Contemporary Chinese Political Economy and Strategic Relations: An International Journal Vol. 5, No. 3, Dec. 2019, pp. 1211-1245

You've Got Money Left Over: Twin Surpluses of Balance of Payments Accounts in China

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Abstract

This study is devoted to explore empirically China's twin (double) surpluses of Balance of Payments (BoP) for the period 1998-2016. This phenomenon reflects the money China have left over from importing (buying) and exporting (selling) goods and services (as recorded in current account), and between outflow and inflow of financial assets (as recorded in financial account). This study answers the following questions: *Are China's twin surpluses sustainable? What are the macroeconomic variables determining China's twin surpluses?* and *What are their possible transmission channels between current account surplus and financial account surplus?* The time series econometric tests offer that China's twin surpluses phenomenon is considerably sustainable. That is both surpluses will be approaching a zero balance in the long run. Secondly, domestic income, exchange rate, and world income are important macroeconomic variables in explaining the behaviour of China's twin surpluses in the long run, except for domestic, and world interest rates. Lastly, no transmission channel has been found, while China's current account surplus is caused by financial account

surplus, and world interest rate, separately. This study has relevant policy implications, especially on the country's external imbalances.

Keywords: *balance of payments, China, current account, financial account, twin (double) surpluses*

1. Introduction

China is unusual from the economic perspective as a country with the important features of both market economy and planned economy. Since Deng Xiaoping's economic reforms at the end of 1970s, China has been transformed dramatically from a centrally-planned economy into a prosperous market-based nation with several episodes of economic reforms implemented. Among them are, developing Shenzhen as the first "*special economic zone*" in 1980, Renminbi convertibility in 1996, and opening more the country to the world (trade). Table 1 provides some stylized facts (macroeconomic indicators) of China's economy between 1995 and 2014. First of all, the country's standard of living as captured by Gross Domestic Product (GDP) per capita has increased remarkably from an averaged US$790.55 to US$5,453.52 between the interval periods of 1995-2000 and 2008-2014. Indeed, China has achieved an extraordinary GDP growth of 9%, 11%, and 9% over the three consecutive periods of 1995-2000, 2001-2007 and 2008-2014 respectively regardless of several "shocks" occurred such as the Asian financial crisis in 1997-1998, and the global financial crisis in 2006-2007.

Also, China's trade performance is considerably outstanding as the statistics reported in Table 1. The country's trade openness (measured by the sum of imports and exports per GDP) has increased from 35.04% to 48.83% during the interval periods of 1995-2000 and 2008-2014

respectively, while their trade values either exports or imports are almost tenfold. As projected, China's exports of goods and services will continue to overweigh imports, and current account (CA) balance will continue to record a surplus (State Administration of Foreign Exchange, China, 2015: 70). More interestingly, International Monetary Fund (IMF) has projected that China's CA balance will be around 0.5% of GDP in 2019, but will enter negative territory in 2022 and stand at -0.2% by 2024.[1]

Table 1 Stylized Facts of China Economy (Averaged), 1995-2014

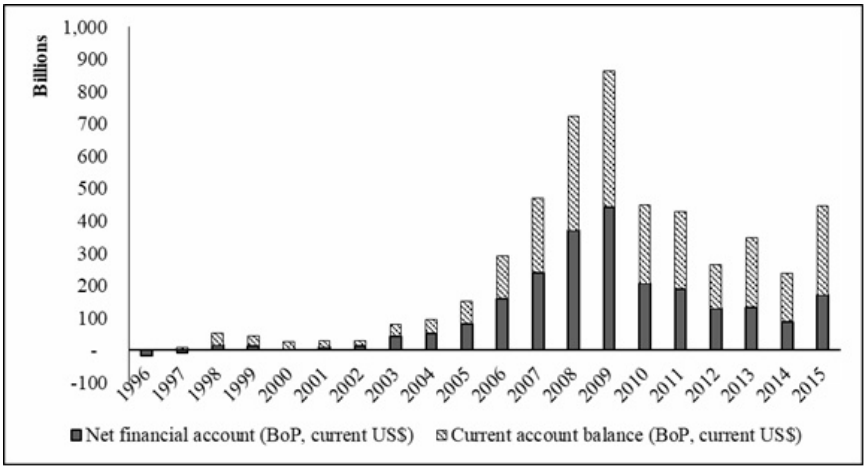
	1995-2000	2001-2007	2008-2014
GDP per capita	790.55US$	1,637.66US$	5,453.52US$
GDP growth	9.01%	10.82%	8.81%
Inflation	4.34%	1.86%	3.02%
Unemployment	3.05%	4.06%	3.97%
Trade openness (% of GDP)	35.04	54.53	48.83
		in US$ billion	
Exports of goods and services	185.27	655.97	1,894.20
Imports of goods and services	157.54	561.94	1,658.35
Net foreign direct investment	-38.19	-74.77	-165.51
Net portfolio investment	1.58	7.89	-41.25
Total reserves (includes gold)	137.41	716.50	3,107.89

Source: Data from *World Development Indicators*, World Bank (*http://data.worldbank.org*).

After a brief review of China's real sector – goods and services market above – China's financial sector, in particular the net foreign direct investment (FDI) has recorded a notable change between 1995 and 2014, more obviously after China joining WTO in 2001, by huge foreign investments that flowed into China. The net FDI as showed in Table 1 has been doubled from -US$38.2 billion (1995-2000) to -US$74.8 billion (2001-2007), and -US$165.5 billion (2008-2014). Meanwhile, China's FDI outflow is about US$118.0 billion in 2014, and of this

amount, US$14.8 billion is along China's "*Belt and Road Initiative*".[2] On the contrary, the net portfolio investment declines in China since 2006, which may be (partially) associated with the unconventional reform that commercial banks are allowed to set bank deposit and lending rates freely with reference rates set by the People's Bank of China (PBOC), which is crucial for financial liberalization in China.[3] According to China's State Administration of Foreign Exchange (2015), financial account (FA)[4] that covers all transactions associated with changes of ownership in the foreign financial assets and liabilities of an economy will be more volatile as China's economy becomes more open (see, pp. 70-72). Yu (2007) highlights that FA balance is foreseen to increase as a result of the intensified cross-border capital flows.[5] By the same token, CA balance is assumed to be in deficits, whereas FA in surpluses, as it is considered that foreign savings will lead a developing country like China to have a higher investment rate than what domestic savings itself can do (p. 10). This offsetting phenomenon is assumed to be true. In fact, China is in a position of *twin surpluses* or *double surpluses* (i.e. +CA and +FA) of Balance of Payments (BoP) since 1998, as showed in Figure 1. Both the CA and FA surpluses have increased rapidly, and reached a peak in 2009. Although they have slightly declined then, their surpluses remain "*big*" – around US$200 billion in CA and more than US$100 billion in FA. Recent statistics from the World Bank (as the source showed in Figure 1) show that China's (net) FA is in deficits of US$28 billion and US$58 billion in 2016 and 2017 respectively.

