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MEASURING CREDIT QUALITY

One of the major problems in studying the quality of any group of credit instruments is understanding what is meant by "credit quality" or simply "quality." These terms have been used and interpreted in a number of ways. Quality has been used to describe the payment record of credit instruments. It has been expressed as various measures of the ability and willingness to pay and is assumed to be indicative of future payment performance. Market yield relationships have been construed as credit quality. Credit quality has also been interpreted in a social welfare context, e.g., the social welfare obtained from credit financing is compared with the past or predictive payment performance of the credit instruments.

Methods Used to Measure Credit Quality

In order to eliminate some of the confusion resulting from varied uses and interpretations of credit quality, two clearly described methods of measuring credit quality are used in this study. *Ex post quality* is a method comparing the actual incidence of payment of interest and principal with that promised for the credit instruments being studied. Defined in this manner, ex post quality can be measured only after bond principal and interest become due, and it may take long periods of time thereafter to determine if there are permanent losses. Ex post quality is usually referred to as past or realized payment performance in this study.

Ex ante quality (generally referred to as prospective quality or simply as quality) is defined as the prospective incidence of payment of principal and interest when they become due. Because ex ante quality purports to measure the prospective incidence of future events, it must be formulated as a probability measure. Defined in this manner, the prospective quality of any grouping of credit instruments is based primarily on two major determinants: (1)

the characteristics of the instrument and the borrower and (2) the future environment that the issues are likely to face.

The credit instrument characteristics include the specific security pledged, the maturity, the legality of the obligations, the provisions for sinking funds, etc. The characteristics of the borrower are indicative of his ability and willingness to pay the debt service charges, and include measures such as the borrower's wealth, cash inflows and financial management abilities.

Instrument and borrower characteristics, *per se*, do not take account of the future external environment in which the indebtedness will exist. External factors, such as the economic conditions during the life of the instrument, clearly affect the prospective incidence of payment difficulties. The future external environment, therefore, must be included as a determinant of credit quality. Unfortunately, the future environment can not be measured precisely at the present time.

Even if one assumes an average or normal future external environment, he still faces the formidable task of determining which instrument and borrower characteristics will affect future payment performance. Also, how much weight should each characteristic be assigned? These decisions are affected by the characteristics available and their significance in the past.

Instrument and borrower characteristics are evaluated by several groups: analysts and economists studying the quality of credit instruments, investment services paid to rate this quality, lenders supplying funds, purchasers and potential purchasers of marketable instruments. The evaluation by rating services and the money and capital markets combine their assessment of instrument and borrower characteristics with that of the future external environment. An individual assessing quality can evaluate the significance of instrument and borrower characteristics, assuming an average or normal economic environment, then add his evaluations about the future external environment.

Using the two restricted methods of measuring quality defined above, the measurement of *ex post* or *ex ante* quality is separated from the effects of the level of and changes in such quality. Changes in the realized payment experience or in the probability of payment are assumed to have no direct connotation, *per se*, for economic activity. For example, if prospective quality has weakened (less probability of payment in full at the time promised), it does not necessarily follow that this alone has dangerous or bad implications for over-all economic activity. Also, the concepts of quality, as defined above, do not include a normative judgment of the social benefits or costs resulting from the use of credit. For example, if the probability of meeting all debt payments when they are due has risen, quality is strengthened, even though the economy may have been hurt by the lack of credit-financed improvements.

Measurement of the Quality of State and Local Debt

State and local debt is defined as all long-term credit obligations and all interest-bearing short-term credit obligations of state and local governments and their agencies. Defined in this manner, state and local debt includes judgments, mortgages and revenue bonds, as well as general obligation bonds, notes and interest-bearing warrants. Excluded under the definition are inter-fund obligations, noninterest-bearing short-term obligations (e.g., trade credit), amounts owed in a trust or agency capacity, advances and contingent loans from other governments and rights of individuals to benefit from employee-retirement funds.

Even the two strictly defined methods of measuring quality described above are difficult to apply to state and local debt. Practical and conceptual problems limit the value of past payment data. Historical records are incomplete. Both borrowers and lenders may find it advantageous to conceal non-payment of bond principal and interest. Permanent losses are difficult or impossible to estimate accurately. There are several methods of measuring the dollar amount in default and these different methods are often confused in literature on the subject. Conceptually, past payment performance would seem to indicate that all state and local debt on which principal and interest were paid when due were of similar and highest ex post quality. In a strict ex post sense this is correct. However, issuers who had to pay much higher interest costs, holders who were forced to sell the bonds they held at a loss (due to lower prospective quality rather than interest rate changes) and holders who were forced to accept a refunding issue, often at a lower return, would probably disagree with the high ex post quality designation given to all such bonds.

Because of the greater availability of data on the number and dollar amount of state and local debt in default, these measures are generally used to indicate past payment performance in this study. Permanent dollar losses of principal and interest from defaults are used whenever adequate information is available. Forced refundings and fundings to avoid defaults are used in some cross-sectional analyses; however, no aggregative time series data are available. This lack of aggregate data is unfortunate, since such fundings and refundings may be an important form of state and local debt payment difficulties. Substantially lower debt prices and higher interest costs (due to lower probability that responsible state and local units could meet their debt service payments) are not used as a measure of past payment performance in this study.

