Economics Bulletin

Volume 37, Issue 2

Domestic Credit Growth, International Capital Inflows, and Risk Perception in Global Markets

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Abstract

This study explores the interaction among credit growth, capital inflows, and risk perception in global markets. An empirical analysis reveals that capital inflows, especially cross-border bank inflows, and risk perception in global markets are key drivers of credit growth in developed countries, whereas country-specific factors mainly have ambiguous effects. The results indicate that cross-border banking contributed toward excess credit creation and its bust, especially in the late 2000s. Moreover, they also indicate that the effects of the US financial and monetary conditions are transmitted to developed countries through cross-border capital transactions and risk perceptions.

I appreciate Shumpei Takemori, Kazuhito Ikeo, Yasuo Maeda, and Masaya Sakuragawa of Keio University for their valuable comments. I also thank an anonymous referee for helpful comments.
Citation: Satoshi Tobe, (2017) "Domestic Credit Growth, International Capital Inflows, and Risk Perception in Global Markets", *Economics Bulletin*, Volume 37, Issue 2, pages 631-636
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Submitted: February 01, 2017. **Published:** April 09, 2017.

1. Introduction

Fluctuations in domestic credit have been co-moving across countries in recent decades (Rey, 2013; Passari and Rey, 2015). Moreover, these fluctuations, especially large upswings before the 2008 financial crisis, generally coincide with neither strong output growth nor high inflation in developed countries (Hume and Sentance, 2009). To reveal the factors that contribute to these co-movements and fluctuations, this study explores the interaction among credit growth, capital inflows, and risk perception in global markets. Most importantly, empirical analysis reveals that cross-border banking and global risk perception are the key drivers of credit growth, whereas country-specific factors tend to have ambiguous effects.

This study relates to the following three extant studies; however, it simultaneously exhibits noticeable differences from each. First, Rey (2013) explores the co-movements of domestic credit, capital inflows, and leverage of financial intermediaries and shows that the co-movements are closely linked to risk perceptions in global markets by performing a vector autoregression (VAR) analysis. Thus, the study focuses on a similar set of variables to those included herein. However, Rey uses global aggregated data, so the analysis insufficiently deals with country-specific domestic factors, although these factors expectedly affect capital inflows and credit growth in each county.

Second, Bruno and Shin (2015a) explore the interaction between the global banking system and credit creation. Although they emphasize that the leverage of the US financial intermediaries and cross-border bank inflows are key drivers of credit growth, their empirical analysis does not directly investigate the interaction between the inflows and credit growth. Additionally, in focusing on banking-sector data, the analysis may miss the effects of total capital inflows on domestic credit.

Finally, Lane and McQuade (2014) explore the relationship between medium-term variation in capital inflows and that of credit growth using cross-country data. However, they do not investigate the short-term covariation between these two variables. According to the study, this is likely to be challenging because capital flows are relatively volatile, whereas credit growth tends to be more stable and persistent in higher frequency data.

This study seeks to address these gaps using panel instrumental variable (IV) regression methodology. The use of panel data enables us to explore the effects of both country-specific factors (e.g., short-term interest rates) and global factors (e.g., risk perceptions in global markets) on credit growth in each country. Furthermore, the method not only reduces endogeneity concerns between capital inflows and credit growth but also enables us to jointly estimate the determinants of capital inflows and credit growth; this helps in understanding the interaction among key factors that have contributed toward the global boom-bust cycles in the recent decades.

The remainder of this study is structured as follows: Section 2 describes materials and methods, Section 3 presents results and discussions, and Section 4 concludes.

2. Material and Methods

This study performs a panel IV regression that involve growth of total credit to the private nonfinancial sector ($\Delta Credit$) and gross capital inflows ($Inflow$) as the dependent and endogenous variables, respectively.[1] The IV method requires the use of instruments that

[1] Throughout this study, data on capital inflows are divided by external liability to avoid undesirable effects of outliers that undertake large cross-border capital transactions relative to the scale of their real economy (e.g., Ireland and Switzerland). Results hold true even when inflows are normalized relative to GDP. In that case, however, F-statistics in the first-stage regressions often decrease below 10, which raises concerns with regard to weak instruments. Trimming outliers by winsorizing cannot fully resolve this problem.

affect the endogenous variables but are not related to variations in the dependent variable. The models contain one of the two instruments described below.

The first instrument is global leverage (lagged level and current growth denoted as *Global_Lev* and *ΔGlobal_Lev*, respectively), which is defined as the ratio of assets over equity of the US broker-dealers. Bruno and Shin (2015a) find that global leverage is the key driver of capital inflows. This is because the US financial institutions finance themselves using wholesale funding and channel their liquidity to all other countries. However, the leverage may be irrelevant to credit growth in a particular country because the US broker-dealers are not the direct suppliers of credit to local agents in most cases.

