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Assessing Bank Performance and the Impact of Financial Restructuring in a Macroeconomic Framework

A New Application

Yavuz Boray
Hector Sierra

It is crucial to include the macroeconomic environment in any scenario that involves assessing the financial condition of a bank and its future liability. This paper describes the development of a simulation model that permits the user to examine in detail the interaction between a financial system and its economic environment.

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Summary findings

Boray and Sierra present a simulation model (applied here to Uruguay and implemented in Javelin) that permits analysis of the interaction between a financial system and the economic environment in which it operates. The model allows the user to compute and project the indicators necessary to monitor the performance of a financial institution and to examine how those indicators respond to economic change.

Traditionally, economic analysis in the World Bank has focused on either the "real" or "financial" sector, but rarely on the interaction between them. The introduction of the extended Revised Minimum Standard Model, or RMSM-X, reflects the Bank's recognition of the importance of incorporating the financial system into the macroeconomy.

Nevertheless, the monetary module in the RMSM-X is too aggregated to allow for any meaningful analysis of the viability of a country's financial system, or any institution in particular. By design, the RMSM-X provides only a generic framework, or "platform," that then may be adapted to particular cases.

Boray and Sierra develop a tool that uses a time series that shows developing trend lines. The model requires an adequate level of detail and a consistency of content, interpretation, and presentation of the financial and economic data, plus an adequate grouping of banks to ensure that comparisons are between like entities.

The model should be useful to financial analysts who need to plan for and forecast the growth and profits of a financial institution, or a group of institutions, and who are interested in capturing the links with the macroeconomy in a fully consistent framework. The model allows the user to compute and project indicators that are necessary to monitor the performance of a financial institution and to examine how these indicators change in response to changes in the macroenvironment. The model should also be valuable to economists interested in assessing the viability of the financial system, particularly in assessing the impact of financial restructuring. When major financial restructuring is involved, model simulations can help policymakers and supervisors to reassure themselves that bank rehabilitation is worth its costs.

This paper—a product of the Trade, Finance, and Private Sector Development Division, Latin America and the Caribbean, Country Department IV — is part of a larger effort in the region to further analyze the link between a financial system and the economic environment in which it operates. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Cecilia Lim, room A7-144, extension 30016 (61 pages). December 1993.

ASSESSING BANK PERFORMANCE AND THE IMPACT OF FINANCIAL RESTRUCTURING IN A MACRO-ECONOMIC FRAMEWORK

A New Application

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* The views expressed here are those of the authors and should not be attributed to the World Bank or any of its affiliated institutions. The authors wish to express gratitude to Philippe Callier, Egbert Gerken and John Panzer for their insightful contributions.

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I. Introduction

In a competitive environment, the ability of an organization, public or private, to plan for an uncertain future may represent the difference between growth or failure. The availability of powerful computers at reduced prices has made the creation of "what-if" scenarios one of the most useful strategic planning tools (See eg. Schwartz [1991]). Creating a realistic scenario clearly involves the representation not only of the internal functioning of the organization or enterprise, but also of the environment in which this operates. It is specially crucial to include the macro-environment in any scenario that involves a bank or financial institution. The rate at which an economy expands, or contracts, and its fiscal and institutional environment, affect directly borrowing and repayment, income and wealth, assets and debt. The performance of a financial institution is then closely tied to that of the macro-economy.

The linkage works both ways. It is now widely recognized that a country needs a sound and efficient financial system to achieve long-term growth. Inefficient credit and capital markets would effectively "crowd-out" private investment by making credit expensive or scarce to the private sector. Any analysis of a country's ability to sustain fiscal and expenditure policies in the long-term should then take into account the viability of its financial system (See eg. Le Houerou and Sierra [1993]). For some countries, bailing-out an inefficient financial system may have a significant impact on its fiscal deficit. As a result, financial restructuring may have important inflationary and fiscal consequences.

In this paper we describe the development of a simulation model that will allow the user to examine in detail the interaction between a financial system and its economic environment. Our model should be useful to financial analysts that need to plan and forecast for growth and profits of a financial institution, or a group of them, and that are interested in capturing the linkages with the macro-economy in a fully consistent framework. The model allows the user to compute and project indicators that are necessary to monitor the performance of a financial institution, and to examine how these indicators change in response to changes in the macro-environment. The model should also be valuable to economists interested in assessing the viability of the financial system, and in particular in assessing the impact of financial restructuring. When major financial restructuring is involved, model simulations can help policy makers and supervisors to reassure themselves that bank rehabilitation is worth its costs.

In general, the methodology presented here will be useful to anybody interested in linking economic and financial analysis. The linkage requires a "translation" of financial flows into economic activity. This is not a straightforward task as most financial statements are primarily designed to meet a variety of legal and administrative requirements, rather than the specific needs of economic analysis. In particular, we stress the difference between "transaction" vs. "accounting" flows in the balance sheet and profit and loss statements. This distinction will be crucial when we apply our methodology to the case of Uruguay. Uruguay represents an interesting case because of its highly dollarized financial sector, which makes it very susceptible to the macro-economic environment. About four fifths of the assets and liabilities of the banking system are dollarized. We will concentrate on one bank, The Bank of the Republic, which allocates around 60 percent of total credit available to residents, and captures about half of total deposits.

We recognize that every country is different, with its own banking legislation and credit allocation rules. The approach in this paper may be applied to most countries and different financial institutions with minor modifications. Our model (implemented in Javelin) has been designed to be used as a "template" that can be adapted to a particular country. The model takes into account most items essential for the analysis of a banking institution, such as provisions, capital gains or losses, paid-in capital, off-

balance sheet items, etc. Nevertheless, the items in the balance sheet, as well as risk and performance indicators selected may be adapted or modified accordingly. One of the main characteristics of the model presented here is its modularity. The model may be used as an independent financial analysis model in which the user examines the performance of a bank, but without necessarily being "connected" to the macro-economy. Other option is to use the model as a macro-economic framework without a very detailed monetary system.

The paper contains six main sections, including the present introduction. In Section II we describe the methodology of the paper. In Section III we present the overall structure of the model, with an emphasis on the monetary accounts. In Section IV we apply the model to the case of Uruguay. In Section V we perform a few representative simulations to show how our model may be used in practice. Finally, in Section VI we provide our concluding remarks. We relegate most tables to Appendices A and B. An algebraic description of the full model is given in Appendix C.

