

The Implications of Simultaneous Capital Stop and Retrenchment during Financial Crises*

JKT 24(7)

Jae-Hyun Suh[†]

Department of Commerce and Finance, Kookmin University, South Korea

Received 10 August 2020
Revised 20 September 2020
Accepted 8 November 2020

Abstract

Purpose – A financial crash triggers asset fire sales by foreign investors and, as a consequence, the price of domestic assets severely decreases. Domestic investors take advantage of these low prices by replacing foreign assets with domestic assets, which helps to alleviate the liquidity shock caused by foreigners. However, is the amount of capital retrenchment by domestic investors sufficient to protect the Korean economy from capital stop by foreign investors during financial crisis? This paper answers this question and suggests the implications of this phenomenon for the Korean economy.

Design/methodology – We estimate the associations between capital stop and retrenchment and various financial crises such as banking, currency, debt, and inflation crises using the complementary log-log model. Specifically, we use data of gross capital flows to differentiate between the role of foreign and domestic investors in financial markets. Capital stop and retrenchment designate a sharp decrease in gross capital inflows and outflows, respectively.

Findings – Capital stop is significantly associated with financial crises, especially currency and debt crises. This implies that increased risk aversion during times of financial turmoil encourages foreign investors to retrench their investments, worsening liquidity shocks. Conversely, capital retrenchment is not significantly associated with such crises. The results show that, although financial crises reduce gross capital outflows, the reduction is not as large as that with capital inflows.

Originality/value – The contribution of this paper is threefold. First, this study investigates how domestic investors behave during times of financial distress by studying gross capital flows—not net capital flows. Second, we concentrate on sharp changes in capital flows during crises. Third, we examine the associations between capital stop and retrenchment and financial crises in general, not specific events.

Keywords: Financial Crisis, Gross Capital Flows, Retrenchment, Stop

JEL Classifications: F32, F34, F40, G01

1. Introduction

Broner et al. (2013) demonstrated that capital inflows by foreigners and capital outflows by domestic agents both decline when a country faces a financial crisis. This challenging question could not be adequately explained by traditional models. Recently, however, researchers somewhat agree that the simultaneous reductions in capital inflows and outflows can be attributed to risk aversion and asymmetrical information availability regarding the domestic economy (see Caballero and Simsek, 2020). Moreover, they argue that the alleviation of the liquidity shock caused by capital stop by foreigners is one virtue of capital retrenchment by domestic agents. To be specific, when a country experiences a financial crash, foreign investors initiate asset fire sales. As a result, domestic assets significantly decrease in price, which further worsens liquidity shock. Consequently, domestic agents seeking to take

*This work was supported by Kookmin University.

[†] **First and Corresponding author:** jasuh@kookmin.ac.kr

© 2020 Korea Trade Research Association. All right reserved.

advantage of low-priced domestic assets purchase them instead of foreign assets. Asset prices then increase and the fire sale ends. This is the contribution of domestic agents to domestic markets during periods of financial turmoil.

This theoretical explanation motivates our study that seeks to address whether domestic agents' net purchases of domestic assets in Korea are large enough to restore the prices that were negatively affected by foreigners' asset fire sales. To be specific, we investigate if capital retrenchment and stop are significantly associated with financial crises using a panel data set consisting of Korea and 60 other countries. Here, capital retrenchment (stop) designates a sharp decrease in capital outflows (capital inflows). Therefore, we must determine if the reduction in capital outflows is sufficient to compensate for the simultaneous reduction in capital inflows that occur during a financial crisis. Accordingly, policy suggestions might differ significantly. If capital retrenchment by domestic agents is sufficient to alleviate liquidity shock, monitoring and developing financial markets might be enough to reduce capital flow volatility. However, if capital retrenchment by domestic investors is insufficient during periods of financial turmoil, the government must implement targeted policies designed to inject additional liquidity into the markets.

Furthermore, the study provides important implications for Korea, which experienced two remarkable financial crises: the Asian crisis in 1997 and the global financial crisis in 2008. During these times, capital inflows by foreigners suddenly and severely dropped for several reasons and this phenomenon certainly worsened domestic economic shocks. Many studies have provided the solutions to this problem but we believe this paper is one of the few works that focuses on the role of domestic investors during financial market crashes. Our results might provide new policy implications for the stability of financial markets to the Korean government.

This is why we must examine gross capital flows rather than net flows. A major advantage of using gross capital flows data is that we can distinguish between the roles of investors in their investing activities by nationality. This advantage is non-negligible because Calderón and Kubota (2013), for instance, have already demonstrated that foreign and domestic investors behave differently in any given situation. According to their work, gross capital flows by foreign and domestic investors are expected to be heterogeneous, even if both were triggered by the same financial turmoil. This information is important for the proper implementation of governmental policies.

To briefly explain our results, although we see that domestic agents sell foreign assets or reduce foreign asset purchases during financial crises, there is no evidence that such sales are significantly large enough to mediate a positive association between capital retrenchment in outflows and financial crises. This is evidence supporting the "flight-to-safety" hypothesis because they continue to purchase foreign assets, while their countries are experiencing financial crashes. This finding is also consistent with Cuddington's (1986) argument that left capital does not easily return. Conversely, capital stop is significantly and positively associated with financial crises, especially currency and debt crises. This indicates capital retrenchment by domestic investors is not sufficient to alleviate the liquidity shock caused by foreign investors in Korea. Therefore, the government's active market intervention can be warranted if Korea faces another financial crisis in the future.