The second instrument is global flow (*Global_Flow*), which is defined as the sample sum of gross capital inflows excluding the inflows to the country under consideration, following Blanchard et al. (2015). Considering the findings in Rey (2013), global flow can be correlated with gross inflows to each country because gross flows co-move at the global level. However, it is clear that global flow is irrelevant to the variations within the country under consideration because data pertaining to the country under consideration are excluded from the flow.

Empirically, the effects of these instruments on endogenous variables may vary across countries. Thus, for some specifications, the models contain interaction terms of the instruments with country-specific dummies as the alternative set of instruments. These specifications may be less restrictive on the sensitivity of the endogenous variables to the instruments.

Moreover, following Bruno and Shin (2015a) and Agrippino and Rey (2013), the models also contain the following control variables: lagged level and current growth of the CBOE Volatility Index (VIX) as a proxy for risk perception in global markets (*VIX* and *ΔVIX*, respectively), local stock market volatility as a proxy of country-specific risk factor (*Stock_Vol*), change in short-term interest rates (*ΔShort_Rate*), GDP growth rate (*ΔGDP*), inflation rate (*Inflation*), and change in real effective exchange rates (*ΔREER*). Appendix A provides further details on these variables. All controls, except the growth of VIX, are lagged by one-quarter. Finally, the sample comprises quarterly data spanning the 1990Q1–2015Q3 period and 22 developed countries as listed in Appendix B.

3. Results and Discussion

Table I presents results pertaining to six panel regression models. Models 1, 3, and 5 (Models 2, 4, and 6) use global leverage (global flow) as instruments. Columns (1) and (2) show the results of the first- and second-stage regressions of Model 1, respectively.

In the first stage, global leverage (lagged level and current growth) is positively correlated with capital inflows at the 1 percent significance level, which is consistent with Bruno and Shin (2015a). As for controls, coefficient for short-term interest rate is positively significant, which is consistent with intuitions on uncovered interest parity. Further, coefficients for GDP growth rate and inflation are also positively significant, implying pro-cyclicality of capital inflows.

In the second stage, capital inflows are positively correlated with credit growth at the 1 percent significance level. This indicates that the inflows contribute toward credit creation. Moreover, VIX (current growth) is negatively correlated with credit. This result indicates that risk perception in global markets is also a key driver of credit growth. In contrast, the coefficients of country-specific factors are insignificant, except for the short-term interest rate, which implies that credit growth is not strongly supported by a country's domestic conditions.

The results are similar when global flow is included as an instrument instead of global leverage (Model 2). As shown in column (3), global flow is positively correlated with capital inflows, which indicates that capital inflows co-move across the sampled countries. Moreover,

coefficient for GDP growth rate remains positive and significant although coefficients for short-term interest rate and inflation lose their significance. Similarly, column (4) indicates that the signs of coefficients for the capital inflows and VIX remain unchanged, and are significant. In this model, coefficient for GDP growth rate becomes positive and significant in the second stage, but the result is not robust as shown in the other models. In addition, the principal results are maintained when the models contain a lagged dependent variable (Models 3 and 4) or use the interaction terms described in the last section as instruments (Models 5 and 6).[2]

Table I. Panel Regression Results (I)

