

Poster Session: #1

Time: Monday, August 6, 2012 PM

*Paper Prepared for the 32nd General Conference of  
The International Association for Research in Income and Wealth*

**Boston, USA, August 5-11, 2012**

**Choosing a Method for the Deflation of FISIM**

Paul den Boer

For additional information please contact:

Name: Paul den Boer

Affiliation: Statistics Netherlands

Email Address: pm.denboer@cbs.nl

**This paper is posted on the following website: <http://www.iariw.org>**



## **Statistics Netherlands**

Division of Macro-economic Statistics and Dissemination  
Development and support department

---

### **CHOOSING A METHOD FOR THE DEFLATION OF FISIM**

**Paul den Boer**

**Statistics Netherlands**

*This paper has been prepared for the IARIW (International Association for Research in Income and Wealth) Conference, from 5-11 August 2012, in Boston.*

*First Poster Session: Productivity Measurement Under Alternative Assumptions*

*Keywords: constant prices, deflated stocks, deflation, FISIM, output indicator, productivity, quantity index, volume terms*

---

*Project number:*

*BPA number:*

*Date:*

22 June 2012

## 1. Introduction

In National Accounts banks produce primarily Financial Intermediation Services Indirectly Measured (FISIM). Paragraph 2 explains the concept of FISIM, which is based on a “reference rate”. Paragraph 3 describes how FISIM in current prices is calculated by Statistics Netherlands. After FISIM the provisions of banks, which are direct fees for their services, are the major source of revenues for banks. FISIM and provisions of banks show different growth rates, especially during the economic crisis years 2008-2011. This difference is primarily caused by a difference in prices, which in the case of FISIM are interest margins. The Handbook on Price and Volume Measures 2001 (Eurostat 2001) recommends two methods to calculate FISIM in volume terms. The first is the deflated stocks method and the second is the output indicator method. In practice and in literature, there are many variations to both methods. Statistics Netherlands uses both methods (paragraph 3). Paragraph 4 describes the deflation method proposed by Fixler and Reinsdorf (2006). Paragraph 5 gives a description of the deflation method advocated by Inklaar and Wang (2011). Paragraph 6 gives the empirical results of the different methods for the deflation of FISIM production. This paper compares the different deflation methods. It concludes with empirical results of multifactor productivity growth of banks, based on the consolidated production by banks. Since FISIM is deflated with three methods, multifactor productivity of banks can also be determined using these different methods. Paragraph 7 gives some conclusions of the comparison between the different methods for the deflation of FISIM.

## 2. FISIM

What is FISIM? The System of National Accounts 2008 (SNA 2008)<sup>1</sup> paragraph 6.163 states:

“One traditional way in which financial services are provided is by means of financial intermediation. This is understood to refer to the process whereby a financial institution such as a bank accepts deposits from units wishing to receive interest on funds for which the unit has no immediate use and lends them to other units whose funds are insufficient to meet their needs. The bank thus provides a mechanism to allow the first unit to lend to the second. Each of the two parties pays a fee to the bank for the service provided, the unit lending funds by accepting a rate of interest lower than that paid by the borrower, the difference being the combined

---

<sup>1</sup> (European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank 2009)

fees implicitly charged by the bank to the depositor and to the borrower. From this basic idea the concept emerges of a “reference” rate of interest. The difference between the rate paid to banks by borrowers and the reference rate plus the difference between the reference rate and the rate actually paid to depositors represent charges for financial intermediation services indirectly measured (FISIM).”

Financial intermediation services indirectly measured (FISIM) are by convention only provided by financial institutions in respect to loans and deposits. This is because financial institutions can only influence the interest rate on these instruments.

SNA 2008 paragraph 6.166 defines the reference rate:

“The reference rate to be used in the calculation of SNA interest is a rate between bank interest rates on deposits and loans. However, because there is no necessary equality between the level of loans and deposits, it cannot be calculated as a simple average of the rates on loans or deposits. The reference rate should contain no service element and reflect the risk and maturity structure of deposits and loans. The rate prevailing for inter-bank borrowing and lending may be a suitable choice as a reference rate. However, different reference rates may be needed for each currency in which loans and deposits are denominated, especially when a non-resident financial institution is involved. For banks within the same economy, there is often little if any service provided in association with banks lending to and borrowing from other banks.”

It is clear that the reference rate should be a rate that excludes any associated service element. The description of a reference rate that reflects the risk and maturity structure of deposits and loans however leaves scope for interpretation. The choice for the right reference rate has been debated for long. Therefore, a Task Force on FISIM was created at the end of 2010. The mandate of the Task Force is to investigate the issues related to currencies, maturities, risks, and price and volume measures. The conclusions of the Task Force (which reference rate should be preferred) depend on the results of a number of tests being conducted by national institutions. With respect to the deflation of FISIM, most countries use a deflated stocks method. Statistics Netherlands uses an output indicator method to deflate FISIM on short term deposits. Both methods have their advantages and disadvantages. Above all, the Task Force agreed that different kind of loans or deposits have different margins (interest spread), and thus different prices. Therefore, each type of loan or deposit must be deflated separately.

### 3. Statistics Netherlands method

Statistics Netherlands calculates FISIM in current and constant prices. Paragraph 3.1 describes how FISIM in current prices is determined. Paragraph 3.2 explains the methods used to derive FISIM in constant prices.

#### 3.1 FISIM in current prices

FISIM is subdivided into FISIM on loans  $A$  (the  $A$  from assets) and FISIM on deposits  $D$ . FISIM on loans is calculated by the interest spread on loans times the stock of loans, FISIM on deposits is the interest spread on deposits times the amount of deposits.

