The Calculation of Chinese Short-term International Capital Flow

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Abstract: Short-term international capital flows are generally considered as having strong volatility, strong current scale changes, easy reversal of the flow direction. Thus it usually takes some bad influence to a country's real economy and the financial markets, and is likely to lead to financial crisis. This article makes a brief analysis of short-term international capital flows' channels with comparative analysis of different methods for estimating the short-term capital flows on the base of the Chinese Balance of International Payments (BOP), and also theoretically demonstrated the relationship between the direct and indirect method. Next, China's short-term international capital flows are calculated based on the indirect method and the improved direct method. Last, estimates the results of tests and analysis, and gives the relevant conclusions and recommendations.

Key word: improved indirect method; improved direct method; BOP; short-term capital

1. Introduction

Short-term international capital flows is generally considered as having strong volatility, strong current scale changes, easy reversal of the flow direction, thus it usually takes some bad influence to a country's real economy and the financial markets (Zhang Ming, 2011). Various international financial crisis occurring in the 1990s indicates that short-term international capital flows are closely related to the outbreak of the financial crisis. Nowadays, China has already open the current items, the capital projects are also gradually opening up, channels and means of international short-term capital out of China is also increasingly diverse. The aspects above not only bring difficulties to the Chinese regulatory authorities, but also bring challenges to China's economic development and stability of financial markets. Therefore, estimates and influencing factors analysis of short-term international capital flows are important in practical significance.

2. Literature summary

Due to the different definitions of short-term international capital flows, the calculation methods of short-term international capital flows are also different. Different scholars have their own view on the classification of the calculation methods of short-term international capital flows. Benu Schneider (2003) divide the calculation method of short-term capital flows into three types based on the different definition of short-term capital flows, which are generalized calculation method, Dooley method and illegal capital flow calculation method. Liu Renwu (2008) divide the calculation method of short-term capital flows into five types，which are indirect investment net adjustment method based on the net errors and omissions item, indirect investment net adjustment method based on partial adjustment, direct method (also known as the Cuddington method), the indirect method (also known as residual method)and the Cline method. According to the available literature now, Zhang (2011) considers there

are three types of calculation methods of short-term capital flow, which are: direct method, indirect method and hybrid method (also known as Dooley method). Yasemin and Talha (2012) divide the calculation method of short-term capital flows into four types, which are the direct method, indirect method, hybrid method and trade misinvoicing method. This article will comment mainly on indirect and direct method.

Summarize all the literature about the direct method, we can found there are three commons in such research literature. First, all of them are based on the idea of Cuddington (1986) method. The relationship between the direct method and the indirect method is not considered theoretically. Second, all of them consider that it is likely to underestimate the actual short-term international capital flows using direct method. Among them, Zhang (2011) considers that direct method put forward by him is the widest caliber algorithm which is debatable. We believe that determine of the width of the direct algorithm caliber does not lie in how much item to add, but lie in the comprehensiveness of analysis that may exist in short-term international capital flows. Third, no one proposed test methods and standards for calculation results, all of them just make a simple analysis.

Summary the research literature of the indirect method, we can find there are three commons in this type of research literature. First, they are all based on the algorithm thought raised by World Bank (1985). There is no theoretical analysis of the relationship between the indirect method and the direct method. Second, all of them consider that the direct method will underestimate the scale of short-term international capital flows, while the indirect method will overestimate the scale of short-term international capital flows. Compared to the first one, the second one is accurate relatively. Third, there are no corresponding test methods and standards for the estimation results.

3. Scale estimates of short-term international capital flows

Under premise of a country's balance of payments, Balance of Payments (BOP) is a traffic statistics based on the transactions between residents and non-residents of the country. BOP table can effectively reflect the balance of payments of a country's total economic output and cross-border capital flow. Generally speaking, all cross-border financial relationships of a country can be reflected from the BOP table. Thus, scale estimates of short-term international capital flows usually base on the BOP table. Before the official estimates of short-term international capital flows, we need to clarify 3 questions. First, short-term capital and long-term capital exist in which item of the BOP. Second, whether there is a logical relationship between the direct and indirect methods. Last, how to determine the specific formulas of direct and indirect methods.

3.1 The logical relationship between direct and indirect method

It is generally believed that the direct method underestimate measurement results, while the indirect method overestimate in the existing literature about the relationship between direct and indirect method(such as Breakthrough, 2000; Zhang, 2011), and there is little literature analyzing on the relationship between the two methods. Both of this two methods are based on the BOP table, and the direct method is based on the net errors and omissions item as the basis for the addition operation, while the indirect

method is based on foreign exchange reserves as the basis for subtraction.

