"MEASURING THE MARKET VALUE OF A BANK, A PRIMER"

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Summary

The object of the paper is to provide a concise but explicit analysis of the determinants of the market value of a bank. These include the current value of assets net of the liabilities, a franchise value and three terms related to the tax system that operates through equity financing, inflation and tax savings on unrealized capital gains on assets and liabilities. The paper ends with an application on the case of an international banking firm.

The usefulness of the 'market value of a bank' concept has been emphasised in at least three areas of research in banking. Economists concerned with the capital adequacy of banks have argued that capital regulation should apply to the market value of equity, not to its book value. For some of these authors[1], the market value of a bank is the difference between the current value of assets and liabilities while for others[2], it incorporates also the franchise value, that is the value of the bank as a going concern. A second area of research deals with the measurement of interest rate risk. A commonly proposed measure of risk is the sensitivity of the market value of a bank to unexpected changes in interest rates. Finally, in an industrial organisation context, economists[3] have analysed the market to book value ratios of banks to infer the extent of monopoly rents or possible cost of capital differentials.

Given the importance of the market value concept in banking, it appears useful to analyse explicitly, in a concise and pedagogical manner, the various determinants of the market value of banks. A second aim of the paper is to call the attention to several determinants which have often been bypassed in the current literature. Particular care will be given to franchise value, taxes (especially the tax treatment of capital gains and losses), real growth, inflation and, finally, in the context of an international bank the effect of currency depreciation on the market value of a bank.

The paper is organised as follows. Cross-country comparative evidence on the market to book value ratio of the equity of banks is provided in Section One. The determinants of the market value of a bank in a 'closed economy', zero tax, zero growth and zero inflation world are analysed in Section Two. These restrictive assumptions are dropped successively in Sections Three, Four, Five and Six.

SECTION ONE : MARKET TO BOOK VALUE RATIO, A CROSS-COUNTRY COMPARATIVE EVIDENCE.

The purpose of Table One is to provide cross-country comparative evidence on the market to book value ratio of the equity of large banks (averaged over the period 74-82), on the average nominal and real rates of growth of private sector lending and clientele deposits and on the average inflation rate.

INSERT TABLE ONE

A reading of Table One shows that low inflation countries (Switzerland, Japan and Germany) tend to be associated with high market to book value ratio and relatively high real rate of growth in lending and deposits while higher inflation countries (United Kingdom, United States and France) are associated with low market value and low real rates of growth in deposits and loans (an exception being France). While other variables such as the volume of non-performing loans or the accounting conventions for the book value of equity account partly for the observed cross-sectional variance, it remains that this table points out to the relevance of an explicit analysis of the determinants of the market value of banks.

SECTION 2 : A ZERO TAX, ZERO GROWTH AND ZERO INFLATION 'CLOSED ECONOMY' WORLD.

In this section, we analyse the determinants of the market value of a bank in a simple world. The implicit model of reference is the micro-economic model originally presented in Monti (1972) and Klein (1971) and further developped by Goodman (1982) and Dermine (1986). The basic characteristic of this model is that the optimal volumes of banks' assets and liabilities are determined by marginal return and cost considerations.

We assume for expository convenience that a bank has two more years before it is liquidated. The bank has on its asset side a portfolio of two years to maturity loans (L) and bonds (B) which have been acquired in the past and which carry fixed interest rates, respectively p and b. These assets are financed with deposits (D) and equity (E). Deposits have a maturity of two years and offer a fixed interest rate d. Loans, bonds and deposits are recorded at their historical book value. The current one year return on similar assets and liabilities are respectively p^*, b^*, and d^*, constant over the next two years. Since the paper will not focus on risk evaluation, all the variables are to be taken as being certain or certainty equivalent. As in the neoclassical model of the banking firm, the bonds and equity markets are assumed perfectly elastic and the (certainty equivalent) cost of equity is the current market rate b^*. The balance sheet of this bank is given in Figure One.

Loans L (p)	Deposits D (d)
Bonds B (b)	Equity E (b*)

Figure One: The Balance Sheet

Notes : Current rates on loans, bonds and deposits are p^*, b^* and d^*.
Two years to maturity fixed rate assets and deposits

The particular structure of the model calls for a comment. There can be many reasons in the real world as to why we observe an interest rate differential between assets and liabilities. The longer maturity of assets may command a risk premium and, with deposits withdrawable on short notice, the posted deposit rate does not include the extra cost of refinancing in case of withdrawal. However, this does not explain the interest rate differential in this model. We assume that the return and cost, p and d, are net of the price for risk and we postulate that it is imperfect competition or regulation on some markets which creates the interest rate differential. Barriers to entry (such as binding regulation on interest paid on demand deposits) prevent the creation of perfect substitutes which would erase the differential. The relevance of this hypothesis can be questioned in a period of deregulation but it would seem that regulation or 'organised competition' creates imperfections in at least some deposits markets. Table Two provides ample evidence that deposit rate regulation is still the rule in many european countries. In any case, our model is quite general as perfect competition will appear as a special case.

