Short-Term International Capital Flows: The Case of China

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ABSTRACT

This paper tries to investigate dynamic relationships between international short-term capital flows and China's economy which including interest rate, exchange rate, stock price and real estate price from 1999Q1 to 2011Q4. We use Augmented Dickey–Fuller test (ADF) to test the stationary of time series data, then make the Johansen Cointegration test and apply Granger Causality test to analyze the relationships among the variables. The study finds that the foreign capital flows impacted by the foreign exchange rate fluctuations and stock price movements rather than interest rate differential; and the continued rise of housing price may partially explained by the inflow of huge foreign capital into China.

Keyword: International capital flows, interest rate, exchange rate, real estate price, stock price, Granger Causality test

INTRODUCTION

Along with the era of economic globalization and financial liberalization, the international capital is taking on an increasingly accelerating trend and playing a more prominent role in today's world economy. Similarly, as the world's second largest economy after the United States, China is the world's fastest-growing major economy with growth rates averaging 10% over the past 30 years since the implementation of reform and opening up policy. China's high increasing economy is to change the charm attracts global investors' eyes. The foreign capital entered into China's industry and commerce extensively, while brings the economic benefits to us, it also browbeats the China's financial market move smoothly in the past decades. Since the early 1990s, the government has allowed foreign investors to established joint ventures, provided some assurances against nationalization, allowed foreign partners to become chairs of joint venture boards, and authorized the establishment of wholly foreign-owned enterprises, now the preferred form of Foreign Direct Investment (FDI). And the foreign investment remains a strong element in China's rapid expansion in world trade and has been an important factor in the growth of job opportunities. Over 480 out of Fortune 500 enterprises have already invested in China. In 2007 alone, China approved 37,888 new foreign business establishments.

The Chinese government has begun relaxing of more than a decade of tight capital controls for foreign investors to put money into China's stock market and other financial investments. To be more specific, China's foreign exchange regulator (the State Administration of Foreign Exchange, SAFE) is to loosen its control over the Qualified Foreign Institutional Investor (QFII) program, which allows overseas institutions to invest in Chinese securities market. And China also authorized foreign financial industries bring their business to China and allowed foreign investors to purchase special B shares of stock in selected companies listed on the Shanghai and Shenzhen Securities Exchanges. As of the end of March 2011, the foreign exchange reserves of China holds $3.0447 trillion, making it the highest foreign exchange reserve in the world and far exceeded holdings of the next largest holder, Japan (about $1 trillion). But China's trade surplus and FDI partially explain this, deducting investment income and reserves still leaves an unexplained residual of $214 billion. Some economists use this as a proxy for hot-money inflows. But some of it may reflect non-speculative transactions, such as foreign borrowing by Chinese firms. According to the report, it estimates that China received up to 168 billion U.S. dollars in hot money in 2011. This far exceeds anything previously experienced by any emerging economy.

In recent years, with the appreciation of RMB strongly expected, large foreign speculative funds have poured into China supposedly seeking short-term profits, especially in 2008. Chinese estimates of the amount of international speculative capital in China vary from $500 billion to $1.75 trillion, severely affecting the China's economic and financial security, as well as have negative

consequences for the U.S. and global economy. The influx of international speculative capital is contributing to China's already existing problems with inflation. While speculate in the appreciation of Chinese RMB, the short-term international capital also hunt for arbitrage opportunities in securities markets and real estate markets. The latest statistics suggest that, the securities markets and real estate markets has boomed since the RMB exchange rate mechanism reform in 2005.To be more specific, real estate prices soar and up to an average rise of 12% even doubling in some large cities like Beijing, Shanghai and Shenzhen, high profits also lured the a large inflow of foreign capital into China every year.

The main research objective of this study involves using the econometric model which primarily aims to examine how short-term international capital flows affects China's macro economy, we applied the quarterly data of interest rate differential, nominal exchange rate, exchange rate expectation, stock price and real estate price of China from 1999 to 2011 as indicators to analyzed the influence of economy brought by short-term international capital flows.

RELEVANT LITERATURE REVIEW

In general, the academy classified the international long-term and short-term capital by the period for repayment. Short-term international capital means the duration of the international investments or loan within one year, it contains marketable securities (short-term investments), short-term loans, bank Instruments, foreign exchange bill discount and trade financing etc.