If both of these two methods are based on the BOP table, then there should be a certain logical relationship between the calculation results of the two methods in theory. Assume that SCF1 represents the short-term international capital flows calculated by direct method, SCF2 represents the short-term international capital flows calculated by indirect method, the relationship between them is shown as following in theory:

$$SCF1 \approx SCF2 \quad (1)$$

We will give a simple proof for equation (1) as follow. We assume that C, D, B, A represent the current account, capital and financial account, reserve assets, net errors and omissions account in the China's BOP, according to the accounting principles of BOP: C + D + A + B = 0 (2). Suppose further that the short-term capital in the currency account (C) for the CS, long-term capital for the CL, then C = CS + CL (3); short-term capital in the capital and financial account (D) for the DS, long-term capital for the DL, then D = DS + DL (4);the short-term capital in net errors and omissions (A)for the AS, the remaining part of the statistical error is denoted by AE, then A = AS + AE (5); substitute (3), (4), (5) into (2) can be obtained:

$$CS + CL + DS + DL + B + AS + AE = 0 \quad (6)$$

Convert equation(6) as following: CS + DS + AS + AE =-B-CL-DL (7). According the idea of the direct method: SCF1 = AS + CS + DS (8), AS can be regarded as adjustments of A; According the idea of the indirect method: SCF2 =-B-CL-DL (9). According to (7), (8), (9), we have:

$$SCF1 + AE = SCF2 \quad (10)$$

As AE represents statistical error term in the net errors and omissions item, its mean is zero: E (AE) = 0 (11). According to (10), (11), we obtain: SCF1 $\approx$ SCF2.

3.2 Formula design for direct and indirect method

According to the analysis above, the most important thing to distinguish between the current account, short-term capital and long-term capital in the capital and financial items, as well as the short-term capital in the net errors and omissions item in the BOP is formula design of the direct and indirect methods. According to Chinese BOP table, we divide the items in the BOP into short-term capital item and long-term capital item, which is based on the other literatures, as shown in Table 1.

According to Table 1, the calculation formula of the direct method can be expressed as: $SCF1 = \sum_{i=1}^{15} S_i$ (12). The meaning of S_1, ..., S_{15} are shown in Table 3. And the similar formula of indirect method can be expressed as: $SCF2 = S - \sum_{i=1}^{16} L_i$ (13).The meaning of S and L_1, ..., L_{16} are shown in Table 1.

3.3 Estimation of Chinese short-term international capital flows

According to the design of the calculation formula of the indirect method and the direct method, we use annual time series data of 1995-2012 to estimate the annual series of short-term international capital flows by these two methods independently, as shown in Table 2

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TABLE 1：short-term and long-term capital flow in the BOP

Long-term item	Short-term item
Workers compensation balances (L1)	Investment income balances (S 1)
government current transfers balances (L 2)	Other sectors current transfers balances (S 2)
Capital account balance (L 3)	Money market instruments balances (assets) (S 3)
Chinese foreign direct investment balance (L 4)	Equity securities balances (liabilities) (S 4)
The equity securities balance (assets) (L5)	Money market instruments balances (liabilities) (S)
(medium) Long-term bonds balances (assets) (L6)	Short-term trade credit balance (assets) (S6)
(medium) Long-term bonds balances (liabilities) (L 7)	Short-term loans balances (assets) (S7)
Long-term trade credit balance (assets) (L8)	Other assets short-term balances (assets) (S8)
long-term balances Loan(assets) (L9)	The trade credit short-term balances (liabilities) (S9)
Currency and deposits balances (assets) (L 10)	Short-term loans balances (liabilities) (S10)
Other long-term assets balances (assets) (L11)	Currency and deposits balances (liabilities) (S 11)
long-term trade credit balances (liabilities) (L12)	Other short-term balances of assets (liabilities) (S12)
long-term Loan balances (liabilities) (L13)	
Other long-term assets balances (liabilities)（L14）	

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                    Items need to be adjusted
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The balance between the foreign direct investment in China = actual value of foreign direct investment in China (L15) + short-term capita of foreign direct investment in China l (S13)

Goods and services balance = actual surplus of trade in goods and services (L16) + short-term capital of trade in goods and services(S14)

Net errors and omissions = amount included   short-term capital flows(S15) + statistical error

Change in reserve assets amounted = foreign exchange increment (S) +other

Table 2：Calculation results of direct and indirect methods（Unit: 0.1 billion dollars）

时间	SCF1	SCF2	时间	SCF1	SCF2	时间	SCF1	SCF2
1995	-249	-202	**2001**	81	34	**2007**	1597	1470
1996	-331	-322	**2002**	116	17	**2008**	1784	4377
1997	-308	-215	**2003**	799	1149	**2009**	2581	2554
1998	-591	-640	**2004**	471	727	**2010**	2770	2846
1999	-426	-400	**2005**	1214	1069	**2011**	2397	2847
2000	-209	-387	**2006**	1823	2701	**2012**	-472	-732

As can be seen from the calculation results, short-term capital flows in our country showed mainly as a net outflow before 2001, and among that, the scale of the net short-term capital outflow in 1998 is the largest one, about $ 60 billion. From 2002 to 2011, Chinese short-term capital flows showed a net inflow and it increased rapidly in scale after 2005. The scale of net inflows reached about $ 250 billion in 2010. What we should note is that Chinese short-term capital flows showed a net outflow from the calculation result in 2012, which is about $ 500 billion.

