Chapter One

Introduction

1.1 A BRIEF SUMMARY

This section contains a brief discussion of the central features and properties of the empirical model and a summary of the major conclusions reached in this study. Some of the main differences between the present model and other econometric models are also indicated. Before proceeding to this discussion, some of the main features of the theoretical model that have motivated the specification of the empirical model will be reviewed.

The theoretical model is general, dynamic, based on microeconomic foundations, and not based on the assumptions of perfect information and the existence of tâtonnement processes that clear markets every period. It accounts for wealth effects, capital gains effects, all flow-of-funds constraints, and the government budget constraint. The decisions of the main behavioral units in the model (banks, firms, and households) result from the solutions of multiperiod optimal control problems. Expectations play an important role in the model in that the behavioral units must form expectations of future values before solving their control problems. The main decision variables of a bank are its loan rate and the maximum amount of money that it will lend in the period. The main decision variables of a firm are its price, production, investment, wage rate, and the maximum amount of labor that it will hire in the period. The main decision variables of a household are the number of goods to purchase and the number of hours to work. There is also a "bond dealer" in the model, representing the stock and bond markets.

An important distinction is made in the theoretical model between the *unconstrained* and *constrained* decisions of firms and households. A firm or household in a period may be constrained in how much money it can borrow at the current loan rate, and a household may also be constrained in how many hours it can work at the current wage rate. An unconstrained decision of a firm is defined to be a decision that results from the solution of

the firm's optimal control problem when the loan constraint is not imposed, and a constrained decision is defined to be a decision that results when the loan constraint is imposed. There are obviously other constraints facing a firm, but for present purposes it is sufficient to distinguish only between the cases of a binding and nonbinding loan constraint. The words "constrained" and "unconstrained" thus refer only to whether the loan constraint is imposed or not. Similarly, an unconstrained decision of a household is defined to be a decision that results from the solution of the household's optimal control problem when neither the loan constraint nor the hours constraint is imposed, and a constrained decision is defined to be a decision that results when one or both constraints are imposed. The actual quantities traded in a period in the theoretical model are the quantities determined from the constrained optimization problems. Comparisons between these actual constrained solutions and the hypothetical unconstrained solutions are used to determine such things as the amount of (involuntary) unemployment in a period.

There are different "regimes" in the theoretical model, corresponding to the different cases of binding and nonbinding constraints. The four main regimes are (1) the regime in which none of the constraints are binding, (2) the regime in which only the loan constraints are binding, (3) the regime in which only the hours constraints are binding, and (4) the regime in which both the loan and hours constraints are binding. Because of the different possible regimes that can exist, there are many examples of asymmetrical reactions in the model. The responsiveness of the economy to various government actions, for example, depends in important ways on which regime is in effect at the time that the policy change is made.

The main determinants of a household's decision variables in the theoretical model, other than the loan and hours constraints when they are binding, are the price of goods, the wage rate, the interest rates, the tax rates, and the value of assets or liabilities at the beginning of the period. These are all variables that one expects on microeconomic grounds to affect a household's decisions. These variables, in conjunction with variables designed to measure the loan and hours constraints, are also used to explain the consumption and work effort variables of the household sector in the empirical model.

Consumption of the household sector is disaggregated into four components in the empirical model: consumption of services (other than services from durable goods and housing), consumption of nondurable goods, consumption of services from durable goods, and consumption of services from housing. Three work effort variables of the household sector are also considered: the labor force participation of men 25–54, the labor force participation of persons 16 and over except men 25–54, and a variable measuring the number of moonlighters.

The equations explaining the consumption of the household sector in the empirical model differ from standard consumption functions in at least

two important ways. First, only the variables (other than the constraint variables) that one expects on microeconomic grounds to affect households' decisions (prices, wage rates, interest rates, tax rates, nonlabor income, and the value of assets or liabilities at the beginning of the period) are included on the right-hand side of the equations. Disposable personal income, for example, is *not* included as an explanatory variable in any of the equations because it is in part a consequence of the households' work effort decisions.

The consumption equations in the empirical model are further distinguished from standard consumption functions by their explicit treatment of the loan and hours constraints. It seems likely in practice that these constraints are sometimes binding and sometimes not, and variables have been constructed here that are designed to try to capture this inherent asymmetry of the constraints. When the hours constraint is binding, a household no longer controls its work effort decision, and its optimization problem degenerates into a simple optimal consumption decision. Under these conditions, since work effort is no longer a decision variable of the household, a reasonable specification of a consumption function may involve the inclusion of something like disposable personal income as an explanatory variable.

The consumption equations here do have the property that when the hours constraint is binding on the household sector, the specification is similar to having income as an explanatory variable in the equations. When the hours constraint is not binding, however, the only explanatory variables in the equations are those that one would expect on microeconomic grounds to affect the households' unconstrained decisions.

The treatment of the loan constraint on the household sector is similar to the treatment of the hours constraint. In particular, the equation explaining housing consumption differs depending on whether or not the loan constraint is binding.

The treatment of the consumption and work decisions of the household sector as being jointly determined also distinguishes the model from most other macroeconomic models. The same set of variables affects both types of decisions in the present model; in most other models the link between the two types of decisions is not made very explicit.

Work effort decisions clearly differ depending on whether or not the hours constraint is binding. In particular, in the model, the labor force participation rate of persons 16 and over except men 25–54 is less when the hours constraint is binding than when it is not. This effect can be interpreted as being similar to what are sometimes referred to in the literature as "discouraged worker" effects. The main difference here is, again, that the hours constraint affects both the consumption and work effort decisions simultaneously; thus there are both "discouraged consumption" and "discouraged worker" effects in the model.

The underlying technology of a firm in the theoretical model is of a "putty-clay" type, where at any one time different types of machines with differing worker-machine ratios can be purchased. The worker-machine ratio is fixed for each type of machine. Given this technology, given the past history of investment of a firm, and given an assumption about the maximum number of hours that each machine can be used each period, it is possible to calculate the minimum number of machines required to produce any given level of output. The difference between the actual number of machines on hand and the minimum number required to produce the actual level of output of the period is referred to as the amount of "excess capital" on hand.

It is likewise possible to compute the minimum number of worker hours required to produce any given level of output, and the difference between the actual number of worker hours paid for in a period and the minimum number required to produce the actual level of output of the period is referred to as the amount of "excess labor" on hand. Because of adjustment costs, it may sometimes be optimal for a firm to plan to hold either excess capital or excess labor or both during certain periods.

Market share considerations play an important role in the theoretical model in determining a firm's price and wage behavior. A firm has a certain amount of monopoly power in the short run in the sense that raising its price above prices charged by other firms will not result in an immediate loss of all its customers and lowering its price below prices charged by other firms will not result in an immediate gain of everyone else's customers. There is, however, a tendency for high price firms to lose customers over time and for low price firms to gain customers. A firm also expects that the future prices of other firms are in part a function of its own past prices. Similar considerations apply to a firm's wage decisions and its ability to gain or lose workers. Because of this market share nature of the model, some of the most important factors affecting a firm's decisions are its expectations of other firms' price and wage decisions.

A firm's price, production, investment, employment, and wage rate decisions are determined simultaneously in the theoretical model through the solution of the firm's optimal control problem. There are two constraints that may be binding on a firm. One is the loan constraint. The other, a labor constraint, results from the fact that a firm lacks perfect foresight and thus may at times set a wage rate that is too low to attract sufficient labor. In this case, actual output may fall short of planned output unless there is enough excess labor on hand to take up the slack.

The main determinants of a firm's decision variables in the theoretical model, other than the loan and labor constraints when they are binding, are the loan rate, the amounts of excess labor and capital on hand, the stock of inventories on hand, and variables affecting the firm's expectations of other firms' price and wage decisions. These variables, in conjunction with variables

designed to measure the loan and labor constraints, are also used to explain the main decision variables of the firm sector in the empirical model. Lagged variables are generally used in the empirical model to try to capture expectational effects.

There are a number of differences between the explanation of the five main decision variables of the firm sector in the empirical model and their explanation in most other econometric models. First, the five variables are treated as being jointly determined. In most other models the variables are determined in a piecemeal fashion, with little thought given to the fact that they may be for each firm the result of the solution of a single optimizing process. Second, inventory investment is not treated in the empirical model as a direct decision variable of the firm sector. Instead, production is treated as a direct decision variable, and inventory investment is determined residually as the difference between production and sales. In most other macroeconomic models inventory investment is explained directly by a stochastic equation.

