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## Volume Accounts of FISIM: a Comparative Study between Stocks Deflation Method and Output Index Method

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### ABSTRACT

Because of the complexity of indirect financial intermediary services (FISIM) accounting, the traditional price index deflation method can no longer meet its accounting needs. The manual of price and volume measurement suggests that the stock deflation method and output index method should be used to calculate the volume of FISIM. Comparing the two accounting frameworks, it can be found that the key to the implementation of the stock deflation method is to set a scientific and reasonable deflation index from two aspects of service price and the service quantity, while the key of the output index method is the selection of the output index and the determination of weight. This paper compares the application cases of stock deflation method and output index method in practice, summarizes the similarities, differences, advantages and disadvantages of each case in index construction, index selection and weight determination, and further provides a reference for China FISIM volume accounting.

### KEYWORDS

FISIM; Volume accounts; Stock deflation method; Output index method

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## 1. Introduction

Finance plays an essential role in economic and social development. It is the core of the modern economy and a significant driving force of economic growth. Its output is a crucial indicator to measure the development of the financial industry, and it is also an indicator to observe the operation of the national economy. Financial output is mainly composed of intermediary financial services with explicit charges and indirect financial intermediary services with implicit charges, while indirect financial intermediary services with implicit charges have unobservable characteristics. The System of National Accounts (SNA) defines its production accounting as financial intermediary services indirectly measured (FISIM). In the financial output accounting, because the indirect financial intermediary services account for the vast majority, accurate measurement of FISIM is the key to financial output accounting. Although the indirect financial intermediary services are traded in the market, the price information of FISIM services cannot be directly observed because the fees are indirectly charged. In addition, there is no reasonable physical unit to measure its quantitative characteristics, which makes the FISIM price and volume accounting face great difficulties, and the traditional price index deflation method can no longer meet its accounting needs. Therefore, it is urgent to study and analyze the FISIM accounting method to better promote the development of FISIM accounting in China.

At present, the handbook of price and volume calculation (Eurostat, 2016) provides two most concerned methods to calculate the volume of FISIM: stock deflation method and output index method. These two methods have been highly praised by many scholars, but no consistent solution has been reached. SNA (2008) suggested that the base reference interest rate and bank interest rate should be used to calculate the current price of FISIM output, and the total price index should be used to reduce the current price of FISIM output to obtain the value of FISIM, which is actually the initial form of stock deflation method. If there is no appropriate deflation factor to reduce the current value, we can also use appropriate indicators to extrapolate the base period value to get the volume index—that is, the output index method. As far as stock deflation is concerned, the US Bureau of Economic Analysis (BEA) proposed a stock deflation method based on the price index deflation method to measure the value of FISIM. Subsequently, many scholars gave specific implementation details and index selection of the stock deflation method. Fixler et al. (2006) used the Fisher index and the domestic purchasing power price index as the service price index and the stock deflation index respectively. Marshall Reinsdorf (2011) used unit value instead of service price index, and gave the calculation method of unit value. Herman Smith (2011) thinks that applying the difference between the reference interest rate of the base year and the interest rate of the deposit and loan banks (base year spread, price factor) to reduce the average stock (average stock of deposits and loans, material factor) provides stable and predictable results in practice. Jia (2021) suggested that the stock deflation method should be adopted to reform FISIM accounting in China by comparing the material quantity accounting methods. For FISIM's import and export volume accounting, it is usually recommended to use the domestic price index to calculate exports, while for imports, the price index of the corresponding country or region should be adopted. The advantage of this method is that the data demand is relatively small, but the disadvantage is that the available price index is not suitable for directly calculating the value of FISIM. Obviously, the accounting framework of stock deflation method has achieved remarkable research results, but it is still an important challenge to construct an appropriate deflation index. When the stock deflation method does not have a suitable deflation factor to reduce the current value, SNA (2008) suggests that appropriate indicators should be used to extrapolate the base period value to obtain the FISIM volume index, that is, the output indicator method.

