

Short-Term International Capital Flows: Empirical Evidence from China

(Aliran Keluar Modal Antarabangsa Jangka Pendek: Bukti Empirikal dari China)

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ABSTRACT

The present study investigates the dynamic relationship between short-term international capital flows and macroeconomic variables in China from 1999 until 2011. Employing the bounds test, autoregressive distributed lag (ARDL) model and Granger causality tests, the results show that interest rate differentials and real estate prices are the main driving forces for short-term international capital movements. The Granger causality test indicates that interest rate differentials and exchange rates Granger cause the short-term international capital flows of China in the short run; while bidirectional causal relationships are found among short-term international capital flows and interest rate differentials; effective exchange rates; stock prices; and real estate prices in the long run.

Keywords: Short-term international capital flows; bound test; ARDL; Granger causality test

ABSTRAK

Kajian ini meneliti kewujudan hubungan dinamik antara aliran modal antarabangsa jangka pendek dengan pemboleh ubah makro ekonomi di China berdasarkan data dari tahun 1999 hingga 2011. Dengan menggunakan ujian Batas, model Autoregresif Lat Teragih (ARDL) dan ujian penyebab Granger, hasil kajian mendapati bahawa dalam jangka masa panjang, perbezaan kadar faedah dan harga hartanah adalah pemacu kepada aliran modal antarabangsa jangka pendek. Keputusan ujian penyebab Granger menunjukkan dalam jangka masa pendek, perbezaan kadar faedah dan kadar pertukaran adalah penyebab Granger kepada aliran modal antarabangsa. Sebaliknya, dalam jangka masa panjang, wujud hubungan penyebab Granger dua hala antara aliran modal antarabangsa jangka pendek dengan pemboleh ubah perbezaan kadar faedah, kadar pertukaran berkesan, harga saham dan harga hartanah.

Kata kunci: Aliran keluar modal antarabangsa jangka pendek; ujian batas; ARDL; ujian penyebab Granger

INTRODUCTION

Short-term international capital refers to the flow of speculative funds or capital from one country to another with the principal ambition of earning a short term profit on interest rate differences and/or anticipated exchange rate shifts (Chari & Kehoe 2003). Along with economic globalization and financial liberalization, international capital is taking on an increasingly accelerating trend and playing a more prominent role in today's world economy. China is the world's second largest economy after the United States and is the world's major fastest-growing economy with growth rates averaging 10% over the past 30 years since the implementation of reform and open policy. The rapidly growing China's economy catches investors globally, while brings extensive benefits to its economy but puts financial markets stability at risk in the past decades as well.

Despite recent capital market liberalizations in China, short-term international capital flows are still strictly restricted and portfolio investments are constrained, providing it with various instruments to prevent the inflow of unwanted hot money (Zhang 2003). However, China is not fully insulated from short-term international capital

flows as capital controls are not applied to all categories of capital account transactions and several of them are free or loosely managed. As of the end of March 2011, the foreign exchange reserves of China held US\$3.0447 trillion, making it the largest foreign exchange reserve in the world and far exceeded the holdings of the next largest holder (Japan with around US\$1 trillion). The deduction of investment income and reserves still leaves an unexplained residual of US\$214 billion and trade surplus and foreign direct investment (FDI) in China are expected to partially explain this. According to the report from People's Bank of China, China received up to an estimated US\$168 billion in hot money in 2011. This amount far exceeds the level that has previously been experienced by any emerging economy.

The Chinese government has begun to relaxing controls after more than a decade of tight capital controls on foreign investors investing money in The Chinese stock market and other financial investments. To be more specific, the State Administration of Foreign Exchange (SAFE) in China is losing its control over the Qualified Foreign Institutional Investor (QFII) program, which allows overseas institutions to invest in the Chinese share market. Meanwhile, in the past few years, the effervescent

Chinese real estate market has been surging rapidly. The Chinese real estate sector, the pre-eminent driver of Chinese economic growth, is in recovery mode as developers cut prices and local city governments begin to ease real estate regulations (Shen et al. 2012). Real estate accounted for 12.4 percent of the total output of China in 2012. Real estate investment, as a share of gross domestic product (GDP), edged up to 13.8 percent last year from 13 percent in 2011. On the other hand, fluctuations in exchange rates also change the situation of short-term foreign capital flows in China. On 21 July 2005, after more than a decade of strictly pegging the Chinese Renminbi (RMB) to the US dollar at an exchange rate of 8.28, the People's Bank of China announced the adoption of a managed floating exchange rate regime based upon market supply and demand, under which the exchange rate of the RMB would be managed in relation to a basket of currencies. The revaluation puts the RMB at 8.11 against the dollar, which amounts to an appreciation of 2.1 percent.

