

It matters where the capital comes from¹

Deokjong Jeong², Tae-Sub Yun², Inbin Hwang², and Sunyoung Park²

Draft ver (May 2018)

Abstract

We analyze the impacts of capital flow exchanges with counterparty countries on extreme capital flow movements. First, we quantify financial position of countries in global capital markets by considering whether a country receives investments from countries that take important positions in bank flows. We construct financial position variables of countries by applying the concept of Google's PageRank so that we capture the relative importance of countries in global capital flows network. Second, we analyze the effects of capital flows network on extreme capital flow movements. We examine the impacts on extreme capital flow movements by dividing four types: (1) whether net capital flows increase or decrease, (2) whether capital flows are from liability-driven (i.e. investment by foreigners) or asset-driven (i.e. investment by residents). This paper shows that financial position in global capital markets is closely related with occurrences of liability-driven episodes (surges and sudden stops) than asset-driven episodes (retrenchments and flights). We also demonstrate that advanced economies with high financial position induces surges while emerging economies with mid financial position experience sudden stops. However, the magnitude of extreme capital flow movements is significantly associated with just flights. This paper contributes to reflecting counterparty risks in capital flows in understanding fluctuations of global capital flows.

Key words: Capital flows, Surges, Sudden stops, Counterparty, Network analysis, PageRank

JEL codes: C63, E44, F21, F32, F34, G15

¹ This work was supported by the National Research Foundation of Korea (NRF) Grant funded by the Korean Government (Ministry of Science, ICT and Future Planning) (No. NRF-2013R1A1A1076066).

² Department of Industrial & Systems Engineering, Korea Advanced Institute of Science and Technology (KAIST)
Deokjong Jeong: deokjong.jeong@kaist.ac.kr
Tae-Sub Yun: andy2402@kaist.ac.kr
Inbin Hwang: inbin1000@kaist.ac.kr
Sunyoung Park: sunyoung.park@kaist.ac.kr

1. Introduction

When a person, company, or country decides to invest overseas, it reviews current and past financial information about the target investment. However, current and past financial information covers only the financial situation for a specific aspect. For example, the balance of payments summarizes economic outputs and transactions for a country for a specific period. Similarly, financial statements show the financial activities and position of a business at a given point in time.

In this paper, we consider interrelationships among countries beyond the target investment in analyzing global capital flows. For instance, when a country attracts foreign investment, it could prefer funds from a country affluent in capital. The recipient country can administer the funds according to its plans without any concerns about early withdrawal by the investor country. In cases where the recipient country is experiencing a liquidity shortage, it may not discriminate between funds from a country affluent in capital and one deficient in capital. Likewise, when a country invests abroad, it may seek a new target investment for higher returns. If the investing country wants to retrieve its funds in the short term, it may consider investing in a safe haven.

Our main goal in this paper is to consider relationships with counterparty in cross-border bank flows. We consider the exchange of capitals around the globe as network of capital flows. So this paper proceeds to the impacts of relationships with counterparty beyond the capital exchange itself. First, we quantify countries' bank flows as financial position variables according to whether a country receives capital flows from countries that have a crucial role in capital flow networks. We consider the incoming and outgoing bank flows of 26 countries based on BIS(Bank for International Settlements)-International Banking Statistics. Then we analyze changes in bank flow networks. Next, we link capital flow episodes (i.e., drastic changes in global capital flows) with bank flow networks captured by financial position variables and analyze the impacts of bank flow networks on capital flow episodes. We show distinct occurrences of capital flow episodes depending on whether a country receives global capital flows from crucial countries in network of bank flows. We also examine the magnitude of capital flow episodes when they do occur.

The differences in number of counterparty for each country motivate us to examine where the capital comes from. Figure 1 illustrates changes in outstanding claims and number of counterparty by bank flows for selected countries (the United Kingdom and the United States are examples of advanced economies and Chile and Mexico are examples of emerging economies, see Figure A1. in the appendix for other countries). We find the fluctuation in number of counterparty countries. The changes are not necessarily consistent with the changes in outstanding claims. Additionally, we note that few existing research covered counterparty of global capital flows. For example, Ghosh et al. (2014) included the variable of financial interconnectedness. However, the variable does not reflect complex interrelationships with counterparty by simply considering the proportion of advanced economies that have banks with cross-border exposure to the recipient country.

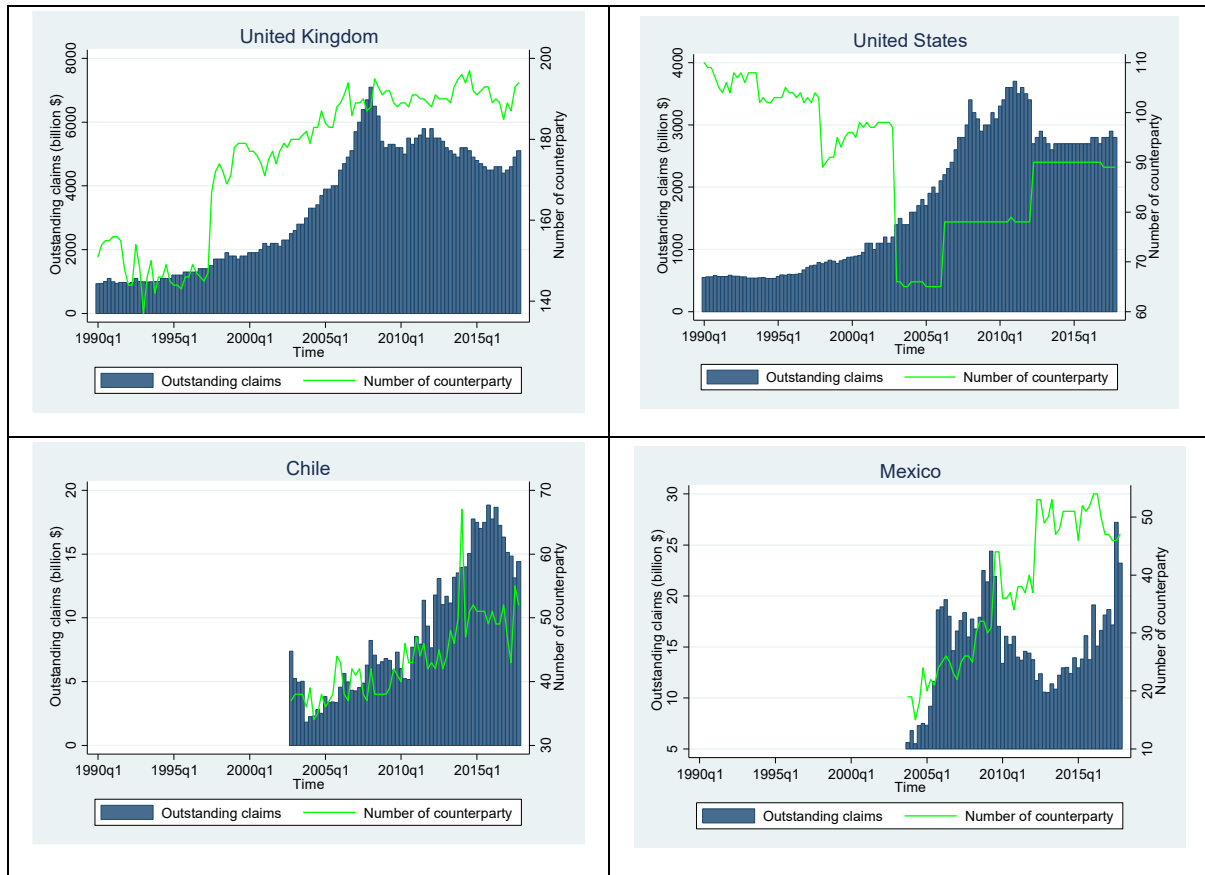
Our main findings are that whether a country receives capital flows from important countries determine liability-driven capital flow episodes (i.e., investment by foreigners). We find that occurrences of surges (i.e.,

rapid increases of net capital flows driven by foreign investors) increase when financial position of a country is large while occurrences of sudden stops (i.e., sharp decreases in net capital flows driven by foreign investors) are higher if a country has mid financial position with counterparty. That is, advanced economies with abundant capital induce surges because advanced economies have high financial position in global capital markets in general. However, sudden stops tend to occur in emerging economies where emerging economies are mid in financial position in general. We suppose that emerging economies are more sensitive to macroeconomic changes so that global capital flows toward emerging economies are more susceptible to macroeconomic situations. Additionally, we find that the magnitude of capital flow episodes is only associated relationship with counterparty in case of flights (i.e., sharp decreases in net capital flows driven by residents). This is because advanced economies have more influence with financial position in global capital markets. While emerging economies with mid financial position do not have much impact on their capital flows.

This paper contributes to the existing literature in three ways. First, we quantify relationships with counterparty in cross-border bank flows, considering global capital flows as networks of capital flows among global banks. Extending our focus from investment targets (i.e., nodes in network analysis), we consider with whom and how much countries exchange bank flows (i.e., dynamic changes of nodes' position in the network). We reflect on whether countries receive capital flows from important countries in global capital markets. Considering the amounts of and parties involved in bank flows, we capture countries' positions in dynamic capital flows. Second, we classify four types of capital flow episodes (surges, retrenchments, sudden stops, and flights). We note that global capital flows differ in purpose and nature depending the kind of investment. So, we divide drastic capital flow movements following Hwang et al. (2017) as to (1) whether net capital flows increase or decrease, and (2) whether capital flow episodes are liability-driven (i.e., investment by foreigners) or asset-driven (i.e., investment by residents). Third, we examine the impacts of financial position with counterparties in global capital markets on capital flow episodes. We also consider the magnitude of episodes when they occur in a country. The link between bank flows and capital flows episodes is supported by Furceri et al. (2011) and OECD (2011). Cross-border bank flows were dominant components prior to the global financial crisis (OECD, 2011). Then, the international banking flows mainly were affected by a sharp contraction in international capital flows. The probability of a crisis of a sudden stop is high after large debt capital inflows (Furceri et al., 2011). Then, capital flow episodes have stronger impact on domestic credit in case of debt-driven capital inflows than foreign direct investment or equity portfolio investment.

The rest of the paper is organized as follows. Section 2 provides a literature review that discusses the motivation and theoretical background of the study. In section 3 we explain the data used. Then, we explain construction and trends of financial position variable as relationships with counterparty in bank flows in section 4. We analyze the impacts of financial position in global capital markets on capital flow episodes in section 5, and finally, we summarize this research and consider implications for future research paths in section 6.

Figure 1: Outstanding claims and number of counterparty for selected countries



Source: BIS-IBS

2. Literature review

Significant impacts of global capital flows for domestic economies have led researchers to focus on the determinants and economic impacts of global capital flows. Some have noted global factors as determinants of global capital flows (Calvo et al., 1993; Fernandez-Arias, 1996; Bruno and Shin, 2015), while others have noticed influences from domestic factors (Taylor and Sarno, 1997; Chuhan et al., 1998; Fratzscher, 2012). Ghosh et al. (2014) clarified the distinct roles of global and domestic factors. That is, global factors determine when surges to emerging economies will occur, while the magnitude of those surges depends on domestic factors. Furthermore, Cerutti et al. (2015) showed that the relative importance of global factors varies depending on types of flows (foreign direct, portfolio equity, portfolio bonds, and other investment flows). They also showed that characteristics of recipient countries' financial markets, such as the liquidity and composition of foreign investor bases, were more significant than macroeconomic or institutional fundamentals. In addition to these volume-based (i.e., normal capital flows) analyses, episode-based (i.e., sudden, extreme movements of capital flows) analyses have focused on the economic impacts of capital flow fluctuations (Calvo, 1998; Calvo et al., 2004, 2008; Cavallo and Frankel, 2008; Reinhart and Reinhart, 2008; Cadarelli et al., 2010). Drastic and larger-than-normal capital

flows could lead to distinct economic effects. A recent study by Hwang et al. (2017) also examined economic impacts focusing on capital flow episodes and classified four types of episodes, which supports our episode-based analysis approach for studying capital flows.

The fear of systemic financial system collapse brought on by the global financial crisis has promoted a network perspective approach. The first step necessary was to construct the network to figure out the nature of interrelationships among global banks. Because of limited data, however, only central banks or regulatory agencies can apprehend entire networks in a financial system. Our research is in line with previous research that used data from regulatory agencies. For example, Hattori and Suda (2007) revealed the global banking network by using evidence of cross-border bank flows from BIS. Hale (2012) and Kapan and Minoiu (2013) revealed global banking networks by using bank-level syndicated loan data from Dealogic's Loan Analytics. Likewise, Kubeleca and Sáb (2012) described cross-country networks of four asset classes, including foreign direct investment, portfolio equity, debt, and foreign exchange reserves from the IMF, World Bank, OECD, and BIS. Chinazzi et al. (2013) structured international financial networks by using a portfolio investment survey from IMF. Additionally, Minoiu and Reyes (2013) used cross-border banking flows confidentially provided by BIS.

Finance/economics research has also applied network methodologies to analyze complex financial systems. An example of a network methodology is Google's PageRank algorithm described by Page et al. (1999). A web page gets a higher PageRank when many other web pages link to it. Existing research that has applied PageRank to figure out financial systems supports the consideration of network methodologies in research. For instance, DebtRank of Battiston et al. (2012) increases when a financial institution is linked by loans and other financial institutions with a high DebtRank. Dungey et al. (2012) proposed SIFIRanking to systemically rank important financial institutions by using the idea of Google's PageRank. SinkRank was developed to identify vulnerable banks in the interbank payment system (Soramäki and Cook, 2013). A recent study by Yun et al. (2017) also developed Rank as a centrality measure and compared it with other well-known systemic risk measures, conditional value at risk, and marginal expected shortfall.

The idea from network theory of focusing on complex relationships among nodes motivates us to reflect on dynamic capital flows among countries beyond applying network methodologies. Due to restricted access to data, previous research has focused on investment targets (i.e., countries that receive and invest global capital flows). That is why the above papers examining global capital flows concentrated their analyses on certain nodes (i.e., countries). However, few studies have reflected on both the countries from which capital flows and the countries to which it flows. Hattori and Suda (2007), Kubeleca and Sáb (2012), Minoiu and Reyes (2013), and Avdjiev et al. (2017) used international banking statistics from BIS. The data cover assets and liabilities held by BIS-reporting banks vis-à-vis counterparty banks. Similarly, Kaminsky et al. (2001), Gelos and WEI (2005), Broner et al. (2006), Jotikasthira et al. (2012), and Raddatz and Schmukler (2012) depended on fund flows from EPFR global. Though the data provide both investment amounts and direction, the data coverage is restricted to fund flows in portfolio investment.