Figure 1 Current Account and Net Financial Account of China's Balance of Payments (BoP), 1996-2015



Source: Data from *World Development Indicators*, World Bank (*http://data.worldbank.org*).

As noted by Kumhof and Yan (2016), "... *the current account surpluses have contributed to explosive central bank foreign exchange reserve accumulation, to the point that reserves now exceed, often by a wide margin, what is required for liquidity purposes or as an insurance device against sudden reversals in capital inflows*" (p. 187). Deng and Zhang (2007) highlight that continuous twin surpluses of BoP may cause other negative effects such as trade conflicts, pressure of high inflation, and pressure of appreciating Renminbi. Additionally, China's twin surpluses have created large welfare losses (Yu, 2012). In fact, China *will continue to stay* in twin surpluses, and will not have any change in the short run (Deng and Zhang, 2007; Zheng, 2006). However, in the long run, as Zhang and Tan (2015: 101) document, twin surpluses

experienced in China *will* fade out eventually because of structural changes externally and internally. To be more specific, their prediction is that China's CA and FA will be balanced out because of the new standards of calculation system of IMF as reserve asset item was categorized into FA. China's twin surpluses would vanish in the future due to the certain structural factors that CA surplus will shrink because of liberalization of domestic factors, appreciation of the Renminbi exchange rate, and weak external demand. In fact, FA surplus is likely to decrease because of strong incentives from China's government that encourage domestic enterprises to invest abroad (Zhang and Tan, 2015: 118). China is not alone, indeed twin surpluses phenomenon had also happened in South Korea during the years of 1999-2005 when the country adjusted industrial structure caused by technological development (see, Deng and Zhang, 2007).

Of the literature search, the twin surpluses phenomenon has not been conceptually explored, and empirically examined, in particular for the case of China. This study aims at examining the twin (double) surpluses (that is both current account and financial account surpluses) of China's BoP. More precisely, this study considers the following research questions.

(i) *Is China's twin surpluses sustainable?* This study answers: the twin surpluses phenomenon in China is either permanent (i.e. always in an imbalance position – surpluses or deficits) or temporary (i.e. approaching a zero balance in the long run). The existing studies (Zheng, 2006; Deng and Zhang, 2007) only describe and summarize the unfavourable effects of twin surpluses. They believe that this phenomenon would be continued, but this projection is lack of empirical support. Perhaps, the question of sustainability of twin surpluses of BoP in China remains puzzling. Zheng's (2006) study

suggests future study to consider a more proper empirical testing on twin surpluses.

(ii) *What are the macroeconomic factors determining the twin surpluses of China's BoP accounts?* Using general equilibrium perspective of open economy macroeconomics (Brooks and Fausten, 1998), a set of macroeconomic variables has been proposed and tested in association with twin surpluses behaviour in China. It is based on a systematic derivation from the behavioural relations of CA(.) and FA(.). Several studies have looked at the relevant variables determining the twin surpluses in China (Zheng, 2006; Deng and Zhang, 2007; Zhou, 2012; Yu, 2007) – Renminbi exchange rate, price of exports, and imports on CA balance (Zhang and Tan, 2015); and FDI inflow, and reserve asset as the main explanators of twin surpluses (Liu, 2008). However, these variables are being considered as ad hoc because of lacking theoretical foundation.

(iii) *What are the potential transmission channels from current account (CA) surplus to financial account (FA) surplus?* This question is to find out the causalities between CA balance and FA surplus with a set of macroeconomic variables, in relation to (ii). The identified transmission channel(s) is important to policymakers, especially in reducing the so-called "unfavourable surpluses" in China, as aired by the U.S. As noted by Yiping Huang, "*China's large external sector imbalance is a product of incomplete economic reform. The best way to reduce the imbalance is to finish the task of economic reform. The growing risks, including large current account surpluses, suggest that liberalizing factor markets should now be placed at the top of Chinese policymakers' agenda.*"[6]

The rest of this study is organized as follows. Section 2 investigates the sustainability of China's twin surpluses behaviour. It covers briefly

the relevant past studies, theoretical (or conceptual) framework, data, testing methods, and empirical results. Similar content applies for the Sections 3 and 4. Section 3 identifies and examines the macroeconomic determinants of China's twin surpluses behaviour from the general equilibrium perspective of open economy macroeconomics. Section 4 is about an empirical investigation of the possible transmission channels of twin surpluses, i.e. from CA to FA via macroeconomic variable as identified in Section 3. Section 5 concludes this study with a brief discussion on policy relevance.

2. Sustainability of China's Twin Surpluses

This section offers an empirical evidence that China's twin surpluses phenomenon is *considerably* sustainable. This finding reflects a phenomenon that the current surpluses recorded by both CA and FA of China's BoP are *temporary* (i.e. in the short run), and a zero balance will be approached over time (i.e. in the long run).

> "*The sustainability hypothesis defines the condition that CA dynamics are consistent with a country's inter-temporal budget constraint, in the sense that this can be met in the long-run without the need for drastic corrections.*"
>
> (Lanzafame, 2014: 1001)

Among the influential works on this (CA) sustainability hypothesis are Hakkio and Rush (1991) and Husted (1992). For a case study of China, Guan (2004) highlights that China's CA is unsustainable because it has been in surpluses for a long time. Aizenman and Sun (2010) have called for reconsidering the arising sustainability issue in China since 1980s, because China's CA surplus (as per GDP) exceeds 10%, and its

relative size to the world economy is getting bigger. Sun (2011) finds no cointegration between real exports and real imports, which suggests that China's CA is unsustainable for the period 1990Q1-2010Q1, but it is sustainable for the sub-period 2005Q2-2010Q1 given the exchange rate regime announced. Tiwari (2011) finds no cointegration between China's real exports and real imports by using Gregory-Hansen (1996) tests for the monthly data of 1992M1-2010M2, but Saikkonen and Lütkepohl (2000) tests suggest cointegration. Xu *et al.* (2013) find that China's CA is weakly sustainable since May 1994[7] because the estimated coefficient of imports is inelastic (0.7).

Indeed, no empirical study is found for testing the sustainability of twin surpluses of BoP, as well as the FA balance. Zhang and Tan (2015) have *predicted* that China's FA surplus will be narrowing in the long term because of shrinking in FDI inflows, portfolio investment and other investments which bring uncertainty (volatility) to FA position. According to them, China's CA and FA balances will be "*deficitted*" in the long run due to domestic structural reforms, and further liberalization of China's services sector. Recently, China's CA surplus is observed to be declining, while a deficit in FA is forecasted. However, China's twin surpluses will stay longer because the world demand of imports and ability to invest overseas will largely rise when the major foreign markets, i.e. the U.K. and the U.S., recover from the recent global financial crisis.[8] Perhaps, a persistent twin surpluses behaviour is neither desirable nor sustainable for China as highlighted by Yu (2007: 18), while studies by Yu (2007) and Zhang and Tan (2015) are rather descriptive without offering an empirical evidence of the sustainability of China's twin surpluses.

