	(.0827)	(.0667)	(.9273)	(.0249)	(.1380)
LSAP1	-.0210	.0172***	-.0030	.1705	.0153***	.0061
	(.2012)	(.0025)	(.0036)	(.1315)	(.0030)	(.0051)
LSAP2	.3367	-.0012	.0019	.2089*	.0217***	-.0162**
	(.2247)	(.0007)	(.0032)	(.1251)	(.0065)	(.0056)
LSAP3	-.0424	.0009	-.0025	.0328	-.0030**	-.0197*
	(.3656)	(.0005)	(.0015)	(.1315)	(.0011)	(.0097)
$LSAP_{taper}$	-.1147	-.0122***	-.0006	-.2083	-.0488***	.0048
	(.2132)	(.0035)	(.0021)	(.1738)	(.0127)	(.0121)
$LSAP_{normal}$	-3.6793***	.0211***	-.0280	-.2548	-.0012	.0265
	(.8326)	(.0033)	(.0221)	(.3701)	(.0019)	(.0298)
LF	-.1831***	-.0169***	.0058	.0197	-.0074***	.0003
	(.0564)	(.0050)	(.0070)	(.0276)	(.0016)	(.0072)

Note: The table reports the results in column (7) of each panel of Table 3.6.1A-F. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.8: Impact of QE Announcement

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
QE1	-1.3862***	-0.0352**	-0.0004	-0.6460**	-0.0655**	-0.0504
	(0.4925)	(0.0122)	(0.0059)	(0.3107)	(0.0206)	(0.0300)
QE2	-0.5500	0.0696***	0.0101**	-0.0114	0.0356***	-0.0813***
	(0.4402)	(0.0113)	(0.0043)	(0.4408)	(0.0090)	(0.0111)
QE3	0.0424	0.0058*	0.0085	0.2962	0.0072***	0.0147
	(0.4942)	(0.0027)	(0.0078)	(0.2043)	(0.0008)	(0.0097)
QE_{taper}	0.6674	-0.0512***	0.0319	0.9331**	0.1055***	0.0410
	(1.1579)	(0.0085)	(0.0303)	(0.4151)	(0.0240)	(0.0218)
QE_{normal}	0.5208	0.0176***	0.0016	-0.0601	-0.0074***	-0.0077
	(0.5412)	(0.0056)	(0.0046)	(0.0723)	(0.0017)	(0.0099)

Note: The table reports the impact of QE announcement. The numbers are calculated by the product of the coefficients in the Table 3.7 and the total change in the yields on 10-year T notes. Asterisk indicates the significance of the coefficient. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.9: Estimated Coefficients for the Benchmark Regression (TS and MBS)

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
QE1	1.9200**	.0483***	-.0096	.3639	.0462***	.0472
	(.8393)	(.0159)	(.0159)	(.3567)	(.0113)	(.0398)
QE2	1.7689	.2850***	.0564**	.3946	.1297***	-.2568***
	(1.7914)	(.0527)	(.0196)	(1.6948)	(.0314)	(.0373)
QE3	-1.7180	.0435*	-.0863	-3.1388*	-.0731***	-.1540
	(3.8490)	(.0214)	(.0769)	(1.8509)	(.0097)	(.0850)
QE_{taper}	-1.0866	-.2233***	.1058	3.2094**	.4096***	.1156
	(6.9723)	(.0433)	(.1079)	(1.2350)	(.0945)	(.1014)
QE_{normal}	-8.2554	-.2569***	-.0262	.9331	.1080***	.1040
	(9.6108)	(.0827)	(.0666)	(.9848)	(.0258)	(.1386)
TS1	-.1547	.0207***	-.0236	-.6350**	-.0476*	-.0291
	(.6559)	(.0028)	(.0228)	(.3049)	(.0221)	(.0313)
MBS1	.0157	.0163***	.0031	.3917**	.0310***	.0164**
	(.2127)	(.0026)	(.0027)	(.1688)	(.0090)	(.0059)
LSAP2	.3330	-.0012	.0018	.1868	.0213***	-.0164**
	(.2264)	(.0007)	(.0031)	(.1272)	(.0064)	(.0055)
LSAP3	-.0424	.0009	-.0023	.0326	-.0026**	-.0193
	(.3672)	(.0005)	(.0013)	(.1319)	(.0010)	(.0097)
$LSAP_{taper}$	-.1153	-.0123***	-.0003	-.2120	-.0482***	.0054
	(.2143)	(.0035)	(.0023)	(.1689)	(.0124)	(.0124)
$LSAP_{normal}$	-3.6705***	.0211***	-.0277	-.2016	-.0006	.0272
	(.8349)	(.0033)	(.0218)	(.3710)	(.0018)	(.0297)
LF	-.1851***	-.0169***	.0054	.0081	-.0086***	-.0004
	(.0569)	(.0050)	(.0066)	(.0243)	(.0021)	(.0076)

Note: The table reports the results of regression (3.3) of each flows (equity or bond) from each investor economies (US, ADE, and EME). The control variables follow the column (6) of regression (3.1). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.10: Size of Transmission Channel

Channel	Stock	Bond	Total
Signaling	2.466	1.574	4.040
(%)	(31.2)	(14.1)	(21.2)
Portfolio balance	3.597	4.609	8.207
(%)	(45.4)	(41.3)	(43.0)
Market functioning	1.852	4.969	6.821
(%)	(23.4)	(44.6)	(35.8)

Note: The table reports the size of transmission channels. The numbers are calculated by the product of the estimated coefficients in the Table 3.9 and each variable.

Table 3.11: Summary of Estimated Coefficients: QE vs Post-QE

	Equity Flows				Bond Flows			
	ADE		EME		ADE		EME	
	QE	PQE	QE	PQE	QE	PQE	QE	PQE
US Monetary policy measures								
Interest rate	1.0958***	-.5589***	-.2889	-.4544	.1644***	.4137***	.2041	.2730**
	(.3136)	(.1268)	(.2281)	(.3432)	(.0225)	(.0897)	(.1226)	(.0982)
LSAP	.3946***	-.0716	-.1211	-.3191	-.1755*	-1.8721***	-.6399**	.9674*
	(.0664)	(.0450)	(.1511)	(.2015)	(.0915)	(.5615)	(.1629)	(.4375)
Controls								
IPI_{world}	-.0587	-.0121	.0062	.0522	.1058	-.1916	-.2099	.0347
	(.0788)	(.0126)	(.0155)	(.0355)	(.0850)	(.1914)	(.1308)	(.0520)
VIX	-.1046	-.3358	-.0070	-.0162	-.0172	-.2004	-.1029	-.1570
	(.1254)	(.1997)	(.0161)	(.0557)	(.0228)	(.2692)	(.1301)	(.1577)
Stock_{world}	.5189	5.3220	-1.7412	-.8537	1.2463	1.4822	2.6502	1.4406
	(.7705)	(4.6847)	(1.6380)	(1.6311)	(.8479)	(1.5564)	(1.6477)	(1.0245)
IPI_{KR}	.0533	-.0192	-.0245	-.0194	.1014	.0735	.1413	-.0327
	(.0404)	(.0114)	(.0270)	(.0267)	(.0984)	(.0809)	(.0857)	(.0256)
CDS_{KR}	-.1266	-.1401	.0042	-.0386	.0428	.1506	-.2589	-.0607
	(.0778)	(.1040)	(.0270)	(.0610)	(.0427)	(.1853)	(.1983)	(.0363)
$\text{Interest rate}_{KR}$	.1161	.8018	.0205	-.4417	-1.1297	-3.6709	-.3273	.4540
	(.1736)	(.6615)	(.0654)	(.2783)	(1.2469)	(2.9260)	(.3406)	(.6950)
Stock_{KR}	2.3627	3.3464	-.3337	-.3532	-3.6331	.9936*	-2.1809	.5732
	(2.1567)	(2.2830)	(.5542)	(1.1960)	(3.9771)	(.5394)	(2.3249)	(1.5133)
$\text{IPI}_{investor}$	-.0208	-.0494	.0351	.0214	-.0081	.0060	-.0826*	.0276
	(.0217)	(.0314)	(.0295)	(.0535)	(.0100)	(.0202)	(.0400)	(.0495)
$\text{Interest rate}_{investor}$	-.9605	.1541	.0561	.1984	-.0273	-.8087	.6137	.1078
	(.6965)	(.2350)	(.0665)	(.2260)	(.1913)	(.6136)	(.6852)	(.2335)
$\text{Stock}_{investor}$	.5098	.6187	-.3514	-.8105	-1.8995	-4.8811	.8776	.8858
	(.9124)	(1.3317)	(.6428)	(.9309)	(2.0280)	(4.2511)	(.7699)	(1.2127)
Observations	1360	799	720	423	800	470	480	282

The Table C.2–C.6 reports the estimated coefficients of the following regression:

$$NCF_{i,t} = \beta_1(\psi_{i,t} \times i_t^{US}) + \beta_2(\psi_{i,t} \times LSAP_t^j) + \gamma X_t + \alpha_i + \epsilon_{i,t} \qquad (3.4)$$

where i is the yield on the US 1-year T-bill; and other variables are as described in equation (3.1). Equation (3.4) has the same specification of the column (6) in Table 3.6A–3.6F. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.12: Estimated Coefficients with Alternative QE Announcement (Drop Operation Twist)

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
QE1	1.9920***	.0437**	.0042	.8557**	.0782***	.0640
	(.6968)	(.0156)	(.0056)	(.3853)	(.0240)	(.0402)
QE2	1.7392	.2854***	.0560***	.3848	.1286***	-.2530***
	(1.7771)	(.0524)	(.0161)	(1.6638)	(.0309)	(.0415)
QE3	-2.4864	-.0791***	-.0876	-.9124	-.0150**	-.1990
	(5.1773)	(.0101)	(.0711)	(1.0032)	(.0058)	(.1409)
QE_{taper}	-1.1406	-.2300***	.1048	3.1830**	.4109***	.1255
	(6.9319)	(.0448)	(.1093)	(1.2855)	(.0948)	(.0942)
QE_{normal}	-8.2918	-.2568***	-.0277	.7548	.1000***	.1061
	(9.6128)	(.0812)	(.0678)	(.9417)	(.0234)	(.1447)
LSAP1	-.0247	.0173***	-.0031	.1532	.0149***	.0055
	(.1984)	(.0025)	(.0033)	(.1311)	(.0030)	(.0052)
LSAP2	.3352	-.0012	.0018	.1987	.0218**	-.0171**
	(.2243)	(.0007)	(.0032)	(.1248)	(.0067)	(.0052)
LSAP3	-.0377	.0019***	-.0025	.0122	-.0035***	-.0204*
	(.3658)	(.0003)	(.0016)	(.1312)	(.0010)	(.0091)
$LSAP_{taper}$	-.1155	-.0117***	-.0004	-.2187	-.0493***	.0038
	(.2123)	(.0033)	(.0021)	(.1745)	(.0129)	(.0113)
$LSAP_{normal}$	-3.6918***	.0201***	-.0280	-.2738	.0003	.0216
	(.8309)	(.0027)	(.0219)	(.3723)	(.0020)	(.0264)
LF	-.1839***	-.0170***	.0056	.0180	-.0072***	-.0006
	(.0562)	(.0051)	(.0071)	(.0275)	(.0013)	(.0071)

Note: The table reports the results in column (7) of each panel of Table 3.6.1A-F. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.13: Estimated Coefficients with Bootstrapping