INSERT TABLE TWO

The growth path of assets and liabilities must be defined to close the example. We assume, for simplicity, that the assets and liabilities are constant in book value terms over the next two years and that the accounting profit (the net interest payment) is paid out as dividends. The subscripts 1, 2 and 3 will indicate respectively the beginning of the first and second period and the end of the second period.

The market value of this bank is the present value of its dividends and liquidation value discounted at the shareholders opportunity cost of funds b^*:

$$MV = \frac{pL + bB - dD}{1 + b^*} + \frac{(1 + p)L + (1 + b)B - (1 + d)D}{(1 + b^*)^2} \qquad (1)$$

This relation can be expressed in a more cumbersome but very meaningful way (see the proof in Appendix One)

$$MV = L_1^* + B_1^* - D_1^* + \left[\frac{(p^*-b^*)L_1^*}{1 + b^*} + \frac{(p^*-b^*)L_2^*}{(1 + b^*)^2}\right] + \left[\frac{(b^*-d^*)D_1^*}{1 + b^*} + \frac{(b^*-d^*)D_2^*}{(1 + b^*)^2}\right] \qquad (2)$$

where L_i^*, B_i^* and D_i^* are the current values in year i of the loans, bonds and deposits evaluated at their loan, bond and deposit current rates. For instance, the current values of the loans at the beginning of years one and two are respectively:

$$L_1^* = \frac{pL}{1+p^*} + \frac{(1+p)L}{(1+p^*)^2} \qquad (3i)$$

$$L_2^* = \frac{(1+p)L}{1 + p^*} \qquad (3ii)$$

The market value of the bank is the sum of two terms: the difference between the value of assets and liabilites evaluated at their respective current rates and the franchise value or goodwill[4]. Guttentag and Herring (1983, p. 116) have proposed the following definition of the goodwill of a bank: "Conceptually, the goodwill is the present value of net income the bank would be expected to earn on new business if it were to retain only its offices, employees and customers. The goodwill depends on the bank's authorised powers including power to do business within specified areas, the market structure in the area, the expertise of the bank's employees, and the customer relationship it has developped". From a purely financial view-point (relation (2)) the goodwill appears to be the ability to pay below market rate on current and future deposits and the ability to ask above market rates on loans. We have assumed implicitly that the current rates have the following ordering : $p^* > b^* > d^*$. This is to be expected if financial intermediaries are to exist but it needs not to be observed for each individual asset, as, for instance, some loans can be subsidised to attract large profitable demand deposits (the case of horizontal integration discussed by Cuckierman (1978)).

A major implication of this analysis is that one should not rely simply on the current value of assets and liabilities to measure the solvency of a financial intermediary or the exposure of the deposit insurance agency. The economic net worth should include in general the current value of equity ($E_1^* = L_1^* + B_1^* - D_1^*$) and the goodwill of the financial firm. This conclusion is not novel but was stated many years ago by Paul Samuelson (1945, p. 24): "It should not be necessary to argue before economists that the banking system is a going concern and is to be treated as such".

A second implication of this valuation formula concerns the measurement of interest rate risk. An extensive literature has focused on the effect of unexpected change in interest rates on the value of assets and liabilities and has proposed a measure of risk related to the average duration of assets and liabilities[5]. Our analysis shows that in the case of a positive franchise value, the market value of a bank will be affected not only by changes in the value of assets and liabilities but also by changes in the franchise value. This last effect will depend on the interest rate margins and on the elasticity of the volumes of deposits and loans[6]. The relevance of the franchise value for interest rate risk measurement will depend very much on regulation and rigidities but even in a country like the United States there appears to be some rigidities. As Flannery and James (1984) put it: "The empirical evidence suggests that demand, savings and retail time deposit balances are 'sticky' or imperfectly responsive to change in market rates. When market interest rates rise (fall), the bank's effective cost of these liabilities changes by a small amount, raising (lowering) bank income, ceteris paribus". Of course, these observations are based on past data and what is relevant today is the future response of the goodwill to interest rate changes.

The determinants of the market value are, in this simple world, the current value of assets net of the liabilities and the value of the franchise or goodwill. Taxes which are introduced in the next section will make the analysis more complex.

SECTION THREE: TAXES, ZERO REAL GROWTH AND ZERO INFLATION

Taxes are likely to affect the value of a bank for two reasons. The first one is that the cost of equity is not tax deductible and the second is that capital gains (losses) on assets and deposits are taxed only when realized. The importance of the tax treatment of capital gains (losses) has been discussed recently by economists in the context of the pricing of bonds and of the term structure of interest rates (Constantinides (1983), Stiglitz (1983) or Roll (1983)). Much earlier work on this issue was done by Samuelson (1964). As we will see, taxes do affect substantially the value of a bank.