II. Methodology

Traditionally, economic analysis in the World Bank has generally focused on either the "real" or the "financial" sectors, but rarely on the interaction between the two. The introduction of the "extended" Revised Minimum Standard Model, or RMSM-X, reflects a recognition in the World Bank of the importance of incorporating the financial system in the macro-economy (see Serven [1990] and Ventura [1991]). The RMSM-X is a useful macroeconomic tool for analyzing developing economies. It represents an improvement over the earlier RMSM in that it allows the user to examine the long-term interaction of broad fiscal and monetary policies in the economy. For example, the model may be used to examine whether the banking sector may be induced to mobilize available savings from surplus sectors and transfer them--through the creation of appropriate claims--to deficit sectors, in consistency with the targets in the economy.

Nevertheless, the monetary module in the RMSM-X is too aggregated to allow for any meaningful analysis of the viability of a country's financial system, or any institution in particular. The basis of the financial module in the RMSM-X is the Monetary Survey, which follows the presentation shown in the *International Financial Statistics* (IFS), published by the IMF. One of the main criteria of the Monetary Survey is to provide, for each country, a standard set of analytic aggregates that emphasize similarities among countries in economic processes and policy choices. For example, in measuring the money supply, the IFS considers a standardized measure of money that considers analytically significant for all countries (see IMF [1984], *A Guide to Money and Banking in the IFS*). While standardization is needed for the sake of simplicity and cross-country comparisons it is, nonetheless, done at the expense of depth and detail. It is clear that banks in each country have different objectives, management practices, and market strengths and weaknesses. Financial analysis must be done within the context of the particular country and economic environment.

By design, The RMSM-X provides only a generic framework, or "platform", that then may be adapted to particular cases. Indeed, some authors have modified and extended the RMSM-X framework to allow for a less restrictive treatment of the financial sector (see eg, Serven [1990] for an application to Chile). However, the modifications have been ad-hoc and focusing less on a systematic way to analyze financial performance, or the impact of financial restructuring and deregulation in the economy. The ideal way to analyze a bank or financial system is using a time series that shows developing trend lines and by comparison with peer banks within the same country. Such an analysis requires an adequate level of detail and a consistency of content, interpretation, and presentation of the data, plus an adequate

grouping of banks to ensure that comparisons are between like entities (see Barltrop and McNaughton [1992], specially Section 2 in Volume 2). The inter-comparison of banks may be too ambitious given the practical difficulties involved, specially if one wants to incorporate the macro-economy. A more realistic approach may be to compute "standardized" risk and performance indicators that then may be used to assess the long-term health of an individual bank or group of banks.

At an aggregated level, our financial module will coincide with the Monetary Survey. When available, we propose to use the more comprehensive Banking Survey, which includes Other Banking Institutions (see IFS). Throughout the paper we will distinguish three main financial agencies or sub-sectors: The Central Bank, the Analysis Banks, and Other Financial Institutions. The balance sheet of the Central Bank follows closely the presentation in the IFS. The Analysis Banks include the set of banks, or particular bank, that we want to examine in depth. The asset-liability structure of the Analysis Banks is the minimum needed for the computation of "core" performance and risk indicators. That is, we want to introduce enough detail in the balance sheet to allow for the computation of the main indicators usually computed by financial analysts. Finally, the data for Other Financial Institutions will be obtained residually, so that the three sub-sectors are fully compatible with the Monetary Survey.

III. Description of the Model

3.1 The Flow-of-Funds Approach

The basis of the RMSM-X is the Flow-of-Funds (FOF) framework, which neatly summarizes all income and financial transactions undertaken in a modern economy. This framework is well known, and we will only concentrate on its basic features, specially in relation to the banking sector (Holsen [1989] provides a detailed overview to those unfamiliar with the FOF method). The FOF system represents a powerful tool of analysis because it describes the expenditure and financing of the various sectors of the economy, and the categories of market instruments used in all financial transactions. Such a system brings out explicitly important macro-economic accounting identities that aid in the formulation of behavioral hypotheses, in the design and control of development plans, and in the design and checking of consistency of short-run financial programs.

The basic idea behind the FOF method is the description of economic activity as the interrelated expenditure and saving patterns of economic "agents." In typical applications, the FOF is divided into five sectors: the Public Sector, the Private Sector, the Monetary Sector, the Foreign Sector (Balance of Payments), and the Producing Sector (National Accounts). The FOF approach considers these sectors as if they were independent economic agents. The structure of the FOF is then based on their budget constraints. That is, the FOF tracks down the **sources** and **uses** of income for these agents in the economy. A typical FOF system, including current and capital account flows, is shown in Table 1, with the rows representing the sources, and the columns the uses. We now describe the system in more detail.

The FOF is divided into two parts, reflecting current and capital transactions. The first part registers the sources of funds, which consist of the receipts from the sale of goods and services currently supplied and transfers; it also records the uses of these funds, such as the purchase of goods and services, and savings. The second part registers the receipts from the sale of financial claims, or the assumption of financial liabilities and the outlays on the acquisition of financial claims, or the repayments of financial liabilities. Thus, every agent will generate current income and expenditures, with savings being the difference between the two. The agent's savings and borrowing (accumulation of liabilities) are then used to finance its capital expenditures and accumulation of assets. For every agent, its budget constraint then may be represented as:

Sources of Funds = Uses of Funds

Current Income = Current Expenditure + Savings

Savings + Accumulation of Liabilities = Capital Expenditures + Accumulation of Assets

For example, in Table 1 in the current account the Public Sector receives direct tax and non-tax income from the Private and Monetary sectors, and net indirect taxes from the Producing sector. Also, the Public Sector may receive foreign grants, or other transfers from abroad. Income will then be used to pay interest on domestic and foreign debt, in transfers and subsidies, and in consumption and savings. Total current revenue should be equal to total current expenditures plus savings. In the capital accounts, the Public Sector will use its savings and borrowing from domestic and foreign sources to finance its capital expenditures. These are mainly investment and transfers to the monetary system in the form of capital inflows. An algebraic description of all budget constraints is given in Appendix C.

