Korea and the World Economy, Vol. 14, No. 3 (December 2013) 447-474

Determinants of International Capital Flows in Korea: Push vs. Pull Factors*

Soyoung Kim** · Sunghyun Kim*** · Yoonseok Choi****

This paper aims to analyze the determinants of international capital flows in Korea during 1980-2010. In particular, we investigate the role of push (external) and pull (internal) factors in determining the magnitude and directions of overall capital flows and their components using a time-series analysis. The regression results show that external factors, in particular world interest rate, significantly affect overall capital flows in Korea. Among internal factors, current account has significant and negative effects on capital flows. The estimated coefficients vary in different sub periods. In particular, the role of internal factors decreases over time. We also find that portfolio investment is more sensitive to internal and external economic environments compared to direct investment.

JEL Classification: F21, F32, F34
Keywords: financial account, international capital flows, Korea, pull factor, push factor

* Received September 4, 2013. Revised November 6, 2013. Accepted November 14, 2013.
** Department of Economics, Seoul National University, Seoul, Korea, E-mail: soyoungkim@snu.ac.kr
*** Author for Correspondence, Department of Economics, Sungkyunkwan University, Jongno-gu, Seoul, Korea, Tel: +82-2-760-0421, E-mail: shenrykim@skku.edu
**** Department of Economics, Suffolk University, Boston, USA, E-mail: ychoi2@suffolk.edu

1. INTRODUCTION

Over the past few decades, we have witnessed a surge in the volume of international capital flows, especially into developing countries. Despite their known benefits, skittish capital flows, in particular capital flight and sudden stop, can impose large costs onto emerging market economies by causing financial and currency crises (Rodrik, 2011; Stiglitz, 2000). Understanding the determinants of capital flows is crucial in implementing proper policies towards stable international capital flows. Policies should depend on whether such determinants are exogenous to the country or internally generated (Fernandez-Arias and Montiel, 1996). However, it is not an easy task to identify the determinants of capital flows since the determinants differ depending on the types of capital and economic environment of the domestic and foreign countries. As the world financial markets grow more integrated, it becomes harder to identify these determinants.

In this paper, we aim to contribute to this literature by analyzing various factors that determine the magnitude and directions of international capital flows, using the data of Korea in 1980-2010. Korea is a good candidate for this exercise because of its recent experience of capital account liberalization and financial crisis.[1)] We investigate the determinants of overall capital flows as well as each component of financial account such as direct investment, portfolio investment and other investment. We distinguish the determinants into push (external) and pull (internal) factors, following the traditional approach in the literature. Push factors include economic conditions outside the host (capital-importing) country such as world interest rate and growth rate, while pull factors include various economic and financial conditions of the host country. We also examine how the determinants on net and gross capital flows are different.

Traditionally, most empirical papers have emphasized the role of push

[1)] Similar topics have been studied for other countries such as Turkey (Culha, 2006) and Greece (Pappas, 2011).

factors in determining capital flows into developing countries.[2] The amount of capital flows into developing countries is negatively correlated with the interest rate or growth rates of capital exporting countries. The role of push factors is different depending on the type of capital flows, such as capital flows in the equity market, bond market, or foreign direct investment.[3] Some recent studies emphasize pull factors as the main determinants of capital flows, including domestic rate of return, economic stability, growth rate, and so on (Hernandez *et al*., 2001; Boschi, 2012).

In terms of empirical methodology, most previous papers have used cross-sectional or panel data regressions and focused on explaining the determinants of average capital flows into certain countries or regions.[4] This approach assumes that the determinants of capital flows and the magnitude of their effects are same across countries. This paper, however, focuses on the patterns of capital flows over time and studies their determinants using a time-series regression method, in particular the generalized method of moments (GMM) estimation.

The main findings are as follows. We find that push (external) factors, in particular world interest rate, play a more important role than pull (internal) factors in determining capital flows in Korea. Among pull factors, current account has significant and negative effects on capital flows. The estimated coefficients vary in different sub periods. As shown in previous studies, we also find that determinants of capital flows differ in specific components of

---

[2] Fernandez-Arias (1996) showed the importance of foreign interest rates in determining portfolio flows in thirteen middle-income countries. Calvo *et al*. (1993, 1996) emphasized the role of the U.S. interest rate and recession in influencing capital flows into Latin American countries. See also Tayebi and Zamani (2013).

[3] Chuhan *et al.* (1998) used the data of capital flows from the U.S. into Asian and Latin American countries and showed that equity flows are more sensitive to push factors than bond flows and different push factors affect bond and equity flows. Sarno and Taylor (1999) demonstrated that global factors are more important than domestic factors in explaining the dynamics of bond flows and the U.S. interest rate explains the short-term dynamics of portfolio investment, especially bond flows.

[4] Some have used the VAR method such as Kim (2000) and Ying and Kim (2001). They showed the importance of push factors in determining capital inflows in some Asian developing countries. Boschi (2012) used the VAR method to identify long- and short-run determinants of capital flows in Latin American countries.

the financial account. In particular, portfolio investment is more sensitive to internal and external economic environments compared to direct investment. The analysis on gross capital flows (liabilities and assets) show that the main determinants are slightly different than net flows.

The remaining sections of the paper are as follows. Section 2 provides an overview of push and pull factors that affect international capital flows. Section 3 describes the data and empirical methodology. Empirical results are reported in section 4. We first analyze the determinants of the overall financial account and then focus on its specific components. Section 5 provides a conclusion and policy implications.

2. OVERVIEW OF PUSH/PULL FACTORS AND FINANCIAL INTEGRATION IN KOREA

2.1. Push Factors

Push factors (external variables) are the economic conditions of capital exporting countries including international interest rate and growth rate of the world GDP. First, international interest rates, in particular the U.S. interest rate, have significantly influenced capital flows into developing countries. The surge of capital inflows in most middle-income countries appears to have been largely pushed by low returns in developed countries (Fernandez-Arias, 1996). Capital flows into Latin American countries are especially sensitive to the U.S. interest rate (Montiel and Reinhart, 1999). However, this result depends on data frequency and sample countries and periods (Hernandez *et al*., 2001).

Second, the GDP growth rate of the developed countries is another external factor that causes capital flows to developing countries. The recessions in the U.S. and Japan in the early 1990s made profit opportunities in developing countries more attractive, although this factor became less important in generating capital flows to Latin America and Asia as the

OECD economies moved toward recovery in the mid-1990s (Chuhan *et al*., 1998; Calvo *et al*., 1996).

2.2. Pull Factors

Pull factors (internal variables) are domestic macroeconomic conditions including credit rating, domestic interest rate and financial strength, inflation, exchange rate volatility, domestic GDP growth rate, the current account balance and policies on financial account liberalization.

