Problems with the Measurement of Banking Services in a National Accounting Framework

Erwin Diewert (UBC and UNSW)

Dennis Fixler (BEA)

Kim Zieschang (IMF)

Meeting of the Group of Experts on Consumer Price Indices; Geneva, May 30-June 1, 2012

Sponsored by the ILO, United Nations, Economic Commission for Europe and the Conference of European Statisticians

Introduction

- **The measurement of bank outputs and inputs is one of the most difficult measurement areas, with many competing approaches and no real consensus on how to measure even nominal bank inputs and outputs, let alone the corresponding real flows.**
- **In the present paper, we concentrate on trying to measure nominal bank flows (but we do talk a bit about real flows).**
- **The basic idea in the paper is to integrate financing decisions of banks (and nonbanks) into a "normal" production function framework.**
- **Our production function framework is due to Böhm-Bawerk (1891), Hicks (1961) and Edwards and Bell (1961) where capital is regarded as an input at the beginning of an accounting period and as an output at the end of the period.**

The Austrian Profit Maximization Problem

The discounted to the end of the period profit maximization problem for a firm is:

(1)max $\{(1+r)^{-1}(py - wx + P_K^1K^1) - P_K^0K^0 : (y,x,K^0,K^1) \in S^1\}$.

The corresponding anti-discounted profit maximization problem is:

(2) max $\{py - wx + P_K^1K^1 - (1+r)P_K^0K^0 : (y,x,K^0,K^1) \in S^1\}$

where py is the value of output produced during the period, wx is the value of noncapital inputs used, $P_K^1K^1$ is the end of the period value of the capital stocks used by the firm, $P_K^0K^0$ is the beginning of the period value of the capital stocks and r is the firm's one period discount rate.

But what exactly is r? We interpret it as the average (or marginal) cost of raising a unit of financial capital.

User Costs

Note that $P_K^1K^1 - (1+r)P_K^0K^0 = -[(1+r)P_K^0K^0 - P_K^1K^1]$ which is minus the user cost of capital times the initial capital stock.

To see this, let $K^1 = (1-\delta)K^0$ where δ is the one period geometric depreciation rate and let $P_K^1 = (1+i_K)P_K^0$ where i_K is the (actual or expected) asset inflation rate over the accounting period). Then

$$(3)\ (1+r)P_K^0K^0 - P_K^1K^1 = (1+r)P_K^0K^0 - (1+i_K)P_K^0(1-\delta)K^0$$
$$= [r - i_K + (1+i)\delta]P_K^0K^0 = uK^0$$

and $u \equiv [r - i_K + (1+i)\delta]P_K^0$ is the usual end of period user cost of capital for the geometric model of depreciation. Thus $(1+r)P_K^0K^0 - P_K^1K^1$ is a generalization of the usual expression for the value of capital services rendered by the asset K^0 over the accounting period.

More on User Costs

Looking at the right hand side of (3), it can be seen that the user cost of capital decomposes into the sum of the following three terms, each of which has an economic interpretation:

- **$rP_K^0K^0$ is equal to *waiting services*;**
- **$-i_KP_K^0K^0$ is the *revaluation term* and**
- **$(1+i)\delta P_K^0K^0$ is a measure of wear and tear *depreciation***

If we drop the r in the decomposition (3), it can be seen that the resulting expression, $P_K^0K^0 - P_K^1K^1$, is equal to the sum of the revaluation and depreciation terms

The System of Cash Flow Accounts

We will consider an economy with a household sector H and three production sectors:

- **(i) a banking sector B;**
- **(ii) a nonfinancial production sector N and**
- **(iii) an owner occupied housing sector O.**

We will start our description of the economy by describing the outputs produced, inputs used and financial flows generated by each of the three production sectors during a reference period.

Each of the 3 production sector produces an output y, uses labour input x and physical capital K. The banking sector also produces deposit services (money) M. Each sector finances its physical capital by raising financial capital: v = debt; V= equity

The Bank's Cash Flow Accounts

The banking sector satisfies the following *cash flow* identity:

(5) $p_{BH}\,y_{BH} + p_{BN}\,y_{BN} - p_{NB}\,y_{NB} \equiv w_B x_B + P_{KB}^0 K_B^0 - P_{KB}^1 K_B^1 + r_H M_H^0 + r_N M_N^0 + r_{HB} v_{HB}^0 + R_{HB} V_{HB}^0 - r_{BN} v_{BN}^0 - R_{BN} V_{BN}^0 - r_{BO} v_{BO}^0 + \pi_B.$

The total value of priced banking services delivered to sectors H and N is $p_{BH}y_{BH}+p_{BN}y_{BN}$. $p_{NB}\,y_{NB}$ is the value of intermediates purchased from N. The eleven terms on the right hand side of equation (5) are provisionally regarded as *primary input flows*. The last ten components comprise *explicitly measured gross operating surplus.* Thus the explicitly measured banking sector value added is equal to the sum of labour used ($w_B x_B$), revaluation plus depreciation of capital services ($P_{KB}^0 K_B^0 - P_{KB}^1 K_B^1$) plus bank deposit interest paid to sectors H and N ($r_H M_H^0 + r_N M_N^0$) plus bond interest, dividends and imputed equity return paid to households for their financial investments in the banking sector ($r_{HB} v_{HB}^0 + R_{HB} V_{HB}^0$) less bond interest, dividend income and imputed equity returns from the banking sector's investments in the nonfinancial sector ($-r_{BN} v_{BN}^0 - R_{BN} V_{BN}^0$) less mortgage interest earned by the banking sector for their loans to owner occupiers of houses ($- r_{BO} v_{BO}^0$) plus pure profits π_B.

More on the Bank's Cash Flow Accounts

- **Note that some of the banking sector's loan and equity investment interest flows that are included in the right hand side of (5) ($-r_{BN}v_{BN}^0 - R_{BN}V_{BN}^0 - r_{BO}v_{BO}^0$) have negative signs associated with them and thus these items are not really cost charges to the banking sector; instead, these loan and investment interest flows represent revenues to the banking sector.**
- **In section 5, we discuss whether these flows should be regarded as contributions to bank value added or be left as (negative) primary input flows.**
- **We now describe the inputs used and the outputs produced by the nonfinancial sector, N.**

The Nonfinancial Sector's Cash Flow Accounts

The sector N cash flow identity is:

$$(6)\ p_{NH}\,y_{NH} + p_{NB}\,y_{NB} - p_{BN}\,y_{BN} = w_N x_N + P_{KN}^{0}K_N^{0} - P_{KN}^{1}K_N^{1} - r_N M_N^{0} + r_{HN}v_{HN}^{0} + R_{HN}V_{HN}^{0} + r_{BN}v_{BN}^{0} + R_{BN}V_{BN}^{0} + \pi_N$$

where $w_N x_N$ = the value of labour input used in the nonfinancial sector;

$P_{KN}^{0}K_N^{0}$ = the value of the physical capital stock used by sector N at the beginning of the period where P_{KN}^{0} is the price and K_N^{0} is the quantity;

$P_{KN}^{1}K_N^{1}$ = the end of period value of the initial capital stock

$r_N M_N^{0}$ = the value of bank interest payments made to sector N depositors where r_N is the sector N bank deposit rate and M_N^{0} is the sector N beginning of period stock of deposits (or money);

$r_{HN}v_{HN}^{0}$ = interest paid by the nonfinancial sector to households for household debt investments in sector N;

$R_{HN}V_{HN}^{0}$ = imputed interest and dividends paid to household equity investors in the nonfinancial sector N;

$r_{BN}v_{BN}^{0}$ = the product of the interest rate that the banking sector charges on loans to the nonfinancial sector r_{BN} times the beginning of the period stock of loans v_{BN}^{0};

$R_{BN}V_{BN}^{0}$ = imputed income paid to the banking sector by the nonfinancial sector for the equity investments of sector B in sector;

π_N = the residually determined unanticipated or monopoly profits earned by the nonfinancial sector during the reference period..