A third characteristic that distinguishes the present empirical model of the firm sector from other models is the explicit treatment of excess labor and excess capital. By postulating that firms may hold as an optimizing strategy excess labor and/or excess capital during certain periods, an explanation is provided for the commonly observed cyclical swings in "productivity." Most other models contain no explicit treatment of excess labor and excess capital and cannot reconcile productivity swings with optimizing behavior.

Finally, loan and labor constraints are considered explicitly in the empirical model, something that is generally not done in other models. The loan constraint is designed to try to capture some of the effects of the financial sector on the firm sector when credit is tight. Effects of this sort are sometimes called "credit rationing" effects. The labor constraint reflects the fact that firms lack perfect foresight, and it tries to capture some of the effects of the household sector on the firm sector when wage rates are set too low and labor markets are tight. In tight labor markets the labor constraint is binding on the firm sector in the model, while in loose labor markets the hours constraint is binding on the household sector. Thus in tight labor markets the level of employment is determined by the household sector, whereas in loose labor markets it is determined by the firm sector.

An important characteristic of the empirical model regarding the financial sector is the accounting for all flows of funds in the system. The data from the national income accounts have been linked by sector to the data from the flow-of-funds accounts. Accounting for all flows of funds means that one can consider explicitly in the model the direct purchase and sale of securities by the government. This is not true of models that have not accounted for all flows of funds, where it has to be assumed that the government has direct control over nonborrowed reserves or some similar type of variable. Accounting for all flows of funds also means that the government budget constraint is

satisfied, so that any nonzero level of saving of the government must result in the change in at least one financial variable in the model.

Accounting for all flows of funds produces one equation out of 83 independent equations in the model for which there is not an obvious left-hand side endogenous variable. This "extra" equation allows the bill rate to be implicitly determined. There is thus no stochastic equation explaining the bill rate; the bill rate is rather determined implicitly through the solution of the 83 equations. The solution value for the bill rate each period should be thought of as being the rate that is necessary to equate the aggregate *constrained* supply of funds to the aggregate *constrained* demand for funds. The constraints can still be binding on the firms and households in the model even though the bill rate clears the financial markets each period.

The determination of the bill rate in the empirical model is somewhat different from its determination in the theoretical model. In the theoretical model the bond dealer sets the bill and bond rates for the next period with the aim of equating the supply of bills and bonds to the demand for bills and bonds in that period. There is thus an explicit equation for the bill rate in the theoretical model that is absent in the empirical model. This difference is due to the different treatment of bank reserves in the two models. For the theoretical model the level of bank reserves is a residual, whereas in the empirical model the level of bank reserves is linked directly to the level of demand deposits. The length of a period in the empirical model is a quarter, and on a quarterly basis it seems likely that banks have close control over their reserves. It thus does not seem reasonable in the empirical model to treat the level of bank reserves as a residual. The length of a period in the theoretical model is most realistically taken to be much less than a quarter, so that it does not seem unreasonable to assume in the theoretical model that the level of bank reserves is residually determined.

The main equation in the foreign sector explains the real value of imports. The real value of imports is, among other things, a negative function of the import price deflator and a positive function of the price deflator for domestically produced goods. Accounting for all flows of funds in the model means that all flows of funds between the domestic and foreign sectors are kept track of. The two most important exogenous variables in the foreign sector are the price of imports (the import price deflator) and the real value of exports.

Most of the variables in the government sector are exogenous. The exogenous variables include a profit tax rate, two personal income tax rates, an indirect business tax rate, employer and employee social security tax rates, the investment tax credit, the number of goods purchased, the number of worker hours purchased (civilian and military), some transfer payments, the reserve requirement ratio, the discount rate, the value of government securities outstanding, the value of currency outstanding, and the value of gold and foreign exchange of the government. There are two stochastic equa-

tions in the government sector—one explaining unemployment insurance benefits and one explaining the interest paid by the government. The two main differences between the treatment of the government sector here and its treatment in other models are the explicit treatment of the government budget constraint and the fact that the value of government securities outstanding can be taken to be a direct policy variable of the government.

The complete model consists of 83 independent equations, 26 of which are stochastic. There are 83 endogenous variables and, counting strike dummies, 78 exogenous variables plus the constant term. The model is simultaneous, nonlinear in variables, and includes lagged endogenous variables as explanatory variables. The error terms in some of the equations show evidence of first order serial correlation, and, after some experimentation, the serial correlation assumption was retained for 12 of the 26 stochastic equations. There are 166 unknown coefficients to estimate in the 26 stochastic equations, counting the serial correlation coefficients but not counting the variances and covariances of the error terms.

Data were collected for the 1952I–1975I period in this study. The basic period of estimation was taken to be 1954I–1974II (82 observations), which leaves three outside sample observations at the end of the period to analyze. All the unknown coefficients were estimated by two stage least squares (TSLS), and some of the coefficients were also estimated by full information maximum likelihood (FIML). It is not yet computationally feasible to obtain FIML estimates for an entire model of the present size, but the procedure described in Chapter Three allows one to proceed at least part way towards the attainment of true FIML estimates of the model.

The predictive accuracy of the empirical model is examined in Chapter Eight. The results in Chapter Eight indicate that the empirical model is more accurate than my earlier forecasting model. Previous results, which are also discussed in Chapter Eight, indicate that my forecasting model is at least as accurate (on an ex post basis) as other models, and probably more so. Consequently, this indirect comparison of the empirical model with other models indicates that the empirical model is more accurate. This conclusion is, of course (as mentioned in the Preface), clearly tentative.

The properties of the model are examined in Chapters Nine and Ten. It is difficult to summarize some of these properties without presenting the model in more detail than has been done so far. The following discussion concentrates on the properties of the model that relate to five important issues in macroeconomics.

The first issue concerns the relationship between the unemployment rate and the rate of inflation. There is no reason to expect this relationship to be at all stable in the model. The unemployment rate and the rate of inflation are both endogenous variables and are influenced by a number of diverse factors. The price set by the firm sector is affected by the bond rate,

the labor constraint variable (when it is binding), and three variables designed to pick up expectational effects: the price level lagged one quarter, the wage rate lagged one quarter, and the price of imports. The unemployment rate is residually determined as one minus the ratio of employment to the labor force. The two labor force variables in the model are two of the work effort variables of the household sector. The main factors affecting the labor force are the wage rate, the price level, an interest rate, the marginal personal income tax rate, the value of assets of the previous period, nonlabor income (including the level of transfer payments from the government), and the hours constraint variable (when it is binding). The factors that affect employment are at times the factors that affect the work effort of the household sector (when the labor constraint is binding on the firm sector) and at times the factors that affect the employment demand of the firm sector (when the hours constraint is binding on the household sector).

Given the large number of diverse factors that influence the price level, the labor force, and the level of employment, it would be surprising if the net result of all of these effects were a stable relationship between the unemployment rate and the rate of inflation. There is in fact nothing in the model that indicates that this relationship should be stable, and so the model suggests that one is unlikely to observe a stable Phillips curve in practice.

Before proceeding to the second issue, it is of interest to examine the work effort variables of the household sector in a little more detail. The real wage rate in the model has a positive effect on work effort. A rise in the real wage rate, for example, increases the size of the labor force, other things being equal, which in turn increases the unemployment rate. The real wage rate thus has a direct positive effect on the unemployment rate. Interest rates also have a direct positive effect on the unemployment rate in the model because they have a positive effect on work effort.

The marginal personal income tax rate has a negative effect on both work effort and the unemployment rate, whereas the level of transfer payments from the government to households has a positive effect. Therefore, decreasing net taxes paid by decreasing the marginal tax rate has a direct positive effect on the unemployment rate, whereas decreasing net taxes paid by increasing the level of transfer payments has a direct negative effect. Finally, the value of assets in a period has a negative effect on work effort in the next period. Assets in this case are inclusive of corporate stocks, so that this effect means that an increase in stock prices in a period has a direct negative effect on the unemployment rate in the next period.