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

The stocks of loans  $q_A$  and deposits  $q_D$  are average balances. For each type of loan or deposit  $n$  the average of the balances at the start and the end of period  $t$  is taken into account. The interest spread on loans  $p_A$  is the difference between the interest rate that banks receive on loans and the reference rate:

$$p_{An}^t = r_{An}^t - r_R^t \quad (2)$$

where  $r_A$  is the interest rate on loans and  $r_R$  is the reference rate. The interest spread on deposits  $p_D$  is usually written as the difference between the reference rate and the interest rate that banks pay to customers on their deposits:

$$p_{Dn}^t = r_R^t - r_{Dn}^t \quad (3)$$

$r_D$  being the interest rate on deposits.

Table 1 gives an idea of the balance structure of banks in the Netherlands. It shows the average balance in the year 2011, per type of loan or deposit.

**Table 1. Assets and liabilities of banks, average balance of 2011 (million euros), per type of loan or deposit**

Assets/liabilities	Type of loan or deposit	Average balance
Assets	Consumer credit	29.200
	Other loans	1.004.382
	Real estate loans	624.317
Liabilities	Long term deposits	1.021.851
	Short term deposits	388.247

Source: Statistics Netherlands

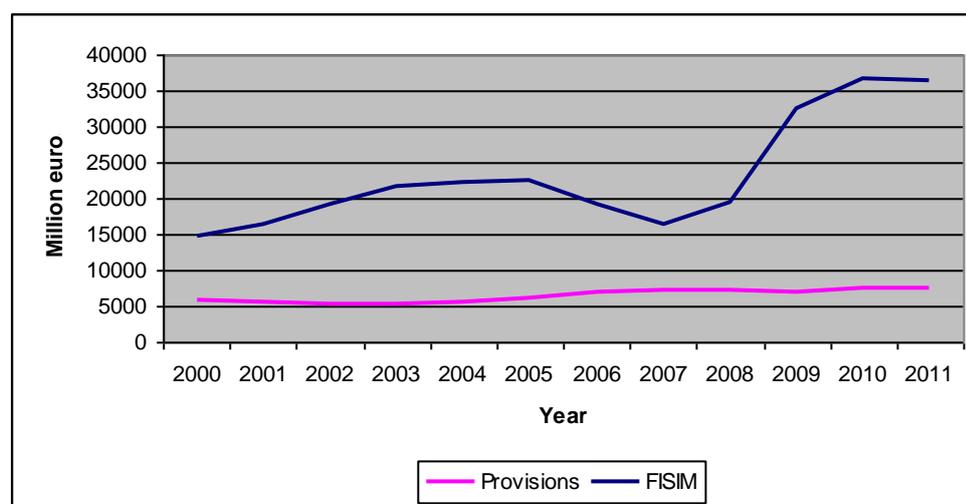
Statistics Netherlands uses a reference rate that is a weighted average of different reference rates, depending on instrument, maturity and currency. For determining the reference rate the following market rates are used:

- Short-term loans: three-month Euribor
- Long-term loans: latest ten-year government bonds
- Short-term deposits: call money euro area
- Long-term deposits in euros: three-month Euribor
- Long-term deposits in other currency: average of three-month Euribor and three-month euro-dollar deposits

The weights used are the average balances of loans and deposits. Only the balances that are both assets and liabilities of banks are taken into account. So, these balances refer to banks borrowing from other banks or banks holding deposits at other banks. The sources of these balances are the sector accounts. Production, intermediate consumption, final consumption, import and export of FISIM are calculated for the supply and use tables as well as the sector accounts. So, FISIM is determined per industry and per subsector.

Banks also receive provisions, which are direct fees for their services. After FISIM, the provisions of banks are the major source of revenues for banks. Figure 1 shows total production of FISIM and provisions of banks in current prices for the period 2000-2011.

**Figure 1. FISIM and provisions of banks in current prices (million euros), 2000-2011**



Source: Statistics Netherlands

FISIM lies on a higher level than provisions of banks. Since the crisis year 2008 FISIM has increased enormously. This increase is primarily a price effect. The reference rate (largely based on three-month Euribor and latest ten-year government bonds) is much lower than before the crisis. The three-month Euribor sharply decreased from 4,64 percent in 2008 to 1,22 percent in 2009. The interest rate on latest ten-year government bonds fell from 4,23 to 2,98 percent between 2008 and 2009. The question is whether banks provide also more services in volume terms. To answer this question, FISIM is calculated in constant prices.

### 3.2 FISIM in constant prices

The Handbook on Price and Volume Measures 2001 (Eurostat 2001) recommends two equally important methods to calculate FISIM in volume terms<sup>2</sup>. The first is the deflated stocks method. The second is an output indicator method, which is only used by Statistics Netherlands. In the Netherlands, FISIM on loans and long term deposits is deflated using the deflated stocks method. The output indicator method is used for the deflation of FISIM on short term deposits.

#### 3.2.1 Deflated stocks method

The deflated stocks method is “the application of the base period interest margins on loans and deposits to the stocks of loans and deposits re-valued (using a general price index such as the implicit price deflator for domestic final demand) to base period prices. It is necessary to deflate the stocks of loans and deposits to remove the influence of price changes on the stock otherwise the changes in price would feed through into the volume measure. The process of deflation aims to derive a volume of stock of loans and deposits on which the base year margin can then be applied” (Eurostat 2001). Statistics Netherlands uses the deflated stocks method for the deflation of FISIM on loans and long term deposits. The following description and formulas relate only to FISIM on loans. Deflating FISIM on long term deposits occurs in the same way.