A country's creditworthiness measured by credit ratings from various agencies influences investors' behavior and the surge of capital inflows in middle-income developing countries (Fernandez-Aria, 1996). The domestic rate of return in stock and bond markets is another significant factor in attracting capital flows (Montiel and Reinhart, 1999). An increase in the domestic productivity of capital initially leads to portfolio inflows and later attracts foreign direct investment. Domestic inflation negatively affects capital inflows to developing countries (Ahn *et al*., 1998). Exchange rate stability is a positive factor for capital flows. Countries adopting fixed exchange rate regimes become increasingly attractive to investors since the risk of exchange rate volatility is transferred from private investors to the government (Lopez-Mejia, 1999).

Private portfolio flows tend to rise in response to higher per capita income and growth performance. FDI flows respond positively to changes in the past rate of economic growth (Dasgupta and Ratha, 2000; Hernandez *et al*., 2001). The current account is another internal factor that determines the volume of capital flows. When capital flows are restricted, financial account responds to offset any imbalances in the current account. Therefore, the current account and financial account should move in opposite directions. Under a liberalized financial account, this negative relationship does not necessarily hold because the autonomous movement of capital can dominate the capital flows (Kim *et al*., 2001). Finally, a single most important factor that affects capital flows is the government's policies on financial account

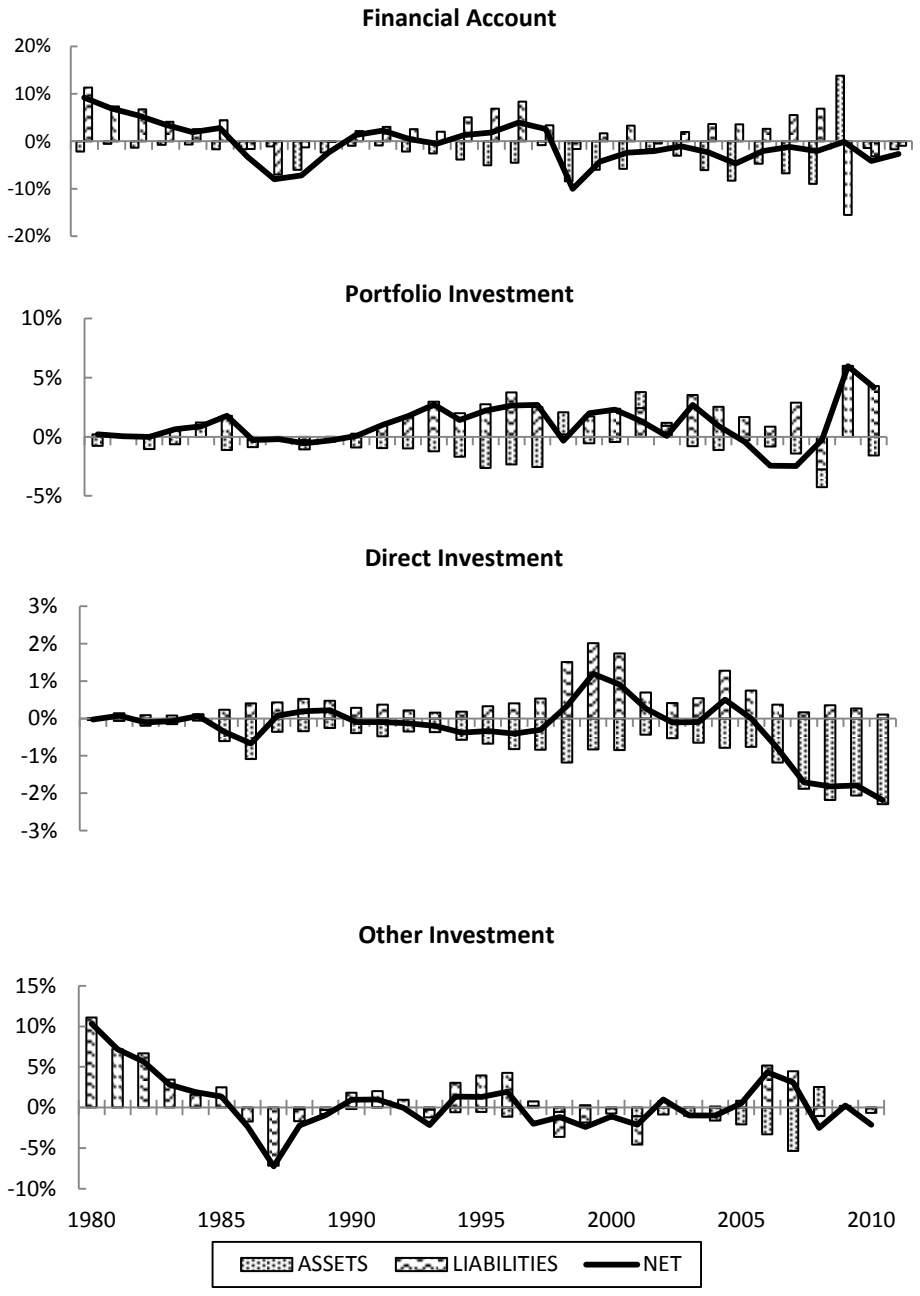
liberalization. Full capital account convertibility increases a country's attractiveness to foreign investors (Nsouli and Rached, 1998).

2.3. Financial Integration and Capital Flows in Korea

Financial integration has become a key phenomenon in East Asian countries since the 1990s. Financial integration is in general associated with financial deregulation and capital account liberalization, and Korea has experienced a rapid financial integration since the Asian Crisis in 1997. Figure 1 displays the time-series graphs of assets, liabilities and net flows of financial account (FA), portfolio investment (PI), direct investment (DI), and other investment (OI), all as a ratio of GDP. All data are taken from Bank of Korea.

Financial account flows in the first panel show that there were two main episodes of outflows, one in mid 1980s and the other in mid 1990s, and the absolute amount of assets and liabilities have increased since 2000s, reflecting rapid capital account liberalization since the Asian Crisis. All three sub-components of the financial account, in particular portfolio investment, exhibits large fluctuations since the 1990s. In the 2000s, movements of liabilities dominate those of assets in PI, while DI displays a larger amount of assets than liabilities. Unlike PI or DI, OI exhibits a large movement in 1980s compared to recent years. This is due to the fact that bank assets and liabilities (classified as OI) dominated FA movement when capital account was not fully liberalized in the 1980s. Overall, figure 1 suggests that Korea has experienced much higher volume of capital flows since the Asian Crisis.