We assume again that the cost of equity is the current market rate b^*. This is done only for convenience; our results would be qualitatively similar with the introduction of personal taxes (Miller, 1977; Orgler-Taggart, 1984). Also, we assume that the assets have been acquired at par, so that only accounting income (net interest receipts) is being taxed. Denoting by t the corporate tax rate, we obtain the following valuation formula:

$$MV = \frac{(1 - t)(pL + bB - dD)}{1 + b^*}$$

$$+ \frac{(1 - t)(pL + bB - dD) + L + B + D}{(1 + b^*)^2} \qquad (4)$$

Following the procedure used in section one, we obtain a more meaningful formula (see the proof in Appendix Two):

$$
\begin{aligned}
MV = & \left\{ L_1^* + B_1^* - D_1^* \right\} + \left\{ \frac{(1-t)(p^*-b^*)L_1^*}{1+b^*} + \frac{(1-t)(p^*-b)L_2^*}{(1+b^*)^2} \right. \\
& \left. + \frac{(1-t)(b^*-d^*)D_1^*}{1+b^*} + \frac{(1-t)(b^*-d^*)D_2^*}{(1+b^*)^2} \right\} + \left\{ - \frac{tb^*E^*_1}{1+b^*} \right. \\
& \left. - \frac{tb^*E^*_2}{(1+b^*)^2} \right\} + \left\{ \frac{t(L_2^*-L_1^*)}{1+b^*} + \frac{t(L_3^*-L_2^*)}{(1+b^*)^2} \right. \\
& + \frac{t(B_2^*-B_1^*)}{1+b^*} + \frac{t(B_3^*-B_2^*)}{(1+b^*)^2} \\
& \left. - \frac{t(D_2^*-D_1^*)}{1+b^*} - \frac{t(D_3^*-D_2^*)}{(1+b^*)^2} \right\}
\end{aligned}
\qquad (5)
$$

The market value is the sum of four terms: the current value of assets net of the liabilities, the after tax value of the goodwill, the present value of the non tax deductibility of equity costs and the present value of the tax savings due to the non taxation of capital gains (losses) on assets and liabilities.

This valuation formula requires some explanatory comments. The current value of assets and liabilities L_i^*, B_i^* and D_i^* are the 'true' economic values as defined by Samuelson (1964), that is the present value of the after tax cash flows discounted at the after tax discount rate where taxes are being paid on current capital gains and losses[7]. We call these true economic values, 'S' values. The first term in the valuation formula

(5) is the 'S' equity, that is the difference between the 'S' value of assets and liabilities. The second term is the after tax goodwill, that is the ability to pay below market and ask above market rates on the 'S' volumes of deposits and loans. The third term is the non tax deductibility of the cost of the 'S' equity[8]. One will notice that the value of equity is not constant during the two years because the current 'S' values of assets and deposits are changing over time. The last set of terms takes into account the specific tax treatement of capital gains and losses on assets and deposits. They are not taxed in our example so that the present value of the tax savings (losses) must be included in the market value. The assumption of not taxing the capital gains and losses was made for convenience. As is stressed by Constantinides (1983), it leaves room for tax management as losses should be taken immediately and gains be realized only later to maximize the tax shelter [9]. A practical implication of this valuation formula is that one must consider the tax status of assets to measure the solvency of a financial intermediary. Kane (1983) reports cases where the mortgage portfolio of a S&L's are worth only 80% of their book value. This estimate is the discounted value of the before tax cash flows earned on these assets evaluated at the before tax current rate (i.e. the Samuelson 'true' value). In fact, these assets are worth much more to the shareholders of S&L's because only the (low) interest income will be taxed, while the capital gain earned on these assets as they reach maturity will be virtually tax free (unless they are realized)[10]. With a 50% tax rate, the difference in effective value can be quite substantial.

To summarize: the determinants of the market value of a bank appear to be the 'S' value of equity, the after tax goodwill, the present value of the non tax deductibility of equity costs and the tax savings (losses) due to the specific treatment of capital gains and losses on assets and liabilities[11].

The analysis so far has been limited to cases where all accounting income is paid as dividend. It needs to be extended to the realistic situations where some earnings are retained to follow the real or inflationary growth of the liabilities.

SECTION FOUR: TAXES, REAL GROWTH AND ZERO INFLATION

Let us consider again a two-years' bank to start with and let us assume that there are no capital gains (losses). The volumes of loans and deposits grow at the real rate ρ .

$$D_2^* = (1 + \rho)D_1^*$$

$$L_2^* = (1 + \rho)L_1^*$$

As all the variables are to be taken as current values from now on, we delete the superscript *. The valuation formula (5) still applies if all income is paid out as dividends:

$$\begin{aligned} MV = & \left(L_1 + B_1 - D_1\right) + \left(\frac{-tbE_1}{1+b} + \frac{-tbE_1}{(1+b)^2}\right) \\ & + \left(\frac{(1-t)(p-b)L_1}{1 + b} + \frac{(1-t)(p-b)(1+\rho)L_1}{(1+b)^2}\right) \\ & + \left(\frac{(1-t)(b-d)D_1}{1 + b} + \frac{(1-t)(b-d)(1+ \rho)D_1}{(1 + b)^2}\right) \end{aligned}$$

