CHAPTER VII

# The Minimum Data Requirements to Start and Run MOSES

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CONTENTS

## 1.1 Introduction

The MOSES model requires a tremendous amount of information on firms and some aggregate macro variables. These data have to be prepared in a specific file called R19*tt.vv* where *tt* denotes the data year, and *vv* the database version. When running the model, a database name has to be entered into the simulation menu (for details, see Taymaz, 1991, Section 1.2). There are three ways to generate a model database.

1) Collect all necessary micro- and macrodata and store them in the *raw* micro and macro datasets, named MIC*tt* and MAC*tt*, respectively, where *tt* denotes the data year. Then, use the MOSES initialization program, MOSES.INIT, to generate *MOSES* dataset R19*tt.vv*. If the model is to be implemented for other countries, this is the only way to prepare the model dataset. Information on firms can be obtained by surveys or through artificial methods based on macrodata (see Chapter I). Survey results are directly entered into the raw micro dataset. Note that the parameter values that affect the behavior of households and firms are also assigned in the initialization process. (The initialization procedure is explained in detail in Bergholm, 1989, Part II, and Taymaz, 1991, Section 2.)

2) A synthetic database can be prepared by simulating the model and saving those variables that are necessary in a MOSES database by using the function SAVE▲OUTPUT. Recall that an initial model database is necessary to create a synthetic database for later years. For example, we have a model database for Sweden for 1982. It is possible to generate a synthetic database for any year *after* 1982 by this method. Since the original datasets contain confidential firm data, a synthetic database for 1990, R1990.10, has been prepared by this method for external use of the model (for details, see Taymaz, 1991, Sections 1.6.1 and 3.4).

3) Finally, real (or synthetic) firms can be added into the model database in any year of a simulation experiment. Although macro consistency is affected in this case, if the total size of new firms is small relative to the economy, this may not be a problem (for details and the micro variables needed for this process, see Taymaz, 1991, Section 1.6.2).

Here we will present the minimum database requirements for those who want to implement MOSES in a new economy, trying to gather all the data needed. It is, however, important to remember that even though all data may not be

available for your particular case, substitute measures may serve the same purpose.

The procedure of implementing the MOSES model in a new country can be summarized as follows.

1) Collect the raw microdata and store them in a file called MIC*tt* by using the format and variable names as specified in Section 1.2.

2) Collect the raw macrodata and store them in a file called MAC*tt* by using the format and variable names as specified in Section 1.3.

3) Use the initialization program, MOSES.INIT, to generate a model database, R19*tt.vv*. (Recall that if you use a synthetic database, you do not need to use the initialization program, since it is already on the appropriate format). The parameter values and exogenous variables are also assigned in this process. You can produce several sets of parameter values, or you can calculate model variables in different ways by using various initialization variants. In other words, various variants of the same micro- and macrodata can be prepared.[1]

4) Use the model, *moses*, for simulations.

## 1.2 Micro database

The micro units of the MOSES model are firms or divisions. They are the decision units. Most of the data for these units (sales, employment, etc.) have to be obtained through surveys. However, financial data (book value of fixed assets, dividend payments, etc.) are usually obtained only at the firm level. Thus, the micro database contains two main matrices: one for those variables that are available at the division level, and one for those variables that are available at the firm level. Firm-level variables are disaggregated into division data by the initialization procedure.

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1. Although the initialization program and the model code have been written to accommodate a wide variety of compatible forms, there may be some problems when they are applied without any modification. First, although the number of internal (whose data are used at the micro level) and external (whose data are used at the macro level) sectors are defined by the MKT and IN variables to make changes easy, explicit numbers are used in a number of cases. Therefore, it is advisable to follow the sectoral classification of the currently used model (see Bergholm, 1989). Second, there are a few *ad hoc* specifications in the initialization code, namely the pricing calculation and value added adjustments in the ESTABLISHMENTS▲91 function (see Albrecht et al., 1989: 256, 265-266). Third, the model version 2.0 which is created by the function VERSION20 assumes that the original Swedish data for 1976 or 1982 are used. If you want to use VERSION20, the special specifications of this version need to be removed. Because of these problems, the initialization and model code should be thoroughly checked when a different dataset is used.

