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**A General Equilibrium Asset-Pricing Approach to the
Measurement of Nominal and Real Bank Output
by J. Christina Wang, Susantu Basu and John G. Fernald**

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Comments by Paul Schreyer, OECD

Introduction

The topic of banking output has long been a thorny issue for national accountants and analysts of banking performance and productivity. Christina Wang, Susantu Basu and John Fernald (WBF in what follows) provide us with an explicit model of the behaviour of households, financial and non-financial firms with a view to drawing conclusions for the measurement of implicitly-priced output of banks. Such a model is useful because it spells out the assumptions underlying the statements about measurement, making them transparent and focussing the discussion. The WBF contribution is also timely because the topic of banking output has attracted renewed attention at the national and international level in the past two or three years: in Europe, Member countries of the European Union agreed on a common method and timeline for the treatment of Financial Intermediation Services Indirectly Measured (FISIM) in their respective national accounts (Commission of the European Communities 2002), the United States recently introduced a revised treatment of FISIM into their National Income and Product Accounts (Fixler et al. 2003), and the OECD discussed the topic in the context of a Task Force on the Measurement of the Production of Financial Institutions (Schreyer and Stauffer 2003). This was complemented by other contributions such as Triplett and Bosworth (2004) who also discuss the measurement of banking output and make several proposals to advance the matter. It is against this background – new developments in the international debate and existing prescriptions in the System of National Accounts (SNA) – that I will discuss WBF's contribution.

A point to re-emphasise: financial institutions provide financial services

An important feature of WBF's model and its conclusions for measurement is to focus on the actual flow of *financial* services provided by banks. More specifically, in WBF's model, banks provide financial services in the form of screening and monitoring to mitigate asymmetric information problems between potential investors and those seeking funds. This differs from a strand of research (e.g., Ruggles 1983) that sees banks as providers of *finance*¹ (to borrowers) and consequently recommends that the output of banks be measured by the flow of revenues from providing *financing* services – note the subtle but important difference between *financing* and *financial* services.

¹ See Triplett and Bosworth (2004) for a fuller discussion.

WBF's emphasis on financial services as the output of financial institutions is a point worth reiterating. According to WBF, banks exist and create value essentially because there are information asymmetries that make it costly for households and investors with surpluses of funds to lend directly to non-financial firms with requirements for funds. There is in fact a significant body of literature that has considered information asymmetries as an explanation for the existence and activity of banks, as documented for example in a survey by Gorton and Winton (2002). However, the step from acknowledging this reason for the existence of financial institutions to bringing out the implications for the measurement of output is much scarcer and this effort is an important merit of WBF's paper. A similar conclusion – to put forward financial services as the output of financial institutions – has been reached by the OECD Task Force on Financial Services Measurement (Schreyer and Stauffer 2003) albeit in the context of a much simpler accounting model.

WBF limit their focus to screening and monitoring services. Other services could easily be put forward, in particular convenience services (say for depositors – for example safeguarding, automatic payments, provision of cheques). This makes little difference to their qualitative conclusions, however. And WBF's limitation to screening and monitoring services reflects the trade-off between providing an explicit modelling approach for important services and keeping the model tractable.

Should the reference rate reflect risk?

One of the central conclusions put forward by WBF is that the 'reference rate' for measuring nominal bank lending services "must be risk-adjusted, i.e., contain a risk premium reflecting the systematic risk associated with loans" (WBF, page 34). This is in contrast to current practice in the U.S. NIPA where the reference rate is an (implicitly) maturity-weighted rate of government bonds and thus a default-free rate. Similarly, the directives for the implementation of the new FISIM measures in the European Union require that countries use an inter-bank rate, i.e., an interest rate that is short-term but also essentially risk-free. The choice of the right reference rate is important because it influences the measured level of banking output, and potentially GDP as well as its growth rates. Some more discussion is required to shed light on this point.

The question behind the reference rate: who bears risk?