The measurement of prospective quality is even more difficult. Conceptually, if sufficient information on instrument characteristics, borrower char-

acteristics and the external environment were available, it would be possible to construct probability distributions for the payment of bond principal and interest. In the case of state and local debt, it is not feasible at this time to construct probability distributions for individual issues or for the state and local segment of the economy for several reasons. Few borrower characteristics are directly associated with the ability to meet debt service payments. For example, proxies, such as the wealth and income of taxpayers in the government unit, must often be used instead of direct measures and may vary greatly depending on who assigns valuations to them. Information on some of the borrower characteristics which can be quantified is not available at the present time. Nor can the effects of the future environment in which state and local debt exists be measured precisely at the present time.

In spite of these problems, it is feasible to roughly estimate how the over-all prospective quality of state and local debt has changed during the postwar period. This objective can be accomplished by selecting measurable instrument and borrower characteristics which seem related in a significant way to the debt quality. The degree to which these selected characteristics affect quality can be estimated by observing their significance in the past and their evaluation by the money and capital markets and investment services that rate state and local bonds. The environment that state and local indebtedness is likely to face must then be evaluated. Some rough ideas may be obtained from evaluations of the quality of such debt by rating agencies and by the money and capital markets.

A Conceptual Model

In order to classify instrument and borrower characteristics into meaningful categories for analysis, a simple conceptual model indicating prospective quality is formulated. This model is used as a framework in examining the influence of instrument and borrower characteristics upon past payment performance. In addition, it acts as a framework in measuring the effect of the characteristics on prospective quality and in pointing out those characteristics used by rating agencies and the money and capital markets.

The conceptual model of instrument and borrower characteristics formulated for use in this study is based on a general credit principle that should be applicable for any type of debt instrument. Financial prudence and willingness to pay on the part of the borrower are assumed. The amount of debt service charges which can successfully be met depends on the minimum cash flow that can be used to pay these charges during the life of the debt. This general credit principle can be transformed into a model with four variables (or groupings of variables for a similar purpose): (1) the debt service charges that must be paid; (2) the expected over-all cash inflows during the life of the

debt; (3) the expected cash expenditures or outflows that will be paid prior to debt service charges during the life of the debt; and (4) the variables that measure the validity of the assumption of financial prudence and willingness to pay.

The relationships between the variables measuring the prospective quality of state and local debt seem reasonably clear. Assuming financial prudence and willingness to pay, an individual issue should be paid when due as long as debt service charges are covered by the minimum expected difference between over-all cash inflows and prior cash outflows.¹ The minimum expected difference between over-all cash inflows and prior cash outflows is usually estimated by examining the present level of this cash flow difference and its largest expected decline. Because of uncertainties about the size and duration of the largest expected decline in the cash flow difference, the prospective quality of an issue is generally expressed in terms of the probability of the debt service charges being paid when due. Doubts as to the financial prudence or willingness to pay of the borrower would lower this probability.

Measuring the level of and movements in the prospective quality of total state and local debt within the framework of this model is difficult. There are two possible approaches. Estimate the quality of individual issues for a representative sample of issues at several points of time. Or, examine the averages (and dispersion when possible) of total debt service charges, over-all cash inflows, over-all prior cash outflows, etc., at several points of time. Both of these approaches involve technical problems and would include probability estimates for the expected decline in cash coverage. Nevertheless, the measurement of the prospective quality of state and local debt would seem to be a quantifiable problem.

The inexact nature of both the expected cash inflows during the period of the indebtedness and the expected cash outflows to be paid prior to debt service costs further complicates the measurement of prospective quality. The expected cash inflows are a function of future level of wealth and income in the government unit and the amount that members of the unit will be willing to pay in the form of taxes or payments for services. The situation is further complicated by questions such as which wealth and income measures are really pertinent in determining future taxpaying ability and how much additional debt financing is available as a potential short-run source of cash. Expected cash expenditures having priority over debt service costs depend on such variables as the future demand for state and local services (and its elasticity) and cash expenditures if wealth and income decline. Because of the

¹Proceeds from the sale of liquid assets and from additional debt financing should be included as potential short-term sources of over-all cash inflows when the minimum expected cash difference is computed.

inexact nature of cash inflows and outflows, proxies must be used for these key measures.

There are several other serious difficulties which limit the exact measurement of the prospective quality of state and local debt. For example, no aggregate state and local debt service charge figures are available at this time. There is considerable controversy over the variables to use in measuring prudence and willingness to pay. Because of the vagueness in measuring the prospective quality of state and local debt, it seems probable that different judges select and weigh the available instrument and borrower characteristics in different ways, even within a similar conceptual model. For this reason it seems profitable to present not only the authors' evaluation of such characteristics but also the evaluations used by rating agencies and the money and capital markets.

In the following two chapters the past payment performance of state and local debt is studied and the historical record of instrument and borrower characteristics as indicators of debt payment difficulties is examined.