3. Data

We constructed a quarterly data set of 26 countries that included financial position variables, capital flow episodes, global factors, and domestic factors since 1990. Table 1 summarizes variable definitions and data sources. We calculated two financial position variables from the Bank for International Settlements' locational banking statistics in the International Banking Statistics (BIS-IBS). The BIS-IBS shows time-varying claims and liabilities that individual countries have for other counterparty countries through cross-border banking flows. We considered 26 reporting countries and 223 counterparty countries for their claims.³

We constructed capital flow episodes that represent extreme capital flow movements. The capital flow episodes were divided into four types: surges, retrenchments, sudden stops, and flights. Net capital flows can be positive either when foreign investors increase their investment (surges) or when residents sell overseas assets and retrieve the proceeds to their home countries (retrenchments). Similarly, net capital flows can be negative either when foreign investors shrink cross-border investment (sudden stops) or when residents increase overseas investment (flights). We calculated capital flow episodes from the International Monetary Fund's International Financial Statistics (IMF-IFS), referring to Calvo et al. (2004), Ghosh et al. (2014), Furceri et al. (2011), and Hwang et al. (2017).⁴ Table 2 represents the 26 countries and sample periods and Table 3 illustrates summary statistics for selected macroeconomic variables. Because sample countries included in IMF-IFS is smaller than sample countries in BIS-IBS, we focused on 26 sample countries covered in both data sources. Additionally, Table 4 and Figure 3 show capital flow episodes constructed for sample countries.

We collected select global factors that supply liquidity in the globe. We gathered the Standard & Poor's (S&P) 500 and the Volatility Index (VIX) of the Chicago Board Options Exchange for overall economic activity and global uncertainty respectively. We included the 3-month Treasury bill rate and treasury inflation protected securities (TIPS) rate as the global interest rate. We captured the global money supply as the sum of money supply in the United States, the eurozone, Japan, and the United Kingdom. We obtained global factors from Thomson Reuters' Datastream and used the data winsorized at the 1% level to reduce the impact of outliers.

We included domestic factors of 26 countries that reflect the characteristics of the individual countries. We gathered nominal and real GDP and GDP per capita to represent economic growth from the Organisation for Economic Co-operation and Development (OECD), IMF-IFS, and Datastream. We also included the money market rate and credit to the private nonfinancial sector to capture domestic interest rate and private debt that was expanded from financial institutions; the money market rates were from IMF-IFS and Datastream, and credit to

³ The estimated global coverage of BIS locational banking statistics of all banks worldwide is 93% as of 1977 (BIS, 2018). The global coverage of BIS locational banking statistics supports the validity in calculating the financial position variables in our research.

⁴ We calculate capital flow episodes by normalizing capital flows of countries by their GDP. We avoid overestimating the occurrences of episodes through more conservative method. We examine the calculation of episodes without normalizing by GDP and empirical analysis using it, however, the results are qualitatively the same.

the private nonfinancial sector was from BIS and Datastream. We calculated net capital flow to capture the amount of capital flow at a country from IMF-IFS. In addition, we covered the exchange rate, real effective exchange rate (REER), and international reserve assets to reflect fluctuations in the exchange rate from bank flows; exchange rate data came from BIS, REER data were from IMF-IFS and Datastream, and international reserve asset data were from IMF-IFS. Lastly, we obtained the GDP deflator, consumer price index (CPI), and residential property price to capture changes in price level driven from bank flows; both GDP deflator and CPI were from IMF-IFS and Datastream, and residential property price was from BIS and Datastream. We winsorized the data of domestic factors at the 1% level after seasonal adjustment.

Table 1: Variable definition and data sources

Variable	Definition	Source
Financial position		
Claims	Measure whether a country receives or invests global capital flows with regard to claims	Authors' calculation based on BIS-IBS
Claims square	Square of financial position by claims	Authors' calculation based on BIS-IBS
Capital flow episodes		
Surge	Rapid increase episode driven by liability flows	Authors' calculation based on IMF-IFS
Retrenchment	Rapid increase episode driven by asset flows	Authors' calculation based on IMF-IFS
Sudden stop	Rapid decrease episode driven by liability flows	Authors' calculation based on IMF-IFS
Flight	Rapid decrease episode driven by asset flows	Authors' calculation based on IMF-IFS
Global factors		
S&P 500	Standard & Poor's (S&P) 500 index	Datastream
VIX	Volatility of S&P 500 index options	Datastream
3M T-bill rate (%)	3-month Treasury bill rate	Datastream
TIPS rate (%)	treasury inflation protected securities (TIPS) rate	Datastream
Money supply (million USD)	Sum of M2 in the United States, Eurozone, Japan, and M4 in the United Kingdom	Datastream
Domestic factors		
GDP (million USD)	Measure for economic output	OECD, IMF-IFS, Datastream
GDP per capita (USD)	Measure for economic output per capita	OECD, Datastream
Interest rate (%)	Money market rate	IMF-IFS, Datastream
Credit to private sector/GDP	Amount of private credit normalized by GDP	BIS, Datastream
Net capital flow/GDP	Amount of net capital flow normalized by GDP	IMF-IFS, OECD, Datastream
REER	Real effective exchange rate	IMF-IFS, Datastream
Exchange rate	Nominal exchange rate compared to 1\$	BIS
International reserve assets (million USD)	International reserves and official reserve assets	IMF-IFS
CPI	Consumer price index	IMF-IFS, Datastream
GDP deflator	Measure of price level by calculating nominal and real GDP	IMF-IFS, Datastream
Residential property price	Price level for housing price	BIS, Datastream

Table 2: Sample countries and time span

Country	From	To	Country	From	To
Australia	1990Q1	2017Q4	Austria	2005Q1	2017Q4
Belgium	2002Q1	2017Q4	Brazil	1990Q1	2017Q4
Canada	1990Q1	2017Q4	Chile	1991Q1	2017Q4
Denmark	1990Q1	2017Q4	Finland	1990Q1	2017Q4
France	1990Q1	2017Q4	Germany	1990Q1	2017Q4
Greece	1999Q1	2017Q4	Hong Kong	1999Q1	2017Q4
Ireland	2005Q1	2017Q4	Italy	1990Q1	2017Q4
Japan	1996Q1	2017Q4	Korea	1990Q1	2017Q4
Luxembourg	2002Q1	2017Q4	Mexico	2001Q1	2017Q4
Netherlands	1990Q1	2017Q4	Philippines	1990Q1	2017Q4
South Africa	1990Q1	2017Q4	Spain	1990Q1	2017Q4
Sweden	1990Q1	2017Q4	Switzerland	1999Q1	2017Q4
United Kingdom	1990Q1	2017Q4	United States	1990Q1	2017Q4

Table 3: Summary statistics of macroeconomic variables

Variable	Observations	Mean	Std dev	Min	Max
Financial position					
Claims	2,912	0.0028262	0.0007893	0.001461	0.0054724
Claims square	2,912	0.00000861	0.00000506	0.00000213	0.0000299
Global factors					
S&P 500	2,912	1,156.129	542.638	316.7561	2,604.414
VIX	2,912	19.34615	7.217788	10.29508	58.32227
3M T-bill rate (%)	2,912	2.755471	2.277662	0.0146154	7.758281
TIPS rate (%)	1,378	1.781305	0.7485741	0.73968	2.915
Money supply (million USD)	2,912	9,442,351	4,603,663	3,595,161	16,400,000
Domestic factors					
GDP (million USD)	2,561	1,993,463	4,205,270	17,808.56	25,400,000
GDP per capita (USD)	2,616	30,917.89	18,192.42	761.2571	104,288.3
Interest rate (%)	2,832	42.25436	1,199.839	-2	61,846.25
Credit to private sector/GDP	2,823	1.405197	0.6655017	0.1784	4.25
Net capital flow/GDP	2,341	-0.000125	0.0064202	-0.082895	0.0753147
REER*	2,870	-0.0151601	3.094212	-35.55886	25.95628
Exchange rate*	2,886	0.9795463	9.509366	-15.05973	192.4994
International reserve assets (million USD)	2,897	86,654.16	170,776.2	67.35535	1,295,839
CPI*	2,886	1.339082	8.124425	-3.025322	195.9903
GDP deflator*					
Residential property price*	2,590	1.128554	2.807539	-28.10214	29.11813

Notes: * denotes growth rate for comparison in multiple sample countries.

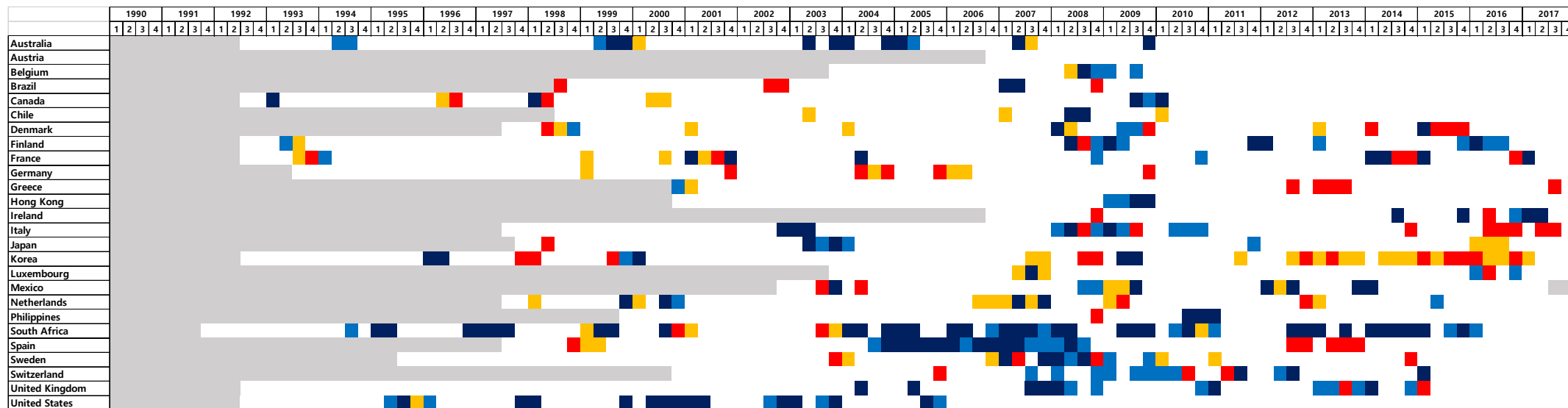
Table 4: Number of capital flow episodes

	Surges			Retrenchments			Sudden stops			Flights			Total
	1990s	2000s	2010s	1990s	2000s	2010s	1990s	2000s	2010s	1990s	2000s	2010s	
Australia	2	7	0	3	1	0	0	0	0	0	2	0	15
Austria	-	0	0	-	0	0	-	0	0	-	0	0	0
Belgium	-	1	0	-	3	0	-	0	0	-	1	0	5
Brazil	0	2	0	0	0	0	1	3	0	0	0	0	6
Canada	2	1	1	0	1	0	2	0	0	1	2	0	10
Chile	0	2	0	0	0	0	0	0	0	0	2	1	5
Denmark	0	1	1	1	2	0	1	1	4	1	3	1	16
Finland	0	2	3	1	2	4	0	1	0	1	0	0	14
France	0	3	4	1	1	1	1	1	3	2	2	0	19
Germany	0	0	0	0	0	0	0	5	0	1	3	0	9
Greece	-	0	0	-	1	0	-	0	5	-	1	0	7
Hong Kong	-	2	0	-	2	0	-	0	0	-	0	0	4
Ireland	-	0	4	-	0	1	-	1	1	-	0	0	7
Italy	0	5	0	0	3	3	0	2	6	0	0	0	19
Japan	0	2	0	0	2	1	1	0	0	0	0	3	9
Korea	2	3	0	1	0	0	3	2	7	0	2	12	32
Luxembourg	-	1	0	-	0	2	-	0	1	-	2	0	6
Mexico	-	2	4	-	2	0	-	2	0	-	2	1	13
Netherlands	1	3	0	0	1	1	0	1	1	1	6	1	16
Philippines	0	0	3	0	0	0	0	1	0	0	0	0	4
South Africa	8	16	11	1	2	4	0	2	0	1	2	1	48
Spain	0	11	0	0	6	0	1	0	5	2	0	0	25
Sweden	0	4	0	0	3	0	0	3	1	0	2	2	15
Switzerland	-	0	3	-	6	3	-	1	2	-	0	0	15
United Kingdom	0	5	2	0	2	5	0	0	2	0	0	0	16
United States	4	9	0	2	3	0	0	0	0	1	0	0	19
Sub total	19	82	36	10	43	25	10	26	38	11	32	22	-
Total		137			78			74			65		354

Source: Authors' calculation based on IMF-IFS

Notes: We arrange each episode of individual countries as the time after calculating each capital flow episode (surges, retrenchments, sudden stops, and flights).

Figure 3: Episodes for sample countries capital flow movements



Source: Authors' calculation based on IMF-IFS

Notes: We mark four types of episodes with different colors: surges (navy), retrenchments (blue), sudden stops (red), and flights (orange); we also indicate when there is no episode (white) or no data (grey).

4. Financial positions of countries with counterparties

4.1. Construction of financial position variables

We quantified the financial positions of countries using the BIS-IBS database. The BIS-IBS data provide information on the quarterly claims and liabilities that a country holds against counterparty countries. After individual banks transact with foreign banks through cross-border bank flows, central banks in each country gather country-level outstanding claims and liabilities and report them to BIS. Thus we can track quarterly changes in how much and with whom a country transacts.

We focused on whether each country received or injected bank flows. We considered outstanding cross-border bank flows among banks as an $M \times N$ matrix. As for a claims matrix, a cell (i, j) represents the amount of bank flows outstanding whose banks in country i lend to banks in country j .

The notion of a financial position variable is based on Google's PageRank algorithm. We aggregated all incoming and outgoing bank flows at once. Then we calculated the financial position of each country as a proportion of bank flows related to that country among all bank flows. This is similar to the effect matrix in Dungey et al. (2012) and Yun et al. (2017). We normalized the financial position variable by dividing it by total number of counterparty countries whose data are available at a given point in time from BIS-IBS. This is because BIS-IBS data are not perfect; that is, the number of counterparty countries varies depending on the quarter.

4.2. Characteristics of financial positions

We got some features from relationships with counterparty in bank flows captured as financial position variables. Figure 4 shows the trends of financial positions for selected countries (see Figure A2. in the appendix for other countries). We note increasing patterns with fluctuations of financial positions in countries. This means that countries receive capital flows from other countries that have important roles in capital flow networks. Though our sample countries are centered among advanced countries, we assume that networks based on global capital flows become so complicated that risks of systemic collapse might increase as well.

We note that there is little parallel relation between financial position and overall economic development. The financial positions for advanced economies are not always high (Figure 5). The financial positions for emerging economies are not always small, either. The financial positions are divergent vertically in most of the groups. Additionally, we do not find clear linear relationship between financial position and occurrence of capital flow episodes (Figure 6). Thus, we believe that financial position variable has unique information apart from macroeconomic variables.