The first point to make is that it is not the reference rate as such that is at stake but the more general question about whether banks assume risk. Consider an investment decision by a bank, say in a loan. In an efficient market, the value of this financial asset to the bank at the beginning of a year (P^L) will equal the discounted value of expected interest payments at the end of the year (R^L) and the discounted market value of the loan at the end of the year (P_1^L) minus the value of financial services (S^L) that the bank

provides to the borrower, where these services are implicitly priced² and assumed to be provided at the beginning of the year.

The appropriate rate for discounting should be the required return that an investment of equal risk and maturity is expected to yield on the financial market. This is also the definition of a risk-adjusted opportunity cost for the bank's investment. Call this required rate of return r^H , following WBF's notation. We can further de-compose this required rate into a risk-free rate and a risk premium: $(1+r^H) = (1+r^F)(1+rp)$ where r^F is a risk-free rate and rp is the risk-premium. An asset market equilibrium should then be characterised by the following condition:

$$(1) \quad P^L = \frac{R^L + P_1^L}{1+r^H} - S^L .$$

After inserting $(1+r^H) = (1+r^F)(1+rp)$ and after a few transformations, (1) becomes:

$$(2) \quad (1+rp)(1+s^L) = \frac{1}{1+r^F} \left(r^L + \frac{P_1^L}{P^L} \right),$$

where $s^L \equiv S^L / P^L$ is the value of financial services implicitly provided per dollar of the value of the asset, and $r^L \equiv R^L / P^L$ is the rate of return that reflects the regular (interest) payments on the asset (loan).

The left-hand side of (2) is the discount factor that combines the risk-premium and the rate of implicitly-priced services. Let us call this combined rate \tilde{s}^L where $(1+\tilde{s}^L) \equiv (1+rp)(1+s^L)$. If one inserts this relation into (2), one gets

$$(3) \quad \tilde{s}^L = \frac{1}{1+r^F} \left(r^L + \frac{P_1^L}{P^L} \right) - 1 = \frac{1}{1+r^F} (r^L + \pi - r^F)$$

where the rate of price change $P_1^L / P^L - 1$ has been labelled π . For simplicity, we shall assume that the loan is not traded and the price change is zero. Thus,

$$(4) \quad \tilde{s}^L = \frac{1}{1+r^F} (r^L - r^F).$$

(4) corresponds to the simplest form of the 'user cost price' that features in the NIPA calculation of FISIM³. What then does one make of all this in relation to the WBF critique of the reference rate?

² We ignore explicitly-priced services because they add nothing to the present debate and can easily be integrated.

User cost prices of loans as in (4) reflect implicitly-priced services to borrowers and risk-premia. By construction, the ‘reference rate’ r^F is a risk-free rate, otherwise the user cost price would not comprise a risk premium. But there is no claim that the risk-free rate constitutes the risk-adjusted required return on investments for financial firms – the latter was assumed to be r^H and this rate correctly entered as the discount factor in the equilibrium condition (1). In (4), the reference rate serves simply as a device to capture the risk premium with a view to reflecting risk-assumption services provided by the bank to the borrower. Thus, it is not the required return to the financial firm that is at issue in the discussion about the reference rate. By challenging the risk-free reference rate, WBF challenge the existence of this service: it is not the bank but its shareholders who ultimately bear systematic risk and consequently, measured bank output is overstated. The real question is therefore whether or not there is a risk-assumption service by the financial institution.

Scope of assets and liabilities

The discussion so far has been in terms of a loan in isolation and statements about the right measure of banking output have to consider both the asset and liability side of the bank’s balance sheet. And while the source of a bank’s funds (equity, deposits, bonds issued etc.) is without importance in WBF’s model, it is not in a national accounts context. In essence, WBF state that the systematic risk of loans is borne by the bank’s shareholders, and not by the bank itself – hence the risk-assumption service should not be identified as part of bank output. Indeed, if one brings in shareholder considerations and computes the user cost price of the bank’s shares from the perspective of shareholders, a computation parallel to the one above can be applied to yield

$$(5) \quad \tilde{s}^{SI} = \frac{1}{1+r^F} (d^{SI} + \pi^{SI} - r^F).$$

In (5), \tilde{s}^{SI} is the user cost price for the bank’s shareholders, d^{SI} are dividends paid by the bank, π^{SI} are expected holding gains and r^F , as before, is a risk-free rate. As in WBF, take the simple case where a bank is only funded by equity and only invests in loans and where the value of equity equals the value of loans which we shall call y^L . Then, correcting the user cost price on loans (4) by the user cost price of shareholders’ investment (5), we get

$$(6) \quad (\tilde{s}^L - \tilde{s}^{SI})y^L = \frac{1}{1+r^F} [r^L - (d^{SI} + \pi^{SI})]y^L.$$