Figure 1 International Capital Flows in Korea (percentage over GDP)



3. DATA AND ECONOMETRIC METHODOLOGY

Focusing on the Korean data, we exploit the time-dimension of the data instead of the cross-sectional dimension. By exploiting the time-dimension of the data, we can also examine how the effects of each determinant of capital flows change over time. We use the following time-series regression:

$$Fi_t = \alpha + \beta X_t + \delta Z_t + u_t, \quad (1)$$

where Fi_t denotes capital flows of type i at time t, and X_t and Z_t are vectors of pull and push factors, respectively.

All the dependent and explanatory variables used in the estimation are summarized in table 1. We first use the overall financial account balance as the dependent variable in the model to examine the determinants of the overall financial account. Then, we examine the determinants of each major component of the financial account balance: balances on direct investment, portfolio investment, and other investment. Since the nature of each major component is different, we expect the determinants are also different. Financial account and each major component of financial account are used as a share of GDP (%).[5)]

Explanatory variables are chosen based on the existing studies, as explained in the previous section. Data for push factors are growth rate of the world real GDP and the world ex-post real interest rate. The U.S. variables are used for the proxy of the world variables. Data for pull factors are the current account balance (% of GDP), the real interest rate, CPI inflation rate, the growth rate of real GDP, the growth rate of the stock price index, and exchange rate volatility.

We calculate the exchange rate volatility based on daily won/dollar exchange rates using GARCH model. This is because of conditional heteroskedasticity in exchange rate data, which may produce an incorrect

[5)] Both GDP and financial account terms are converted to the dollar terms. Since we take the ratio of financial account balance over the GDP, we analyze cyclical movements, not trends.

Table 1 List of Variables

Dependent Variables	
FA	Financial Account (share of trend GDP) Data Source: Bank of Korea
DI	Balance on Direct Investment (share of trend GDP) Data Source: Bank of Korea
PI	Balance on Portfolio Investment (share of trend GDP) Data Source: Bank of Korea
OI	Balance on Other Investment (share of trend GDP) Data Source: Bank of Korea
Explanatory Variables	
External Variables (Push Factors)	
$WRGDP_g$ (Real)	World (U.S.) Real GDP Growth Rate Real GDP is obtained by GDP deflator (2005=100) Data Source: International Financial Statistics (IFS)
WRIR (Real)	World (U.S.) Ex-Post Real Interest Rate (Lending Rate) Inflation is measured by GDP deflator Data Source: International Financial Statistics (IFS)
Internal Variables (Pull Factors)	
CUR	Current Account Balance, as a share of trend GDP (%) Data Source: Bank of Korea
RIR (Real)	Real Ex-post Domestic Interest Rate (%) (Deposit Rate) Data Source: International Financial Statistics (IFS)
INF	Inflation Rate using GDP deflator (2005=100) Data Source: Bank of Korea
$RGDP_g$ (Real)	Real GDP Growth Rate Real GDP is obtained by GDP deflator Data Source: Bank of Korea
SPI	Growth Rate of Stock Price Index Data Source: International Financial Statistics (IFS)
VER	Exchange Rate (against the USD) Volatility using the AR(5)-IGARCH(1,1) specification Data Source: Bank of Korea

Notes: 1) GDP deflator for Korea is calculated using IFS data to make base year consistent with the one for US (2005=100). 2) The real interest rate is computed as $r_t = \frac{1+i_t}{1+\pi_{t+1}} - 1$. 3) Since the Bank of Korea data for FA, PI, DI, OI and CUR in USD, the nominal GDP in Korean won is converted into USD using current exchange rate.

measure for volatility. More specifically, we employ an AR(5)-IGARCH(1, 1) specification according to the preliminary inspection of the data such as ACF and PACF, etc. To estimate this model, we use the maximum likelihood (ML) method with the Berndt-Hall-Hall-Hausman (BHHH) optimization algorithm. In addition, we assume that the distribution of errors follows the *t*-distribution to capture excess kurtosis in the residuals.[6] Since we use daily exchange rate, we convert it into the quarterly volatility (i.e., average quarterly volatility using daily data).

To deal with the possible endogeneity problem, we use the generalized method of moments (GMM) estimation. Specifically, we choose the iterative GMM with Bartlett kernel and Newey-West automatic bandwidth selection criterion (based on observation-based selection) for both weighting matrix estimation (iterative to convergence method) and covariance weighting matrix estimation.[7] For instrumental variables (IVs), we use 2 lags of internal variables and current external variables. We use the current external variables because it is not germane to endogeneity issue by assumption. We also report results from diagnostic check such as *F*-statistic, *Q*-statistic up to 4th order and 8th order and Durbin-Watson, *J*-statistic in all regressions.

Table 2 reports the ADF unit root test results to check if there is a unit root in data. Test results suggest that all variables are stationary at 1% level except for direct investment flows (net and assets) and world real interest rate.[8] For the world real interest rate, we use the level data. For all other variables, we use the data as ratios of GDP or in percentage terms.[9]

---

[6] We use the Jarque-Bera (JB) statistic to see if the *t*-distribution is correctly assumed. The test statistic (*p*-value) is 13980.73 (0.00), suggesting that it rejects strongly the null of normality. In addition, we formally test whether or not there is still remaining conditional heteroskedasticity using ARCH LM test. The test statistics (*p*-values) are 8.633 (0.125) up to lag at 5 and 12.363 (0.262) up to lag at 10. The null of no remaining ARCH effect in the residuals cannot be rejected, implying that the variance equation is suitably specified.

[7] Since there are many equations to be estimated, we add AR or MA terms to capture remaining serial correlation in the residuals when the models do not pass the diagnostic check. To estimate the model with AR or MA terms, we employ the sequential iterative to convergence method. The numerical optimization procedure is BHHH.

[8] Even though ADF test cannot reject the null of a unit root, the Phillips-Perron test rejects the null of a unit root.

[9] We also experimented with the first differenced data but the test statistics including *R*-square

Table 2 Unit Root Test for Level Variables

Variable	Statistic	*P*-value
FA	–3.881 (–6.823, –6.906)	0.003 (0.000, 0.000)
DI	–1.448 (–2.660, 0.095)	0.557 (0.084, 0.964)
PI	–4.187 (–7.349, –5.419)	0.001 (0.000, 0.000)
OI	–4.373 (–3.940, –8.651)	0.001 (0.002, 0.000)
CUR	–3.746	0.005
RIR	–4.080	0.002
INF	–7.890	0.000
$RGDP_g$	–9.660	0.000
SPI	–7.598	0.000
VER	–7.402	0.000
$WRGDP_g$	–5.328	0.000
WRIR	–2.079	0.254

Notes: 1) ADF test is employed. 2) For FA, DI, PI and OI, the numbers in parentheses are test statistics for gross liabilities and gross assets. 3) For net and asset flows of DI, we cannot reject the null of a unit root using the ADF test but we can reject the null of a unit root when the Phillips-Perron (PP) test is used. The PP test statistics (*p*-value) for net and asset flows are –4.523 (0.000) and –3.670 (0.006), respectively. 4) For WRIR, we cannot reject the null of a unit root even when the PP test is used.