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
QE1	2.0006	.0438*	.0041	.8493	.0781**	.0638
	(3.2907)	(.0231)	(.0081)	(1.9389)	(.0389)	(.1578)
QE2	1.7777	.2845**	.0569**	.4477	.1294**	-.2517***
	(5.2041)	(.1138)	(.0286)	(2.9935)	(.0639)	(.0484)
QE3	-1.6714	.0426	-.0914	-2.8577	-.0645*	-.1348
	(7.2905)	(.0380)	(.1057)	(2.6489)	(.0358)	(.1808)
QE_{taper}	-1.1019	-.2247**	.1048	3.1175	.4088**	.1285
	(6.3283)	(.0942)	(.1494)	(2.0361)	(.1980)	(.1436)
QE_{normal}	-8.2859	-.2552*	-.0279	.7492	.0992*	.1067
	(17.0377)	(.1353)	(.0727)	(1.5803)	(.0507)	(.1250)
LSAP1	-.0210	.0170**	-.0029	.1705	.0152	.0058
	(.1921)	(.0074)	(.0049)	(.1640)	(.0095)	(.0167)
LSAP2	.3367*	-.0014	.0019	.2089*	.0219*	-.0171**
	(.1978)	(.0014)	(.0054)	(.1244)	(.0120)	(.0076)
LSAP3	-.0424	.0009	-.0024	.0328	-.0030*	-.0209
	(.3490)	(.0009)	(.0023)	(.1578)	(.0016)	(.0218)
$LSAP_{taper}$	-.1147	-.0121*	-.0003	-.2083	-.0490**	.0036
	(.2628)	(.0062)	(.0040)	(.1527)	(.0247)	(.0191)
$LSAP_{normal}$	-3.6793***	.0205***	-.0280	-.2548	.0002	.0220
	(.9838)	(.0077)	(.0276)	(.5461)	(.0036)	(.0382)
LF	-.1831	-.0170*	.0057	.0197	-.0071***	-.0005
	(.1428)	(.0088)	(.0089)	(.0756)	(.0024)	(.0090)

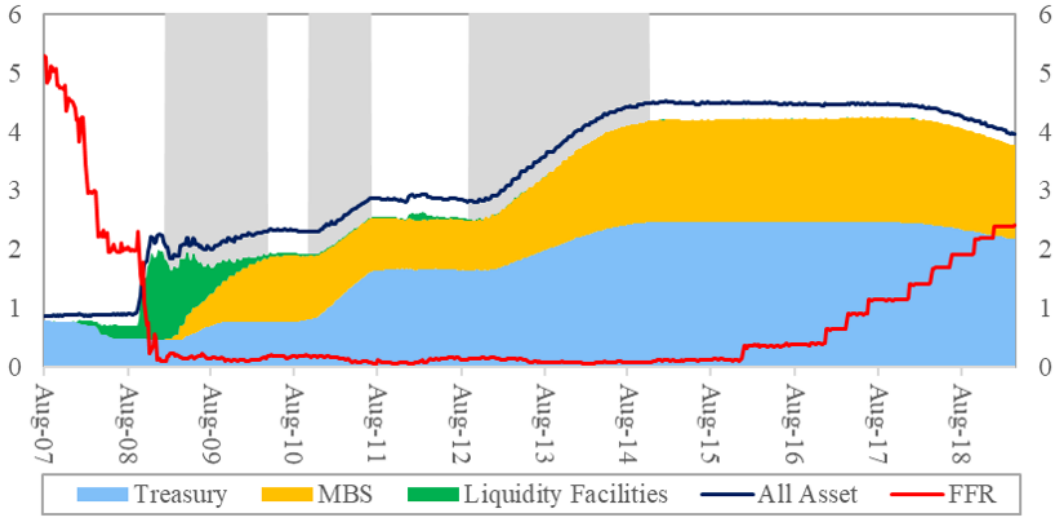
Note: The table reports the results in column (7) of each panel of Table 3.6.1A-F. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.14: Estimated Coefficients with Driscoll-Kraay Standard Errors

	Equity flows				Bond flows			
	ADE		EME		ADE		EME	
	(Base)	(DK)	(Base)	(DK)	(Base)	(DK)	(Base)	(DK)
QE1	.0463**	.0463	.0024	.0024	.0825**	.0825***	.0644	.0644
	(.0162)	(.0363)	(.0061)	(.0155)	(.0259)	(.0281)	(.0383)	(.0414)
QE2	.2844***	.2844***	.0556**	.0556***	.1301***	.1301*	-.2567***	-.2567
	(.0527)	(.0417)	(.0189)	(.0095)	(.0314)	(.0666)	(.0374)	(.2153)
QE3	.0424*	.0424	-.0795	-.0795***	-.0656***	-.0656	-.1473	-.1473
	(.0214)	(.1390)	(.0710)	(.0216)	(.0074)	(.1411)	(.0889)	(.1317)
QE_{taper}	-.2231***	-.2231***	.1054	.1054***	.4079***	.4079**	.1132	.1132
	(.0432)	(.0710)	(.1074)	(.0261)	(.0939)	(.1816)	(.1018)	(.0741)
LSAP1	.0177***	.0177***	-.0038	-.0038	.0154***	.0154*	.0069	.0069
	(.0025)	(.0068)	(.0042)	(.0024)	(.0031)	(.0087)	(.0055)	(.0111)
LSAP2	-.0011	-.0011	.0015	.0015	.0218***	.0218**	-.0159**	-.0159
	(.0007)	(.0055)	(.0029)	(.0016)	(.0065)	(.0107)	(.0058)	(.0196)
LSAP3	.0010*	.0010	-.0029	-.0029	-.0029**	-.0029	-.0194	-.0194**
	(.0006)	(.0062)	(.0019)	(.0030)	(.0010)	(.0278)	(.0100)	(.0098)
$LSAP_{taper}$	-.0121***	-.0121	-.0011	-.0011	-.0487***	-.0487***	.0052	.0052
	(.0035)	(.0164)	(.0018)	(.0034)	(.0126)	(.0124)	(.0124)	(.0068)
LF	-.0168***	-.0168***	.0054	.0054***	-.0074***	-.0074***	.0008	.0008
	(.0050)	(.0031)	(.0067)	(.0008)	(.0016)	(.0026)	(.0071)	(.0052)

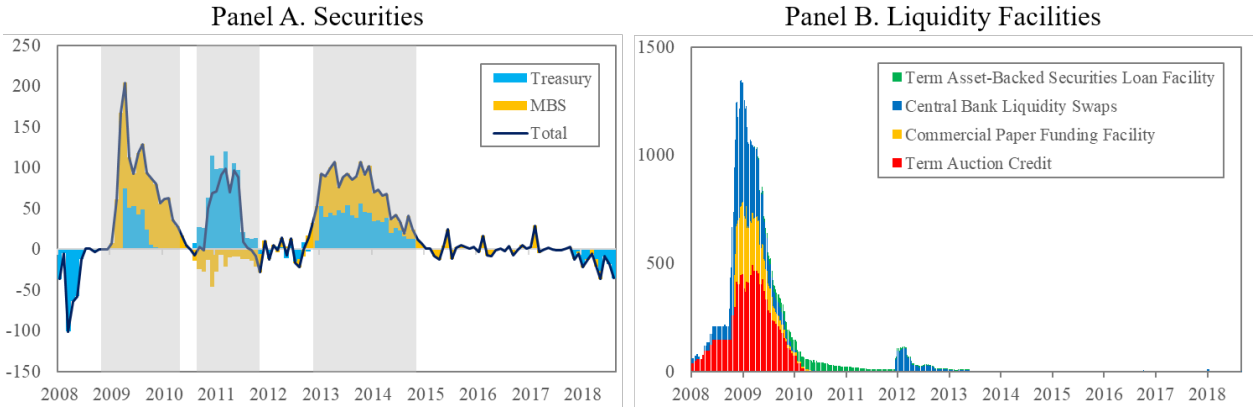
Note: The table reports results from the base model with standard errors clustered by country (Base) and from Driscoll–Kraay standard errors (DK). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 3.1: US Fed's Balance Sheet



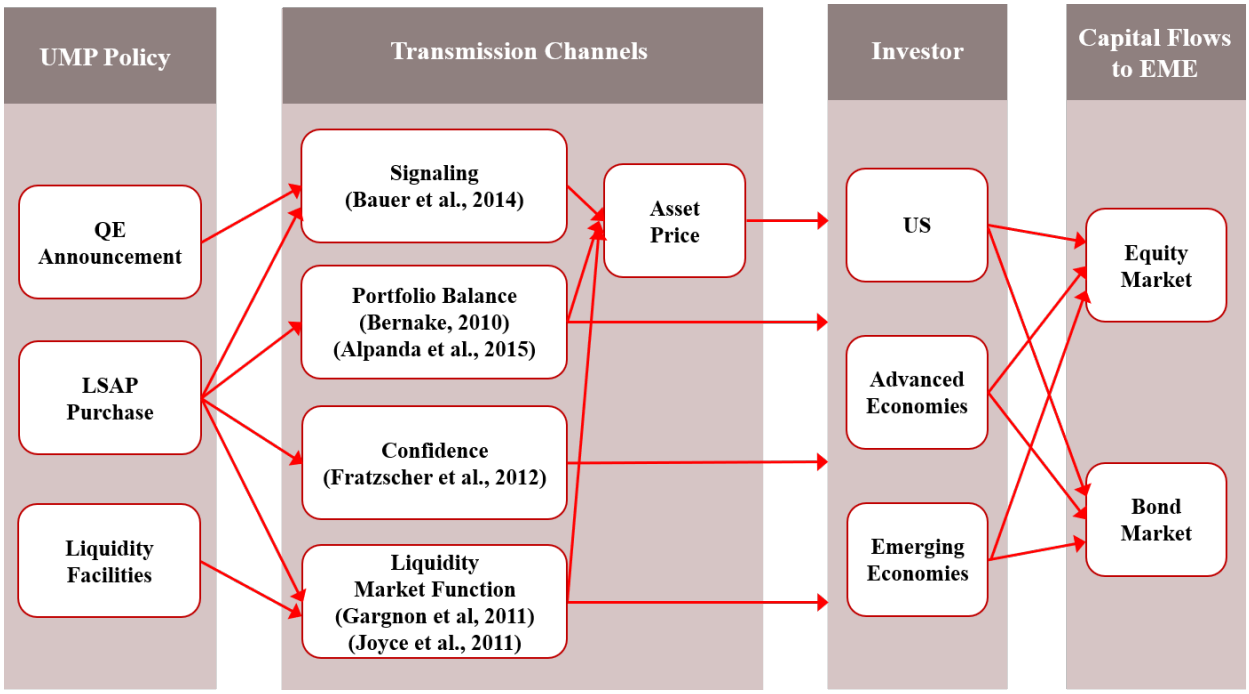
Note: The figure describes the asset of the US Fed's balance sheet. The units of left and the right y-axis are USD trillion and %, respectively. The grey columns indicate the period of QE1, QE2, and QE3, respectively.