In (6), the rate of return on loans r^L is compared with the expected rate of return on the bank’s equity $(d^{SI} + \pi^{SI})$ which in equilibrium would equal the bank’s opportunity

³ The national accounts measure does not comprise the factor $1/(1+r^F)$ but this is of secondary importance and depends only on the assumptions about the timing of interest payments during the accounting period.

cost r^H . But if $(d^{SI} + \pi^{SI}) = r^H$, one ends up with a value for bank output that corresponds to WBF's formula with a risk-adjusted 'reference rate' r^H rather than the risk-free rate r^F .

Thus, the two approaches would yield the same result if the national accounts corrected for shareholders' user costs as specified in (5). However, the national accounts do not perform this correction, as by convention no user costs are computed on equity. There is thus an underlying issue of scope – which financial instruments are carriers of financial services – that needs addressing in the national accounts. In its narrowest form, implemented for example in the European Union, the national accounts measure of financial services is solely based on deposits and loans. U.S NIPA takes a wider perspective and considers all assets and liabilities that earn interest or imputed interest. Obviously, the broader the scope of assets and liabilities that the national accounts take into account, the smaller the difference to the WBF results, even if the national accounts employ a risk-free reference rate.

A different way of interpreting WBF's results vis-à-vis the national accounts is to say that the national accounts implicitly take a perspective where a financial firm and its owners constitute one economic entity. WBF's model sees banks separately from their shareholders and by implication, any risk premia charged by banks are passed on to shareholders who bear the systematic risk of investment. WBF conclude that banking output as presently measured is overstated by the risk premium because financial firms should be considered different entities from their shareholders.

A practical point: choosing the required rate of return for shareholders

If one accepts WBF's suggestion to use a risk-adjusted reference rate and/or to correct the national accounts computation for user costs to shareholders, the practical question arises how to choose the appropriate risk-adjusted rate that reflects the required return to shareholders. As shown in WBF's model, the theoretically correct rate is determined by the representative consumers' expected consumption path or more specifically, the required rate equals the risk-free rate plus a risk premium that depends on the covariance between the consumer's intertemporal pricing kernel and the assets in which the bank invests.

The empirical implementation of this risk-adjusted rate is a difficult issue. Typically, the covariance between asset returns and consumption is weak – a finding that is well established in the literature on the equity premium puzzle (see Kocherlakota 1996 for an overview). A weak covariance implies a small adjustment to the risk-free rate, however, and would diminish the empirical impact of the choice. For example, using the components of the Federal Reserve System monetary aggregates, Barnett, Liu and Jensen (1997) found that risk adjustments were small. Of course, such empirical considerations have no bearing on the theoretical points made by WBF but they are of interest to statistical agencies that have to implement measures.

Is the test of 'The bank that does nothing' a valid one?

One test proposed by WBF to substantiate the plausibility of their model is to ask what their measure of production would be for a bank that ‘does nothing’ (WBF page 16). More specifically, a hypothetical situation is invoked where banks are simple ‘accounting devices’, only there to receive households’ capital (they buy the bank’s shares) and to lend out these funds to entrepreneurs but provide no screening or monitoring services – shareholders themselves see right through the bank and are able to screen borrowers and to monitor them. Then, WBF argue, the measure of this bank’s output should be zero. The national accounts measure, under the same circumstances, produces a positive value of output because, in the above notation, it would correspond to the user costs of the loans: $(r^L - r^F)y^L$ and they are positive if there is systematic risk.