Our contribution to the literature is threefold. First, this study investigates how domestic investors behave during times of financial distress by examining gross capital flows—not net capital flows. It is noteworthy that, although previous studies on net capital flows¹ provide important insight into the relationship between capital movements and financial markets,

¹ See Fratzscher (2012) and Milesi-Ferretti and Tille (2011), for instance.

they do not consider heterogeneity between foreign and domestic investors. Second, we concentrate on sharp changes in capital flows that occur during crises. Although some studies have investigated how gross capital moved during financial crises, this is one of the few studies, to the best of our knowledge, that seeks to determine if such movement is significant. Although the work of Forbes and Warnock (2012a) is notable because they studied the determinants of sharp changes in capital flows, they did not consider financial crises as the determinant. On the contrary, this study pays special attention to the role of capital retrenchment in liquidity shock in the presence of financial distress and capital stop. Finally, we do not specifically focus on remarkable events such as the 2008-09 global financial crisis (Cheung et al., 2020), the Asian crisis (Mishkin, 1999), or the Euro Area crisis (Schmidt and Zwick, 2015). We examine the associations between extreme capital flow episodes and financial crises in general, including banking, currency, debt, and inflation crises.

The rest of the paper is organized as follows. Section 2 explains our dataset in detail and introduces the definitions of extreme capital flow episodes. Moreover, it explains our estimation strategy. Section 3 presents the results. We first provide descriptive statistics on capital flow episodes and related variables. Then, we estimate the associations between financial crises and capital flow episodes and interpret the results. Section 4 discusses policy implications for the Korean economy that are consistent with our results. Finally, Section 5 summarizes and concludes the paper.

2. Data and Estimation Strategy

2.1. Data

We use annual data for Korea and the following 60 countries over the sample period 1980-2009: Albania, Angola, Argentina, Armenia, Azerbaijan, Republic of, Belarus, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Chile, China, P.R.: Mainland, Colombia, Congo, Republic of, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Georgia, Guatemala, Honduras, India, Indonesia, Jamaica, Jordan, Kazakhstan, Latvia, Libya, Lithuania, Macedonia, Malaysia, Mauritius, Mexico, Moldova, Mongolia, Morocco, Namibia, Nicaragua, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, South Africa, Sri Lanka, Swaziland, Syrian Arab Republic, Thailand, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, R.B., and Vietnam. Note that major oil-exporting countries and bank havens were excluded because of strong outliers in data.

To study cross-border flows of gross capital in these countries, we consider only private capital flows and excluded public capital flows such as gold and total reserves because they are closely monitored and managed by the government. We seek to analyze investor behavior during times of financial turmoil; hence, including public capital flows would be inappropriate. Gross capital flows consist of three types of private capital flows—foreign direct investment (FDI) flows, portfolio investment flows (e.g., equities and debts), and other investment flows (e.g., trade credits, deposits, and bank loans). The definition of gross capital outflows (inflows) is the net purchase of foreign (domestic) assets by domestic agents (foreigners). According to this definition, gross capital flows can be negative when the sales of assets are higher than purchases.

The indicator variables define the reductions in gross capital outflows by domestic investors (retrenchment) and gross capital inflows by foreign investors (stop).² Their formal

² The terminologies “stop” and “retrenchment” follow the definitions of Forbes and Warnock (2012a).

definitions are as follows:

- Retrenchment:

$$\begin{cases} 1 & \text{if } KO_{jt} \in \left\{ \text{bottom 30\% of } (KO_{js})_{s=1}^T \right\} \cap \left\{ \text{bottom 30\% of } (KO_{js})_{j=1,s=1}^{N,T} \right\} \\ 0 & \text{otherwise} \end{cases}$$

- Stop:

$$\begin{cases} 1 & \text{if } KI_{jt} \in \left\{ \text{bottom 30\% of } (KI_{js})_{s=1}^T \right\} \cap \left\{ \text{bottom 30\% of } (KI_{js})_{j=1,s=1}^{N,T} \right\} \\ 0 & \text{otherwise} \end{cases}$$

where KO_{jt} and KI_{jt} designate gross capital outflows and inflows in country j at time t . The first criterion requires gross capital flows to be significantly reduced according to the country's own experience such that they are in the bottom 30th percentile of the distribution in that country. A concern regarding this criterion is that some countries may still have a large amount of gross capital flows when they are experiencing retrenchment or stop. To avoid this case, we require the second criterion, which necessitates gross capital flows to be in the bottom 30th percentile of the distribution of all countries. Therefore, the second criterion represents the common requirement that gross capital flows in every country must satisfy to be defined as capital flow episodes. We use these dummy variables as the dependent variables to investigate the association between capital flow episodes and financial crises.

Although we aggregated three types of capital flows as gross capital flows, each capital flow might respond differently to financial crises due to their individual characteristics (see Forbes and Warnock, 2012b). To address this issue, we disaggregate gross capital flows and separately define retrenchment and stop of each component, that is, FDI retrenchment and stop, portfolio investment (PI) retrenchment and stop, and other investment (OI) retrenchment and stop. The formal definitions are as follows.