The short-term international capital inflow is regarded to have fueled inflation; driven up stock prices; and accelerated worrisome bubbles in the real estate market. Short-term international capital flows would create an enormous volatility in the financial market in China due to the short-term nature of investing. Therefore, a sophisticated and well-organized stock market would attract more foreign capital into China and promote the utilization of foreign investment. As the mirror of the Chinese macro economy and a constituent part of global stock market, the Chinese stock market has a far greater impact on the global economy as well. Similarly, it is important to establish a complete foreign exchange control system to promote the development of real estate market, while utilizing foreign capital reasonably; and maintaining steady and rapid economic growth in China.

By making a careful observation of the 1982 Latin American debt crisis; Mexico's financial crisis in 1994; and the Asian financial crisis in 1997, it is noticed that a most remarkable common thread is the significant amounts of international capital flowing into the capital markets of the countries affected before the crises hit. A huge short-term international capital inflow is bound to generate a rapid rise in commodity prices and the economic growth in such countries would moderate and cause the current account imbalances to grow even larger. In the meantime, the expected devaluation would certainly cause panic in financial markets and speculators would probably launch an attack on the foreign exchange rate. The following drastic fall in the value of the currency would cause a financial crisis to erupt ultimately.

For developing countries, short-term foreign capital movements are essential for the national economy to compensate for the deficiency of the capital and promote closer economic integration with the world. However, how to avoid risks brought by the capital inflow is still a trouble placed before such countries. As the world's largest developing country, the experiences and policy

implications in China relating to economic growth when using short-term international capital flows could serve a learning aid for other developing countries. The transformation of the Chinese capital market may also provide meaningful insights for other developing countries. Meanwhile, China also confronts lots of unforeseeable dangers for its economy, which is highly reliant on external trade and business. The results obtained herein may provide suggestions for governments and regulators to control the short-term foreign capital, as well as offer some hints for promoting stable economic development to other developing countries. Therefore, research on this issue is necessary and imperative.

Zhang et al. (2007) set up an arbitrage model of interest rates and foreign exchange rates. The empirical results indicate that both variables have strong effects on the short-term international capital flows of China. The interest rate spreads and exchange rates are inevitably the main indicators that explain short-term international capital flows. Generally, from basic economic theory, the great profit potential in the stock market and property market will attract foreign capital inflow. The enormous amount of foreign capital entering the property market and stock market may push the price of the subject matter.

The organization of the paper is as follows. Firstly, the theoretical framework is explained and a literature review concerning short-term international capital flows is performed. The following section outlines the empirical approach adopted in the present study, which employs the bounds test and autoregressive distributed lag (ARDL) model to examine determinants of China's short-term international capital flows by using a time series data set of the short-term international capital flows and relevant economic variables of China over the period of 1999-2011. Next, the analysis, evaluation and discussion of the results are presented. Finally, the conclusion and policy implications are provided based upon the results obtained.

THEORETICAL FRAMEWORK

The Mundell-Fleming model is an economic model first established by Mundell (1963) and Fleming (1962). The model is an extension of the investment-saving/liquidity preference-money supply (IS-LM) model. The Mundell-Fleming model is based on the following equations:

$$\text{IS curve: } Y = C + I + G + NX; \text{ and}$$

$$\text{LM curve: } \frac{M}{P} = L(i, Y)$$

where Y is GDP; C is consumption; I is physical investment; G is government spending; NX is net exports; M is the nominal money supply; P is the price level; L is the liquidity preference; and i is the nominal interest rate. A higher interest rate or a lower income (GDP) level leads to lower money demand.

While the traditional IS-LM model deals with economy under autarky (or a closed economy), the Mundell-Fleming model tries to describe an open economy. Typically, the Mundell-Fleming model portrays the relationship between the nominal exchange rate and an economy's output (unlike the relationship between interest rate and the output in the IS-LM model) in the short run. The Mundell-Fleming model has been used to argue that an economy cannot simultaneously maintain a fixed exchange rate; free capital movement; and an independent monetary policy. Based upon the Mundell-Fleming model, which is an extension of interest rate parity theory, the risk reward of arbitrage capital flows are defined as follows:

$$P = r_d - r_f - \Delta E$$

where P denotes risk reward pursued by arbitrage capital flows; r_d denotes domestic interest rates; r_f denotes foreign interest rates; and ΔE denotes a static expected exchange rate.