Figure 3.2: US Unconventional Monetary Policy



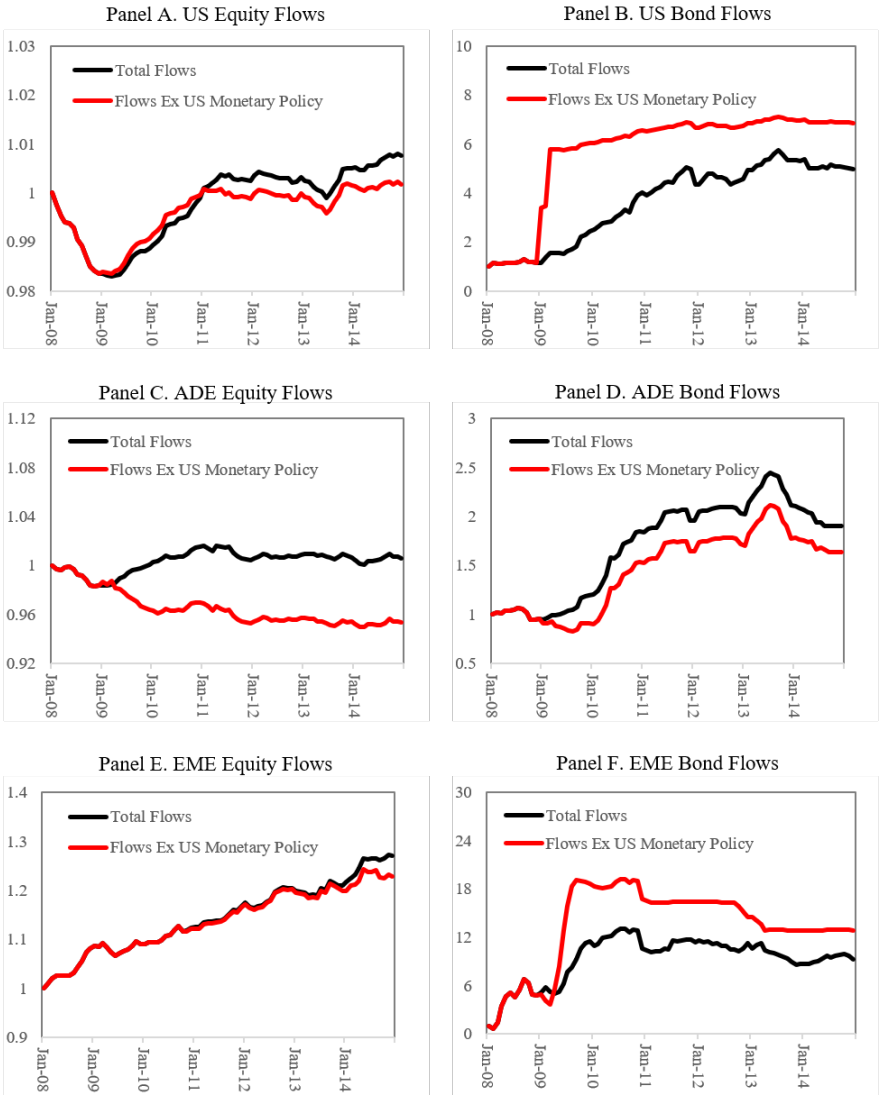
Note: Panel A represents the monthly difference in the Fed balance sheet. In Panel B, Agency bond and Dealer Credit Facility, Market Fund Liquidity Facility, Money market investing funding facility are not reported since their amount is relatively minimal.

Figure 3.3: Transmission Channels of UMP on Portfolio Capital Flows



Note: The figure describes the transmission channels of the US Fed's unconventional monetary policy. The channels jointly affect directly and indirectly on the behavior of investor from each economy and finally change the capital inflows to Emerging economies.

Figure 3.4: Cumulated Contribution of QE to Portfolio Flows



Note: The figure shows the actual cumulated capital flows (equity or bond) and the estimated cumulated flows net of the estimated impact of QE policies from each type of investor economies (US, ADE, and EME). The estimated impact (EI_t) is calculated by sum of estimated impact of each of QE program based on the regression with the comprehensive controls (column (6) in Table 3.6A–3.6F (i.e. $EI_t = \beta_{1,j}(\psi_{i,t} \times QE^j_{t-1}) + \beta_{2,j}(\psi_{i,t} \times LSAP^j_t) + \beta_{3,j}(\psi_{i,t} \times LF_t)$. The regression excludes variables not statistically significant at 20% level. The index is constructed by the average of the cumulated value over the countries in such economic group and set to 1 in January 2008.

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Appendix A

APPENDIX TO CHAPTER 1

A.1 Reduced Form

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

$$B(L)Y_t = V_t \tag{A.1}$$

The moving average representation is:

$$Y_t = B(L)^{-1}V_t = C(L)V_t \tag{A.2}$$

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

$$U_t = A_0^{-1}V_t \tag{A.3}$$

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

Since C_1 are obtained as the moving average representation of the reduced form VAR, $A_i^{'}$ and the structural representations are obtained if A_0 is known

To find A_0, note that

$$A_0 S A_0^{'} = A_0 A_0^{'} = \Omega \tag{A.4}$$

$$A_1 A_1^{'} = C_1 \Omega C_1^{'} \tag{A.5}$$

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:

$$A_0^{-1} = A(1)C(1)^{-1} \tag{A.6}$$

A.2 Additional Tables

Table A.1: Bivariate Granger-Causality Tests (PI → X)

	USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Total	0.423	0.173	0.072*	0.259	0.373	0.315	0.236
Stock	0.187	0.733	0.736	0.53	0.216	0.439	0.009***
Bond	0.108	0.517	0.35	0.522	0.692	0.473	0.112
Bank	0.367	0.187	0.319	0.707	0.531	0.276	0.727
Mutual	0.243	0.616	0.021	0.142	0.462	0.290	0.098*
Securities	0.506	0.879	0.231	0.143	0.78	0.526	0.621
Pension	0.786	0.389	0.333	0.314	0.442	0.280	0.692

Note: The table reports p-values for the Granger-causality test. The null hypothesis is that lagged values of portfolio flows in 1st column do not cause each of explanatory variables in the 1st row. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ significance levels respectively, indicating evidence of Granger-causality.

Table A.2: Bivariate Granger-Causality Tests (X → PI)

	Total	Stock	Bond	Bank	Mutual	Securities	Pension
KOSPI	0.002***	0.051*	0.003***	0.038**	0.145	0.235	0.129
EXCH	0.031**	0.245	0.011**	0.067*	0.263	0.338	0.156

Note: The table reports p-values for the Granger-causality test. The null hypothesis is that lagged values of explanatory variable in the 1st column do not cause each of portfolio flows in 1st row. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ significance levels respectively, indicating evidence of Granger-causality.

Table A.3: FEVD of Capital Inflows of Securities Company to Separated Market

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
	1	1.7	3.1	**9.3**	0.1	**3.8**	**16.6**	3.5
Securities	2	1.4	8.4	**8.2**	0.5	**6.8**	**14.4**	4.9
Inflows	3	1.4	7.9	**9.7**	1.8	**7.4**	**14.4**	5.9
to	4	1.3	7.1	**8.7**	3.5	**14.1**	**12.7**	5.2
Stock	5	1.3	6.6	**10.1**	3.3	**14.4**	**11.8**	9.6
Market	6	1.5	6.4	**10.1**	3.9	**15.1**	**11.4**	9.9
	12	2.0	7.1	**10.0**	4.3	**16.3**	**11.0**	11.1
	1	0.2	5.4	**1.6**	0.3	**0.2**	0.2	7.9
Securities	2	0.4	4.8	**16.6**	0.2	**8.1**	0.2	6.7
Inflows	3	1.1	4.8	**15.2**	1.7	**10.8**	1.0	7.0
to	4	1.0	4.4	**15.4**	1.7	**9.9**	1.0	8.2
Bond	5	1.4	4.2	**15.1**	2.1	**9.2**	2.0	10.3
Market	6	2.7	4.3	**14.8**	2.1	**10.5**	2.4	9.9
	12	3.8	5.5	**14.0**	4.3	**10.6**	3.8	12.5

Note: The table reports the result of the FEVD of the capital inflows of securities company to the separated market (stock and bond market). The upper panel and the lower panel reports the result of capital inflows to the stock market and the bond market, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the capital inflows. The sample period ranges from January 2008 to June 2016.

Table A.4: FEVD of Capital Inflows of Pension Company to Separated Market

	Period	Push Factors			Pull Factors			
		USIND	TED	VIX	KRIND	KRBOND	KOSPI	EXCH
Pension Inflows to Stock Market	1	0.8	3.3	0.4	**6.2**	**2.1**	2.1	0.5
	2	0.8	4.1	0.5	**6.2**	**3.1**	2.4	1.4
	3	2.1	4.0	0.7	**6.6**	**4.8**	2.4	1.4
	4	2.7	4.6	0.9	**7.6**	**4.6**	2.6	2.0
	5	3.1	4.5	0.9	**7.5**	**5.6**	3.0	2.0
	6	3.2	4.4	1.0	**7.5**	**7.0**	2.9	2.1
	12	3.5	5.0	1.6	**8.0**	**7.5**	3.3	3.1
Pension Inflows to Bond Market	1	**0.3**	2.6	0.0	**5.2**	**5.5**	0.3	0.1
	2	**5.6**	2.8	0.1	**4.4**	**4.6**	0.7	0.5
	3	**5.5**	3.3	0.3	**5.0**	**4.6**	2.7	0.5
	4	**5.4**	3.5	0.3	**5.3**	**5.0**	2.8	0.5
	5	**6.5**	3.4	0.4	**5.1**	**5.4**	2.7	0.6
	6	**6.5**	3.5	0.4	**5.3**	**5.4**	2.8	1.1
	12	**6.8**	3.9	0.6	**5.8**	**5.4**	3.1	1.5

Note: The table reports the result of the FEVD of the capital inflows of pension company to the separated market (stock and bond market). The upper panel and the lower panel reports the result of capital inflows to the stock market and the bond market, respectively. The numbers in the table indicate the percent contribution of each factor to the variance of the capital inflows. The sample period ranges from January 2008 to June 2016.

Table A.5: FEVD of Total Portfolio Flows with Alternative Ordering

	Period	Push Factors			Pull Factors			
		USIND	(1)	(2)	KRIND	KRBOND	KOSPI	EXCH
	1	0.3	0.7	**10.2**	0.1	4.4	**23.2**	0.0
(1)TED	3	11.3	1.7	**10.4**	0.5	13.3	**16.8**	0.9
(2)VIX	6	10.2	2.2	**14.4**	5.2	12.1	**14.8**	2.8
	12	9.5	3.5	**15.2**	5.6	13.1	**13.1**	4.8
	1	0.3	**10.2**	0.7	0.1	4.4	**23.2**	0.0
(1)VIX	3	11.3	**10.4**	1.7	0.5	13.3	**16.8**	0.9
(2)TED	6	10.2	**14.4**	2.2	5.2	12.1	**14.8**	2.8
	12	9.5	**15.2**	3.5	5.6	13.1	**13.1**	4.8

Note: The table reports the result of the FEVD of the total portfolio flows with alternative ordering. The upper panel shows the results when TED spread is considered more exogenous than VIX index while the lower panel shows the results then the order is reversed. The numbers in the table indicate the percent contribution of each factor to the variance of the capital inflows. The sample period ranges from January 2008 to June 2016.