- FDI retrenchment and stop:

$$\begin{cases} 1 & \text{if } FDI_{kjt} \in \left\{ \text{bottom 30\% of } (FDI_{kjt})_{s=1}^T \right\} \cap \left\{ \text{bottom 30\% of } (FDI_{kjt})_{j=1,s=1}^{N,T} \right\} \\ 0 & \text{otherwise} \end{cases}$$

- PI retrenchment and stop:

$$\begin{cases} 1 & \text{if } PI_{kjt} \in \left\{ \text{bottom 30\% of } (PI_{kjt})_{s=1}^T \right\} \cap \left\{ \text{bottom 30\% of } (PI_{kjt})_{j=1,s=1}^{N,T} \right\} \\ 0 & \text{otherwise} \end{cases}$$

- OI retrenchment and stop:

$$\begin{cases} 1 & \text{if } OI_{kjt} \in \left\{ \text{bottom 30\% of } (OI_{kjt})_{s=1}^T \right\} \cap \left\{ \text{bottom 30\% of } (OI_{kjt})_{j=1,s=1}^{N,T} \right\} \\ 0 & \text{otherwise} \end{cases}$$

where, for instance, FDI_{1jt} equals FDI outflows and FDI_{2jt} equals FDI inflows. Therefore, retrenchment in outflows and stop in inflows are defined by index k . Tables 1 and 2 demonstrate the amounts of capital flows during retrenchment and stop periods. We can see that approximately 20% of the total observations are defined as extreme capital flow episodes and that the mean of every capital flow is negative during these periods. This suggests that retrenchment and stop are abnormal events in which the sales of foreign assets exceed purchases.

Our study considers four kinds of financial crises, namely, banking, currency, debt, and inflation crises. Each type of crisis is defined as a dummy variable that takes the value of one

Table 1. Summary of Capital Outflows During Retrenchment and Non-retrenchment Periods

Retrenchment Period					
Outflows	Obs.	Mean	Std. Dev	Min	Max
Gross	314	-1.5619	2.3782	-15.0481	0.1834
FDI	110	-0.3201	0.5112	-2.9665	-0.002
Portfolio	195	-0.3899	0.6735	-4.8828	0
Others	323	-1.6829	2.4091	-14.9735	0.0028
Non-retrenchment Periods					
Outflows	Obs.	Mean	Std. Dev	Min	Max
Gross	1,220	3.1553	4.0534	-5.3839	41.548
FDI	1,424	0.2927	0.861	-0.1687	13.8796
Portfolio	1,339	0.5258	1.7244	-0.563	16.7802
Others	1,211	2.3428	3.2835	-5.3839	39.4907

Notes: 1. The mean difference between the two periods is significant at less than the 1% level.
2. Each flow was scaled by GDP.

Table 2. Summary of Capital Inflows During Stop and Non-stop Periods

Stop Periods					
Inflows	Obs.	Mean	Std. Dev	Min	Max
Gross	343	-3.7697	6.5615	-39.9381	1.5728
FDI	261	-0.2061	1.445	-14.369	0.6318
Portfolio	265	-0.8984	2.4015	-35.0192	-0.0007
Others	320	-5.3746	7.1541	-40.7045	-0.1728
Non-stop Periods					
Inflows	Obs.	Mean	Std. Dev	Min	Max
Gross	1,191	7.058	6.8301	-13.3457	52.3416
FDI	1,273	3.2042	3.9639	-1.0103	45.1498
Portfolio	1,269	0.6716	1.7683	-0.829	38.1223
Others	1,214	3.4269	5.2812	-13.3457	41.5539

Notes: 1. The mean difference between the two periods is significant at less than the 1% level.
2. Each flow was scaled by GDP.

(1) when it meets the criteria and zero (0) otherwise. A country experiences a banking crisis if significant signs of financial distress exist in financial markets and the government uses policy to intervene in the banking system. Meanwhile, a country experiences a currency crisis if the nominal depreciation of its currency vis-à-vis the United States (US) dollar is significant. An inflation crisis is defined as the inflation rate being greater than 20% during a given period.³ A debt crisis is defined if a country defaults on local-currency or foreign-currency debts. Moreover, a financial crisis is denoted by 1 if a country experiences any of these four types of crises, and 0 otherwise.

Note that we only consider the initial year of each crisis in our study to reduce estimation bias. Financial crises have been persistent in several countries; some have lasted over 10 years. In this case, retrenchment or stop that occurs in the middle of a 10-year financial crisis might not be responding to that particular crisis. Furthermore, determining exactly when a financial

³ This definition follows the work of Reinhart and Rogoff (2009).

crisis ends is sometimes difficult, which cause potential measurement errors.

The use of control variables is expected to reduce omitted-variable bias. In this study, we used the following control variables: global real interest rate (GLOBRATE) and global real GDP growth (GLOBGDP) as globally common factors and capital market openness (KAOPEN), domestic real GDP growth (ZGDP), and exchange rate regime (EXREGIME) as country-specific factors. Global interest rate and global real GDP growth were calculated according to the average of all G7 countries. Moreover, the capital market openness index was drawn from the work of Chinn and Ito (2006), ranging from zero (0) to one (1), where a value of one (1) indicates the most liberalized markets. We prefer to use the exchange rate regime rather than real exchange rate as a control variable because many countries in our sample were managing their exchange rate, at least implicitly (Calvo and Reinhart, 2002). In this case, exchange rate regime might provide better information to investors. Table 3 summarizes the definitions of the variables and their sources.