The price index of FISIM on loans, used by Statistics Netherlands (SN), is a variation of the Drobisch price index:

$$P_A^{SN-U} \equiv CPI \cdot P_A^U(p^1, q^1, p^0, q^0) = CPI \frac{\sum_{n=1}^N p_{An}^1 q_{An}^1 / \sum_{n=1}^N q_{An}^1}{\sum_{n=1}^N p_{An}^0 q_{An}^0 / \sum_{n=1}^N q_{An}^0} \quad (4)$$

with  $1$  as the current period and  $0$  as the previous period. The price index of FISIM on loans consists of two parts. The first part is the Consumer Price Index (CPI)<sup>3</sup>,

<sup>2</sup> These are B-methods. The Handbook on Price and Volume Measures 2001 (Eurostat 2001) finds it impossible to identify a suitable A-method for FISIM in volume terms.

<sup>3</sup> The CPI with base year 2006 is used.  $CPI = CPI^1 / CPI^0$ , where 1 is the current period and 0 is the previous period.

which deflates the stocks of loans to remove the influence of price changes on the stock. The second part is a Drobisch price index  $P^U$ . The formula of the Drobisch price index has become known as the unit value index (that's why the superscript  $U$  is used), and is a ratio of weighted arithmetic averages of prices. This unit value index can also be interpreted as a value index divided by a Drobisch quantity index<sup>4</sup>. The quantity index of FISIM on loans is a variation of the Drobisch quantity index:

$$Q_A^{SN-U} \equiv \frac{1}{CPI} \cdot Q_A^U(p^1, q^1, p^0, q^0) = \frac{1}{CPI} \frac{1_N \cdot q_A^1}{1_N \cdot q_A^0} \quad (5)$$

where  $1_N \equiv (1, \dots, 1)$ . The left part of the formula deflates the stocks of loans.

FISIM on long term deposits is deflated in the same way as FISIM on loans. Substituting  $p_A$  and  $q_A$  for respectively  $p_D$  and  $q_D$  in formulas 4 and 5 gives the price and quantity indices of FISIM on long term deposits. This is only valid for  $n$  not being a type of short term deposits, because short term deposits are deflated with the output indicator method.

### 3.2.2 Output indicator method

The output indicator method gives output indicators for different activities of the financial institution. The Handbook on Price and Volume Measures in National Accounts stresses that “important differences between business market and the consumer market do exist and must be reflected by different output indicators for both markets” (Eurostat 2001). Therefore, in the Netherlands subsectors S.14 (households and unincorporated enterprises) and S.15 (non-profit institutions serving households) have different output indicators than the other subsectors. Statistics Netherlands applies the output indicator method for the deflation of short term deposits. The output indicator used is the number of payment transactions of a variety of deposit transactions. Table 2 shows the different types of transactions with their weights, and per type of transaction the number of payment transactions in the period 2005-2011.

---

<sup>4</sup> Bert Balk (2008) describes the Drobisch quantity index  $Q_A^U = 1_N \cdot q_A^1 / 1_N \cdot q_A^0$  as a Dutot-kind quantity index.

**Table 2. Output indicators: number of payment transactions (in millions), 2005-2011**

Type of transaction	Weight	2005	2006	2007	2008	2009	2010	2011
Cheques	0,60	0	0	0	0	0	0	0
Credit cards	3,23	30	32	34	37	35	35	39
Debit cards	0,17	1.334	1.451	1.588	1.756	1.946	2.154	2.285
Direct debits	0,10	1.059	1.139	1.177	1.226	1.272	1.310	1.340
E-money cards	0,09	147	164	175	176	177	178	172
Inpayments transfers	0,30	231	209	209	205	195	187	177
Transfers electronic	0,07	914	1.031	1.078	1.134	1.164	1.228	1.259
Transfers paper-based	0,30	75	63	53	48	43	38	33

Source: Dutch Central Bank

The weights of the different types of transactions are developed by price statistics experts of Statistics Netherlands, using the report of McKinsey & Company (2006) on the revenues and costs of payment services for banks. Per type of transaction the weighted number of payments transactions is calculated as the weight times the number of payment transactions. The sum of the weighted number of payment transactions in the current period divided by that of the previous period gives the growth in volume of short term deposits. The quantity index of FISIM on short term deposits:

$$Q_D^{SN} = \frac{\sum_{i=1}^I w_i T_i^1}{\sum_{i=1}^I w_i T_i^0} \quad (6)$$

where  $i$  is the type of transaction,  $w$  is the weight and  $T$  is the number of payment transactions in the current period  $I$  and the previous period  $0$ . The corresponding (implicit) price index of FISIM on short term deposits:

$$P_D^{SN} = \frac{\sum_{n=1}^N p_{Dn}^1 q_{Dn}^1 / \sum_{n=1}^N p_{Dn}^0 q_{Dn}^0}{\sum_{i=1}^I w_i T_i^1 / \sum_{i=1}^I w_i T_i^0} \quad (7)$$

if  $n$  is a type of short term deposits.

#### 4. Fixler and Reinsdorf method

Dennis Fixler and Marshall Reinsdorf (2006) prefer to use a Fisher price index (instead of a unit value price index) for the deflation of FISIM. The Fisher index is based on the Laspeyres and Paasche indices. And instead of the CPI, they use the price index for gross domestic purchases<sup>5</sup> for the deflation of stocks. They apply the

<sup>5</sup> Gross domestic purchases = gross domestic product – exports + imports. The price index for gross domestic purchases measures the prices paid by residents.

deflated stocks method to all types of loans and deposits. For an easy comparison between the different methods of deflation, the indices are rewritten using the same symbols as in the formulas of the Statistics Netherlands method. So, the Laspeyres price index of FISIM on deposits proposed by Fixler and Reinsdorf (FR) becomes:

$$P_D^{FR-L} \equiv P^{GDPU} \cdot P_D^L(p^1, q^1, p^0, q^0) = P^{GDPU} \sum_{n=1}^N s_{Dn}^0 \frac{P_{Dn}^1}{P_{Dn}^0} \quad (8)$$