The OOH Sector's Cash Flow Accounts

- **The final production sector we need to consider is sector O, the sector that produces (imputed) housing services from owners of their own houses.**
- **The reason for including this sector in the present banking context is that the banking sector is an important contributor to this sector by providing owners of dwelling units with housing (mortgage) loans.**
- **Sector O produces only one output, housing services with imputed price p_{OH} and corresponding quantity y_{OH}**
- **Sector O produces OOH services with inputs of depreciation, loans from other households, bank mortgage loans and household equity capital.**

The OOH Sector's "Cash Flow" Equation

- **The decomposition of the value of OOH housing services output, $p_{OH}\, y_{OH}$, into its primary input components is given by equation (7):**

(7) $$p_{OH}y_{OH} = P_H^0H^0 - P_H^1H^1 + r_{HO}v_{HO}^0 + R_{HO}V_{HO}^0 + r_{BO}v_{BO}^0 ;$$

$P_H^0H^0$ = the value of the owner occupied housing stock owned by sector O at the beginning of the period where P_H^0 is the price and H^0 is the quantity;

$P_H^1H^1$ = the end of period value of the initial housing stock used by sector O where P_H^1 is the end of period price and H^1 is the corresponding depreciated end of period housing stock measured in constant quality units;

$r_{HO}v_{HO}^0$ = interest paid by sector O to other households where v_{HO}^0 is the household sector's beginning of the period stock of loans made to sector O and r_{HO} is the corresponding interest rate;

$r_{BO}v_{BO}^0$ = mortgage interest paid by sector O to the banking sector where v_{BO}^0 is the banking sector's beginning of the period stock of loans made to sector O and r_{BO} is the corresponding mortgage interest rate;

$R_{HO}V_{HO}^0$ = imputed interest foregone by household equity investments in owner occupied housing where V_{HO}^0 is the beginning of the period equity value of the owner occupied housing stock and R_{HN} is the corresponding imputed interest rate.

More on the OOH Sector's Cash Flow Equation

- **Note that equation (7) has two imputed prices in it: the output price of owned housing services, p_{OH}, and the opportunity cost of investing in housing equity, R_{HO}. There are at least two strategies that can be used to determine these imputed prices:**

- **The *rental equivalence approach* where p_{OH} is set equal to the rental price of comparable properties and then (7) can be used to determine R_{HO} residually;**
- **The *user cost approach* where R_{HO} is set equal to an appropriate household sector rate of return that homeowners are giving up by investing in housing equity. Equation (7) is then used to determine p_{OH} residually.**

We do not make a specific recommendation on which approach should be used. For our purposes, we simply assume that all of the flows in (5)-(7) have been determined by the national statistical agency.

We turn now to the cash flow equation for the Household Sector, H.

The Household Sector's Cash Flow Accounts

- **We assume that the flows for this sector are simply the sum of the flows across the three production sectors in the economy by commodity and so there is no need to define any new variables.**
- **Of course, various intermediate input flows within the aggregate production sector will cancel and making these cancellations, we find that the (directly priced) *final consumption* of sector H is equal to:**

$$(8)\ p_{NH}\, y_{NH} + p_{NH}\, y_{NH} + p_{OH}\, y_{OH} = w_B x_B + w_N x_N + P_{KB}^{0} K_B^{0} - P_{KB}^{1} K_B^{1} + P_{KN}^{0} K_N^{0} - P_{KN}^{1} K_N^{1} + P_H^{0} H^{0} - P_H^{1} H^{1} + r_H M_H^{0} + r_{HB} v_{HB}^{0} + R_{HB} V_{HB}^{0} + r_{HN} v_{HN}^{0} + R_{HN} V_{HN}^{0} + r_{HO} v_{HO}^{0} + R_{HO} V_{HO}^{0} + \pi_B + \pi_N.$$

- **On the left hand side of (8), we have the delivery of priced outputs to the household sector from sectors B, N and O.**
- **On the right hand side of (8), we have total labour income plus depreciation and revaluation in all three productions sectors plus interest paid by banks to households on household deposit accounts plus total debt and equity returns to sector H for investments in B,N and H plus sectoral pure profits generated in sectors B and N (if any).**

Table 1: The System of Sectoral Flow Accounts

Row	Description	Sector H	Sector B	Sector N	Sector O
1	Priced	$p_{BH}\, y_{BH}$	$p_{BH}\, y_{BH}$		
2	Output	$p_{NH}\, y_{NH}$		$p_{NH}\, y_{NH}$	
3	Flows and	$p_{OH}\, y_{OH}$			$p_{OH}\, y_{OH}$
4	Intermediate		$p_{BN}\, y_{BN}$	$-p_{BN}\, y_{BN}$	
5	Input Flows		$-p_{NB}\, y_{NB}$	$p_{NB}\, y_{NB}$	
6	Labour Services	$w_B x_B + w_N x_N$	$w_B x_B$	$w_N x_N$	
7	Sector B Revaluation And Depreciation	$P_{KB}^{0} K_B^{0} - P_{KB}^{1} K_B^{1}$	$P_{KB}^{0} K_B^{0} - P_{KB}^{1} K_B^{1}$		
8	Sector N Revaluation And Depreciation	$P_{KN}^{0} K_N^{0} - P_{KN}^{1} K_N^{1}$		$P_{KN}^{0} K_N^{0} - P_{KN}^{1} K_N^{1}$	
9	Sector O Revaluation And Depreciation	$P_H^{0} H^{0} - P_H^{1} H^{1}$			$P_H^{0} H^{0} - P_H^{1} H^{1}$
10	Deposit Interest B to H	$r_H M_H^{0}$	$r_H M_H^{0}$		
11	Deposit Interest B to N		$r_N M_N^{0}$	$- r_N M_N^{0}$	
12	H Loans to B: Interest	$r_{HB} v_{HB}^{0}$	$r_{HB} v_{HB}^{0}$		
13	H Loans to N: Interest	$r_{HN} v_{HN}^{0}$		$r_{HN} v_{HN}^{0}$	
14	H Loans to O: Interest	$r_{HO} v_{HO}^{0}$			$r_{HO} v_{HO}^{0}$
15	B Loans to N: Interest		$-r_{BN} v_{BN}^{0}$	$r_{BN} v_{BN}^{0}$	
16	B Loans to O: Interest		$-r_{BO} v_{BO}^{0}$		$r_{BO} v_{BO}^{0}$
17	H Equity in B: Returns	$R_{HB} V_{HB}^{0}$	$R_{HB} V_{HB}^{0}$		
18	H Equity in N: Returns	$R_{HN} V_{HN}^{0}$		$R_{HN} V_{HN}^{0}$	
19	H Equity in O: Returns	$R_{HO} V_{HO}^{0}$			$R_{HO} V_{HO}^{0}$
20	B Equity in N: Returns		$-R_{BN} V_{BN}^{0}$	$R_{BN} V_{BN}^{0}$	
21	Pure Profits	$\pi_B + \pi_N$	π_B	π_N	

More on Table 1: The System of Sectoral Flow Accounts

- **Note that our preliminary measure of value added for this economy can be computed in four equivalent ways (as is usual in national income accounting);**
- **As the sum of the entries in rows 1 to 5 of the H column;**
- **As the sum of the entries in rows 6 to 21 of the H column;**
- **As the sum of the entries in rows 1 to 5 of the B, N and O columns and**
- **As the sum of the entries in rows 6 to 21 of the B, N and O columns.**

We now turn our attention to the opening balance sheets for each of the four sectors in our economy.

The Opening Balance Sheet Accounts: General

- **The beginning of the period balance sheet accounts for each sector are much easier to explain than the corresponding flow accounts.**
- **The basic principle is that the value of sector liabilities (sources of financial capital) should equal the value of sector assets (the value of loans plus real assets plus monetary assets).**
- **All of the necessary notation has been defined, so we can proceed to list the beginning of the period balance sheet constraints for each of our three production sectors.**

The Opening Balance Sheet Accounts: Sector B

The opening balance sheet identity for the banking sector B is defined by:

(9) $M_H^0 + M_N^0 + v_{HB}^0 + V_{HB}^0 = v_{BN}^0 + V_{BN}^0 + v_{BO}^0 + P_{KB}^0 K_B^0$.