Table A.6: FEVD of Total Portfolio Investment Flows with S&P500

Period	Push Factors				Pull Factors			
	USIND	TED	VIX	S&P500	KRIND	KRBOND	KOSPI	EXCH
1	2.6	2.1	7.3	0.2	0.0	3.3	17.2	0.1
2	5.9	4.9	6.5	4.3	0.0	9.1	14.0	0.8
3	8.6	5.4	7.7	7.5	3.8	8.0	12.3	1.1
4	9.3	5.3	8.0	7.5	3.6	9.6	11.8	1.1
5	8.6	4.7	7.7	7.0	7.5	8.4	11.1	5.7
6	8.3	4.4	11.5	6.6	7.1	7.9	11.5	5.9
7	7.8	4.2	11.9	6.2	6.7	7.4	11.0	9.8
8	7.7	4.1	12.3	6.2	6.7	8.3	10.8	9.7
9	7.7	4.1	12.4	6.1	6.7	8.2	11.0	9.6
10	7.7	4.6	12.3	6.1	6.6	8.3	10.9	9.5
11	8.3	4.8	12.1	6.1	6.5	8.3	10.7	9.6
12	8.3	4.9	12.1	6.0	6.5	8.5	10.7	9.6

Note: This table reports the result of the FEVD of the total portfolio investment flows with S%P500 index in push factors. The numbers in the table indicate the percent contribution of each factor to the variance of the total capital inflows to Korea. The contribution of total capital inflows itself is not reported. The sample period ranges from January 2008 to June 2016.

Appendix B

APPENDIX TO CHAPTER 2

B.1 Estimation of IRF and FEVD

Using state-space form, a reduced-from VAR can be transformed as follows:

$$\begin{bmatrix} Y_t \\ Y_{t-1} \\ Y_{t-2} \\ \vdots \\ Y_{t-p+1} \end{bmatrix} = \begin{bmatrix} \hat{\beta}_1 & \hat{\beta}_2 & \cdots & \hat{\beta_{p-1}} & \hat{\beta}_p \\ I_k & 0_k & \cdots & 0_k & 0_k \\ 0_k & I_k & \cdots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0_k & 0_k & \cdots & I_k & 0_k \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ Y_{t-2} \\ Y_{t-3} \\ \vdots \\ Y_{t-p} \end{bmatrix} + \begin{bmatrix} \epsilon_{i,t} \\ 0_k \\ 0_k \\ \vdots \\ 0_k \end{bmatrix} \tag{B.1}$$

or

$$\tilde{Y_t} = F \times \tilde{Y}_{t-1} + \tilde{e_t} \tag{B.2}$$

Hamilton (1994) and Lütkepohl (2005) show that the VAR model is stable if all the coefficients of the companion matrix, F, are less than one. Using Wold representation, Equation (2.7) can be transformed to vector moving average (VMA) process as follows:

$$\tilde{Y_t} = \tilde{e_t} + F \times \tilde{e}_{t-1} + F^2 \times \tilde{e}_{t-2} + \cdots + F^j \times \tilde{e}_{t-j} + \ldots \tag{B.3}$$

By taking the first (k$\times$ k) block of equation (2.8), we can get the following equation.

$$\begin{aligned} Y_t = &\ e_t + \psi_1 e_{t-1} + \psi_1 e_{t-2} + \cdots + \psi_j e_{t-j} + \ldots \\ = &\ B^{-1}\epsilon_t + \psi_1 B^{-1}\epsilon_{t-1} + \psi_1 B^{-1}\epsilon_{t-2} + \cdots + \psi_j B^{-1}\epsilon_{t-j} + \ldots \\ = &\ \theta_0\epsilon_t + \theta_1\epsilon_{t-1} + \theta_2\epsilon_{t-2} + \cdots + \theta_j\epsilon_{t-j} + \ldots \end{aligned} \tag{B.4}$$

where ψ_j is the first (k×k) block of F^j and $\theta_j = \psi_j B^{-1}$.

A stability of the matrix means that it has an inverse matrix and it can be expressed as an infinite vector moving average. By rewriting the model with an infinite vector moving average, we can get the coefficients of the IRF as follows.

$$\Phi = \begin{cases} I_k & i = 0 \\ \sum_{j=1}^{i} \Phi_{t-j}\beta_j & i = 1, 2, \ldots \end{cases}$$

Because the error terms are correlated, one variable can be affected by the impact of other variables. Matrix P, which is $P'P = \Sigma$, can be used to orthogonalize the error terms as $\epsilon_{i,t}P^{-1}$ and to convert the VMA parameters to the orthogonal impulse response $P\Phi_i$. With the actual value at time t + h, $Y_{i,t+h}$ and the expected value of it, $\mathrm{E}[Y_{i,t+h}]$ the prediction error of h ahead can be expressed as follows:

$$Y_{i,t+h} - E[Y_{i,t+h}] = \sum_{i=0}^{h-1} \Phi_i \epsilon_{i,t+h-i} \tag{B.5}$$

The contribution of variable m to the variance of the prediction error of variable n after h is as follows:

$$\sum_{i=0}^{h-1} \theta_m^2 = \sum_{i=0}^{h-1} (i_n' P \Phi_i i_m)^2 \tag{B.6}$$

where i represents the s−th column of the I matrix. These FEVDs show the proportion of relative shocks that response variables receive over time as shocks occur in other variables.

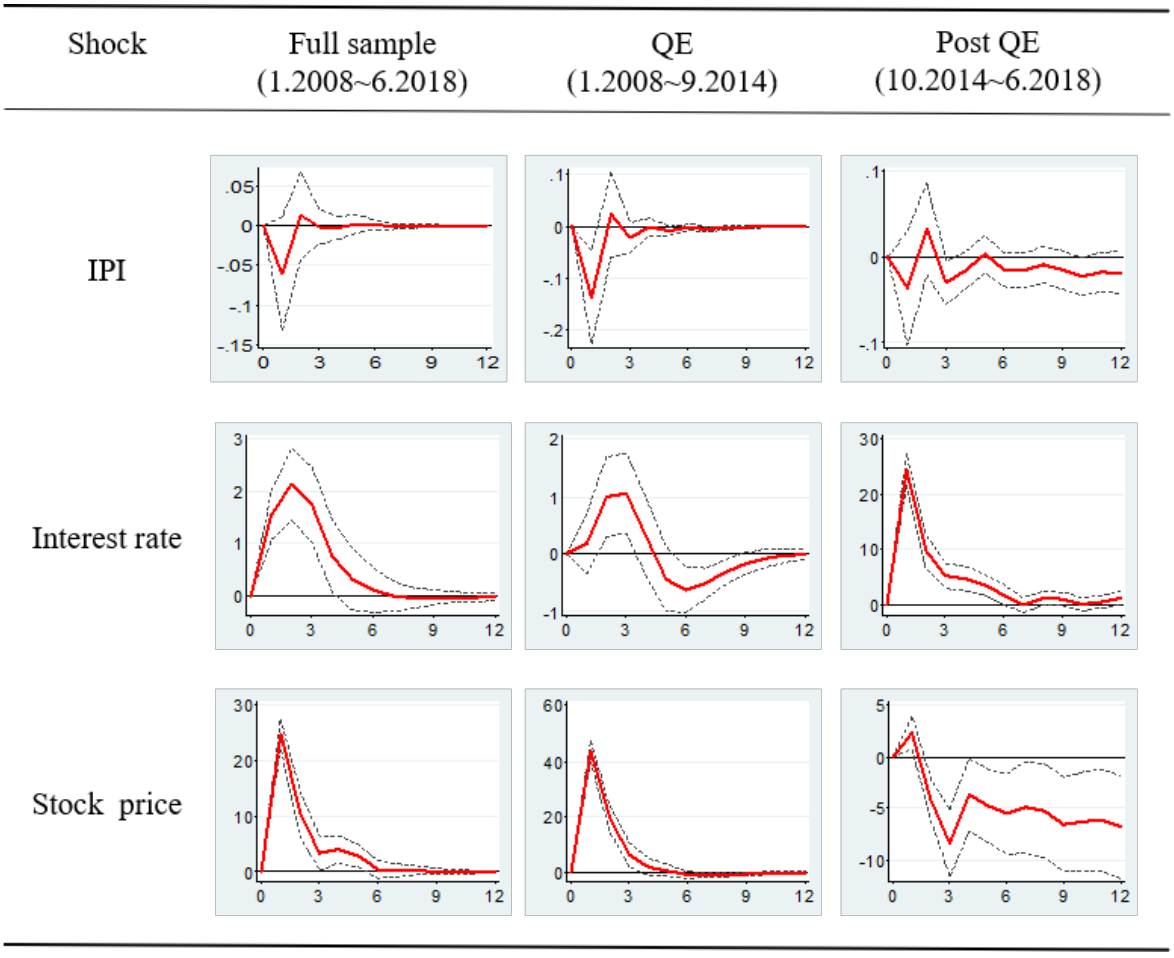
B.2 Additional Tables and Figures

Table B.1: Panel Unit-root Tests

	Levin Lin Chu test		Harris Tzavalis test	
	Adjusted t	p-value	rho	p-value
TED	-46.873	0.000	0.056	0.000
VIX	-11.697	0.000	0.831	0.000
Stock_global	-35.235	0.000	0.187	0.000
IPI_investor	-27.908	0.000	0.049	0.000
Interest rate_Investor	-21.780	0.000	0.018	0.000
Stock_investor	-34.770	0.000	-0.049	0.000
IPI_KR	-32.137	0.000	0.128	0.000
Interest rate_KR	-27.300	0.000	0.719	0.000
Stock_KR	-37.591	0.000	-0.254	0.000

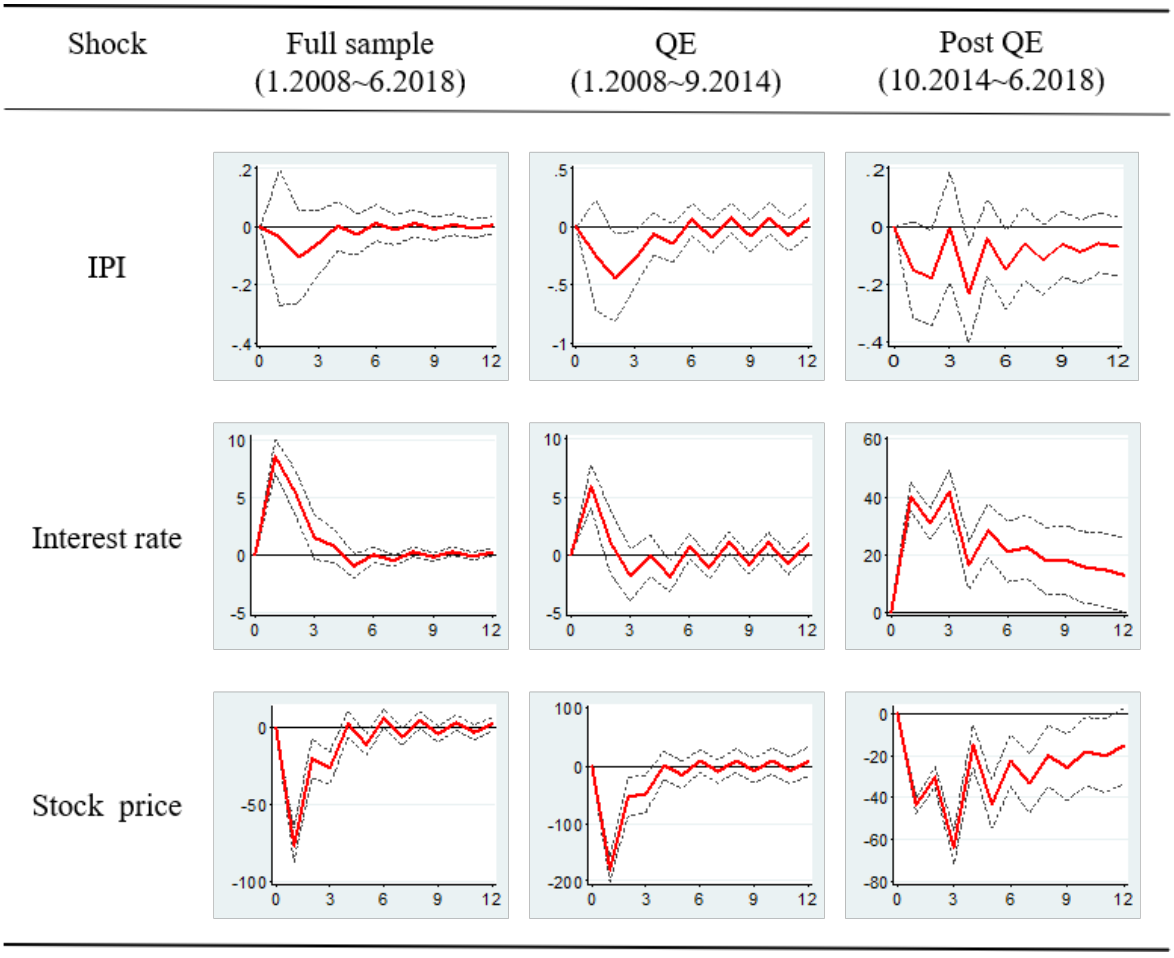
Note: The table reports the results of the Levin–Lin–Chu test and Harris–Tzavalis for the determinants variables. In both tests, the null hypothesis is that the series contains a unit root, and the alternative is that the series is stationary.