The price index  $P_D^{FR-L}$  is a variation of the Laspeyres price index and consists of two parts. The left part of the formula  $P^{GDPU}$  is the price index for gross domestic purchases, which deflates the stocks of deposits. The right part is a Laspeyres price index  $P_D^L$ , which is written as a weighted arithmetic mean of price relatives, with the base period value shares as weights<sup>6</sup>. The weights are in general defined by  $s_{Dn}^t \equiv p_{Dn}^t q_{Dn}^t / P_D^t Q_D^t$  and add up to 1. The corresponding Laspeyres quantity index of FISIM on deposits:

$$Q_D^{FR-L} \equiv \frac{1}{P^{GDPU}} \cdot Q_D^L(p^1, q^1, p^0, q^0) = \frac{1}{P^{GDPU}} \sum_{n=1}^N s_{Dn}^0 \frac{q_{Dn}^1}{q_{Dn}^0} \quad (9)$$

The Paasche price index of FISIM on deposits is a weighted harmonic mean of price relatives, with the value shares of the comparison period as weights<sup>7</sup>:

$$P_D^{FR-P} \equiv P^{GDPU} \cdot P_D^P(p^1, q^1, p^0, q^0) = P^{GDPU} \left[ \sum_{n=1}^N s_{Dn}^1 \left( \frac{P_{Dn}^1}{P_{Dn}^0} \right)^{-1} \right]^{-1} \quad (10)$$

The corresponding Paasche quantity index of FISIM on deposits:

$$Q_D^{FR-P} \equiv \frac{1}{P^{GDPU}} \cdot Q_D^P(p^1, q^1, p^0, q^0) = \frac{1}{P^{GDPU}} \left[ \sum_{n=1}^N s_{Dn}^1 \left( \frac{q_{Dn}^1}{q_{Dn}^0} \right)^{-1} \right]^{-1} \quad (11)$$

The Fisher price index is the geometric mean of the Laspeyres and the Paasche price index:

$$P_D^{FR-F} \equiv [P_D^{FR-L}(p^1, q^1, p^0, q^0) P_D^{FR-P}(p^1, q^1, p^0, q^0)]^{1/2} \quad (12)$$

The corresponding Fisher quantity index of FISIM on deposits:

$$Q_D^{FR-F} \equiv [Q_D^{FR-L}(p^1, q^1, p^0, q^0) Q_D^{FR-P}(p^1, q^1, p^0, q^0)]^{1/2} \quad (13)$$

<sup>6</sup>  $P_D^L$  can also be written as  $P_D^L = \sum_{n=1}^N p_{Dn}^1 q_{Dn}^0 / \sum_{n=1}^N p_{Dn}^0 q_{Dn}^0$

<sup>7</sup>  $P_D^P$  can be rewritten as  $P_D^P = \sum_{n=1}^N p_{Dn}^1 q_{Dn}^1 / \sum_{n=1}^N p_{Dn}^0 q_{Dn}^1$

The indices of FISIM on loans are determined in the same way as with FISIM on deposits. Substituting  $p_D$ ,  $q_D$  and  $s_D$  for respectively  $p_A$ ,  $q_A$  and  $s_A$  (with  $s_{An}^t \equiv p_{An}^t q_{An}^t / p_A^t q_A^t$ ) in formulas 8, 9, 10 and 11 gives the Laspeyres and Paasche indices of FISIM on loans. The Fisher indices of FISIM on loans can again be derived from the Laspeyres and Paasche indices. This method of deflation is in line with the recommendations of the FISIM Task Force that each type of loan or deposit must be deflated separately. It is agreed that in theory this is better than simply summing up the stocks of all different kind of loans and deposits, which have different margins.

## 5. Inklaar and Wang method

Inklaar and Wang (2011) measure bank output in terms of quality-adjusted activity-counts of different categories of banking transactions. They strongly prefer the output indicator method above the deflated stocks method. They have chosen output indicators and calculated quantity indices for the deflation of FISIM on commercial and industrial (C&I) loans (paragraph 5.1), real estate loans (paragraph 5.2) and deposits (paragraph 5.3).

### 5.1 Commercial and industrial loans

Aggregate growth of lending services is calculated as the weighted average growth in different rating classes:

$$Q_A^{JW} = \sum_{i=1}^L \bar{w}_i \frac{L_i^1}{L_i^0} \quad (14)$$

where  $L$  is the number of loans in rating class  $i$ . Here  $\bar{w}_i$  is the average share of rating- $i$  loans in total FISIM from C&I loans, with  $\bar{w}_i = .5(w_i^1 + w_i^0)$ , and

$$w_i^t = \frac{p_{Ai}^t q_{Ai}^t}{p_A^t q_A^t} \quad (15)$$

### 5.2 Real estate loans

For the deflation of FISIM on real estate loans an output indicator is derived from a deflated balance. The relation between the number and the balance of mortgages can be expressed as  $m^t = b^t - p^t$  where  $m$  is the growth of the number of mortgage loans processed, including both outstanding loans and new loans originated<sup>8</sup>. Here,  $b$

---

<sup>8</sup> Due to empirical limitations, Inklaar and Wang (2011) assume that outstanding loans and new originated loans represent the same quantity of service. Further,  $n$  also depends on the growth of the loan-to-value ratio (ratio of mortgage loans to house prices), which is assumed to be constant over time, because of the lack of data.

is the growth in the loan balance, which is deflated using the growth in house price index  $p$ . According to Inklaar and Wang (2011), the proper deflator should be the price index for the assets funded, not a general price index. For the Netherlands, they use the sales price index of existing homes, which has been developed by Statistics Netherlands in cooperation with the Property Register. The quantity index of FISIM on real estate loans according to Inklaar and Wang (IW):

$$Q_A^{IW-U} \equiv \frac{1}{PEH} \cdot Q_A^U(p^1, q^1, p^0, q^0) = \frac{1}{PEH} \frac{1_N \cdot q_A^1}{1_N \cdot q_A^0} \quad (16)$$

where  $1_N \equiv (1, \dots, 1)$  and  $PEH$  is the price index of existing homes. This quantity index looks like the one used by Statistics Netherlands (formula 5). The difference is the price index chosen to deflate the balance of loans. The quantity index is valid if  $n$  relates to real estate loans.