- **Thus banking sector deposit liabilities to households and businesses** ($M_H^0 + M_N^0$) **plus household debt plus equity investments in the banking sector** ($v_{HB}^0 + V_{HB}^0$) **are equal to bank loans and equity investments in the nonfinancial sector** ($v_{BN}^0 + V_{BN}^0$) **plus mortgage loans** (v_{BO}^0) **plus the value of the banking sector's initial stock of physical capital** ($P_{KB}^0 K_B^0$).
- **The only items that require a bit of discussion are the beginning of the period deposits held by the household and nonfinancial business sectors,** M_H^0 **and** M_N^0. **Basically, households and businesses are providing loans of financial capital to the banking sector and in return, they get some interest payments (which are generally small) but they also get some banking services associated with their deposits. These extra (costly) services justify a separate treatment of monetary deposits from other debt and equity supplies of financial capital.**

The Opening Balance Sheet Accounts: Sector N

The opening balance sheet constraint for the nonfinancial sector N is:

(10) $v_{HN}^0 + V_{HN}^0 + v_{BN}^0 + V_{BN}^0 = P_{KN}^0 K_N^0 + M_N^0$.

- **Thus household debt plus equity investments in the nonfinancial sector** $(v_{HN}^0 + V_{HN}^0)$ **plus banking sector debt plus equity investments in the nonfinancial sector** $(v_{BN}^0 + V_{BN}^0)$ **are equal to the value of the nonfinancial sector's initial stock of physical capital** $(P_{KN}^0 K_N^0)$ **plus its initial holdings of bank deposits** (M_N^0).
- **Beginning of the period Liabilities of Sector N are on the LHS of (10) and the corresponding Assets are on the RHS.**

The Opening Balance Sheet Accounts: Sector O

The opening balance sheet constraint for the owner occupied housing sector O is:

(11) $v_{HO}^0 + V_{HO}^0 + v_{BO}^0 = P_H^0 H^0$.

- **Thus household debt plus equity investments in the owner occupied housing sector** ($v_{HO}^0 + V_{HO}^0$) **plus banking sector mortgage loans to sector O** (v_{BO}^0) **are equal to the value of the sector O initial stock of physical housing capital** ($P_H^0 H^0$).
- **It is useful to relate sector O's balance sheet constraint (11) to sector O's value added equation (7).**
- **From (11), we see that beginning of the period value of the owner occupied housing stock,** $P_H^0 H^0$, **is equal to the sum of loan and equity investments in the sector,** $v_{HO}^0 + V_{HO}^0 + v_{BO}^0$.

The Sector O Balance Sheet Accounts and User Costs

We know that total interest paid and imputed interest earned in this sector is $r_{HO}v_{HO}^0 + R_{HO}V_{HO}^0 + r_{BO}v_{BO}^0$. This interest sum can be set equal to an average rate of interest, ρ_O, earned on the asset base; i.e., define ρ_O as follows:

(13) $\rho_O \equiv [r_{HO}v_{HO}^0 + R_{HO}V_{HO}^0 + r_{BO}v_{BO}^0]/[v_{HO}^0 + V_{HO}^0 + v_{BO}^0]$.

Now substitute (13) into equation (7), which defined sector O's value added:

(14) $$\begin{aligned} p_{OH}\, y_{OH} &= P_H^0H^0 - P_H^1H^1 + r_{HO}v_{HO}^0 + R_{HO}V_{HO}^0 + r_{BO}v_{BO}^0 \\ &= P_H^0H^0 - P_H^1H^1 + \rho_O[v_{HO}^0 + V_{HO}^0 + v_{BO}^0] \quad \text{using (13)} \\ &= P_H^0H^0 - P_H^1H^1 + \rho_O P_H^0H^0 \quad \text{using (11)} \\ &\equiv u_OH^0 \end{aligned}$$

where $u_OH^0 \equiv (1+\rho_O)P_H^0H^0 - P_H^1H^1$ is the *value of owner occupied housing capital services* and u_O is the *user cost of capital* for the beginning of the period owner occupied housing stock.

- **(14) has consolidated all of the financial interest flows into a single interest rate ρ_O which is applied to the initial value of the owner occupied housing stock, $P_H^0H^0$.**
- **Moreover, the usual user cost of capital u_O has made its appearance in (14) and "traditional" production theory can be applied to this sector. Thus the use of an average interest rate and the balance sheet constraint for sector O has considerably simplified the flow accounts for this sector.**

The Opening Balance Sheet Accounts: Sector H

- **In our simplified model of the economy, the household sector owns all of the assets in the three production sectors.**
- **Thus the household sector's balance sheet constraint can be set equal to the sum of the three production sector balance sheet constraints.**
- **Some of the loans of the banking sector to other sectors (assets to sector B) cancel out with some of the liabilities of sectors N and O. Thus the consolidated household balance sheet constraint for sector H is:**

$$(12)\ v_{HB}^{0} + v_{HN}^{0} + v_{HO}^{0} + V_{HB}^{0} + V_{HN}^{0} + V_{HO}^{0} + M_{H}^{0} = P_{KB}^{0}K_{B}^{0} + P_{KN}^{0}K_{N}^{0} + P_{H}^{0}H^{0}.$$

- **The LHS of (12) is equal to the sum of household loans to the three business sectors ($v_{HB}^{0} + v_{HN}^{0} + v_{HO}^{0}$) plus the sum of household equity investments in the three sectors ($V_{HB}^{0} + V_{HN}^{0} + V_{HO}^{0}$) plus household "loans" to the banking sector in the form of bank deposits (M_{H}^{0}) and on the RHS, we have the consolidated value of the nonmonetary assets that are used by the three business sectors, namely banking and nonfinancial business capital stocks ($P_{KB}^{0}K_{B}^{0} + P_{KN}^{0}K_{N}^{0}$) plus the beginning of the period value of the owner occupied housing stock ($P_{H}^{0}H^{0}$). Thus the financial claims on the LHS are equal to the value of real assets.**

Towards a General Strategy for Integrating the Opening Balance Sheet Accounts with the Sectoral Flow Accounts

- **The above algebra for sector O shows how the use of an average cost of capital or reference rate ρ_O along with the sector's balance sheet constraint can bring the sector's flow accounts closer to a "standard" format which is suitable for traditional production theory.**
- **However, the other two sectors in our simple model are more complex and it is not entirely clear what the "right" cost of capital or reference rate should be. Also, for these more complex sectors, we may want to introduce various loan margins and the user cost of money into our framework.**
- **Thus in the following section, we will use a modification of the above methodology in order to integrate the balance sheet accounts with the flow accounts. The way our more general framework will work is as follows: take the balance sheet constraints with the sector's assets as positive entries and then subtract the sector's liabilities from these assets, which leads to an equation with a zero on the right hand side. Then multiply this equation by the reference rate for the sector. The resulting expression is then added to the primary input flows for that sector, which leads to a new value added equation for that sector.**
- **We leave open for now the question about how exactly should the sectoral reference rates be chosen. To fit in with our Hicksian model of production, the reference rate should equal the sectoral cost of capital.**

The Integrated System of Flow Accounts: The Banking Sector

- **Let the reference rate for the banking sector be ρ_B. Multiply both sides of the balance sheet constraint (9) for sector B by ρ_B and rearrange terms in order to obtain the following equation:**

(16) $\rho_B[P_{KB}^0 K_B^0 + v_{BN}^0 + V_{BN}^0 + v_{BO}^0 - M_H^0 - M_N^0 - v_{HB}^0 - V_{HB}^0] = 0.$

- **Now add the terms in (16) to the right hand side of the banking sector's value added equation (5) in order to obtain a new *integrated accounts value added decomposition*:**