We use quarterly data from 1980 to 2010. Data are from the International Financial Statistics of the IMF and Bank of Korea. The Asian crisis in 1997 and global crisis in 2008-2009 significantly affected capital flows into Korea. In order to isolate the contagion effects during crisis periods, we include two crisis dummies (1997Q3-1998Q2 and 2008Q3-2009Q4) in the regression (regression 2). Moreover, there have been substantial changes in the foreign exchange market and financial account regulations since the Asian Crisis in 1997; the exchange rate regime has changed into a more flexible regime and the financial account has been greatly liberalized. Considering these phenomena above, we select two subsamples (1980-1997Q2 and 1998Q1-2008Q2) and do the subsample analyses to see how the effects of capital flow determinants have changed over time.

and *F*-statistics are much worse than the model with level variables.

4. EMPIRICAL RESULTS

We first examine the determinants of net capital flows of FA, PI, DI and OI. For all capital flows terms, we report 4 regression results: regression 1 is from the whole sample period, regression 2 is from the whole sample with two dummies for crisis periods (1997Q3-1998Q2, and 2008Q3-2009Q4), and regressions 3 and 4 are from the subsamples ranging from 1980Q1-1997Q2 and from 1998Q1-2008Q2, respectively. All tables report the parameter estimates and the HAC standard error for each variable as well as the diagnostics of regressions including *F*-statistics, *Q*-statistics, Durbin-Watson statistics and *J*-statistics.

4.1. Determinants of Overall Financial Account

4.1.1. Pull factors

The results for FA are in table 3. The estimated coefficients on the current account are negative in all cases, which is statistically significant at 1% level. The negative coefficient is not surprising because financial account surplus is required to finance current account deficits. The estimated coefficient for the whole sample period (regression 1) is –0.933 and subsample analyses show similar estimates. The estimate for the first sub-period (1980-1997) is larger in absolute value (–1.125) than that in the second sub-periods (1998-2008), which is consistent with the findings of Kim *et al*. (2001) that the role of the financial account in financing current account deficits was more significant in the 1980s when autonomous capital flows were limited.

All other pull factors are not significant in the whole sample regression but we can still provide interpretations on signs of coefficients. Real interest rate has near zero effects on the financial account in the whole sample period but the coefficient is insignificant. According to the arbitrage condition (interest parity condition), an increase in domestic interest rate, which represents an increase in the return on the domestic asset, is likely to attract foreign capital and improve financial account. However, this channel is not observed in the

Table 3 Determinants of Overall Financial Account (FA)

	Reg1	Reg2	Reg3	Reg4
Sample	1980Q1-2010Q4	1980Q1-2010Q4	1980Q1-1997Q2	1998Q1-2008Q2
Constant	–0.013***	–0.014**	0.010***	–0.005
	(0.005)	(0.006)	(0.000)	(0.006)
Internal Variable				
CUR	–0.933***	–0.924***	–1.125***	–0.962***
	(0.050)	(0.059)	(0.001)	(0.055)
RIR	–0.003	0.009	–0.502***	0.093
	(0.065)	(0.072)	(0.004)	(0.121)
$RGDP_g$	0.104	0.111	–0.097***	–0.131
	(0.225)	(0.230)	(0.005)	(0.177)
INF	–0.062	–0.054	–0.146***	–0.076
	(0.127)	(0.144)	(0.005)	(0.114)
SPI	0.004	0.004	0.085***	0.022*
	(0.016)	(0.018)	(0.001)	(0.012)
VER	0.196	0.305	0.873***	0.156
	(0.375)	(0.633)	(0.167)	(0.933)
External Variable				
$WRGDP_g$	0.221	0.228	0.387***	0.812***
	(0.147)	(0.220)	(0.003)	(0.246)
WRIR	0.199***	0.199***	0.381***	–0.025
	(0.066)	(0.070)	(0.002)	(0.067)
DUM1	N/A	–0.005	N/A	N/A
		(0.019)		
DUM2	N/A	–0.002	N/A	N/A
		(0.012)		
Diagnostic Check				
F-statistic	699.076	567.961	523205.7	8392.052
(*p*-value)	(0.000)	(0.000)	(0.000)	(0.000)
Q-statistic (4)	6.195	6.112	7.811	3.754
(*p*-value)	(0.185)	(0.191)	(0.099)	(0.440)
Q-statistic (8)	7.991	8.081	11.508	9.489
(*p*-value)	(0.434)	(0.426)	(0.175)	(0.303)
Durbin-Watson	2.036	2.000	2.110	2.132
J-statistic	4.130	4.024	1.000	3.264
(*p*-value)	(0.659)	(0.403)	(0.986)	(0.775)

Notes: 1) Numbers in parentheses are HAC standard error (Bartlett kernel, Newey-West automatic bandwidth selection). 2) *F*-statistic is the test statistic on joint zero restriction on estimated coefficients. 3) *Q*-statistic is the Ljung-Box *Q*-statistic with the null of no group autocorrelation. 4) *, ** and *** indicate significance at 10%, 5% and 1% level respectively. 5) The *J*-statistic is used to test whether over-identifying restrictions hold under the considered IVs or not. 6) In Reg2, DUM1 and DUM2 indicate crisis dummy for 1997Q3-1998Q2 and 2008Q3-2009Q4, respectively.

case of Korea, probably due to the fact that Korea's bond markets were mostly closed until recently and the capital flows are dominated by other financial markets such as stock markets.

Coefficients on stock price index are positive but insignificant in the whole sample period but in sub-sample regressions, stock price index becomes significant and positive in both sub-periods. Increase in stock prices attracts foreign capital and positively contributes to financial account. Real GDP growth rates of Korea have positive but insignificant effects on capital flows. Inflation rates have negative but insignificant effects on capital inflows (except for the first sub-period where the coefficient is significantly negative), which is consistent with the theory that a high inflation rate discourages capital inflows. VER (exchange rate volatility) has insignificant effects on capital flows.

In the sub-period analysis, most pull factors are significant in the first sub-period (1980-1997) but they become insignificant in the second period (1998-2007). Domestic economic conditions paly a much important role before the Asian Crisis but these domestic factors lose explanatory power in the 2000s. Increased capital market liberalization and subsequent high fluctuations in capital flows in 2000s provide evidence for stronger impact of external factors rather than internal factors in determining financial capital flows.