The second issue concerns the relationship between aggregate demand and the rate of inflation. There is also no reason to expect this relationship to be stable in the model. On the one hand, the price level has a direct negative effect on the consumption demand of the household sector. The main way that the firm sector contracts in the model is in fact to increase its price,

which lowers sales, and then to decrease its production, investment, and demand for employment. On these grounds one would thus expect to observe a negative relationship between aggregate demand and the rate of inflation. On the other hand, tight labor markets, which exist during periods of high aggregate demand, have a positive effect on the price level. The price that the firm sector sets is directly affected by tight labor markets through the labor constraint variable and indirectly affected through the lagged wage rate, the wage rate being directly affected by the conditions of the labor market. On these grounds one would thus expect to observe a positive relationship between aggregate demand and the rate of inflation.

There are also many other factors at work on both the price level and the level of aggregate demand. The bill rate, for example, has a positive effect on the price level (through its effect on the bond rate) and a negative effect on consumption. The wage rate has a positive effect on consumption and, as just mentioned, a positive effect on the price level. Again, because of the many diverse factors that influence the price level and the level of aggregate demand, it would be surprising if the net result of all these effects were a stable relationship between aggregate demand and the rate of inflation. There is nothing in the model that suggests that this relationship should be stable.

The third issue involves the relationship between real output and the unemployment rate. There is once again no reason to expect this relationship to be stable in the model. Although the relationship between real output and employment is likely to be fairly stable (especially in the long run), a stable relationship between real output and the unemployment rate is unlikely because of the large number of factors that influence the labor force. The conclusion here is thus to be wary of Okun's law.

The fourth issue concerns the relationship between aggregate demand and the money supply. The model does predict a close relationship between aggregate demand and the money supply in the long run. The two main factors affecting demand deposits and currency of the household sector are the bill rate and the taxable income of the household sector. The two main factors affecting demand deposits and currency of the firm sector are the bill rate and the sales (in current dollars) of the firm sector. In the long run the sales of the firm sector and the taxable income of the household sector are closely tied to current dollar GNP, so that one would expect the aggregate value of demand deposits and currency to be closely tied to current dollar GNP in the long run. In the short run, however, changes in the bill rate can cause the relationship between the value of demand deposits and currency and current dollar GNP to be far from stable.

The final issue concerns the effectiveness of monetary policy and fiscal policy. Let XG denote the real value of goods purchased by the government, and let VBG denote the value of government securities outstanding.[a] XG is a fiscal policy variable under the control of the Administration and the

Congress in the United States. *VBG* is a monetary policy variable controlled by the Federal Reserve. If monetary policy is defined as a change in *VBG* with no change in any other exogenous variable, then the results in Chapter Nine indicate that monetary policy is effective: a change in *VBG* has, other things being equal, important effects on the economy. Similarly, if fiscal policy is defined as a change in *XG* with no change in any other exogenous variable, the results in Chapter Nine indicate that fiscal policy is also effective. Fiscal policy defined in this way is a policy that offsets any change in the saving of the government caused by the change in *XG* by changes in bank reserves and bank borrowing.

A decrease in *XG*, other things being equal, has a contractionary effect on the economy. So also does an increase in *VBG*. The net result of a decrease in both *XG* and *VBG* depends on the size of the two decreases. An equal initial decrease in both variables is contractionary in the model. A decrease in *XG* matched by a sufficient decrease in *VBG* to keep the money supply unchanged is, on the other hand, contractionary only for the first few quarters after the change. In fact, given any change in *XG*, it is possible to change *VBG* enough so that some important endogenous variable such as, say, real output is unchanged even in the current quarter. The model thus shows clearly the power of the Federal Reserve to influence the economy and to offset efforts of the fiscal branch of the government.

Many of the experiments in Chapter Nine are designed to explore possible asymmetrical properties of the model. The results show that the quantitative impact of a government policy action is different depending on the state of the economy at the time that the action is taken. The absolute size of the impact is also different depending on whether the policy action is contractionary or expansionary. The experimental results in Chapter Nine also show the different effects that result from changing different government policy variables. The effects of changing thirteen government variables are analyzed in Chapter Nine. These results will not be summarized here; they are summarized in Table 9-6 in Chapter Nine.

The final property of the model that will be discussed in this section relates to the optimal control results in Chapter Ten. When loss functions that target a given level of output and a given rate of inflation each quarter are minimized, the optima tend to correspond much more closely to the output targets being achieved than they do to the inflation targets being achieved. This is true even when the output target is weighted much less than the inflation target in the loss function. The model turns out to have the property that during most periods the level of output can be increased to a level of high activity without having too serious an effect on the rate of inflation. (The inflation rate may, of course, already be high. All this property implies is that it will not be much higher if output is increased.) It is generally not possible, however, to lower the inflation rate without having serious effects

on the level of output. Consequently, when loss functions in the level of output and the rate of inflation are minimized, the optima tend to correspond to a more closely met output target. If this characteristic is also true of the real world, it has, of course, important policy implications.

This completes the summary of the model and its properties. Some general remakrs about the specification of the model are presented in the next section, and then the linking of the national income accounts with the flow-of-funds accounts by sector is explained in section 1.3.

1.2 FOUR GENERAL REMARKS ABOUT THE SPECIFICATION OF THE EMPIRICAL MODEL

It will be useful for the discussion in the rest of the text to make four general remarks now about the principles or tenets that have guided the specification of the empirical model. The first remark concerns the question of aggregation. The theory in Volume I is concerned with the behavior of individual units, whereas the data that are used to estimate the empirical model are aggregated into only five sectors: financial, firm, household, foreign, and government.

One of the key premises of this study is the assumption that one can use the behavior of the individual firms and households in the theoretical model to guide the specification of the equations relating to the behavior of the entire firm and household sectors in the empirical model. The main defense of this procedure is one of feasibility. Even if all the necessary data were available, which is not the case, it is clearly not feasible in a study of this sort to develop a highly disaggregated model. Consequently, little more will be said about the aggregation question except to admit that this study depends heavily on the premise just stated. (It is also the case that the various types of securities that exist in practice are aggregated in the empirical model into only five different types. This issue is discussed in the next section.)

The second remark concerns the question of unobserved variables. Expectations, which play an important role in the theoretical model, are generally not observed. Likewise, *unconstrained* decision values are generally not observed. Unconstrained decision values are observed in the theoretical model if none of the constraints are binding on the behavioral unit in question, but otherwise only the constrained decision values are assumed to be observed.

One generally tries to account for expectational effects in empirical work through the use of lagged values, and in this study lagged endogenous variables have been used freely as explanatory variables to try to account for these effects. It is generally not possible, of course, to separate expectational effects from lagged response effects, and no attempt has been made here to do so. Each stochastic equation of the model, however, has been

estimated under the assumption of first order serial correlation of the error terms to make sure that the lagged endogenous variables are not erroneously picking up serial correlation effects. When the estimate of the serial correlation coefficient was significant for a particular equation, the serial correlation assumption was retained for the equation.

The problem of not generally observing unconstrained decision values is perhaps even more difficult to deal with than the problem of not observing expectations. Much of the discussion in Chapters Four and Five is concerned with explaining how this problem was handled in this study. As will be seen in these two chapters, there are other ways that one might try to deal with this problem than the way chosen here, and an important area for further research is the consideration of alternative procedures.

The third remark, which is related to the aggregation question, concerns the use of quarterly data. Although quarterly data have been used to estimate the empirical model, the time period postulated in the theoretical model is probably most realistically taken to be shorter than quarterly. Many of the interactions among the behavioral units that take place over more than one period in the theoretical model are likely to take place within a quarter in practice. This situation requires some differences of specification between the theoretical and empirical models, especially relating to the firm and financial sectors. One of the most important of these differences is that the empirical model is simultaneous, whereas the theoretical model is recursive.

The final remark, which is related to the question of expectations and lags, concerns the question of how many a priori constraints to impose on the data before estimation. This question is particularly important with regard to the effects of changes in tax laws. There is, unfortunately, much uncertainty regarding both the short run and long run response of the economy to various tax law changes. The data do not appear to be very good at discriminating among different lag structures and among alternative assumptions about how tax law changes affect the economic decisions of the private sector.

The imposition of a priori constraints in this study can be considered, in a loose sense, to be on two different levels. On the first level, the theoretical model is used as a guide to the specification of the empirical model. This procedure imposes very important constraints on the data. On the second level, further constraints on the parameters and equations of the model may be imposed that are not a direct consequence of anything in the theoretical model. The imposition of constraints on the second level works within the basic framework of the model that has been established on the first level.