Theoretically speaking, given a small open two-sector economy of real sector (goods and services) and financial sector (bond and money), an equality of $CA=\Delta F+\Delta IR$ is assumed to hold from the general

equilibrium perspective, where ΔF is changes in the foreign bonds, and ΔIR is changes in international reserves (money market). According to Fausten (1989-1990), CA and FA are interdependent, in which a deficit of one sector's balance is being funded by a surplus acquired in another sector. For example, a CA deficit will be financed by either private and official capital inflows or other transactions in FA at fixed exchange rate parity.[9] Re-arranging $CA=\Delta F+\Delta IR$ by incorporating twin surpluses, i.e. +CA and +FA, a consequent equality reflects either $CA-\Delta F-\Delta IR=0$, or $CA-FA=0$. Since this (twin surpluses sustainability) hypothesis remains exploratory, the econometric approaches employed by the well-established CA sustainability hypothesis have been considered by (i) stationarity or $I(0)$ of the sum of *CA* and *FA* (per GDP) – if $(CA+FA)/Y$ is stationary or $I(0)$, twin surpluses behaviour is said to be sustainable; otherwise, unsustainable, and (ii) cointegration between CA and FA (as scaled by China's nominal GDP) – if both variables are cointegrated, twin surpluses behaviour is sustainable, or *vice versa*.

The data are obtained from CEIC database for the available observations between 1998Q1 and 2016Q2.[10,11] For the first approach, Table 2 shows the results of unit root tests – Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1981), Phillips-Perron (PP) (Phillips and Perron, 1988), and KPSS stationarity tests (Kwiatkowski *et al.*, 1992), as well as unit root tests with structural break. The ADF and PP tests including the tests with structural break (by assuming innovation outlier) fail to reject the null hypothesis of a unit root (unsustainable) at 10% level. Meanwhile, the KPSS and unit root tests with structural break when additive outlier is assumed are inconclusive. In this regard, the second approach is *necessary* and *feasible*. Indeed, both approaches have been employed *interchangeably* in the CA sustainability literature.

Table 2 Unit Root and Stationary Tests for Variable *(CA+FA)/Y*

	ADF	PP	KPSS	Structural break: Innovation outlier	Addictive outlier
Constant	-1.558[4] (0.498)	-2.545[3] (0.109)	0.220[6]	-2.857[10] (0.759) Break Date: 2004Q1	-2.896[10] (0.741) Break Date: 2004Q1
Constant & trend	-1.481[4] (0.827)	-2.510[3] (0.323)	0.218[6]***	-4.682[10] (0.163) Break Date: 2004Q2	-5.090[0]*(0.064) Break Date: 2010Q1
Sustainable?	Not	Not	Inconclusive	Not	Inconclusive

Notes: Asterisks *** and * indicate significance levels at 1%, and 10%, respectively. Figures in parentheses (.) indicate *p*-value. Figures in square brackets [.] indicate the optimal lag length based on Akaike's information criterion (AIC) for ADF (maximum lag is 12) and bandwidth for PP and KPSS. The critical values for KPSS tests are 0.739 (1%), 0.463 (5%), and 0.347 (10%) for constant, and 0.216 (1%), 0.146 (5%), and 0.119 (10%) for constant and trend. The ADF and PP tests have H_0: A unit root; while H_0: (trend) stationary for KPSS test.

Alternatively, the second approach infers that twin surpluses behaviour is sustainable if a cointegrating relation exists between CA and FA. For this (cointegration) method, at least one of the underlying variables must be *I*(1). If both *CA/Y* and *FA/Y* are *I*(0), no cointegration can be delivered. ADF and unit root tests with structural break suggest *I*(1) for *CA/Y*, but PP test shows it to be *I*(0), while KPSS test is inconclusive. Also, *FA/Y* is inconclusive between *I*(0) and *I*(1).[12] Hence, Autoregressive Distributed Lag (ARDL) bound testing procedure (Pesaran *et al.*, 2001) is employed for testing cointegration. This procedure is feasible irrespective of whether the regressors are *I*(0), *I*(1) or a combination of both. It eliminates the pre-testing problems related to standard cointegration analysis which requires the classification of the variables into *I*(1) and *I*(0) (Pesaran and Pesaran, 1997: 302-303). An ARDL equation with two variables, let us say *y* and *x*, can be written as $\Delta y_t = c + \gamma_0 y_{t-1} + \gamma_1 x_{t-1} + b_{1i}\Delta y_{t-i} + b_{2i}\Delta x_{t-i} + u_t$, and it can be estimated by OLS (ordinary least squares) estimator for testing (i.e. rejecting) the null

hypothesis H_0: $\gamma_0=\gamma_1=0$ (no level relationship), against H_1: $\gamma_0\neq_0$, $\gamma_1\neq0$ (a level relationship). If the computed *F*-statistic exceeds the 0.10 upper bound of the critical value band *I*(1), the null hypothesis can be rejected: a cointegrating relation exists. If, the computed *F*-statistic is below the 0.10 lower bound *I*(0), no cointegration can be concluded because the null hypothesis cannot be rejected. In the case that the computed *F*-statistic falls within the 0.10 critical value bands, the cointegration between *y* and *x* is inconclusive.

Table 3 reports the results of ARDL bound tests. It is interesting to find that *CA/Y* and *FA/Y* are cointegrated since the respective computed *F*-statistics are above the 0.10 upper band, *I*(1). The null hypothesis of no cointegration (or unsustainable) can be rejected, suggesting that China's twin surpluses behaviour is *considerably* sustainable. That is the country's CA and FA imbalances (surpluses) will be approaching zero (or toward an equilibrium) in the long run by adjusting (i.e. reduction) their surpluses during the short runs.

Table 3 ARDL Cointegration Approach to Twin Surpluses Sustainability Hypothesis

	F-statistics			Critical values:	*I*(0);	*I*(1)
Lag length:	4	8	12	10%	4.04;	4.78
F(*CA/Y*|*FA/Y*)	29.197***	5.480*	5.480*	5%	4.94;	5.73
F(*FA/Y*|*CA/Y*)	5.261*	41.200***	4.444	1%	6.84;	7.84

Notes: Asterisks *** and * indicate significance levels at 1%, and 10% levels, respectively. The dynamic specification of ARDL(*p, q*) is suggested by AIC with constant (level) in trend specification.

3. Determination of China's Twin Surpluses Behaviour

This section proposes an empirical framework from general equilibrium perspective of open economy macroeconomics, to understand what are

the macroeconomic variables determining the twin surpluses behaviour, and to examine China's data. Relevant past studies are relatively few, and they are generally descriptive without proper and systematic derivation from a theory in their empirical equation(s). Among them are Deng and Zhang (2007), Yu (2007; 2012; 2015), Yue (2015), and Zhang and Tan (2015). To recall, twin surpluses in BoP are about surplus in CA and FA respectively during the same period. Therefore, a review of those studies examining each behaviour of CA and FA is essential.