(17) $p_{BH}\, y_{BH} + p_{BN}\, y_{BN} - p_{NB}\, y_{NB} = w_B x_B + (1+\rho_B)P_{KB}^0 K_B^0 - P_{KB}^1 K_B^1 - (\rho_B - r_H)M_H^0 - (\rho_B - r_N)M_N^0 + (r_{HB} - \rho_B)v_{HB}^0 + (R_{HB} - \rho_B)V_{HB}^0 - (r_{BN} - \rho_B)v_{BN}^0 - (R_{BN} - \rho_B)V_{BN}^0 - (r_{BO} - \rho_B)v_{BO}^0 + \pi_B.$

- **The rational for adding (16) to the cost side of the sectors flow accounts is that net assets could be sold and distributed to the owners of the banking sector at the beginning of the period. Thus to justify holding net assets over the period rather than selling them, they need to be productive enough to cover the reference cost of financial capital, ρ_B, and so ρ_B times net assets should be added to the cost side of the banks flow accounts.**
- **We can now recognize the appearance of the user cost of capital in the RHS of (17), $(1+\rho_B)P_{KB}^0 K_B^0 - P_{KB}^1 K_B^1$, plus various other FISIM margins!**

The Integrated System of Flow Accounts: The Banking Sector: FISIM Margins Explained

- **The left hand side of (17) is simply sector B's conventional value added as in equation (5).**
- **On the RHS, $w_B x_B$ is simply the value of labour input for sector B.**
- **The next set of terms, $(1+\rho_B)P_{KB}^0 K_B^0 - P_{KB}^1 K_B^1$, can be recognized as the *value of capital services* for the banking sector; note that ρ_B is the reference interest rate that is used in this user cost.**
- **The next two terms, $-(\rho_B - r_H)M_H^0 - (\rho_B - r_N)M_N^0$, will generally be negative; i.e., the banking sector's imputed cost of capital, ρ_B, will generally be greater than the deposit interest rates paid to households and nonfinancial businesses, r_H and r_N respectively. The negative signs suggest that these FISIM deposit margins should be regarded as outputs, rather than as negative inputs.**
- **Note that $(\rho_B - r_H)$ is the bank's *supplier benefit* from supplying a dollar's worth of deposit services to the household sector; it is the bank's counterpart to the household's *user cost of money*.**

The Integrated System of Flow Accounts: The Banking Sector: FISIM Margins Explained (continued)

- **The next two terms on the right hand side of (17) are $(r_{HB}-\rho_B)v_{HB}^0 + (R_{HB}-\rho_B)V_{HB}^0$. These two terms represent *relative margins* on the costs of raising financial capital from households via debt and equity respectively. If we chose the bank's reference rate ρ_B to be the average cost of capital raised through debt and equity so that $\rho_B \equiv [r_{HB}v_{HB}^0 + R_{HB}V_{HB}^0]/[v_{HB}^0 + V_{HB}^0]$, then the sum of the two terms $(r_{HB}-\rho_B)v_{HB}^0 + (R_{HB}-\rho_B)V_{HB}^0$ would vanish. In this case, since the cost of debt is usually less than the cost of raising financial capital via equity, the term $(r_{HB}-\rho_B)v_{HB}^0$ would be negative and the term $(R_{HB}-\rho_B)V_{HB}^0$ would be positive. These terms can be regarded as risk premium adjustments.**
- **The next three terms on the right hand side of (16) are (generally) negative *loan margins*, $-(r_{BN}-\rho_B)v_{BN}^0 -(R_{BN}-\rho_B)V_{BN}^0 -(r_{BO}-\rho_B)v_{BO}^0$. Thus usually, the rates of return that the banking sector obtains on its loans to sectors N and O, r_{BN} and r_{BO}, and its rate of return earned on equity investments in the sector N, R_{BN}, will be greater than the bank's cost of financial capital, ρ_B, and so the three loan margin terms will be sources of bank net revenue rather than cost items.**
- **This suggests that these three loan margin value flows should be regarded as outputs rather than negative inputs.**
- **The final value flow on the right hand side of (17) is π_B, the pure profits of the banking sector.**

The Integrated System of Flow Accounts: Sector N

- **Multiply both sides of the sector N balance sheet equation (10) by the sector N reference discount rate ρ_N and obtain the following equation:**

(18) $\rho_N[P_{KN}^0K_N^0 + M_N^0 - v_{HN}^0 - V_{HN}^0 - v_{BN}^0 - V_{BN}^0] = 0.$

- **Now add the terms in (18) to the right hand side of the nonfinancial sector's value added equation (6) in order to obtain a new *integrated accounts value added decomposition*:**

(19) $p_{NH}\,y_{NH} + p_{NB}\,y_{NB} - p_{BN}\,y_{BN} = w_Nx_N + (1+\rho_N)P_{KN}^0K_N^0 - P_{KN}^1K_N^1$
$+ (\rho_N - r_N)\,M_N^0 + (r_{HN} - \rho_N)v_{HN}^0 + (R_{HN} - \rho_N)V_{HN}^0 + (r_{BN} - \rho_N)v_{BN}^0$
$+ (R_{BN} - \rho_N)V_{BN}^0 + \pi_N$

- **The left hand side of (19) is simply sector N's conventional value added as in equation (6). As in the initial decomposition (6), w_Nx_N is simply the value of labour input for sector N.**
- **The next set of terms, $(1+\rho_N)P_{KN}^0K_N^0 - P_{KN}^1K_N^1$, can be recognized as the *value of capital services* for the nonfinancial sector. Note that ρ_N is the reference interest rate that is used in this user cost.**

The Integrated System of Flow Accounts: Sector N: FISIM Margins

- **The next term, $(\rho_N - r_N)M_N^0$, will generally be positive; i.e., the nonfinancial sector's imputed cost of capital, ρ_N, will generally be greater than the deposit interest rate paid to nonfinancial businesses, r_N. Note that $(\rho_N - r_N)$ is the nonfinancial sector's *user cost of money* and this is a FISIM margin.**
- **The next four terms on the right hand side of (19) represent *relative margins* on the costs of raising financial capital from households and banks via debt and equity. If we chose sector N's reference rate ρ_N to be the average cost of capital raised through debt and equity so that $\rho_N \equiv [r_{HN}v_{HN}^0 + R_{HN}V_{HN}^0 + r_{BN}v_{BN}^0 + R_{BN}V_{BN}^0]/[v_{HN}^0 + V_{HN}^0 + v_{BN}^0 + V_{BN}^0]$, then the sum of the four terms $(r_{HN-}\rho_N)v_{HN}^0 + (R_{HN}-\rho_N)V_{HN}^0 + (r_{BN}-\rho_N)v_{BN}^0 + (R_{BN}-\rho_N)V_{BN}^0$ would vanish. In this case, since the cost of debt is usually less than the cost of raising financial capital via equity, the terms $(r_{HN-}\rho_N)v_{HN}^0 + (r_{BN}-\rho_N)v_{BN}^0$ would be negative and the terms $(R_{HN}-\rho_N)V_{HN}^0 + (R_{BN}-\rho_N)V_{BN}^0$ would be positive.**
- **The final value flow on the right hand side of (19) is π_N, the pure profits of the nonfinancial sector.**

The Integrated System of Flow Accounts: Sector O

- **The initial value added decomposition for sector O is (7) and if we add (15) to the right hand side of (7), we obtain the following *integrated accounts value added decomposition* for the owner occupied housing sector:**

$$(20)\ p_{OH}\, y_{OH} = (1+\rho_O)P_H^0H^0 - P_H^1H^1 + (r_{HO}-\rho_O)v_{HO}^0 + (R_{HO}-\rho_O)V_{HO}^0 + (r_{BO}-\rho_O)v_{BO}^0.$$