	Model 1		Model 2		Model 3		Model 4		Model 5	Model 6
	1st stage $Inflow_t$	2nd stage $\Delta Credit_t$	1st stage $Inflow_t$	2nd stage $\Delta Credit_t$	1st stage $Inflow_t$	2nd stage $\Delta Credit_t$	1st stage $Inflow_t$	2nd stage $\Delta Credit_t$	2nd stage $\Delta Credit_t$	2nd stage $\Delta Credit_t$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Endogenous var.										
$Inflow_t$		0.553***		0.189***		0.568***		0.164***	0.368***	0.174***
		(0.075)		(0.042)		(0.083)		(0.040)	(0.048)	(0.034)
Instruments										
$Global\_Lev_{t-1}$	0.084***				0.078***					
	(0.013)				(0.013)					
$\Delta Global\_Lev_t$	0.217***				0.205***					
	(0.035)				(0.035)					
$Global\_Flow_t$			0.730***				0.701***			
			(0.097)				(0.103)			
Control var.										
VIX_{t-1}	0.004	0.005	0.006	0.000	0.003	0.005	0.005	0.000	0.002	0.000
	(0.008)	(0.004)	(0.009)	(0.004)	(0.007)	(0.004)	(0.008)	(0.004)	(0.004)	(0.004)
ΔVIX_t	0.003	-0.013*	0.006	-0.014**	0.002	-0.013*	0.005	-0.014**	-0.013**	-0.014**
	(0.007)	(0.006)	(0.008)	(0.006)	(0.007)	(0.006)	(0.008)	(0.006)	(0.006)	(0.006)
$Stock\_Vol_{t-1}$	-0.001	0.000	-0.001	0.000	-0.002	0.001	-0.002	-0.001	0.000	0.000
	(0.005)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
$\Delta Short\_Rate_{t-1}$	0.629**	-1.175***	0.272	-0.933***	0.497*	-1.156***	0.174	-0.988***	-1.052***	-0.923***
	(0.276)	(0.220)	(0.301)	(0.188)	(0.285)	(0.227)	(0.297)	(0.198)	(0.195)	(0.190)
ΔGDP_{t-1}	0.849***	-0.083	0.535*	0.425**	0.831***	-0.092	0.520*	0.429**	0.175	0.445**
	(0.266)	(0.224)	(0.264)	(0.202)	(0.264)	(0.227)	(0.258)	(0.196)	(0.210)	(0.198)
$Inflation_{t-1}$	0.640*	-0.168	0.628	0.231	0.598*	-0.168	0.586	0.220	0.034	0.247
	(0.333)	(0.236)	(0.388)	(0.171)	(0.346)	(0.243)	(0.394)	(0.166)	(0.187)	(0.167)
$\Delta REER_{t-1}$	0.026	0.008	0.039	0.021	-0.129	0.041	-0.089	-0.059	0.014	0.021
	(0.069)	(0.056)	(0.063)	(0.043)	(0.079)	(0.071)	(0.081)	(0.049)	(0.049)	(0.043)
$\Delta Credit_{t-1}$					0.144***	-0.031	0.119**	0.075***		
					(0.041)	(0.033)	(0.047)	(0.023)		
Constant	-0.238***	-0.039***	-0.002	-0.003	-0.214***	-0.041***	0.000	-0.001	-0.021**	-0.002
	(0..051)	(0.012)	(0.025)	(0.009)	(0.053)	(0.012)	(0.026)	(0.009)	(0.010)	(0.010)
Fixed effect	Yes		Yes		Yes		Yes		Yes	Yes
F-stat	11.04	-	13.58	-	15.25	-	21.43	-	-	-
Wald χ^2	-	115.45	-	103.93	-	119.33	-	125.79	97.37	150.14
Sargan-Hansen	0.104		-		0.123		-		74.397	18.681
(p-value)	(0.747)				(0.725)				(0.002)	(0.605)
R^2	0.128	0.005	0.183	0.015	0.134	0.004	0.187	0.020	0.007	0.016
Observation	1846		1846		1846		1846		1846	1846
# Country	22		22		22		22		22	22

Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively. Model 5 uses interaction terms of global leverage with country-specific dummies as instruments. Model 6 uses interaction terms of global flow with country-specific dummies as instruments.

[2] The results of the first stage are omitted because of space constraints.

Table II. Panel Regression Results (II)