The various constraints that have been imposed in this study are discussed in the following chapters. In some cases important constraints have been imposed regarding the effects of tax law changes, and in some cases not. An important constraint has, for example, been imposed concerning the effects of indirect business taxes. Households are assumed to respond to a change in

indirect business taxes in the same way that they respond to any other type of change in the price level. On the other hand, severe constraints have not been imposed regarding the effects of changes in the personal income tax structure and the investment tax credit.

Constraints are imposed on the shapes of the lag distributions in the model by the use of lagged endogenous variables to try to capture expectational and lag effects. Some experimentation was done in estimating alternative lag structures, and in a few cases from the results of this work further constraints were imposed on the shapes of the lag distributions.

1.3 LINKING THE NATIONAL INCOME ACCOUNTS WITH THE FLOW-OF-FUNDS ACCOUNTS BY SECTOR

The most important issue regarding data in this study is the linking of the national income accounts (NIA) with the flow-of-funds accounts (FFA) by sector. Since this linking plays such an important role in the model, it is necessary to consider it in some detail before proceeding to a general discussion of the model. The rest of this chapter is concerned with explaining the linking.

As mentioned above, there are five sectors in the model: household, firm, financial, foreign, and government. The household sector is an aggregate of three sectors in the FFA: the households, personal trusts, and nonprofit organizations sector; the farm business sector; and the nonfarm noncorporate business sector. The government sector is an aggregate of four sectors: the state and local governments sector; the U.S. government sector; the federally sponsored credit agencies sector; and the monetary authorities sector. And the financial sector is an aggregate of two sectors: the commercial banking sector, and the private nonbank financial institutions sector. The commercial banking sector in the FFA is in turn an aggregate of four subsectors, and the private nonbank financial institutions sector is an aggregate of eleven subsectors. The relationship between the sectors in this study and the sectors in the FFA is summarized in Table 1-1.

Let y_{ijt} denote the payments from sector i to sector j during period t, and let N be the total number of sectors. The total amount paid by sector i during period t is

$$\sum_{j=1}^{N} y_{ijt},$$

and the total amount received by sector i during period t is

$$\sum_{j=1}^{N} y_{jit}.$$

Table 1–1. The Five Sectors of the Model

Sector in the Model (Abbreviation)	*Corresponding Sector(s) in the Flow-of-Funds Accounts*
1. Household (H)	1a. Household, Personal Trusts, and Nonprofit Organizations
	1b. Farm Business
	1c. Nonfarm Noncorporate Business
2. Firm (F)	2. Nonfinancial Corporate Business
3. Financial (B)	3a. Commercial Banking:
	(1) Commercial Banks
	(2) Domestic Affiliates of Commercial Banks
	(3) Edge Act Corporations and Agencies of Foreign Banks
	(4) Banks in U.S. Possessions
	3b. Private Nonbank Financial Institutions:
	(1) Savings and Loan Associations
	(2) Mutual Savings Banks
	(3) Credit Unions
	(4) Life Insurance Companies
	(5) Private Pension Funds
	(6) State and Local Government Employee Retirement Funds
	(7) Other Insurance Companies
	(8) Finance Companies
	(9) Real Estate Investment Trusts
	(10) Open-End Investment Companies
	(11) Security Brokers and Dealers
4. Foreign (R)	4. Rest of the World
5. Government (G)	5a. State and Local Governments
	5b. U.S. Government
	5c. Federally Sponsored Credit Agencies
	5d. Monetary Authorities

The difference between the total amount received and the total amount paid is the amount saved (or dissaved) by the sector during the period. Let s_{it} denote the amount saved by sector i during period t:

$$s_{it} = \sum_{j=1}^{N} y_{jit} - \sum_{j=1}^{N} y_{ijt}.$$

Dissaving corresponds to negative values of s_{it}. By definition, the savings of all sectors must sum to zero:

$$\sum_{i=1}^{N} s_{it} = 0.$$

Let TA_{it} denote the total net worth of sector i at the end of period t. If TA_{it} is negative, then sector i is a net debtor. Ignoring capital gains and

losses, the change in net worth of sector i during period t is equal to its saving: $TA_{it} - TA_{it-1} = s_{it}$. TA_{it} is the sum of many different kinds of securities. Let A_{kit} denote the value of security k held by sector i at the end of period t, and let K be the total number of different kinds of securities in existence. Liabilities correspond to negative values of A_{kit}. By definition,

$$TA_{it} = \sum_{k=1}^{K} A_{kit}.$$

For this study, data must be collected on y_{ijt} $(i, j = 1, \ldots, N)$ and on A_{kit} $(k = 1, \ldots, K;\ i = 1, \ldots, N)$ for each time period. With five sectors $(N = 5)$, this means that there are 25 values of y_{ijt} to collect for each period, although a few of these values are always zero. For many ij pairs, data on components of y_{ijt} are also available, and in most of these cases data on at least some of the components are needed.

Although data on y_{ijt} are NIA data, the best source for the data are the flow-of-funds publications. Some of the breakdown on the NIA data by sector is not published in the *Survey of Current Business*, but the breakdown can be obtained from the flow-of-funds publications. The data that were collected on y_{ijt} and its various components for each of the 25 pairs of values of i and j are presented in Table 1-2. Because of the somewhat tedious nature of this data collection, enough detail is presented in Table 1-2 so that in any future work with these data, one should be able to duplicate the collection fairly easily.

The numbers in parentheses in the table are the actual values for 1971, actual as of July 1975.[b] The numbers are at an annual rate in billions of current dollars. The first number in brackets for each variable is the code number of the variable on the flow-of-funds tape. The second number is the page number in the flow-of-funds publication (see reference [3]) where the variable can be found. For those variables in Table 1-2 that are not available on the flow-of-funds tape, the table numbers in the *Survey of Current Business* where the variables can be found are presented in brackets. The table numbers are taken from the July 1974 issue of the *Survey of Current Business*. It should be noted that the actual values in parentheses in the table are values that appear in either the flow-of-funds publication [3] or the *Survey of Current Business without any change of sign*. If a minus sign precedes the description of a variable, the number in parentheses does *not* include this minus sign.

The following is an explanation of the construction of Table 1-2. The first letter of a variable name in Table 1-2 denotes the sector making the payment, and the second letter denotes the sector receiving the payment. For example, $FH\text{—}_t$ is a payment by the firm sector to the household sector for period t, while $HF\text{—}_t$ is a payment by the household sector to the firm sector for period t. In I.1 in the table, $HHINT_t$ is the value of interest paid by the