The model indicates that the risk reward can be divided into two parts. One part is interest difference since short-term capital always flows from countries with lower interest to higher ones. Another part is reward from expected fluctuations in the exchange rate. The mechanism of risk reward shows that the expectation of currency appreciation brings about short-term capital inflows, and vice versa. In light of the Mundell-Fleming model, the costs of short-term capital flows in China are high. Therefore, the real interest difference, which has been adjusted for inflation, must be considered. The fluctuations of exchange rate may be another important driving factor because the expectation of Chinese RMB appreciation has existed since 2002, which may induce capital flow. Short-term capital is supposed to aim at appreciating real assets and revenue on portfolio investment in China for it is undergoing economic transformation. Real estate prices and circulated stock values listed on Shanghai stock markets are adopted in the present study as 'push factors' proxies (Yang et al. 2009).

LITERATURE REVIEW

Obstfeld (1994) believes that capital flows can spread the investment risks; and promote the specialization of production and reasonable distribution of capital in the markets of the developing countries. Bosworth and Collins (1999) study 20 developing countries with capital inflow using multi-variance analysis and find that FDI has a strong influence on the financial market of capital importation. However, Alejandro (1999) points out that exclusive foreign capital inflow may cause money creation; exchange rate depreciation and inflation; and the international short-term capital flows would probably impede economic development.

Wang (2003) performs a regressing analysis on the foreign exchange settlement and sales business of China from June 1999 to May 2002 using the least squares method and the empirical results demonstrate that the capital inflow is greatly influenced by short-term assets yield during this period. Li et al. (2003) measure the capital volatility coefficients and find that foreign loans and portfolio investments are more sensitive to the volatility of international short-term capital flows than FDI, so the effects of the two factors are more crucial to the real economy of China.

To examine the determinants of short-term international capital flows in China, Wang (2006) proposes an influencing factor model for the international capital flows of China and insists that Chinese capital movements are mainly affected by interest rates; foreign exchange rates; inflation rates; and the Chinese economic reform. Song and Gao (2007) develop an error correction model (ECM) using the quarterly data concerning the disbursement of foreign capital and real estate prices from 1999 to 2006 in consideration of continued inflation. The Granger causality test indicates that an increase in housing prices results in inflow of foreign capital in the short run, while the inflow of foreign capital has an effect on the increase in housing prices. Therefore, Song and Gao (2007) suggest that it is advantageous for China to maintain the stability of housing prices by controlling the excessive inflow of foreign capital under the current circumstances.

MODEL AND DATA

The present study proposes an extension of Mundell-Fleming model to explain the short-term international capital flows of China as below:

$$InSCF = f(DUM_{0507}, IRD, InEER, InSP, InREP) \quad (1)$$

where SCF denotes international short-term capital flows; DUM_{0507} is the dummy variable; IRD represents interest rate differential; EER represents the effective exchange rate; SP represents stock prices; and the REP represents real estate prices. Quarterly data from the first quarter of 1999 until the fourth quarter of 2011 are utilized in the present study for the following variables.

SHORT-TERM INTERNATIONAL CAPITAL FLOWS (SCF)

In general, academia classifies international long-term capital and short-term capital according to the period for repayment. Short-term international capital means the duration of the international investments or loan is one year and can include marketable securities (short-term investments), short-term loans, bank instruments, foreign exchange bill discount and trade financing. The subsequent empirical analyses are based on short-term international capital data derived from the World Bank residual method (World Bank 1985), which is commonly

adopted in empirical studies. The method assumes that short-term international capital is taken as a residual of four components: an increase in official foreign reserves (IOFR); an increase in external debt (IEB); net foreign direct investment (NFDI); and current account deficit (CAD). Wu and Tang (2000) and Yang and Chen (2000) use the residual method in their estimates of capital flight in China and obtained roughly the same results. The research conducted by Claessens and Naudé (1993) indicates various methodologies that have been used to measure capital flight. The study emphasizes that while alternative methodologies may differ in their approach to measuring capital flight, the identities used in balance of payment (BOP) data make these methodologies close in regards to the final measurement obtained. Data are released by the National Bureau of Statistics (NBS) of China and SAFE. The formula of capital flight (short-term international capital flows, SCF) is described as follows:

$$SCF = IEB + NFDI + CAD - IOFR \quad (2)$$

Because of the negative data of SCF, the present study normalizes the data by using the form

$$SCF_1 = \ln(SCF + \sqrt{SCF^2 + 1})$$

DUMMY VARIABLE

Due to structural change occurring during exchange rate system reform of the RMB performed in July 2005, the present study adds the dummy variable. The present study estimates the dummy variable to be equal to 0 before July 2005 and 1 afterward. If the dummy variable is statistically significant, this indicates that the exchange rate system reform of the RMB had a crucial impact on capital flows. The present study predicts that the change in the exchange rate of the RMB from being pegged to the US Dollar to a floating rate generated a fluctuation of SCF. Consequently, the present study expects the coefficient of the dummy variable to be positive.