As far as the output index method is concerned, many scholars have done relevant research, and the first one is Statistics Netherlands. Statistics Netherlands has done a lot of theoretical and applied research on the output index method, and the BLS method recommended by the Bureau of Labor Statistics of the United States is also the output index method. The output method is a method to calculate the average value of the volume index of various

financial intermediary service output indicators (volume factor) by taking the transaction amount of various financial intermediary service output indicators in the base period (transaction amount is only one of the optional schemes) as the weight, and using it as the FISIM volume index. Output indicators generally include total deposit and loan transactions, electronic transfers, account cancellations, etc. Relatively speaking, the output index method has many defects: (1) it is difficult to measure the contribution of various output indexes; (2) the demand for data is great; (3) This method may not work properly in case of significant changes in the company, because such changes will not be reflected in the original data of the transaction. As Marshall and Reinsdorf (2011) said, although this method may be an acceptable choice, the main way to calculate the volume of FISIM is the price index deflation method. In addition, Reindorf (2011) and Inklaar and Wang (2013) also give different opinions on the selection and weight of indicators in the output indicator method. However, due to the availability of data, these studies only carried out simple trial calculations for individual research objects, and were not popularized in practice.

To sum up, the two international methods of FISIM volume accounting, both the stock deflation method and the output index method, are still in the initial stage of theoretical discussion, but the existing research has provided some references for FISIM volume accounting. At present, there are very few documents about FISIM accounting in China. In practice, they are only briefly mentioned in the accounting of constant price-added the value of financial industry, and the weighted average price index of CPI and fixed asset investment price index are used to reduce the output and added value of current FISIM. The application premise of this method is harsh, which was questioned by Chen Weiyi (2005). In view of the vacancy of FISIM accounting in China, this paper tries to compare and analyse the details of the accounting framework and practical implementation between the stock deflation method and the output index method, so as to provide some reference for FISIM accounting in China.

The full text is divided into four parts: The first part is the introduction, which summarizes the research status of the stock deflation method and output index method at home and abroad; The second part, on the theoretical level, makes an in-depth comparative analysis of the accounting frameworks of the stock deflation method and the output index method; The third part, on the level of practical application, discusses the difference between stock deflation method and output index method in practical application; The fourth part, by comparing and analysing the advantages and disadvantages of the two accounting methods, provides reference for China FISIM accounting.

## 2. Comparison of accounting framework between stock deflation method and output index method

### 2.1. The difficulty of the stock deflation method is to determine the appropriate deflation index

SNA (2008) pointed out that "the ideal way to obtain the estimation of macroeconomic gross volume is to strictly use the appropriate price index to reduce each component at a very detailed level", while the stock deflation method can be regarded as the application expansion of the price index deflation method in FISIM volume accounting, and its accounting basis is FISIM nominal output accounting method recommended by SNA (2008). Namely:

$$FISIM^t = FISIM_A^t + FISIM_D^t = \sum_{n=1}^N p_{An}^t q_{An}^t + \sum_{m=1}^M p_{Dm}^t q_{Dm}^t \quad (1)$$

Among them,  $A$  and  $D$  respectively represent loans and deposits,  $q_{An}^t$  and  $q_{Dm}^t$  respectively represent the average stock of all kinds of loans and deposits in  $T$  period.  $N$  and  $M$  respectively represent deposits and loan types. Loan spread  $p_{An}^t$  is the difference between loan interest rate and reference interest rate, and deposit spread  $p_{Dn}^t$  is the difference between reference interest rate and deposit interest rate. Obviously, the nominal output of FISIM determined from this is partly implied in the service price determined by the reference interest rate and the bank interest rate, while the other part is implied in the service quantity in the form of deposit and loan value.

Therefore, in FISIM material accounting, it is necessary to adopt an appropriate price index to reduce the difference between the reference interest rate and the deposit and loan interest rate in the reporting period, and another appropriate price index to reduce the average stock of deposits and loans in the reporting period. Moreover, for different types of deposits and loans, the spread between their interest rates and reference interest rates is often different. When measuring the nominal output of FISIM, it is often regarded that different types of deposits and loans have different service prices. Therefore, it is necessary to separately reduce various types of deposit (loan) services, and then use the index theory to synthesize them.