Let us look at the determination of CA behaviour. Theoretically, CA is equivalent to savings-investments gap, in which its behaviour can be explained by either the factors which affect exports and imports (i.e. real income, foreign income and real exchange rate) or which affect savings and investments (i.e. real interest rate and real income).[13] Among the studies, Zhang and Zhang (2015) find that China's CA and its examined determinants, namely secondary industry ratio, domestic income, age profile, male population, consumption and investment, are cointegrated (i.e. existence of a long-run relation) over the period 1980-2012. Secondary industry ratio is found to be the most important factor explaining China's CA behaviour, with estimated coefficient of 0.48. Also, excessive savings variable does cause CA surplus. Another study by Gervais *et al.* (2016) investigates if real exchange rate adjustment helps to re-balance CA by considering 22 emerging-market countries, including China. For China's data, there is no cointegration between CA per GDP and real exchange rate – it is partially explained by fixed exchange regime that has been implemented.[14]

For the FA behaviour, it is fundamentally determined by *changes* in nominal interest rates at home country and at foreign country. The former variable is expected to have a positive influence on FA, while the latter is negative (Brooks and Fausten, 1998: 158). Yu (2015) and Yue (2015) have explained that large inflows of foreign capital (i.e. attracted

by government's reckless policies towards FDI) fail to translate CA surplus into capital outflow, which results in a large surplus in China's FA. More precisely, imperfect financial markets in China explain the country's FA surplus. Again, Zhang and Zhang (2015) find that financial openness (i.e. its estimated elasticity, 1.18), secondary industry ratio (0.17), age (0.33), male population ratio (0.11), income (-0.29), consumption (-0.15), and credit to private sector (-0.14) are statistically significant to explain China's FA surplus, except for investment.

By and large, general equilibrium perspective of open economy macroeconomics as in Brooks and Fausten (1998) has offered a theoretical insight on the determination of twin surpluses behaviour via the behavioural relations of CA(.) and FA(.). Given the behaviour relations of demand for exports, $EX(Y^{*+}, e^{+})$, and imports demand at home, $IM(Y^{+}, e^{-})$ (where Y^{*} is world income, e is exchange rate, Y is domestic income (Y), and the superscript '+' and '-' are the expected signs of the respective coefficients, and CA balance (i.e. net exports) is exports minus imports, i.e. $CA=EX(Y^{*}+, e^{+})-IM(Y^{+}, e^{-})$ (Brooks and Fausten, 1998: 155), a CA behavioural relation can be expressed as $CA(Y, e^{+}, Y^{*+})$.[15,16] For the FA of BoP, which records all transactions of direct investment, portfolio investment, other investment, and reserve assets, its behavioural relation can be expressed as $FA(i^{+}, i^{*-})$.[17,18] Hence, twin surpluses that are $+CA(.)$ and $+FA(.)$ can be written as a behavioural relation $CAFA(.)$ as in (1):

$$CAFA(Y, i^{+}, e^{+}, Y^{*+}, i^{*-}) \qquad (1)$$

This behavioural relation $CAFA(.)$ informs that domestic income (Y), domestic interest rate (i), exchange rate (e), world income (Y^{*}), and world interest rate (i^{*}) are the macroeconomic determinants of the twin surpluses behaviour, as in theory. Their expected sign is as

superscripted. The twin surpluses behaviour, more technically the dependent variable, *CAFA* is measured by the sum of CA and FA scaled by GDP. Some variables are transformed into natural logarithm (*ln*), *lnY* and lnY^* – China's and the U.S. (proxies the world) real GDP (in 2010 prices), and *lnREER*, the real effective exchange rate (2010=100).[19] *i* and i^* are home (China) and the U.S. (the world) real interest rates (as % pa) proxied by lending rate. The data are quarterly observations between 1998Q1 and 2016Q2. Since the unit root or stationary tests suggest that the underlying variables are inconclusive between stationary *I*(0) and non-stationary *I*(1) (see, Appendix A), ARDL bound testing approach for cointegration is feasible to be employed in this section, including their long-run (i.e. cointegrating relation) and short-run (i.e. error-correction model) estimates. More technically, an ARDL equation of relation (1) used for OLS estimation can be written as:

$$\begin{aligned}\Delta CAFA_t = {} & c + \gamma_1 CAFA_{t-1} + \gamma_2 lnY_{t-1} + \gamma_3 i_{t-1} + \gamma_4 lnREER_{t-1} \\ & + \gamma_5 lnY^*_{t-1} + \gamma_6 i^*_{t-1} + \sum_{i=1}^{p} b_{1i} \Delta CAFA_{t-i} \\ & + \sum_{i=0}^{q} b_{2i} \Delta lnY_{t-i} + \sum_{i=0}^{r} b_{3i} \Delta i_{t-i} + \sum_{i=0}^{s} b_{4i} \Delta lnREER_{t-i} \\ & + \sum_{i=0}^{t} b_{5i} \Delta lnY^*_{t-i} + \sum_{i=0}^{u} b_{6i} \Delta i^*_{t-i} + e_t \end{aligned} \quad (2)$$

where e_t is residual. It is estimated by OLS estimator in order to reject the null hypothesis H_0: $\gamma_1=\gamma_2=\gamma_3=\gamma_4=\gamma_5=\gamma_6=0$ (i.e. no level relationship), against alternative hypothesis, H_1: at least one of them $\neq 0$ (i.e. a level relationship). The statistical inference of the computed *F*-statistic has been previously discussed, i.e. Section 2. Again, an error-correction model of equation (2) is presented as

$$\Delta CAFA_t = \eta ECT_{t-1} + \sum_{i=1}^{p} b'_{1i}\Delta CAFA_{t-i} + \sum_{i=0}^{q} b'_{2i}\Delta lnY_{t-i} + \sum_{i=0}^{r} b'_{3i}\Delta i_{t-i} + \sum_{i=0}^{s} b'_{4i}\Delta lnREER_{t-i} + \sum_{i=0}^{t} b'_{5i}\Delta lnY^*_{t-i} + \sum_{i=0}^{u} b'_{6i}\Delta i^*_{t-i} + e' \quad (3)$$

where ECT_{t-1} represents error-correction term, that is $CAFA_{t-1} - c - \gamma_0 CAFA_{t-1} - \gamma_1 lnY_{t-1} - \gamma_2 i_{t-1} - \gamma_3 lnREER_{t-1} - \gamma_4 lnY^*_{t-1} - \gamma_5 i^*_{t-1}$. The η is the estimated speed of adjustment that the underlying variables are co-moving over time towards long-run equilibrium path – it is expected to be negative and less than one.