4.1.2. Push factors

Regarding push factors, the coefficient on the world real interest rate is positive and significant in all regressions except for 2000s where the coefficient is negative but insignificant. The positive coefficient is against the standard theory. The standard theory suggests that an increase in the world real interest rate should worsen the financial account. It is difficult to rationalize this observation but there are some possible explanations. The increase in U.S. interest rate is usually associated with the monetary stabilization policy of the Federal Reserve Board: when the economy is in a boom phase or under inflationary pressure, the Fed increases the interest rate

to stabilize output and inflation. Therefore, a high interest rate may reflect an economic boom or an inflationary phase in the U.S. In this case, a positive coefficient of U.S. interest rate may simply reflect that capital inflows into Korea are highly related to the economic boom or an inflation surge in the U.S.[10)]

An increase in the world GDP growth rate improves the financial account in all regressions and the positive coefficients become significant in both sub-period regressions. Theoretical predictions are mixed. Chuhan *et al*. (1998) and Calvo *et al*. (1993) suggest that slowdown in the U.S. economy causes an increase in capital flows to developing countries by making the profit opportunities in the developing countries more attractive. The positive relation can be explained by the following argument. Better world economic conditions may increase the funds available for investment in the emerging markets, and improve the financial account in the developing countries.

Overall, the results in table 3 suggest that pull factors in general do not have significant effects on financial account, except for current account. Push factors have much more significant effects on financial account.[11)] Explanatory powers of some variables differ across sub periods. Diagnostic checks of the regression equations (*Q*-, *J*- and *F*-Statistics) show significantly high fit of all regression equations. Including crisis dummy does not significantly change the results and the two dummy variables for crisis periods are not significant.

4.2. Determinants of Components of Financial Account

This section considers three major components of the financial account, portfolio investment, direct investment and other investment. Tables 4-6 report the results.

[10)] Such a result might be due to the problem of including the domestic real interest rate together with the foreign interest rate.

[11)] Some previous studies emphasized the role of push factors only (Calvo *et al.*, 1993; Kim, 2000), while others emphasized the role of pull factors including Chuhan *et al*. (1998) and Hernandez *et al*. (2001).

Table 4 Determinants of Net Portfolio Investment Flows (PI)

	Reg1	Reg2	Reg3	Reg4
Sample	1980Q1-2010Q4	1980Q1-2010Q4	1980Q1-1997Q2	1998Q1-2008Q2
Constant	0.021**	0.020*	–0.001	–0.002
	(0.009)	(0.012)	(0.021)	(0.036)
Internal Variable				
CUR	–0.294***	–0.478***	–0.113	–1.767***
	(0.080)	(0.098)	(0.113)	(0.585)
RIR	0.090	0.526**	–0.183	1.689***
	(0.150)	(0.261)	(0.171)	(0.562)
$RGDP_g$	–0.149	–0.228	0.402	–0.516
	(0.187)	(0.198)	(0.376)	(0.540)
INF	–0.269	–0.153	0.224	–1.398***
	(0.173)	(0.255)	(0.274)	(0.405)
SPI	0.013	0.087***	-0.018	0.086
	(0.024)	(0.029)	(0.063)	(0.051)
VER	3.056***	0.182	18.397*	4.352
	(0.936)	(0.613)	(9.244)	(3.697)
External Variable				
$WRGDP_g$	0.408	0.315	0.476*	2.294**
	(0.255)	(0.260)	(0.271)	(0.982)
WRIR	–0.229*	–0.576***	–0.077	–1.076
	(0.123)	(0.195)	(0.085)	(0.657)
DUM1	N/A	0.014	N/A	N/A
		(0.042)		
DUM2	N/A	0.075***	N/A	N/A
		(0.016)		
Diagnostic Check				
F-statistic	8.960	6.868	15.354	25.285
(*p*-value)	(0.000)	(0.000)	(0.000)	(0.000)
Q-statistic (4)	3.294	2.548	3.838	2.786
(*p*-value)	(0.348)	(0.467)	(0.428)	(0.426)
Q-statistic (8)	5.045	5.104	7.946	9.876
(*p*-value)	(0.654)	(0.647)	(0.439)	(0.196)
Durbin-Watson	1.833	2.155	1.913	1.950
J-statistic	4.887	5.099	3.327	3.312
(*p*-value)	(0.770)	(0.747)	(0.767)	(0.913)

Notes: 1) Reg1 needs an AR(1) term to correct serial correlation, which has the value 0.339*** with the standard error 0.063. 2) Reg2 needs an AR(1) term to correct serial correlation, which has the value 0.396*** with the standard error 0.059. 3) Reg4 needs an AR(1) term to correct serial correlation, which has the value 0.490*** with the standard error 0.120.

Table 5 Determinants of Net Direct Investment Flows (DI)

	Reg1	Reg2	Reg3	Reg4
Sample	1980Q1-2010Q4	1980Q1-2010Q4	1980Q1-1997Q2	1998Q1-2008Q2
Constant	–0.007**	–0.007***	–0.006**	0.012
	(0.003)	(0.002)	(0.003)	(0.017)
Internal Variable				
CUR	0.028	0.002	0.012	–0.073
	(0.026)	(0.021)	(0.028)	(0.192)
RIR	0.006	0.024	–0.007	0.807*
	(0.031)	(0.029)	(0.021)	(0.406)
$RGDP_g$	–0.014	0.022	0.015	–0.705
	(0.035)	(0.028)	(0.034)	(0.551)
INF	0.004	0.047	0.025	–0.179
	(0.054)	(0.055)	(0.030)	(0.305)
SPI	–0.004	–0.006	0.019**	0.037
	(0.006)	(0.004)	(0.008)	(0.039)
VER	–0.273**	–0.008	0.022	–6.190
	(0.119)	(0.132)	(1.244)	(3.712)
External Variable				
$WRGDP_g$	–0.023	–0.005	0.025	–0.044
	(0.039)	(0.030)	(0.024)	(0.649)
WRIR	0.064**	0.039*	0.044**	–0.356
	(0.030)	(0.023)	(0.020)	(0.234)
DUM1	N/A	0.000	N/A	N/A
		(0.002)		
DUM2	N/A	-0.007	N/A	N/A
		(0.005)		
Diagnostic Check				
F-statistic	3.290	3.346	6.769	6.397
(*p*-value)	(0.001)	(0.000)	(0.000)	(0.000)
Q-statistic (4)	3.191	3.074	8.058	2.249
(*p*-value)	(0.203)	(0.215)	(0.045)	(0.690)
Q-statistic (8)	5.738	3.846	9.748	8.829
(*p*-value)	(0.453)	(0.698)	(0.203)	(0.357)
Durbin-Watson	1.968	1.819	1.885	1.729
J-statistic	7.599	7.446	4.573	3.751
(*p*-value)	(0.668)	(0.827)	(0.802)	(0.710)

Notes: 1) Reg1 needs AR(1) and AR(2) to correct serial correlation, which have the values 0.352*** and 0.472*** with the standard errors 0.089 and 0.096, respectively. 2) Reg2 needs AR(1) and AR(2) to correct serial correlation, which have the values 0.330*** and 0.504*** with the standard errors 0.079 and 0.083, respectively. 3) Reg3 needs an AR(1) to correct serial correlation, which has the value 0.208*** with the standard error 0.075.