It can be seen that the stock deflation method needs to focus on solving the following four problems: First, it can collect the average stock data of all kinds of deposits and loans. Second, choose the appropriate general price index.<sup>1</sup> Reduce the stock of all kinds of deposits and loans to eliminate the impact of price changes on the number of services (stock of deposits and loans). Thirdly, because the interest rate difference between various deposit and loan interest rates and reference interest rates is different, it is necessary to construct a price index that can reflect the price changes of various deposit and loan services. Fourthly, select an appropriate index formula (for example, Laplace index, Pardon index or Fisher index) to combine all kinds of deposit and loan service price indexes respectively, so as to obtain the total FISIM price deflation index of deposits and loans.

The biggest difficulty of stock deflation method is determining the appropriate price index. The deviation of using an unreasonable price index to calculate the output of FISIM will vary with time, country and banking service category. Therefore, the output of FISIM obtained by the stock deflation method may not accurately reflect the real output of banks.

## 2.2. The key of output index method is the selection of the output index and the construction of weights

The basic idea of the output method is to measure the output of FISIM according to the quantity index of different types of financial intermediary services adjusted by quality (Paulden, 2012). This method is based on the quantity of financial intermediary service activities, subdivides them according to their different characteristics (such as the quantity, value and term of deposits and loans, etc.), and selects an appropriate quantity output index for each type of financial intermediary service activities, which is used to calculate the quantity index of this kind of financial intermediary service activities. Finally, all the quantity indexes are weighted and summarized to obtain the FISIM quantity index.

The key to the operation of the index method is to design a set of output index system covering all FISIM production activities, which should take into account both loans and deposits. For loans, the output indicators should reflect the initial cost, the screening credit cost and the loan payment processing cost, for example, new consumer loans, newly issued credit cards, loans, repayment, cancellation, etc. In addition, loans should be divided into long-term loans and short-term loans, safe loans and unsafe loans. For deposits, the output indicators should reflect account opening cost, operating account cost and managing account cost, for example, new deposit account, bank transfer, check settlement, withdrawal, direct debit, debit card and credit card payment, and account closing.

Secondly, in order to meet the requirements of quality adjustment, it is necessary to determine reasonable weights in order to summarize various quantitative indexes. The weight can be determined according to the share of various financial intermediary service activities in FISIM, but there are not only practical problems, but also theoretical problems, because the calculation method of the nominal output of FISIM has nothing to do with the number of various financial intermediary activities. Of course, the weights of various financial intermediary service activities can also be determined according to their cost composition, but the costs used should reflect all financial intermediary services within the scope involved. Even if the quantitative indicators fail to cover some costs, it should

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<sup>1</sup> In this paper, the general price index used to reduce the stock of deposits and loans is called stock reduction index.

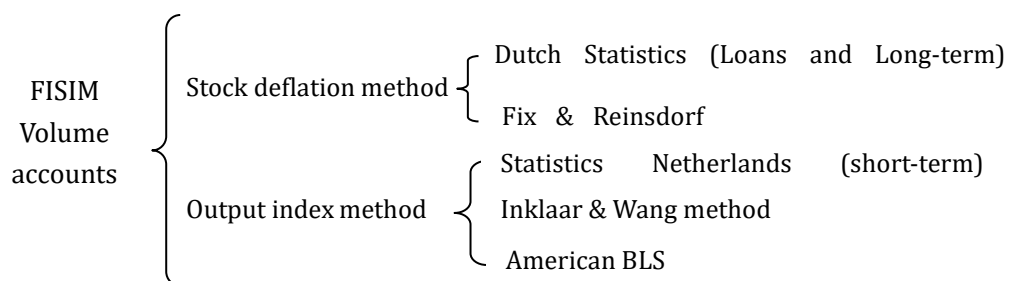
be ensured that the changes of the uncovered parts are the same as those of the covered parts, and the cost weights should be updated regularly.

The output method puts aside the price factor and simply considers the quantitative index of financial activities, so as to construct the FISIM volume index, which is more advantageous in theory. However, the output index method is a data-intensive method, and the amount of data collected is large. Once some relevant data are missing, it is very difficult to fully adjust the quality. In addition, determining the contribution of various output indicators is also an arduous and complicated task. Moreover, in the case of significant changes in the company (the indicators of current bank accounts may change during the accounting period), the output indicator method can hardly be implemented.