Following a r*ule of thumb* of quarterly data in use, a lag length of four is used, and ARDL(p=4,q=2,r=0,s=0,t=2,u=4) is selected based on Akaike information criterion (AIC). The computed F-statistic is 6.956 which is above the 0.01 critical band, 4.68, that the null hypothesis of no level relationship can be rejected. It suggests that all of the underlying variables are cointegrated, that is the underlying variables are moving together in the long run (i.e. toward equilibrium) as predicted by theory – general equilibrium perspective. Table 4 presents the estimated cointegrating relation *CAFA*(.). The empirical results inform that China's twin surpluses behaviour can be explained by domestic income (*lnY*), exchange rate (*lnREER*), and world income (lnY^*) in the long run. These macroeconomic variables are statistically significant at 1% level with their estimated coefficients of -0.170, -0.354 and 1.734 respectively, and their signs are as expected in *CAFA* relation (1). However, real interest rates of home (i) and world (i^*) are statistically insignificant at 10% level, and these results suggest that both interest rates do not affect China's twin surpluses in the long run – it implies that monetary policy via interest rate channel implemented by the home country, China, and by the U.S. has no implication on China's CA as well as FA imbalances.

Also, an interesting finding is that the U.S. real GDP is the only reason for the upsurge of China's twin surpluses, i.e. the higher the U.S. real GDP, the larger China's twin surpluses. China's real GDP and exchange rate both play a crucial role in ratifying the country's BoP imbalances by reducing their surpluses via higher output, and Renminbi appreciation, for examples.

Table 4 ARDL Long-Run Relation (Dependent Variable, $CAFA_t$)

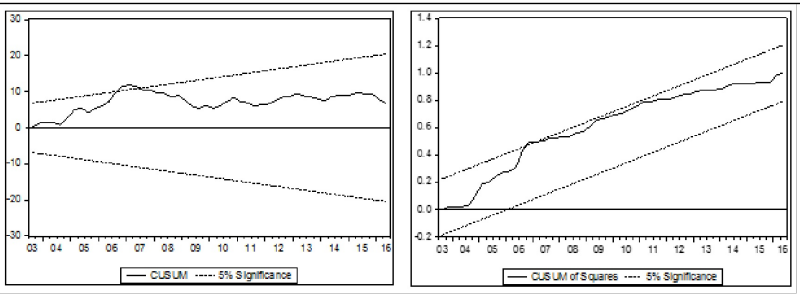
lnY_t	-0.170*** (0.002)
i_t	0.148 (0.142)
$lnREER_t$	-0.354*** (0.000)
lnY^*_t	1.734*** (0.000)
i^*_t	0.707 (0.193)
Constant	-24.574*** (0.000)

Notes: Asterisks *** indicate significance level at 1% level. Figures in parentheses (.) indicate *p*-value.

Table 5 presents the estimated ECM equation (3) which is about the short-run estimates of how the *change* in (or *growth* of) China's twin surpluses behaviour responds to the change in the underlying macroeconomic variables. In the short run, the expansion of China's twin surpluses can be explained by growth in domestic income (*lnY*), exchange rate (*lnREER*), and the U.S real interest rate (i^*), respectively. The past three years of twin surpluses have negative coefficients suggesting that China's twin surpluses behaviour is "self-correcting", i.e. reducing the surpluses. The estimated coefficient of error-correction term ECT_{t-1} is -0.736 which is statistically significant at 1% level, and with an expected sign and size that 73.6% of disequilibrium (in the short run) is corrected in a quarter toward its equilibrium (in the long run). This finding further reaffirms the existence of a level relationship (cointegration) between twin surpluses and the underlying

Table 5 Estimates of Error-Correction Model (ECM)

$\Delta CAFA_{t-1}$	-0.224*(0.089)
$\Delta CAFA_{t-2}$	-0.368***(0.001)
$\Delta CAFA_{t-3}$	-0.357***(0.000)
ΔlnY_t	0.131 (0.238)
ΔlnY_{t-1}	0.256** (0.034)
Δi_t	0.109 (0.144)
$\Delta lnREER_t$	-0.261*** (0.008)
ΔlnY^*_t	-0.663 (0.346)
ΔlnY^*_{t-1}	0.850 (0.211)
Δi^*_t	-0.231 (0.822)
Δi^*_{t-1}	3.545** (0.036)
Δi^*_{t-2}	-1.457 (0.377)
Δi^*_{t-3}	-1.441 (0.169)
ECT_{t-1}	-0.736***(0.000)
LM test	0.066 [2] (0.936)
Adj. R-squared	0.608
F-stat. (*p*-value)	7.294*** (0.000)
Durbin-Watson test	2.052



Notes: Asterisks ***, ** and * indicate significance levels at 1%, 5% and 10% levels, respectively. Figures in parentheses (.) indicate *p*-value. The lag structure is selected by AIC from a maximum lag of 4. ECT is error-correction term which is derived from the respective long-run relations. For example, A *CAFA* relation $CAFA$-(-0.170lnY+0.148i-0.354$lnREER$+1.734lnY^*+0.707i^*-24.574). The LM tests (*F*-statistics) is under the null hypothesis of no serial correlation exists.

macroeconomic variables as derived from the general equilibrium perspective of open economy macroeconomics. Additionally, the LM test suggests no serial correlation, while the CUSUM and CUSUM squares tests suggest a structural break which is dated in 2007Q1 (at the 5% significant level) because of the 2007-2008 global financial crisis.

4. Transmission Channels of China's Current and Financial Accounts

What are the possible transmission channels of CA and FA in China? More generally, this question assumes that money left over in China's CA would not at least cause (transmit to) FA account surplus *directly* without any "transmission" channels (i.e. through other variables). A conceptual framework advocated by Fausten (1989-1990) on the current and capital accounts (of BoP) interdependence helps to understand the fundamental relationships between CA and FA.[20] He conceptualizes and explains the possible inter-linkages between real sector (i.e. CA) and financial sector (i.e. FA). According to him, "*If domestic saving falls short of an increase in demand of real assets, the resulting excess demand has an upward influence on their price and on the CA deficit. The excess demand must be funded either by running down financial assets or by issuing liabilities, i.e., by securing new credit extensions from the financial sector.*" (Fausten, 1989-1990: 280-281) Intuitively, it reflects a one-way causality from CA to FA of BoP, that is the presence of (predicted) FA surplus is because of CA surplus. Or, it is to say that CA surplus comes first, and followed by FA surplus. Causality is about *what came first the Chicken or the Egg*?