- **The left hand side of (20) is sector O's conventional value added as in equation (7), which is simply the value of OOH services.**
- **The set of terms, $(1+\rho_O)P_H^0H^0 - P_H^1H^1$, can be recognized as the *value of capital services* for the owner occupied housing sector.**
- **The next three terms on the right hand side of (20) represent *relative margins* on the costs of raising financial capital from households and banks via debt and equity. If we chose sector O's reference rate ρ_N to be the average cost of capital raised through debt and equity as in equation (13) above, then the sum of the three terms $(r_{HO}-\rho_O)v_{HO}^0 + (R_{HO}-\rho_O)V_{HO}^0 + (r_{BO}-\rho_O)v_{BO}^0$ would vanish.**

The Integrated System of Flow Accounts: Sector H

- **Recall that this sector's value added was given by equation (8) and its opening balance sheet identity was given by (12). Multiply both sides of (12) by the sector H reference discount rate ρ_H, we obtain the following equation:**

$$(21)\ \rho_H[P_{KB}^0K_B^0 + P_{KN}^0 K_N^0 + P_H^0H^0 - v_{HB}^0 - v_{HN}^0 - v_{HO}^0 - V_{HB}^0 - V_{HN}^0 - V_{HO}^0 - M_H^0] = 0.$$

- **Now add the terms in (21) to the right hand side of the household sector,s final demand decomposition equation (8) in order to obtain a new household *integrated accounts final demand decomposition*:**

$$(22)\ p_{NH}\,y_{NH} + p_{NH}\,y_{NH} + p_{OH}\,y_{OH} = w_Bx_B + w_Nx_N + (1+\rho_H)P_{KB}^0K_B^0 - P_{KB}^1K_B^1 + (1+\rho_H)P_{KN}^0K_N^0 - P_{KN}^1K_N^1 + (1+\rho_H)P_H^0H^0 - P_H^1H^1 - (\rho_H-r_H)M_H^0 + (r_{HB}-\rho_H)v_{HB}^0 + (R_{HB}-\rho_H)V_{HB}^0 + (r_{HN}-\rho_H)v_{HN}^0 + (R_{HN}-\rho_H)V_{HN}^0 + (r_{HO}-\rho_H)v_{HO}^0 + (R_{HO}-\rho_H)V_{HO}^0 + \pi_B + \pi_N.$$

- **The left hand side of (22) is simply the household sector's conventional final demand as in equation (8).**
- **$w_Bx_B+w_Nx_N$ is the value of the aggregate supply of labour.**

The Integrated System of Flow Accounts: Sector H; FISIM Margins

- $(1+\rho_H)P_{KB}^0K_B^0-P_{KB}^1K_B^1$, is the *value of capital services* for the banking sector except that now, the household opportunity cost of capital ρ_H is used in this user cost formula instead of the bank's opportunity cost of capital ρ_B. Similarly, $(1+\rho_H)P_{KN}^0K_N^0-P_{KN}^1K_N^1$ is the household *value of capital services* provided to sector N valued from the household perspective and $(1+\rho_H)P_H^0H^0-P_H^1H^1$ is the value of housing stock services provided to owner occupiers by the household sector.
- $-(\rho_H-r_H)M_H^0$, the *user cost of money*, will generally be negative; i.e., the household sector's imputed cost of providing financial capital, ρ_H, will generally be greater than the deposit interest rate paid to household depositors, r_H.
- The next six terms on the right hand side of (22) represent *relative margins* on the benefits to households of providing financial capital (both debt and equity) to the three sectors in the economy. If we chose sector H's reference rate ρ_H to be the average benefit of providing financial capital to the three sectors so that $\rho_H \equiv [r_{HB}v_{HB}^0+R_{HB}V_{HB}^0+r_{HN}v_{HN}^0+R_{HN}V_{HN}^0+r_{HO}v_{HO}^0+R_{HO}V_{HO}^0]/[v_{HB}^0+V_{HB}^0+v_{HN}^0+V_{HN}^0+v_{HO}^0+V_{HO}^0]$, then the sum of these six terms will vanish.
- The final two terms on the right hand side of (22) are $\pi_B+\pi_N$, the pure profits of the banking and nonfinancial sectors.

Table 2: The System of Integrated Sectoral Flow Accounts

Row	Description	Sector H	Sector B	Sector N	Sector O
1	Priced Final	$p_{BH}\, y_{BH}$	$p_{BH}\, y_{BH}$		
2	Output	$p_{NH}\, y_{NH}$		$p_{NH}\, y_{NH}$	
3	Flows	$p_{OH}\, y_{OH}$			$p_{OH}\, y_{OH}$
4	Intermediate		$p_{BN}\, y_{BN}$	$-p_{BN}\, y_{BN}$	
5	Input Flows[1]		$-p_{NB}\, y_{NB}$	$p_{NB}\, y_{NB}$	
6	Labour Services	$w_B x_B + w_N x_N$	$w_B x_B$	$w_N x_N$	
7	B Capital Services	$(1+\rho_H)P_{KB}^{0}K_B^{0} - P_{KB}^{1}K_B^{1}$	$(1+\rho_B)P_{KB}^{0}K_B^{0} - P_{KB}^{1}K_B^{1}$		
8	N Capital Services	$(1+\rho_H)P_{KN}^{0}K_N^{0} - P_{KN}^{1}K_N^{1}$		$(1+\rho_N)P_{KN}^{0}K_N^{0} - P_{KN}^{1}K_N^{1}$	
9	O Capital Services	$(1+\rho_H)P_H^{0}H^{0} - P_H^{1}H^{1}$			$(1+\rho_O)P_H^{0}H^{0} - P_H^{1}H^{1}$
10	H Deposit Services	$-(\rho_H - r_H)M_H^{0}$	$-(\rho_B - r_H)M_H^{0}$		
11	N Deposit Services		$-(\rho_B - r_N)M_N^{0}$	$(\rho_N - r_N)M_N^{0}$	
12	H-B Loan Margins	$(r_{HB} - \rho_H)v_{HB}^{0}$	$(r_{HB} - \rho_B)v_{HB}^{0}$		
13	H-N Loan Margins	$(r_{HN} - \rho_H)v_{HN}^{0}$		$(r_{HN} - \rho_N)v_{HN}^{0}$	
14	H-O Loan Margins	$(r_{HO} - \rho_H)v_{HO}^{0}$			$(r_{HO} - \rho_O)v_{HO}^{0}$
15	B-N Loan Margins		$-(r_{BN} - \rho_B)v_{BN}^{0}$	$(r_{BN} - \rho_N)v_{BN}^{0}$	
16	B-O Loan Margins		$-(r_{BO} - \rho_B)v_{BO}^{0}$		$(r_{BO} - \rho_O)v_{BO}^{0}$
17	H-B Equity Margins	$(R_{HB} - \rho_H)V_{HB}^{0}$	$(R_{HB} - \rho_B)V_{HB}^{0}$		
18	H-N Equity Margins	$(R_{HN} - \rho_H)V_{HN}^{0}$		$(R_{HN} - \rho_N)V_{HN}^{0}$	
19	H-O Equity Margins	$(R_{HO} - \rho_H)V_{HO}^{0}$			$(R_{HO} - \rho_O)V_{HO}^{0}$
20	B-N Equity Margins		$-(R_{BN} - \rho_B)V_{BN}^{0}$	$(R_{BN} - \rho_N)V_{BN}^{0}$	
21	Pure Profits	$\pi_B + \pi_N$	π_B	π_N	

[1] Excluding intermediate consumption of FISIM. Positive terms along this row are intra-sector transactions while negative terms represent inter-sector transactions.

Discussion of Table 2: The Balance Sheet Integrated Accounts

The integrated system of accounts represented by Table 2 has some major *advantages* over the conventional system of flow accounts that was represented by Table 1:

- **The Table 2 accounts are more closely aligned with traditional production theory (traditional user costs of capital make their appearance in Table 2);**
- **User costs of monetary deposits and loan margins for the banking sector also make their appearance in Table 2 and**
- **The balance sheet accounts for the economy are fully reconciled with the flow accounts.**

But there are some disadvantages as well.