Table 1–2. The Data from the National Income Accounts by Sector

I. Receipts to the Household Sector from:

1. The Household Sector (y_{HHt}):		
$HHINT_t$	= Consumer Interest	(17.746) [156901103, p. 3]
$HHDIV_t$	= Dividends, Farms	(0.054) [136120003, p. 8]
2. The Firm Sector (y_{FHt}):		
$FHWAG_t$	= Wages and Salaries, Private	(449.469) [SCB, 1.10]
$-FHWLD_t$	= −Wage Accruals Less Disbursements, Private	(0.373) [836700003, p. 6]
$FHOTH_t$	= Other Labor Income	(36.386) [SCB, 1.10]
	−General Government (Compensation of Employees of Fed. Gov. and S & L Gov.)	(124.646) [SCB, 1.7[a]]
	+Wages and Salaries, Government Civilian	(104.702) [SCB, 1.10]
	+Wages and Salaries, Military	(19.419) [SCB, 1.10]
$FHSUB_t$	= −Subsidies Less Current Surplus of Fed. Gov. Enterprises	(5.181) [316402001, p. 4]
	−Subsidies Less Current Surplus of S & L Gov. Enterprises	(−4.058) [206402003, p. 5]
$FHPRI_t$	= Proprietors' Income	(69.179) [166111105, p. 3]
$FHRNT_t$	= Rental Income	(25.168) [116112103, p. 3]
$FHINT_t$	= Net Interest	(41.589) [86130003, p. 3]
$FHTRP_t$	= Transfer Payments, From Business	(4.274) [146401003, p. 3]
$FHDIV_t$	= Dividends, Nonfinancial Corporations	(20.171) [106120005, p. 8]
	+Dividends, Net Foreign	(2.869) [266120001, p. 8]
$FHPFA_t$	= Profits, Farms	(0.101) [136060003, p. 8]
$FHCCA_t$	= Capital Consumption, Owner-Occupied Homes	(9.304) [156300203, p. 8]
	−Capital Consumption, Nonprofit Institutions	(1.853) [156300103, p. 8]
	+Capital Consumption, Farm Noncorporate	(6.476) [136300203, p. 8]
	+Capital Consumption, Nonfarm Noncorporate Business	(15.682) [116300005, p. 8]
	+Capital Consumption, Corporate Farms	(0.515) [136300103, p. 8]
$FHCSI_t$	= Employer Social Insurance Contributions	(33.080) [146601005, p. 1]
3. The Financial Sector (y_{BHt}):		
$BHDIV_t$	= Dividends, Financial Corporations	(1.897) [796120001, p. 8]
$BHCGD_t$	= Capital Gains Dividends	(0.776) [656120000, p. 16]
4. The Foreign Sector: None		
5. The Government Sector (y_{GHt}):		
$GHCIV_t$	= Wages and Salaries, Government Civilian	(104.702) [SCB, 1.10]
$GHMIL_t$	= Wages and Salaries, Military	(19.419) [SCB, 1.10]
$-GHWLD_t$	= −Wage Accruals Less Disbursements, Fed. Gov.	(0.039) [316700003, p. 4]
	−Wage Accruals Less Disbursements, S & L Gov.	(0.170) [206700003, p. 5]

Table 1–2. (continued)

$GHOTH_t$	= General Government (Compensation of Employees of Fed. Gov. and S & L Gov.)	(124.646) [SCB, 1.7[a]]
	−Wages and Salaries, Government Civilian	(104.702) [SCB, 1.10]
	−Wages and Salaries, Military	(19.419) [SCB, 1.10]
$GHTRP_t$	= Transfer Payments, To Persons, Fed. Gov.	(72.311) [156401005, p. 4]
	+Transfer Payments, S & L Gov.	(16.687) [206401003, p. 5]
$GHINS_t$	= Insurance Credits to Households, Fed. Gov.	(2.914) [313154005, p. 25]
$GHRET_t$	= Retirement Credit to Households, S & L Gov.	(6.285) [224090005, p. 24]
$GHINT_t$	= Net Interest, Fed. Gov.	(13.642) [316132001, p. 25]
	+Net Interest, S & L Gov.	(−0.224) [SCB, 3.4[b]]
$GHSUB_t$	= Subsidies Less Current Surplus of Fed. Gov. Enterprises	(5.181) [316402001, p. 4]
	+Subsidies Less Current Surplus of S & L Gov. Enterprises	(−4.058) [206402003, p. 5]

II. Receipts to the Firm Sector from:

1. The Household Sector (y_{HFt}):

$HFCON_t$	= Personal Consumption Expenditures, Services	(284.799) [SCB, 1.1]
	+Personal Consumption Expenditures, Nondurable Goods	(278.408) [SCB, 1.1]
	+Personal Consumption Expenditures, Durable Goods	(103.918) [155011001, p. 1]
	−Indirect Business Taxes, Fed. Gov.	(20.448) [316240001, p. 4]
	−Indirect Business Taxes, S & L Gov.	(82.238) [206240001, p. 5]
	−Imports	(65.620) [266903001, p. 1]
	−Profits, Financial Corporations	(15.555) [796060001, p. 8]
	−Capital Consumption, Financial Business	(2.238) [796300003, p. 8]
$HFRES_t$	= Residential Construction, 1–4 Family, Household Purchases	(26.906) [155012001, p. 7]
	+Residential Construction, 1–4 Family, Farm	(0.557) [135012001, p. 7]
	+Residential Construction, 1–4 Family, Change in Work in Process on Nonfarm Noncorporate	(1.202) [115012405, p. 7]
	+Residential Construction, Multifamily, Noncorporate Business	(9.051) [115012200, p. 7]
$HFPAE_t$	= Nonresidential Plant and Equipment Investment, Nonprofit Institutions	(5.574) [155013001, p. 7]
	+Nonresidential Plant and Equipment Investment, Farm	(6.425) [135013001, p. 7]
	+Nonresidential Plant and Equipment Investment, Nonfarm Noncorporate Business	(11.479) [115013001, p. 7]

Table 1–2. (continued)

$HFIVT_t$ = Inventory Investment, Farm	(1.394) [135020003, p. 7]
+ Inventory Investment, Nonfarm Noncorporate	(−0.143) [115020000, p. 7]
2. The Firm Sector (y_{FFt}):	
$FFRES_t$ = Residential Construction, 1–4 Family, Change in Work in Process on Nonfarm Corporate	(1.201) [105012405, p. 7]
+ Residential Construction, Multifamily, Corporate Business	(3.793) [105012205, p. 7]
$FFPAE_t$ = Nonresidential Plant and Equipment Investment, Nonfinancial Corporation	(77.107) [105013005, p. 7]
$FFIVT_t$ = Inventory Investment, Nonfarm Corporate	(5.061) [105020005, p. 7]
3. The Financial Sector (y_{BFt}):	
$BFRES_t$ = Residential Construction, Multifamily, REITS	(0.134) [645012205, p. 7]
$BFPAE_t$ = Nonresidential Plant and Equipment Investment, Financial Corporations	(3.977) [795013005, p. 7]
4. The Foreign Sector (y_{RFt}):	
$RFEXP_t$ = Exports	(65.450) [266902001, p. 1]
5. The Government Sector (y_{GFt}):	
$GFPGO_t$ = Purchases of Goods and Services, Fed. Gov.	(97.642) [316901001, p. 4]
+ Purchases of Goods and Services, S & L Gov.	(136.600) [206901001, p. 5]
− General Government (Compensation of Employees of Fed. Gov. and S & L Gov.)	(124.646) [SCB, 1.7[A]]

III. Receipts to the Financial Sector from:

1. The Household Sector (y_{HBt}):	
$HBPRO_t$ = Profits, Financial Corporations	(15.555) [796060001, p. 8]
$HBCCA_t$ = Capital Consumption, Financial Business	(2.238) [796300003, p. 8]
2. The Firm Sector: None	
3. The Financial Sector: None	
4. The Foreign Sector: None	
5. The Government Sector: None	

IV. Receipts to the Foreign Sector from:

1. The Household Sector (y_{HRt}):	
$HRIMP_t$ = Imports	(65.620) [266903001, p. 1]
$HRTRP_t$ = Personal Transfer Payments to Foreigners	(1.062) [156901203, p. 3]
2. The Firm Sector: None	
3. The Financial Sector: None	
4. The Foreign Sector: None	
5. The Government Sector (y_{GRt}):	
$GRTRP_t$ = Transfer Payments to Foreigners, Fed. Gov.	(2.585) [266401005, p. 4]

Table 1–2. (continued)

V. Receipts to the Government Sector from:

1. The Household Sector (y_{HGt}):	
$HGIBT_t$ = Indirect Business Taxes, Fed. Gov.	(20.448) [316240001, p. 4]
+ Indirect Business Taxes, S & L Gov.	(82.238) [206240001, p. 5]
$HGPTX_t$ = Personal Taxes, Fed. Gov.	(89.926) [316210001, p. 4]
+ Personal Taxes, S & L Gov.	(27.681) [206210001, p. 5]
$HGFRM_t$ = Tax Accruals, Farms	(0.095) [136231003, p. 8]
$HGSI1_t$ = Employer Social Insurance Contributions [$=FHCSI_t$]	(33.080) [146601005, p. 1]
$HGSI2_t$ = Personal Contributions to Social Insurance	(30.719) [156601003, p. 3]
2. The Firm Sector (y_{FGt}):	
$FGTAX_t$ = Profits Tax Accruals, Nonfinancial Corporate Business	(29.685) [106231005, p. 8]
3. The Financial Sector (y_{BGt}):	
$BGTAX_t$ = Profits Tax Accruals, Financial Corporations	(7.769) [796231001, p. 8]
$BGSUR_t$ = Current Surplus, Federally Sponsored Credit Agencies	(0.084) [406006003, p. 26]
+ Current Surplus, Monetary Authorities	(−0.055) [716006001, p. 27]
4. The Foreign Sector: None	
5. The Government Sector: None	