Figure 4: Trend of financial position for selected countries

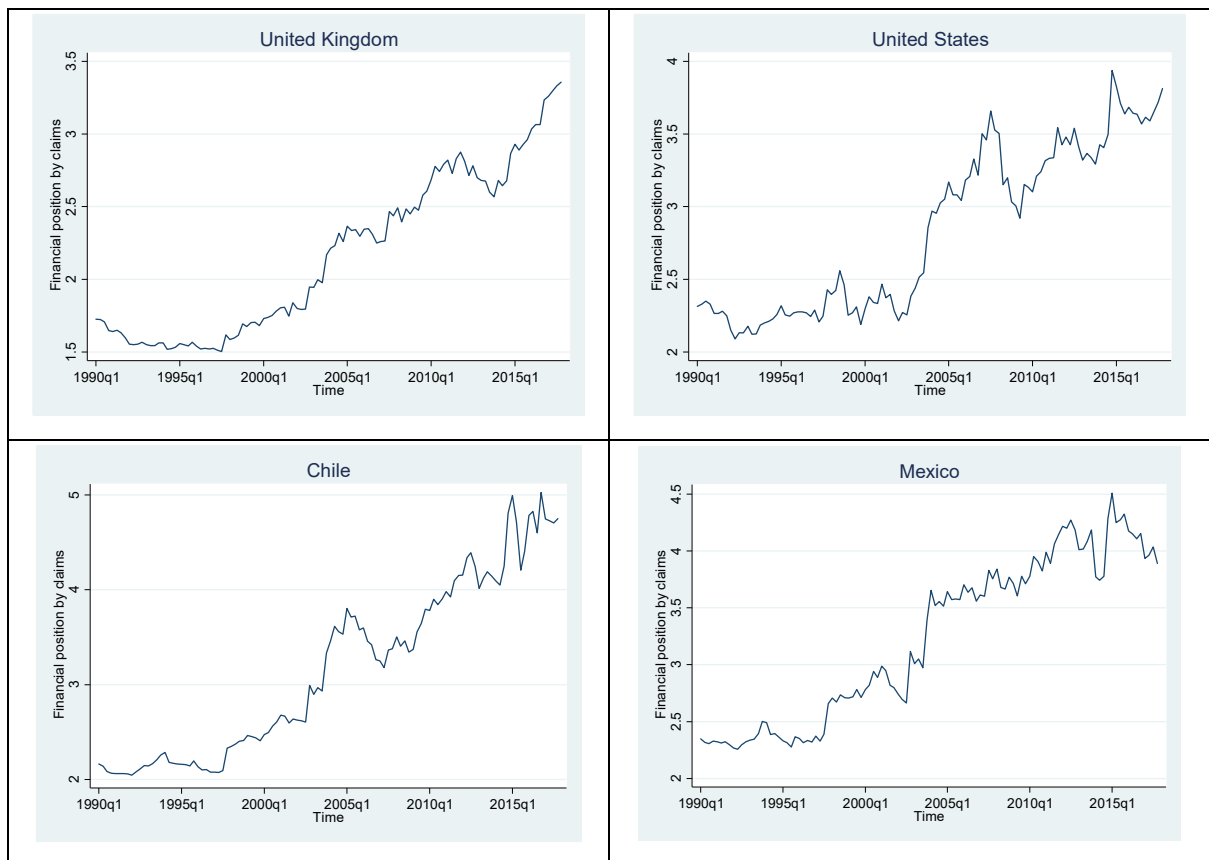
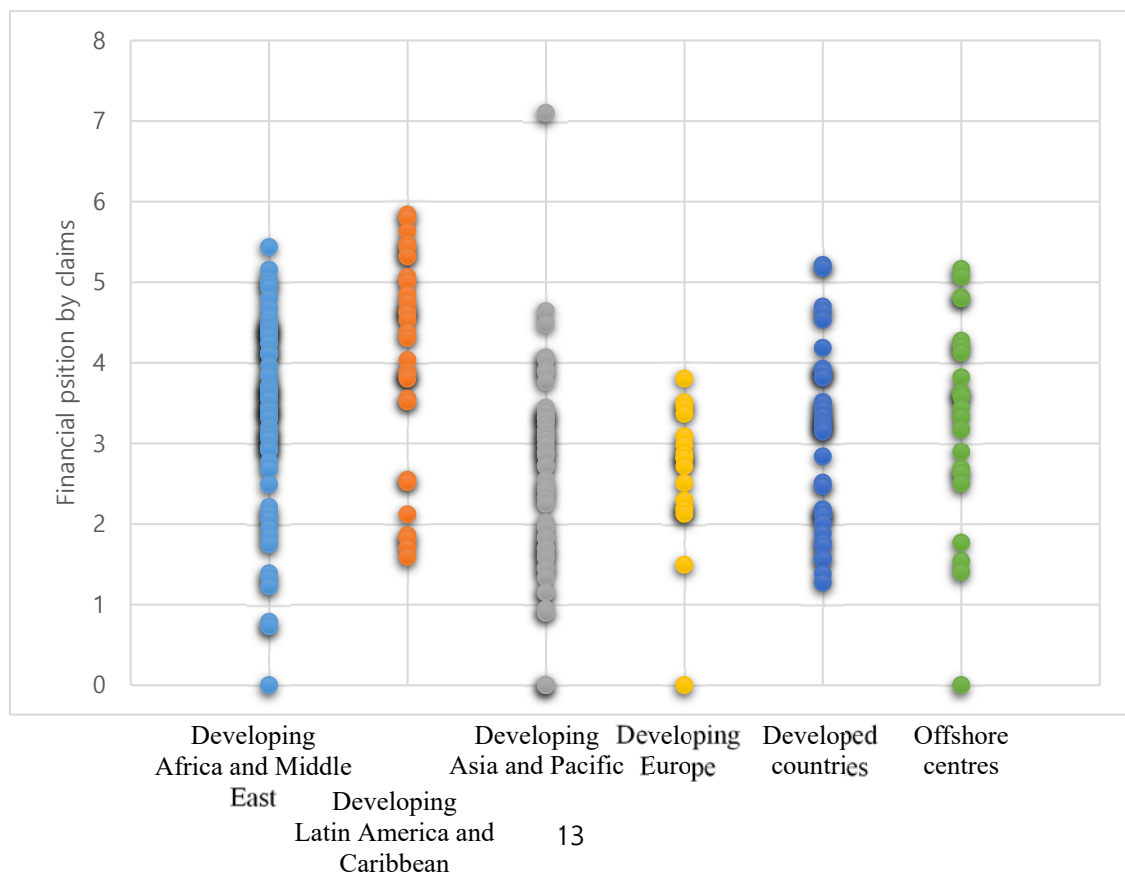
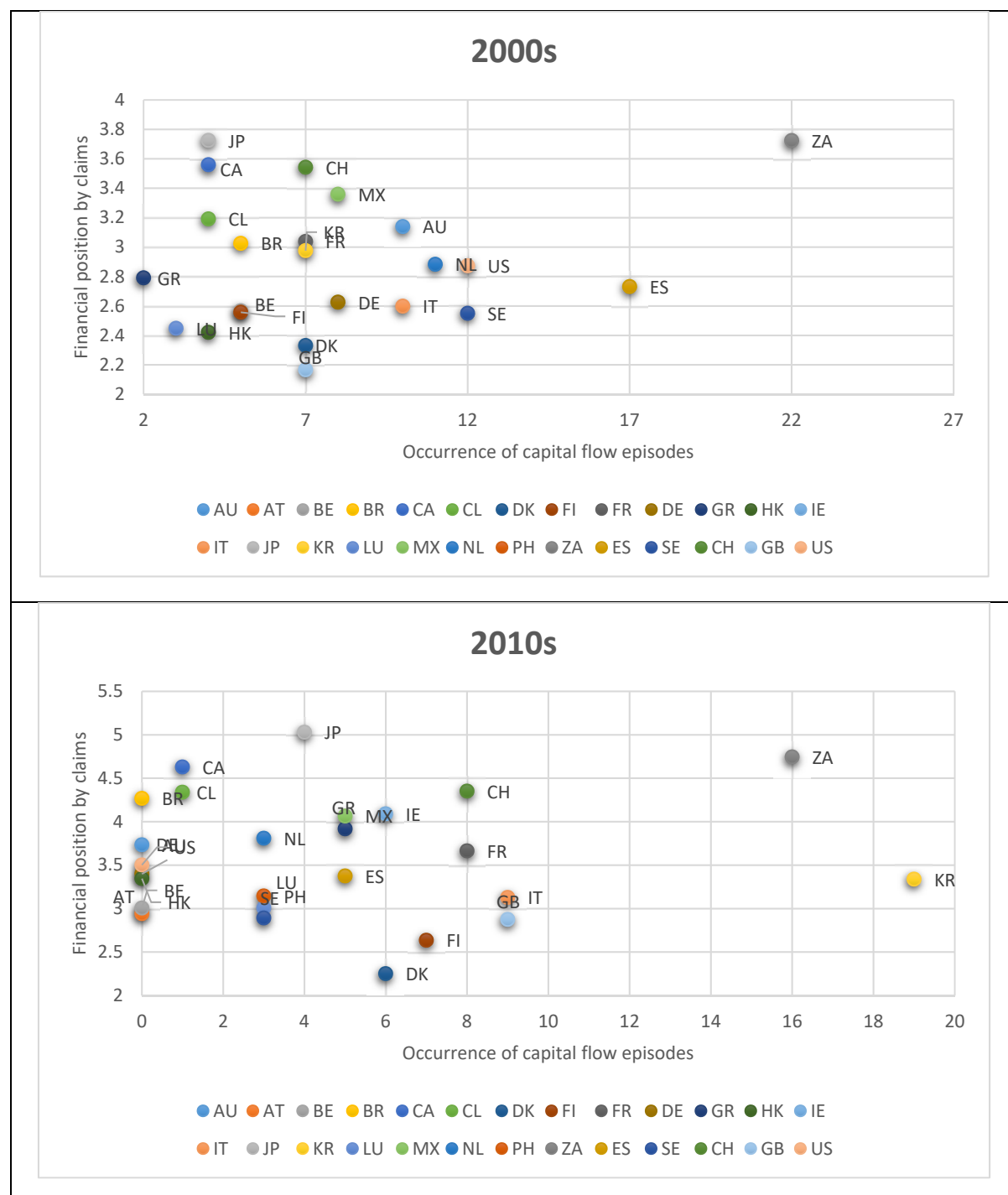


Figure 5: Financial position by groups



Notes: The financial position by claims in y axis represents the variable calculated as of 2017Q4. We classify countries by the region and economic development following BIS (2017). We omit several countries in the figure (Czechoslovakia, German Democratic Republic, International organisations, Soviet Union, and Yugoslavia) which are unclassified in BIS (2017). See Table A1. in the appendix for financial positions for countries in detail.

Figure 6: Relationship between financial position and capital flow episodes in the 2000s and 2010s



Notes: The occurrence of capital flow episodes on y axis denotes the total number of four types of capital flow episodes in each decade. The financial position by claims on x axis shows the average of financial position variable

in each decade. Additionally, the codes for countries follow the notation in BIS-IBS: AT-Austria, AU-Australia, BE-Belgium, BR-Brazil, CA-Canada, CH-Switzerland, CL-Chile, DE-Germany, DK-Denmark, ES-Spain, FI-Finland, FR-France, GB-United Kingdom, GR-Greece, HK-Hong Kong SAR, IE-Ireland, IT-Italy, JP-Japan, KR-South Korea, LU-Luxembourg, MX-Mexico, NL-Netherlands, PH-Philippines, SE-Sweden, US-United States, ZA-South Africa.

5. Empirical analysis

5.1. Impact of financial position on capital flow episodes

We examined the effects of financial position on the probability of capital flow episodes. We analyzed the effect of financial position depending on capital flow episodes (surges, retrenchments, sudden stops, and flights) and employed a panel probit model as follows:

$$\Pr(\text{Episode}_{it} = 1) = F(c + \text{Financial position}_{it}A + X_{it}B + Y_{it}C)$$

$$i \in \{1, 2, \dots, N\}, t \in \{1, 2, \dots, T\}$$

where Episode_{it} is an indicator variable of whether a capital flow episode occurs. Because we divide capital flow episodes into four types, the variable can be surges, retrenchments, sudden stops, or flights. $\text{Financial position}_{it}$ is composed of financial position and square of financial position. The financial position calculated from bank flows denotes whether a country receives bank flows from other countries that are important in global capital markets. As financial position is large, a country i receives global bank flows from countries that have a crucial position in the global capital flows. On the contrary, as the variable is small, a country i receives global bank flows from countries that have a less important position in the global capital flows. The square of financial position is included to capture possible nonlinear relationship in the analysis. In addition, X_{it} is a vector of global factors including S&P 500 growth, VIX growth, 3-month T-bill rate, and money supply growth. Lastly, Y_{it} is a vector of domestic factors, including real GDP growth, interest rate, credit to the private nonfinancial sector/GDP, net capital flow/GDP, REER, and CPI.

The estimation results reported in Tables 5 through 8 show that global capital flows are more closely related to liability-driven episodes (surges and sudden stops) than to asset-driven episodes (retrenchments and flights). The results are consistent with our expectations because countries where capital flows from foreigners play a large role also tend to experience fluctuations in capital from foreign investors. Hwang et al. (2017) also support the importance of liability-driven episodes for macroeconomic impacts. We assume that systemic risk can happen in a country that receives global capital flows from other countries that have crucial roles in global capital markets. We also consider that occurrences of capital flow episodes may increase when a country receives capital flows from important countries.

Table 5 shows that surges are more likely to occur when a country receives capital from countries with

high financial position. However, we do not find significant relationship between square of financial position and surges (columns 3 and 9 in Table 5). We think that occurrences of surges are mainly related to advanced economies. Countries with abundant capital are generally parallel with advanced economies. The financial position is also large in advanced economies in general. The results from surges are reasonable in that surges can occur in a country that has already received investments from important countries. We also assume that the sample countries are concentrated in advanced countries.

On the contrary, Table 7 shows that square of financial position is significantly associated with sudden stops. The occurrences of sudden stops seem to decrease when a country receives investments from important countries without square of financial position. However, the results change when the square of financial position is included (columns 3 and 9 in Table 7). Emerging economies with mid financial position induce more sudden stops than advanced economies with high financial position. We suppose that there is nonlinear relation between financial position and occurrences of sudden stops. That is, emerging economies than advanced economies are more closely related to sudden stops. The results of sudden stops are intuitive. Emerging economies are more sensitive to changes in macroeconomic environment so that investments toward emerging economies can fluctuate drastically. Sudden stops are expected to occur in emerging economies because foreign investors want to retrieve capitals in case of sudden macroeconomic downturn. The inconsistency between financial position and economic development in Section 4.2 also support our argument using square of financial position.

We focused on the relationships between financial position with counterparty and capital flow episodes because the results of global and domestic factors are consistent with previous research findings. For robustness, we replaced 3-month T-bill rate with the TIPS rate, real GDP growth with GDP per capita growth, REER with exchange rate and international reserve assets, and CPI with GDP deflator and residential property price in examining the impacts of capital flow networks on capital flow episodes. However, the results were qualitatively the same.

To sum up, the results show that surges are closely related to advanced economies, however sudden stops are more related to emerging economies. Surges can occur if countries invest capital to advanced countries with high financial position. On the other hand, sudden stops tend to happen if investors do not continue to invest capital or retrieve the proceeds from emerging economies with middle financial position.