Table 6 Determinants of Net Other Investment Flows (OI)

	Reg1	Reg2	Reg3	Reg4
Sample	1980Q1-2010Q4	1980Q1-2010Q4	1980Q1-1997Q2	1998Q1-2008Q2
Constant	0.001 (0.014)	–0.009 (0.009)	–0.048** (0.022)	–0.056* (0.033)
Internal Variable				
CUR	–0.330*** (0.095)	–0.239** (0.101)	–0.534*** (0.119)	0.512 (0.378)
RIR	–0.151 (0.215)	–0.024 (0.175)	0.095 (0.205)	–2.782*** (0.707)
$RGDP_g$	–0.068 (0.311)	–0.595** (0.246)	0.554 (0.497)	0.088 (0.976)
INF	–1.085*** (0.301)	–1.364*** (0.218)	–0.230 (0.374)	–1.384 (0.908)
SPI	–0.076* (0.042)	0.028 (0.023)	–0.044 (0.085)	–0.046 (0.074)
VER	1.399 (1.535)	–0.013 (0.917)	8.227 (9.923)	17.349** (8.044)
External Variable				
$WRGDP_g$	–0.237 (0.453)	–0.604** (0.231)	–0.233 (0.257)	0.839 (1.571)
WRIR	0.385* (0.211)	0.684*** (0.180)	0.385*** (0.115)	1.976*** (0.441)
DUM1	N/A	–0.054* (0.031)	N/A	N/A
DUM2	N/A	0.044*** (0.016)	N/A	N/A
Diagnostic Check				
F-statistic (*p*-value)	6.940 (0.000)	23.795 (0.000)	34.923 (0.000)	4.620 (0.000)
Q-statistic (4) (*p*-value)	1.978 (0.577)	2.172 (0.338)	0.645 (0.958)	6.207 (0.184)
Q-statistic (8) (*p*-value)	4.281 (0.747)	3.384 (0.759)	3.071 (0.930)	9.991 (0.266)
Durbin-Watson	2.171	1.754	1.879	1.701
J-statistic (*p*-value)	5.715 (0.679)	8.898 (0.712)	4.202 (0.649)	2.391 (0.880)

Notes: 1) Reg1 needs an AR(1) term to correct serial correlation, which has the value 0.292** with the standard error 0.103. 2) Reg2 needs AR(1) and AR(2) terms to correct serial correlation, which have the values 0.123** and 0.123* with the standard errors 0.056 and 0.064, respectively.

4.2.1. Portfolio investment

For the portfolio investment flows, the coefficients on some pull factors such as real interest rate (with crisis dummy), stock price index (with crisis dummy) and exchange rate volatility (without crisis dummy) become significant in the whole sample regression. Real interest rate has significantly positive effects on portfolio capital flows, so does the stock price index. Exchange rate volatility has positive and significant effects on portfolio inflows, while the coefficient is insignificant for the overall financial account case. A high volatility in exchange rate seems to be associated with potential profit opportunities in stock markets which attract foreign investment in financial markets. Also, note that more number of coefficients are significant in the case of net portfolio investment flows than in the case of overall financial account. As in the case with overall financial account, current account has significant and negative effects on portfolio investment, while the absolute value of coefficients are smaller in this case.

On the other hand, among external factors, real world GDP growth rates have significant and positive effects on net portfolio flows in both sub-period analyses, while it is positive but insignificant in the whole sample regression with and without crisis dummy. Improvement in global economic conditions increases capital inflows into financial markets in Korea. One main difference is that the coefficient on real world interest rate now becomes significantly negative, mostly due to the period of 2000s. An increase in world interest rate is associated with a rise in profitability in US bond market and therefore increases capital outflows from financial markets in Korea. Crisis dummy variable, in particular for the 2007 financial crisis, becomes significantly positive. In addition, the estimation results from regression 1 (whole sample without crisis dummies) and regression 2 (whole sample with crisis dummies) are quite different in terms of significance and signs.

4.2.2. Direct investment

For the net direct investment flows, most internal factors become insignificant in the regressions except for exchange rate volatility. Unlike the

overall financial account or portfolio investment, the current account and direct investment inflows have a positive but insignificant relationship, implying that direct investment is not much related to capital flows to compensate for current account imbalances. Exchange rate volatility has significant and negative coefficient. Such a negative relation is predicted by the standard theory; an increase in exchange rate uncertainty may contribute to discouraging foreign capital inflows. The coefficient in the first sub-period (1980-1997) is positive, while the second period shows negative coefficient. However, these coefficients are insignificant. This can be explained by the fact that Korea maintained a managed floating exchange rate regime (near fixed) during the 1980s and exchange rate volatility was quite small with limited foreign capital flows. Among external factors, world real interest rate has positive and significant effects on direct investment flows, while world GDP growth rates have insignificant effects.

4.2.3. Other investment

Other investment capital flows include capital flows in banking and government sectors. An increase in net other investment flows can result from either an increase in foreign bank loans to Korean banks or a decrease in the net purchase of foreign assets by Korean banks. Current account has negative effects as in the case of overall financial flows, but becomes insignificant in 2000s. Domestic GDP growth rate has negative effects on capital flows, with significant sign with crisis dummy. This may be due to an increase in investment in foreign assets by domestic banks when the economy is in boom, which results in capital outflows. Domestic inflation rate has significant and negative effects on capital flows, which fits the intuition that increased inflation deters capital inflows. Other internal factors including interest rate and stock price index are in general insignificant. Among the external factors, the world interest rate has a positive effect on capital inflows, especially in 2000s. As explained in the previous section, an increase in world interest rate can be interpreted as a policy reaction to the economic boom or inflationary pressure which is associated with high capital

inflows into developing countries. World GDP growth rate is significantly negative with crisis dummy which indicates that a boom in developed countries generates capital inflows into emerging markets such as Korea. Both crisis dummies are significant in this regression, suggesting that bank assets and liabilities are sensitive to contagion effects during crisis.