Discussion of Table 2: (continued)

- **Rows 10 and 11 in Table 2 (which correspond to deposit services) are grouped together with other primary input flows and these monetary service flows appear with a negative sign in the banking column. Most economists would regard these monetary deposit services as an output of the banking sector (rather than as a negative input as in Table 2) and so it would be natural to change the signs of the entries in these two rows and group them with the value added output (SNA final uses) rows (1-3) rather than keep them in the primary input rows (10-20).**
- **Similarly, it is likely that the loan margin entries in rows 15 and 16 of the banking column B are negative (because the bank makes loans at higher interest rates than its imputed cost of capital ρ_B) and so again, these rows could be grouped (with the signs of their entries changed) with the output rows (1-3) rather than being kept in the list of primary input entries (10-20).**
- **Although not consistent with the current SNA, one could also argue that the entries in row 20 (bank equity investment margins in the nonfinancial sector) are likely to be negative and perhaps these services should be grouped (with changed signs) with the list of bank outputs (rows 1-3).**
- **Thus there are 4 possible measures of GDP depending on where the above rows are allocated! In our empirical part, we look at all 4 options.**

Discussion of Table 2: (continued)

- **The 3 authors DFZ of this paper agree that deposit margins should be moved from the income side of the accounts to the output side but there is less agreement on moving other bank asset margins (such as loan margins) to the output side.**
- **It is true that from the perspective of the banking sector, loan margins are "best" regarded as outputs rather than negative income payments but the problem occurs on the other side of the FISIM "transaction"; e.g., look at the FISIM margins in rows 15 and 16 in the N and O columns. From the viewpoint of the borrower, all that matters is the total cost of raising financial capital and these costs are essentially income flows to the sectors making the loans. Thus sticking a the loan margin in row 15 and column N into the output accounts (where it would become an intermediate input for sector N) leads to some complications which would be avoided if we simply left the row 15 entries in the income accounts. This "intermediate input service" for sector N is simply an added interest cost that should be reflected in the sector N's user cost of capital rather than as a separate service charge. This is only D's opinion!**

Discussion of Table 2: (continued)

The integrated system of accounts that is represented by Table 2 also has some major *disadvantages* over the conventional system of flow accounts that was represented by Table 1:

- **Reference rates ρ_H, ρ_B, ρ_N, and ρ_O must be chosen for each sector of the economy and this may prove to be contentious and**
- **If the reference rates are not chosen to be all equal to the same rate, then the accounts will no longer be additive along the rows of Table 2; i.e., for each row, the sum of the entries in columns B, N and O will not in general equal the entry in the household column H.**

Discussion on the Choice of Reference Rates: Option 1

***Option 1*: $\rho_B = \rho_N = \rho_O = \rho_H = \rho$ where ρ is a *risk free rate of return*.**

The advantages of this option are as follows:

- **The integrated accounts are additive along each row across columns;**
- **Each sector faces the same safe rate of return and so this is a suitable common reference rate of return.**

Some disadvantages of this option are:

- **It may not be easy to achieve consensus on exactly what this risk free rate of return is. Even short term government bonds for triple A countries face some inflation risk.**
- **The problem with choosing a safe rate of return as the benchmark discount rate is that it will lead to user costs of (physical) capital that are generally *too low* and to margins on various financial instruments which are *too high*. This means it will be difficult to apply traditional production theory to the producer sectors in the economy; i.e., it will be necessary to model various margins or to allow for a large unexplained "profit" component in the producer models.**

Discussion on the Choice of Reference Rates: Option 2

Option 2*: $\rho_B = \rho_N = \rho_O = \rho_H = \rho$ where ρ is the *average rate of return on household debt and equity investments

The advantages of this option are as follows:

- **The integrated accounts are additive along each row across columns;**
- **The household accounts are greatly simplified; i.e., the sum of the entries in rows 12-19 in column H of Table 2 is zero and hence these entries can be ignored in a household model of economic behavior.**
- **The business margin entries in rows 12-20 and columns B, N and O of Table 2 will generally be smaller in magnitude than they were under option 1 above and hence it will be easier to apply traditional (nonfinancial) production theory to these sectors than it was under option 1.**

Discussion on the Choice of Reference Rates: Option 2 (cont)

A disadvantage of Option 2 is:

•Although this ρ is an appropriate supply price of financial capital across the entire household sector, it is not necessarily an appropriate cost of financial capital for each producing sector in the economy. Thus it will be difficult to justify using a household discount rate as the reference rate for sectors B and N.

The above discussion leads us to propose a third option where we give up on achieving exact row additivity of the accounts.

Discussion on the Choice of Reference Rates: Option 3

***Option 3*: The reference rate for each sector is the average cost of raising debt and equity financial capital for the producing sectors and for the household sector, the reference rate is the average return from financial capital, ρ_H defined by (23).**

Thus for the three production sectors, the reference rate ρ_O is defined by (13) and the reference rates ρ_B and ρ_N are defined as follows:

$$\text{(24)}\ \rho_B \equiv [r_{HB}v_{HB}^0 + R_{HB}V_{HB}^0]/[v_{HB}^0 + V_{HB}^0]\ ;$$

$$\text{(25)}\ \rho_N \equiv [r_{HN}v_{HN}^0 + R_{HN}V_{HN}^0 + r_{BN}v_{BN}^0 + R_{BN}V_{BN}^0]/ [v_{HN}^0 + V_{HN}^0 + v_{BN}^0 + V_{BN}^0].$$

Discussion on the Choice of Reference Rates: Option 3 (cont)

The advantages of this option are as follows:

- **The accounts are greatly simplified; i.e., the sum of the entries in rows 12-19 in column H of Table 2 is zero, the entries in rows 12 and 16 of column B sum to zero, the entries in rows 12 to 20 of column N sum to zero and the entries in rows 12 to 20 of column O sum to zero and hence these entries can be ignored in producer models of business behavior.**
- **The reference rates are "reasonable" for each production sector.**
- **The business margin entries in rows 12-20 and columns B, N and O of will generally be smaller in magnitude than they were under option 1 above and hence it will be easier to apply traditional (nonfinancial) production theory to these sectors than it was under option 1.**

The main disadvantage of this option is:

- **Row additivity has been lost in this option; i.e., the entries in columns B, N and H do not necessarily sum to the corresponding column H entry in rows 7-20 of Table 2.**

How Should Monetary Aggregates be Deflated?

The Wang and coauthors (Basu, Fernald and Inklaar) View:

- **Wang and her coauthors take a transactions perspective to the deflation of banking sector monetary flows such as deposit and loan services; i.e., what does it cost the bank to service a deposit account and a loan account?**
- **However, this perspective seems to be unsatisfactory from the viewpoint of the deposit holder and the borrower; i.e., the depositor does not really care how much it costs the bank to service his or her deposit—what is relevant is the real opportunity cost of the financial capital tied up in the deposit. Similarly, the mortgage borrower does not care about the bank's cost of servicing the loan; the borrower cares about how much house the loan can purchase.**

How Should Monetary Aggregates be Deflated? (cont)

There are 11 financial flow variables that appear in Table 1 and 2:

- **Three household loan amounts to the three sectors (v_{HB}^0, v_{HN}^0 and v_{HO}^0);**
- **Three household equity investment amounts (V_{HB}^0, V_{HN}^0 and V_{HO}^0);**
- **Three bank loan and equity investments (v_{BN}^0, V_{BN}^0 and v_{BO}^0) and**
- **Two deposit accounts (M_H^0 and M_N^0).**

Traditional production theory deals only with inputs and outputs that have real quantities associated with them but the above 11 financial flows have no explicit real quantity units associated with them. Thus traditional production theory does not provide much guidance on how to deflate these nominal financial flows into real flows.