INTEREST RATE DIFFERENTIAL (IRD)

The theory of covered interest rate parity (CIRP) provides a means of determining the relationship between the forward rate and the spot rate. One thing to consider is that forward markets only exist between major currencies. However, the same core intuition can be utilized to derive the CIRP, along with the notion that investors in an integrated world economy compare the rate of return in different countries and choose to invest their money in the country that offers the highest rate of return to derive another relationship, this time between the spot rate and the expected spot rate in the future. The relative change in IRD significantly affects SCF and the capital usually flows from a country with low interest

rate to a higher one. The hypothesis is that the wider the spreads of the interest rates between two countries, the larger the amount of short-term international capital that will inflow, all other things being equal. Thus, at the theoretical level, the coefficient of IRD is positive. The present study chooses the China Time Deposit Rate (1 year) as domestic interest rate of China and the US dollar (one-year Federal Funds Rate) as the foreign interest rate. The data is collected directly from Data Stream.

EFFECTIVE EXCHANGE RATE (EER)

Similarly, the appreciation in value of the Chinese RMB also attracts foreign capital inflow for getting profits. An EER is a multilateral rate that measures the overall nominal value of a currency in the foreign exchange market. It is computed by formulating a weighted average (reflecting the importance of each country's currency in international trade) of selected bilateral rates. Hence, the EER of the Chinese RMB is an index that describes the relative strength of RMB relative to a basket of foreign currencies. Therefore, the effect of EER on SCF is expected to be negative. The data is obtained from the statistics of the Bank for International Settlement (BIS).

STOCK PRICE (SP)

The high returns in a stock market are also bound to attract international capital inflows and a foreign capital swarm into the Chinese stock market would push the respective share price. The present study selects SP to analyze the relationship between the securities markets and SCF. Specifically, the study uses the Shanghai Composite Index (SCI) as SP and the data are obtained from the official website of Shanghai Stock Exchange. A high SP is expected to positively affect SCF.

REAL ESTATE PRICE (REP)

Property price also has a positive effect on SCF. To examine the impact between SCF and REP in China, the present study chooses the statistics data of the housing price index after the reform of the real estate market in 1997. The selected data are released by NBS. The impact of REP on SCF is also expected to be positive.

ESTIMATION PROCEDURES

Before conducting the ARDL bounds test, the present study needs to test the stationarity status of all variables to check the order of integration. This is performed to ensure that the variables are not I (2) stationary to avoid spurious results. Therefore, the implementation of unit root tests in the ARDL procedure may still be necessary for the purposes of ensuring that all of the variables are integrated of order 0, 1 or mixed. The study applies the augmented Dickey–Fuller test (Dickey & Fuller 1979) and Phillips–Perron test (Phillips & Perron 1988) for autoregressive unit root. The test regression includes

the levels and the first differences of the variables respectively.

ARDL BOUNDS TESTING PROCEDURE

Step 1: Estimating ARDL – Testing the Cointegration

Generally, an ARDL approach to cointegration involves estimating the conditional error correction model (CECM):

$$\begin{aligned} \Delta \ln SCF_t = & \alpha_0 + \alpha_1 T + \alpha_2 Dum_{0507} + \sum_{i=1}^p \gamma_i \Delta \ln SCF_{t-i} + \sum_{i=0}^p \theta_i \Delta IRD_{t-i} \\ & + \sum_{i=0}^p \varphi_i \Delta \ln EER_{t-i} + \sum_{i=0}^p \lambda_i \Delta \ln REP_{t-i} + \sum_{i=0}^p \omega_i \Delta \ln SP_{t-i} + \delta_1 \ln SCF_{t-1} \\ & + \delta_2 IRD_{t-1} + \delta_3 \ln EER_{t-1} + \delta_4 \ln REP_{t-1} + \delta_5 \ln SP_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

The ARDL model testing procedure starts with conducting the bounds test for the null hypothesis of no cointegration. In order to test for the presence of a long-run relationship among the variables, the first step in the bounds testing approach is to estimate by using ordinary least squares (OLS) and conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables (i.e. $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$) against the alternative. The study employs a test which normalizes on $\ln SCF$ by $F_{\ln SCF} = (\ln SCF / IRD, \ln EER, \ln REP, \ln SP)$

The ARDL cointegration test assumes that a long run relationship exists between dependent and exogenous variables. To obtain appropriate evidence, the present study establishes each variable as the dependent variable in order to compute the F-statistic for the respective joint significance of each variable in the ARDL models. The ARDL bounds testing approach estimates using the variable addition test (OLS case), which conducts an F-test to test the joint significance of the coefficients. Then, the bound testing procedure developed by Pesaran et al. (2001) is applied to investigate the presence of a long-run relationship among the variables. Two critical values are provided by Narayan and Narayan, (2005) for the cointegration test. The lower critical bound assumes that all of the variables are I(0), which indicates that no cointegration relationships exist among the examined variables. The upper bound assumes that all the variables are I(1), indicating that cointegration exists among the selected variables. When the computed F-statistic is greater than the upper bound critical value, then H_0 is rejected (the variables are cointegrated). If the F-statistic is below the lower bound critical value, then H_0 cannot be rejected (no cointegration exists among the variables). If the computed F-statistics falls between the lower and upper bound critical, the result is inconclusive.