Of literature search, the existing studies have only tested their causality between CA and FA of BoP. They ignore the transmission channel(s) either by using a bivariate VAR framework, or by

considering a set of *ad hoc* variables such as GDP, exchange rate as well as the components of FA's components (i.e. FDI, equity investments, debt, and bank liabilities) that are not systematically derived from a theory.[21]

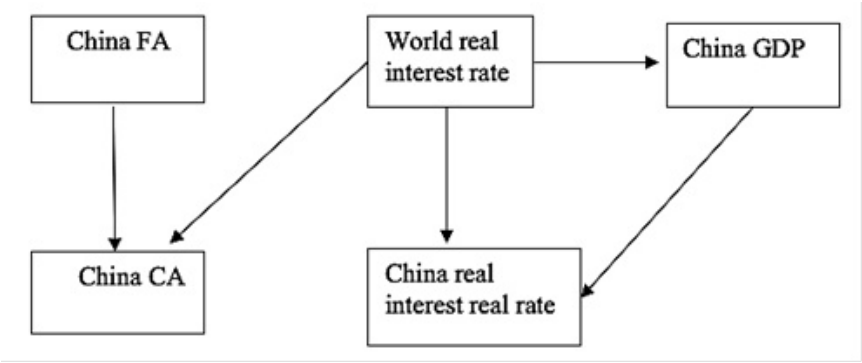
This section fills this gap by looking at the possible causal relationships between CA and FA of China's BoP with a set of transmission variables as outlined in the *CAFA*(.) relation, namely domestic income (*lnY*), domestic interest rate (*i*), exchange rate (*lnREER*), world income (lnY^*) and world real interest rate (i^*). To recall, an empirical equation that explains the twin surpluses behaviour had been derived from a general equilibrium perspective (see, Section 3), which also explains a causal relationship from CA to FA. It is highlighted that an *effect* cannot occur before its *cause* (see, Granger, 1969). Of equation (1) *CAFA*(.) relation, an open economy with flexible exchange rate is assumed; given CA surplus, money supply may overweigh money demand, so interest rate falls, and capital flows out, resulting in deficit in FA. On the other hand, an opposite direction of causality holds, i.e. from FA to CA via exchange rate channel – when a large amount of capital flows in, it may cause a rise in exchange rate, which makes exports more expensive and imports cheaper, hence CA runs into a deficit.

This section employs the so-called (Granger) non-causality testing method which has been extended by Toda and Yamamoto (1995) (T-Y) in order to find out the possible transmission channel(s) via causality(ies) between CA and FA by including domestic income, domestic interest rate, exchange rate, world income, and world real interest rate in a multivariate framework. Again, the data are those used in the previous section (Section 3). T-Y method is applicable regardless of whether the underlying time series are $I(0)$, $I(1)$ or $I(2)$, non-cointegrated or cointegrated of an arbitrary order. In brief, it involves

two steps. The first step is to compute the OLS estimates of an augmented vector autoregressive model VAR($k+d_{max}$) with an optimal lag length k^{th} and a maximum order of integration d_{max} of the time series. And, it is followed by a standard Wald test of the estimated coefficients of k from the estimated VAR($k+d_{max}$). Their tests statistics are reported in Appendix B.

For convenience, Figure 2 illustrates the T-Y non-causality findings. Surprisingly, no transmission channel has been suggested by the data between CA and FA of BoP in China. A one-way causality is found from FA to CA. This finding implies that China's CA surplus is reflected (caused) by her FA surplus, in which it is consistent with Liu *et al.* (2007). Or, it is to say that FA *came first* and then CA. According to Yu (2007), "*... market distortion or imperfection has led to excess capital inflows to China, while it has to 'park' its excess domestic savings abroad as foreign exchange reserves*" (p. 17), which justifies this finding that causality is from FA to CA. Furthermore, CA and FA balances are *not interdependent* as intuited by Fausten (1989-1990) that a two-way causality is assumed to hold. Perhaps, world (the U.S.) interest rate is an important variable (cause) to be monitored closely by China, and has important policy implication, because it is another reason at the side of China's FA that China's CA runs into surplus. The world interest rate also affects China's interest rate either directly or indirectly via China's real GDP. And, the country's economy (GDP) is directly caused by world interest rate which is being considered as *exogenous* variable as informed by the findings – the U.S. interest rate is determined by the Federal Reserve (Fed) on her target range for its benchmark interest rate.

Figure 2 Diagram of Causality for China's CA and FA Surpluses



5. Conclusions and Policy Implications

This study complements the early work of Zhang and Tan (2015) by examining more systematically and empirically three fundamental concerns of China's twin surpluses. They are: the sustainability of China's twin surpluses, the macroeconomic factors explaining the twin surpluses behaviour in China, and the directions of causality or transmission channel(s) between current account and financial account of BoP. To refresh, twin surpluses reflect both positive balances (i.e. money left over) in a country's current account, and financial account of BoP simultaneously in the time period-*t*. The key findings are summarized as follows. Firstly, China's twin surpluses behaviour is reasonably sustainable over the period 1998-2016, and both surpluses will be ratified, i.e. both imbalances will approach zero in the long run. It offers a signal that contemporary China's government macroeconomic policies as well as other policies (i.e. monetary) are favourable in the long run. Secondly, China's twin surpluses, and its macroeconomic determinants, namely domestic income, domestic interest rate, exchange

rate, world income, and world interest rate, are cointegrated or moving together in the long run. The behaviour of China's twin surpluses can be understood and monitored by these variables, except for the domestic and world interest rates. Lastly, no transmission channel between current account and financial account has been identified from a simplified framework employed in this study. China's current account surplus is *directly* caused by financial account surplus, and world (the U.S.) interest rate. Also, it reveals that these two major components (accounts) of BoP are not interdependent – no "inter-feedback" between China's real sector (goods and services market) and financial sector (financial market) in China.

Policy implications from this study are that, in general, China is advisable to continue the existing policies both from fiscal and monetary perspectives of the country's economic reforms, for example, those policies in improving the structure of industries which have comparative advantage. This also suggests that the existing policies or more informally "negotiations" or "responses" ought to be continued (or to say to be favourable) regardless of the recent tension of trade war between China and the U.S., given a finding that China's twin surpluses behaviour is sustainable – both imbalances will be "zero-balanced" in the long run. Accordingly, the U.S. is expected to accelerate an ongoing structural change in China's current account balance making it a capital importer that buys more from the rest of the world than it sells to it.[22] However, Li *et al.* (2018) have pointed out that "*China will be significantly hurt by the China–US trade war, but negative impacts are affordable*". China is found to be feasible to spur her economy growth (i.e. growth in her real GDP) via fiscal reforms as they manage to ratify (i.e. reduce) China's twin surpluses over time. Also, a Renminbi revaluation is another possibility in a position of the country's twin surpluses. It does not assume China to have drastic liberalization

exercise on the exchange rates market, so that it can respond to the possible "shocks" more flexibly because: "*To use the exchange rate change as an instrument to achieve trade balance might lead to great exchange rate fluctuation.*" (Yu, 2007: 21). This study forwards that domestic (China) monetary shocks and world (the U.S.) real interest rates have no desirable implication on China's twin surpluses position because of the fixed interest rate "guided" by PBOC, and a low interest rate (i.e. zero interest rate policy) by the rest of the world such as Japan and the U.S. Further liberalization and evolution on non-conventional monetary policy are urged for China in order to ratify (or adjust) the country's current BoP imbalances – twin surpluses. More precisely, policymakers in China should formulate and implement such relevant policies in ratifying the country's financial account surplus in priority, as an ideal financial market is where excessive investment from overseas can be utilized perfectly. By and large, this brief policy discussion is mainly based on the empirical findings from this study, in which they only depict a crude picture in order to understand better the twin surpluses behaviour in China, and are for a more general perspective of policy implications. It is due to the fact that more information or inputs (for example, comprehensive stimulation outputs from computable general equilibrium, CGE, models) are necessary for policymakers to design the related policies, in practice.