VI. The Saving of Each Sector:

$$SAVH_t = (y_{HHt} + y_{FHt} + y_{BHt} + y_{RHt} + y_{GHt}) - (y_{HHt} + y_{HFt} + y_{HBt} + y_{HRt} + y_{HGt})$$
$$SAVF_t = (y_{HFt} + y_{FFt} + y_{BFt} + y_{RFt} + y_{GFt}) - (y_{FHt} + y_{FFt} + y_{FRt} + y_{FGt})$$
$$SAVB_t = (y_{HBt}) - (y_{BHt} + y_{BFt} + y_{BGt})$$
$$SAVR_t = (y_{HRt} + y_{GRt}) - (y_{RFt})$$
$$SAVG_t = (y_{HGt} + y_{FGt} + y_{BGt}) - (y_{GHt} + y_{GFt} + y_{GRt})$$

Note that the savings of all sectors sum to zero:

$$SAVH_t + SAVF_t + SAVB_t + SAVR_t + SAVG_t = 0$$

Notes: [a]Quarterly numbers from SCB 1.7; annual numbers from SCB 3.1 and SCB 3.3.
[b]Quarterly numbers from SCB 3.4; annual numbers from SCB 3.3.
The numbers in parentheses are actual values of the variables for 1971 at an annual rate in billions of current dollars.
See the text for an explanation of the numbers in brackets.

household sector to itself. $HHDIV_t$ is the value of dividends paid by farms. Since farms are part of the household sector, the value of dividends paid by farms is a payment by the household sector to itself.

Payments by the firm sector to the household sector are listed in I.2. $FHOTH_t$ includes other labor income as defined in the NIA plus three other items. The value of these items is the difference between compensation of the government (both state and local and federal) and wages and salaries of the government. The value of this difference is the value of other labor income

of the government, which must be subtracted from the other labor income item in the NIA to obtain the other labor income component of the firm sector.

The variable $FHSUB_t$ is composed of two items. The first is minus the value of net subsidies of federal government enterprises. The value of net subsidies is a payment from the government sector to the household sector. In the NIA this value is distributed among various income terms listed in I.2, and so it must be subtracted from the other terms in I.2 in order to measure correctly the income received by the household sector from the firm sector. The second item making up $FHSUB_t$ is minus the value of the net subsidies of state and local government enterprises. It is treated in the same way as the first item. Its value in parentheses is negative, which means that the state and local government enterprises actually run a net surplus.

The five capital consumption items in I.2 represent money received by the household sector, but money that is not included as income in any of the other terms in I.2. Consequently, they are included separately in I.2, as money received by the household sector from the firm sector. Employer contributions for social insurance, $FHCSI_t$, are also counted as money received by the household sector from the firm sector. The second variable is I.2, $FHWLD_t$, is wage accruals less disbursements of the firm sector, and this variable must be subtracted from the income received by the household sector from the firm sector in order to retain the consistency of the accounts.

The payments by the financial sector to the household sector in I.3 are small and consist of two dividend variables. There are no payments by the foreign sector to the household sector. The payments by the government sector to the household sector consist of wages and salaries, other labor income, transfer payments, insurance and retirement credits, interest, and the net subsidies of the government enterprises. Subtracted from these variables is the value of wage accruals less disbursements of the government sector. $GHSUB_t$ in I.5 is the negative of $FHSUB_t$ in I.2, and $GHOTH_t$ in I.5 is the amount subtracted in I.2 from the NIA value of other labor income to get $FHOTH_t$.

The payments by the household sector to the firm sector in II.1 consist of items relating to personal consumption, residential construction, nonresidential plant and equipment investment, and inventory investment. Subtracted from the personal consumption items are indirect business taxes, imports, and profits and capital consumption of financial corporations. These latter terms, which are included in the personal consumption items, are not payments by the household sector to the firm sector, but are instead payments by the household sector to the government sector, the foreign sector, and the financial sector, respectively.

The payments by the firm sector to itself in II.2 consist of investment in residential construction, nonresidential plant and equipment, and

inventories. The payments by the financial sector to the firm sector in II.3 consist of investment in residential construction and nonresidential plant and equipment. The payments by the foreign sector to the firm sector in II.4 consist of exports. The payments by the government sector to the firm sector in II.5 are obtained by subtracting from government purchases of goods and services the compensation of employees of the government sector.

The only payments to the financial sector in section III in Table 1-2 consist of payments by the household sector in the form of profits and capital consumption. These are two of the terms that were subtracted from the personal consumption items in II.1. The payments by the household sector to the foreign sector in IV.1 consist of imports and personal transfer payments to foreigners. The payments by the government sector in IV.5 consist of federal government transfer payments to foreigners.

The payments by the household sector to the government sector in V.1 consist of indirect business taxes, personal income taxes, tax accruals of farms, and contributions to social insurance, both employer and personal. The payments by the firm sector in V.2 are merely profits tax accruals. The payments by the financial sector in V.3 consist of profits tax accruals and two small items measuring the current surpluses of the federally sponsored credit agencies and the monetary authorities. No terms are included as payments by the government sector to itself, although a term such as federal government grants in aid to state and local governments could have been. It makes no difference in the following analysis whether terms like this are included or not, and so for simplicity they were not included.[c]

The saving of each sector is defined in section VI in Table 1-2. As mentioned above, the savings of all sectors sum to zero by definition. These savings are net of capital gains and losses, net of increases in the world's gold stock, and net of the creation of SDRs and the like.

Before considering the variables in Table 1-2 any further, it will be useful to consider the collection of the flow-of-funds data. In the FFA there are 24 major kinds of securities. For purposes here, these have been aggregated into five kinds: demand deposits and currency, bank reserves, borrowing at federal reserve banks, gold and foreign exchange, and all other. The all other category includes insurance and pension fund reserves, time deposits and savings accounts, government securities, corporate and foreign bonds, corporate equities, all types of mortgages, consumer credit, bank loans, other loans, security credit, trade credit, profit taxes payable, proprietors' equities, and some miscellaneous financial claims.

The all other category is obviously quite heterogeneous, but it is beyond the scope of this study to consider the detailed portfolio behavior of each sector. Contrary to the thrust of the Brainard-Tobin work [4], the present study ignores any possible effects on the economy of substitution among different types of securities. Considerable effort was expended here, however,

in making sure that all aggregate flows of funds are accounted for, since the results in Volume I indicate that it is quite important to do so in a macroeconomic model.

With five kinds of securities and five sectors, this means, using the notation introduced at the beginning of this section, that there are 25 values of A_{kit} for each t. Some of the values of A_{kit} are, however, always zero. The FFA data that have been collected are presented in Table 1-3. The basic data that have been collected are flow data, not stock data. Although quarterly data on stocks are available from the flow-of-funds tape, it is generally advisable to construct stock data from the flow data, using the stock data only for benchmark purposes for one particular quarter. Because of changes in benchmarks and the like, the change in the stock of a particular variable on the flow-of-funds tape does not always equal the flow. This is true even for securities that are not subject to capital gains and losses.

All the data in Table 1-3 exclude capital gains and losses, increases in the world's gold stock, and the creation of SDRs and the like. Capital gains and losses will be considered later. The fourth quarter of 1971 was used for benchmark purposes, and the benchmark values that were used to create the stock data from the flow data are presented in brackets in Table 1-3. The numbers in parentheses in the table are the values of the flows for 1971. The flow data are at annual rates. Both the stock and flow data are in billions of current dollars. The second set of brackets in the table contains the code numbers of the variables on the flow-of-funds tape and the page numbers in [3] where the variables can be found. As in Table 1-2, the values in brackets and parentheses in Table 1-3 are values that appear in the flow-of-funds publication [3] without any change of sign. The items in the table are all *net* items. An increase in net liabilities, for example, is a negative item.

The construction of Table 1-3 is fairly self-explanatory. The data on the change in the value of all securities by sector are presented first in the table. This change is called "net financial investment" (*NFI*) in the FFA. The change in all securities of each sector in the table is an aggregate of the *NFI* of the corresponding sectors in the FFA. For the financial sector and for two of the four FFA sectors that make up the government sector, data on *NFI* are not available directly in the FFA. In these cases the data on *NFI* must be collected as the difference between the net increase in assets and the net increase in liabilities.