Step 2: Estimating Long-run Model

According to the standard procedure of ARDL, the study must derive along-run model and an error correction model (ECM). If evidence of long-run relationships (cointegration) of the variables exists, the following long-run model is estimated:

$$\begin{aligned} \ln SCF_t = & \alpha_0 + \alpha_1 T + \alpha_2 Dum_{0507} + \sum_{i=1}^p \gamma_{1i} \ln SCF_{t-i} + \sum_{i=0}^p \theta_{1i} IRD_{t-i} + \sum_{i=0}^p \varphi_{1i} \ln EER_{t-i} \\ & + \sum_{i=0}^p \lambda_{1i} \ln REP_{t-i} + \sum_{i=0}^p \omega_{1i} \ln SP_{t-i} \\ & + \mu_t \end{aligned} \quad (4)$$

where all variables are as previously defined. For quarterly data utilized, a maximum of 4 lags are selected here. This involves selecting the orders of the five variables in the ARDL models using the Akaike Information Criteria (AIC) estimated by ordinary least squares (OLS).

Step 3: Estimating Short-run Model

The short-run dynamic parameters can be derived by constructing an ECM as follows:

$$\begin{aligned} \Delta \ln SCF_t = & \alpha_0 + \alpha_1 T + \alpha_2 Dum_{0507} + \sum_{i=1}^p \gamma_{2i} \Delta \ln SCF_{t-i} + \sum_{i=0}^p \theta_{2i} \Delta IRD_{t-i} \\ & + \sum_{i=0}^p \varphi_{2i} \Delta \ln EER_{t-i} + \sum_{i=0}^p \lambda_{2i} \Delta \ln REP_{t-i} + \sum_{i=0}^p \omega_{2i} \Delta \ln SP_{t-i} + \psi ECM_{t-1} \\ & + \nu_t \end{aligned} \quad (5)$$

where ECM_{t-1} is the error correction term, defined as

$$\begin{aligned} ECM_t = & \ln SCF_{t-1} - \alpha_0 - \alpha_1 T - \alpha_2 Dum_{0507} - \sum_{i=1}^p \gamma_{1i} \ln SCF_{t-i} - \sum_{i=0}^p \theta_{1i} IRD_{t-i} \\ & - \sum_{i=0}^p \varphi_{1i} \ln EER_{t-i} - \sum_{i=0}^p \lambda_{1i} \ln REP_{t-i} - \sum_{i=0}^p \omega_{1i} \ln SP_{t-i} \end{aligned} \quad (6)$$

The model can be selected using lag length criteria, such as Schwartz-Bayesian Criteria (SBC) and Hannan-Quinn (HQ) information criterion. To ascertain the goodness of fit of the ARDL model, a diagnostic test and a stability test are conducted. The diagnostic test determines whether the model exhibits serial correlation; functional form; normality; and/or heteroscedasticity.

The stability of the long-run coefficients is used to form the error-correction term in conjunction with the short run dynamics. Therefore, some of the problems of instability could be derived from inadequate modeling of the short-run dynamics, characterizing departures from the long run relationship. Hence, it is necessary to incorporate the short run dynamics for constancy of long run parameters. In view of this, the present study applies the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests to test for parameter constancy. The CUSUM test is based upon the cumulative sum of recursive residuals from the first set of n observations. It is updated recursively and plotted against the break points. If the plot of the CUSUM statistic stays within the 5% significance level, then estimated coefficients are considered to be stable. Another procedure is used to carry out the CUSUMSQ that is based on the squared recursive residuals.