Also, further research on this topic of China's twin surpluses behaviour is feasible since this study is not free from limitations. This study uses the available quarterly observations spanning between 1998 and 2016, but data *prior to* 1998 before China joining WTO are excluded. Pre-1998 official data (i.e. quarterly) are incomplete from the official sources which may give different stories on the twin surpluses results in China. In addition, for simplicity reason, this study employs the basic current account and financial account relations for

conceptualizing twin surpluses behaviour with a set of traditional factors. Perhaps, other potential factors are eventually ignored because of the lack of theoretical foundation. Among them are institutional quality – it is about law, individual rights, and high-quality government regulation and services, globalization including financial liberalization, and China's accession to the WTO on 11 December 2001. They are important to be considered for further study. Also, appropriate forecasting techniques can be applied in order to predict the behaviour of twin surpluses in China, in which it adds information for policy implication. Last but not least, comparative study is recommended between China and other countries which record a similar position of their BoP accounts, i.e. twin surpluses, for example, South Korea was in twin surpluses during the periods between 1999 and 2005 (Deng and Zhang, 2007).

Notes

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1. "Why China's current account balance approaches zero". <*http://bruegel.org/2019/04/why-chinas-current-account-balance-approaches-zero/*>, retrieved on 17 June 2019.
2. See, National Bureau of Statistics of China. <*http://www.stats.gov.cn/english/PressRelease/201602/t20160229_1324019.html*>, retrieved on 21 August 2016.
3. Christopher J. Neely, "Chinese foreign exchange reserves and the U.S. economy", 6 May 2016. <*https://research.stlouisfed.org/publications/economic-synopses/2016/05/06/*>, retrieved on 29 August 2016.
4. A name of "Financial Account" had been formerly labelled as "Capital Account" before IMF re-named it and re-defined its *transactors* in 1993. According to the new definition, "Financial Account" is the sum of (existing) "Capital Account" (KA) and net official monetary movements.
5. "China reports balanced current, capital accounts" (reported by Liyan Qi), *MarketWatch*, 11 May 2015. <*http://www.marketwatch.com/story/china-reports-balanced-current-capital-accounts-2015-05-11*>, retrieved on 30 August 2016.
6. Yiping Huang, "Fixing China's Current Account Surplus", *East Asia Forum*, 13 September 2009. <*http://www.eastasiaforum.org/2009/12/13/fixing-chinas-current-account-surplus/*>, retrieved on 8 August 2016.
7. In January of 1994, China had enforced the single managerial floating exchange rate system as part of reforms to embrace a socialist market economy.
8. See "China's surpluses start to balance out" (reported by Aaron Back), *The Wall Street Journal*, 1 February 2013. <*http://www.wsj.com/articles/SB10001424127887323926104578277441519268074*>, retrieved on 1 September 2016.

9. Fixed exchange rate parity informs that exchange rate tends to appreciate when trade balance exceeds capital exports and depreciate when capital exports exceeds trade balance (Mundell, 1962: 71).
10. The sample period ends in 2016Q2 due to data availability. In fact, China's (net) FA balance runs into a deficit in 2016 and 2017. The data are measured in million US dollars and in nominal terms.
11. Of the reporting source, a positive value of FA represents a net decrease, while a negative value represents a net increase (see, State Administration of Foreign Exchange, China). For convenience reason, this study has reversed their sign, i.e. positive value is about net increase, and *vice versa*.
12. The computed test statistics of both unit root and stationarity tests are not reported here, but they are available upon request from the corresponding author.
13. According to Yu (2007), China's CA surplus is due to both global and domestic economic cycles, in which surplus occurs when the economy is weak, and deficit when the economy is overheating. Ding (2008) further labels "saving glut", a situation that savings exceed investment, as the main reason for China's CA surplus. Indeed, Yue (2015) notes that excess savings in China is due to culture for social security, health welfare, and so on.
14. The other 16 emerging countries have their long-run CA relation (i.e. the underlying variables are cointegrated) and their real exchange rate adjustment (i.e. increases) reducing CA imbalance in the long run.
15. There are a few of *ad hoc* variables that explain the CA balance – among them are trade openness, inflation volatility, secondary industry ratio, labour cost, demography, and so on. For simplicity and data availability, this study follows this relation as from Brooks and Fausten (1998).
16. Domestic income (Y) is expected to have negative association with CA as a rise in domestic income increases purchasing power for importing goods

and services. Exchange rate (e) is measured by the *number of units of domestic currency required to purchase one unit of a foreign currency* (Brooks and Fausten, 1998). An increase of e reflects domestic currency depreciation, so exports increase, and imports decrease. Exchange rate has positive implication on CA. CA is positively related to World income (Y^*) as higher world income reflects higher purchasing power of foreign countries – when demand from the world rises, it results in more exports, thus CA increases (i.e. surplus).

17. The existing empirical studies have incorporated other variables such as credit granted to private sector and financial openness.
18. Higher domestic interest rate (i) attracts funds inflow, and *vice versa*. Meanwhile, for foreign interest rates (i^*), a relatively higher level of interest rate abroad induces funds to flow out, weakening the FA position.
19. According to IMF's data (*http://datahelp.imf.org*), REER is defined as nominal effective exchange rate which is "*the value of a currency against a weighted average of several foreign currencies divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade competitiveness.*" Hence, an increase in REER implies Renminbi appreciation. However, the estimated equation (2) indicates that exchange rate variable has a positive impact on China's twin surpluses. Given the REER used is domestic currency (Renminbi) per one foreign currency (USD), a decrease reflects Renminbi appreciation making exports more expensive. The expected sign of REER from the empirical model should be reversely interpreted that is in negative sign to indicate appreciation.
20. Tang and Fausten (2012) have considered the sample countries used by Yan (2005) in order to examine the interdependence between CA and FA of BoP. Their study is inconclusive from different empirical specifications with OLS estimator.

21. Liu *et al.*'s (2007) study has considered GDP growth and three components of FA (i.e. FDI, portfolio investment, and other investments) in examining their causal linkages with CA in China for the period 1982-2004. They find that China's FA does Granger cause China's CA, but no reversed causality. Meng (2004) offers a two-way causality between China's CA and FA over the sample period of 1982-2002. A similar study is from Yan (2005) that considers five developed countries (i.e. France, Germany, Japan, the U.K. and the U.S.) and five developing countries (i.e. Argentina, Mexico, Indonesia, South Korea and Thailand) for the sample period of 1989Q1-2000Q4. Toda and Yamamoto non-causality tests show that FA does Granger cause CA in the developing countries, but reversed causality in the developed countries, in general. Studies of other countries are Kim and Kim (2011) for Korea, Ersoy (2011) for Turkey, and Garg and Prabheesh (2015) for India. Another branch of studies examines a set of macroeconomic variables in explaining the behaviour of China's twin surpluses. For example, Liu (2008) finds that China's twin surpluses (as proxied by foreign exchange reserves), FDI, trade surplus from OEM (original equipment manufacturer), and deposit-loan gap are cointegrated (i.e. co-moving) over the period 1994-2007. Indeed, FDI is the most influential variable to China's twin surpluses in the long run, while OEM and deposit-loan gap lead the way in the short run. All these variables do Granger cause twin surpluses, respectively.
22. "Trade war drives down China's current account forcing new reliance on foreign investment", *South China Morning Post*, 10 Jan, 2019. <*https://www.scmp.com/economy/china-economy/article/2181565/trade-war-drives-down-chinas-current-account-forcing-new*>

