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Duration Gap for Financial Institutions

THE PROBLEM OF INTEREST RATE risk exposure has become increasingly important for financial institutions, particularly for thrift institutions. This article describes a number of single-factor duration gap equations that may help financial institutions control the value of a desired "target" account.[1]

Interest Rate Risk

Financial institutions assume interest rate risk when the interest sensitivity of their assets differs from that of their liabilities. When the price (income) sensitivity of assets is greater (less) than the price (income) sensitivity of deposits, an unexpected increase in interest rates will reduce the institution's net worth (net income).[2] Conversely, under these conditions, an unexpected decline in interest rates will increase net worth (net income).

The impact of unexpected interest rate changes on a financial institution will depend, not only on the relative interest rate sensitivities of its asset and deposit accounts, but on the account the institution targets as its primary concern. Values of different target accounts are sensitive to changes in the values of different balance sheet accounts.

Theory holds that bankers, or any private firm, should maximize shareholders' wealth—i.e., the market value of net worth or capital. In practice, many bankers prefer to maximize or stabilize annual net income or the income-to-asset ratio, whereas bank regulators may be interested in measuring the impact of interest rate changes on a bank's capital-to-asset ratio. Given different goals, a number of alternative accounts may be targeted for greatest attention; the ultimate selection will depend on the preferences of an institution's senior management. The selection process is not discussed here; suffice it to say that it is nearly impossible to control more than one account simultaneously.

The institution's sensitivity to unexpected interest rate changes may be measured by its maturity gap or duration gap, the gap being the difference between the interest sensitivity measure of one or more asset accounts and that of one or more liability accounts. The duration gap generally provides a more accurate and useful measure of a financial institution's interest sensitivity than the maturity gap.[3]

Calculating Duration Gap

The simple Macaulay measure of duration is:

$$D = \frac{\sum_{n=1}^{m}\left[\frac{nS_n}{(1+i)^n}\right]}{\sum_{n=1}^{m}\left[\frac{S_n}{(1+i)^n}\right]}, \qquad (1)$$

where

S_n = expected cash flow in period n,
m = term to the final expected cash payment, and
i = yield to maturity.

Macaulay's duration measures accurately either a security's average life or its price sensitivity *only* if the yield curve is flat. If the yield curve changes, interest rates change by equal amounts for all maturities, so that the curve remains flat. More complex assumptions about either the current shape of the yield curve or how it may change if interest rates change unexpectedly produce more complex versions of Equation (1). For the sake of expediency, we use only the Macaulay duration and do not consider options, variable rates and risk of default.

Using this measure of duration, we can calculate alternative duration gap measures for four typical target accounts of an institution that has only cash, loans, deposits and net worth on its balance sheet.[4] Table I gives the duration gap measures for capital, capital-to-asset ratio, net income and net-income-to-asset ratio target ac-

1. Footnotes appear at end of article.

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