Figure B.1: IRF of Stock Flows from Advanced Economies



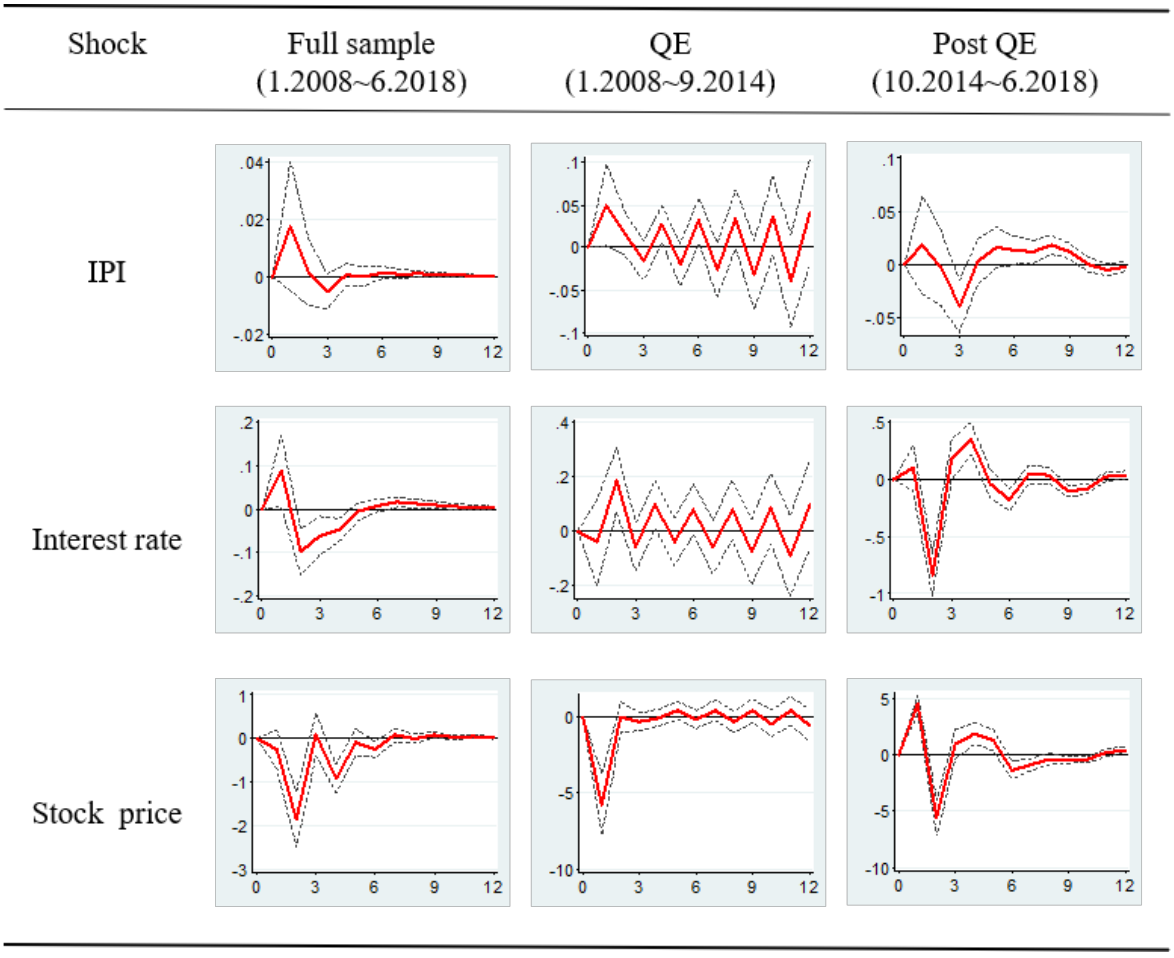
Note : The figure represents the impulse response function of the stock flows to Korea in response of the shocks on the variables of the advanced economies during the sub-period of the QE and post-QE. The dotted lines indicate the 68% confidence interval.

Figure B.2: IRF of Stock Flows from Emerging Economies



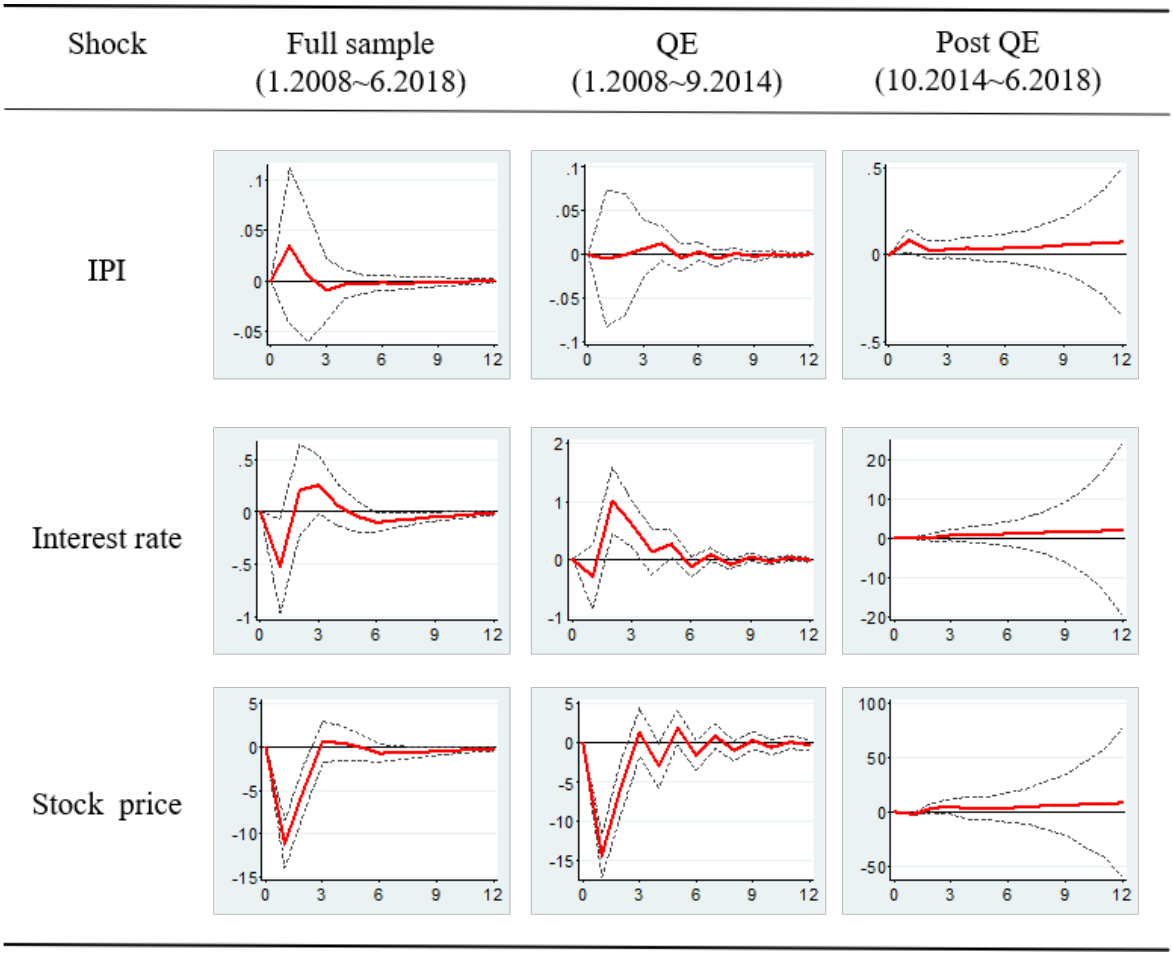
Note : The figure represents the impulse response function of the stock flows to Korea in response of the shocks on the variables of the emerging economies during the sub-period of the QE and post-QE. The dotted lines indicate the 68% confidence interval.

Figure B.3: IRF of Bond Flows from Advanced Economies



Note : The figure represents the impulse response function of the stock flows to Korea in response of the shocks on the variables of the advanced economies during the sub-period of the QE and post-QE. The dotted lines indicate the 68% confidence interval.

Figure B.4: IRF of Stock Flows from Emerging Economies



Note : The figure represents the impulse response function of the stock flows to Korea in response of the shocks on the variables of the emerging economies during the sub-period of the QE and post-QE. The dotted lines indicate the 68% confidence interval.

Appendix C

APPENDIX TO CHAPTER 3

Table C.1: Model Summary and Regression Result (QE vs Post-QE)

The Table C.2–C.6 reports the estimated coefficients of the following regression:

$$NCF_{i,t} = \beta_1(\psi_{i,t} \times i_t^{US}) + \beta_2(\psi_{i,t} \times LSAP_t^j) + \gamma X_t + \alpha_i + \epsilon_{i,t} \qquad (3.4)$$

where i is the yield on the US 1-year T-bill; and other variables are as described in equation (3.1). Equation (3.4) has the same specification of the column (6) and (7) in Table 3.6A–3.6F.