How Should Monetary Aggregates be Deflated? (cont)

First Approach to Deflation:

- **Just deflate all monetary aggregates by a general price index.**
- **A problem with this approach is that the choice of the index P is somewhat arbitrary.**

Second Approach to Deflation:

Look at the liabilities equal assets balance sheet constraints for the 3 production sectors, equations (8), (9) and (10). On the asset side of each of these equations, there is a single nonmonetary asset, $P_{KB}{}^0K_B{}^0$, $P_{KN}{}^0K_N{}^0$ and $P_H{}^0H^0$ respectively. Use the price of each of these nonmonetary assets to deflate the corresponding liabilities on the liability side of each of these equations (8), (9) and (10). Thus $M_H{}^0$, $M_N{}^0$, $v_{HB}{}^0$ and $V_{HB}{}^0$ would be deflated by the price of physical capital used in the banking sector, $P_{KB}{}^0$, $v_{HN}{}^0$, $V_{HN}{}^0$, $v_{BN}{}^0$ and $V_{BN}{}^0$ would be deflated by the price of physical capital used in the nonfinancial sector, $P_{KN}{}^0$ and $v_{HO}{}^0$, $V_{HO}{}^0$ and $v_{BO}{}^0$ would be deflated by the price of housing capital, $P_H{}^0$. This deflation strategy would give each of our 11 monetary assets a definite deflator and the strategy seems reasonable: each sector's liabilities are ultimately directed towards the purchase of physical assets.

Empirical Example: the Case of the U.S. Banking Sector

- **We used quarterly data drawn from the Federal Deposit Insurance Corporation on the activities of U.S. commercial banks by quarter over the period Q2-2001 to Q2-2011.**
- **The data did not exactly fit our categories; i.e., loans were not broken down into business and household loans, etc.**
- **But we used the same principles as in the theory part.**
- **The main issues were (1) which financial flows should be regarded as outputs and (2) what reference rate should be used?**
- **We computed bank value added using 3 reference rates and 3 different output concepts so there were 9 options considered in all.**

Three Options for the Reference Rate for the US Banking Sector

- ***Option 1***: $\rho_1 \equiv r_{L2}$; **i.e., set the reference rate equal to the average cost of raising financial capital via debt;**
- ***Option 2***: $\rho_2 \equiv [r_{L1}V_{L1}+r_{L2}V_{L2}]/[V_{L1}+V_{L2}]$; **i.e., set the reference rate equal to the weighted average cost of raising capital via deposits and debt;**
- ***Option 3***: $\rho_3 \equiv [r_{L1}V_{L1}+r_{L2}V_{L2}+r_{L3}V_{L3}]/[V_{L1}+V_{L2}+V_{L3}]$; **i.e., set the reference rate equal to the weighted average cost of raising capital via deposits, debt and equity.**

We regard the Option 1 reference rate as the most plausible approximation to the banking sector's cost of financial capital. The problem with Option 2 is that raising financial capital via deposits is not the "full" cost of raising capital from this source since servicing deposit accounts takes bank resources. The problem with Option 3 is that the banking sector is likely to have some monopoly profits and thus this sector tends to raise extra financial capital via debt or deposits (subject to regulatory constraints) in order to maximize the return to equity capital. Also the ex post rate of return on equity is quite variable and this can lead to large fluctuations in outputs.

Three Options for the Output Concept for the US Banking Sector

In addition to explicitly measured bank value added, V_{EVA}, we will consider the following *three alternative measures of bank value added*:

(41) $V(\rho,A) \equiv V_{EVA} + V_{DS}(\rho)$;
(42) $V(\rho,B) \equiv V_{EVA} + V_{DS}(\rho) + V_{MA3}(\rho)$;
(43) $V(\rho,C) \equiv V_{EVA} + V_{DS}(\rho) + \sum_{i=1}^{4} V_{MAi}(\rho)$.

Thus the *Option A* measure of bank nominal output defined by (41) adds deposit services to explicitly measured value added. The *Option B* measure defined by (42) adds loan services to the Option A measure while the *Option C* measure defined by (43) adds all four asset margin services to explicitly measured value added plus deposit services.

The major advantage of Option A is that only one imputed financial service (deposit services) is added to the list of commodity outputs in the economy's System of National Accounts and thus the additivity of the output and intermediate input production accounts will only be minimally affected by adding deposit services to the commodity classification

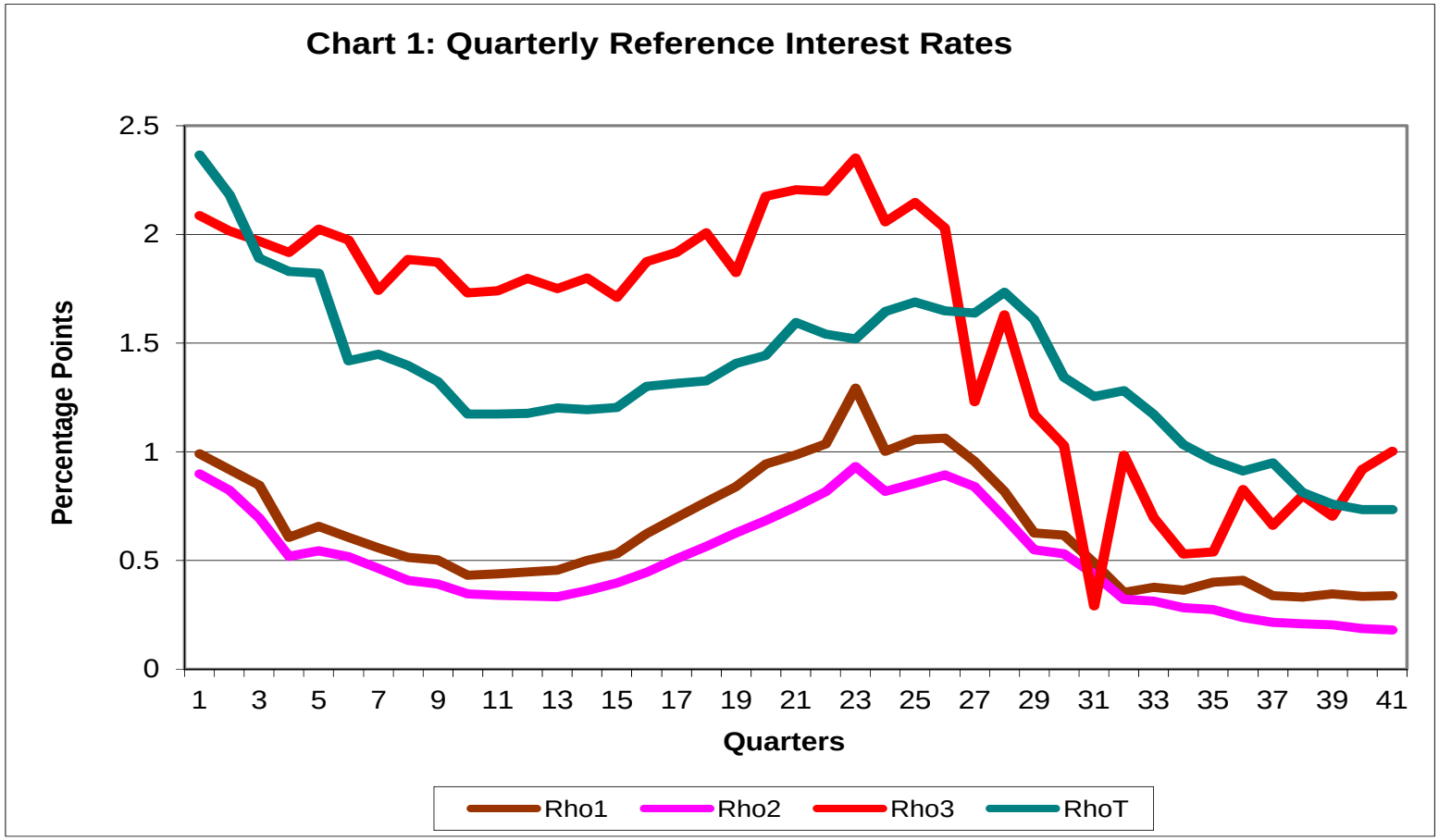
Options for the Output Concept for the US Banking Sector (cont)