SOURCES AND USES OF FUNDS FOR THE OVERALL ECONOMY

CURRENT ACCOUNT:	PUBLIC SECTOR	PRIVATE SECTOR	MONETARY SECTOR	FOREIGN SECTOR	PRODUCTION ACCOUNT	TOTAL SOURCES
PUBLIC SECTOR		DIRECT TAXES NON-TAX REVENUE	DIRECT TAXES NET TRANSFERS	CURRENT OFFICIAL GRANTS OTHER NET TRANSFERS	INDIRECT TAXES ON FACTOR INCOME -PRODUCER SUBSIDIES	
PRIVATE SECTOR	INTEREST ON BONDS CURRENT TRANSFERS & SUBSIDIES		PROFIT & DIVIDENS INTEREST PAID ON TIME & SIGHT DEPOSITS	WORKERS' REMITTANCES PROFIT REMITTANCES OTHER CURRENT TRANSFERS	FACTOR INCOME	
MONETARY SECTOR	INTEREST RECEIVED ON CREDIT	INTEREST RECEIVED ON CREDIT		INTEREST RECEIVED ON RESERVES		
FOREIGN SECTOR	INTEREST PAID ON FOREIGN DEBT	INTEREST PAID ON FOREIGN DEBT	INTEREST PAID ON FOREIGN DEBT		IMPORTS -(EXPORTS)	
C & S ACCOUNT	PUBLIC CONSUMPTION PUBLIC SAVINGS	PRIVATE CONSUMPTION PRIVATE SAVINGS	NET WORTH	FOREIGN SAVINGS		
TOTAL USES						

CAPITAL ACCOUNT:	PUBLIC SECTOR	PRIVATE SECTOR	MONETARY SECTOR	FOREIGN SECTOR	SAVINGS ACCOUNT	TOTAL SOURCES
PUBLIC SECTOR		NET DOMESTIC BONDS	NET DOMESTIC CREDIT	NET FOREIGN CREDIT CAPITAL OFFICIAL GRANTS	SAVINGS	
PRIVATE SECTOR			NET DOMESTIC CREDIT	NET FOREIGN CREDIT PORTFOLIO INVESTMENT	SAVINGS	
MONETARY SECTOR	PAID-IN CAPITAL	BASE MONEY SIGHT DEPOSITS TIME DEPOSITS		FOREIGN CREDIT	NET WORTH	
FOREIGN SECTOR			FOREIGN RESERVES		FOREIGN SAVINGS	
INVESTMENT ACCOUNT	PUBLIC INVESTMENT	PRIVATE INVESTMENT		DIRECT FOREIGN INVESTMENT		
TOTAL USES						

Internal consistency is forced on the system by the fact that what is a use (asset) for one agent, must be a source (liability) for another. Because of this, if the incomes of a sector change during an accounting period, not only that sector's expenditures or its overall position will change, but other sectors will also show corresponding changes. Furthermore, a change in the position of a sector--surplus or deficit--is related to changes in the amount and possibly in the composition of financial assets or liabilities held by the sector. Corresponding adjustments can be found in other sectors. Similarly, a linkage within the sector or between sectors can be traced if a change originates in the holding of a certain financial instrument in a sector.

For example, in Table 1 an increase in government investment may be financed by an increase in net borrowing from the banking sector, which may decrease the availability of bank loans to business firms, given the total amount of credit of the banking sector. This decrease may in turn lead to a decrease in private investment. It is important to recognize that the FOF system itself does not indicate the cause and effect of these adjustments. However, behavioral hypotheses can be investigated within the framework of this accounting system, and different adjustment patterns have different implications for policies. Except for the monetary system, our behavioral assumptions are the same as in the RMSM-X, and are presented in Appendix C. We, nevertheless, discuss later the concept of **closure**. That is, how is it that we may bring about the equality between supply and demand. Different closure assumptions will have different policy and behavioral implications.

The interlocking nature of the FOF gives rise to a problem of identifying which sector is associated with a particular flow. To identify whether a particular item is a use or a source for certain sector, the user must remember that every sector's disaggregation is based on factor ownership and sector behavior. In our example, direct taxes are a use for the Private Sector, and a source for the Public Sector. In the current matrix in Table 1, the placement of direct taxes in the column (uses) for the Private Sector and the row (sources) for the Public Sector reflects this relationship.

The case of the Monetary Sector, however, requires more discussion, specially since we use a very detailed balance sheet for the Analysis Banks. To start with, not all assets (liabilities) in the balance sheet represent immediate uses (sources) for another agent. For example, items like depreciation and loan provisions, while important in balance sheet accounting, should **not** enter in the FOF for the simple reason that nobody is really receiving or paying them. (nevertheless, one may assume that the sector is paying those flows to 'itself.') The same applies to accounting items. When dealing with assets and liabilities expressed in local currency which were originally denominated in foreign currency, valuation adjustments have to be made in order to maintain the consistency between stocks and flows. For example, at the time of a devaluation, the local currency value of net foreign assets automatically increases. The balance sheet should reflect such an increase, although there is not an actual disbursement until the flows are realized. Also, one has to be careful in identifying the right asset or liability holder. For example, we should not identify the Foreign Sector as the holder of all dollar claims. In the next sub-section we cover these issues in more detail.

Double-entry is also important since it forces reconciliation of the accounting practices of different agents. The two accounting approaches generally used to record transaction flows are the cash basis and the accruals basis. For example, balance of payments, national accounts and monetary statistics are normally recorded on an accruals basis, where transactions are recorded when an obligation or a liability arises, not when it is actually paid. For the monetary sector, the difference between cash and accruals basis is not significant because most bank transactions are conducted in cash. On the other hand, government finance statistics are often presented on a cash basis and the underlying budgetary accounts

may record cash flows with a time lag. Usually, one finds that it is common practice, in the government as well as other sector statistics, to mix cash and accrual accounts, making difficult a clear cut distinction between the two. For simplicity, and since our main purpose is to focus in the methodology of bank analysis, in our application to Uruguay we will assume that all macro-economic statistics are recorded on a cash basis, even if they are actually recorded on an accruals basis. A good discussion on data sources, and data problems usually faced in the construction of an actual FOF may be found in Chun, Garcia-Pinto, and Kongsamut [1991].

In our system we also distinguish five main sectors, Public, Private, Monetary, Foreign and Producing sectors. Ideally, the Public Sector should incorporate local and regional governments, as well as the activities of para-statal enterprises. However, in general it is difficult to obtain information for a comprehensive public sector. For simplicity, in our application to Uruguay, we will limit ourselves to Central Government operations. Thus, the Private Sector will comprise both private businesses and para-statal enterprises. A refinement of our method may be to separate para-statal enterprises, and to have a more comprehensive public sector. A description of the budget constraints for all sectors is given in Appendix C. Since our treatment for non-financial sectors is the same as in the RMSM-X, we will only discuss the accounts of the monetary sector in detail. (See Ventura [1991], for a thorough exposition of the RMSM-X framework). We now explain our methodology.

3.2 The Monetary Sector

At an aggregated level, the monetary sector accounts in our model will be basically compatible with those of the Banking Survey in the IFS. In Table A.1 (see Appendix A) we list the current and capital accounts for the consolidated monetary system. The behavior of this sector is modeled as in the RMSM-X. A description of the model equations is given in Appendix C. The Monetary Sector includes the Central Bank (CB), the Analysis Banks (AB), and Other Financial Institutions (OFI). We will model independently the behavior of the Central Bank, and the Analysis Banks, which represent the financial institutions, or institution that we want to examine in more detail. The flows for Other Financial Institutions are always obtained residually. We first discuss general issues regarding all monetary system flows. Later, we examine the accounts of the consolidated monetary sector, the CB and the AB.