Table 5: Impact of financial position on surges: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	0.210** (2.29)	-0.00718 (-0.04)	0.816 (1.55)	0.240** (2.57)	0.214** (2.33)	0.245** (2.54)	0.228** (2.46)	0.221** (2.43)	0.817 (1.55)
Claims square			-0.0889 (-1.17)						-0.0889 (-1.17)
Global factors									
S&P 500	0.000953 (0.09)	0.00915 (0.59)	0.00115 (0.10)	0.00191 (0.18)	0.00108 (0.10)	-0.00442 (-0.39)	0.00140 (0.13)	-0.000236 (-0.02)	0.00115 (0.11)
VIX	-0.00518* (-1.65)	-0.00305 (-0.85)	-0.00526* (-1.68)	-0.00544* (-1.73)	-0.00511 (-1.63)	-0.00626* (-1.94)	-0.00534* (-1.71)	-0.00533* (-1.69)	-0.00527* (-1.68)
3M T-bill rate	0.0357 (1.06)		0.0401 (1.18)	0.0386 (1.16)	0.0358 (1.06)	0.0505 (1.43)	0.0347 (1.03)	0.0324 (0.96)	0.0402 (1.18)
TIPS rate		0.124 (1.00)							
Money supply	0.0127 (1.02)	0.00359 (0.19)	0.0100 (0.79)	0.0130 (1.03)	-0.00604 (-0.39)	-0.0114 (-0.70)	0.0151 (1.22)	0.0101 (0.80)	0.0100 (0.79)
Domestic factors									
Real GDP	0.0256 (0.43)	-0.000663 (-0.01)	0.0246 (0.41)		0.0218 (0.36)	0.0217 (0.35)	0.0184 (0.30)	-0.0282 (-0.44)	0.0245 (0.41)
GDP per capita				0.0145 (0.65)					
Interest rate	0.00764 (0.36)	0.0516 (1.50)	0.00972 (0.45)	0.00732 (0.34)	0.0116 (0.55)	0.00221 (0.10)	0.0121 (0.58)	0.0293 (1.42)	0.00972 (0.45)
Credit to private sector/GDP	0.117*** (4.38)	0.113*** (3.42)	0.116*** (4.33)	0.117*** (4.35)	0.115*** (4.30)	0.122*** (4.45)	0.119*** (4.44)	0.105*** (3.85)	0.116*** (4.34)
Net capital flow/GDP	0.00112 (0.09)	0.00152 (0.09)	0.000997 (0.08)	0.000305 (0.03)	0.00107 (0.09)	0.000745 (0.06)	0.00117 (0.10)	0.00470 (0.38)	
REER	0.0515*** (2.97)	0.0354 (1.52)	0.0512*** (2.95)	0.0504*** (2.81)			0.0525*** (3.01)	0.0498*** (2.81)	0.0513*** (2.96)
Exchange rate					-0.0328** (-2.21)	-0.0254* (-1.66)			
International reserve assets						0.0322*** (6.12)			
CPI	0.0947 (1.41)	0.0720 (0.84)	0.0906 (1.34)	0.0965 (1.43)	0.103 (1.52)	0.130* (1.87)			0.0906 (1.34)
GDP deflator							0.0590 (1.00)		
Residential property price								0.0766*** (3.07)	
Constant	-2.612*** (-7.48)	-2.182*** (-3.15)	-3.599*** (-3.93)	-2.708*** (-7.62)	-2.600*** (-7.45)	-2.827*** (-7.62)	-2.662*** (-7.57)	-2.694*** (-7.74)	-3.601*** (-3.93)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Impact of financial position on retrenchments: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	-0.0379 (-0.39)	0.0776 (0.47)	-0.353 (-0.62)	-0.0325 (-0.33)	-0.0378 (-0.39)	-0.0311 (-0.32)	-0.0184 (-0.19)	-0.0348 (-0.37)	-0.340 (-0.60)
Claims square			0.0465 (0.56)						0.0446 (0.54)
Global factors									
S&P 500	-0.0131 (-1.09)	-0.0193 (-1.20)	-0.0132 (-1.10)	-0.0162 (-1.40)	-0.0135 (-1.12)	-0.0180 (-1.47)	-0.0125 (-1.05)	-0.0126 (-1.06)	-0.0130 (-1.09)
VIX	0.00302 (0.99)	-0.000195 (-0.06)	0.00309 (1.02)	0.00272 (0.90)	0.00311 (1.02)	0.00223 (0.72)	0.00270 (0.90)	0.00277 (0.92)	0.00310 (1.02)
3M T-bill rate	-0.0470 (-1.16)		-0.0494 (-1.21)	-0.0537 (-1.35)	-0.0470 (-1.16)	-0.0333 (-0.81)	-0.0511 (-1.26)	-0.0492 (-1.23)	-0.0495 (-1.22)
TIPS rate		0.310** (2.37)							
Money supply	-0.00471 (-0.34)	-0.0190 (-0.97)	-0.00414 (-0.30)	-0.00493 (-0.35)	-0.00965 (-0.50)	-0.0109 (-0.56)	-0.00297 (-0.22)	-0.00277 (-0.20)	-0.00411 (-0.30)
Domestic factors									
Real GDP	-0.0633 (-0.99)	-0.0715 (-0.95)	-0.0651 (-1.02)		-0.0642 (-1.00)	-0.0596 (-0.92)	-0.0563 (-0.88)	-0.0643 (-0.95)	-0.0657 (-1.03)
GDP per capita				-0.0124 (-0.44)					
Interest rate	-0.0383 (-1.44)	-0.0707 (-1.58)	-0.0407 (-1.51)	-0.0373 (-1.39)	-0.0375 (-1.41)	-0.0519* (-1.89)	-0.0190 (-0.74)	-0.0246 (-1.01)	-0.0400 (-1.49)
Credit to private sector/GDP	0.0398 (1.25)	0.0560 (1.39)	0.0406 (1.27)	0.0415 (1.31)	0.0408 (1.27)	0.0417 (1.29)	0.0387 (1.20)	0.0359 (1.10)	0.0408 (1.28)
Net capital flow/GDP	0.00842 (0.63)	0.0223 (1.34)	0.00866 (0.65)	0.00825 (0.61)	0.00851 (0.63)	0.00834 (0.62)	0.00832 (0.62)	0.00726 (0.54)	
REER	0.00574 (0.27)	0.00774 (0.29)	0.00631 (0.29)	0.00857 (0.38)			0.00498 (0.23)	0.00386 (0.18)	0.00630 (0.29)
Exchange rate					-0.00704 (-0.41)	0.00312 (0.18)			
International reserve assets						0.0276*** (4.71)			
CPI	0.0780 (0.99)	0.0108 (0.11)	0.0820 (1.04)	0.0770 (0.97)	0.0803 (1.02)	0.110 (1.37)			0.0812 (1.03)
GDP deflator							-0.0917 (-1.21)		
Residential property price								0.00665 (0.25)	
Constant	-1.556*** (-4.53)	-2.498*** (-3.61)	-1.041 (-1.06)	-1.579*** (-4.53)	-1.551*** (-4.51)	-1.655*** (-4.77)	-1.585*** (-4.56)	-1.546*** (-4.60)	-1.067 (-1.09)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Impact of financial position on sudden stops: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	-0.214*	-0.479***	2.508***	-0.206*	-0.206*	-0.180	-0.218*	-0.218*	2.359***
	(-1.84)	(-2.60)	(2.70)	(-1.76)	(-1.77)	(-1.52)	(-1.87)	(-1.84)	(2.60)
Claims square			-0.415***						-0.391***
			(-2.90)						(-2.80)
Global factors									
S&P 500	0.0204	0.00547	0.0201	0.0163	0.0226*	0.0218	0.0196	0.0170	0.0203
	(1.53)	(0.27)	(1.49)	(1.23)	(1.68)	(1.58)	(1.46)	(1.24)	(1.52)
VIX	0.00713**	0.00589	0.00670*	0.00720**	0.00632*	0.00597*	0.00773**	0.00721**	0.00671**
	(2.07)	(1.43)	(1.95)	(2.06)	(1.80)	(1.65)	(2.24)	(2.06)	(1.96)
3M T-bill rate	-0.128***		-0.104**	-0.138***	-0.123***	-0.126***	-0.125***	-0.114**	-0.104**
	(-2.93)		(-2.38)	(-3.20)	(-2.82)	(-2.83)	(-2.86)	(-2.51)	(-2.42)
TIPS rate		-0.395***							
		(-2.77)							
Money supply	0.00971	0.00335	0.00778	0.0109	0.0536***	0.0550***	0.00675	0.0122	0.00892
	(0.64)	(0.15)	(0.50)	(0.71)	(2.58)	(2.59)	(0.45)	(0.77)	(0.57)
Domestic factors									
Real GDP	-0.183***	-0.197**	-0.177***		-0.171**	-0.180***	-0.185***	-0.145**	-0.170**
	(-2.72)	(-2.28)	(-2.60)		(-2.54)	(-2.62)	(-2.77)	(-2.01)	(-2.53)
GDP per capita				-0.0658**					
				(-2.35)					
Interest rate	0.00752	-0.0231	0.0147	0.00903	-0.00233	-0.00131	-0.000399	-0.0126	0.0165
	(0.36)	(-0.45)	(0.71)	(0.43)	(-0.11)	(-0.06)	(-0.02)	(-0.52)	(0.80)
Credit to private sector/GDP	-0.0870**	-0.0585	-0.0930**	-0.0807**	-0.0972***	-0.109***	-0.0852**	-0.0777**	-0.0867**
	(-2.38)	(-1.16)	(-2.51)	(-2.23)	(-2.61)	(-2.86)	(-2.36)	(-2.06)	(-2.37)
Net capital flow/GDP	-0.0389***	-0.0472**	-0.0421***	-0.0383***	-0.0393***	-0.0412***	-0.0396***	-0.0409***	
	(-2.78)	(-2.51)	(-2.94)	(-2.75)	(-2.81)	(-2.81)	(-2.84)	(-2.88)	
REER	-0.0844***	-0.0428	-0.0882***	-0.0694***			-0.0799***	-0.0796***	-0.0875***
	(-3.41)	(-1.16)	(-3.48)	(-2.75)			(-3.27)	(-3.13)	(-3.51)
Exchange rate					0.0678***	0.0624***			
					(3.93)	(3.50)			
International reserve assets						-0.0277***			
						(-3.58)			
CPI	-0.169**	-0.169	-0.185**	-0.183**	-0.209**	-0.204**			-0.185**
	(-2.02)	(-1.46)	(-2.20)	(-2.16)	(-2.42)	(-2.33)			(-2.23)
GDP deflator							-0.0685		
							(-0.88)		
Residential property price								-0.0694**	
								(-2.10)	
Constant	-1.037**	0.423	-5.358***	-1.075***	-1.101***	-1.169***	-1.045***	-1.050**	-5.094***
	(-2.57)	(0.60)	(-3.55)	(-2.63)	(-2.73)	(-2.83)	(-2.58)	(-2.55)	(-3.45)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Impact of financial position on flights: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	0.114 (0.98)	-0.347 (-1.31)	0.835 (1.20)	0.120 (1.02)	0.118 (1.00)	0.152 (1.21)	0.102 (0.87)	0.0949 (0.82)	0.806 (1.16)
Claims square			-0.107 (-1.05)						-0.103 (-1.01)
Global factors									
S&P 500	0.0107 (0.79)	0.0110 (0.49)	0.0116 (0.86)	0.00627 (0.47)	0.00981 (0.72)	0.00846 (0.59)	0.0126 (0.92)	0.0107 (0.78)	0.0118 (0.87)
VIX	-0.00563 (-1.47)	-0.00104 (-0.22)	-0.00567 (-1.48)	-0.00646* (-1.67)	-0.00548 (-1.42)	-0.00631 (-1.53)	-0.00484 (-1.25)	-0.00537 (-1.39)	-0.00536 (-1.41)
3M T-bill rate	0.103** (2.48)		0.105** (2.55)	0.0878** (2.19)	0.106** (2.55)	0.105** (2.39)	0.104** (2.54)	0.105** (2.55)	0.103** (2.52)
TIPS rate		-0.211 (-1.22)							
Money supply	-0.00552 (-0.35)	0.0235 (0.83)	-0.00914 (-0.56)	-0.00679 (-0.42)	-0.0264 (-1.24)	-0.0278 (-1.26)	-0.00858 (-0.54)	-0.00755 (-0.47)	-0.00886 (-0.54)
Domestic factors									
Real GDP	-0.0543 (-0.73)	-0.0716 (-0.69)	-0.0498 (-0.67)		-0.0600 (-0.80)	-0.0429 (-0.53)	-0.0574 (-0.78)	-0.0428 (-0.56)	-0.0463 (-0.62)
GDP per capita				0.0393 (1.33)					
Interest rate	-0.00755 (-0.29)	0.125** (2.07)	-0.00301 (-0.12)	0.000413 (0.02)	-0.00608 (-0.24)	-0.00669 (-0.24)	-0.0269 (-1.04)	-0.0171 (-0.68)	-0.00201 (-0.08)
Credit to private sector/GDP	0.0536 (1.49)	0.0602 (1.11)	0.0531 (1.48)	0.0578 (1.61)	0.0565 (1.56)	0.0414 (1.06)	0.0507 (1.43)	0.0492 (1.36)	0.0517 (1.45)
Net capital flow/GDP	-0.0167 (-1.12)	-0.00205 (-0.09)	-0.0173 (-1.15)	-0.0171 (-1.14)	-0.0165 (-1.11)	-0.0181 (-1.14)	-0.0160 (-1.08)	-0.0179 (-1.19)	
REER	0.0377 (1.56)	0.0857** (2.51)	0.0386 (1.60)	0.0297 (1.18)			0.0412* (1.71)	0.0383 (1.59)	0.0363 (1.51)
Exchange rate					-0.0356* (-1.70)	-0.0578*** (-2.59)			
International reserve assets						-0.0472*** (-5.14)			
CPI	-0.202** (-2.04)	-0.225 (-1.50)	-0.204** (-2.07)	-0.217** (-2.15)	-0.191* (-1.92)	-0.227** (-2.12)			-0.202** (-2.05)
GDP deflator							0.0447 (0.57)		
Residential property price								-0.0110 (-0.35)	
Constant	-2.518*** (-5.80)	-1.209 (-1.20)	-3.676*** (-3.10)	-2.578*** (-5.91)	-2.510*** (-5.75)	-2.658*** (-5.64)	-2.536*** (-5.86)	-2.493*** (-5.81)	-3.615*** (-3.07)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2. Magnitude of capital flow episodes depending on financial position

We next examined the magnitude of capital flow episodes when they occur. We analyzed the effects of magnitude of episodes by looking at four types of episodes. We employed a panel regression as follows:

$$K_{it|Episode_{it}=1} = \alpha \cdot Financial\ position_{it} + X_{it}A + Y_{it}B + \varepsilon_{it}$$

where $K_{it|Episode_{it}=1}$ denotes the net capital flow to GDP to country i at time t on the condition that capital flow episodes occur. Because we classified four types of episodes (surges, retrenchments, sudden stops, and flights), the indicator variable becomes 1 depending on type. $Financial\ position_{it}$ indicates whether a country receives capital flows from other countries that have an important position in global capital markets. A larger $Financial\ position_{it}$ denotes that a country receives investment from important countries, and vice versa. We include global factors in X_{it} : S&P 500 growth, VIX growth, 3-month T-bill rate, and money supply growth. Then, we also include domestic factors as Y_{it} : real GDP growth, interest rate, credit to private nonfinancial sector/GDP, REER, and CPI.

We expected the magnitude of surges to increase when surges occurred because we found a positive relationship between surges and financial position variables in the previous analysis. However, we found significant association only between financial position flights in Tables 9 through 12 compared to our expectations. We found no evidence of differences in magnitude of episodes between liability-driven and asset-driven capital flows and between increasing and decreasing capital flows, either. Considering the size and complex transactions in global capital markets, there is no country which can influence on global capital markets. A country cannot manipulate the magnitude of capital flows when capital flow episodes occur although a country has high financial position. We assume that advanced economies with high financial position can experience flights when residents increase foreign investment or decrease retrieving the proceeds from foreign countries.