If regulators succeed in enforcing a constant capital ratio, earnings will be retained to increase equity at a rate ρ. The valution formula (6) must be adapted: a negative cash flow ($-\rho E_1$) is added in period one and the proceeds of the investment are added in year two, that is

$$\frac{\rho E_1}{1+b} + \frac{(1+b(1+t))\rho E_1}{(1+b)^2} = \frac{-tb\rho E_1}{(1+b)^2} \qquad (7)$$

Retained earnings have a negative effect on the market value of a bank. It is a straightforward application of the Miller-Modigliani result (1961): retained earnings add to the value of a firm if and only if the return on investment is larger than the cost of capital. In this case, the effect is negative since the after tax return $(b(1-t))$ is smaller than the the cost of equity (b). This result holds as long as we assume that retained earnings do not affect personal taxes. In Appendix Three, we consider the case where personal taxes apply to dividend income only. In this case, the Modigliani-Miller tax penalty on the income earned on retained earnings is partly offset by a personal tax gain due to delayed taxation. For expository convenience, we will ignore the personal tax delay benefit.

Adding (7) to (6), we obtain a valuation formula for the constant capital ratio growth case:

$$MV = (L_1 + B_1 - D_1) + \left(\frac{1}{1+b} + \frac{(1+\rho)}{(1+b)^2}\right)\left(-tbE_1 + (1-t)(p-b)L_1 + (1-t)(b-d)D_1\right) \tag{8}$$

The infinite period case follows immediately:

$$MV = (L_1+B_1-D_1) + \frac{1}{b-\rho}(-tbE_1) + \frac{1}{b-\rho}((1-t)(p-b)L_1 + (1-t)(b-d)D_1) \tag{9}$$

The market value is the sum of three terms: the current value of assets minus the liabilities, the present value of the non tax-deductibility of equity costs for the constant growth scenario and the after tax value of the goodwill. Real growth affects the value of a bank if it raises the fiscal cost of equity or the value of the goodwill.

The inflationary growth case is considered next.

SECTION FOUR: TAXES AND INFLATION

Let us assume that the volumes of deposits and loans grow in nominal terms at a perfectly anticipated inflation rate $\dot{p}$ and that the nominal interest rates follow the Fisher relationship, that is:

$$p = p^r(1+\dot{p}) + \dot{p}$$
$$b = b^r(1+\dot{p}) + \dot{p}$$
$$d = d^r(1+\dot{p}) + \dot{p}$$

where the superscript r denotes a real rate.

We assume that the regulators enforce a constant capital ratio so that one simply needs to substitute in the valuation formula (9) $\dot{p}$ in place of ρ and the nominal rates in place of the real rates:

$$MV = (L_1 + B_1 - D_1) + \frac{(-t(b^r(1+\dot{p})+\dot{p})E_1}{b^r(1+\dot{p}) + \dot{p} - \dot{p}}$$

$$+ \frac{(1-t)(1+\dot{p})(p^r-b^r)L_1}{b^r(1+\dot{p}) + \dot{p} - \dot{p}} + \frac{(1-t)(1+\dot{p})(b^r-d^r)D_1}{b^r(1+\dot{p}) + \dot{p} - \dot{p}} \tag{10}$$

$$= (1-t)E_1 - \frac{t\dot{p}E_1}{b^r(1+\dot{p})} + \frac{(1-t)(p^r-b^r)L_1}{b^r} + \frac{(1-t)(b^r-d^r)D_1}{b^r}$$

The market value of a bank under inflationary growth is identical to the value in the non growth case (2), less an inflation tax. The inflation premium ($\dot{p}$) which should compensate for the loss of equity purchasing power is taxed, increasing de facto the real tax burden on shareholders. Financial firms are net holders of financial assets and as such will suffer under inflation. This is the reverse case of the traditional business firms which are in general net suppliers of financial assets (Feldstein, 1983)[12]. For empirical purposes, the valuation formula (10) would have to be adapted to the situations where equity does not follow the inflationary growth of deposits or to the cases where the nominal interest rates neutralize the inflation tax (Darby,1975). This tax can be substantial: With a tax rate of .5, a real interest rate of .03 and an inflation rate of 10 percent during five years, the ratio of market value to equity (MV/E) would fall by twenty percent (Dermine, 1985). This figure does not appear excessive compared to the effective drop of forty percent in the United States which occured in 1974, precisely the year the inflation rate was sharply increasing (Maisel, 1981, p. 117).

In the final section, we apply the valuation formula to the case of an international banking firm in a situation of currency depreciation.