Transaction vs. Accounting Flows

Like any other sector, monetary sector flows should conform to the FOF current and capital account format. This may require some explanation for somebody not acquainted with this type of accounting. The most important distinction is that between "transaction" vs. "accounting" flows. By definition, the FOF system should capture only transactions or exchanges in the economy. For the financial sector, this means that we should record in the FOF only those flows that represent an asset (use) or liability (source) to other sectors in the economy. These include government credits--a source to the government--and demand and savings deposits--a use of the private sector. By contrast, accounting flows are items recorded in the balance sheet, like cash kept in vaults, loan provisions, depreciation, or currency revaluation, that do not represent an immediate asset or liability to other agents.

Currency revaluation is an important component of the balance sheet, specially in institutions with a big proportion of its assets and liabilities denominated in one or more foreign currencies. This is precisely the case of the Uruguayan bank that we examine later on. Our model will keep track of all

accounting flows. They are not, however, immediately translated into economic activity, and thus should not be reflected in the FOF, until they are realized.

The correct treatment of the so-called accounting items implies that every increase or decrease in the stocks as a result of accounting flows should be reflected in a counterpart payment/receipt in the profit & loss statement. For instance, suppose that a bank increases its stock of loan provisions (registered as a liability in the balance sheet) from 100 million pesos at the end of 1992, to 150 million pesos at the end of 1993. Thus, **retained earnings**, or the net result of the profit & loss statement, should include a payment or expense of 50 million pesos. Stripped of all accounting flows, the net result of the profit & loss statement is usually known as the bank's net cash flow or the change in net worth. The savings balance in the current account matrix of the FOF will be exactly compatible with this concept. We discuss this account shortly. In our final reports, we follow the standard procedure of including accounting items in the profit & loss statement and the balance sheet. Nevertheless, we will also report the net cash flow.

Due to its special importance, our treatment of currency revaluation flows is slightly different from other accounting flows. In the balance sheet, we will include explicitly an item called Revaluation Account that will capture all capital gains or losses incurred by movements in the exchange rate. We consider the Revaluation Account a liability. Thus, if a bank's net foreign assets are positive, an exchange rate depreciation should generate an increase in the domestic value of net foreign assets, and a matching increase in the Revaluation Account. Conversely, if net foreign assets are negative, an exchange rate devaluation implies a decrease in the account. The main advantage of this presentation, specially in a macro-economic context, is that it should be obvious that a devaluation should not have an immediate impact on base money creation.

Currency revaluation is related to the difficulty of achieving stock and flow reconciliation. This problem manifest itself when end-of-period stocks are not consistent with the flows reported for that same period of time. For example, if international reserves in the balance sheet are reported as $100 (in local currency) at the end of 1992, and $200 at the end of 1993, then the implicit flow is the difference of $100, which should be recorded in the capital account of the FOF. However, another source like the balance of payments may report only $90 and the modeler is faced with an inconsistency. Aside from faulty data, there are three effects that may account for the observed inconsistency: cross-currency, revaluation, and timing effects. We now explain them briefly. (For a more thorough discussion see Chun, Garcia and Kongsamut [1991]).

The cross-currency effect affects the value of stocks that consist of assets and liabilities denominated in more than one currency. For instance, a country may hold assets and liabilities in more than one currency that should be reported in a single currency. Suppose that a bank's foreign debt at the end of 1992 is worth 100 million US$, half of which is held in dollars, and half in Japanese Yens. The Yen-Dollar (¥/$) exchange rate at the end of 1992 is 123. Thus, the banks owes 50 million dollars, and 6,150 million Yens. Assume there were no new external debt issues, and that the Yen appreciates to 115 at the end of 1993. Then, the dollar value of the debt will increase by [(6150/123) - (6150/115)]. Thus, it appears that there was a net inflow of capital when in reality the stock of debt remained constant.

We can compute cross-currency effects explicitly in the following way. Let us assume that a country has foreign debt denominated in US dollars, German marks and Japanese yens. At time t the total end-of-period stock of debt may be expressed in US dollars as follows:

$$F_t^{TOT} = F_t^{US} + e_t^{DM} \cdot F_t^{DM} + e_t^{YEN} \cdot F_t^{YEN}$$

where e^{DM} represents the exchange rate of German marks to dollars, and e^{YEN} represents the exchange rate of Japanese yens to dollars. Expressed in flows, representing the change of values from one year to the next, the equation above becomes:

$$\Delta F_t^{TOT} = \Delta F_t^{US} + e_t^{DM} \cdot \Delta F_t^{DM} + e_t^{YEN} \cdot \Delta F_t^{YEN} + \Delta e_t^{DM} \cdot F_{t-1}^{DM} + \Delta e_t^{YEN} \cdot F_{t-1}^{YEN}$$

The equation shows that changes in the stock of debt are due to new borrowing:

$$\Delta F_t^{US} + e_t^{DM} \cdot \Delta F_t^{DM} + e_t^{YEN} \cdot \Delta F_t^{YEN}$$

and cross-currency effects (CCE):

$$\Delta e_t^{DM} \cdot F_{t-1}^{DM} + \Delta e_t^{YEN} \cdot F_{t-1}^{YEN}$$

the equation may, of course, be generalized for more than three currencies.

In the event of a devaluation, there are two effects that should be considered when converting from foreign to local currency. First, is the revaluation effect, which occurs when stocks denominated in a foreign currency are converted to local currency. Clearly, a devaluation will increase the domestic value of the stock, even when its value in foreign currency remains the same. Second, is the timing effect which results from the fact that foreign currency denominated stock are converted to local currency values using end-of-period exchange rates, while the period average exchange rates are used to convert foreign currency flows to domestic equivalents.

Consider, for example, Foreign exchange reserves. These include reserves maintained at the IMF. The information source for this item is the Central Bank balance sheet, and is usually given in local currency as an end-of-period stock. To compute the flows, stocks first must be converted to US dollars by dividing by end-of-period exchange rates. One way to estimate the cross currency effect is to assume that reserves follow the same composition as foreign debt. With this assumption, we may correct the stock of reserves in US dollars. After this correction, we compute the implicit flow in dollars, and then multiply by the **average** exchange rate to obtain the flow in local currency. In most cases, however, only a percentage of the stocks is denominated in foreign currency, the rest being in local currency. In this case, we have to separate the local from the foreign components.