Both Obstfeld (1994) and Kevin (2000) believed that capital flows could spread the investment risks, promote specialization of production and reasonable distribution of capital in the markets of the developing countries. But a few experts offer different view and proposal, Alejandro Lopez-Mejia (1999) pointed out that international capital inflow in big scale is possible to cause money creation, exchange depreciation and inflation, so the international short-term capital flows would probably impede economic development. Bosworth and Collins (1999) researched 20 developing countries with capital inflow by using multi-variance analysis and obtained that foreign direct investment (FDI) has a strong influence on the investment of capital inflow countries, the standard regression coefficient of them was approaches Edison and Levine (2002) clarified the relationship between International Financial Integration and economic growth based on the way of econometrics metrology, and they got that there does not exist explicit relationship between those two.

Shen Kunrong (1998) analyzed the correlation between international capital inflow and economic growth of China, and he drew a conclusion that China is still a country with capital shortage from generally speaking. In order to maintain economic growth, the only effective way is to rely on foreign investments to support. He also offered some constructive advices for attracting foreign capital such as improving the environment for investment, adjusting industry structure and increasing policy supports from government. Wang Xin (2003) carried out regressing analyses on the foreign exchange settlement and sales business of China from June 1999 to May 2002 by using least square method, and the empirical result demonstrated that the capital inflow was greatly influenced by short-term assets yield in this period. Li Zeguang, Fufei and Tang Weixia (2003) explored by measuring the capital volatility coefficients and found that foreign loans and portfolio investment are more sensitive to the volatility of international short-term capital flows than FDI, so the effects of those two factors are most significant to China's real economy.

Wang Qi (2006) proposed an influencing factors model for China's international capital flows according to international standard, and he insisted that China's capital movements are mainly affected by interest rate, foreign exchange rate, inflation rate, economic openness, national policy and so on through multiple regression analysis. Song Bo and Gao Bo (2007) set up Error Correction Model (ECM) by using the quarterly data of disbursement of foreign capital and real estate price from 1999 to 2006 in consideration of an environment of continued inflation. And Granger Causal Relation Test indicated that jack-up of housing price results in inflow of foreign capital in the short run; while in the long run, inflow of foreign capital has an effect on housing price shot up. So they thought it is advantageous for China to keep stabilization of housing price by controlling excessive inflow of foreign capital in current circumstance. Zhang Yihao (2007) set up an arbitrage model of interest rate, foreign exchange rate and price; he found that the factors related to interest rate, foreign exchange rate and price are also have strong effects to international short-term capital movements.

MODEL AND DATA

The Mundell-Fleming model is an economic model first set forth by Robert Mundell and Marcus Fleming. The model is an extension of the IS-LM model. Whereas 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. The study follows Chen Langyun & Chen Yun (2009), we propose the extension of Mundell–Fleming model (Mundell, Robert A. (1963) & Fleming, J. Marcus (1962)) to explain as follow:

$$SCF_t = \alpha_0 + \alpha_1 T + \beta_1 IRD_t + \beta_2 NER + \beta_3 SMR_t + \beta_4 R \qquad (1)$$

(1) International short-term capital flows (SCF)

For SCF, we follow the previously studies that use the World Bank Residual Method, which was firstly proposed to measure the capital flight in the "World Development Report 1985" released by World Bank. In World Bank's point of view, capital flight cannot be measured directly, but can be roughly estimated as a residual. Which assumes the capital flight is taken as a residual of four components: the Increase in Official Foreign Reserves (IOFR), the Increase in External Debt (IEB), Net Foreign Direct Investment (NFDI) and Current Account Deficit (CAD). So the formula of capital flight would be described as follows:

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

(2) Interest Rate Differential (IRD)

The relative change in interest rate differential affects the international short-term capital flows seriously, and the capital usually flows from a country with low interest rate to a higher one. The hypothesis is that the wider spreads the interest rate between two countries, the larger the international short-term capital that will inflow, other things being equal. We choose China Time Deposit Rate (one year) as China's domestic interest rate and US dollar (one-year interest rate) as foreign interest rate. And we use proportionality of them to represent the interest rate differential. The sources of statistic data are output directly from the software of DataStream.