Table 3. Data Sources

Variable	Definition	Source
Gross capital outflows (% of GDP)	Net foreign-asset purchases by domestic agents. Foreign assets consist of foreign direct investment, portfolio investment, and other investment.	IMF, BOPS
Gross capital inflows (% of GDP)	Net domestic-asset purchases by foreigners. Domestic assets consist of foreign direct investment, portfolio investment, and other investment.	IMF, BOPS
Crisis	An indicator variable that is	
Banking crisis	1 if there is 1) significant signs of financial distress and 2) significant banking policy intervention in the banking system.	Laeven and Valencia (2012)
Currency crisis	1 if nominal depreciation of the currency vis-à-vis the U.S. dollar is at least 30 percent and also at least 10 percentage points higher than the rate of depreciation in the year before.	Laeven and Valencia (2012)
Debt crisis	1 if a country defaults by local-currency debts or by foreign-currency debts.	Reinhart and Rogoff (2009) and Broner et al. (2013)
Inflation crisis	1 if the inflation rate is larger than 20%.	Author's own calculations
Financial crisis	1 if a country experiences any of the banking, currency, debt, and inflation crises.	Author's own calculations
Global real interest rate (%)	The average of G7 countries' real interest rate	IMF, IFS
Global real GDP growth (%)	The average of G7 countries' real GDP growth	World Bank
Domestic real GDP growth (%)		World Bank
Capital market openness	Index ranging from 0 to 1. The most liberalized market is denoted by 1.	Chinn and Ito (2006)
Exchange rate regime	Index ranging from 1 to 16. The most flexible regime is denoted by 16.	Ilzetzki, Reinhart and Rogoff (2017)

2.2. Estimation Strategy

We employ a binary model in which the dependent variable is a dummy variable. In this model, the coefficient of each variable estimates the likelihood of capital flow episodes according to the change in the selected control variables. Although probit and logit models are the more commonly used binary models, we do not use them in this paper because both assume that the value of the dependent variable is symmetrically distributed. As shown in Tables 1 and 2, the values of retrenchment and stop are asymmetrically distributed; only about 20% of the total observations are one (1). In this case, we need to use a different model that assumes asymmetrical distribution of the dependent variable. For this reason, we used the complementary log-log (clog) model. According to the clog model, the probability p that the dependent variable becomes 1, conditional on the control variables ($Pr(y = 1|X)$), is

$$F(X'\beta) = 1 - \exp\{-\exp(X'\beta)\}.$$

In addition, the marginal effect of the j_{th} variable, $(\partial p / \partial x_j)$, is

$$\exp(-\exp(X'\beta))\exp(X'\beta)\beta_j.$$

Here, $X'_t\beta$ is

$$\begin{aligned} &\beta_0 + \beta_1Crisis_{t-1} + \beta_2Crisis_t + \beta_3Crisis_{t+1} + \beta_4GLOBRATE_t + \beta_5GLOBGDP_t \\ &+ \beta_6KAOPEN_t + \beta_7ZGDP_t + \beta_8EXREGIME_t \end{aligned}$$

where “Crisis” is one of the five crisis indices. We also included $Crisis_{t-1}$ and $Crisis_{t+1}$ to consider the case if investors respond one year before or after the crisis. Therefore, our main interests are β_1 , β_2 , and β_3 .

3. Results

3.1. Descriptive Statistics

We first provide the descriptive statistics that might give information on the main results. Table 4 shows the correlations between the selected variables. Gross capital outflows and inflows are strongly correlated, as indicated by their co-movement. Moreover, both flows are negatively correlated with all types of crises. Foreign investors likely stop their investments in

Table 4. The Correlations between Selected Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Gross Outflows	1						
(2) Gross Inflows	0.375	1					
(3) Banking Crisis	-0.029	-0.015	1				
(4) Currency Crisis	-0.019	-0.101	0.133	1			
(5) Debt Crisis	-0.051	-0.105	0.105	0.167	1		
(6) Inflation Crisis	-0.014	-0.079	-0.012	0.187	0.127	1	
(7) Financial Crisis	-0.048	-0.135	0.544	0.575	0.55	0.431	1

Source: Author’s own calculations.

the domestic economy, whereas domestic investors retrench their investments from foreign countries in turbulent times. This is consistent with empirical evidence in other studies. However, it is noteworthy that negative correlations between capital inflows and crises are about twice as large as those between capital outflows and crises, except for the case of banking crises. This suggests that the reduction of capital inflows during financial crises is larger than the reduction of capital outflows.

Table 5 exhibits the fact that stronger relationships exist between capital inflows and financial crises than between capital outflows and financial crises. For instance, 14% of all 288 capital retrenchments coincided with a debt crisis within one year. Conversely, 26% of all 318 capital stops coincided with debt crises, indicating that stops were more frequent than retrenchments during crises. Note also that the cumulative frequency of stop is larger than that of retrenchment in all cases. Based on the descriptive statistics, we hypothesize that the association between retrenchments and crises is much weaker than that between stops and crises. We surmise that the amount of retrenched capital outflows during times of financial crisis is not sufficient to alleviate the liquidity shock caused by stops. We test this hypothesis in the next sub-section.

Table 5. The Frequency of Capital Flow Episodes Accompanying Financial Crises

Episodes	Obs.	Crisis	Frequency			Cumulative
			t-1	t	t+1	Frequency
Retrenchment	314	Banking Crisis	4%	4%	3%	11%
	314	Currency Crisis	5%	6%	4%	15%
	288	Debt Crisis	5%	5%	4%	14%
	294	Inflation Crisis	3%	3%	3%	9%
Stop	343	Banking Crisis	6%	4%	3%	13%
	343	Currency Crisis	9%	9%	5%	23%
	318	Debt Crisis	10%	10%	6%	26%
	296	Inflation Crisis	4%	5%	3%	12%

Source: Author's own calculations.

3.2. Main Results

We now estimate the association between extreme capital flow episodes and financial crises using the clog model. Tables 6 and 7 show the results when the dependent variable is the capital stop and capital retrenchment, respectively. Note that our main interests are the coefficients in the first three rows, which are β_1 , β_2 , and β_3 in Section 2.2.