For robustness, we replaced 3-month T-bill rate with the TIPS rate, real GDP growth with GDP per capita growth, REER with exchange rate and international reserve assets, and CPI with GDP deflator and residential property price in examining the impacts of capital flow networks on capital flow episodes. However, the results were qualitatively the same.

Table 9: Magnitude of surges: panel regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial position							
Claims	0.174 (0.02)	-35.26 (-1.20)	-1.155 (-0.11)	0.742 (0.07)	8.800 (0.89)	2.463 (0.23)	-0.621 (-0.06)
Global factors							
S&P 500	0.0759 (0.89)	0.142 (0.98)	0.0990 (1.17)	0.0799 (0.96)	0.0636 (0.81)	0.0900 (1.05)	0.109 (1.25)
VIX	0.0406* (1.66)	0.0449 (1.31)	0.0540** (2.12)	0.0372 (1.55)	0.0329 (1.44)	0.0423* (1.71)	0.0427* (1.72)
3M T-bill rate	-0.120 (-0.38)		0.0257 (0.08)	-0.0902 (-0.29)	0.0196 (0.07)	-0.142 (-0.44)	-0.147 (-0.46)
TIPS rate		-2.478 (-1.48)					
Money supply	-0.275*** (-3.04)	-0.332* (-1.82)	-0.256*** (-2.74)	-0.145 (-1.43)	-0.155 (-1.61)	-0.269*** (-2.95)	-0.264*** (-2.86)
Domestic factors							
Real GDP	0.696 (1.26)	1.138 (1.49)		0.710 (1.33)	0.602 (1.18)	0.628 (1.13)	0.813 (1.42)
GDP per capita			-0.163 (-1.04)				
Interest rate	-0.510** (-2.07)	-0.333 (-0.64)	-0.608** (-2.44)	-0.497** (-2.06)	-0.495** (-2.16)	-0.403* (-1.69)	-0.466* (-1.91)
Credit to private sector/GDP	-0.460** (-2.04)	-0.513* (-1.70)	-0.522** (-2.25)	-0.516** (-2.32)	-0.535** (-2.53)	-0.477** (-2.09)	-0.450** (-1.97)
REER	-0.175 (-1.47)	-0.215 (-1.15)	-0.183 (-1.51)			-0.194 (-1.63)	-0.183 (-1.51)
Exchange rate				0.233** (2.24)	0.247** (2.50)		
International reserve assets					0.121*** (3.16)		
CPI	0.762 (1.51)	0.838 (1.22)	0.672 (1.30)	0.691 (1.39)	0.920* (1.93)		
GDP deflator						0.174 (0.35)	
Residential property price							-0.277 (-1.26)
Constant	0.275** (2.46)	0.442*** (2.75)	0.286*** (2.69)	0.270** (2.37)	0.233** (2.00)	0.269** (2.38)	0.285** (2.55)
Observations	136	91	136	136	136	136	135

Notes: Independent variables were divided by 100 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Magnitude of retrenchments: panel regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial position							
Claims	12.86 (0.50)	-4.237 (-0.05)	16.05 (0.61)	14.24 (0.56)	7.627 (0.29)	1.542 (0.06)	12.41 (0.47)
Global factors							
S&P 500	-0.0177 (-0.09)	0.0260 (0.07)	0.156 (0.81)	0.00908 (0.04)	0.0981 (0.46)	0.00470 (0.02)	0.00338 (0.02)
VIX	-0.0266 (-0.49)	-0.0505 (-0.65)	0.00539 (0.10)	-0.0405 (-0.72)	-0.0294 (-0.52)	-0.0310 (-0.55)	-0.0323 (-0.58)
3M T-bill rate	-0.349 (-0.29)		0.0739 (0.06)	-0.287 (-0.24)	-0.973 (-0.77)	-0.388 (-0.31)	-0.314 (-0.26)
TIPS rate		-4.754 (-1.00)					
Money supply	-0.504* (-1.74)	-0.835 (-1.59)	-0.328 (-1.10)	-0.200 (-0.56)	-0.134 (-0.37)	-0.457 (-1.53)	-0.463 (-1.57)
Domestic factors							
Real GDP	1.902 (1.48)	1.583 (0.88)		1.838 (1.46)	1.965 (1.56)	1.972 (1.49)	2.530* (1.75)
GDP per capita			-0.402 (-0.57)				
Interest rate	0.349 (0.39)	0.00544 (0.00)	0.0988 (0.11)	0.332 (0.37)	0.817 (0.87)	0.430 (0.47)	0.475 (0.52)
Credit to private sector/GDP	-0.353 (-0.56)	0.656 (0.66)	-0.460 (-0.70)	-0.454 (-0.71)	-0.567 (-0.88)	-0.170 (-0.26)	-0.0999 (-0.15)
REER	-0.418 (-0.99)	-0.0744 (-0.12)	-0.0639 (-0.11)			-0.457 (-1.04)	-0.359 (-0.82)
Exchange rate				0.423 (1.26)	0.420 (1.25)		
International reserve assets					-0.163 (-1.56)		
CPI	2.636 (1.62)	2.953 (1.31)	2.974* (1.76)	2.588 (1.60)	2.676* (1.66)		
GDP deflator						1.757 (1.01)	
Residential property price							-0.538 (-0.84)
Constant	0.0785 (0.61)	0.229 (0.70)	0.0786 (0.60)	0.0703 (0.54)	0.0969 (0.76)	0.119 (0.93)	0.0934 (0.72)
Observations	78	61	78	78	78	78	78

Notes: Independent variables were divided by 100 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Magnitude of sudden stops: panel regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial position							
Claims	-8.401 (-0.41)	-6.586 (-0.24)	-1.162 (-0.07)	-4.902 (-0.25)	-4.770 (-0.24)	-11.87 (-0.48)	-5.164 (-0.24)
Global factors							
S&P 500	0.182 (1.11)	0.221 (1.04)	0.112 (0.83)	0.162 (1.02)	0.171 (1.08)	0.207 (1.06)	0.260 (1.54)
VIX	0.0479 (0.98)	0.0744* (1.75)	0.0519 (1.27)	0.0492 (1.04)	0.0584 (1.22)	0.0393 (0.69)	0.0589 (1.19)
3M T-bill rate	0.165 (0.34)		-0.0587 (-0.15)	0.0185 (0.04)	0.0614 (0.13)	0.0678 (0.12)	0.713 (1.27)
TIPS rate		3.480 (1.47)					
Money supply	-0.0717 (-0.40)	-0.00127 (-0.01)	-0.231* (-1.67)	-0.205 (-1.02)	-0.213 (-1.07)	-0.0187 (-0.09)	-0.0379 (-0.21)
Domestic factors							
Real GDP	-1.230 (-1.60)	-1.524 (-1.58)		-1.096 (-1.49)	-0.981 (-1.32)	-1.330 (-1.46)	-1.431* (-1.80)
GDP per capita			0.260 (0.94)				
Interest rate	-0.0565 (-0.19)	-1.410 (-1.17)	0.274 (1.28)	0.0649 (0.21)	0.0488 (0.16)	-0.202 (-0.55)	-0.139 (-0.42)
Credit to private sector/GDP	0.461 (1.29)	1.401*** (2.83)	0.486 (1.62)	0.589 (1.64)	0.625* (1.74)	0.413 (0.98)	0.360 (1.04)
REER	0.496* (1.65)	0.929*** (2.85)	0.333 (1.16)			0.478 (1.46)	0.675** (2.19)
Exchange rate				-0.274* (-1.82)	-0.270* (-1.79)		
International reserve assets					0.0543 (0.87)		
CPI	0.681 (0.89)	0.0749 (0.08)	0.569 (0.90)	0.818 (1.06)	0.740 (0.96)		
GDP deflator						1.617 (1.50)	
Residential property price							-0.811 (-1.53)
Constant	-0.270* (-1.89)	-0.380* (-1.76)	-0.304* (-1.67)	-0.283* (-1.94)	-0.283* (-1.93)	-0.255* (-1.87)	-0.295** (-1.99)
Observations	74	54	74	74	74	74	71

Notes: Independent variables were divided by 100 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Magnitude of flights: panel regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Financial position							
Claims	35.38*** (3.77)	72.48 (1.51)	30.81*** (3.10)	33.27*** (3.41)	33.21*** (3.54)	35.51*** (3.72)	34.46*** (3.32)
Global factors							
S&P 500	-0.0161 (-0.24)	0.134 (0.41)	-0.0754 (-1.19)	-0.0199 (-0.29)	-0.0174 (-0.26)	-0.0180 (-0.28)	-0.00941 (-0.13)
VIX	-0.00638 (-0.42)	-0.00371 (-0.07)	-0.0173 (-1.21)	-0.00566 (-0.37)	-0.00683 (-0.47)	-0.00644 (-0.43)	-0.00481 (-0.29)
3M T-bill rate	0.359 (1.49)		0.164 (0.76)	0.382 (1.57)	0.417* (1.77)	0.388 (1.46)	0.421 (1.59)
TIPS rate		1.436 (0.42)					
Money supply	-0.170** (-2.10)	-0.256 (-0.48)	-0.184** (-2.24)	-0.283** (-2.37)	-0.289** (-2.52)	-0.171** (-2.08)	-0.149 (-1.63)
Domestic factors							
Real GDP	-0.617 (-1.47)	-1.176 (-0.74)		-0.610 (-1.43)	-0.697* (-1.69)	-0.652 (-1.51)	-0.642 (-1.43)
GDP per capita			0.155 (0.94)				
Interest rate	0.452** (2.18)	1.074 (0.77)	0.595*** (2.85)	0.427** (2.06)	0.421** (2.12)	0.446** (2.09)	0.398* (1.70)
Credit to private sector/GDP	-0.0515 (-0.20)	-2.709 (-1.60)	-0.0666 (-0.25)	-0.0516 (-0.20)	-0.0471 (-0.19)	-0.0664 (-0.26)	0.0183 (0.06)
REER	0.245* (1.89)	-0.179 (-0.33)	0.291** (2.26)			0.241* (1.82)	0.217 (1.51)
Exchange rate				-0.213 (-1.60)	-0.200 (-1.56)		
International reserve assets					0.0806* (1.68)		
CPI	0.0361 (0.06)	-0.283 (-0.11)	0.279 (0.48)	0.153 (0.26)	0.231 (0.41)		
GDP deflator						-0.121 (-0.22)	
Residential property price							-0.174 (-1.03)
Constant	-0.330** (-2.32)	-0.526** (-2.52)	-0.323** (-2.16)	-0.322** (-2.21)	-0.317** (-2.09)	-0.330** (-2.40)	-0.326*** (-2.72)
Observations	64	40	63	64	64	64	64

Notes: Independent variables were divided by 100 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6. Conclusion

Financial systems are one of the most complex social structures. Financial data such as trade and investment data show increasing global capital flows around the world. Financial institutions in different countries exchange capital. However, we noted that capital differs depending on whether it is from crucial counterparty in global capital markets. We considered whether countries receive investments from other countries that have a crucial position in the financial system. Then, we analyzed the impacts of capital flow networks on capital flow episodes.

This paper shows that whether a country receives capital flows from important countries is more closely related to occurrences of liability-driven episodes (i.e., extreme capital flow movements by foreigners) than asset-driven episodes (i.e., extreme capital flow movements by residents). The occurrence of surges increases with high financial position, but the occurrence of sudden stops is related with mid financial position. These results show that advanced economies are main driver for surges (advanced economies have high financial position in general) while emerging economies are main driver for sudden stops (emerging economies have mid financial position in general). We also found that the magnitude of episodes is only significantly associated with flights. This is because that no country can control the magnitude of capital flows although a country has high financial position in global capital markets. The magnitude of flights is significantly large when residents in advanced economies increase foreign investment or decrease retrieving foreign investment.

This research suggests that the economic impacts of capital flows differ depending on counterparty countries. Due to unconventional monetary policy from advanced countries following the global financial crisis, global capital flows moved to emerging economies searching for greater yields. Therefore, fluctuations in global capital flows are expected again with an increase in the US interest rate. This research can help government authorities and regulatory agencies to maintain stable economies. When a country receives foreign investment from a counterparty with mid financial position, receiving country can monitor the capital flows closely. Additionally, in future research we can consider covering more emerging economies to capture entire impacts from capital flow movement.

References

- Avdjiev, S., Koch, C., McGuire, P., & von Peter, G. (2017). International Prudential Policy Spillovers: A Global Perspective. *International Journal of Central Banking*, Vol. 13 No. 2, pp. 5-33.
- Bank for International Settlements. (2017). BIS locational banking statistics: explanation of the data structure definitions. Version DSD_LBS_V201712.
- Bank for International Settlements. (2018). Global coverage of BIS locational banking statistics.
- Battiston, S., Puliga, M., Kaushik, R., Tasca, P. and Caldarelli, G. (2012), “Debtrank: Too central to fail? financial networks, the fed and systemic risk”, *Scientific reports*, Vol. 2.
- Broner, F. A., Gelos, R. G., & Reinhart, C. M. (2006). When in peril, retrench: Testing the portfolio channel of contagion. *Journal of International Economics*, Vol. 69 No. 1, pp. 203-230.
- Bruno, V., & Shin, H. S. (2015). Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics*, 71, pp. 119-132.
- Calvo, G. A., Leiderman, L., & Reinhart, C. M. (1993). Capital inflows and real exchange rate appreciation in Latin America: the role of external factors. *Staff Papers*, 40(1), pp. 108-151.
- Calvo, G. A. (1998). Capital flows and capital-market crises: the simple economics of sudden stops. *Journal of Applied Economics*, Vol. 1 No. 1, pp. 35-54.
- Calvo, G. A., Izquierdo, A., & Mejia, L. F. (2004). On the empirics of sudden stops: the relevance of balance-sheet effects (No. w10520). National Bureau of Economic Research.
- Calvo, G. A., Izquierdo, A., & Mejía, L. F. (2008). Systemic sudden stops: the relevance of balance-sheet effects and financial integration (No. w14026). National Bureau of Economic Research.
- Caldarelli, R., Elekdag, S., & Kose, M. A. (2010). Capital inflows: Macroeconomic implications and policy responses. *Economic Systems*, Vol. 34 No. 4, pp. 333-356.
- Cavallo, E. A., & Frankel, J. A. (2008). Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality. *Journal of International Money and Finance*, Vol. 27 No. 8, pp. 1430-1452.
- Cerutti, E., Claessens, S., & Puy, M. D. (2015). Push factors and capital flows to emerging markets: why knowing your lender matters more than fundamentals (No. 15-127). International Monetary Fund.
- Chinazzi, M., Fagiolo, G., Reyes, J. A., & Schiavo, S. (2013). Post-mortem examination of the international financial network. *Journal of Economic Dynamics and Control*, Vol. 37 No. 8, pp. 1692-1713.
- Chuhan, P., Claessens, S., & Mamingi, N. (1998). Equity and bond flows to Latin America and Asia: the role of global and country factors. *Journal of Development Economics*, Vol. 55 No. 2, pp. 439-463.
- Dungey, M., Luciani, M., & Veredas, D. (2012). Ranking systemically important financial institutions. Discussion Paper No.12-115/IV/DSF44, Tinbergen Institute.
- Fernandez-Arias, E. (1996). The new wave of private capital inflows: push or pull?. *Journal of development economics*, Vol. 48 No. 2, pp. 389-418.
- Fratzscher, M. (2012). Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics*, Vol. 88 No. 2, pp. 341-356.
- Furceri, D., Guichard, S., & Rusticelli, E. (2011). Episodes of large capital inflows and the likelihood of banking