SECTION SIX: THE INTERNATIONAL BANKING FIRM

In this section, we apply the model to the case of an international banking firm whose assets and liabilities are denominated in two currencies, the domestic and the foreign ones. Given the importance of the U.S. $ denomination in the international financial markets, this model is of greater relevance to non-american banks. For instance, in a small open economy like Belgium, the ratio of foreign currency liabilities to total liabilities is 45% for the three largest banks. The principal motivation for developing a model with two currency assets and liabilities is due to a concern by regulatory authorities (Watson, Keller, Mathieson, 1984; Commission Bancaire, 1984) about the capital ratios of international banks. They observed that the 1984 appreciation of the dollar has increased the domestic currency value of the assets and liabilities of these banks without a corresponding increase in equity. It seems therefore useful to analyse the determinants of the market value of an international banking firm in the case of currency depreciation. As will be shown, this case involves a mix of real and inflationary growth.

To simplify the notation, we assume that the bank holds only one year to maturity perfect market bonds B (domestic bonds with a nominal return b) and B^f (foreign currency bonds with a nominal return b^f). These assets are financed with one year to maturity domestic deposits (D,d) and foreign currency deposits (D^f, d^f) and equity. Equity is by regulation proportional to total deposits ($E = k(D^f+D)$). The balance sheet of this bank is given in Figure Two.

$B^f(b^f)$: foreign currency bonds	$D^f(d^f)$: foreign currency deposits
$B(b)$: domestic currency bonds	$D(d)$: domestic currency deposits
	E : equity

Figure Two: The International Bank

We normalize the current exchange rate at unity and denote by e the rate of domestic currency depreciation. To simplify the notation, we assume that the anticipated rate of currency depreciation is constant through time. The interest rate parity theorem is supposed to hold for the perfect market securities but, because of frictions on the domestic deposits markets, the cost of foreign currency deposits expressed in domestic currency (d^{fd}) can differ from the cost of domestic deposits. Formally, we have

$$(1 + b) = (1+b^f)(1 + e)$$

$$(1 + d^{fd}) = (1 + d^f)(1 + e) \text{ with } d^{fd} \gtrless d$$

We further assume that the inflation rate in the foreign country is zero and that the rate of currency depreciation may under or over-estimate the inflation differential[13]. Denoting by $\dot{p}$ the domestic inflation rate, we assume:

$$\dot{p} = \alpha e.$$

In the neoclassical model of the banking firm (Goodman, 1982), the volumes of deposits or assets are determined by marginal cost and return considerations and the appropriate mix of foreign and domestic bonds can be fixed for hedging purposes.

$$(1 + b^f)B^f = (1 + d^f)D^f$$

The growth paths for deposits and equity follow, assuming that domestic deposits grow with inflation:

Time	0	1	2	...
Domestic deposits	D_o	$(1+\alpha e)D_o$	$(1+\alpha e)^2 D_o$	...
Foreign deposits	$D^f{}_o$	$D^f{}_o$	$D^f{}_o$	...
Equity	E_o	$k((1+e)D^f{}_o+(1+\alpha e)D_o)$	$k((1+e)^2 D^f{}_o+ (1+\alpha e)^2 D_o)$	...

The cash flow accruing to shareholders in year one (the profit net of the necessary retained earnings that will maintain constant the capital adequacy ratio F_1) ratio follows:

$$F_1 = (1-t)((1+e)b^f B_o{}^f + eB_o{}^f + bB_o - (1+e)d^f D_o{}^f - eD_o{}^f - dD_o)$$
$$-k(\alpha e D_o + eD^f{}_o) \qquad (11)$$

After manipulation, we obtain:

$$F_1 = (1-t)((b-d^{fd})D_o{}^f + (b-d)D_o + bE_o) - k(\alpha e D_o + eD^f{}_o) \qquad (12)$$

The cash flows for the next periods follow immediately:

$$F_2 = (1-t)((b-d^{fd})(1+e)^1 D_o{}^f + (b-d)D_o(1+\alpha e)^1 + bE_1) - k(\alpha e(1+\alpha e)^1 D_o + e(1+e)^1 D^f{}_o) \tag{13}$$

$$F_3 = \ldots\ldots..$$

Summing the discounted value of these cash flows, we obtain the market value of the bank:

$$MV = E_o + \frac{(1-t)(b-d^{fd})D^f{}_o}{b-e} + \frac{(1-t)(b-d)D_o}{b-\dot{p}} - \frac{tbkD^f{}_o}{b-e} - \frac{tbkD_o}{b-\dot{p}} \tag{14}$$

The market value of the international banking firm is equal to the current value of equity plus the goodwill on foreign and domestic deposits minus the non tax deductibility of equity costs.