### 5.3 Deposits

Inklaar and Wang (2011) have applied an output indicator method to deflate FISIM on deposits. Just like the Statistics Netherlands method, the number of payment transactions is used as output indicator. They distinguish almost the same types of deposit transactions: cheques, credit card payments, credit transfers, debit card payments, direct debits, e-money and other transactions. However, the weights of the types of transactions are determined in a different way. They assume two kind of weighting schemes:

- 1) Every type of deposit transaction is weighted equally;
- 2) The weight each type of transaction is its share in the total transaction value, assuming that customers' willingness to pay for each transaction is proportional to the amount transacted.

The quantity index of FISIM on deposits, according to Inklaar and Wang (IW), using familiar symbols:

$$Q_D^{IW} = \frac{\sum_{i=1}^I w_i T_i^1}{\sum_{i=1}^I w_i T_i^0} \quad (17)$$

Again,  $T$  is the number of payment transactions and  $i$  is the type of transaction. The weights are  $w_i=1$  (weighting scheme 1) or  $w_i = \frac{V_i}{\sum_{i=1}^I V_i}$  (weighting scheme 2)

where  $V$  is the transaction value.

## 6. Empirical results

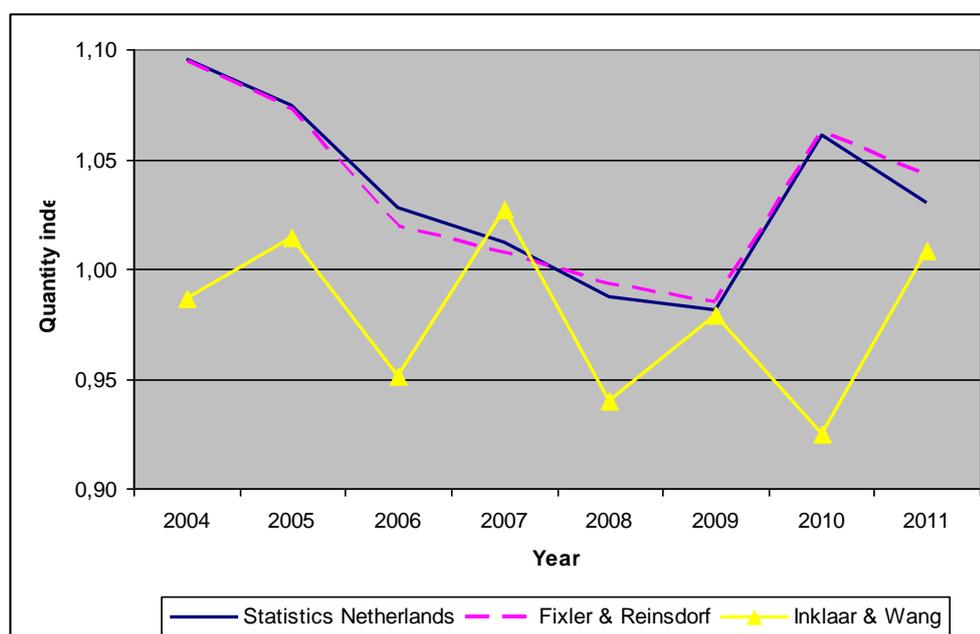
The three methods described have been applied to calculate quantity indices of FISIM for the years 2004-2011. The Inklaar and Wang method could not be applied

to other loans, because there are no data of the number of other loans. Further, their method is only applied to short term deposits, so the long term deposits are only calculated with the other two methods (the Statistics Netherlands method and the Fixler and Reinsdorf method). All methods could be applied to consumer credit (paragraph 6.1), real estate loans (paragraph 6.2) and short term deposits (paragraph 6.3). All the quantity indices can be found in appendix table A1.

### 6.1 Consumer credit

FISIM on consumer credit has been deflated by three methods: the Statistics Netherlands method, Fixler and Reinsdorf method, and the Inklaar and Wang method. Inklaar and Wang (2011) experiment by 1) using the same reference rate for low-, moderate- and other-risk loans; 2) raising the reference rate for moderate- and other-risk loans until the price ( $r_{Ai} - r_R$ ) equals that for low-risk loans. In the Netherlands, interest on different types of consumer credit is measured by one interest rate. The reference rate used is also the same. So, both variations of the Inklaar & Wang method give the same results. Figure 2 gives the quantity indices calculated with the three methods, for the years 2004-2011.