List of estimated models in Table C.2–C.6:

(*i*) Column (1): Full samples (Jan 2008–Aug 2018) with US control variables (lagged yield on the US 1 year Treasury bill, lagged VIX, and the lagged return on S&P500 index) and the domestic control variables (lagged Korea IPI, lagged yield on the Korean 1 year government bond, lagged Korea CDS index, and the lagged return on KOSPI), and two dummies capturing macro-prudential policy and capital control policy adopted to Korea

(*ii*) Column (2): Full samples (Jan 2008–Aug 2018) with Controls for US and Korea plus investor country control variables (lagged IPI of Investor country, lagged yields on 1 year government bond of investor country, and the lagged return on the stock index of investor country)

(*iii*) Column (3): QE samples (Jan 2008–Oct 2014) with controls for US and Korea

(*iv*) Column (4): QE samples (Jan 2008–Oct 2014) with controls for US and Korea plus investor country

(*v*) Column (5): Column (4) plus separating LSAP into the purchase of Treasuries (TB) and MBS

(*vi*) Column (6): Post-QE samples (Nov 2014–Aug 2018) with controls for US and Korea

(*vii*) Column (7): Post-QE samples (Nov 2014–Aug 2018) with controls for US and Korea plus investor country

Table C.2: Dependent Variable: Total Portfolio Flows (QE vs Post-QE)

	Full Sample		QE			Post QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US Monetary policy measures							
Interest rate	.6494***	.6547***	1.1029***	1.1109***	1.1165***	-.1865***	-.1728***
	(.2245)	(.2278)	(.3889)	(.3920)	(.3928)	(.0322)	(.0291)
LSAP	.4631**	.4623**	.2539**	.2508**		-1.6741**	-1.6671**
	(.1734)	(.1736)	(.1161)	(.1155)		(.6196)	(.6161)
TB					.0478		
					(.1022)		
MBS					.3159***		
					(.0579)		
Controls							
IPI_{world}	-.0339	-.0279	-.0266	-.0205	-.0190	-.0466	-.0394
	(.0296)	(.0257)	(.0272)	(.0256)	(.0256)	(.0620)	(.0574)
VIX	-.0603	-.0676	-.0328	-.0417	-.0389	-.2586	-.2617
	(.0692)	(.0758)	(.0438)	(.0500)	(.0501)	(.1826)	(.1852)
$Stock_{world}$	1.0945	1.0559	.5527	.5027	.5482	3.3019	3.3589
	(1.0835)	(1.0532)	(.6935)	(.6642)	(.6754)	(3.0366)	(3.0565)
IPI_{KR}	.0375	.0391	.0690	.0715	.0651	.0030	-.0017
	(.0364)	(.0378)	(.0484)	(.0502)	(.0495)	(.0241)	(.0222)
CDS_{KR}	-.0722**	-.0725**	-.1146**	-.1157**	-.1099**	-.0437	-.0470
	(.0276)	(.0278)	(.0501)	(.0505)	(.0502)	(.0338)	(.0334)
Interest $rate_{KR}$	-.5312	-.5142	-.5943	-.5626	-.5227	-1.0336	-1.0514
	(.4707)	(.4543)	(.5163)	(.4935)	(.4881)	(.7508)	(.7531)
$Stock_{KR}$	-.0423	.0766	-.8020	-.6670	-.7203	1.9153	2.1473
	(.4280)	(.4262)	(.6762)	(.5870)	(.5832)	(1.4877)	(1.5768)
$IPI_{investor}$		-.0285		-.0319	-.0307		-.0383
		(.0230)		(.0215)	(.0212)		(.0335)
Interest $rate_{investor}$		-.0360		-.0657	-.0701		.1675
		(.0476)		(.0665)	(.0678)		(.2230)
$Stock_{investor}$		-.3986		-.1600	-.2097		-1.2269
		(.5055)		(.4938)	(.5051)		(.7580)
Observations	3937	3937	2480	2480	2480	1457	1457
Controls	US	US	US	US	US	US	US
	KR	KR	KR	KR	KR	KR	KR
		Investor		Investor	Investor		Investor

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.3: Dependent Variable: Equity Flows from ADE (QE vs Post-QE)

	Full Sample		QE			Post QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US Monetary policy measures							
Interest rate	.7261***	.7536***	1.0433***	1.0958***	1.1064***	-.5594***	-.5589***
	(.2105)	(.2111)	(.3056)	(.3136)	(.3162)	(.1171)	(.1268)
LSAP	.3118***	.3043***	.4210***	.3946***		-.0821*	-.0716
	(.0610)	(.0603)	(.0700)	(.0664)		(.0415)	(.0450)
TB					.0873**		
					(.0310)		
MBS					.4770***		
					(.0589)		
Controls							
IPI_{world}	-.0560	-.0503	-.0543	-.0587	-.0550	-.0289**	-.0121
	(.0677)	(.0645)	(.0763)	(.0788)	(.0771)	(.0101)	(.0126)
VIX	-.0974	-.1419	-.0503	-.1046	-.1014	-.3417	-.3358
	(.1118)	(.1408)	(.0890)	(.1254)	(.1249)	(.2062)	(.1997)
$Stock_{world}$	1.0147	1.0337	.5010	.5189	.6100	5.3507	5.3220
	(1.0698)	(1.1357)	(.7206)	(.7705)	(.8019)	(4.6047)	(4.6847)
IPI_{KR}	.0114	.0265	.0317	.0533	.0416	-.0186	-.0192
	(.0117)	(.0230)	(.0247)	(.0404)	(.0362)	(.0120)	(.0114)
CDS_{KR}	-.0698	-.0809	-.1115	-.1266	-.1155	-.1417	-.1401
	(.0454)	(.0549)	(.0642)	(.0778)	(.0731)	(.1065)	(.1040)
Interest $rate_{KR}$	-.2984	.0606	-.3267	.1161	.2095	.8124	.8018
	(.2089)	(.1094)	(.2122)	(.1736)	(.2035)	(.6836)	(.6615)
$Stock_{KR}$	2.2114	2.7503	1.6685	2.3627	2.2828	3.4261	3.3464
	(1.9216)	(2.2754)	(1.6671)	(2.1567)	(2.1429)	(2.3701)	(2.2830)
$IPI_{investor}$		-.0352		-.0208	-.0219		-.0494
		(.0262)		(.0217)	(.0223)		(.0314)
Interest $rate_{investor}$		-.8092		-.9605	-.9964		.1541
		(.5879)		(.6965)	(.7094)		(.2350)
$Stock_{investor}$		.1815		.5098	.3291		.6187
		(.8121)		(.9124)	(.7303)		(1.3317)
Observations	2159	2159	1360	1360	1360	799	799
Controls	US	US	US	US	US	US	US
	KR	KR	KR	KR	KR	KR	KR
		Investor		Investor	Investor		Investor

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.4: Dependent Variable: Equity Flows from EME (QE vs Post-QE)

	Full Sample		QE			Post QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US Monetary policy measures							
Interest rate	-.2961	-.3074	-.2766	-.2889	-.2929	-.4483	-.4544
	(.2765)	(.2725)	(.2376)	(.2281)	(.2341)	(.3606)	(.3432)
LSAP	-.1309	-.1317	-.1195	-.1211		-.2948	-.3191
	(.0939)	(.0951)	(.1477)	(.1511)		(.1766)	(.2015)
TB					.0175		
					(.0231)		
MBS					-.2431		
					(.2719)		
Controls							
IPI_{world}	.0156	.0166	.0046	.0062	.0051	.0578	.0522
	(.0106)	(.0126)	(.0145)	(.0155)	(.0151)	(.0348)	(.0355)
VIX	.0090	.0179	-.0158	-.0070	-.0097	-.0139	-.0162
	(.0113)	(.0137)	(.0134)	(.0161)	(.0168)	(.0516)	(.0557)
Stock_{world}	-1.5282	-1.5957	-1.6907	-1.7412	-1.7595	-.8759	-.8537
	(1.6420)	(1.6802)	(1.5882)	(1.6380)	(1.6555)	(1.6041)	(1.6311)
IPI_{KR}	-.0209	-.0228	-.0222	-.0245	-.0201	-.0193	-.0194
	(.0204)	(.0203)	(.0268)	(.0270)	(.0239)	(.0277)	(.0267)
CDS_{KR}	.0086	.0082	.0044	.0042	.0015	-.0370	-.0386
	(.0066)	(.0075)	(.0270)	(.0270)	(.0257)	(.0633)	(.0610)
$\text{Interest rate}_{KR}$	.0206	-.0390	.0755	.0205	-.0024	-.3185	-.4417
	(.1010)	(.0604)	(.1126)	(.0654)	(.0490)	(.3422)	(.2783)
Stock_{KR}	-.5076	-.4948	-.3392	-.3337	-.3000	-.4793	-.3532
	(.3455)	(.3377)	(.4987)	(.5542)	(.5419)	(1.2016)	(1.1960)
$\text{IPI}_{investor}$		.0372		.0351	.0322		.0214
		(.0327)		(.0295)	(.0276)		(.0535)
$\text{Interest rate}_{investor}$		.0634		.0561	.0606		.1984
		(.1020)		(.0665)	(.0692)		(.2260)
$\text{Stock}_{investor}$		-.3775		-.3514	-.3333		-.8105
		(.6659)		(.6428)	(.6330)		(.9309)
Observations	1143	1143	720	720	720	423	423
Controls	US	US	US	US	US	US	US
	KR	KR	KR	KR	KR	KR	KR
		Investor		Investor	Investor		Investor

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.5: Dependent Variable: Bond Flows from ADE (QE vs Post-QE)

	Full Sample		QE			Post QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US Monetary policy measures							
Interest rate	-.0467	-.0341	.1525***	.1644***	.1602***	.3777***	.4137***
	(.0454)	(.0385)	(.0189)	(.0225)	(.0217)	(.0674)	(.0897)
LSAP	.1470**	.1486**	-.1720*	-.1755*		-1.8441***	-1.8721***
	(.0497)	(.0498)	(.0903)	(.0915)		(.5463)	(.5615)
TB					-.0433		
					(.0541)		
MBS					-.2084**		
					(.0664)		
Controls							
IPI_{world}	.0249	.0257	.0997	.1058	.1030	-.1830	-.1916
	(.0225)	(.0227)	(.0832)	(.0850)	(.0837)	(.1733)	(.1914)
VIX	-.0482	-.0561	-.0054	-.0172	-.0204	-.1749	-.2004
	(.0447)	(.0534)	(.0137)	(.0228)	(.0236)	(.2403)	(.2692)
Stock_{world}	1.9124	1.7299	1.3810	1.2463	1.1862	1.7475	1.4822
	(1.5455)	(1.3424)	(1.0260)	(.8479)	(.8278)	(1.7313)	(1.5564)
IPI_{KR}	.1023	.0986	.1030	.1014	.1089	.0821	.0735
	(.0907)	(.0871)	(.1026)	(.0984)	(.1017)	(.0868)	(.0809)
CDS_{KR}	.0314	.0366	.0377	.0428	.0360	.1554	.1506
	(.0669)	(.0714)	(.0361)	(.0427)	(.0393)	(.1966)	(.1853)
$\text{Interest rate}_{KR}$	-1.0344	-1.0398	-1.1501	-1.1297	-1.1806	-3.8503	-3.6709
	(1.0679)	(1.1048)	(1.2121)	(1.2469)	(1.2692)	(3.0443)	(2.9260)
Stock_{KR}	-3.0296	-2.8460	-3.8712	-3.6331	-3.5780	.8212	.9936*
	(3.5185)	(3.3908)	(4.1208)	(3.9771)	(3.9675)	(.4623)	(.5394)
$\text{IPI}_{investor}$		.0023		-.0081	-.0074		.0060
		(.0098)		(.0100)	(.0101)		(.0202)
$\text{Interest rate}_{investor}$		.0580		-.0273	-.0187		-.8087
		(.2115)		(.1913)	(.1975)		(.6136)
$\text{Stock}_{investor}$		-2.4949		-1.8995	-1.7779		-4.8811
		(2.4322)		(2.0280)	(1.8840)		(4.2511)
Observations	1270	1270	800	800	800	470	470
Controls	US	US	US	US	US	US	US
	KR	KR	KR	KR	KR	KR	KR
		Investor		Investor	Investor		Investor

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.6: Dependent Variable: Bond Flows from EME (QE vs Post-QE)