This formula provides further insights when we substitute the real rates (denoted by the superscript r) given by the Fisher equation,

$$(1 + b) = (1 + b^r)(1 + \dot{p})$$
$$(1 + d) = (1 + d^r)(1 + \dot{p})$$
$$(1 + d^{fd}) = (1 + d^{fdr})(1 + \dot{p})$$

$$MV = E_o + \left(\frac{(1-t)(1+\dot{p})(b^r-d^{fdr})D_o{}^f}{b^r(1+\dot{p})+\dot{p} - e} + \frac{(1-t)(b^r-d^r)D_o}{b^r}\right) - \left(tkD_o + \frac{tb^r(1+\dot{p})kD_o{}^f}{b^r(1+\dot{p})+\dot{p}-e}\right) - \left(\frac{t\dot{p}kD_o}{b^r(1+\dot{p})} + \frac{t\dot{p}kD_o{}^f}{b^r(1+\dot{p})+\dot{p}-e}\right) \tag{15}$$

The market value is the sum of four terms: current equity plus the franchise value on foreign and domestic deposits, plus the non tax deductibility of equity costs minus an inflation tax. This case is a mix of real growth for foreign deposits ($e > \dot{p}$ with $\alpha < 1$) and inflationary growth ($\alpha > 0$). The net benefit for a banking firm of a real currency depreciation will therefore depend on the relative weights of the real growth of the franchise value, the fiscal cost of equity and the inflation tax.

CONCLUSIONS

The main objective of this paper has been to present in a simple framework the determinants of the market value of a financial intermediary. This analysis has several implications for capital regulation and for the measurement of interest rate risk.

The economic net worth of a bank is not simply the difference between the current value of assets and liabilities. Failed institutions rarely go into liquidation but are merged with sounder institutions. It implies that it is the global net worth which matters. This includes the current value of equity, the non tax deductibility of equity costs, the tax savings on capital gains, the franchise value and the inflation tax.

A second implication concerns the measurement of interest rate risk. If one wants to hedge the market value of a bank against unexpected change in interest rates, one must consider their effects not only on the current value of assets and liabilities but also their effects on the other determinants of the market value (Dermine, 1985).

Finally, as a caveat or suggestion for further research, one needs to introduce risk explicitly, in particular, the risk of bankruptcy and the value of the put option granted by the fixed premium deposit insurance system (Merton, 1977).

APPENDIX ONE: The Zero Tax Case

Proof : We will show that a two period asset A with historical return a, current (one period) return a^* and discount rate b^* is equal to :

$$MV = \frac{a\ A}{1+b^*} + \frac{(1+a)\ A}{(1+b^*)^2} = A_1^* + \frac{(a^*-b^*)\ A_1^*}{1+b^*} + \frac{(a^*-b^*)\ A_2^*}{(1+b^*)^2}$$

$$\text{with}\quad A_1^* = \frac{a\ A}{1+a^*} + \frac{(1+a)\ A}{(1+a^*)^2}$$

$$A_2^* = \frac{(1+a)\ A}{1+a^*} \qquad \text{(A1)}$$

$$\text{Proof :}\quad MV = \frac{a\ A}{1+b^*} + \frac{(1+a)\ A}{(1+b^*)^2} = \left(\frac{a\ A}{1+a^*} + \left(\frac{a\ A}{1+b^*} - \frac{a\ A}{1+a^*}\right)\right)$$

$$+ \left(\frac{(1+a)A}{(1+a^*)^2} + \left(\frac{(1+a)A}{(1+b^*)^2} - \frac{(1+a)A}{(1+a^*)^2}\right)\right)$$

$$= \left(\frac{a\ A}{1+a^*} + \frac{(1+a)A}{(1+a^*)^2}\right) + \left(\frac{aA(a^*-b^*)}{(1+a^*)(1+b^*)} + \frac{(1+a)A(a^*-b^*)((1+a^*)+(1+b^*))}{(1+a^*)^2\ (1+b^*)^2}\right)$$

$$= A_1^* + \frac{(a^*-b^*)\left(\frac{a\ A}{1+a^*} + \frac{(1+a)A}{(1+a^*)^2}\right)}{(1+b^*)} + \frac{(a^*-b^*)\ \frac{(1+a)A}{1+a^*}}{(1+b^*)^2}$$

$$= A_1^* + \frac{(a^*-b^*)\ A_1^*}{1+b^*} + \frac{(a^*-b^*)\ A_2^*}{(1+b^*)^2} \qquad \text{q.e.d.} \qquad \text{(A2)}$$

The analysis can be repeated for loans, bonds and deposits to obtain the valuation formula (2).