Starting from the balance sheet, the following summarize the steps needed to compute monetary sector capital account flows for some period t:

a) Obtain value of stocks at times t and t-1, ($Stock_t$, $Stock_{t-1}$). These values are usually given as end-of-period, local currency values. In general, items such as deposits and credit will have local and foreign currency components. Thus:

$$Stock_t = LC\_Stock_t + FC\_Stock_t$$

b) Convert foreign currency stocks to US dollars using end-of-period exchange rate (E^e_t), and then obtain flows:

$$FC\_Stock^*_t = FC\_Stock_t / E^e_t$$

$$FC\_Flow^*_t = (FC\_Stock^*_t - FC\_Stock^*_{t-1})$$

c) Correct dollar flows by cross-currency effect (CCE):

$$FCC\_Flow^*_t = FC\_Flow^*_t - CCE_t$$

d) If E_t is the period average exchange rate, then compute the flow as:

$$Flow_t = (LC\_Stock_t - LC\_Stock_{t-1}) + E_t \bullet FCC\_Flow^*_t$$

e) The discrepancy between the first difference of original local currency stocks, and the computed flows:

$$[(Stock_t - Stock_{t-1})] - Flow_t = (E^e_t - E_t)\bullet FC\_Flow^*_t + (E^e_t - E^e_{t-1})\bullet FC\_Stock^*_{t-1} + E_t\bullet CCE_t$$

amounts exactly to the timing, valuation, and cross-currency effects of the foreign currency component respectively.

This methodology should be applied to all transaction flows, except accumulated retained earnings. If we then subtract total liability flows from total asset flows, we should obtain the implicit net cash flow, equivalent to savings of the monetary sector in our current account matrix.

Monetary Sector Current Account

The Monetary Sector current account consists primarily of interest payments and receipts, as shown in Table A.1. As we have discussed, the information needed for the current account is basically that found in the profit & loss statement of a particular financial institution, excluding items like provision, and depreciation, ie, accounting flows. All payments and receipts, including interest differential and fee income, are contained in the profit & loss statement, which also follows the flow concept. Unfortunately, this data is not directly available in the Banking Survey for most countries. Thus, the current account most be constructed from the balance sheet from the previous period by applying the corresponding interest rates to the respective assets and liabilities. The values for interest payments on foreign debt and interest received on reserves may be obtained from balance of payment sources. Also, data for interest rates for items such as CB rediscounts, treasury paper, and demand deposits is available for most countries. Then, it should be relatively easy to calculate interest payments and receipts of the Monetary Sector.

As we discuss shortly, the data for the changes in the net worth or net cash flow is determined

in the capital account. The remaining item in the current account in Table A.1, distributed net profits and other net expenses, becomes the adjusted residual variable. This variable encompass all items other than interest payments and receipts, including operating costs, exceptional revenues and costs, etc. Net profits therefore are uses (column) for the Monetary Sector, and are transferred as a current source (row) for the Private Sector. In the case where the current account is not crucial, a lack of information of prices and interest rates can be overcome by allocating all the interest payments on foreign liabilities and interest received on foreign assets of the financial system into the private sector current account.

Monetary Sector Capital Accounts

As we know, the Banking Survey aggregates data from the Central Bank, Deposit Money Banks, and Other Financial Institutions. Data for this survey is usually found in the form of balance sheets expressed in local currency at the end of the year. For assets and liabilities denominated in local currency, the corresponding flows are easily obtained as the difference in stocks. However, when dealing with items expressed in local currency which were originally denominated--totally or partially--in foreign currency, some adjustments must be made. As we have already discussed, we have to compute cross-currency, revaluation and timing effects to achieve consistency between stocks and flows. Thus, capital account flows in the FOF are obtained by computing stock differentials in local currency, corrected by the mentioned effects when appropriate.

All credits are expressed as net values. For example, net claims to central government equals total central government credits minus deposits. In the same way, credit to non-financial public enterprises (NFPE), minus their deposits give net claims on NFPE. In the FOF matrices, the Private Sector will consolidate private sector as well as NFPE activities.

On the liability side, currency in circulation plus notes and coins issued and held by the Private Sector constitute base money. Sight, saving and other time deposits will be taken as they are originally presented in the monetary accounts, but they will be captured in local and foreign currency. Foreign borrowing figures may be obtained from different sources, such as the Debt Reporting System. In any event, the debt flows should be compatible with the figures in the Balance of Payments. Other liabilities is subtracted from the net other assets account.

It is important to differentiate in the "net other liabilities" category in the Banking Survey between the net worth of the monetary sector, and the value of the revaluation account. The devaluation or revaluation account is also a stock. Thus, in the starting of base year we have to provide its value as end-of-period stock. For next year, it will be equal to its initial value plus the "total revaluation account" figure. The latter is computed by calculating and adding all the net (positive for assets, negative for liabilities) revaluation, timing and cross-currency effects mentioned above. Finally, the monetary sector's change in net worth, or savings in our notation, closes the capital account.

Looking at the capital account matrix, in Table 1, note that two items have to be consistent with information from other sources in the Foreign Sector: Foreign debt (labeled foreign credit), and the change in foreign reserves.

3.3 The Central Bank

The Central Bank budget holds for flows over any discrete period of time. For a Central Bank, no less than for any other economic unit, the difference between the flow of receipts and the flow of expenditures over some time period--that is, "saving", or the current "budget surplus", or the "change in net worth"--is necessarily equal to the sum of changes in assets less the sum of changes in liabilities. Table A.2 shows the current and capital account flows assumed for the Central Bank.

Current revenues of the Central Bank include interest receipts on its net domestic credit to the government, private and commercial banks credit, and interest on foreign reserves. Its current revenues finance the Central Bank's operating cost, interest payments on the Central Bank's foreign debt, transfers to the government in the form of profits, and savings, or change in net worth. The operating costs, also include net other assets (buildings, real state, etc).. Notice that the change in the Central Bank's net worth are identical to the difference between the Central Bank's revenues and expenses, but excluding capital gains or losses due to exchange rate devaluations.

In the capital account, the change in net worth, along with the net issue of foreign debt, the net increase in the monetary base (currency in circulation and reserve requirements), and capital gains/losses (the so called accounting flows), and the deposit balance of the government, finance the acquisition of foreign reserves and domestic credit creation. Net disbursements include both short- and long-term net disbursements, as well as changes in arrears, which we consider as a financing item.

If we define the Central Bank deficit as the negative of the change in net worth, as defined here, then there is full consistency of treatment between the deficit of the Government and the Central Bank losses. In the case of the Government, the public sector deficit was intended to measure the financing needs rather than economic results. Consistency was achieved by adjusting the Central Bank's results for what is necessary to become a measure of financing needs. As in the case of the Government, amortization payments are included in net disbursements, and hence excluded from the deficit, even though they have to be financed.