	Full Sample		QE			Post QE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US Monetary policy measures							
Interest rate	.2215*	.1414	.3225*	.2041	.2245	.2606*	.2730**
	(.0870)	(.0846)	(.1500)	(.1226)	(.1186)	(.1016)	(.0982)
LSAP	-.5685***	-.5524**	-.6801***	-.6399**		.9380*	.9674*
	(.1322)	(.1377)	(.1389)	(.1629)		(.4033)	(.4375)
TB					-.7482*		
					(.3279)		
MBS					.1172		
					(.2916)		
Controls							
IPI_{world}	-.1199	-.1233	-.2118	-.2099	-.2065	.0416	.0347
	(.0713)	(.0745)	(.1291)	(.1308)	(.1311)	(.0603)	(.0520)
VIX	-.0529	-.0446	-.1138	-.1029	-.0934	-.1655	-.1570
	(.1127)	(.1152)	(.1253)	(.1301)	(.1329)	(.1623)	(.1577)
Stock_{world}	2.2849*	2.5338*	2.3718	2.6502	2.7185	1.4608	1.4406
	(1.1321)	(1.2056)	(1.6978)	(1.6477)	(1.6876)	(1.1257)	(1.0245)
IPI_{KR}	.0313	.0300	.1350	.1413	.1238	-.0298	-.0327
	(.0344)	(.0368)	(.0825)	(.0857)	(.0938)	(.0245)	(.0256)
CDS_{KR}	-.1433	-.1529	-.2417	-.2589	-.2457	-.0655	-.0607
	(.1143)	(.1194)	(.1841)	(.1983)	(.2081)	(.0398)	(.0363)
$\text{Interest rate}_{KR}$	-.1108	-.1675	-.2088	-.3273	-.2189	.5154	.4540
	(.4091)	(.3841)	(.3049)	(.3406)	(.4089)	(.6275)	(.6950)
Stock_{KR}	-.7489	-1.2743	-1.5747	-2.1809	-2.2597	.8962	.5732
	(1.7488)	(1.8674)	(2.1848)	(2.3249)	(2.2802)	(1.3024)	(1.5133)
$\text{IPI}_{investor}$		-.0582		-.0826*	-.0696		.0276
		(.0395)		(.0400)	(.0421)		(.0495)
$\text{Interest rate}_{investor}$		.4778		.6137	.5527		.1078
		(.4392)		(.6852)	(.7045)		(.2335)
$\text{Stock}_{investor}$		.9772		.8776	.7519		.8858
		(.6403)		(.7699)	(.6751)		(1.2127)
Observations	762	762	480	480	480	282	282
Controls	US	US	US	US	US	US	US
	KR	KR	KR	KR	KR	KR	KR
		Investor		Investor	Investor		Investor

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.7: Estimated Coefficients for the Regression without Exposure to the US

	Equity flows			Bond flows		
	US	ADE	EME	US	ADE	EME
qe1	.2001***	.6560	.1402	.0849**	1.3154	2.8490
	(.0695)	(.5897)	(.2235)	(.0395)	(1.3065)	(1.6014)
qe2	.1778	4.8884	.9565*	.0448	4.0313	-4.8100*
	(.1775)	(4.0417)	(.4220)	(.1644)	(4.0725)	(1.9619)
qe3	-.1671	.4782	-1.6293*	-.2858	-.7561	-4.0969
	(.3815)	(1.0807)	(.7761)	(.1818)	(.7244)	(2.5122)
qet	-.1102	-3.3451	1.6469	.3117**	8.8715	-.0033
	(.6928)	(2.3169)	(1.3928)	(.1276)	(8.7575)	(2.8370)
qen	-.8286	-4.4028	1.5649	.0749	1.6010	4.4460
	(.9580)	(4.6867)	(2.5219)	(.0927)	(1.9540)	(3.3557)
lsap1	-.0000	.0017	.0002	.0002	-.0018	.0053
	(.0002)	(.0015)	(.0007)	(.0001)	(.0013)	(.0035)
lsap2	.0003	-.0014*	.0007	.0002*	.0038	-.0027
	(.0002)	(.0007)	(.0008)	(.0001)	(.0043)	(.0028)
lsap3	-.0000	-.0002	.0000	.0000	-.0006	-.0013
	(.0004)	(.0008)	(.0003)	(.0001)	(.0009)	(.0040)
lsapt	-.0001	-.0031	.0022*	-.0002	-.0112	.0030
	(.0002)	(.0028)	(.0011)	(.0002)	(.0116)	(.0027)
lsapn	-.0037***	.0018	-.0031	-.0003	-.0020	.0110
	(.0008)	(.0011)	(.0060)	(.0004)	(.0017)	(.0111)
lf	-.0002***	-.0012	.0005	.0000	-.0012	-.0009
	(.0001)	(.0011)	(.0006)	(.0000)	(.0007)	(.0010)

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.8: Dependent Variable: Equity Flows (Advanced Economies)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qe1	-.8418***	-.8613***	-.6752***	-.7259***	-.8202***	-.4451***	-.8762***
	(.2139)	(.2320)	(.1607)	(.1708)	(.2102)	(.1064)	(.2350)
qe2	-5.7457***	-5.4838***	-5.5742***	-5.5469***	-4.6543***	-5.3084***	-8.9932**
	(1.0548)	(.9665)	(.9906)	(.9963)	(1.2043)	(1.0025)	(3.1390)
qe3	-1.1173**	-.9741*	-.7187	-.9035	-.6621	.5561	.2811
	(.4724)	(.5305)	(.5498)	(.5349)	(.7707)	(.4750)	(1.3056)
qet	4.0065**	4.3086**	4.6243**	4.7418**	4.6999**	4.0973**	7.9744*
	(1.4877)	(1.6327)	(1.8157)	(1.8867)	(1.8607)	(1.4989)	(4.0021)
qen	9.0885***	8.8447***	10.0417***	9.8482***	9.9047***	7.1808***	10.4845***
	(2.3843)	(2.2276)	(2.8919)	(2.5919)	(2.6543)	(1.5487)	(2.9722)
lsap1	-.0033***	-.0031***	-.0046***	-.0045***	-.0062*	-.0042**	-.0052**
	(.0007)	(.0006)	(.0013)	(.0013)	(.0030)	(.0018)	(.0018)
lsap2	-.0007*	-.0016	-.0017	-.0016	-.0002	.0001	-.0009
	(.0003)	(.0011)	(.0012)	(.0011)	(.0007)	(.0005)	(.0006)
lsap3	.0003	-.0008	-.0006	-.0006	-.0007	.0003	-.0017
	(.0003)	(.0012)	(.0009)	(.0010)	(.0011)	(.0003)	(.0018)
lsapt	.0027***	.0012	.0019**	.0019**	.0019**	.0018**	.0009
	(.0007)	(.0012)	(.0007)	(.0007)	(.0007)	(.0007)	(.0014)
lsapn	-.0044**	-.0089	-.0077	-.0071	-.0075	-.0054	-.0095
	(.0015)	(.0053)	(.0046)	(.0041)	(.0045)	(.0032)	(.0057)
lf	.0028***	.0034***	.0031***	.0031***	.0030***	.0020***	.0036**
	(.0007)	(.0011)	(.0009)	(.0009)	(.0009)	(.0006)	(.0013)
qe1e	.0553***	.0549***	.0559***	.0582***	.0578***	.0297***	.0577***
	(.0097)	(.0096)	(.0097)	(.0110)	(.0108)	(.0085)	(.0110)
qe2e	.3474***	.3469***	.3475***	.3480***	.3479***	.3161***	.3477***
	(.0272)	(.0270)	(.0271)	(.0276)	(.0276)	(.0278)	(.0276)
qe3e	.0603***	.0612***	.0604***	.0631***	.0632***	-.0454***	.0632***
	(.0088)	(.0094)	(.0091)	(.0116)	(.0117)	(.0087)	(.0116)
qete	-.2761***	-.2764***	-.2767***	-.2766***	-.2766***	-.2375***	-.2751***
	(.0355)	(.0356)	(.0358)	(.0360)	(.0359)	(.0325)	(.0356)
qene	-.3664***	-.3659***	-.3666***	-.3673***	-.3672***	-.2908***	-.3681***
	(.0597)	(.0595)	(.0596)	(.0594)	(.0594)	(.0497)	(.0594)
lsap1e	.0194***	.0190***	.0194***	.0195***	.0193***	.0137***	.0192***
	(.0018)	(.0017)	(.0017)	(.0019)	(.0018)	(.0015)	(.0019)
lsap2e	.0000	-.0000	-.0000	.0000	-.0000	-.0054***	-.0001
	(.0009)	(.0009)	(.0009)	(.0010)	(.0009)	(.0002)	(.0009)
lsap3e	.0011**	.0010**	.0011**	.0012**	.0012**	-.0002	.0011**
	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0003)	(.0004)
lsapte	-.0141***	-.0142***	-.0141***	-.0143***	-.0143***	-.0086***	-.0144***
	(.0022)	(.0023)	(.0023)	(.0024)	(.0024)	(.0020)	(.0024)
lsapne	.0235***	.0236***	.0235***	.0237***	.0238***	.0189***	.0239***
	(.0031)	(.0032)	(.0032)	(.0034)	(.0034)	(.0037)	(.0034)
lfe	-.0230***	-.0231***	-.0230***	-.0230***	-.0230***	-.0161***	-.0230***
	(.0039)	(.0039)	(.0039)	(.0039)	(.0039)	(.0032)	(.0039)

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.9: Dependent Variable: Equity Flows (Emerging Economies)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qe1	.1103	.2930	.2562	.2265	.1837	.1676	.2162
	(.0889)	(.1688)	(.1996)	(.2468)	(.2481)	(.2069)	(.2472)
qe2	.7100	.2791	.1854	.3039	.3534	.1699	-.2179
	(.4758)	(.6389)	(.6432)	(.6141)	(.4715)	(.6266)	(.7381)
qe3	-1.2491	-.8548	-1.1234	-1.0580	-1.0626	-.7374	-.8936
	(.7734)	(.7456)	(.7319)	(.7392)	(.7700)	(.6065)	(.7231)
qet	.9146	.7385	.7084	.5783	.5671	.6357	1.0722
	(.9987)	(.8938)	(.8707)	(.8205)	(.8263)	(.8642)	(.9755)
qen	4.8389	4.3274	4.0370	3.7106	3.7080	3.6130	3.8352
	(3.1487)	(3.0648)	(3.1611)	(3.0967)	(3.0915)	(2.8977)	(3.0889)
lsap1	.0013*	.0007	.0014	.0012	.0007	.0011	.0011
	(.0007)	(.0008)	(.0008)	(.0008)	(.0008)	(.0007)	(.0008)
lsap2	.0003	.0006	.0006	.0006	.0007	.0005	.0007
	(.0005)	(.0006)	(.0007)	(.0007)	(.0012)	(.0006)	(.0007)
lsap3	-.0001	.0003	.0004	.0004	.0005	.0002	.0003
	(.0002)	(.0002)	(.0002)	(.0003)	(.0003)	(.0002)	(.0002)
lsapt	.0031**	.0038**	.0036**	.0038**	.0038**	.0033**	.0036**
	(.0011)	(.0013)	(.0013)	(.0014)	(.0014)	(.0013)	(.0014)
lsapn	.0023	.0010	.0005	.0004	.0005	-.0005	.0000
	(.0029)	(.0051)	(.0054)	(.0053)	(.0055)	(.0053)	(.0055)
lf	.0001	-.0001	-.0001	-.0000	-.0000	-.0001	.0000
	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)
qe1e	-.0031	-.0027	-.0047	-.0056	-.0060	.0062	-.0062
	(.0038)	(.0042)	(.0038)	(.0072)	(.0073)	(.0082)	(.0071)
qe2e	.0517*	.0529*	.0522*	.0479*	.0480*	.0534	.0476*
	(.0254)	(.0268)	(.0261)	(.0256)	(.0257)	(.0301)	(.0253)
qe3e	-.0605	-.0618	-.0609	-.0536	-.0537	-.0472	-.0538
	(.0766)	(.0786)	(.0779)	(.0779)	(.0778)	(.0631)	(.0775)
qete	.0808	.0811	.0816	.0858	.0856	.0879	.0865
	(.1054)	(.1058)	(.1064)	(.1084)	(.1084)	(.1160)	(.1092)
qene	-.1400	-.1393	-.1381	-.1289	-.1293	-.1246	-.1303
	(.1007)	(.1007)	(.1005)	(.0949)	(.0951)	(.0923)	(.0950)
lsap1e	-.0074	-.0065	-.0072	-.0069	-.0070	-.0051	-.0071
	(.0055)	(.0048)	(.0053)	(.0056)	(.0058)	(.0041)	(.0057)
lsap2e	.0006	.0007	.0006	.0006	.0006	.0006	.0006
	(.0019)	(.0020)	(.0019)	(.0020)	(.0019)	(.0023)	(.0019)
lsap3e	-.0030	-.0029	-.0030	-.0033	-.0033	-.0030	-.0034
	(.0021)	(.0020)	(.0020)	(.0023)	(.0024)	(.0021)	(.0024)
lsapte	-.0119**	-.0116**	-.0117**	-.0124**	-.0124**	-.0110**	-.0125**
	(.0040)	(.0040)	(.0040)	(.0044)	(.0044)	(.0041)	(.0045)
lsapne	-.0246	-.0256	-.0256	-.0256	-.0256	-.0239	-.0251
	(.0152)	(.0162)	(.0164)	(.0165)	(.0165)	(.0177)	(.0161)
lfe	.0056	.0058	.0058	.0057	.0057	.0057	.0057
	(.0082)	(.0084)	(.0084)	(.0081)	(.0081)	(.0079)	(.0081)