4. Test of the estimation results

To test results of the short-term international capital flows, the general practice

from the existing literature is comparing the results with the real economy and explains it. We can call this test method "real event" test method. In addition we believe that different measurement results should be consistent, which is so-called the consistency of measurement results" test method. The definition of "Consistency of measurement results" is that for the different estimates of one same population parameter value, if the results of these estimates are valid, then the results of these estimates should have the direction of the consistency and the magnitude of a similar nature.

4.1 "Real event" test of the estimation results

For the estimation results in Table 4, we will be divided into three stages and the reality of economic control test. The first stage is from 1995 to 2002. China's short-term international capital is mainly for the outflow. On the one hand, due to the outbreak of the Asian financial crisis, the negative impact on market investors. On the other hand, China's exchange rate reform, the implementation of the peg to the dollar's exchange rate policy, resulting in a certain degree of RMB overestimated. Two years before the Asian financial crisis, China's short-term international capital has been the performance of the flight, the net outflow in 1995 was approximately 20 billion dollars net outflow, in 1996 of approximately 30 billion dollars, in 1998, a net outflow reached the maximum net, after outflow scale is gradually reduced. In 2001 and 2002, the net outflow of short-term capital is weakened, the net flow direction into a net inflow.

The second stage is from 2003 to 2005. The short-term international capital in China is mainly inflow, which is mainly because after 2003, the increase in pressure on the dollar, forcing the market adjusted to the expected appreciation of the RMB exchange rate pegged to the U.S. dollar by the expected depreciation.

The third stage is from 2006 to 2011. Short-term international capitals mainly focus on accelerating the inflow. On the one hand, enhance the market in July 2005 and June 2010 by two consecutive implementation of the exchange rate reform. On the other hand, international economic downturn, the United States and Europe have a debt crisis. The U.S. imposed a third round of quantitative easing (QE3), interest rate between China and the U.S. continues to expand, accelerate the inflow of short-term international capital.

4.2 "Consistency of measurement results" test

As for the consistency test of the estimation results by direct method and indirect method in Table 4, we can see from Figure 1 and Figure 4 that first, two estimates of short-term capital flows the direction is consistent. Second, estimates the numbers of size, the direct and indirect methods of calculation results are basically consistent. Two calculation results relatively large difference between the number of years occurred in 2006 and 2008, this is because while estimating the scale of short-term capital flow, we have adopted a foreign exchange incremental, but did not use the reserve assets incremental. Figure 2 shows the foreign exchange the incremental reserve assets incremental sequence diagram. We can find from the figure, China's foreign exchange reserve assets incremental increase was significantly higher than in 2006 and 2008, which led directly to the use of the formula (13) calculated results in these two years

was significantly higher than the direct method of measurement results.

On the other hand, we compare our results and Zhang (2011)'s 6 measurement results, find that our estimation results are significantly better than Zhang (2011) on the consistency test. Zhang (2011) estimates a total of 19 years of short-term international capital flows in 1991-2009 with 6 ways, the 6 estimation results only maintain the consistency of the direction of the measurement results in the following 9 years (1995, 1996, 1998, 1999, 2000, 2003, 2004, 2005, 2006) . In the estimated value of 19, the consistency of the direction is less than 50%.

5. Conclusions and recommendation

This article demonstrates the relationship between the 2 common calculation method of short-term international capital flows based on China's BOP table. On this basis, China 1995-2012 years of short-term international capital flows was calculated. There are two main conclusions. First, based on the BOP table of direct and indirect methods of calculation results should be consistent. Second, China's 1995-2012 short-term capital flow characteristics can be divided into three stages, from 1995 to 2002, the short-term international capital is mainly for the outflow; 2003 to 2005, the short-term international capital is mainly for the inflow; 2006-2011, short-term international capital is mainly for accelerating the inflow.

We need to pay attention that we measure the short-term international capital flows in 2012 showed net outflows, the size of about 50 billion dollars. We suggested that China's relevant government departments to strengthen supervision to prevent large-scale short-term capital flows due to the adverse impact on the real economy of the recent short-term capital flows.

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