WALD STATISTICS FOR CAUSALITY TEST

Through the error-correction mechanism, the ECM opens up an additional causality channel that is overlooked by the standard Granger (1969) and Sims (1972) testing

procedures. In the Granger sense, variable X causes variable Y if the current value of Y can better be predicted by using the past values of X than by not doing so. The Granger causality testing procedure involves testing the significance of the A_{ijs} conditional on the optimum lags. Through the error correction term (ECT), the ECM offers an alternative test of causality (or weak exogeneity of the dependent variable). For example, if λ_{SCF} is zero, then it can be implied that the change in SCF_t does not respond to deviation during the long-run equilibrium in period $t-1$. Also, if λ_{SCF} is zero and A_{12} , A_{13} , A_{14} , A_{15} are zero, it can be implied that IRD , $lnEER$, $lnREP$ and $lnSP$ do not Granger-cause $lnSCF$. Non-significance of both the t and Wald F -statistics in the ECM would imply that the dependent variable is weakly exogenous.

If the variables $lnSCF_t$, IRD_t , $lnEER_t$ and SP_t are cointegrated, then it is expected that at least one or all of the ECTs should be significantly non-zero. Granger causality of the dependent variables is tested as follows: (1) by a simple t -test of the λ_{is} ; (2) by a joint Wald F -test of the significance of the sum of the lags of each of the explanatory variables in turn; and (3) by a joint Wald F -test of the interactive terms, i.e. Eq. (7) — (λ_{SCF} and A_{12}), (λ_{SCF} and A_{13}), (λ_{SCF} and A_{14}), (λ_{SCF} and A_{15})

$$DlnSCF_t = A_{11}DlnSCF_{t-1} + A_{12}DIRD_{t-1} + A_{13}DlnEER_{t-1} + A_{14}DlnREP_{t-1} + A_{15}DlnSP_{t-1} + \lambda_{SCF}ECT_{t-1} + \mu_{1t}(7)$$

Where D is a difference operator, $A_{12}(L)$ are polynomials in the lag operator L , ECT_{t-1} is the lagged error-correction term derived from the long-run cointegrating relationship and μ_{1t} is an error-correction term assumed to be uncorrelated and random with mean zero. The coefficients λ_{SCF} of the ECTs represent the deviation of the dependent variables from the long-run equilibrium.

ESTIMATIONS AND RESULTS DISCUSSION

The unit root tests results for the variables reported in Table 1 indicate that SCF; SP; IRD; and EER rejected the null hypothesis of the unit root process of these four variables at level, which means SCF; SP; IRD and EER are stationary on $I(0)$. Meanwhile, REP rejected the null hypothesis of unit root process at the first difference, thus REP is $I(1)$.

TABLE 1. Unit root tests on variables

	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	Levels	First Difference	Levels	First Difference
lnSCF	-2.49	-4.32***	-1.33	-10.54***
lnIRD	-0.40	-6.69***	-0.40	-6.69***
lnEER	-0.55	-6.24***	-0.73	-6.20***
lnREP	-3.39**	-4.65***	-2.06	-4.65***
lnSP	-2.44	-3.97***	-2.12	-4.00***

Notes: 1. ***, ** imply significance at the 1% and 5% levels, respectively.
2. The lag length for the ADF and PP was automatically selected by Schwartz Information Criterion (SIC).

TABLE 2. The critical value

Probability.	Lower Bound I(0)	Upper Bound I(1)
1%	3.656	5.331
5%	2.726	4.057
10%	2.309	3.507

Notes: Where N is the number of observations (N = 50) and K is the number of regressors (K = 6). Asymptotic critical value bounds are obtained from Appendixes A1, A2 and A3, Critical values for the bounds test: Case 11: restricted intercept and no trend for k = 6 (Narayan 2004: 26-28). The table of critical value shows Lower Bound I (0) and Upper Bound I (1) at the 1%, 5% and 10% significance levels, respectively.

TABLE 3. Results from bounds tests

Dependent variable	F-statistic	Probability	Result
lnSCF	4.315	0.007	5%

Since quarterly observations are utilized in the present study, 4 is selected as the maximum lag length in the ARDL model and, as reported in Table 3, the calculated F-statistics of $lnSCF$ is 4.315, which falls between the lower and upper bound critical value at the 5 percent level (refer to Table 2). Thus, the null hypotheses of no cointegration are rejected, implying long-run cointegration relationships among the variables.

One of the more important issues in applying ARDL is choosing the order of the distributed lag functions. The SBC should be used rather than other model specification criteria because it often has more parsimonious specifications; and the data sample in the present study further reinforces this point. Furthermore, the coefficient of standard error of regression is also smaller than that of the AIC. The optimal number of lags for each of the variables is shown as ARDL (4, 2, 0, 0, 2).