The following variables should be specified in the raw micro database.[2]

| | |
|---|---|
| X | an e*56 matrix for divisions' data where e is the number of establishments. |
| FΔDATA[3] | an f*65 matrix for firms' data where f is the number of firms |
| FIRMID | an e-element vector matching establishments and firms. For example, if the first establishment in the X matrix is a part of the $10^{th}$ firm in the FΔDATA matrix, then $FIRMID_1 = 10$. In other words, Establishment B's data are stored in the first row of the X matrix, and the data for Firm BB to which Establishment B belongs are stored in the $10^{th}$ row of the FΔDATA matrix. |
| LIST | a vector of establishment codes whose firm data are available in the FΔDATA matrix. Note that each establishment has a unique code. |
| RΔMARKET | an e-element vector that contains market codes for each establishment. For example, if the first establishment in the X matrix is in the third sector (consumer goods sector), then $RΔMARKET_1 = 3$. |

Those variables are used by the ESTABLISHMENTSΔ91 function during the initialization procedure. This function, by using the LIST variable, deletes those divisions whose firm data are not available in the FΔPARA matrix. Then, the firm data are disaggregated into establishments. Finally, micro variables used in the MOSES model are formed.

The columns of the X matrix contain the following establishment variables. (Columns that are not specified in the following table can be used to store other kinds of data, or can be filled with 0s. Column numbers are almost identical to the question numbers of the 1982 Planning Survey. See Chapter III of this volume.)

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2. Note that you cannot change variable names.

3. Δ is the APL character entered by Shift-h.

| Column No. | Variable |
|---|---|
| 1 | Establishment code |
| 2 | Number of employees at time t-1[4] |
| 3 | Number of employees at time t |
| 4 | Total wage bill at time t-1 (in $10^6$ units)[5] |
| 5 | Total wage bill at time t ($10^6$) |
| 6 | Value of exports at time t-1 ($10^6$) |
| 7 | Value of exports at time t ($10^6$) |
| 8 | Expected value of exports for time t+1 ($10^6$) |
| 11 | Value of domestic sales at time t-1 ($10^6$) |
| 12 | Value of domestic sales at time t ($10^6$) |
| 13 | Expected value of domestic sales at time t+1 ($10^6$) |
| 17 | Value of inputs (raw materials, electricity, fuel, etc.) at time t ($10^6$) |
| 21 | Value of investments on building at time t ($10^6$) |
| 24 | Value of investments on machinery at time t ($10^6$)<br>[If only total investment figures are available, enter the total into column 21, and zero into column 24.] |
| 26 | Increase in the *volume* of output from t-1 to t (in percent)[6] |
| 28 | Expected increase in the *volume* of output from t to t+1 (in percent) |
| 30 | Maximum possible increase in the volume of output from t-1 to t with infinite amount of labor (in percent)<br>[This question is used to determine the A22 variable. See Chapter III of this volume.] |
| 32 | Maximum possible increase in the volume of output from t-1 to t with current amount of labor (in percent)<br>[This question is used to determine the A21 variable. See Chapter III of this volume.] |
| 44 | Current input inventories/total inputs ratio at time t (in percent) |
| 46 | Optimum input inventories/total inputs ratio at time t (in percent) |
| 48 | Current output inventories/sales ratio at time t (in percent) |
| 50 | Optimum output inventories/sales ratio at time t (in percent) |

4. The initial data year is denoted by t. t-1 refers to the last year's data. Unless otherwise stated, *annual* data are referred to.

5. E.g., enter 10 for SEK 10 million.

6. I.e., enter 10 for 10% increase.

The columns of the F▲DATA matrix contain the following firm variables. (Columns that are not specified in the following table can be used to store other kinds of data, or can be filled with 0s.)

| Column No. | Variable |
|---|---|
| 3,4,6, 8,9,10 | Various components of the current assets at time t. Total will be equal to the total value of the current assets ($10^6$) [K2 variable of the model] |
| 5 | Total value of input and output inventories at time t ($10^6$) [K3 variable of the model] |
| 11 | Replacement value of fixed assets—machinery, building, etc., at time t ($10^6$) [K1 variable of the model] |
| 16 | Short-term borrowing from banks at time t ($10^6$) |
| 17 | Long-term borrowing from banks at time t ($10^6$) |
| 22 | Book value of fixed assets—machinery, building, etc. at time t ($10^6$) |
| 31 | Value of sales (domestic+exports) at time t ($10^6$) |
| 47 | Dividends paid at time t ($10^6$) |