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.10: Dependent Variable: Bond Flows (Advanced Economies)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qe1	-2.0298***	-1.4997**	-2.1203***	-2.1194***	-3.1414*	-2.0164***	-2.1090***
	(.5483)	(.4727)	(.5686)	(.5873)	(1.5391)	(.5765)	(.5805)
qe2	-3.6987***	-3.1558***	-2.0866	-2.1892	-3.2994***	1.5191	-1.9330
	(.9104)	(.8574)	(1.6157)	(1.5353)	(.7108)	(1.7371)	(1.7280)
qe3	1.5061**	1.0531	2.7585*	2.6925*	1.6764**	1.1638	2.6055*
	(.5527)	(.7165)	(1.3201)	(1.3032)	(.5931)	(.9414)	(1.2208)
qet	-12.9891**	-12.7220***	-13.2673**	-13.5220**	-13.9135**	-11.2881**	-13.7643**
	(4.0240)	(3.8962)	(4.1798)	(4.4131)	(4.7080)	(3.8306)	(4.5776)
qen	-5.2165***	-5.5913***	-6.6647**	-5.7611**	-6.2597**	-7.5011**	-5.8098**
	(1.1738)	(1.5227)	(2.5024)	(1.8615)	(2.3570)	(2.7009)	(1.9052)
lsap1	-.0056**	-.0059**	-.0103*	-.0104	-.0204	-.0090	-.0104
	(.0017)	(.0021)	(.0056)	(.0057)	(.0167)	(.0056)	(.0057)
lsap2	-.0082***	-.0087***	-.0091***	-.0093**	-.0119*	-.0074**	-.0093**
	(.0024)	(.0026)	(.0028)	(.0029)	(.0053)	(.0023)	(.0029)
lsap3	.0017**	.0016**	.0010**	.0012***	.0028	.0016***	.0013***
	(.0007)	(.0006)	(.0004)	(.0004)	(.0019)	(.0004)	(.0004)
lsapt	.0174***	.0176***	.0177***	.0176***	.0201**	.0136***	.0176***
	(.0050)	(.0052)	(.0051)	(.0050)	(.0070)	(.0041)	(.0051)
lsapn	-.0018	-.0013	.0009	-.0004	.0014	-.0004	-.0002
	(.0012)	(.0012)	(.0026)	(.0017)	(.0034)	(.0023)	(.0018)
lf	.0013***	.0015***	.0016**	.0016**	.0017**	.0018**	.0016**
	(.0003)	(.0005)	(.0006)	(.0007)	(.0007)	(.0007)	(.0006)
qe1e	.1111***	.1102***	.1145***	.1174***	.1148***	.1113***	.1174***
	(.0134)	(.0127)	(.0149)	(.0175)	(.0153)	(.0164)	(.0175)
qe2e	.1468***	.1463***	.1471***	.1476***	.1470***	.0023	.1476***
	(.0111)	(.0109)	(.0112)	(.0109)	(.0107)	(.0035)	(.0109)
qe3e	-.0805***	-.0799***	-.0810***	-.0782***	-.0738***	-.0241***	-.0782***
	(.0121)	(.0114)	(.0115)	(.0076)	(.0028)	(.0036)	(.0076)
qete	.5322***	.5318***	.5313***	.5315***	.5322***	.4351***	.5314***
	(.0648)	(.0647)	(.0645)	(.0659)	(.0667)	(.0573)	(.0659)
qene	.1421***	.1425***	.1409***	.1395***	.1397***	.1886***	.1396***
	(.0161)	(.0164)	(.0156)	(.0146)	(.0153)	(.0210)	(.0146)
lsap1e	.0210***	.0206***	.0220***	.0222***	.0209***	.0157***	.0222***
	(.0035)	(.0033)	(.0040)	(.0041)	(.0032)	(.0033)	(.0041)
lsap2e	.0304***	.0304***	.0305***	.0303***	.0302***	.0243***	.0303***
	(.0045)	(.0045)	(.0046)	(.0043)	(.0043)	(.0036)	(.0043)
lsap3e	-.0039***	-.0039***	-.0038***	-.0041***	-.0042***	-.0058***	-.0041***
	(.0006)	(.0006)	(.0005)	(.0006)	(.0007)	(.0007)	(.0006)
lsapte	-.0647***	-.0647***	-.0645***	-.0642***	-.0644***	-.0485***	-.0642***
	(.0084)	(.0084)	(.0083)	(.0080)	(.0082)	(.0064)	(.0080)
lsapne	-.0019	-.0018	-.0022	-.0027	-.0023	-.0009	-.0027
	(.0016)	(.0016)	(.0017)	(.0018)	(.0015)	(.0014)	(.0018)
lfe	-.0106***	-.0107***	-.0107***	-.0111***	-.0111***	-.0103***	-.0111***
	(.0009)	(.0009)	(.0009)	(.0013)	(.0013)	(.0013)	(.0013)

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.11: Dependent Variable: Bond Flows (Emerging Economies)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
qe1	3.1042	4.0599	4.3428	4.1969	3.9918	3.3298*	4.1805
	(2.0919)	(2.7092)	(2.7124)	(2.3736)	(2.3369)	(1.4699)	(2.3499)
qe2	-1.2970	.1788	.0548	-.9181	-3.0453	-.1825	-1.9608
	(3.9088)	(3.0721)	(3.4303)	(3.8760)	(3.9164)	(3.9244)	(4.6424)
qe3	1.7313	-.4820	-2.2452	-2.6380	-3.4587	-1.9395	-2.2697
	(2.6556)	(2.4452)	(2.8742)	(2.9601)	(3.0447)	(2.0745)	(2.7839)
qet	-6.1891*	-5.9156	-5.1084	-5.7086*	-5.7521	-4.5399	-4.7531
	(2.9781)	(2.9601)	(2.8469)	(2.8228)	(2.9317)	(2.4678)	(2.9020)
qen	2.4476	3.0661	3.6664	3.9837	3.6909	1.9634	4.2297
	(2.6948)	(3.0566)	(2.8127)	(2.5536)	(2.6005)	(1.9760)	(2.7069)
lsap1	.0048	.0047	.0083	.0079	.0072	.0063	.0078
	(.0037)	(.0033)	(.0057)	(.0054)	(.0055)	(.0037)	(.0053)
lsap2	-.0011	-.0006	.0008	.0005	-.0033	.0009	.0008
	(.0060)	(.0052)	(.0044)	(.0047)	(.0046)	(.0039)	(.0046)
lsap3	.0024	.0040	.0048	.0049	.0057*	.0048*	.0046
	(.0013)	(.0021)	(.0025)	(.0026)	(.0027)	(.0019)	(.0025)
lsapt	.0010	.0035*	.0039*	.0042*	.0051*	.0040**	.0039*
	(.0020)	(.0015)	(.0016)	(.0019)	(.0021)	(.0014)	(.0018)
lsapn	-.0035	.0093	.0086	.0081	.0094	.0104	.0071
	(.0025)	(.0137)	(.0129)	(.0123)	(.0123)	(.0099)	(.0114)
lf	-.0017	-.0019	-.0016	-.0017*	-.0015	-.0018	-.0015*
	(.0011)	(.0011)	(.0008)	(.0008)	(.0008)	(.0010)	(.0007)
qe1e	-.1153	-.1198	-.1291	-.1175	-.1196	-.1263	-.1189
	(.1015)	(.1033)	(.1111)	(.0939)	(.0945)	(.0753)	(.0946)
qe2e	-.2447	-.2491*	-.2536*	-.2243	-.2246	-.2754*	-.2254
	(.1219)	(.1205)	(.1182)	(.1324)	(.1315)	(.1187)	(.1314)
qe3e	-.1073	-.0956	-.0943	-.0926	-.0876	-.2044*	-.0942
	(.1011)	(.1059)	(.1071)	(.1125)	(.1170)	(.0832)	(.1129)
qete	.3073**	.3061**	.3054**	.3103**	.3085**	.2495**	.3135**
	(.0994)	(.0989)	(.0987)	(.0888)	(.0908)	(.0826)	(.0896)
qene	.0351	.0313	.0377	.0195	.0202	.0895	.0168
	(.1857)	(.1854)	(.1826)	(.1756)	(.1766)	(.1174)	(.1761)
lsap1e	-.0117	-.0142	-.0173	-.0158	-.0165	-.0189	-.0163
	(.0149)	(.0161)	(.0185)	(.0173)	(.0177)	(.0152)	(.0177)
lsap2e	-.0168	-.0170	-.0173	-.0161	-.0162	-.0128	-.0162
	(.0140)	(.0139)	(.0138)	(.0149)	(.0149)	(.0131)	(.0148)
lsap3e	-.0333***	-.0337***	-.0340***	-.0332***	-.0333***	-.0299***	-.0334***
	(.0035)	(.0036)	(.0036)	(.0035)	(.0035)	(.0041)	(.0035)
lsapte	-.0061	-.0063	-.0070	-.0069	-.0068	-.0061	-.0071
	(.0085)	(.0086)	(.0083)	(.0081)	(.0081)	(.0071)	(.0079)
lsapne	.0069	.0098	.0093	.0133	.0127	.0149	.0147
	(.0218)	(.0191)	(.0203)	(.0198)	(.0200)	(.0132)	(.0187)
lfe	.0070	.0065	.0065	.0073	.0070	.0042	.0073
	(.0055)	(.0056)	(.0056)	(.0057)	(.0057)	(.0078)	(.0057)

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$