TABLE 4. The Long-run coefficients of the ARDL model

Regressor	Coefficient	Standard Error	T-Ratio
DUM	0.038	0.093	0.413
lnIRD	0.107	0.050	2.141**
lnEER	-0.847	0.902	-0.939
lnREP	6.818	2.100	3.246***
lnSP	-0.433	0.159	-2.723***
lnINPT	-15.521	12.327	-1.259

Notes: 1. Number inside the parenthesis is the value of the t-ratio.
2. ***, ** imply significance at the 1% and 5% level, respectively.
3. Dependent variable is $lnSCF$

Table 4 shows the long-run coefficients of the variables under investigation. Most of the estimated coefficients have their expected theoretical or hypothesized signs except for stock prices, which is not statistically significant. The empirical results reveal that, in the long-run, IR and REP are two major factors that influence SCF. The results confirm that SCF in China is significantly affected by exchange rate reforms and the appreciation of the Chinese RMB. The findings also indicate that potential

profits in the real estate market tend to attract short-term foreign capital inflows into China.

Specifically, the reform of foreign exchange rates of China (DUM) also has a positive effect on attracting short-term capital inflow. In regards to IRD, the coefficient means that a 1% change in the IRD of the Chinese Yuan and foreign currency may result in 0.107% increase in the short-term international capital inflow. Similarly, an increase in the EER causes a decrease in SCF. More specifically, in the long run, a 1% increase in EER leads to a 0.847 percent decrease in SCF; and a 1% increase in REP leads to a 6.818% increase in SCF. The results indicate that EER and REP have a substantial or statistically significant effect on SCF in China.

TABLE 5. Results for error correction representation dependent variable is SCF (4, 2, 0, 0, 2)

Regressor	Coefficient	Standard Error	T-Ratio
dlnSCF1	-0.431	0.115	-3.740***
dlnSCF2	-0.256	0.126	-2.028**
dlnSCF3	-0.535	0.107	-5.016***
dlnIRD	-0.033	0.05	-0.664
dlnIRD1	-0.123	0.054	-2.28 **
dlnEER	-0.402	0.482	-0.8328
dlnREP	3.234	0.793	4.078***
dlnSP	-0.047	0.132	-0.354
dlnSP1	0.287	0.139	2.056**
dINPT	-7.363	5.053	-1.457
ecm(-1)	-0.474	0.094	-5.03***

ECM=lnSCF - 0.039*DUM - 0.107*lnIRD + 0.848*lnEER - 6.818*lnREP + 0.433*lnSP + 15.521*INPT

Model Criteria/Goodness of Fit

R-Squared	0.856	R-Bar-Squared	0.799
S.E. of Regression	0.082	F-stat. F(11, 35)	17.844***
AIC	45.265	SBC	32.314
DW-statistic	1.850	RSS	0.221

Notes: 1. The values of t-ratios are in parentheses.
 2. *** and ** denote significance at the 1% and 5% levels, respectively.

The estimated equilibrium correction coefficient ECM (-1) is -0.474 (-5.03), which is significant at the 1 percent level; has the correct sign; and implies a fairly low speed of adjustment to equilibrium after a shock. Approximately 0.47 percent of the disequilibria from the previous quarter's shock converge back to the long-run equilibrium in the current quarter. The DW-statistic is 1.85 and approaches 2, indicating that the model is suitable and the standard error of regression equals to 0.082, which is quite small. The regression for the underlying ARDL equation fits well at $R^2 = 0.856$ and also passes all diagnostic tests, including serial correlation tests and functional form misspecification tests, with non-normal errors at the 1 percent level and heteroscedasticity at the 10 percent level.

TABLE 6. Results of diagnostic tests

Diagnostics	LM version	F version
A: Serial Correlation	CHSQ(4)=23.063[.000]	F(4,22)=5.299[.004]
B: Functional Form	CHSQ(1)=23.070[.000]	F(1,25)=24.102[.000]
C: Normality	CHSQ(2)=61.496[.000]	Not applicable
D: Heteroscedasticity	CHSQ(1)=3.701[.054]	F(1,45)=3.846[.056]

Notes: A: Lagrange multiplier test of residual serial correlation
 B: Ramsey's RESET test using the square of the fitted values
 C: Based on a test of skewness and kurtosis of residuals
 D: Based on the regression of squared residuals on squared fitted values

The CUSUM and CUSUMSQ tests are applied to test for parameter constancy. The results clearly reveal the stability of the coefficients during the period investigated due to the fact that the plots of the two statistics are confined within the 5% critical bounds regarding parameter stability.