### 1.3 Macro database

The macro database should contain the following variables.[7]

| Variable | Description |
|---|---|
| AMAN▲YEAR | 1-element vector. Time for using the AMAN functions. Enter 0. (Kept in the model for some technical reasons.) |
| BLD▲RATE1 | 1-element vector. *Index*[8] of the annual growth rate of investment in building and construction at time t. Used in the |

7. In addition to these variables, the function AGGRITAX should also be available in the macro database.

8. I.e., enter 1.12 for 12% annual growth in construction.

MARKETS function[9] to calculate investment in building and construction in the last quarter.

BLD▲RATE2 — 1-element vector. Index of the long-term trend of the annual growth rate of investment in building and construction. Used in the MARKETS function to calculate exogenous quarterly growth rate of investment in building and construction.

EXO▲QTXVA1 — 4-element vector. Value added tax rate for capital goods for the next four quarters, i.e., at time t+1 (%).[10] Used in the TAX▲PARAMETERS function to calculate exogenous quarterly *change* in the VAT for capital goods. Enter the same value for each element.

EXO▲QTXVA2 — 4-element vector. Value added tax rate for consumer goods for the next four quarters (%). Used in the TAX▲PARAMETERS function to calculate exogenous quarterly *change* in the VAT for consumer goods. Enter the same value for each element.

EXO▲RI — q-element vector. Exogenous value of the annual rate of interest (%). Enter q-many quarterly values. If q<NQR where NQR is the simulation period in quarters, the last element of the EXO▲RI vector[11] will be repeated NQR - q times. Used in the MONETARY function.

EXO▲RIBWFOR — Similar to the EXO▲RI variable. Exogenous value of the rate of interest on foreign debts.

EXO▲RIDEPFOR — Similar to the EXO▲RI variable. Exogenous value of the rate of interest on foreign deposits.

EXO▲TXC — q-element vector. Quarterly exogenous value of the corporate tax rate. If q<NQR where NQR is the simulation period in quarters, the last element of the EXO▲TXC vector will be repeated NQR - q times. Used in the TAX▲PARAMETERS function.

EXO▲TXI1 — Same as the EXO▲TXC variable. Exogenous income tax rate.

EXO▲TXW — Same as the EXO▲TXC variable. Exogenous payroll-tax rate for the non-government sector.

EXO▲TXWG — Same as the EXO▲TXC variable. Exogenous payroll-tax rate for

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9. Unless otherwise stated, all functions referred to in this section are used in the MOSES.INIT workspace.

10. I.e., enter .12 for 12% tax rate.

11. For the definitions of the MOSES variables, see Albrecht et al., 1989: 196-220, and Bergholm, 1989: 98-118.

| | |
|---|---|
| | the government sector. |
| FIRST▲SIM▲YEAR | 1-element vector. First simulation year. Enter the value of t+1, i.e., 84 for 1984. |
| G▲RATE1 | 1-element vector. Index of the annual growth rate of public investment at time t. Used in the PUBLIC▲SECTOR function to calculate public investment in the last quarter. |
| G▲RATE2 | 1-element vector. Index of the long-term trend of the annual growth rate of public investment. Used in the PUBLIC▲SECTOR function to calculate public investment in the last quarter. |
| HIST▲TXVA2 | 4*4 matrix. The rate of value added tax for each sector (rows) in the last four quarters (columns) (%). Used in the MARKETS function. |
| HOURS▲PER▲YEAR | 1-element vector. Total number of hours worked per year. Used in the ESTABLISHMENTS▲91 and PUBLIC▲SECTOR functions. |
| HUSHALLSDEP | 1-element vector. Total households' wealth (*in units*).[12] Used in the HOUSEHOLDS function to calculate the WHSUM variable. |
| IMPLP▲REF | 10-element vector. Used in the model's transcription functions to aggregate all sectors. |
| IMPL▲PRIS | 4*4 matrix. Price indices for four internal sectors at time t-2, t-1, t, and t+1 (rows are sectors, and columns are years). Indices are equal to 100 for all sectors at time t. Used in the MARKETS function. |
| IMPL▲PRIS▲IN | 6*4 matrix. Prices indices for six external sectors at time t-2, t-1, t, and t+1. Indices are equal to 100 for all sectors at time t. Used in the MARKETS function. |
| IN▲RATE1 | 1-element vector. Index of the annual growth rate of investment in the external sectors at time t. Used in the MARKETS function to calculate investment in the external sectors in the last quarter. |
| IN▲RATE2 | 1-element vector. Index of the long-term trend of the annual growth rate of investment in the external sectors. Used in the MARKETS function to calculate exogenous quarterly growth rate of investment in the external sectors. |
| IO*tt* | 14*21 matrix. I-O table for time t. (For details, see Bergholm 1989.) |
| IOCOEFF*tt* | 13*19 matrix. I-O coefficients for time t. (For details, see |