4.2.4. Comparison across components

In this part, we compare the coefficients of each internal and external variable in explaining each component of the financial account.[12] We also examine the relative contribution of each component to explain the overall movement of the financial account. Generally, the number of significant variables in the case of net direct investment flows is smaller than in the case of net portfolio investment or other investment flows, which suggests that capital flows in stock markets and banking sectors respond more sensitively to changes in the internal and external economic environment.

The tables show that the relative importance and estimated sign of each factor are different across the components of the financial account. The coefficients of the real interest rate, stock market index, exchange rate volatility as well as both external factors are significant in most regressions in the case of portfolio investment but they are sometimes not significant for the case of direct investment. The estimate for the coefficient on the current account is significant for net portfolio investment flows and net other investment flows in most sample cases but not for net direct investment flows. In addition, the estimate is negative and larger in the former cases, but smaller in the latter case with a positive sign. The results suggest that the current account imbalances are financed by portfolio investment and other investment, not by direct investment, which is not surprising since direct investment, often related to long-term investment based on the long-term

[12] Alternatively, we can run the regression of the ratio of each component of financial account to the whole volume of capital flows to examine the effects of capital flows on composition. However, since the balance of payments data are in flows, it is impossible to construct meaningful composition data. Therefore, we indirectly infer the effects of capital flows on composition by comparing the coefficients from individual regressions.

perspective of the country, is not a natural way of financing the short-term movements of current account imbalances. In the whole sample period, the estimated values of current account are –0.29 and –0.33 for portfolio investment and other investment, respectively. The current account imbalance is financed up to 29 percent by portfolio investment and up to 33 percent by other investment.

4.3. Analysis on Gross Capital Flows (Assets and Liabilities)

So far, all the analysis is based on net capital flows including both changes in assets (investment in foreign countries by domestic residents) and liabilities (investment in Korea by foreign residents). In table 7, we report the whole sample regression with gross liabilities instead of net variables for all four dependent variables (FA, PI, DI and OI). These regressions can explain what determines capital flows induced by foreign investors excluding the cross-border capital flows driven by domestic residents.

The table shows that internal factors now have significant coefficients, in particular for overall financial account flows. Domestic real GDP growth rate has positive effects on capital flows and inflation rate has negative effects. Both are quite significant. External factors become insignificant in this regression, except that portfolio investment is significantly explained by both external factors. Overall, explanatory power of domestic internal factors increases for gross liabilities, while external factors become less significant.

Table 8 reports the estimation results for gross assets. Similar to the case of gross liabilities, more pull factors are now significant: exchange rate volatility, inflation rate, and real GDP growth rates have positive effects on gross assets flows, while stock price index has negative effects. Unlike gross liabilities, the coefficient on current account becomes insignificant, implying that domestic residents' investment is not used to compensate for current account imbalances. Among push factors, the coefficient on world GDP growth rate is significant and positive.

Table 7 Determinants of Gross Liabilities: FA, PI, DI and OI (1980-2010)

Dependent Variables	FA	PI	DI	OI
Constant	0.025*** (0.009)	0.031*** (0.011)	0.001 (0.004)	–0.008 (0.014)
Internal Variable				
CUR	–0.942*** (0.092)	–0.306*** (0.093)	0.067*** (0.020)	–0.734*** (0.124)
RIR	–0.259 (0.186)	0.010 (0.108)	–0.027 (0.033)	–0.300 (0.265)
$RGDP_g$	0.353* (0.192)	–0.186 (0.226)	0.025 (0.047)	0.894** (0.387)
INF	–0.379* (0.215)	–0.391 (0.254)	0.002 (0.034)	–0.332 (0.427)
SPI	–0.042* (0.023)	0.024 (0.032)	–0.006 (0.006)	–0.036 (0.047)
VER	6.831*** (1.374)	2.603** (1.171)	–0.694*** (0.157)	6.360** (2.739)
External Variable				
$WRGDP_g$	0.349 (0.223)	0.615* (0.356)	0.066 (0.042)	–0.446 (0.440)
WRIR	0.234 (0.169)	–0.232** (0.103)	0.049** (0.021)	0.345 (0.218)
Diagnostic Check				
F-statistic (*p*-value)	89.359 (0.000)	10.195 (0.000)	8.134 (0.000)	25.430 (0.000)
Q-statistic (4) (*p*-value)	7.159 (0.028)	3.628 (0.304)	6.967 (0.031)	1.535 (0.674)
Q-statistic (8) (*p*-value)	7.737 (0.258)	8.953 (0.256)	10.061 (0.122)	4.088 (0.770)
Durbin-Watson	1.504	1.766	2.060	1.832
J-statistic (*p*-value)	8.242 (0.984)	5.022 (0.755)	6.047 (0.811)	9.169 (0.328)

Notes: 1) Reg1 needs MA(1) and MA(2) terms to correct serial correlation, which have the values 0.251*** and 0.156*** with the standard errors 0.030 and 0.017, respectively. 2) Reg2 needs an AR(1) term to correct serial correlation, which has the value 0.255** with the standard error 0.112. 3) Reg3 needs AR(1) and MA(1) terms to correct serial correlation, which have the values 0.931*** and -0.573 with the standard errors 0.065 and 0.168. 4) Reg4 needs an AR(1) term to correct serial correlation, which has the value 0.213*** with the standard error 0.064.

Table 8 Determinants of Gross Assets: FA, PI, DI and OI (1980-2010)

Dependent Variables	FA	PI	DI	OI
Constant	–0.084*** (0.009)	–0.014* (0.007)	–0.004 (0.003)	–0.022*** (0.007)
Internal Variable				
CUR	–0.018 (0.092)	0.015 (0.062)	–0.018 (0.018)	0.045 (0.052)
RIR	0.320 (0.202)	0.232** (0.107)	–0.003 (0.043)	0.052 (0.095)
$RGDP_g$	0.501* (0.270)	0.049 (0.135)	–0.025 (0.039)	0.001 (0.142)
INF	1.082*** (0.249)	0.323** (0.159)	–0.007 (0.043)	–0.234 (0.145)
SPI	–0.049** (0.022)	–0.004 (0.015)	0.008 (0.006)	0.067*** (0.022)
VER	2.294*** (0.853)	–0.946 (0.650)	–1.527*** (0.364)	1.305* (0.732)
External Variable				
$WRGDP_g$	0.967*** (0.347)	–0.075 (0.187)	–0.113** (0.057)	–0.214 (0.263)
WRIR	–0.071 (0.148)	–0.136 (0.107)	0.029 (0.035)	0.103 (0.086)
Diagnostic Check				
F-statistic (*p*-value)	29.357 (0.000)	9.266 (0.000)	27.413 (0.000)	10.982 (0.000)
Q-statistic (4) (*p*-value)	5.401 (0.067)	8.464 (0.037)	5.534 (0.137)	0.510 (0.917)
Q-statistic (8) (*p*-value)	6.160 (0.406)	10.069 (0.185)	7.723 (0.358)	4.160 (0.761)
Durbin-Watson	1.699	1.628	1.635	2.053
J-statistic (*p*-value)	10.815 (0.930)	5.291 (0.726)	7.120 (0.789)	6.827 (0.813)