Appendix Two: The Corporate tax case

Proof : We show that the after tax value of a two period asset A issued at par with historical return a, current (one period) return a^* and discount rate b^* is equal to :

$$MV = \frac{(1-t)\,a\,A}{1+b^*} + \frac{(1-t)aA + A}{(1+b^*)^2} = A_1^* + \frac{(1-t)(a^*-b^*)A_1^*}{1+b^*} + \frac{(1-t)(a^*-b^*)A_2^*}{(1+b^*)^2}$$

$$- \frac{t\,b^*\,A_1^*}{1+b^*} - \frac{t\,b^*\,A_2^*}{(1+b^*)^2} + \frac{t\,(A_2^* - A_1^*)}{1+b^*} + \frac{t\,(A_3^* - A_2^*)}{(1+b^*)^2}$$

Where

$$A_1^* = \frac{a\,A}{1+a^*} + \frac{(1+a)\,A}{(1+a^*)^2}$$

$$A_2^* = \frac{(1+a)\,A}{1+a^*}$$

$$A_3^* = A \qquad \text{(B1)}$$

Proof :

$$MV = \left[\frac{a\,A - t\,(a\,A + A_2^* - A_1^*)}{1+b^*} + \frac{(1+a)\,A - t\,(a\,A + A_3^* - A_2^*)}{(1+b^*)^2}\right]$$

$$+ \left[\frac{t\,(A_2^* - A_1^*)}{1+b^*} + \frac{t\,(A_3^* - A_2^*)}{(1+b^*)^2}\right] \qquad \text{(B2)}$$

Denoting by T the last factor (the capital gain tax shelter), we have :

$$MV = \frac{a\,A - t\,(a\,A + A_2^* - A_1^*)}{1 + a^*\,(1-t)} + \frac{(1+a)\,A - t\,(a\,A + A_3^* - A_2^*)}{(1 + a^*\,(1-t))^2}$$

$$+ \left[\frac{a\,A - t\,a^*\,A_1^*}{1+b^*} - \frac{a\,A - t\,a^*\,A_1^*}{1 + a^*\,(1-t)}\right]$$

$$+ \left[\frac{(1+a)\,A - t\,a^*\,A_2^*}{(1+b^*)^2} - \frac{(1+a)\,A - t\,a^*\,A_2^*}{(1 + a^*\,(1-t))^2}\right] + T \qquad \text{(B3)}$$

The Tax Invariance Theorem of Samuelson (1964) allows us to write:

$$MV = A_1^* + \left[\frac{(a\, A - t\, a^* A_1^*)\,(a^*\,(1 - t) - b^*)}{(1 + b^*)\,(1 + a^*\,(1 - t))} + \frac{((1 + a)\, A - t\, a^* A_2^*)\,((a^*\,(1 - t) - b^*)\,((1 + a^*\,(1 - t) + (1 + b^*))}{(1 + b^*)^2\,(1 + a^*\,(1 - t))^2} \right] +$$

$$= A_1^* + (a^*\,(1 - t) - b^*) \left(\frac{\dfrac{a\, A - t\, a^* A_1^*}{1 + a^*\,(1 - t)} + \dfrac{(1 + a)\, A - t\, a^* A_2^*}{(1 + a^*\,(1 - t))^2}}{1 + b^*} \right)$$

$$+ \frac{\dfrac{(1 + a)\, A - t\, a^* A_2^*}{1 + a^*\,(1 - t)}}{(1 + b^*)^2} + T$$

$$= A_1^* + \frac{(1 - t)\,(a^* - b^*)\,A_1^*}{1 + b^*} + \frac{(1 - t)\,(a^* - b^*)\,A_2^*}{(1 + b^*)^2}$$

$$\frac{-\,t\, b^* A_1^*}{1 + b^*} - \frac{t\, b^* A_2^*}{(1 + b^*)^2} + \frac{t\,(A_2^* - A_1^*)}{1 + b^*} + \frac{t\,(A_3^* - A_2^*)}{(1 + b^*)^2} \qquad \text{q.e.d.} \quad \text{(B4)}$$

The analysis can be repeated for loans, bonds and deposits to obtain the valuation formula (5).

Appendix Three: The Growth Case with Personal Tax

We will assume that personal taxes are levied on dividend payments only. We denote by t the corporate tax rate, by t_p the personal tax rate and by t^* the joint tax defined as

$$(1 - t^*) = (1 - t)\ (1 - t_p)$$

In the absence of retained earnings, equation (6) holds, except that the tax rate t is replaced by the effective tax rate t^* and that the discount rate is after personal tax $(b(1-t_p))$:

$$MV = (L_1+B_1-D_1) + \left(\frac{-\,t^*bE_1}{1+b(1-t_p)} + \frac{-\,t^*bE_1}{(1+b(1-t_p))^2}\right)$$
$$+\left(\frac{(1-t^*)(p-b)L_1}{1+b(1-t_p)} + \frac{(1-t^*)(p-b)(1+\rho)L_1}{(1+b(1-t_p))^2}\right)$$
$$+\left(\frac{(1-t^*)(b-d)D_1}{1 + b(1-t_p)} + \frac{(1-t^*)(b-d)(1+\rho)D_1}{(1+b(1-t_p))^2}\right) \qquad \text{C1.}$$

If regulators enforce a constant capital ratio, earnings will be retained to increase equity at a rate ρ. Equation (C1) must be adapted: a negative after personal tax cash flow is added in period one and the after tax proceeds of the investement are added in period two:

$$\frac{-\rho(1-t_p)E_1}{1+b(1-t_p)} + \frac{(1-t_p)(1+b(1-t_p))\rho E_1}{(1+b(1-t_p))^2}$$

$$= \frac{-\rho(1-t_p)E_1(b(t-t_p))}{(1+b\ (1-t_p))^2} \qquad \text{C2.}$$

One observes that the Modigliani-Miller tax penalty on the income earned or retained earnings can be offset by the benefit of delayed personal taxation.