Data on the change in demand deposits and currency by sector are presented next in Table 1-3, followed by the change in bank reserves, the change in borrowing at federal reserve banks, and the change in gold and foreign exchange. The household, firm, and foreign sectors hold no bank reserves and do not borrow from the federal reserve banks. The household, firm, and financial sectors hold no gold and foreign exchange. In section VI of Table 1-3 the change in the value of all other securities for each sector is

Table 1–3. The Data from the Flow-of-Funds Accounts by Sector

Abbreviations Used for the Securities:
TOT = All Securities
DDC = Demand Deposits and Currency
RES = Bank Reserves
BOR = Borrowing at Federal Reserve Banks
GFX = Gold and Foreign Exchange
SEC = All Other Securities (*TOT* less *DDC*, *RES*, *BOR*, and *GFX*)
NFI denotes Net Financial Investment
DIS denotes Discrepancy

I. The Change in TOT by Sector (NFI by Sector):

1. The Household Sector:			
$TOTH_t - TOTH_{t-1}$	= *NFI* of Households, Personal Trusts, and Nonprofit Organizations	[1611.645]	(49.684)[155000005, p. 16]
	+ *NFI* of Farm Business	[−51.401]	(−1.432)[135000005. p. 20]
	+ *NFI* of Nonfarm Noncorporate Business	[−53.227]	(−5.903)[115000005, p. 20]
2. The Firm Sector:			
$TOTF_t - TOTF_{t-1}$	= *NFI* of Nonfinancial Corporate Business	[−204.570]	(29.392)[105000005, p. 22]
3. The Financial Sector:			
$TOTB_t - TOTB_{t-1}$	= Net Acq. of Fin. Assets of Commercial Banking	[576.712]	(58.492)[764090005, p. 27]
	− Net Increase in Liabilities of Commercial Banking	[543.175]	(56.840)[764190005, p. 28]
	+ Net Acq. of Fin. Assets of Private Nonbank Fin. Institutions	[928.577]	(84.887)[694090005, p. 32]
	− Net Increase in Liabilities of Private Nonbank Fin. Institutions	[865.418]	(82.228)[694190005, p. 32]
4. The Foreign Sector:			
$TOTR_t - TOTR_{t-1}$	= *NFI* of the Rest of the World	[−2.393]	(13.593)[265000005, p. 39]
5. The Government Sector:			
$TOTG_t - TOTG_{t-1}$	= *NFI* of S & L Gov.	[−95.865]	(−12.050)[205000005, p. 24]
	+ *NFI* of U.S. Gov.	[−280.185]	(−24.883)[315000005, p. 25]
	+ Net Increase in Assets of Federally Sponsored Credit Agencies	[50.339]	(3.410)[404090005, p. 26]
	− Net Increase in Liabilities of Federally Sponsored Credit Agencies	[49.286]	(3.315)[404190005, p. 26]
	+ Net Acq. of Fin. Assets of Monetary Authorities	[93.547]	(8.298)[714090005, p. 27]
	− Net Increase in Liabilities of Monetary Authorities	[93.977]	(8.353)[714190005, p. 27]

Table 1–3. (continued)

II. The Change in DDC by Sector:

1. The Household Sector:			
$DDCH_t - DDCH_{t-1}$	= Change in *DDC* of Households, Personal Trusts, and Nonprofit Organizations	[145.484]	(10.964)[153020001, p. 16]
	− Change in *DDC* of Farm Business	[6.638]	(0.123)[133020003, p. 20]
	+ Change in *DDC* of Nonfarm Noncorporate Business	[12.515]	(0.000)[113020003, p. 20]
2. The Firm Sector:			
$DDCF_t - DDCF_{t-1}$	= Change in *DDC* of Nonfinancial Corporate Business	[36.312]	(0.524)[103020001, p. 22]
3. The Financial Sector:			
$DDCB_t - DDCB_{t-1}$	= − Net Increase in Net Demand Deposit Liabilities of Commercial Banking	[204.589]	(12.995)[763120005, p. 28]
	+ Net Acq. of Demand Deposit and Currency Assets of Commercial Banking	[0.514]	(0.127)[743020003, p. 27]
	+ Change in *DDC* of Private Nonbank Financial Institutions	[14.545]	(1.079)[693020005, p. 32]
4. The Foreign Sector:			
$DDCR_t - DDCR_{t-1}$	− Change in U.S. *DDC* of the Rest of the World	[6.453]	(0.284)[263020005, p. 39]
5. The Government Sector:			
$DDCG_t - DDCG_{t-1}$	= Change in *DDC* of S & L Gov.	[13.494]	(1.022)[213020005, p. 24]
	+ Change in *DDC* of U.S. Gov.	[13.482]	(3.301)[313020001, p. 25]
	+ Change in *DDC* of Federally Sponsored Credit Agencies	[0.247]	(0.054)[403020000, p. 26]
	− Net Increase in *DDC* Liabilities due to U.S. Gov. of the Monetrary Authorities	[2.484]	(0.897)[713123101, p. 27]
	− Net Increase in *DDC* Liabilities due to Rest of the World of the Monetary Authorities	[0.465]	(0.119)[713122605, p. 27]
	− Net Increase in Liabilities in the form of Currency Outside Banks of the Monetary Authorities	[53.438]	(3.392)[713125001, p. 27]

Table 1–3. (continued)

III. The Change in RES by Sector:

1. The Household Sector: None
2. The Firm Sector: None
3. The Financial Sector:
   $RESB_t - RESB_{t-1}$ = Change in Vault Cash and Member Bank Reserves of Commercial Banking [35.329] (4.132)[723020005, p. 28]
4. The Foreign Sector: None
5. The Government Sector:
   $RESG_t - RESG_{t-1}$ = −Net Increase in Liabilities in the form of Member Bank Reserves of the Monetary Authorities [27.788] (3.638)[713113001, p. 27]
   −Net Increase in Liabilities in the form of Vault Cash of Commercial Banks of the Monetary Authorities [7.541] (0.494)[723025001, p. 27]

IV. The Change in BOR by Sector:

1. The Household Sector: None
2. The Firm Sector: None
3. The Financial Sector:
   $BORB_t - BORB_{t-1}$ = −Change in Borrowing at Federal Reserve Banks of Commercial Banking [0.039] (−0.296)[713068001, p. 28]
4. The Foreign Sector: None
5. The Government Sector:
   $BORG_t - BORG_{t-1}$ = Change in Federal Reserve Loans to Domestic Banks of the Monetary Authorities [0.039] (−0.296)[713068001, p. 27]

V. The Change in GFX by Sector:

1. The Household Sector: None
2. The Firm Sector: None
3. The Financial Sector: None
4. The Foreign Sector:
   $GFXR_t - GFXR_{t-1}$ = Change in Gold and *SDR*s of the Rest of the World [36.778] (1.334)[263011005, p. 39]
   −Change in U.S. Foreign Exchange Position [0.861] (−1.731)[263110005, p. 39]

Table 1–3. (continued)

5. The Government Sector:
   $GFXG_t - GFXG_{t-1}$ = Change in Gold and Official Foreign Exchange of U.S. Gov. [2.094] (−2.233)[313011005, p. 25]
   − Change in Gold and Foreign Exchange of the Monetary Authorities [10.073] (−0.832)[713011005, p. 27]

VI. The Change in SEC by Sector:

1. The Household Sector:
   $SECH_t - SECH_{t-1} = (TOTH_t - TOTH_{t-1}) - (DDCH_t - DDCH_{t-1})$
2. The Firm Sector:
   $SECF_t - SECF_{t-1} = (TOTF_t - TOTF_{t-1}) - (DDCF_t - DDCF_{t-1})$
3. The Financial Sector:
   $SECB_t - SECB_{t-1} = (TOTB_t - TOTB_{t-1}) - (DDCB_t - DDCB_{t-1}) - (RESB_t - RESB_{t-1}) - (BORB_t - BORB_{t-1})$
4. The Foreign Sector:
   $SECR_t - SECR_{t-1} = (TOTR_t - TOTR_{t-1}) - (DDCR_t - DDCR_{t-1}) - (GFXR_t - GFXR_{t-1})$
5. The Government Sector:
   $SECG_t - SECG_{t-1} = (TOTG_t - TOTG_{t-1}) - (DDCG_t - DDCG_{t-1}) - (RESG_t - RESG_{t-1}) - (BORG_t - BORG_{t-1}) - (GFXG_t - GFXG_{t-1})$