We can see from Table 6 that the coefficients of crisis at time $t-1$ and at time t are all positive. Moreover, the stop is significantly associated with both currency and debt crises. The fact that a significant association exists between stops and debt crises is not surprising because foreign investors concerned with asset default risk would be willing to sharply increase their asset sales. Furthermore, an asset fire sale can itself precipitate a debt crisis. Therefore, stop and a debt crisis simultaneously reinforce each other, as Table 6 confirms. The significant association between currency crises and stop is also not surprising. Currency depreciation lowers the value of domestic assets, and therefore, if they expect depreciation, foreign investors would try selling their assets before the onset of the crisis. It is even worse if the sales were triggered by speculative motivation. Indeed, some speculative attacks were successful, as proven by the economic history, which suggests that the government should monitor short-term capital movements. The significant association between stop and financial crises at time $t-1$ and t also verifies the fact that foreign investors sharply reduce domestic asset

purchases when they expect financial turmoil.

Meanwhile, capital retrenchment is not significantly associated with financial crises. Furthermore, the coefficients are mostly negative. These results suggest no evidence in the likelihood of retrenchment to occur during financial crises. Rather, it is more plausible that financial crises reduce the likelihood of retrenchment. Overall, this indicates that the sales amount by domestic agents is both comparatively and quantitatively small. Sales is comparatively small in the sense that it is less than the amount of sales by foreign investors and quantitatively small in the sense that it is below historical trends. The government cannot therefore simply depend on capital retrenchment by domestic investors for the recovery of the financial market. Additional accommodative monetary policy might be warranted to increase the supply of credit.

Other independent variables are also associated with capital flow episodes, which implies their contribution to reducing omitted-variable bias. A higher global interest rate and lower global GDP growth both increase the likelihood of retrenchment. The seemingly contradictory effects of these two common global factors were driven by their negative correlation. That is, when an advanced country raises its real interest rate, the country's GDP growth becomes lower than its trend; consequently, domestic investors are motivated to reduce their foreign investments. Meanwhile, we found that higher global GDP growth increases the likelihood of stop, probably because our sample consists only of middle-income countries. If G7 countries' economies are more robust and safer than middle-income countries, investors

Table 6. The Association between Capital Stops and Crises

	Banking	Currency	Debt	Inflation	Financial
Crisis					
t-1	0.35 (0.23)	0.49** (0.21)	0.71*** (0.19)	0.41 (0.33)	0.49*** (0.14)
t	0.12 (0.28)	0.43* (0.22)	0.69*** (0.21)	0.31 (0.35)	0.41*** (0.15)
t+1	-0.09 (0.28)	-0.09 (0.26)	0.29 (0.24)	-0.47 (0.52)	-0.06 (0.17)
GLOBRATE	0.02 (0.05)	0.02 (0.05)	0.05 (0.05)	0.03 (0.05)	-0.00 (0.05)
GLOBGDP	0.15*** (0.05)	0.15*** (0.05)	0.17*** (0.05)	0.16*** (0.05)	0.16*** (0.05)
KAOPEN	-0.39*** (0.05)	-0.39*** (0.05)	-0.35*** (0.05)	-0.39*** (0.06)	-0.39*** (0.05)
ZGDP	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
EXREGIME	0.06*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.06*** (0.02)	0.04** (0.01)
Constant	-2.66*** (0.29)	-2.56*** (0.3)	-2.83*** (0.31)	-2.83*** (0.32)	-2.51*** (0.29)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	306	306	285	269	306

Notes: 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

2. Dependent variable: Stop in gross capital inflows.

3. Robust standard errors are in parentheses.

Source: Author's own calculations.

Table 7. The Association between Capital Retrenchments and Crises

	Banking	Currency	Debt	Inflation	Financial
Crisis					
t-1	-0.23 (0.29)	-0.06 (0.26)	-0.18 (0.48)	0.33 (0.34)	-0.19 (0.18)
t	-0.22 (0.31)	0.04 (0.25)	-0.16 (0.29)	-0.07 (0.47)	-0.13 (0.18)
t+1	-0.11 (0.31)	-0.41 (0.31)	0.02 (0.29)	0.53 (0.36)	-0.05 (0.18)
GLOBRATE	0.11** (0.05)	0.1** (0.04)	0.11** (0.04)	0.11** (0.04)	0.11** (0.04)
GLOBGDP	-0.12** (0.06)	-0.11* (0.05)	-0.14** (0.06)	-0.14** (0.06)	-0.12** (0.05)
KAOPEN	-0.08* (0.05)	-0.08* (0.04)	-0.08* (0.05)	-0.09* (0.05)	-0.08* (0.04)
ZGDP	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00** (0.00)
EXREGIME	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.02* (0.01)
Constant	-1.88*** (0.27)	-1.89*** (0.27)	-1.85*** (0.28)	-1.86*** (0.28)	-1.92** (0.27)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	292	292	269	274	292

Notes: 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

2. Dependent variable: Retrenchment in gross capital outflows.

3. Robust standard errors are in parentheses.

Source: Author's own calculations.

would prefer to invest in advanced markets.

Capital market openness prevents capital stop and retrenchment, which is not surprising because more liberal markets promote capital transactions. Although higher growth encourages investors' foreign activities, a more flexible regime discourages them. Domestic investors seem to be concerned about the exchange rate risk, which would cause uncertainty in asset returns. This implies the usefulness of exchange rate adjustments as a policy tool for managing capital flows.