**Figure 2. Quantity index of FISIM on consumer credit, calculated with different methods, 2004-2011**



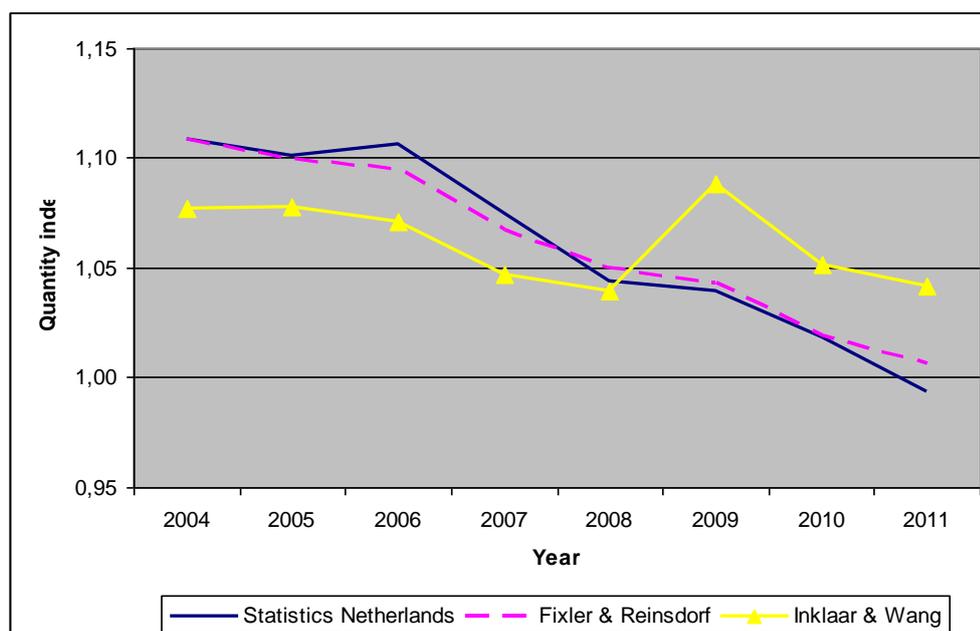
The CPI deflated stocks method (Statistics Netherlands) and the deflated stocks method using a Fisher index corrected for price changes in gross domestic purchases (Fixler and Reinsdorf) give about the same results. The Inklaar and Wang method uses the number of loans as an output indicator. For consumer credit, that is the number of current accounts overdrawn, outstanding contracts of fixed credit, and

limits granted for revolving and savings-based credit. It is clear that this output indicator method gives different and more fluctuating results.

## 6.2 Real estate loans

When the deflated balance method is used, all methods advocate a different deflator. The choice for the right deflator is important, because it can influence the measurement of FISIM in volume terms a lot. Figure 3 shows the results.

**Figure 3. Quantity index of FISIM on real estate loans, determined by different methods, 2004-2011**

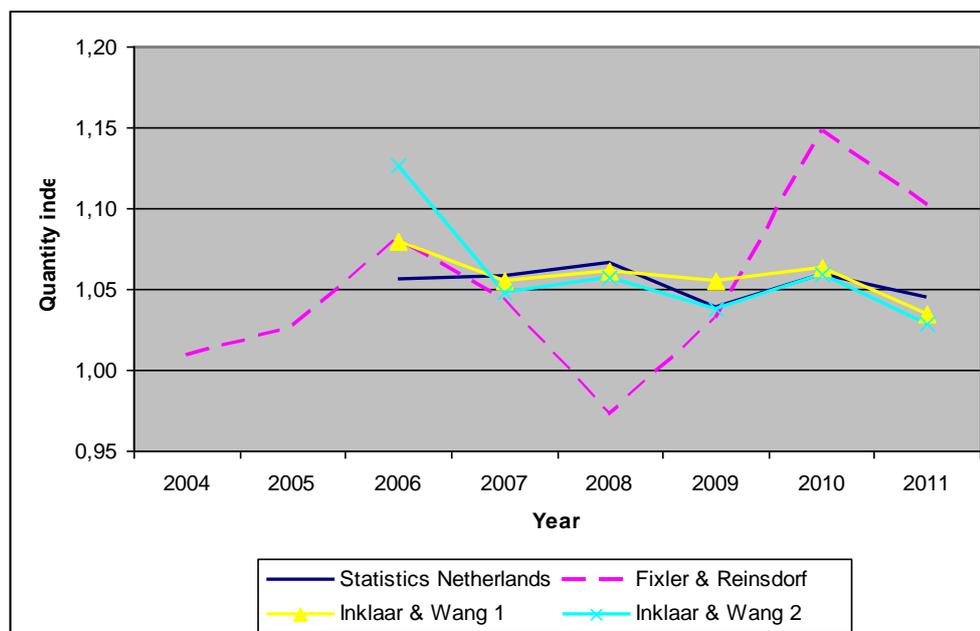


In the Netherlands there is not so much difference between the CPI (used by Statistics Netherlands) and the price index of gross domestic purchases (proposed by Fixler and Reinsdorf). However, the price index of existing houses (advocated by Inklaar and Wang) is higher than inflation in the period 2004-2008, but lower in the crisis years 2009-2011. The peak of the Inklaar and Wang quantity index in 2009 is caused by a sharp decline in the house prices, not because banks have processed far more mortgages than the year before. According to the Property Register the number of mortgages processed decreased enormously and fell by 31,6 percent between 2008 and 2009. This explains the difference in the quantity index of FISIM on real estate loans between on the one hand the Statistics Netherlands method and the Fixler and Reinsdorf method, and on the other hand the Inklaar and Wang method.

### 6.3 Short term deposits

The quantity index of FISIM on short term deposits is determined by a deflated stocks method and by various variations of the output indicator method. Figure 4 gives the results.

