Technical Appendix

The structural features of the market for State and local government bonds which are described in section 2 of the text suggest the following model of that market. On the demand side, borrowing of State and local governments is positively affected by the following variables: Needs for constructing; low prices for construction relative to the general price level; and Federal grants-in-aid.[1] It is also positively affected by a divergence between expected and actual rates of interest paid on new debt and negatively influenced by the stock of debt outstanding relative to the tax base for servicing it and by stocks of liquid assets (an alternate source of finance). In addition, borrowing may be influenced negatively by levels of interests rates, although the studies analyzed in part 1 suggest that fluctuations around trend rather than the upward trend of rates during the 1950's influenced borrowing.

However, adjustment of borrowing to the above factors requires time because of decision and administrative lags in the borrowing process and because many State and local units borrow only after construction projects have been approved making causation flow from interest rates to construction decisions to borrowing). Since this required reaction time for all State and local units together may be longer than the semiannual periods chosen for analysis, the writer hypothesizes that collective behavior can be depicted by a stock-adjustment demand function of the following type:

$$B_t=\delta_1(\beta'_1 X'_{it}-S_{t-1}) \tag{1}$$

when B is borrowing (gross of debt repayments and thus equal to bond sales), X'_t represents a vector of variables influencing the desired (target) stock of debt, the betas are the coefficients relating these factors to the desired stock of debt, S_{t-1} equals the lagged stock of State and local contractual debt *minus* current debt amortization,[2] and delta sub-one is the familiar reaction-speed coefficient.

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[1] Grants for construction itself or for purposes necessitating construction lower the cost of construction relative to the cost of current outlays financed out of current tax revenues, when each alternative is related to the stream of benefits expected to flow from it. Grants for purposes not involving or necessitating construction would tend to have the opposite effect, favoring more spending on the cheaper (to local taxpayers) current services than on construction financed by borrowing. However, the writer's review of the functional components of total Federal grants-in-aid showed that the first-defined type of grant dominated the total both as to level and changes.

[2] Current debt amortization is removed from the lagged stock of debt because what might be called the classical stock-adjustment model is inappropriate to the behavior of both borrowers and lenders in municipal bond markets. That classical model, which is used widely today in such studies as those by Frank de Leeuw in the Brookings quarterly econometric model of the U.S. economy, assumes implicitly that only net changes in stocks matter in the analysis. This is tantamount to saying that while decisions on altering stocks during a period are subject to behavior lags, those on maintaining the value of the stock at the beginning of the period are not subject to behavior lags. For example, let S be the actual stock of State and local bonds, S^* be the desired stock, delta S be net changes in the actual stock between the beginning and end of the period, A be amortization payments received by bondholders during the period, and B be bond sales during the period. The classical stock-adjustment model

$$\Delta S_t=\delta(S_t^*-S_{t-1})$$

implies that

$$B=\delta(S_t^*-S_{t-1})+A_t$$

since bond purchases are definitionally equal to the algebraic sum of net changes in bondholdings and amortization payments received by bondholders. But if inertia, brokerage