It is useful to obtain an independent estimate of the size of the accounting gains or losses. In principle, the accounting flows of the central bank should capture only the accrued capital gains or losses arising from converting stocks of assets and liabilities denominated in a foreign currency to local currency. Accounting flows may be considered either an asset or a liability, the sign of which will depend on the value of net foreign assets. If the accounting flow is considered a liability, and if net foreign assets of the central bank are positive, an exchange rate depreciation should generate an increase in the domestic currency value of net foreign assets, and a matching increase in the accounting flows. Conversely, if the net foreign assets are negative, an exchange rate devaluation implies a decrease in the accounting flows. Thus, a devaluation should not have an immediate impact on base money creation.

3.4 Analysis Banks

This component of the monetary system represents the financial institution, or group of them, that will be the focus of our analysis. In particular, we want to be able to make an assessment related to the **performance** and **viability** of Analysis Banks (AB). Later, when we describe an application of the model, this sector will represent the activities of the *Banco de la República*, the largest public bank in

Uruguay. In this sub-Section, we start by defining more precisely what we mean by performance and viability of a financial institution. Later, we describe briefly the balance sheet structure of AB, the profit and loss statement, and the computation of performance indicators. Finally, we discuss what are the projection rules for the model variables of the AB.

The first question we have to ask ourselves, before we start to examine the performance of a given financial institution, is what is the main purpose or objective of its existence. The main role of a bank, either public or private, is to attract funds from people with surpluses (depositors) and provide these funds to people (borrowers) who have productive projects. Ideally, the borrowers will earn enough money to repay the funds (principal) with an adequate increment (interest) to be able to pay back depositors, cover operating costs and in the case of private banks distribute dividends to shareholders. The bank should attract depositors' funds through a combination of value on interest return, ease of access and security. At the same time, the bank should identify borrowers with the highest probability of repaying the funds. Thus, banks should provide a social function acting as information brokers and earning profits, or for a public bank at least not making losses, in the process.

To compete effectively, a bank should be able to provide these quality services at a "low cost." If a bank cannot compete on cost control and service quality, it is unlikely to survive for long in a competitive environment. A public bank may not be subject to the same competitive pressures from shareholders as commercial banks. Nevertheless, the very nature of its social function requires that it performs efficiently. A public bank that is not behaving competitively has a negative impact for the society at large. Thus, it is important to understand the bank's relative performance with respect to other domestic, and foreign, banks. As we show below, the most convenient way to assess the performance of a bank, is through the computation of standard indicators. Ideally, one may compute performance indicators for a bank and then compare them with those computed for peer banks. Because of the obvious difficulty of doing this, we may be able only to compare them against indicators computed for some "representative" banks. There are various publications that provide information indicative of what would be good performance for different kinds of banks in different environments.

Even if a bank is performing well, however, it does not necessarily means that it is viable. The best evidence that a bank is viable is if it is able to **sustain** consistent growth of high-quality earnings. For a commercial bank, it is important to sustain earnings growth at a pace compatible with a level of dividends satisfactory to shareholders, while at the same time reinforcing its capital so as to maintain an adequate capital to assets ratio. Similarly, a public bank should be able to maintain growth without making undue losses on its core operations. Clearly, to study the issue of viability it is essential to be able to project not only all the relevant internal variables of a bank, but also of its external environment. A bank may find it difficult to maintain its viability in a changing regulatory, economic, or competitive environment. The model presented here should then be a helpful tool to address these issues.

The Balance Sheet

The balance sheet has been the traditional analysis tool of a financial institution. The balance sheet provides a snapshot of the assets, liabilities, and equity of a bank at a point in time. This is the one statement that is usually available in some form at the end of the bank's fiscal year in its annual or quarterly report. Some international banks also prepare a monthly, or even a daily balance sheet for internal management purposes. A thorough analysis of a financial institution requires a balance sheet that exposes realistically its financial condition, and that reflects accurately the (net) income generation of its

different (net) assets. Tables A.4 and A.5 in Appendix A show the complete balance sheet of the Analysis Banks that is implemented in our model. Although somewhat aggregated, it basically conforms to the risk differentiation requirements of the Basle Agreement. (See eg Barltrop and McNaughton [1992] for the full text of these agreements).

In the balance sheet, cash represents the most liquid assets available, and is given as a percentage of deposits. Deposits with the Central Bank consist of mandatory reserves, based on a percentage of the bank's customer deposits, and other working deposits. The latter may represent deposits needed to cover the settlement of interbank payments and check clearings. The bank may have deposits on foreign correspondent banks, or keep money in overseas branches. Other foreign bank deposits may include items such as funds blocked in other countries by exchange control restrictions. The bank may also keep foreign exchange reserves deposited in foreign banks. In the case of Analysis Banks, the interbank account is a clearing account. That is, the model assumes that the bank has full access to market funds to finance any gap between its normal sources of funds, and its applications, including financing operating cash flow losses.

In the loan portfolio, we distinguish between loans to private enterprises and state owned enterprises, and central government. Clearly, the quality of a bank's loans is critical to our analysis. It is essential to understand the bank's lending practices and the lending environment. The bank takes in depositor's funds and lends them to borrowers. By doing so, the bank runs the risk that some borrowers will not be able or willing to repay the loans, thus reducing the value and capital of the bank. These losses should then must be made up by earnings from those who repay if the bank is to remain solvent. Thus, the higher the non-repayments, the higher the interest margin that the bank must charge to survive, and the less efficient the bank becomes. In our model, we distinguish three types of credit risk for private and public-sector enterprises: performing, non-performing, and lost loans. This breakdown is the minimum required to make an assessment of a bank's credit risk. Further risk categories may be added, eg semi-performing loans, but that will depend on the user's needs. Every loan category has a counterpart loan provision, which for convenience is entered in the model as a contra-asset.

The model includes a category for fixed or tangible assets. These represent the bank's investments in physical facilities such as buildings and equipment needed to conduct its business. These represent longer-term investments that are generally not liquid, may be special purpose, and are not directly income-producing. Such assets should be funded by equity rather than by deposits, unless the bank is undercapitalized. In the model we allow for gross and net fixed assets, the difference being depreciation, which has to be computed explicitly. Assets that are not included elsewhere in the balance sheet are consolidated under the Other Assets account, which has a breakdown between domestic and foreign assets. The user may decide to brake these by separate line items, which can be done without affecting the model structure. The rest may be consolidated into a catch-all category.

The core of the resources available to a bank are in the form of deposits mobilized either directly from the public, or from the government sector. These can be presented in the balance sheet either by source or by type of deposit. In our model we only distinguisn by type of deposit: demand, savings, and other time deposits. Demand deposits reflect clients' working balances and are thus transaction oriented. As such, they are withdrawable at any time and are, in theory, the most volatile source of funds. Savings deposits generally reflect small-scale private savings at rates between the demand deposit rate and time deposit rate. Time and other deposits pay the highest deposit rate, and are the most sensitive form of deposit. Since longer-term deposits are generally more expensive, the composition of the deposit base

is a reflection of national saving patterns, and the depository bank's marketing efforts. In our model, we use shares to break down between the different types of deposits. A change in deposit shares can reflect changing management policy.