(3) Nominal Exchange Rate (NER)

As well, the appreciation in Chinese RMB also attracts foreign capital inflow for getting profits. Because of RMB exchange rate reform, this study chooses the nominal exchange rate of RMB to US Dollar as indicator. The exchange rate is expressed in units of domestic currency price of foreign currencies in direct quotation system, the numbers upward means RMB's devaluation and vice versa. Data also comes from DataStream.

(4) Stock Market's Return (SMR)

This study picks the stock market's return of China to analyze the influence on securities' markets brought by international short-term capital flows. Specifically, we apply the Shanghai Composite Index (SCI) as the stock price, and the statistic data from official website of Shanghai Stock Exchange.

(5) Real Estate Market's Return (REMR)

For study the impact between international short-term capital flows and China's real estate price, we choose the statistics data of housing price after the real estate market reformed in 1997. The data we selected are released by National Bureau of Statistics of China.

RESEARCH METHODOLOGY

   (1) The Augmented Dickey–Fuller (ADF) Test

In statistics and econometrics, an Augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The Augmented Dickey–Fuller (ADF) statistic is a negative number when used in the test. The more negative it is, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence.

   (2) Johansen Cointegration Test

In statistics, the Johansen test is a procedure for testing cointegration of several I(1) time series. This test permits more than one cointegrating relationship so is more generally applicable than the Engle–Granger test which is based on the Dickey–Fuller (or the augmented) test for unit roots in the residuals from a single (estimated) cointegrating relationship.There are two types of Johansen test, either with trace or with eigenvalue, and the inferences might be a little bit different. The null hypothesis for the trace test is the number of cointegration vectors r ≤ ?, the null hypothesis for the eigenvalue test is r = ?.

   (3) Vector Auto Regression (VAR) Models

Vector Auto Regression (VAR) is a statistical model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate autoregression (AR) models. All the variables in a VAR are treated symmetrically; each variable has an equation explaining its evolution based on its own lags and the lags of all the other variables in the model. A VAR model describes the evolution of a set of k variables (called endogenous variables) over the same sample period (t = 1... T) as a linear function of only their past evolution. The variables are collected in a k x 1 vector , which has as the ith element $y_{i,t}$ the time t observation of variable y_i .

   (4) The Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. Clive Granger argued that there is an interpretation of a set of tests as revealing something about causality. The test involves estimating the following pair of regressions:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + u_{1t}$$

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + u_{2t}$$

where it is assumed that the disturbances u_{1t} and u_{2t} are uncorrelated.

   If variable X (Granger) causes variable Y , then changes in X should precede changes in Y . Therefore, in a regression of Y on other variables (including its own past values) if we include past or lagged values of X and it significantly improves the prediction of Y , then we can say that X (Granger) causes Y . A similar definition applies if Y (Granger) causes X .

EMPIRICAL RESULTS

Table 1 reports the results of ADF test. The test consistently suggest that all variables including ΔSCF, ΔIRD, ΔNER, ΔREMR, ΔSMR are stationary in levels I (1).

TABLE 1: Results of Augmented Dickey-Fuller Unit Root Test

Variable	First Difference			t-Statistic	Prob.*
	Test critical values				
	1%	5%	10%		
ΔSCF	-3.600987	-2.935001	-2.605836	-3.501625	0.0129
ΔIRD	-3.568308	-2.921175	-2.598551	-7.281872	0.0000
ΔNER	-3.568308	-2.921175	-2.598551	-3.160165	0.0285
ΔREMR	-3.568308	-2.921175	-2.598551	-5.944955	0.0000
ΔSMR	-3.577723	-2.925169	-2.600658	-5.232981	0.0001

Before take tests, we should identify the order of lag length for the unrestricted VAR at first. The optimal lag length is selected according to a set of statistical selection information criterions like Final prediction error (FPE), Akaike information criterion (AIC), Schwarz criterion (SC) and Hannan-Quinn information criterion (HQ). Table 2 provides the appropriate lag length for the estimated VAR models. The optimal lag length for the chosen VAR models is five lags.

TABLE 2: Lag length selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-731.9478	NA	1.15e+08	32.75324	32.95398	32.82807
1	-636.3352	165.7285	5042935.	29.61490	30.81934	30.06390
2	-570.5791	99.36469	859962.3	27.80352	30.01166*	28.62669
3	-538.4235	41.44504	699722.3	27.48549	30.69733	28.68283
4	-502.2537	38.58111*	535527.2	26.98905	31.20460	28.56057
5	-461.8846	34.08950	412512.8*	26.30598	31.52523	28.25166*
6	-428.8369	20.56298	614407.6	25.94831*	32.17126	28.26816

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

TABLE 3: The results of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace).