According to the F-statistics of the variables, the null hypothesis of no cointegration relationships is rejected in favor of the alternative of one cointegration relationship among the variables at the 5 percent level. The presence of cointegration relationships between SCF, IRD, EER, SP, and REP suggest that Granger causality must exist in at least

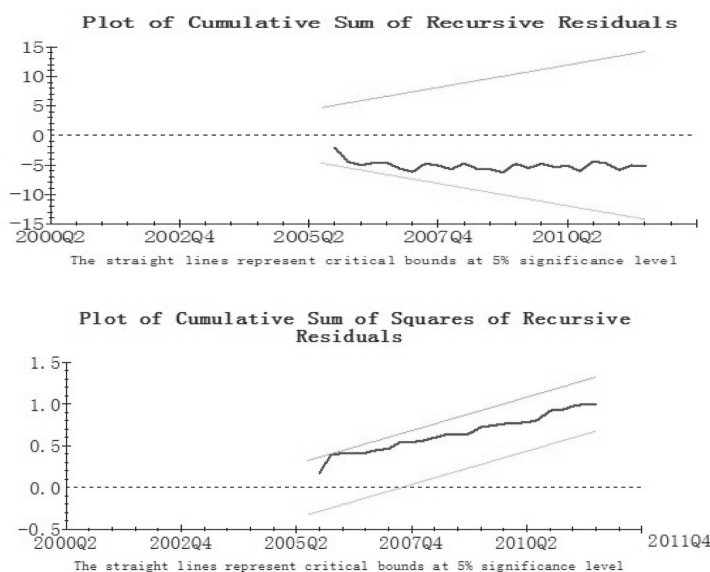


FIGURE 1. Plots of CUSUM and CUSUMQ statistics for coefficients stability tests

one direction. Therefore, the ECM results are examined to determine the direction of causality among variables. The ECM provides the direction of the long run and short run causal relationships. Table 7 reports the Wald Statistics of the lagged explanatory variables of the ECM, which is an indication of the significance of short-run causal effects. The t-statistics for the coefficients of the ECT are also calculated, which offer an indication of long-run causal effects. Joint Wald Statistics for the interactive terms (i.e. ECT and explanatory variables) are then calculated, which indicate which variables bear the burden of short-run adjustment to rebuild the long-run equilibrium following a shock to the system. All coefficients of the ECT are significant at the 5% level, which means that all variables interact in the short-term to restore long-run equilibrium to others.

Panel A of Table 7 shows the short-run causality results. When the dependent variable is SCF, only the Wald statistics of the dummy variable in explanatory variables is significant at the 5% level. The result implies that in the short-run, unidirectional Granger causality exists and runs from short-term international capital flowstointerest rate differential and effective exchange rate.

Meanwhile, the results concerning the long-run causal relationships are reported in Panel B of Table 7. Most Wald statistics are significant at the 1% level except for the causal relationship from SCF to IRD, which is significant at the 5% level. The results show that SCF has long run bidirectional Granger causalities with IRD, EER, REP, and SP.

CONCLUSION

In explaining the determinants of SCF in China, the ARDL results indicate that SCF in China is mainly determined by IRD and fluctuations in EER of the Chinese Yuan to the US dollar. The ARDL results also offer evidence confirming that the overvaluation of housing prices also lures the international speculative capital inflow into the Chinese real estate market. In the meantime, the short-run causality results show that SCF has critical effects on IRD and EER. Next, the long-run causality tests provide robust evidences that IRD; EER; the dramatic increases in Chinese REP; and fluctuations in SP have bidirectional relationships with SCF.

The present study suggests that the Chinese government needs to stabilize the fluctuation range of interest rates and foreign exchange rates to prevent massive arbitrage behavior from occurring; and promote the reform of the RMB exchange rate mechanism to lower the anticipation concerning the Chinese Yuan. Similarly, in order to restrict foreign fund investments in the Chinese stock market and restrict foreign capital inflow into China's real estate market, the supervision organizations of China (e.g., China Securities Regulatory Commission and SAFE) should establish regulations, such as Commitments of Traders and Position Limits that have been utilized in derivatives trading.

TABLE 7. Granger causality results from long-run and short-run

Panel A. Short-run causal relationship						
Dependent Variable	Short-run Effects (Wald Statistic)					
	dlnSCF	dlnIRD	dlnEER	dlnREP	dlnSP	
dlnSCF		0.27	1.59	1.99	0.7	
dlnIRD	3.27*					
dlnEER	4.68**					
dlnREP	1.09					
dlnSP	0.98					

Panel B. Long-run causal relationship						
Dependent Variable	ECT only t-Ratio	Source of Causation (Wald Statistic)				
		dlnSCF, ECT	dlnIRD, ECT	dlnEER, ECT	dlnREP, ECT	dlnSP, ECT
dlnSCF	-3.58***		12.92***	21.12***	16.28***	13.14***
dIRD	-2.78***	8.33**				
dlnEER	-3.27***	23.73***				
dlnREP	-5.45***	30.01***				
dlnSP	-4.18***	17.64***				

Notes: 1. ECT denotes the error correction term in the error-correction model.

2. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

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