- and currency crises and sudden stops. OECD Economics Department Working Papers, No. 865.
- Gelos, R. G., & WEI, S. J. (2005). Transparency and international portfolio holdings. *The Journal of Finance*, Vol. 60 No. 6, pp. 2987-3020.
- Ghosh, A. R., Qureshi, M. S., Kim, J. I., & Zalduendo, J. (2014). Surges. *Journal of International Economics*, Vol. 92 No. 2, pp. 266-285.
- Hale, G. (2012), “Bank relationships, business cycles, and financial crises”, *Journal of International Economics*, Vol. 88 No. 2, pp. 312-325.
- Hattori, M. and Suda, Y. (2007), “Developments in a cross-border bank exposure “network””, In *Research on global financial stability: the use of BIS international financial statistics*, Committee on the Global Financial System, Bank for International Settlements, pp. 16-31.
- Hwang, I., Jeong, D., Park, H., & Park, S. (2017). Which net capital flows matter?. *Emerging Markets Finance and Trade*, Vol. 53 No. 2, pp. 289-305.
- Jotikasthira, C., Lundblad, C., & Ramadorai, T. (2012). Asset fire sales and purchases and the international transmission of funding shocks. *The Journal of Finance*, Vol. 67 No. 6, pp. 2015-2050.
- Kaminsky, G. L., Lyons, R. K., & Schmukler, S. L. (2001). Mutual Fund Investment in Emerging Markets: An Overview. *The World Bank Economic Review*, Vol. 15 No. 2, pp. 315-340.
- Kapan, M. T., & Minoiu, C. (2013). Balance sheet strength and bank lending during the global financial crisis (No. 13-102). International Monetary Fund.
- Kubeleca, C., & Sáb, F. (2012). The Geographical Composition of National External Balance Sheets: 1980–2005. *International Journal of Central Banking*, Vol. 8 No. 2, pp. 143-189.
- Minoiu, C. and Reyes, J. A. (2013), “A network analysis of global banking: 1978–2010”, *Journal of Financial Stability*, Vol. 9 No. 2, pp. 168-184.
- Organisation for Economic Co-operation and Development. (2011). International capital flows: Structural reforms and experience with the OECD Code of Liberalisation of Capital Movements. Report from the OECD to the G20 Sub-Group on Capital Flow Management.
- Page, L., Brin, S., Motwani, R., & Winograd, T. (1999). The PageRank citation ranking: Bringing order to the web. Stanford InfoLab.
- Raddatz, C., & Schmukler, S. L. (2012). On the international transmission of shocks: Micro-evidence from mutual fund portfolios. *Journal of International Economics*, Vol. 88 No. 2, pp. 357-374.
- Reinhart, C. M., & Reinhart, V. R. (2008). Capital flow bonanzas: an encompassing view of the past and present (No. w14321). National Bureau of Economic Research.
- Soramäki, K., & Cook, S. (2013). SinkRank: An algorithm for identifying systemically important banks in payment systems. *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 7(2013-28), pp. 1-27.
- Taylor, M. P., & Sarno, L. (1997). Capital flows to developing countries: long-and short-term determinants. *The World Bank Economic Review*, Vol. 11 No. 3, pp. 451-470.
- Yun, T., Jeong, D., & Park, S. (2017). “Too central to fail” systemic risk measure adopting PageRank algorithm, in *the international conference on finance and economic growth in aftermath of the crisis*, Milan, Italy, 11-13 September.

Appendix

Table A1: Financial position of countries as of 2017Q4

Classification (number of total countries)	Country	Code	Financial position by claims
Developing Africa and Middle East (66)	Central African Republic	CF	5.4345
	South Africa	ZA	5.1534
	Kuwait	KW	5.0202
	Sierra Leone	SL	4.9781
	Nigeria	NG	4.9289
	Egypt	EG	4.7985
	Qatar	QA	4.6766
	Saudi Arabia	SA	4.5595
	Libya	LY	4.4918
	Guinea	GN	4.4441
	Sudan	SD	4.4368
	Mozambique	MZ	4.4097
	Zimbabwe	ZW	4.409
	Israel	IL	4.353
	Burundi	BI	4.3353
	Malawi	MW	4.3198
	Ghana	GH	4.2408
	Jordan	JO	4.2398
	United Arab Emirates	AE	4.1328
	Oman	OM	4.1113
	Zambia	ZM	4.1071
	Chad	TD	4.1011
	Kenya	KE	3.9663
	Angola	AO	3.8522
	Djibouti	DJ	3.8336
	Rwanda	RW	3.7137
	Mauritania	MR	3.7091
	Senegal	SN	3.6844
	Uganda	UG	3.6572
	Benin	BJ	3.6429
	Tanzania	TZ	3.5988
	Cameroon	CM	3.5643
	Syria	SY	3.5436
	Burkina Faso	BF	3.4596
	Somalia	SO	3.447
	Cote d'Ivoire	CI	3.4219
	Mali	ML	3.4175
	Morocco	MA	3.4078
	Ethiopia	ET	3.3482
	Iraq	IQ	3.3257
	Tunisia	TN	3.3078
	Gambia	GM	3.2004
	Congo	CG	3.1529
	Algeria	DZ	3.1194
	Liberia	LR	3.0967
	Togo	TG	3.0934
	Yemen	YE	3.0514
	Iran	IR	2.9634
	Gabon	GA	2.9507
	Botswana	BW	2.9167
	Niger	NE	2.9144
	Cape Verde	CV	2.7741
	Swaziland	SZ	2.68

	Seychelles	SC	2.4908
	Comoros	KM	2.2098
	Madagascar	MG	2.1248
	Equatorial Guinea	GQ	2.0515
	Congo Democratic Republic	CD	1.9484
	Namibia	NA	1.8416
	Palestinian Territory	PS	1.7456
	Guinea-Bissau	GW	1.3881
	Eritrea	ER	1.3251
	South Sudan	SS	1.2253
	Lesotho	LS	0.78693
	St. Helena and Dependencies	SH	0.72902
	Sao Tome and Principe	ST	0
	Haiti	HT	5.8394
	Guatemala	GT	5.7944
	El Salvador	SV	5.6348
	Trinidad and Tobago	TT	5.4751
	Nicaragua	NI	5.4385
	Turks and Caicos Islands	TC	5.3246
	Costa Rica	CR	5.3178
	Ecuador	EC	5.0639
	Jamaica	JM	5.0053
	Argentina	AR	4.8479
	Chile	CL	4.7488
	Peru	PE	4.6407
	Brazil	BR	4.6357
	Colombia	CO	4.6096
	Dominican Republic	DO	4.5318
	Honduras	HN	4.38
	Venezuela	VE	4.306
	Uruguay	UY	4.0328
	Mexico	MX	3.889
	Belize	BZ	3.8467
	Guyana	GY	3.837
	Bolivia	BO	3.8021
	Suriname	SR	3.5559
	Paraguay	PY	3.5186
	St. Lucia	LC	2.5488
	Cuba	CU	2.519
	Dominica	DM	2.1187
	Grenada	GD	1.8602
	Falkland Islands	FK	1.8219
	St. Vincent and the Grenadines	VC	1.7085
	Bonaire, Sint Eustatius and Saba	BQ	1.592
	US Pacific Islands	PU	7.1005
	Brunei	BN	4.6406
	Kazakhstan	KZ	4.4759
	Pakistan	PK	4.0668
	Armenia	AM	4.0421
	India	IN	3.9093
	Georgia	GE	3.8915
	Azerbaijan	AZ	3.764
	French Polynesia	PF	3.4432
	New Caledonia	NC	3.3885
	South Korea	KR	3.3326
	Wallis and Futuna	WF	3.3106
	Philippines	PH	3.3024
	Chinese Taipei	TW	3.2429
	North Korea	KP	3.1617

	Bangladesh	BD	3.1077
	Nepal	NP	3.0621
	Malaysia	MY	3.0557
	Marshall Islands	MH	2.98
	Mongolia	MN	2.8959
	Sri Lanka	LK	2.8846
	Thailand	TH	2.8454
	Indonesia	ID	2.7286
	Maldives	MV	2.7173
	Timor Leste	TL	2.5481
	Vietnam	VN	2.4597
	China	CN	2.4101
	Myanmar	MM	2.324
	Tajikistan	TJ	2.2481
	Turkmenistan	TM	2.0199
	Uzbekistan	UZ	1.9562
	Laos	LA	1.8338
	Papua New Guinea	PG	1.8217
	Afghanistan	AF	1.7006
	Cambodia	KH	1.6951
	Fiji	FJ	1.6223
	Micronesia	FM	1.5776
	Tonga	TO	1.4613
	Solomon Islands	SB	1.4438
	British Overseas Territories	1W	1.3356
	Kiribati	KI	1.1498
	Nauru	NR	1.1498
	Bhutan	BT	0.94174
	Kyrgyz Republic	KG	0.89716
	Palau	PW	0
	Tuvalu	TV	0
	Montenegro	ME	3.804
	Turkey	TR	3.5098
	Albania	AL	3.4454
	Russia	RU	3.3672
	Poland	PL	3.0878
	Ukraine	UA	2.986
	Moldova	MD	2.8714
	Serbia	RS	2.8209
	Macedonia, FYR	MK	2.8162
	Hungary	HU	2.717
	Czech Republic	CZ	2.5092
	Romania	RO	2.2922
	Belarus	BY	2.1929
	Bulgaria	BG	2.1802
	Croatia	HR	2.125
	Bosnia and Herzegovina	BA	1.4944
	Serbia and Montenegro	CS	0
	Canada	CA	5.2124
	Japan	JP	5.1758
	Ireland	IE	4.6965
	Switzerland	CH	4.6299
	Greece	GR	4.5342
	Netherlands	NL	4.1849
	France	FR	3.9253
	Iceland	IS	3.8947
	Germany	DE	3.8929
	Australia	AU	3.8237
	United States	US	3.8145

	Luxembourg	LU	3.5127
	Belgium	BE	3.4914
	Spain	ES	3.4158
	United Kingdom	GB	3.357
	Sweden	SE	3.332
	Cyprus	CY	3.266
	Italy	IT	3.241
	Austria	AT	3.2002
	Norway	NO	3.1785
	Malta	MT	3.1442
	Portugal	PT	2.8377
	Finland	FI	2.5121
	Denmark	DK	2.4663
	New Zealand	NZ	2.1816
	Slovenia	SI	2.1658
	Slovakia	SK	2.1098
	Andorra	AD	2.1097
	Liechtenstein	LI	2.01
	Lithuania	LT	1.8794
	Latvia	LV	1.7698
	San Marino	SM	1.7241
	Vatican City State	VA	1.5781
	Estonia	EE	1.5582
	Greenland	GL	1.3781
	Faeroe Islands	FO	1.2724
	Aruba	AW	5.1625
	Mauritius	MU	5.0665
	Isle of Man	IM	4.8124
	Jersey	JE	4.7972
	Cayman Islands	KY	4.2742
	Bahrain	BH	4.1997
	Curacao	CW	4.1248
	Gibraltar	GI	3.8184
	Hong Kong SAR	HK	3.6329
	Sint Maarten	SX	3.6172
Offshore centres (22)	Bermuda	BM	3.5791
	West Indies UK	IZ	3.4334
	Singapore	SG	3.3201
	Bahamas	BS	3.1721
	Panama	PA	2.8953
	Guernsey	GG	2.683
	Lebanon	LB	2.6268
	Vanuatu	VU	2.5017
	Barbados	BB	1.7677
	Macao SAR	MO	1.5368
	Samoa	WS	1.4034
	Netherlands Antilles	AN	0
Total (218)			

Notes: We list financial position of countries as descending order. The classification of countries by the region and economic development is based on BIS (2017). We omit several countries (Czechoslovakia, German Democratic Republic, International organisations, Soviet Union, and Yugoslavia) which are unallocated by classification.

Table A2: Impact of financial position on foreign direct investment: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	0.271*** (3.73)	0.248 (1.54)	-0.308 (-0.82)	0.260*** (3.51)	0.273*** (3.75)	0.274*** (3.76)	0.259*** (3.54)	0.284*** (3.80)	-0.313 (-0.83)
Claims square			0.0844 (1.57)						0.0855 (1.59)
Global factors									
S&P 500	0.00897 (1.05)	-0.00338 (-0.25)	0.00813 (0.95)	0.00922 (1.10)	0.00840 (0.98)	0.00835 (0.97)	0.00852 (0.99)	0.00343 (0.39)	0.00815 (0.95)
VIX	-0.000143 (-0.06)	-0.000186 (-0.06)	-0.0000862 (-0.04)	-0.0000769 (-0.03)	-0.0000104 (-0.00)	0.0000102 (0.00)	-0.000244 (-0.11)	-0.00103 (-0.44)	0.0000366 (0.02)
3M T-bill rate	0.193*** (7.66)		0.190*** (7.52)	0.194*** (7.81)	0.194*** (7.68)	0.194*** (7.67)	0.193*** (7.63)	0.209*** (7.88)	0.190*** (7.52)
TIPS rate		-0.210* (-1.90)							
Money supply	-0.0325*** (-3.46)	0.00749 (0.50)	-0.0302*** (-3.19)	-0.0340*** (-3.58)	-0.0417*** (-3.41)	-0.0416*** (-3.40)	-0.0339*** (-3.62)	-0.0352*** (-3.64)	-0.0306*** (-3.23)
Domestic factors									
Real GDP	0.0278 (0.64)	0.137** (2.41)	0.0253 (0.58)		0.0248 (0.57)	0.0252 (0.58)	0.0284 (0.66)	0.0731 (1.57)	0.0251 (0.58)
GDP per capita				0.0146 (0.77)					
Interest rate	-0.00217 (-0.14)	0.147*** (3.40)	-0.00653 (-0.42)	-0.00252 (-0.16)	-0.00103 (-0.07)	-0.000593 (-0.04)	-0.000559 (-0.04)	-0.0206 (-1.17)	-0.00618 (-0.40)
Credit to private sector/GDP	0.0156 (0.74)	0.0386 (1.33)	0.0163 (0.77)	0.0167 (0.79)	0.0176 (0.83)	0.0170 (0.80)	0.0165 (0.78)	0.0130 (0.58)	0.0153 (0.72)
Net capital flow/GDP	-0.0165* (-1.82)	-0.0363** (-2.53)	-0.0163* (-1.80)	-0.0161* (-1.77)	-0.0167* (-1.84)	-0.0166* (-1.83)	-0.0170* (-1.87)	-0.0175* (-1.88)	
REER	0.0156 (0.74)	0.00915 (0.46)	0.0107 (0.77)	0.0107 (0.73)			0.0117 (0.84)	0.0128 (0.88)	0.00996 (0.72)
Exchange rate						-0.0154 (-1.35)			
International reserve assets					-0.0144 (-1.27)	-0.00263 (-0.60)			
CPI	-0.00589 (-0.11)	-0.0787 (-1.11)	-0.00139 (-0.03)	-0.00108 (-0.02)	-0.0000853 (-0.00)	-0.00117 (-0.02)			0.0000509 (0.00)
GDP deflator							-0.0357 (-0.78)		
Residential property price								-0.00898 (-0.50)	
Constant	-2.346*** (-8.48)	-2.240*** (-3.24)	-1.394** (-2.10)	-2.314*** (-8.23)	-2.343*** (-8.46)	-2.341*** (-8.45)	-2.296*** (-8.29)	-2.367*** (-8.27)	-1.383** (-2.08)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,74

Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Impact of financial position on portfolio investment: panel probit regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	0.114 (1.63)	-0.0186 (-0.16)	0.553 (1.47)	0.104 (1.47)	0.114 (1.63)	0.114 (1.63)	0.0970 (1.38)	0.106 (1.51)	0.552 (1.47)
Claims square			-0.0648 (-1.19)						-0.0647 (-1.19)
Global factors									
S&P 500	0.00719 (0.93)	-0.00819 (-0.76)	0.00755 (0.98)	0.00424 (0.56)	0.00706 (0.92)	0.00654 (0.85)	0.00801 (1.04)	0.00621 (0.79)	0.00755 (0.98)
VIX	0.00273 (1.33)	0.000875 (0.37)	0.00266 (1.30)	0.00287 (1.39)	0.00280 (1.36)	0.00261 (1.27)	0.00296 (1.44)	0.00264 (1.27)	0.00267 (1.30)
3M T-bill rate	0.0464* (1.91)		0.0484** (1.99)	0.0452* (1.89)	0.0466* (1.92)	0.0493** (2.02)	0.0457* (1.88)	0.0442* (1.77)	0.0483** (1.99)
TIPS rate		0.206** (2.43)							
Money supply	0.00405 (0.46)	0.0244* (1.89)	0.00252 (0.28)	0.00477 (0.54)	-0.00190 (-0.17)	-0.00209 (-0.18)	0.00295 (0.34)	0.00747 (0.83)	0.00253 (0.29)
Domestic factors									
Real GDP	-0.124*** (-3.00)	-0.0915* (-1.85)	-0.122*** (-2.93)		-0.126*** (-3.04)	-0.126*** (-3.02)	-0.129*** (-3.10)	-0.108** (-2.45)	-0.122*** (-2.93)
GDP per capita				-0.0757*** (-4.33)					
Interest rate	0.0185 (1.19)	0.00706 (0.26)	0.0218 (1.38)	0.0175 (1.12)	0.0194 (1.25)	0.0177 (1.13)	0.0128 (0.83)	0.0231 (1.42)	0.0218 (1.38)
Credit to private sector/GDP	0.0371* (1.82)	0.0633** (2.44)	0.0359* (1.76)	0.0348* (1.70)	0.0371* (1.81)	0.0381* (1.85)	0.0392* (1.92)	0.0379* (1.78)	0.0359* (1.76)
Net capital flow/GDP	-0.000758 (-0.09)	0.0121 (1.04)	-0.000948 (-0.11)	-0.000453 (-0.05)	-0.000697 (-0.08)	-0.000873 (-0.10)	-0.000733 (-0.09)	-0.00156 (-0.18)	
REER	0.0156 (1.21)	-0.00280 (-0.16)	0.0152 (1.17)	0.0321** (2.38)			0.0184 (1.41)	0.0102 (0.76)	0.0151 (1.17)
Exchange rate					-0.0103 (-0.99)	-0.00631 (-0.60)			
International reserve assets						0.00984** (2.50)			
CPI	0.00937 (0.19)	-0.0440 (-0.69)	0.00559 (0.11)	0.0149 (0.29)	0.0124 (0.25)	0.0149 (0.29)			0.00565 (0.11)
GDP deflator							0.0846* (1.90)		
Residential property price								-0.0198 (-1.13)	
Constant	-1.518*** (-5.81)	-1.295*** (-2.74)	-2.233*** (-3.40)	-1.494*** (-5.85)	-1.512*** (-5.79)	-1.533*** (-5.85)	-1.491*** (-5.67)	-1.489*** (-5.65)	-2.231*** (-3.40)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

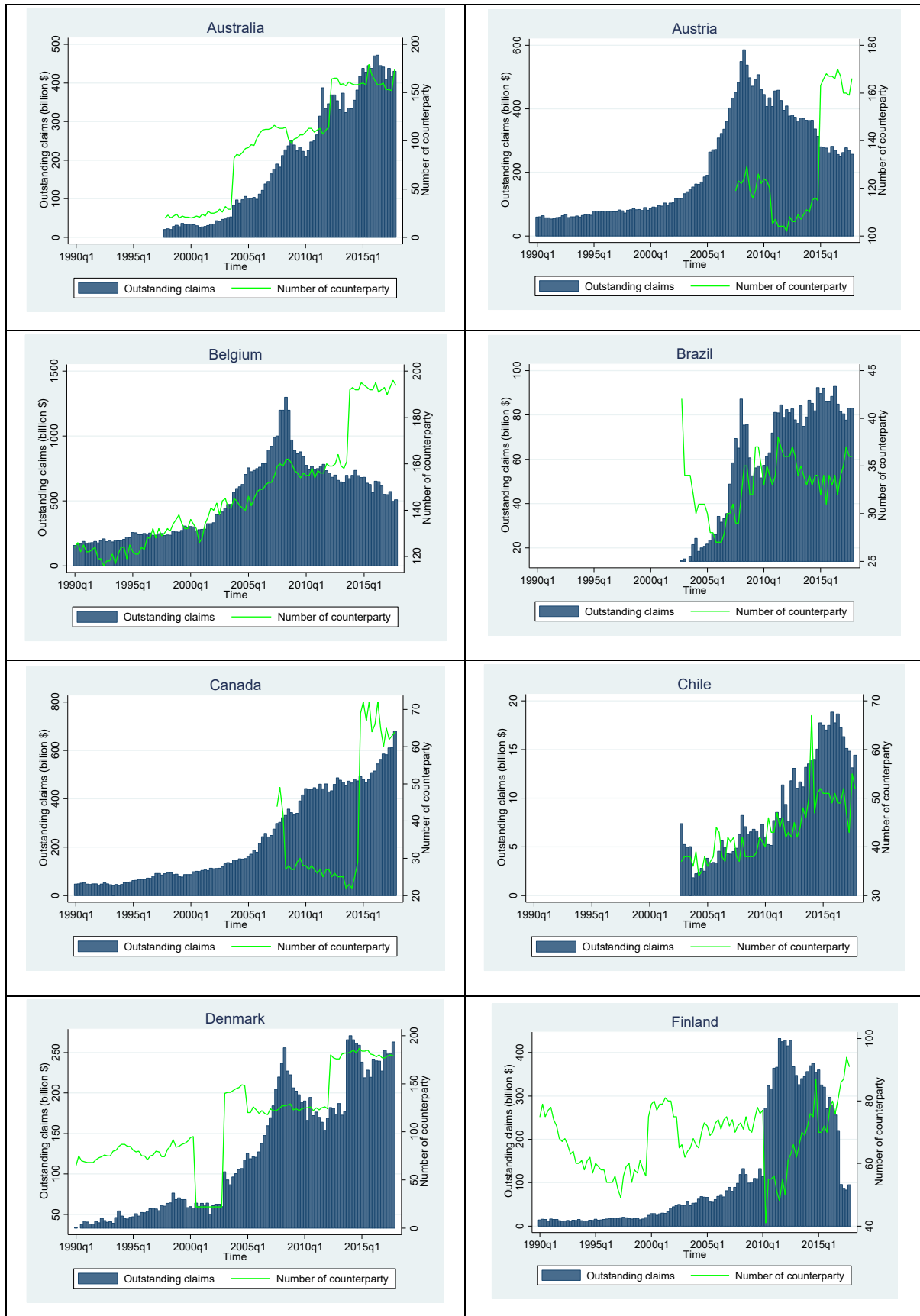
Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

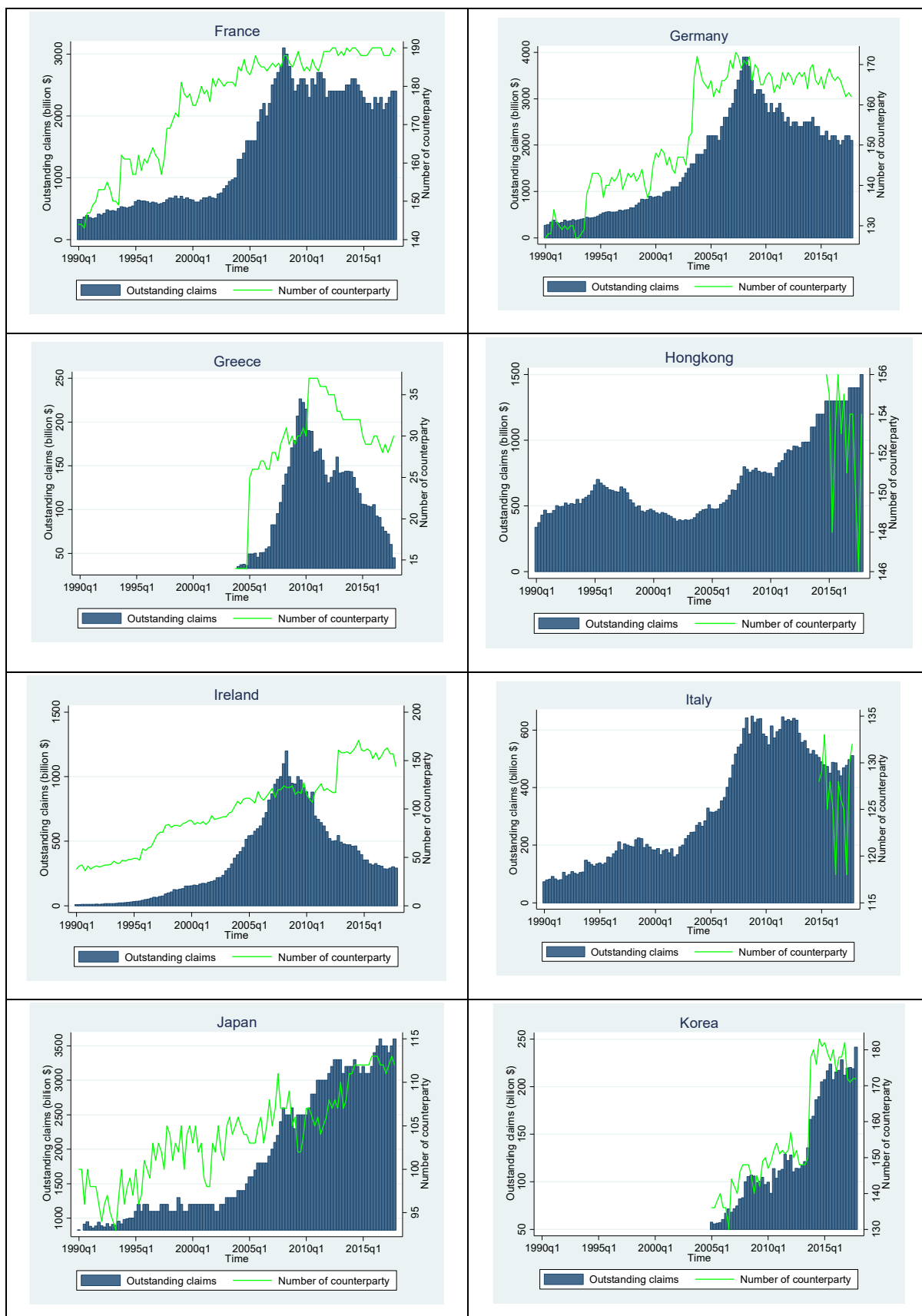
Table A4: Impact of financial position on other investment: panel probit regression