Adding C_2 to C_1, one obtains:

$$MV = (L_1 + B_1 - D_1) + \left(\frac{1}{1+b(1-t_p)} + \frac{(1+\alpha\rho)}{(1+b(1-t_p))^2} \right) (-t^* bE_1)$$

$$+ \left(\frac{(1-t^*)(p-b)L_1}{1+b\,(1-t_p)} + \frac{(1-t^*)(p-b)(1+\rho)L_1}{(1+b(1-t_p))^2} \right)$$

$$+ \left(\frac{(1-t^*)(b-d)D_1}{1+b\,(1-t_p)} + \frac{(1-t^*)(b-d)(1+\rho)D_1}{(1+b\,(1-t_p))^2} \right) \qquad \text{C3.}$$

where $\alpha = \dfrac{(1-t_p)(t-t_p)}{t^*}$.

	Market value to book value ratio (average 1974-1982) (a)	Market value to book value ratio (1978) (b)	Average growth of demand + time deposits (real growth: (c)-(d)) (c)	Average inflation (d)	Average growth of private sector lendi (real growth: (e)-(d) (e)
FRANCE	0.89	0.94	13.4 (2.4)	11.0	15.5 (4.5)
SWITZERLAND	1.65	1.61	10.2 (6.4)	3.8	10.2 (6.4)
GERMANY	1.34	1.43	7.5 (2.8)	4.7	8.5 (3.8)
UNITED KINGDOM	0.59	0.68	14.4 (-.1)	14.5	14.0 (-.5)
JAPAN	1.92	1.62	11.0 (4.5)	6.5	9.6 (3.1)
UNITED STATES	0.9	0.87	8.6 (-.2)	8.8	9.3 (.5)

Table One: Cross-Country Comparative data.

(Sources: Aliber (1984) and IMF financial statistics

	Market rate paid on demand deposits	Market rate paid on savings deposits
Belgium	No	No
France	No	No
Germany	No	Yes
Greece	No	No
Ireland	No	No
Italy	Yes	Yes
Netherlands	No	Yes[a]
Spain	No	No
Switzerland	Yes[a]	Yes[a]
United Kingdom	Yes	Yes

(a) 'concerted' pricing

Table Two: Deposit Rate Regulation in Europe
Sources: Baltensperger - Dermine (1986)

Notes

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1. Bierwag-Kaufman (1983), Eisenmenger (1981), Kane (1983), Kopcke (1981), Rolnick-Weber (1982).

2. Guttentag-Herring (1983), Mingo (1981), Pierce (1981), Samuelson (1945).

3. Aliber (1984), Maisel (1981).

4. In a more general model with variable interest rates and assets, we obtain:

$$MV = L_1^* + B_1^* - D_1^* + \sum_{t=1}^{\infty} \frac{(p_t^* - b_t^*)L_t^* + (b_t^* - d_t^*)D_t^*}{\prod_{t=1}^{\tau} (1+b_\tau^*)}$$

5. See for instance Bierwag-Kaufmann (1985).

6. A measure of interest rate risk along these lines is presented in Dermine (1985).

7. Equivalently, given Samuelson's invariance theorem (1964), they are the present value of the before tax cash flows discounted at the before tax discount rate.

8. The non tax deductibility effect will be much smaller (eventually) zero in a Miller world (1977) as the cost of equity would be smaller than the bond return.

9. It may not always be possible to record the losses when the book value of equity is contrained by regulatory norms. In such a case, the bankshould compare the cost of an equity issue with the benefit of an optimal timing of capital losses.

10. In which case a valuable tax shelter is created.

11. From an empirical viewpoint, one must note that the pure economic S values are not likely to be observed on the financial markets (Constantinides, (1983)). The quoted price will include the pure economic S value and the capital gain tax savings as perceived by the market. In assessing the solvency of a bank, the analyst must add to this market price the specific tax advantage of the firm (for instance, the fact that S & L's will not be taxed on future capital gains if the losses have not been booked).

12. The existence of tax-exempt securities will not modify the valuation formula if the following equilibrium relationship between the return on tax-exempt securities (b_{NT}) and the return on taxable securities (b_T) is observed:

$$b_T \, (1 - t) = b_{NT}$$

Empirical evidence relationship is available in Skelton (1983).

13 With Purchasing Power Parity applying in the long run, the assumption of a constant rate of real currency depreciation is rather strong and is more likely to be observed only in the short or medium run. However, we prefer to keep this hypothesis for notation and expository convenience.

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