In our balance sheet we show explicitly all sources for total borrowing requirements. These include long-term foreign liabilities, direct credit from Central Banks, credit from other domestic banks, and the issue of bonds and notes. If markets are stable, banks may raise long-term funds through the sale of long-term debt instruments to the public. Bonds may be attractive to depositors who may wish long-term investments with a steady income flow. This category may include any long-term, unsecured, unsubordinated debt instrument that achieves essentially the same objective, even if it is not called a bond.

The normal conduct of banking business results in a number of other liabilities that are not normally a concern unless they become material. These are collected in our Other Liabilities category in our model. For example, these may include interest or taxes payable, items in suspense, credit items in transmission, etc. We also include here provisions for securities. In contrast with loan provisions, these are shown explicitly as liabilities.

In the capital accounts, we distinguish three categories: Paid-in capital, retained earnings (net worth), and revaluation accounts. Paid-in capital represents the par value of the stock outstanding and may be further broken down by the user. For example, we may distinguish between common and preferred stock. This category may also include other capital reserves. Retained earnings, also known as revenue reserves, represent the internal generation of capital through retention of earnings. The value for this item is directly obtained from the profit and loss account (see below). These accumulated surpluses of the bank must be free and unencumbered by any specific claims by creditors to effectively supplement the share capital. Finally, the revaluation account is the added value of all the valuation, timing, and cross-currency effects computed according to the specifications above, and that we have already been discussed.

Our balance sheet also includes Off-Balance Sheet items. Banks routinely engage in transactions on behalf of their clients, in effect substituting their credit standing for that of their clients. This enables their clients to conduct business with third parties with whom these clients may have an insufficient track record to justify complete confidence. The main off-balance sheet categories in our model are the issuing of (documentary and non-documentary) letters of credit, client guarantees, and other. The latter is a catch-all category that includes services not accounted for in our model. The fees and commissions charged on these services are shown in the profit and loss statement.

The model uses two relevant currencies, domestic (denoted as LC) and foreign (denoted as FC.) For most of the accounts in the balance sheet, off-balance sheet, and profit and loss accounts, we allow for domestic and foreign currency values. FC items are entered into the initial balance sheet directly in foreign currency units. In our model application to Uruguay we use dollars. The model will then use the end-of-period exchange rate to convert to their equivalent amount in LC. As we explained above, the FC flows are converted to LC using the average exchange rate. Subsequently, projected statements in FC are prepared and maintained in FC units. The model only allows for one type of FC, thus a problem may arise if the bank operates with more than one FC unit. In the latter case, and depending on the FC mix, we may have to adjust FC figures for cross-currency adjustments, in the manner that we have specified. For projections, however, this may not pose as problem unless we foresee substantial foreign inter-rate changes.

The Profit and Loss Statement

In addition to the balance sheet, the profit and loss statement provide key information about the financial health of a bank or financial institution. Also known as a statement of income and expense, it provides information on all income and expense items that represent the normal, core business of a bank. Table A.3 shows the profit and loss statement structure for Analysis Banks. This follows the so-called flow concept, starting with interest differential and fee income, deducting operating expenses to obtain net operating income, then covering non-operating income or expense, provisions, and taxes to yield net income. This is one of the two presentations recommended by the European Community Directives, the other being the parallel format that shows income in one column and expenses in the other. The flow presentation shown here is not only more analytically useful, but also follows closely the current account presentation of the FOF. Unfortunately, for many financial institutions, specially public banks, the information available in the profit and loss statement is usually not published. Therefore it has to be constructed using the data available on interest rates and margins, and operating fees and expenses. This is a second-best approach, but the only possible when information is not readily available.

In Table A.3, net income represents the net result of the profit & loss account. In the FOF, however, it is the cash flow that represents the balance between income and expense. The difference between net income and cash flow is precisely the value of all accounting flows, provisioning and depreciation, except for the revaluation account, which is explicitly included in the balance sheet. In the FOF, the cash flow is exactly equal to the savings of Analysis Banks, and forms part of total liability (transaction) flows of AB. For every period, the interbank account is obtained residually so that the equality between asset and liability flows is assured. The model then maintains equilibrium equalities between transaction flows. To maintain overall equality, all accounting items subtracted from retained earnings have to be equivalent to the accounting flows added in the balance sheet. In the next Section we explain this in more detail when we examine

Performance Indicators

Just by reading the balance sheet and the profit and loss statement, an expert financial analyst may understand what the bank does, what the numbers in the financial statement indicate, and, to some extent, how they have been manipulated. After such reading, an analyst may conclude that there are obvious disparities, or that some numbers look suspicious and merit a closer examination. However, the absolute numbers are most likely to yield immediate insight only in extreme cases; for example if the bank is showing negative equity, which means that most likely the bank is insolvent. As we argue above, the best way to assess the bank's competitiveness is to compute ratios or indicators that permit direct comparison with other banks. Our model allows for the computation of some key ratios that indicate the underlying level of performance and health of the bank.

Table A.6 shows the list of core performance indicators that are computed in our model. The indicators provide performance measures in seven core areas, including: capital adequacy, credit quality, nominal and real return and profitability, efficiency, and spreads and operating margins. Our indicators cover important measures on profitability such as return on assets and return on equity. We also include ratios for net interest margin, net operating income and net operating margin, which are important measures off operating efficiency. Measures of staffing efficiency are also included since staffing costs generally represent the major component of a bank's non-interest cost and staff productivity. A number of additional ratios may be used to extend the analysis to complement our measures for efficiency, staff-

productivity, spread, cost of intermediation, etc. Since the computation of these ratios is a pretty standard procedure, we are not going to explain them here.

Projection Rules for Variables of Analysis Banks

The projection rules in the model are fairly simple. The model provides growth rates for most financial stocks of assets and liabilities. The user has the option of entering growth rate values directly, or using some kind of rule. That is, growth rates may by linked to relevant macro-economic variables. For example, the growth rate of credit to private enterprises may be linked to nominal growth of GDP, and the growth of private deposits may be tied to household disposable income growth, or to changes in income and money velocity. International reserves may grow so as to maintain a target ratio in terms of months of imports. The model keeps track of financial stocks by adding each period flow to the previous stock. As we have discussed before, accounts in foreign currency are converted to local currency using the end-of-period exchange rate for stocks, and the average exchange rates for flows.