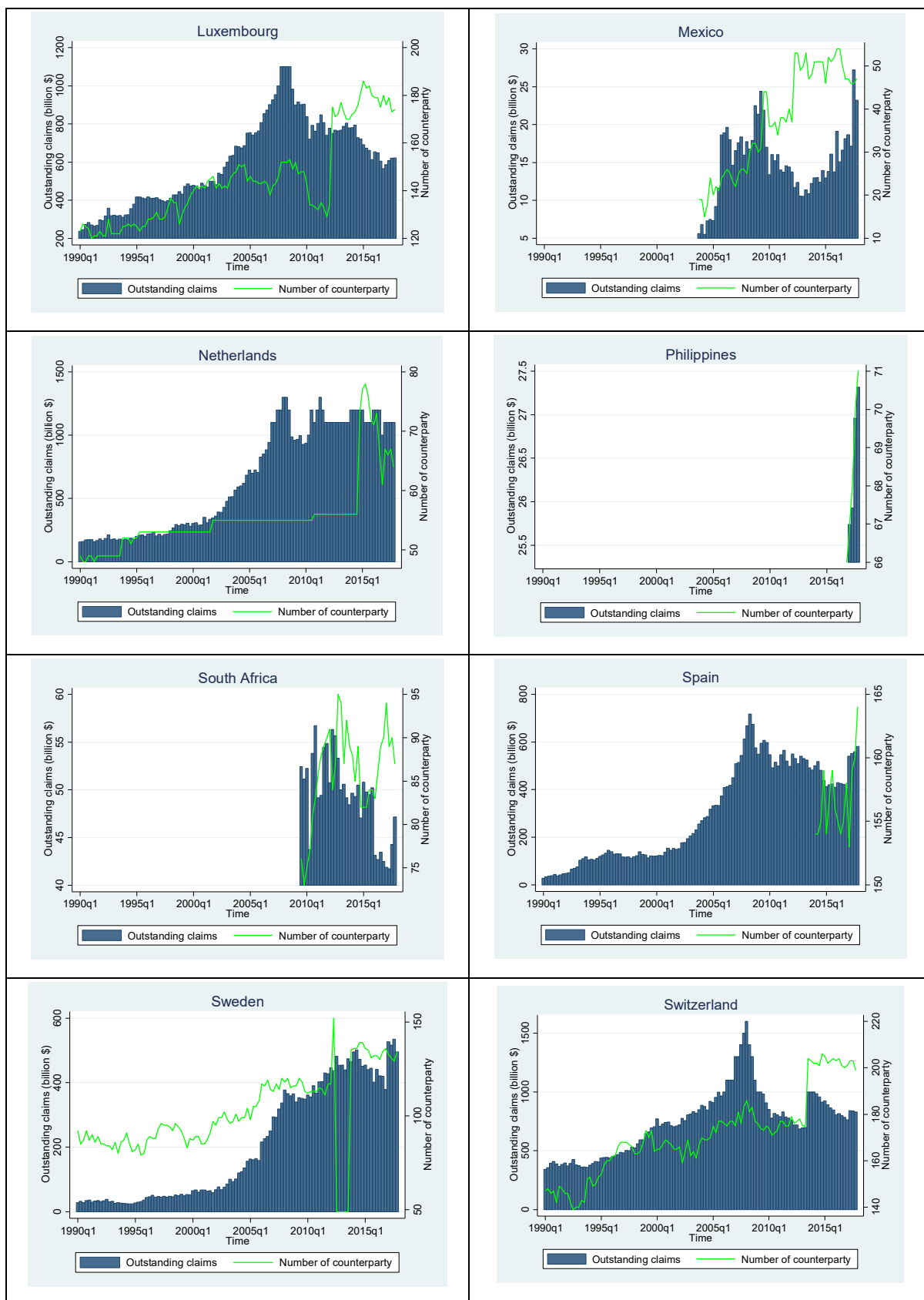
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial position									
Claims	0.0441 (0.65)	-0.0634 (-0.49)	1.311*** (3.36)	0.0663 (0.96)	0.0443 (0.65)	0.0420 (0.62)	0.0589 (0.85)	0.0361 (0.52)	1.309*** (3.36)
Claims square			-0.189*** (-3.29)						-0.189*** (-3.29)
Global factors									
S&P 500	0.00123 (0.16)	0.00201 (0.18)	0.00209 (0.27)	-0.000724 (-0.10)	0.00147 (0.19)	0.000527 (0.07)	0.000907 (0.12)	-0.00205 (-0.26)	0.00208 (0.27)
VIX	0.000877 (0.42)	0.00212 (0.86)	0.000722 (0.35)	0.000994 (0.48)	0.000839 (0.40)	0.000609 (0.29)	0.000696 (0.34)	0.000494 (0.24)	0.000728 (0.35)
3M T-bill rate	0.0529** (2.21)		0.0604** (2.50)	0.0554** (2.35)	0.0528** (2.20)	0.0559** (2.33)	0.0537** (2.24)	0.0610** (2.46)	0.0604** (2.49)
TIPS rate		0.457*** (5.20)							
Money supply	-0.00173 (-0.19)	-0.00457 (-0.34)	-0.00587 (-0.65)	0.00188 (0.21)	-0.00268 (-0.23)	-0.00302 (-0.26)	-0.00103 (-0.12)	-0.000735 (-0.08)	-0.00587 (-0.65)
Domestic factors									
Real GDP	-0.0941** (-2.24)	-0.0915* (-1.76)	-0.0896** (-2.11)		-0.0942** (-2.24)	-0.0951** (-2.25)	-0.0936** (-2.22)	-0.0838* (-1.87)	-0.0894** (-2.11)
GDP per capita				-0.0605*** (-3.50)					
Interest rate	-0.00221 (-0.15)	-0.0491* (-1.72)	0.00421 (0.28)	-0.00445 (-0.31)	-0.00209 (-0.14)	-0.00358 (-0.25)	0.00224 (0.15)	-0.0118 (-0.72)	0.00423 (0.28)
Credit to private sector/GDP	0.00844 (0.41)	-0.0484* (-1.73)	0.00657 (0.32)	0.0115 (0.55)	0.00638 (0.31)	0.00794 (0.38)	0.00742 (0.36)	0.00240 (0.11)	0.00652 (0.31)
Net capital flow/GDP	-0.00120 (-0.14)	0.00282 (0.24)	-0.00179 (-0.20)	-0.000580 (-0.07)	-0.00109 (-0.12)	-0.00158 (-0.18)	-0.00132 (-0.15)	-0.00278 (-0.31)	
REER	0.0127 (0.97)	0.0298 (1.64)	0.0121 (0.92)	0.0247* (1.83)			0.0122 (0.93)	0.0118 (0.87)	0.0120 (0.91)
Exchange rate					-0.00293 (-0.28)	0.00209 (0.20)			
International reserve assets						0.0137*** (3.58)			
CPI	0.0149 (0.30)	0.0400 (0.61)	0.00163 (0.03)	0.00239 (0.05)	0.0146 (0.29)	0.0155 (0.31)			0.00162 (0.03)
GDP deflator							-0.0421 (-0.94)		
Residential property price								0.00672 (0.39)	
Constant	-1.255*** (-5.03)	-1.534*** (-2.94)	-3.291*** (-4.93)	-1.317*** (-5.24)	-1.253*** (-5.02)	-1.277*** (-5.12)	-1.286*** (-5.09)	-1.203*** (-4.68)	-3.289*** (-4.92)
Observations	2,074	1,320	2,074	2,050	2,074	2,074	2,071	1,989	2,074

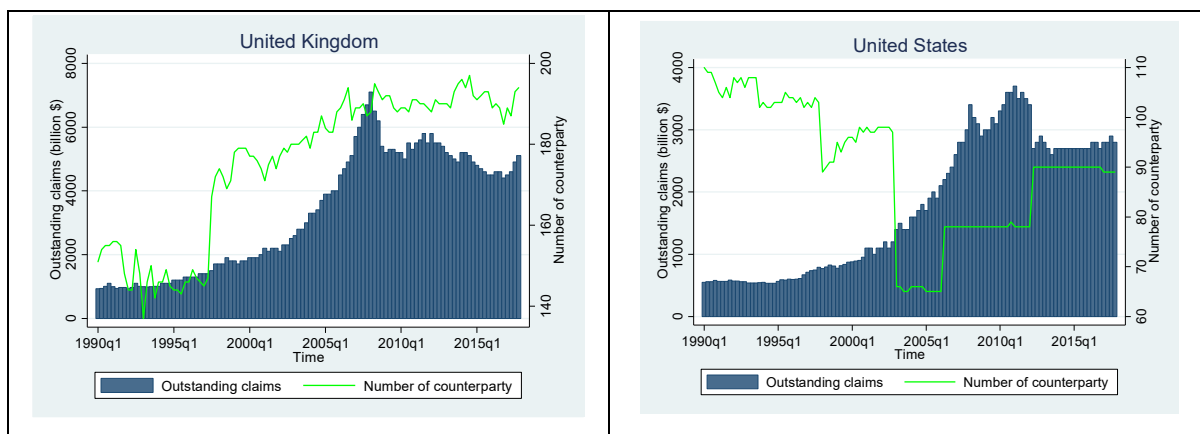
Notes: Dependent variables were divided by 1,000 to make the coefficients of the variables easier to recognize. *t* or *z* statistics in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A1: Outstanding claims and number of counterparty for sample countries



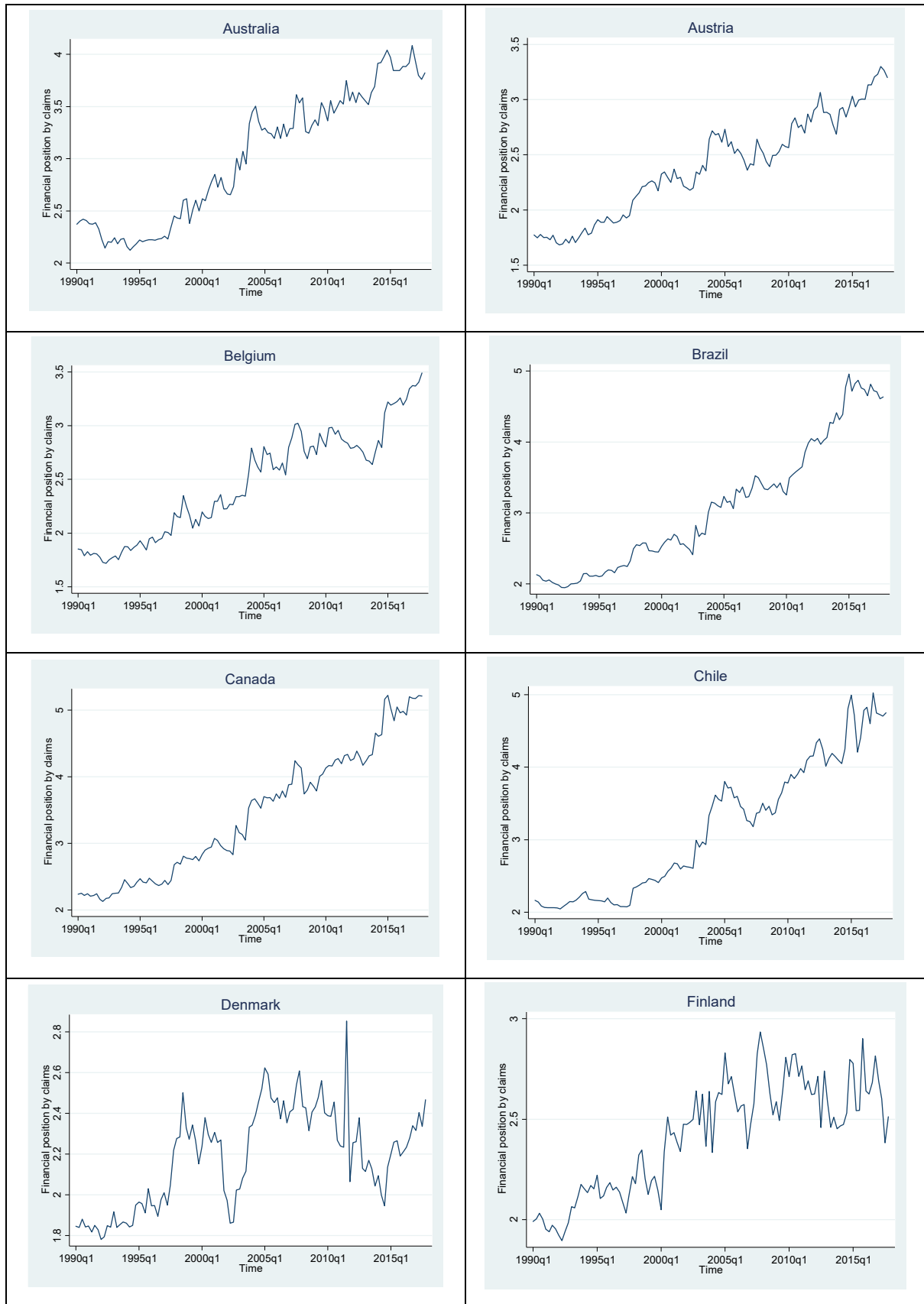




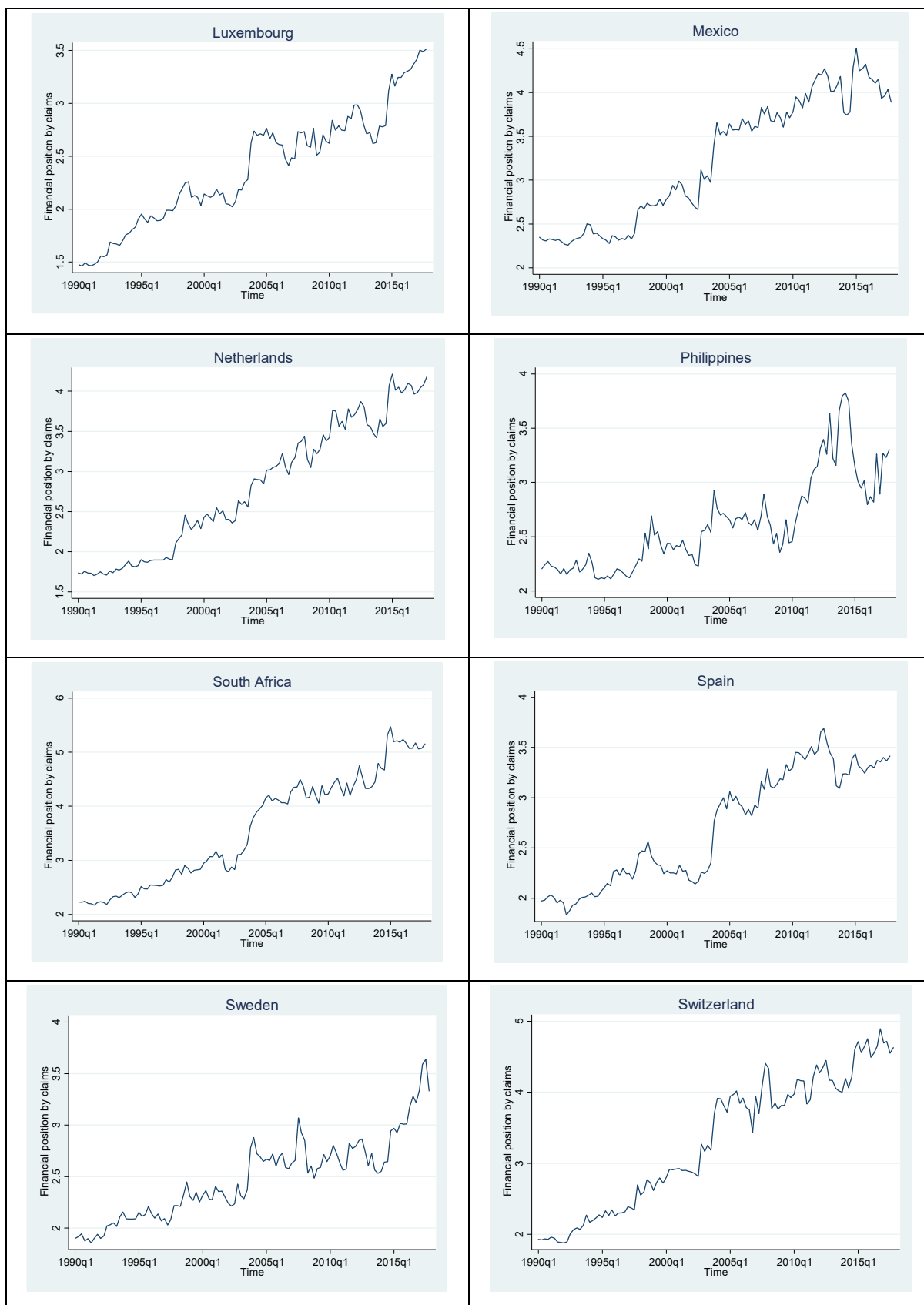


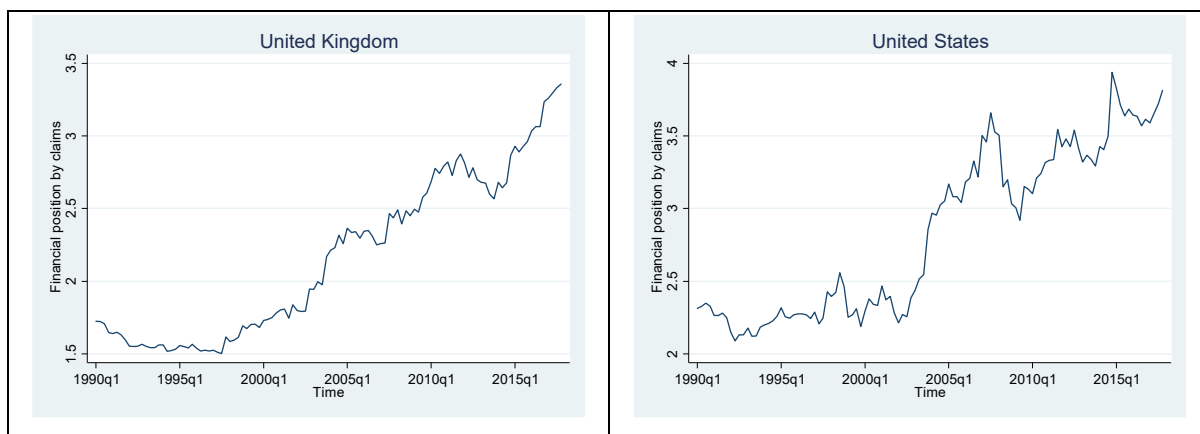
Source: BIS-IBS

Figure A2: Trend of financial position for sample countries









Source: Authors' calculation based on BIS-IBS