In addition, from the perspective of the theoretical framework, there may be great differences between the actual calculation results in the stock deflation method and the output index method. Suppose a country's average loan scale (nominal and actual value) decreases gradually over time, but the number of transactions increases year by year. Therefore, the stock deflation method may underestimate the real growth rate of loan service output. Similarly, the number of deposit transactions grows faster than the stock of deposits, which means that the stock deflation method may also underestimate the real growth rate of deposit service output. Therefore, due to different methods, the official estimates of the growth rate of FISIM in different countries are likely to have deviations, so we must be quite cautious when comparing the growth rates of FISIM among countries.

### 3. The comparison of stock deflation method and output index method in practical application

In practice, due to the difference of data availability, different departments or regions adopt different accounting methods. Since 1999, the U.S. Bureau of Labor Statistics has used the BLS method to measure the output of FISIM. Because it is based on the total output index of banks published by the BLS Productivity and Technology Office, it is called the BLS method (Jia, 2013). Statistics Netherlands puts forward a FISIM method for measuring the number of short-term deposits from the point of view of the amount of physical output-the output index method, while loans and long-term deposits adopt the stock deflation method. Fixler and Reinsdorf (2006) applied the stock deflation method to all types of loans and deposits. Inklaar and Wang (2013) constructed a FISIM material output calculation model based on transaction activity numbers from the perspective of banks as information and transaction processors, which is called the "activity counting method". However, other countries in the European Union basically rely entirely on the stock deflation method, and even countries that adopt the same accounting method have great differences in the implementation process. Up to now, there is no unified method for FISIM volume accounting. Several typical FISIM volume accounting methods in practice are classified and compared as follows (Figure 1):



**Figure 1.** Classification of FISIM accounting methods.

#### 3.1. Comparison of the practical operation of stock deflation method

Although both Statistics Netherlands and Fixler and Reinsdorf use the stock deflator method to account for

FISIM physical output, there are major differences in the specific applications, mainly in the three aspects of the application object, service price index and the choice of the stock deflator (see Table 1 for details).

**Table 1.** Comparison of application cases of stock deflation method.

| Method                 | Application object           | Service price index  | Stock deflation index                 |
|------------------------|------------------------------|----------------------|---------------------------------------|
| Dutch Statistics Act   | Loans and long-term deposits | Drobisch price index | CPI                                   |
| Fix & Reinsdorf method | All deposits and loans       | Fisher price index   | Price Index of Gross Domestic Product |

The key point of stock deflation method is to determine the service price index and stock deflation index. As far as the stock deflation index is concerned, Statistics Netherlands believes that CPI can effectively reflect the price factors contained in long-term deposits and deposits and loans, so CPI is adopted to reduce the loan stock to eliminate the influence of price changes on the loan stock. While Fixler and Reinsdorf has reconstructed a new index-gross domestic purchasing power.<sup>2</sup>The price index is used to reduce the stock of all types of deposits and loans. Relatively speaking, the price index of GDP can effectively eliminate the influence of price factors on the stock of deposits and loans. The reason is that although CPI can reflect the price change level of a country's consumption field in a certain period, consumption is only one of the purposes of loans, and its share is small. Loans are mainly used for intermediate investment and investment in fixed assets in the production field. Therefore, the stock deflation index should also fully reflect the price change level of intermediate investment, fixed asset investment and import and export, and make quality adjustment according to the loan ratio, not just the CPI of consumption. From the perspective of GDP accounting by expenditure method, the price index of GDP can reflect the range of price changes in a country's consumption and investment fields in a certain period, and it can more effectively reflect the changes of price factors in the stock of deposits and loans. However, the price index of GDP can't reflect the price changes of various intermediate inputs and imports and exports, so it still can't completely eliminate the price factor in the loan stock. In addition, even though the price index of GDP can effectively eliminate the price factor in the loan stock, it is still a debatable question whether it can be used to eliminate the price factor in the deposit stock (Jiang and Jia, 2012).

In terms of the structure of service price index, Statistics Netherlands adopts Drobisch price index.<sup>3</sup>To reflect the change in the price of the implied fee-based service. Fixler and Reinsdorf constructs Fisher service price index from the perspective of user cost price. From the perspective of utility theory, Fisher price index can better reflect the utility change caused by price change. Mathematically, Fisher price index is better than Drobisch price index, which is a better choice to determine the service price index. However, the calculation of this method is complicated, and the quantity series obtained by Fisher price index loses its additivity, so the total output of FISIM quantity cannot be obtained by adding the output of loan FISIM quantity and the output of deposit FISIM quantity.