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.581909	91.27278	69.81889	0.0004
At most 1 *	0.437949	51.15818	47.85613	0.0237
At most 2	0.351698	24.65467	29.79707	0.1742
At most 3	0.091065	4.718327	15.49471	0.8380
At most 4	0.007065	0.326154	3.841466	0.5679

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.581909	40.11461	33.87687	0.0079
At most 1	0.437949	26.50351	27.58434	0.0682
At most 2	0.351698	19.93635	21.13162	0.0728
At most 3	0.091065	4.392173	14.26460	0.8158
At most 4	0.007065	0.326154	3.841466	0.5679

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** MacKinnon-Haug-Michelis (1999) p-values

From the results of Johansen Cointegration test, the Trace test and Maximum Eigenvalue test indicated that 2 cointegrating eqn(s) and 1 cointegrating eqn(s) separately at the 0.05 level. The empirical results

denote that the short-term international capital flows, interest rate, exchange rate, real estate markets return and stock markets return have a steady equilibrium relationship in the long run.

Appendix shows the results of VAR Granger Causality/Block Exogeneity Wald Tests with lag length of 5. The test results suggest that there is strong evidence of a unidirectional causal linkage that runs from Nominal Exchange Rate (NER) to Short-term International Capital Flows (SCF) and Stock Market Return (SMR) to SCF. Moreover, the causality findings show that SCF rejects the Null Hypothesis, so it does Granger Cause Real Estate Market Return (REMR). This may explain why the cost of houses have been rising an estimated 25% annually in Beijing and Shanghai in recent years. The constant influx of foreign capital to China real estate markets contributes to the precipitous rise of housing prices to a great extent.

CONCLUSION

The present study empirically investigates the relationships among the Short-term International Capital Flows, Interest Rate Differential, Nominal Foreign Exchange Rate, Real Estate Markets Return and Stock Markets Return. And the empirical results indicated that, the foreign exchange rate and equity markets return have strong influences to short-term international capital flows. In sum, the appreciation of Chinese RMB and the potential value of the stock would attract tons of short-term international capital inflow into China's capital markets. Especially the call for an appreciation of the Chinese RMB heated up, and it would directly affect the return rate between RMB and other foreign exchange assets. With the appreciation of RMB strongly expected, large foreign speculative capital has poured into real estate industries and financial markets of China, severely affecting the state's economy and financial security.

The results also show that the Interest rate is not the critical factor determining the flows of international short-term capital. Even low interest rate differential exists in different capital markets, the investors are eager to get a higher profit rather than the hope of cashing in on the Chinese currency's steady rise in value.

The findings also provide robust evident that the high real estate price of China largely on the strength of support from short-term international capital flows. So the influx of international speculative capital is contributing to China's already existing problems with inflation.

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APPENDIX

VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: SCF

Excluded	Chi-sq	df	Prob.
IRD	8.449592	5	0.1331
NER	12.74696	5	0.0259
REMR	9.781888	5	0.0817
SMR	37.00391	5	0.0000
All	100.1828	20	0.0000

Dependent variable: IRD

Excluded	Chi-sq	df	Prob.
SCF	7.658575	5	0.1761
NER	1.927777	5	0.8590
REMR	10.70772	5	0.0575
SMR	4.886924	5	0.4298
All	38.73094	20	0.0072

Dependent variable: NER

Excluded	Chi-sq	df	Prob.
SCF	8.917025	5	0.1124
IRD	3.031114	5	0.6952
REMR	3.852907	5	0.5708
SMR	17.08290	5	0.0043
All	45.16462	20	0.0010

Dependent variable: REMR

Excluded	Chi-sq	df	Prob.
SCF	21.28220	5	0.0007
IRD	1.888542	5	0.8643
NER	6.854823	5	0.2317
SMR	4.622253	5	0.4637
All	48.77888	20	0.0003

Dependent variable: SMR

Excluded	Chi-sq	df	Prob.
SCF	5.111489	5	0.4024
IRD	2.820848	5	0.7276
NER	5.197868	5	0.3922
REMR	4.991060	5	0.4170
All	11.21704	20	0.9404