- **The advantage of Option B is that it corresponds most closely to the current treatment of FISIM in the SNA; i.e., only bank deposit and loan services are recognized as imputed outputs of the banking sector.**
- **The advantage of Option C is that this option, when applied to other nonbanking sectors which have substantial net revenues from financial services, will lead to a consistent treatment of financial services across all sectors of the production accounts.**

The following slide shows our 3 reference rates by quarter plus the US Treasury Bill rate for reference purposes. Remember:

- ρ_1 **= the banking sector's average cost of capital for debt;**
- ρ_2 **= average cost of capital for debt and deposits;**
- ρ_3 **= average cost of capital for debt, deposits and equity.**

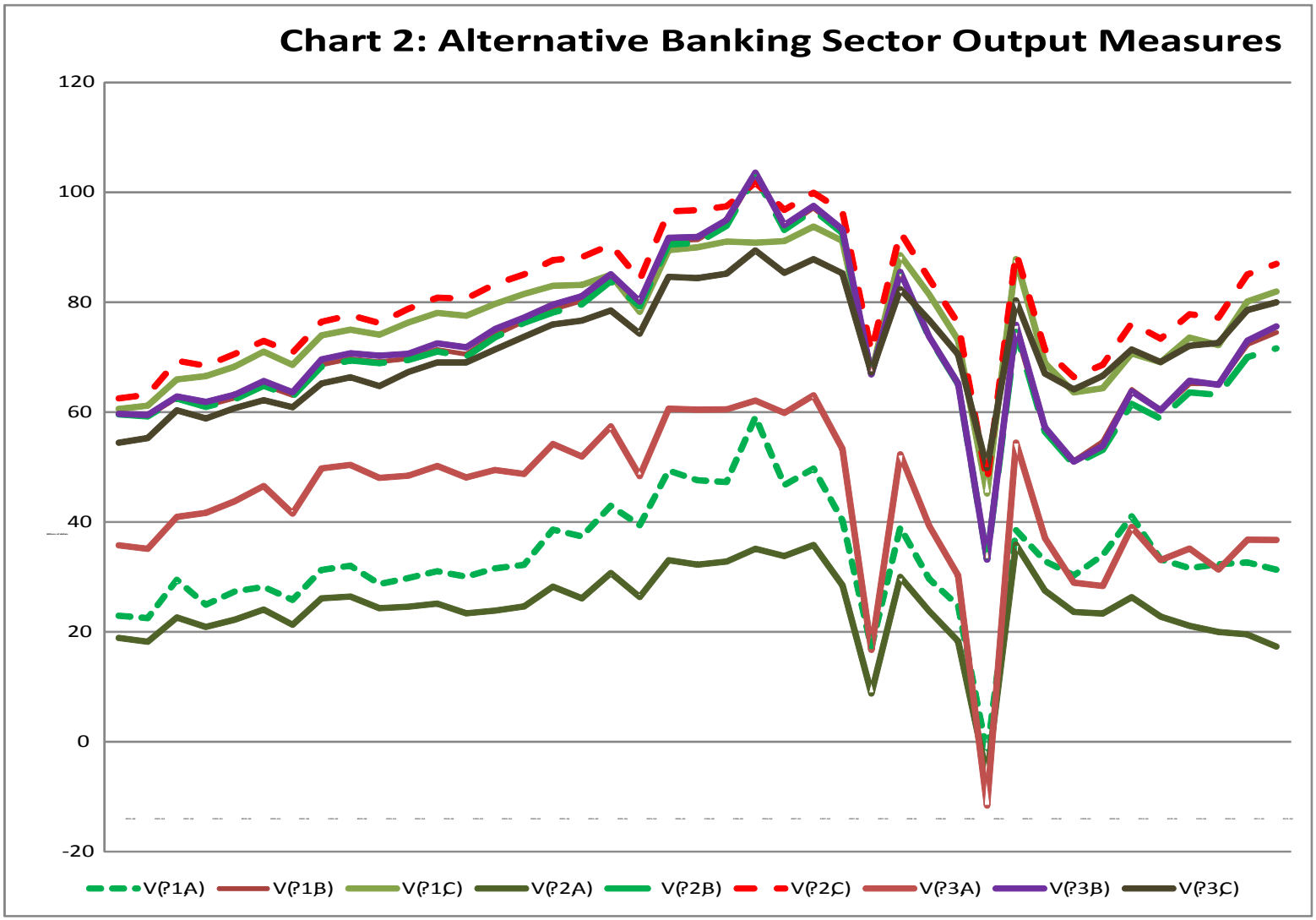
Reference Interest Rates for the US Banking Sector



Discussion of Chart 1

ρ_2 is less than because ρ_1 includes deposits (in addition to debt funding) and the interest cost of deposits is less than the cost of debt. Note that these two reference rates are close together and generally follow the same pattern. The reference rate under option 3, ρ_3, is generally much higher because it includes equity funding (except for Q$-2008 when bank equity returns became negative, leading to a very low ρ_3). To provide a context for these reference rates, a *Treasury based reference rate*, ρ_T or RhoT, is also included. This reference rate is computed as a unit value; the ratio of interest earned on all Treasury securities held by banks divided by the banking sector's book value of the stock of Treasuries. The chart shows that the Treasury rate is generally greater than the reference rates under options 1 and 2. This is explained by the fact that the Treasury rate is an average of short term rates (which are generally low) and longer term rates (which are generally higher). Bank deposit interest rates are generally below short term Treasury Bill rates and bank debt contains a large proportion of money market debt, which also pays very low rates. Thus ρ_1 and ρ_2 are generally well below the average Treasury interest rate ρ_T. Finally, except for the recessions in 2001 and 2007-2010 when bank profits fell sharply, the Treasury rate ρ_T is lower than ρ_3, since rates of return to bank equity are generally very high except during recessions.

Nine Alternative Measures of US Bank Output 2001-2011



Nine Alternative Measures of US Bank Output: Discussion

- **The measures of banking sector output that include both deposit and loan services (the B options) are tightly clustered and cannot be readily distinguished in the Chart; i.e., the output estimates for the U.S. commercial banking sector represented by $V(\rho_1,B)$, $V(\rho_2,B)$ and $V(\rho_3,B)$ are all very similar. As mentioned in the text, this is due to the fact that the asset value of loans is approximately equal to the liability value of deposits for the U.S. banking sector over our sample period and thus measures of bank output will be approximately invariant to changes in the reference rate.**

- **The banking sector output concepts that include only explicitly measured value added plus deposit services (the A options, $V(\rho_1,A)$, $V(\rho_2,A)$ and $V(\rho_3,A)$) are the lowest three lines in Chart 1. Since the choice of a reference rate changes the value of deposit services rather dramatically, these three curves vary substantially from each other. Thus if these concepts for bank output are used, it is important to choose the "right" reference rate.**

Nine Alternative Measures of US Bank Output (cont)

- **The output concepts that include deposit services plus all bank asset services, $V(\rho_1,C)$, $V(\rho_2,C)$ and $V(\rho_3,C)$, lie a bit above the cluster of B measures for the most part, with the exception of $V(\rho_3,C)$, which lies below the cluster until the onset of the Great Recession. As might be expected, the C measures of output are much more variable than the B measures; i.e., in good times, banks make profits on their investments and stock market purchases but in bad times, they lose money on these non loan investments.**

Conclusion

Good stuff:

- **We have provided a coherent approach to financial transactions in a national income accounting framework.**
- **We have integrated the problem of the treatment of OOH into this framework.**
- **Our framework can readily be extended to investment banks.**

Not so good stuff:

- **No definite choices for reference rates.**
- **We have not suggested any definite choice of output concept for financial services; i.e., to move a row or not to move it!**
- **Unless a common reference rate is chosen across all sectors, the accounts will not satisfy additivity along rows.**
- **As far as the bank is concerned, no definite deflator emerges from the bank's profit maximization problem so we have suggested going to the other side of the market for deflators.**