Theoretically, the choice of Fixler and Reinsdorf method is better than that of Statistics Netherlands in terms of both service price index and stock deflation index, but in practice, Statistics Netherlands is easier to implement. In short, the choice of deflation factor should reflect the price change of deposit and loan stock and interest rate spread as much as possible. On this basis, the availability of data and the perfection of index system should be further considered in order to design a more reasonable and feasible FISIM deflation index.

### 3.2. Comparison of the practical operation of the output index method

The output index method of Statistics Netherlands is basically the same as that of Inklaar and Wang's method,

<sup>2</sup> Gross domestic purchasing power is equal to GDP minus net exports.

<sup>3</sup> Drobisch price index is actually a unit value index, which is the ratio of the average price of the reporting period to the base period.

that is, the output of goods can be calculated by the number of various service activities provided by banks. The BLS rule is to indirectly calculate the total output of implied fee-based services by making clear the logical relationship between the total output of bank services and the total output of implied fee-based services. The other three methods also have big differences in application objects, index selection and weight determination (see Table 2 for details).

**Table 2.** Comparison of application cases of output index method.

| Output index method   | Application object     | Index selection   | Weight structure   |
|-----------------------|------------------------|---|--|
| Bl method             | All deposits and loans | Various bank transactions (for example, check clearing, ATM transactions, electronic fund transfer, various outstanding loans and trust accounts)                         | The weight is based on the functional cost analysis survey of the Federal Reserve Board of the United States (fixed weight).   |
| Dutch statistics      | short-term deposits    | Payment quantity of various short-term deposit transactions (check, credit card, debit card, electronic money card, electronic transfer, internal payment transfer, etc.) | Design weights (fixed weights) for income and cost reports of bank payment transaction services.   |
|                       | business loans         | Number of various credit risk loan transaction service activities   | Average share (variable weight) of all kinds of credit risk loan service income in total loan service income.  |
| Inklaar & Wang method | Real estate loan       | Number of real estate transaction service activities  | Unweighted (no sub-classification)   |
|                       | All deposits           | Use transaction activity as output index (including credit transfer, direct debit, credit and debit card payment, electronic money, check and other transactions, etc.)   | A The weights of all deposit transactions are the same;<br>B Take the proportion of various transactions in the total transaction value as the weight (variable weight). |

Since 1999, the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor has adopted the BLS method to measure the output of FISIM. This method assumes the growth rate of total output of banks and the BLS total output index of banks.<sup>4</sup> Similarly, because it is based on the total output index of banks published by BLS Productivity and Technology Office, it is called BLS method. The BLS method uniformly compiles the volume index for all the trading activities of banks. Starting with the nominal output of banks, it decomposes layer by layer, and extrapolates to get the price index and volume index of the bank's implicit charging services, which is an indirect measurement method. Other methods are aimed at a certain deposit or loan transaction, and directly construct the volume index through the output index. The BLS method needs to reasonably select the output indicators that can reflect the development of domestic banking services to construct the BLS index, so as to fully reflect the development level of banking services. However, the establishment of output index system and the collection of raw data is a huge and complicated task. This method is not the best choice if only for measuring the production of FISIM. The reason why the United States adopts this method is that the main purpose of BLS index constructed by the Bureau of Labor Statistics is not to measure the output of FISIM, but to measure the output of FISIM is only one of its by-products. At the same time, it is necessary to ensure the additivity of the estimated value of the total output of bank services, that is, to find a method to estimate the total output of bank services, so that the total output of

<sup>4</sup> The BLBank Gross Output Index is based on the weighted average of all kinds of bank transaction activity indexes, including bank transactions (check clearing, ATM transactions, electronic fund transfer), all kinds of outstanding loans and trust accounts. It integrates the direct measurement values of transaction or activity, and the weights used are based on the functional cost analysis survey of the Federal Reserve Board of the United States. Its components include check endorsement, electronic payment quantity measurement, time deposit, withdrawal, loan and trust industry.