**Figure 4. Quantity index of FISIM on short term deposits, determined by different methods, 2004-2011**



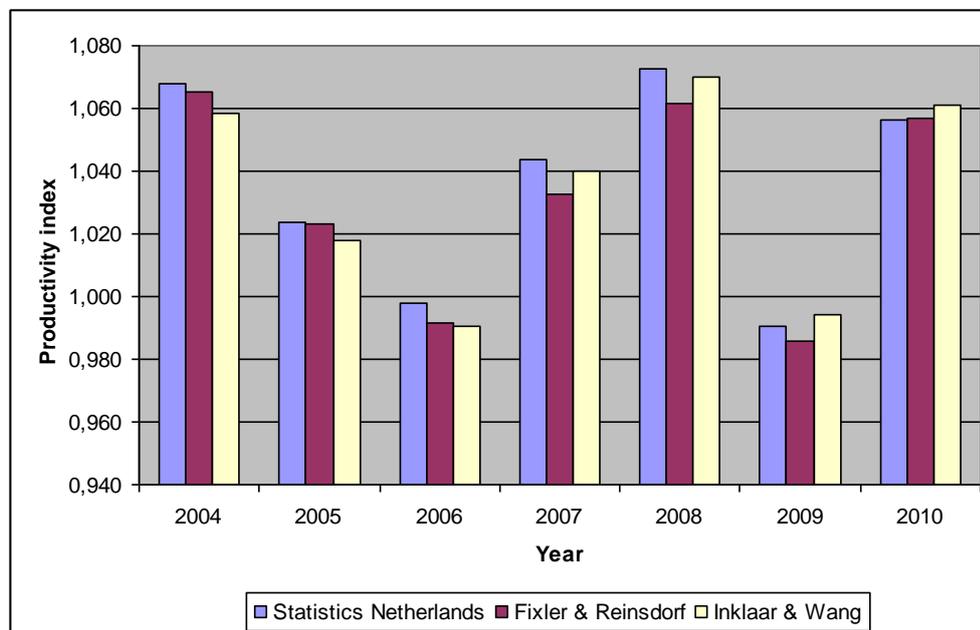
For short term deposits (current accounts) the deflated stocks method is more volatile than any output indicator method used. Maarten Molders (2010) argues that current accounts differ more within than between periods. Thus a measure based on the number of transactions within a period could be seen as a better indicator of the amount of action or service provided by the bank. However, choosing the weights of the various output indicators is a difficult and complex task. Further, not all major changes in the volume of implicit financial intermediation services might be reflected in the number of payment transactions. The deflated stocks method does have its disadvantages too. It is a simple method using price indices for deflation that may not be directly applicable to FISIM. The Task Force on FISIM has considered both methods and agreed that the output indicator method could be used to calculate volume measures of FISIM.

### 6.4 Multifactor productivity measurement under alternative assumptions

The quantity index of the production of FISIM has been calculated with three methods. So, multifactor productivity (MFP) of banks can also be determined using these deflation methods (appendix table A2). Figure 5 shows MFP growth based on

consolidated production of banks<sup>9</sup>, which is the change in production if total inputs of production (labour, capital, intermediate consumption) would remain the same.

**Figure 5. MFP growth of banks, based on different deflation methods of FISIM, 2004-2010<sup>10</sup>**



In the period 2004-2008, the Statistics Netherlands method gives the highest MFP growth. In the recent years 2009 and 2010 the Inklaar and Wang method measures the highest MFP growth. All methods show a sharp decrease of MFP in 2009. In this crisis year the volume of consolidated production by banks declined (Statistics Netherlands method (SN): -1,2 percent growth; Fixler and Reinsdorf method (FR): -1,7 percent growth; Inklaar and Wang method (IW): -0,9 percent growth). There was also a decline in volume of the inputs capital (-1,3 percent growth) and intermediate consumption (-0,8 percent growth). However, the volume of labour input increased with 1,1 percent, resulting in a diminished efficiency of production by banks. This may be caused by some lack of flexibility in the labour market (fixed labour contracts, reorganisations take time). In 2010 the volume of consolidated production increased (SN: 2,6 percent growth; FR: 2,7 percent growth; IW: 3,1 percent growth). In that year the volume of labour input did strongly decrease with 5,8 percent, and the volume of the other inputs of production decreased further. The result is that in 2010 all deflation methods showed positive MFP growth of banks again.

<sup>9</sup> Multifactor productivity can only be determined for the aggregate banks including special purpose entities.

<sup>10</sup> Labour and capital data of 2011 are not available yet. So, MFP can only be calculated for the period 2004-2010.

## 7. Conclusions

This paper has compared different methods for the deflation of FISIM. It has described how in the Netherlands in practice FISIM is calculated in current and constant prices. The Handbook on Price and Volume Measures 2001 (Eurostat 2001) recommends two equally important methods to calculate FISIM in volume terms. The first is the deflated stocks method and the second is an output indicator method. In practice and literature, there are some variations to these methods. Statistics Netherlands uses both methods. It applies a CPI deflated stocks method using a unit value index to deflate FISIM on loans and long term deposits. For the deflation of short term deposits an output indicator method based on the number of payment transactions is used. In practice, the output indicator method is only used in the Netherlands. Besides Eurostat, the Task Force on FISIM also proposes these two methods. Both methods have their advantages and disadvantages. Above all, the Task Force agreed that different kind of loans or deposits have different margins (interest spread), and thus different prices. Therefore, each type of loan or deposit must be deflated separately. In theory, this is better than a deflated stocks method that simply sums up the stocks of all different types of loans and deposits. In literature, Fixler and Reinsdorf (2006) have developed a variation to the deflated stocks method that is in line with these recommendations of the FISIM Task Force. The Fixler and Reinsdorf method proposes to use a Fisher index corrected for inflation by the price index on gross domestic purchases. The third method compared is advocated by Inklaar and Wang (2011), who have experimented with different variations to the output indicator method. In principle, the measurement of bank output is best done in terms of quality-adjusted activity-counts of different categories of banking transactions. They strongly prefer the output indicator method above the deflated stocks method. When a deflated stocks method is still used, the proper deflator should be the price index for the assets funded, not a general price index. So, they have proposed the sales price index of existing homes to deflate FISIM on real estate loans. For the deflation of other loans they use the number of loans as output indicator, the deflation of short term deposits occurs like the Statistics Netherlands method, but with other weighting schemes.