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Appendix A Unit Root and Stationarity Tests

		ADF	PP	KPSS	Structural break: Innovation outlier	Structural break: Additive outlier
(CA+FA)/Y	Constant	-1.558[4]	-2.545[3]	0.220[6]	-2.857[10] 2004Q1	-2.896[10] 2004Q1
	Constant & Trend	-1.481[4]	-2.510[3]	0.218[6]***	-4.682[10] 2004Q2	-5.090[0]* 2010Q1
Δ(CA+FA)/Y	Constant	-4.310[3]***	-19.323[60]***	0.138[23]	-5.091[3]*** 2009Q2	-10.143[2]*** 2008Q4
	Constant & Trend	-4.424[3]***	-23.329[43]***	0.123[23]*	-10.797[2]*** 2007Q4	-10.537[2]*** 2008Q4
I(d)		*I*(1)	*I*(1)	*I*(0)/*I*(1)	*I*(1)	*I*(0)/*I*(1)
lnY	Constant	-0.963[0]	-0.988[1]	1.151[6]***	-3.193[1] 2005Q3	-2.850[10] 2001Q3
	Constant & Trend	-1.281[0]	-1.219[1]	0.127[6]*	-2.504[0] 2009Q4	-3.270[7] 2009Q1
ΔlnY	Constant	-9.127[0]***	-9.126[1]***	0.179[1]	-9.799[0]*** 2010Q4	-10.866[0]*** 2004Q1
	Constant & Trend	-9.132[0]***	-9.132[0]***	0.143[1]*	-10.552[0]*** 2010Q4	-11.403[0]*** 2004Q1
I(d)		*I*(1)	*I*(1)	*I*(0)/*I*(1)	*I*(1)	*I*(1)
i	Constant	-2.294[8]	-3.341[0]**	0.182[5]	-2.741[0] 2011Q4	-3.380[0] 2008Q2
	Constant & Trend	-2.094[8]	-3.326[0]*	0.151[5]**	-5.752[11]*** 2003Q4	-4.975[2]* 2005Q3
Δi	Constant	-4.986[7]***	-9.273[5]***	0.051[5]	-5.618[11]*** 2004Q1	-9.953[0]*** 2005Q1
	Constant & Trend	-5.098[7]***	-9.207[5]***	0.041[5]	-6.530[7]*** 2004Q1	-10.069[0]*** 2005Q1
I(d)		*I*(1)	*I*(0)	*I*(0)/*I*(1)	*I*(0)/*I*(1)	*I*(0)/*I*(1)
lnREER	Constant	0.050[2]	0.150[1]	0.801[6]***	-2.556[6] 2010Q4	-2.695[6] 2009Q3
	Constant & Trend	-1.571[5]	-1.904[1]	0.271[6]***	-4.730[1] 2004Q3	-4.694[1] 2004Q1
ΔlnREER	Constant	-5.522[2]***	-5.399[3]***	0.417[2]*	-6.089[1]*** 2003Q4	-6.352[1]*** 2008Q3
	Constant & Trend	-4.737[3]***	-5.307[5]***	0.057[2]	-6.187[1]*** 2002Q2	-6.665[1]*** 2008Q3
I(d)		*I*(1)	*I*(1)	*I*(0)/*I*(1)	*I*(1)	*I*(1)
lnY^*	Constant	-1.910[1]	-2.101[4]	1.112[6]***	-2.957[1] 2009Q3	-1.843[1] 2011Q2
	Constant & Trend	-2.468[1]	-2.424[4]	0.200[6]**	-5.552[1]** 2008Q3	-3.238[2] 2008Q3
$ΔlnY^*$	Constant	-5.525[0]***	-5.520[2]***	0.282[5]	-6.890[0]*** 2008Q4	-6.002[0]*** 2005Q1
	Constant & Trend	-5.705[0]***	-5.729[2]***	0.108[4]	-7.142[0]*** 2008Q4	-6.711[0] 2009Q1
I(d)		*I*(1)	*I*(1)	*I*(1)	*I*(0)/*I*(1)	*I*(0)/*I*(1)
i^*	Constant	-2.375[1]	-2.051[4]	0.696[6]**	-3.334[1] 2007Q3	-5.813[10]*** 2007Q1
	Constant & Trend	-2.502[1]	-1.985[4]	0.097[6]	-4.770[12] 2009Q1	-4.548[11] 2007Q4
$Δi^*$	Constant	-4.843[0]***	-4.911[3]***	0.135[4]	-5.188[0]*** 2004Q2	-5.470[0]*** 2001Q4
	Constant & Trend	-4.917[0]***	-4.987[3]***	0.056[4]	-5.497[0]** 2006Q4	-4.548[11] 2007Q4
I(d)		*I*(1)	*I*(1)	*I*(0)/*I*(1)	*I*(1)	*I*(0)/*I*(1)

Notes: As for Table 2.

Appendix B T-Y (Toda and Yamamoto, 1995) Non-Causality Tests

	Dependent variable:						
	CA/Y	*FA/Y*	*lnY*	*i*	*lnREER*	lnY^*	i^*
Σ*CA/Y*		2.209	3.201	0.216	5.676	5.863	3.476
		(0.820)	(0.669)	(0.999)	(0.339)	(0.320)	(0.627)
Σ*lnY*	5.89	0.377		7.107***	2.871	2.414	2.151
	(0.317)	(0.996)		(0.004)	(0.720)	(0.789)	(0.828)
Σ*i*	3.616	0.988	6.08		3.722	0.739	0.531
	(0.606)	(0.964)	(0.299)		(0.590)	(0.981)	(0.991)
Σ*lnREER*	4.526	4.113	7.385	4.389		2.186	4.446
	(0.476)	(0.533)	(0.194)	(0.495)		(0.823)	(0.487)
ΣlnY^*	6.244	3.818	7.651	6.85	3.723		4.883
	(0.283)	(0.576)	(0.177)	(0.232)	(0.590)		(0.430)
Σi^*	13.669**	5.508	14.368**	12.465**	5.01	3.189	
	(0.018)	(0.357)	(0.013)	(0.029)	(0.415)	(0.671)	
Σ*FA/Y*	10.436*		6.083	1.344	7.411	4.979	3.622
	(0.064)		(0.298)	(0.930)	(0.192)	(0.418)	(0.605)

Notes: Asterisk ***, ** and * indicate significance levels at 1%, 5% and 10%, respectively. The reported figures are Chi-square statistics, while the figures in parentheses (.) are *p*-value. A VAR(5+1) framework is employed because of no serial correlation residuals.