12. Enter $10*10^9$ for SEK 10 billion.

Bergholm 1989.)

LAST▲YEAR — 1-element vector. Enter the value of t-1.

LGTRENDCH — 1-element vector. Quarterly exogenous increase in the level of public employment. Used in the PUBLIC▲SECTOR function to calculate the EXO▲REALCHLG variable.[13]

LIQB — 1-element vector. Liquid balances of the bank at time t (in units).

LIQBFOR — 1-element vector. Liquid foreign balances of the bank at time t (in units).

LON — 4-element vector. Wage payments in four internal sectors at time t (in units). Used in the ESTABLISHMENTS function.

LON▲OFF — 2-element vector. Wage payments in the public sector at time t and t+1, respectively (in units). Used in the PUBLIC▲SECTOR function to calculate QWG and WG variables.

NMARKETS — 1-element vector. The number of internal sectors. Enter 4.

NWB — 1-element vector. The net value of the bank (assets–liabilities) at time t (in units).

POSG — 1-element vector. Government's net position in the bank at time t (in units).

QCHRI — 1-element vector. Change at the level of the domestic interest rate in the last quarter (%).

QINPAY — 1-element vector. Households' aggregate wage and capital income from the external sectors during the last quarter (in units).

QPFOR — 4-element vector. Indices of foreign prices of four explicit internal sectors in the last quarter.

QTTAX — 1-element vector. Total tax receipts by the government in the last quarter (in units).

RI — 1-element vector. The domestic rate of interest in the last quarter (%).

RU — 1-element vector. The unemployment rate at time t (%).

RSUBS — 4*q element matrix. The exogenous subsidies/sales ratio in four internal sectors for $q$ quarters (%). Used in the PUBLIC▲SECTOR function to calculate the EXO▲RSUBS variable which is a 4*NQR matrix and which contains quarterly exogenous industrial subsidies data. If $q$<NQR where NQR is

13. This specification is replaced in the VERSION20 function. When data for a different country are used, the specification of the VERSION20 function should also be modified accordingly.

| | |
|---|---|
| | the simulation period in quarters, the last column of the RSUBS matrix will be repeated NQR-*q* times to generate the EXO▲RSUBS variable. |
| SALES*tt* | 4-element vector of annual sales in four internal sectors at time t. Used in the ESTABLISHMENTS▲91 function. |
| THIS▲YEAR | 1-element vector. Enter t. |
| TIM | 4-element vector. Number of hours worked in four internal sectors at time t. Used in the ESTABLISHMENTS▲91 and CONTROLS functions. |
| TIM▲OFF | 2-element vector. Number of hours worked in the public sector at time t and t+1. Used in the PUBLIC▲SECTOR function. |
| TRENDM | 6-element vector. Trend values of quarterly price increases in the external sectors (%). Used in the MARKETS function. |
| TXC | 1-element vector. Corporate tax rate at the end of time t (%). |
| TXI1 | 1-element vector. Income tax rate at the end of time t (%). |
| TXVA1 | 1-element vector. Value added tax rate for capital goods at the end of time t (%). |
| TXVA2 | 1-element vector. Value added tax rate for consumer goods at the end of time t (%). |
| TXW | 1-element vector. Payroll-tax rate for the non-government sector at the end of time t (%). |
| TXWG | 1-element vector. Payroll-tax rate for the non-government sector at the end of time t (%). |

## References


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