The empirical results compare the application of the Statistics Netherlands method, the Fixler and Reinsdorf method, and the Inklaar and Wang method. The Inklaar and Wang method could not be applied to other loans and long term deposits, because of the lack of data. All methods have been applied to consumer credit, real estate loans, and short term deposits. For the deflation of FISIM on consumer credit, the CPI deflated stocks method using a unit value index (Statistics Netherlands) and the price index of gross domestic purchases deflated stocks method based on a Fisher index give about the same results. The Inklaar and Wang output indicator method shows different and more fluctuating results. Deflating FISIM on real estate loans, the Statistics Netherlands method and the Fixler and Reinsdorf method again give about similar results. This is because in the Netherlands there is not so much

difference between the CPI and the price index of gross domestic purchases. The Inklaar and Wang quantity index shows a high peak in the crisis year 2009, caused by a sharp decline in the house prices (the deflator used), not because banks have processed more mortgages than the year before. According to the Property Register the number of mortgages processed decreased enormously by 31,6 percent between 2008 and 2009. All this makes clear that the choice for the right deflator is important, because it can influence the measure of FISIM in volume terms a lot. For the deflation of FISIM on short term deposits the deflated stocks method is more volatile than any output indicator used. Maarten Molders (2010) argues that short term deposits differ more within than between periods. He concludes that a measure based on the number of transactions within a period could be seen as a better indicator of the amount of service provided by the bank. However, it remains difficult to choose the right weights of the various output indicators. Except the year 2006 the different weighting schemes (Statistics Netherlands, Inklaar and Wang 1, Inklaar and Wang 2) give about similar results.

Multifactor productivity (MFP) of banks has been measured with three different methods. These are the three methods for the deflation of FISIM production. In the period 2004-2008, the Statistics Netherlands method gives the highest MFP growth (based on consolidated production). In the recent years 2009 and 2010, MFP growth is highest measured with the Inklaar and Wang method. All methods show a sharp decrease of MFP in the crisis year 2009. This decline is caused by a fall of consolidated production of banks, depending on the method, by -1,2 percent (Statistics Netherlands), -1,7 percent (Fixler and Reinsdorf) or -0,9 percent. The volume of the inputs capital and intermediate consumption also fell, but the volume of labour input increased. Decline of MFP of banks in 2009 may have been caused by the lack of flexibility in the labour market. In 2010 all methods result in positive MFP growth of banks again.

## 8. References

- Balk, Bert M. (2008), *Price and Quantity Index Numbers, Models for Measuring Aggregate Change and Difference*, Cambridge University Press
- European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank (2009), *System of National Accounts 2008*, New York: European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank
- Eurostat (2001), *Handbook on price and volume measures in national accounts*, Luxembourg: European Communities
- Fixler, Dennis and Marshall Reinsdorf (2006), *Computing Real Bank Services*, paper prepared for the NBER/CRIW Summer Institute 2006
- Inklaar, Robert and J. Christina Wang (2011), *Real Output of Bank Services: What Counts Is What Banks Do, Not What They Own*, Federal Reserve Bank of Boston, Working Paper Series, no. 11-1
- McKinsey & Company (2006), *Payment Services in The Netherlands: an analysis of revenues and costs for banks*, McKinsey & Company Inc.
- Molders, Maarten (2010), *Volume and price measurement: output indicators*, paper presented at the 2<sup>nd</sup> Meeting of the Task Force on FISIM (Frankfurt, 28-29 March 2011)

## Appendix

**Table A1. Quantity index of FISIM, per type of loan and deposit, calculated with different methods, 2004-2011**

Type of loan or deposit	Method	Quantity index							
		2004	2005	2006	2007	2008	2009	2010	2011
Consumer credit	Statistics Netherlands	1,10	1,07	1,03	1,01	0,99	0,98	1,06	1,03
	Fixler & Reinsdorf	1,10	1,07	1,02	1,01	0,99	0,99	1,06	1,04
	Inklaar & Wang	0,99	1,01	0,95	1,03	0,94	0,98	0,92	1,01
Real estate loans	Statistics Netherlands	1,11	1,10	1,11	1,07	1,04	1,04	1,02	0,99
	Fixler & Reinsdorf	1,11	1,10	1,09	1,07	1,05	1,04	1,02	1,01
	Inklaar & Wang	1,08	1,08	1,07	1,05	1,04	1,09	1,05	1,04
	Number of mortgages			0,95	0,85	0,83	0,68	0,96	0,96
Other loans	Statistics Netherlands	1,07	1,10	1,09	1,09	1,04	1,01	1,04	1,06
	Fixler & Reinsdorf	1,08	1,09	1,08	1,06	1,04	1,00	1,02	1,06
Long term deposits	Statistics Netherlands	1,08	1,11	1,11	1,13	1,04	0,95	0,96	1,00
	Fixler & Reinsdorf	1,04	1,13	1,04	1,07	1,06	0,93	0,89	0,99
Short term deposits	Statistics Netherlands			1,06	1,06	1,07	1,04	1,06	1,04
	Fixler & Reinsdorf	1,01	1,03	1,08	1,04	0,97	1,03	1,15	1,10
	Inklaar & Wang 1			1,08	1,06	1,06	1,05	1,06	1,03
	Inklaar & Wang 2			1,13	1,05	1,06	1,04	1,06	1,03

**Table A2. Productivity of banks, based on different deflation methods of FISIM, 2004-2010**

Method	Productivity index						
	2004	2005	2006	2007	2008	2009	2010
Statistics Netherlands	1,068	1,024	0,998	1,044	1,072	0,991	1,056
Fixler & Reinsdorf	1,065	1,023	0,991	1,033	1,061	0,986	1,057
Inklaar & Wang	1,058	1,018	0,991	1,040	1,070	0,994	1,061