To check robustness, we re-estimated the associations with different specifications. First, we changed the criteria for capital stop and retrenchment so that inflows and outflows would be at the bottom 20th percentile of their distributions rather than the 30th percentile. This method was done to observe if the results were sensitive to the thresholds. Second, we excluded the years for the global financial crisis (2007, 2008, and 2009) to see if our results were being driven by this remarkable event. The global economy was in recession during this period, and many countries were systemically experiencing financial crises. Consequently, international capital flows were significantly reduced. Therefore, we checked whether the main results were simply reflecting the effects of this abnormal event. Third, we included country-specific effects. Estimating country-fixed effects reduces omitted-variable bias. However, it also reduces the number of individuals because the coefficients are unidentifiable for countries that have never experienced an extreme capital flow episode. Thus, we excluded country-fixed effects in the main results, but we used it to check if time-invariant effects

change them.

We do not provide the results here for brevity.⁴ They are similar to the previous results and therefore support our hypothesis that flown capital does not easily return during financial crashes.

3.3. FDI, Portfolio Investment, and Other Investment Flow Episodes

The previous results demonstrate heterogeneous responses of foreign and domestic investors to financial turmoil. However, considering the different characteristics of equity and debt flows, such responses might be dependent on the kind of investments (Forbes and Warnock, 2012b). Unlike debt flows, which are short-term investments and volatile, equity flows are determined on long-term prospects and are therefore more persistent. Specifically, other investments, which consist mostly of bank loans, can quickly adjust to risk, whereas FDIs, which directly or indirectly influence foreign enterprises, may not be able to do so. Thus, we examine if the kinds of investments mattered for the association between capital flow episodes and financial crises.

The results on FDI, portfolio investment, and other investment are reported in Tables 8, 9, and 10, respectively. Note that the covariates are the same as the previous ones, but their coefficients are not reported here to save space.

Table 8. The Association between FDI Flow Episodes and Crises

	Banking	Currency	Debt	Inflation	Financial
Retrenchment					
Crisis(t-1)	0.24 (0.465)	0.387 (0.432)	-0.403 (0.589)	0.288 (0.718)	-0.209 (0.336)
Crisis(t)	-0.7 (0.723)	0.607 (0.414)	0.201 (0.459)	0.578 (0.738)	0.012 (0.321)
Crisis(t+1)	-0.219 (0.589)	-0.008 (0.515)	-0.157 (0.59)	0	-0.168 (0.35)
Obs.	1,384	1,384	1,278	1,244	1,384
Events	101	101	83	90	101
Stop					
Crisis(t-1)	0.156 (0.281)	0.153 (0.284)	1.061*** (0.224)	0.847** (0.336)	0.522*** (0.17)
Crisis(t)	0.196 (0.289)	0.276 (0.28)	0.972*** (0.23)	0.658 (0.435)	0.351* (0.182)
Crisis(t+1)	0.392 (0.271)	0.383 (0.262)	0.533* (0.28)	0.49 (0.438)	0.392** (0.18)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	221	221	208	200	221

Notes: 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

2. Dependent variable: FDI flow stop and retrenchment.

3. Covariates: Global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term.

4. Robust standard errors are in parentheses.

Source: Author's own calculations.

⁴ These results are available from the author upon request.

Table 9. The Association between Portfolio Investment Flow Episodes and Crises

	Banking	Currency	Debt	Inflation	Financial
Retrenchment					
Crisis(t-1)	-0.288 (0.455)	0.058 (0.396)	-0.039 (0.388)	-1.034 (1.006)	-0.175 (0.26)
Crisis(t)	0.087 (0.379)	0.473 (0.336)	-0.200 (0.423)	-0.029 (0.72)	0.095 (0.247)
Crisis(t+1)	-0.393 (0.509)	0.868*** (0.297)	-0.198 (0.462)	-0.818 (1.009)	0.106 (0.26)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	180	180	167	167	180
Stop					
Crisis(t-1)	0.334 (0.286)	0.649** (0.264)	0.778*** (0.245)	0.295 (0.424)	0.385** (0.181)
Crisis(t)	0.068 (0.326)	0.759*** (0.252)	0.900*** (0.235)	0.459 (0.459)	0.478*** (0.178)
Crisis(t+1)	-0.038 (0.366)	0.393 (0.294)	0.878*** (0.248)	0.140 (0.501)	0.308 (0.196)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	257	257	244	240	257

Notes: 1. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

2. Dependent variable: Portfolio investment flow stop and retrenchment.

3. Covariates: Global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term.

4. Robust standard errors are in parentheses.

Source: Author's own calculations.

Table 10. The Association between Other Investment Flow Episodes and Crises

	Banking	Currency	Debt	Inflation	Financial
Retrenchment					
Crisis(t-1)	-0.311 (0.307)	-0.032 (0.267)	-0.596* (0.343)	0.408 (0.355)	-0.303 (0.19)
Crisis(t)	-0.439 (0.346)	-0.080 (0.271)	-0.082 (0.288)	-0.022 (0.479)	-0.214 (0.195)
Crisis(t+1)	0.025 (0.297)	-0.476 (0.327)	-0.252 (0.329)	0.214 (0.421)	-0.156 (0.195)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	300	300	272	278	300
Stop					
Crisis(t-1)	0.373 (0.248)	0.740*** (0.21)	0.587*** (0.209)	0.178 (0.358)	0.490*** (0.146)
Crisis(t)	0.170 (0.28)	0.510** (0.225)	0.624*** (0.222)	0.466 (0.348)	0.423*** (0.158)

Table 10. (Continued)

	Banking	Currency	Debt	Inflation	Financial
Crisis($t+1$)	-0.706* (0.396)	-0.008 (0.279)	0.313 (0.259)	-0.061 (0.461)	-0.061 (0.182)
Obs.	1,384	1,384	1,278	1,265	1,384
Events	294	294	272	260	294

Notes: 1. $*p < 0.1$, $**p < 0.05$, $***p < 0.001$.