This raises again the question about the source of financing. In WBF’s model, the Modigliani-Miller theorem applies to banks as well as to non-financial firms and therefore, banks’ financing structures are of no consequence for the required rate of return. Consequently, allowing for debt financing of banks makes no difference to WBF’s argument that national accounts overstate banking output by the risk premium on loans and other assets. This is correct, if one accepts the assumptions underlying the Modigliani-Miller theorem (perfect capital markets, equal access, homogenous expectations etc.) which we shall do for the present argument. Thus, the structure of bank financing has no influence on the bank’s required rates of return. However, the structure of financing *does* make a difference when applying the test of the ‘bank that does nothing’ because different sources of financing are not treated symmetrically in the national accounts. Take a bank that does nothing – a pure accounting device in WBF’s terms – but assume that it is deposit-financed; not equity financed. Applying national accounts methodology to this case yields a zero measure of production.

This is easily demonstrated by considering the national accounts’ FISIM calculation where y^D and r^D are the value of deposits and the interest rate paid on them, respectively:

$$(7) \quad \text{National accounts’ banking output} = y^L(r^L - r^F) - y^D(r^D - r^F)$$

In WBF’s case of a bank that ‘does nothing’, there are no implicitly-priced depositor services, and the rate that is paid on deposits must equal the loan rate, itself equal to the return required by the financing units, the depositors: $r^L = r^D$. In the absence of equity financing and in the equilibrium situation postulated by WBF, $y^L = y^D$ and the banking output measured by the national accounts equals zero. This makes the relevance of the test of ‘the bank that does nothing’ dependent on an empirical issue: national accounts fail to register zero output to the extent that bank loans are equity-financed – in the more realistic case of deposit-financed banks, the argument applies to a much smaller extent.

Timing of provision and measurement of financial services

WBF’s model assumes that screening services are provided at the beginning of a contractual relationship between banks and borrowers and the authors rightly point out

that there is an issue of timing when the flow of services is measured via flows of interest that are observed during the life of the loan. This is not a contentious issue, and the accrual principle, one of the cornerstones of the SNA, suggests that efforts be made to enter payments for a service at a time as closely as possible to the provision of the service. Remains the tricky empirical issue of implementing this principle in the context of a flow of service payments that cannot be directly observed!

Another point worth emphasising: holding gains

WBF rightly observe that “...if interest income is often employed as implicit compensation for financial services provided without explicit charge, then in principle capital gains can be used in place of interest for the same purpose.”(WBF, p. 49). To illustrate, WBF use the example of a loan that is sold off and argue that only expected capital gains should enter the computation of financial services output whereas capital gains or losses purely due to the random realisation of asset returns should not be counted as financial output.

This is an important observation that lines up with a suggestion made by Fixler and Moulton (2001) and the discussion in Schreyer and Stauffer (2003). At the same time, any consideration of holding gains or losses in measures of production turns out to be highly controversial in the context of national accounts because the SNA considers that holding gains cannot be production. But the basic issue remains: there are many items on a bank's balance sheets with remunerations other than interest payments, and if an argument can be made that financial services are somehow associated with these assets and liabilities, expected holding gains cannot be ignored. Thus, WBF have raised another important and valid point here.

Conclusions

There are many advantages to having an explicit model when devising proposals for measurement and WBF should be commended for that. Explicit statements of assumptions and behaviour of economic agents and the use of a model to bring things together are most valuable to make informed choices about measurement.

A core issue that arises from the discussion and which probably deserves further research is the role of risk and the question whether, from an accounting perspective, banks or their share holders bear the risk involved in lending.

Generally, WBF's model is relevant, raises the right issues and treats them in a rigorous way: (i) we should view banks as institutions that provide financial services, and then should be clear about what these services are and how they should be measured; (ii) the choice of the reference rate is important and its theoretical foundations need to be clearly put down; (iii) measuring service flows at the time when they are produced and consumed can be difficult; (iv) expected holding gains are an integral part of the return of certain financial instruments and should not be ignored in measuring financial services; (v) interest rates are not normally the appropriate measures of financial service prices;

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