bank services is equal to the sum of the total output of explicitly charged services and the total output of implicitly charged services. This can be achieved theoretically, but there are still great difficulties in practice. The difference between LSFA and BLS is that Statistics Netherlands only applies the output index method to short-term deposits. Therefore, both of them are different in the selection of indicators and the construction of weights. Statistics Netherlands finally chose the payment transaction quantity of various short-term deposit transactions as the output index to measure the output of short-term deposit FISIM. The weight of each index is designed by McKinsey and Company (2006), an expert in price statistics, using the income and cost report of bank payment transaction services. Statistics Netherlands can directly calculate the volume index of short-term deposit FISIM according to the type, weight and payment number of short-term deposit transactions, that is, the sum of payment amount of weighted transactions in the reporting period divided by the sum of payment amount of weighted transactions in the base period, and the weight is fixed. Generally speaking, the output index method of Statistics Netherlands is relatively simple and easy to implement, while the calculation process of BLS method is more complicated.

According to the availability of existing data, Inklaar and Wang (2013) has built a calculation model of banking services volume based on transaction activity, aiming at industrial and commercial loans, real estate loans and deposit transaction services, so that banking transaction services and deposit and loan transaction activities are equal. Bank loans use the average growth rate of different credit risk loan services to calculate the growth rate of the whole industrial and commercial loan services; Real estate loans use the accurately reduced loan stock to approximate the number of activities of real estate loan transaction services; The deposit transaction service adopts the output index method similar to that of Statistics Netherlands, and the output index and deposit transaction types adopted are almost the same as those of Statistics Netherlands. It's just that the weights of various transaction types are determined in different ways. They think that the weights of various deposit transactions are the same on the assumption that they are willing to pay the same fees for each type of transaction; However, if it is assumed that consumers' willingness to pay for various transactions is proportional to the transaction amount, the weight of each transaction is its proportion in the total transaction value.

#### 4. Findings

At present, China adopts the weighted average of consumer price index and fixed asset investment price index to deflate the current value added of the financial and insurance industry, so as to obtain the constant value added of the industry. The fatal disadvantage of this method is that it does not reduce the price factor in the number of services. Moreover, it is assumed that the price change of financial insurance services provided to residents is equal to that of the whole consumer price, and that the price change of financial insurance services provided to enterprises is equal to that of the whole fixed asset investment. Whether this strict assumption is true is doubtful. However, with the reform and improvement of China's national economic accounting system, the FISIM material accounting in China will inevitably change from simple price index deflation method to stock deflation method or output index method. There are two points worth learning in this process:

(1) The key to adopting stock deflation method in China FISIM material accounting is to set scientific and reasonable deflation factors from two aspects: service price and service quantity (i.e. deposit and loan stock). The service price deflation factor needs to be designed from the nominal FISIM accounting method combined with the price index theory. Influenced by the nominal FISIM accounting method (accounting for loan FISIM and deposit FISIM respectively), the additivity of volume index should be considered in the choice of service price deflation factor. Of course, from the practice of the volume accounting of other goods and services, the existing price index is almost always compiled by Laplace formula, which meets the additive requirements. The service deflation factor should be designed from the point of view of where the funds are used, because the potential inflation level of the funds used in different places is different. If the funds are used for consumption, you can use CPI to reduce the loan



stock; If it is used for investment, the fixed asset investment price index can be used to reduce the loan stock; If it is used for intermediate consumption, PPI can be used to reduce the loan stock. Finally, the stock deflation index of each usage destination can be adjusted by weighting (taking the proportion of the capital share of different usage destinations in the total capital as the weight) to obtain the service quantity deflation factor.

(2) The output index method is adopted in China FISIM volume accounting, and the output index must be set according to the availability of data. Relatively speaking, deposit transaction data is easier to obtain than loan transaction data.<sup>5</sup>Therefore, Statistics Netherlands only uses output fingering for short-term deposits. For loans and long-term deposits, the idea of Inklaar and Wang (2013) is more meaningful for reference. According to the availability of data, according to the specific types of each loan, we can find the appropriate output index. When it is unavailable, we can equate it with some obvious transaction activities, so that we can calculate the growth rate of FISIM volume through the output index method. In practice, according to the availability of data, we can gradually accumulate data of various deposit and loan trading activities, so as to measure the production of FISIM materials through the change of trading activities.

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### Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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<sup>5</sup> The Red Book published by the Bank for International Settlements contains the annual data of various payment transactions in many countries.