2. Dependent variable: Other investment flow stop and retrenchment.

3. Covariates: Global real GDP growth, global real interest rate, capital market openness, domestic real GDP growth, exchange rate regime, and a constant term.

4. Robust standard errors are in parentheses.

Source: Author's own calculations.

There are two findings worth noting. First, retrenchment for portfolio investments is positively associated with currency crisis at time $t+1$. This is not surprising because currency depreciation increases foreign asset prices, which in turn, encourages their sale.

Second, stop for other investments is negatively associated with banking crises at time $t+1$. This seemingly unanticipated result is, in fact, plausible if we consider the definition of banking crisis. According to Table 2, policy intervention exists when a country is experiencing a banking crisis. Such interventions include deposit freezes and bank holidays, which restrict the sale of domestic assets. Accordingly, this could be the empirical evidence that such interventions successfully prohibited foreign investors from withdrawing their deposits.

Nonetheless, the overall scheme is similar. Capital retrenchment is negatively or insignificantly associated with crises, whereas capital stop is positively and significantly associated with currency, debt, and inflation crises. The results therefore are robust and still support our hypothesis.

4. Policy Implications for Korea

This paper thus far has demonstrated that capital retrenchment in outflows by domestic investors is lower than the stop in inflows by foreign investors. This heterogeneous response between two investor groups might worsen domestic liquidity shocks during periods of financial turmoil and therefore necessitate government intervention. In this section, we suggest some policy options for managing capital flows probably suitable for Korea.

The best way to handle such a situation would be to prevent it. Many studies have argued that capital inflow surges increase financial bubbles and occur sudden capital stop and consequent bankruptcies.⁵ For this reason, the government should monitor capital flows so that they cannot precipitate a financial crisis or worsen an existing one. Moreover, capital restrictions might be warranted if markets become overheated. Successful capital controls would manage targeted capital flows, enabling Korea to alleviate the concern. This paper emphasizes the necessity for restrictions on gross capital outflows.

Unfortunately, in practice, capital control policy is not always an easy and optimal solution. Unanimous agreement on the effect of such a policy still does not exist, and many studies have offered different answers to this issue (see Magud et al., 2011). Even if such controls were effective, irrelevant capital restrictions can depress domestic investment, portfolio diversification, and economic growth. Moreover, they hinder external adjustments by destabilizing

⁵ See Agosin and Huaita (2012), Ghosh et al. (2016) and Reinhart and Reinhart (2008).

the exchange rate and international transactions. Therefore, policymakers must implement capital controls carefully, considering both their benefits and costs.

The International Monetary Fund (IMF, 2012) provides useful guidelines for implementing capital controls. Following these guidelines, we argue that capital restrictions should be implemented temporarily and transparently, targeting short-term flows. Furthermore, we suggest policies for financial development, high institutional quality, and macroeconomic adjustment should also be implemented before capital controls, accounting for their potential costs. Otherwise, the process of experiencing a financial crisis and the resultant liquidity drought may become a chronic problem.

Once foreign investors stop their investments in the domestic economy, the government must supply sufficient credit to encourage the recovery of asset prices. Traditional accommodative monetary policy is certainly an option, but we depict nontraditional policies such as those discussed after the 2008-09 global financial crisis. The government can first inject liquidity into impaired banks through direct lending, which may stop asset fire sales and recapitalize them. Diamond and Rajan (2009) explain this policy in detail. They argue that the government should inject liquidity into a market before the end of a crisis.

However, Shleifer and Vishny (2010) point out two potential issues. The first issue is the moral hazard problem. Although the government lends to banks to encourage asset purchases and support credit markets, there is no guarantee that doing so would successfully accomplish those objectives. Banks might instead use those loans to protect their creditors or simply keep them on hold because they believe a fire sale is not completed yet. Second, the government might not be able to choose suitable banks that have urgent credit needs. Note that liquidity injection is effective only with the assumption that resources are properly distributed. Nonetheless, information asymmetry makes such choices difficult. If the government misallocated resources, it will vitiate the efficiency of such a policy.

For these reasons, Shleifer and Vishny (2010) suggest that the government should instead purchase toxic assets. This method does not require the government to choose suitable banks—all it must do is purchase domestic assets until their price reaches the pre-crisis level. Considering the fact that the moral hazard issue and information asymmetry were indeed major reasons for the Asian crisis (Mishkin, 1999), it seems that their suggestion is more appropriate for our economy. Studying the validity of these policies in Korea is an important and interesting subject for future research.

5. Concluding Remarks

This paper estimated the association between extreme capital flow episodes and financial crises. Furthermore, it used data of gross capital flows to differentiate the roles of foreign and domestic investors in financial markets. As a result, it demonstrated their heterogeneous responses to periods of financial turmoil. To be specific, foreigners significantly reduce their investments in the country, whereas domestic agents do not. Although domestic agents also reduce their foreign investments, and purchase domestic assets instead, the magnitude of such purchases seems not very large due to their risk averse behavior. We see this as empirical evidence supporting the “flight-to-safety” hypothesis because it suggests that domestic agents would not completely substitute domestic assets for foreign assets under high-risk conditions.

Heterogeneous responses between the two groups indicate that the liquidity shock caused by foreign investors is not easily resolved. Although capital retrenchment by domestic investors might restore liquidity to credit markets, our results suggest that this is unlikely. The government will then have to implement accommodative monetary policies to provide

liquidity so that investors stop asset sales and begin purchasing assets with the expectation of a price increase.