VII. Discrepancy (DIS) by Sector:

1. The Household Sector:
   $DISH_t$ = *DIS* of Households, Personal Trusts, and Nonprofit Organizations (−0.534)[157005005, p. 17]
   + Capital Consumption of Nonfarm Noncorporate Business (15.682)[116300005, p. 20]
   − Current Surplus of Nonfarm Noncorporate Business (15.686)[116000105, p. 20]
   + Farm Discrepancy (−0.001)[137010005, p. 70]
2. The Firm Sector:
   $DISF_t$ = *DIS* of Nonfinancial Corporate Business (10.190)[107005005, p. 23]
3. The Financial Sector:
   $DISB_t$ = *DIS* of Commercial Banking (−1.051)[727005005, p. 28]
   + *DIS* of Private Nonbank Financial Institutions (−0.049)[697005005, p. 32]
4. The Foreign Sector:
   $DISR_t$ = *DIS* of the Rest of the World (−9.776)[267005005, p. 40]
5. The Government Sector:
   $DISG_t$ = *DIS* of S & L Gov. (9.124)[207005005, p. 24]
   + *DIS* of U.S. Gov. (0.094)[317005005, p. 25]
   + *DIS* of Federally Sponsored Credit Agencies (−0.011)[407005005, p. 26]

Notes: The numbers in the first set of brackets are benchmark values for the fourth quarter of 1971 in billions of current dollars.
The numbers in parentheses are actual values of the (flow) variables for 1971 at an annual rate in billion of current dollars.
See the text for an explanation of the numbers in the second set of brackets.

computed as a residual category, the difference between the value of all securities and the sum of the values of the other four. Finally, the data on the discrepancy for each sector are presented in section VII of Table 1-3.

It is now possible to consider the relationships among the variables in Tables 1-2 and 1-3. For each sector except the firm sector, the saving of the sector as defined in Table 1-2 is equal to the change in all securities (net financial investment) of the sector plus the discrepancy of the sector:

$$SAVH_t = TOTH_t - TOTH_{t-1} + DISH_t, \tag{1.1}$$

$$SAVB_t = TOTB_t - TOTB_{t-1} + DISB_t, \tag{1.2}$$

$$SAVR_t = TOTR_t - TOTR_{t-1} + DISR_t, \tag{1.3}$$

$$SAVG_t = TOTG_t - TOTG_{t-1} + DISG_t. \tag{1.4}$$

For the firm sector, saving equals net financial investment plus the discrepancy of the firm sector in Table 1-3 *plus* wage accruals less disbursements of the firm sector and *plus* the statistical discrepancy of the NIA:

$$SAVF_t = TOTF_t - TOTF_{t-1} + DISF_t + FHWLD_t + STATDIS_t, \tag{1.5}$$

where $STATDIS_t$ denotes the statistical discrepancy of the NIA. The value of $STATDIS_t$ in 1971 was -2.323, its code number is 87005005, and it is found on page 2 in [3].

The fact that Equations (1.1)–(1.5) must hold provides an important consistency check on the data. If in Table 1-2 the saving of any sector has been defined incorrectly, this error will show up when the checks in Equations (1.1)–(1.5) are made. Equations (1.1)–(1.5) provide the key links between the NIA data in Table 1-2 and the FFA data in Table 1-3.

Two other consistency checks are also available for the data in Table 1-3. First, the sum of the change in bank reserves across sectors must equal zero, the sum of the change in borrowing from federal reserve banks across sectors must equal zero, and the sum of the change in gold and foreign exchange across sectors must equal zero:

$$(RESB_t - RESB_{t-1}) + (RESG_t - RESG_{t-1}) = 0, \tag{1.6}$$

$$(BORB_t - BORB_{t-1}) + (BORG_t - BORG_{t-1}) = 0, \tag{1.7}$$

$$(GFXG_t - GFXG_{t-1}) + (GFXR_t - GFXR_{t-1}) = 0. \tag{1.8}$$

Second, the sum of the change in demand deposits and currency across sectors *plus* the change in demand deposit mail floats must equal zero:

$$(DDCH_t - DDCH_{t-1}) + (DDCF_t - DDCF_{t-1}) + (DDCB_t - DDCB_{t-1}) + (DDCR_t + DDCR_{t-1}) + (DDCG_t - DDCG_{t-1}) + MAILFLT_t = 0, \tag{1.9}$$

where $MAILFLT_t$ denotes the demand deposit mail floats. $MAILFLT_t$ consists of two items: a U.S. government item and an all other item. The values of these two items in 1971 were −0.173 and 0.098; the code numbers are 903023105 and 903029205, respectively; and the items are found on page 70 in [3].

It is also the case, because of Equations (1.1)–(1.5) and the fact that the savings of all sectors sum to zero, that the sum of the change in all securities across sectors, plus the sum of the discrepancies across sectors, plus $FHWLD_t$, and plus $STATDIS_t$ equal zero:

$$(TOTH_t - TOTH_{t-1}) + (TOTF_t - TOTF_{t-1}) + (TOTB_t - TOTB_{t-1}) + (TOTR_t - TOTR_{t-1}) + (TOTG_t - TOTG_{t-1}) + DISH_t + DISF_t + DISB_t + DISR_t + DISG_t + FHWLD_t + STATDIS_t = 0. \quad (1.10)$$

This, of course, is not an independent check on the data to the extent that Equations (1.1)–(1.5) have already been checked.

Equations (1.6)–(1.10) and the definition of the change in all other securities for each sector in section VI in Table 1-3 imply that:

$$(SECH_t - SECH_{t-1}) + (SECF_t - SECF_{t-1}) + (SECB_t - SECB_{t-1}) + (SECR_t - SECR_{t-1}) + (SECG_t - SECG_{t-1}) = -(DISH_t + DISF_t + DISB_t + DISR_t + DISG_t) - FHWLD_t - STATDIS_t + MAILFLT_t. \quad (1.11)$$

In other words, the sum of the change in all other securities across sectors is equal to the negative of the sum of the discrepancies across sectors, less wage accruals less disbursements of the firm sector, less the statistical discrepancy of the NIA, and plus the demand deposit mail floats.

Aside from the adjustments for the various discrepancies, all that Equations (1.6)–(1.11) state is that each security that is an asset to one sector is a corresponding liability to some other sector. Since liabilities correspond to negative values of A_{kit}, the sum of A_{kit} across sectors for a given k and t must be zero, except for the various discrepancies.

This completes the discussion of the linking of the NIA and FFA data by sector. What remains to be done in this section is to discuss the treatment of capital gains and losses on stocks held by the household sector. There is a variable on the flow-of-funds tape that measures households' holdings of corporate equities. Its code number is 153064005, and it is found on page 50 in [3]. The level data on this variable measure the market value of the stock. The flow data, on the other hand, measure the value of the change in the stock *excluding* capital gains and losses. Therefore, the value of capital gains or losses for a period, denoted in the model as CG_t, can be computed as

the difference between the change in the value of the stock (using the level data) and the value of the flow (using the flow data). Seasonally unadjusted flow data were used for this purpose because the stock data are seasonally unadjusted. (All the other flow data used in this study are seasonally adjusted.) CG_t measures a few other items aside from capital gains and losses (mostly adjustments to the level data), but these items are quite small compared to the capital gains and losses component.

Data on capital gains and losses for the other sectors in the model were not collected because they were not used anywhere in the model. Data on increases in the world's gold stock were not collected for the same reason. There are no data in the FFA for capital gains and losses on bonds.

NOTES

[a] *VBG* is exclusive of capital gains and losses, so that a change in the price of government securities outstanding caused by a change in interest rates does not affect *VBG*.

[b] Although the model is quarterly, the actual values presented in parentheses in this chapter are annual. The annual data are less rounded than the quarterly data, and for purposes of making the various consistency checks discussed in this chapter, it is better to use less rounded data.

[c] It also makes no difference whether the household sector's payments to itself in I.1 are included or not. These payments were included here merely to avoid any possible confusion that might arise as to how the two items in I.1 are to be treated.