	Model 7		Model 8		Model 9			Model 10		
	1st stage $Bank_t$	2nd stage $\Delta Credit_t$	1st stage $Bank_t$	2nd stage $\Delta Credit_t$	1st stage $Bank_t$	1st stage Non_bank_t	2nd stage $\Delta Credit_t$	1st stage $Bank_t$	1st stage Non_bank_t	2nd stage $\Delta Credit_t$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Endogenous var.										
$Bank_t$		0.552***		0.527***			0.727***			0.707***
		(0.100)		(0.106)			(0.202)			(0.210)
Non_bank_t							-0.266			-0.273
							(0.179)			(0.172)
Instruments										
$Global\_Bank_t$	0.573***		0.539***		0.482***	0.221**		0.457***	0.212**	
	(0.093)		(0.101)		(0.079)	(0.084)		(0.085)	(0.085)	
$Global\_Nonbank_t$					0.221***	0.529***		0.203***	0.522***	
					(0.063)	(0.096)		(0.063)	(0.098)	
Control var.										
VIX_{t-1}	0.001	0.000	0.001	0.000	0.004	0.002	-0.002	0.004	0.002	-0.002
	(0.006)	(0.004)	(0.198)	(0.004)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)
ΔVIX_t	0.002	-0.015**	0.001	-0.015**	0.005	0.001	-0.021***	0.005	0.000	-0.021***
	(0.004)	(0.006)	(0.006)	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
$Stock\_Vol_{t-1}$	-0.006*	0.004	0.001	0.003	-0.006*	0.004	0.006	-0.007**	0.004	0.005
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)
$\Delta Short\_Rate_{t-1}$	-0.050	-0.855***	-0.110	-0.881***	-0.139	0.418	-0.710***	-0.210	0.392	-0.742***
	(0.142)	(0.174)	(0.152)	(0.170)	(0.124)	(0.280)	(0.169)	(0.125)	(0.278)	(0.172)
ΔGDP_{t-1}	0.515***	0.258	0.496***	0.263	0.439***	0.093	0.247	0.427***	0.089	0.251
	(0.139)	(0.194)	(0.137)	(0.192)	(0.127)	(0.224)	(0.211)	(0.125)	(0.221)	(0.209)
$Inflation_{t-1}$	0.148	0.308*	0.104	0.294	0.029	0.588**	0.553**	-0.003	0.576**	0.542*
	(0.198)	(0.181)	(0.198)	(0.182)	(0.202)	(0.257)	(0.281)	(0.206)	(0.256)	(0.281)
$\Delta REER_{t-1}$	0.129**	-0.059	0.032	-0.096	0.130*	-0.090	-0.093	0.035	-0.124	-0.135
	(0.062)	(0.061)	(0.056)	(0.066)	(0.063)	(0.073)	(0.096)	(0.060)	(0.084)	(0.089)
$\Delta Credit_{t-1}$			0.087**	0.036				0.087**	0.032	0.039
			(0.033)	(0.029)				(0.032)	(0.033)	(0.037)
Constant	0.005	0.000	0.006	0.000	-0.012	0.009	0.015	-0.010	0.009	0.016
	(0.016)	(0.008)	(0.016)	(0.008)	(0.018)	(0.017)	(0.014)	(0.018)	(0.017)	(0.014)
Fixed effect	Yes		Yes			Yes			Yes	
F-stat	15.39	-	34.39	-	13.04	8.36	-	25.88	10.45	-
Wald χ^2	-	86.18	-	132.76	-	-	90.54	-	-	158.64
Sargan-Hansen (p-value)	-		-			-			-	
R^2	0.100	0.025	0.105	0.026	0.118	0.092	0.021	0.123	0.093	0.023
Observation	1940		1940			1846			1846	
# Country	22		22			22			22	

Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.

To investigate the role of cross-border banking on credit growth, we consider models in which total capital inflows are split into cross-border bank inflows (*Bank*) and other inflows (*Non_bank*). Model 7–10 use the sample sum of each inflow (*Global_Bank* and *Global_Nonbank*) as instruments. These new instruments are constructed using the methodology described in the previous section. Further details are provided in Appendix A.

Table II presents results pertaining to four additional models. In the first stage, instruments and controls have largely performed well. Coefficients for global flows and GDP growth on cross-border bank inflows are positively significant in all specifications. In Models 7, 9, and 10, coefficients for local stock market volatility on cross-border bank inflows become negatively significant, implying that a country-specific risk factor affects the bank inflows. Further, coefficients for exchange rate on cross-border bank inflows are positively significant in Models 7 and 9, as also revealed in Bruno and Shin (2015a).

In the second stage, coefficients for cross-border bank inflows are positively significant in all specifications, whereas those of non-bank inflows are negative and insignificant (Model 9

and 10). These results indicate that cross-border banking contributed to credit creation in the developed countries. In addition, coefficients for change in VIX remain negatively significant in all specifications. As for controls, GDP growth still appears to have an ambiguous effect on credit, although coefficients for inflation become positively significant in 3 out of 4 models. Coefficient for short-term interest rate remain negative and significant in all specifications. Finally, the results hold true even when (1) the analysis uses yearly change (compared to previous year) data instead of quarterly change data, (2) the specifications include a linear trend, and (3) the analysis uses total bank credit to the private nonfinancial sector as a dependent variable (Appendix C).[3]

4. Conclusion

This article explores the interaction among credit growth, capital inflows, and risk perception in global markets. The empirical analysis yields the following key results: (1) capital inflows are closely linked to the leverage of the US financial intermediaries and co-move across developed countries, (2) increases in capital inflows, especially cross-border bank inflows, and an easing of risk perception in global markets induce higher credit growth, and (3) country-specific factors tend to have ambiguous effects on domestic credit. These results reveal that cross-border banking and global risk perception are key drivers of credit growth in each country.

Overall, the results support the notion that the global banking system facilitated the creation of excess credit and its bust in the late 2000s (e.g., Borio and Disyatat, 2011; Shin, 2012). Additionally, considering that the leverage of the US financial intermediaries and VIX are closely tied with federal fund rate shocks (e.g., Rey, 2013; Bruno and Shin, 2015b), the findings of this article indicate that the effects of the US financial and monetary conditions are transmitted to developed countries through cross-border capital transaction and risk perceptions in the global markets.

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[3] Results also hold true when the specifications include country-specific linear trends (available on request).

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