This issue is also important for Korea to prevent future crises. Notably, foreigners are more likely to stop their investments in countries with less financial development and higher uncertainty. Therefore, Korea should further develop its financial market and foreign exchange market because less developed markets are more vulnerable to fickle and extreme capital movements. In the worst scenario in which Korea faces financial crises, effective and efficient capital restrictions may be necessary. Our study sheds light on the necessity of capital outflow controls.

However, several issues remain to be investigated; we emphasize two of them. First, we suggested using two unconventional monetary policies, namely, liquidity injection and toxic asset purchases. Although these two policies were heavily discussed after the 2008-09 global financial crisis, relatively little literature examining their validity in the context of the Korean economy exists. These two policies could enable the government to protect financial markets from liquidity droughts in principle, but we cannot be certain about its usefulness and efficiency in Korea in practice. We should examine this question carefully considering the specific characteristics of the Korean economy.

Second, it would be interesting to observe what determines these heterogeneous responses of foreign and domestic investors to financial crises. Our empirical evidence provides a broad picture of the relationship between capital flows and financial crises. However, the detailed mechanism underlying this phenomenon is worth investigating to design better policy responses. For instance, if factors that hinder domestic agents' capital retrenchment during financial crisis exist, the government should resolve them for market recovery. This would then improve external adjustments and require less intervention.

References

- Agosin, M. R. and F. Huaita (2012), "Overreaction in Capital Flows to Emerging Markets: Booms and Sudden Stops", *Journal of International Money and Finance*, 31(5), 1140-1155.
- Broner, F., T. Didier, A. Erce and S. L. Schmukler (2013), "Gross Capital Flows: Dynamics and Crises", *Journal of Monetary Economics*, 60(1), 113-133.
- Caballero, R. J. and A. Simsek (2020), "A Model of Fickle Capital Flows and Retrenchment", *Journal of Political Economy*, 128(6), 2288-2328.
- Calderón, C. and M. Kubota (2013), "Sudden Stops: Are Global and Local Investors Alike?", *Journal of International Economics*, 89(1), 122-142.
- Calvo, G. A. and C. M. Reinhart (2002), "Fear of Floating", *The Quarterly Journal of Economics*, 117(2), 379-408.
- Cheung, Y. W., S. Steinkamp and F. Westermann (2020), "Capital Flight to Germany: Two Alternative Measures", *Journal of International Money and Finance*, 102, 102095.
- Chinn, M. D. and H. Ito (2006), "What Matters for Financial Development? Capital Controls, Institutions, and Interactions", *Journal of Development Economics*, 81(1), 163-192.
- Cuddington, J. T. (1986), *Capital Flight: Estimates, Issues, and Explanations*, Princeton, NJ: Princeton University.
- Diamond, D. W. and R. G. Rajan (2009), *Fear of Fire Sales and the Credit Freeze* (NBER Working Paper, No. 14925), Cambridge, MA: National Bureau of Economic Research.
- Forbes, K. J. and F. E. Warnock (2012a), "Capital Flow Waves: Surges, Stops, Flight, and Retrenchment", *Journal of International Economics*, 88(2), 235-251.
- Forbes, K. J. and F. E. Warnock (2012b), *Debt- and Equity-Led Capital Flow Episodes* (NBER

- Working Paper, No. 18329), Cambridge, MA: National Bureau of Economic Research.
- Fratzscher, M. (2012), "Capital Flows, Push versus Pull Factors and the Global Financial Crisis", *Journal of International Economics*, 88(2), 341-356.
- Ghosh, A. R., J. D. Ostry and M. S. Qureshi (2016), "When Do Capital Inflow Surges End in Tears?", *American Economic Review*, 106(5), 581-585.
- Ilzetzki, E., C. M. Reinhart and K. S. Rogoff (2017), *Exchange Arrangements Entering the 21st Century: Which Anchor will Hold?* (NBER Working Paper, No. 23134), Cambridge, MA: National Bureau of Economic Research.
- IMF (2012), *The Liberalization and Management of Capital Flows: An Institutional View* (International Monetary Fund Policy Papers), Washington, DC: Author.
- Laeven, L. and F. Valencia (2012), *Systemic Banking Crises Database: An Update* (IMF Working Paper, No. 12/163), Washington, DC: Author.
- Magud, N. E., C. M. Reinhart and K. S. Rogoff (2011), *Capital Controls: Myth and Reality-a Portfolio Balance Approach* (NBER Working Paper, No. 16805), Cambridge, MA: National Bureau of Economic Research.
- Milesi-Ferretti, G. M. and C. Tille (2011), "The Great Retrenchment: International Capital Flows During the Global Financial Crisis", *Economic Policy*, 26(66), 289-346.
- Mishkin, F. S. (1999), "Lessons from the Asian Crisis", *Journal of International Money and Finance*, 18(4), 709-723.
- Reinhart, C. M. and V. R. Reinhart (2008), *Capital Flow Bonanzas: An Encompassing View of the Past and Present* (NBER Working Paper, No. 14321), Cambridge, MA: National Bureau of Economic Research.
- Reinhart, C. M. and K. S. Rogoff (2009), *This Time is Different: Eight Centuries of Financial Folly* (1st ed.), Princeton, NJ: Princeton University Press.
- Schmidt, T. and L. Zwick (2015), "Uncertainty and Episodes of Extreme Capital Flows in the Euro Area", *Economic Modelling*, 48, 343-356.
- Shleifer, A. and R. W. Vishny (2010), "Asset Fire Sales and Credit Easing", *American Economic Review*, 100(2), 46-50.