Notes: 1) Reg1 needs MA(1) and MA(2) terms to correct serial correlation, which have the values 0.321*** and 0.074*** with the standard errors 0.031 and 0.023, respectively. 2) Reg2 needs an AR(1) term to correct serial correlation, which has the value 0.346*** with the standard error 0.064. 3) Reg3 needs a MA(1) term to correct serial correlation, which has the value 0.532*** with the standard error 0.093. 4) Reg4 needs a MA(1) term to correct serial correlation, which has the value 0.256*** with the standard error 0.061. 5) Reg2 starts from 1988Q1 because of the lack of data availability.

5. CONCLUSION

We analyze the determinants of capital flows in Korea by dividing the factors into push and pull factors. From the analysis of overall capital flows, we find that push (external) factors play more important role than pull (internal) factors in determining capital flows to Korea. Sub-period analysis shows that the role of internal factors decreases over time. Among all the factors, the current account and the world interest rate are the most significant factors in explaining overall capital flows.

The analysis of the determinants of each component of financial account — portfolio investment, direct investment, and other investment — shows that the determinants of each component of capital flows and the direction of their effects are often different, in particular exchange rate volatility, stock market index and world interest rate. We find that a greater number of factors affect portfolio investment than direct investment flows. The current account plays a significant role for portfolio investment and other investment, but not for direct investment.

We can draw some policy implications from this empirical exercise. If push factors are the main causes of capital inflows into Korea, then the government is extremely limited in implementing any types of policies that can affect the direction, volume, and composition of capital flows. In such a case, it may be more desirable to implement more long-term policies such as improving the health of the Korean economy against external shocks, maintaining stable exchange rates, and implementing appropriate monetary and fiscal policies for macroeconomic stability and international policy coordination.

On the other hand, if the main causes of capital flows into Korea are domestic macroeconomic and financial market conditions, then there is much room for policy manipulation. Policies aimed at increasing the volume of capital inflows include removing or reducing capital market restrictions, favorable tax policies for foreign investment, etc. The government can also influence the composition and maturity of capital flows. A desirable policy

direction is to increase the portion of long-term capital flows and FDI, decreasing short-term and portfolio investment, at least until the domestic financial market matures enough to digest all kinds of capital flows.

REFERENCES

Ahn, Y. S., S. Adji, and T. Willett, "The Effects of Inflation and Exchange Rate Policies on Direct Investment to Developing Countries," *International Economic Journal*, 12, 1998, pp. 95-104.

Boschi, M., "Long- and Short-run Determinants of Capital Flows to Latin America: A Long-run Structural GVAR Model," *Empirical Economics*, 43, 2012, pp. 2041-2071.

Calvo, G., L. Leiderman, and C. Reinhart, "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors," IMF Staff Papers, 40, 1993, pp. 108-151.

_____, "Inflows of Capital to Developing Countries in the 1990s," *Journal of Economic Perspectives*, 10, 1996, pp. 123-139.

Chuhan, P., S. Claessens, and N. Mamingi, "Equity and Bond Flows to Latin America and Asia: the Role of Global and Country Factors," *Journal of Development Economics*, 55, 1998, pp. 439-463.

Culha, A., "A Structural VAR Analysis of the Determinants of Capital Flows into Turkey," *Central Bank Review*, 2, 2006, pp. 11-35.

Dasgupta, D. and D. Ratha, "What Factors Appear to Drive Private Capital Flows to Developing Countries? And How Does Official Lending Respond?," World Bank Working Paper, No. 2392, 2000.

Fernandez-Arias, E., "The New Wave of Private Capital Inflows: Push or Pull?," *Journal of Development Economics*, 48, 1996, pp. 389-418.

Fernandez-Arias, E. and P. J. Montiel, "The Surge in Capital Inflows to Developing Countries: An Analytical Overview," *World Bank Economic Review*, 10, 1996, pp. 51-77.

Hernandez, L., P. Mellado, and R. Valdes, "Determinants of Private Capital

Flows in the 1970s and 1990s: Is there Evidence of Contagion?," IMF Working Paper 01/64, 2001.

Kim, S., S. H. Kim, and Y. Wang, *Capital Market Liberalization and Macroeconomic Performance: Case of Korea*, Seoul, Korea: Korea Institute of International Economic Policy Press, 2001.

Kim, Y., "Causes of Capital Flows in Developing Countries," *Journal of International Money and Finance*, 19, 2000, pp. 235-253.

Lopez-Mejia, A., "Large Capital Flows: Causes, Consequences, and Policy Responses," *Finance and Development*, 36, 1999, pp. 28-31.

Montiel, P. and C. Reinhart, "Do Capital Controls and Macroeconomic Policies Influence the Volume and Composition of Capital Flows? Evidence from the 1990s," *Journal of International Money and Finance*, 18, 1999, pp. 619-635.

Nsouli, M. S. and M. Rached, "Capital Account Liberalization in the Southern Mediterranean," *Finance and Development*, 35, 1998, pp. 24-27.

Pappas, A., "The Short-term Determinants of Capital Flows for a Small Open Economy: The Case of Greece," *Review of Development Economics*, 15, 2011, pp. 699-713.

Rodrik, D., "Who Needs Capital Account Convertibility?," in P. Kenen, ed., *Should the IMF Pursue Capital Account Convertibility?*, Essays in International Finance No. 207, Princeton University, 2011.

Sarno, L. and M. Taylor, "Hot Money, Accounting Labels and the Performance of Capital Flows to Developing Countries: An Empirical Investigation," *Journal of Development Economics*, 59, 1999, pp. 337-364.

Stiglitz, J., "Capital Market Liberalization, Economic Growth and Instability," *World Development*, 28, 2000, pp. 1075-1086.

Tayebi, S. and Z. Zamani, "Synchronization between Financial Crisis and International Business Cycles: Evidence from Asia," *Korea and the World Economy*, 14, 2013, pp. 313-341.

Ying, Y. and Y. Kim, "An Empirical Analysis on Capital Flows: The Case of

Korea and Mexico," *Southern Economic Journal*, 67, 2001, pp. 954-968.