Accounting flows, except the revaluation account, are projected simply as percentage ratios of other variables. For example, reserve requirements are computed as percentage of total deposits. Different ratios are given for local currency and foreign currency deposit accounts. Cash is given as a percentage of total assets, loan provisions as a percentage of loans. This for every loan category. Depreciation is computed as a percentage of gross fixed assets. Also, as we have discussed, the interbank account is computed residually

The values in the profit and loss account are computed based on the stock values in the balance sheet, and the off-balance sheet. Interest payments on domestic and foreign assets and liabilities are projected as the product of the previous period stock, and the applicable nominal interest rate. Nominal interest rates are computed for domestic and foreign currencies according to the following formula:

$$(\text{Domestic Interest Rate})_i = \text{Domestic Base} * (1 + \text{Spread})_i$$

$$(\text{Foreign Interest Rate})_i = \text{Foreign Base} * (1 + \text{Spread})_i$$

The base rates for pricing loans may be computed following different criteria. In our model, we define the base rates as:

$$\text{Domestic Base} = (1 + \text{LIBOR} + \text{COUNTRY RISK PREMIUM}) * (1 + \text{DEVALUATION RATE}) - 1$$

$$\text{Foreign Base} = \text{LIBOR} + \text{COUNTRY RISK PREMIUM}$$

Similarly, fees and commission earnings are based on a percentage of the amount of off-balance sheet services in the last period.

3.5 Closure Rules

The use of closure rules is an important feature in the standard RMSM-X. The value of most model variables are mathematically determined through the specification of the budget constraints and other structural and behavioral equations. In general, however, we will find that there are more variables than equations. That is, the system is under-determined. A closure rule is precisely the specification of

how it is that the values for these variables will be determined to "close" the model. There are indeed different ways in which this can be achieved, and the user is referred to Ventura [1991] for a thorough discussion. We will nevertheless discuss two of the most useful closure rules: the normative and the positive. In our model we allow for these two types of closure rules. It is therefore important to examine their implications, specially in terms of the distribution of domestic credit. The solution of the model under these closures is illustrated in Figure 1, which we now describe.

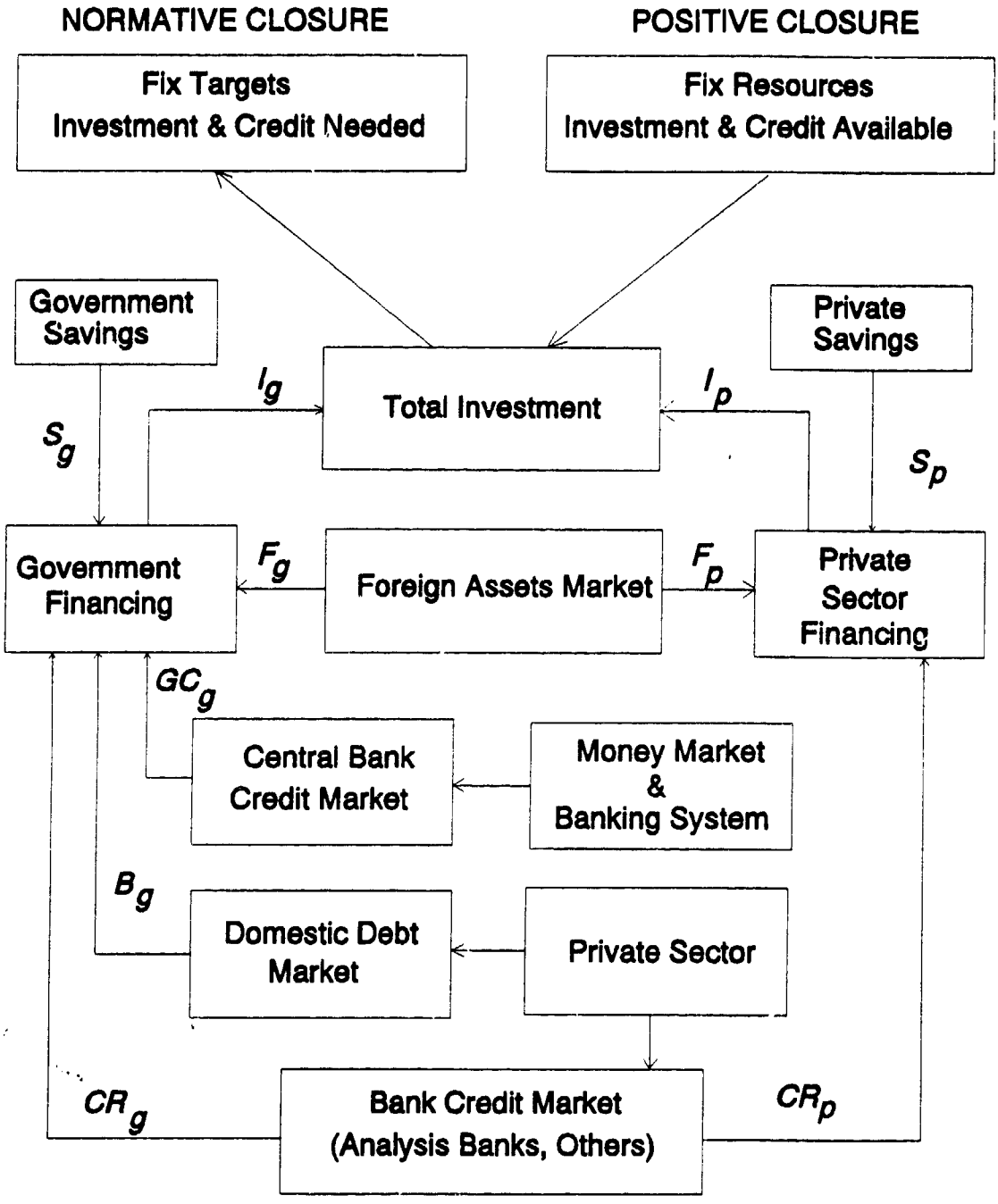
Normative Closure

In the normative approach, the user selects a set of **target** values for some variables, and lets the model determine the resources needed to achieve the targets. For example, in our model we allow the user to determine the growth of income and inflation, private credit and investment, imports (thorough income an price elasticities) and government foreign borrowing. Given the said targets, the technology available to the economy, in the form of the ICOR (Incremental Capital-Output Ratio) parameter, and fiscal and consumption propensity rates, the model computes endogenously investment and savings, and thus borrowing needs for the whole economy. The financing gap, computed endogenously, represents the difference between total foreign financing needs, and foreign financing available.

Government saving (S_g) is defined as fiscal revenues--tied to income and expenditures--minus current expenditures. From the total level of investment needed in the economy, and the pre-determined level of private investment (I_p), it follows how much the government needs to invest (I_g). The difference between government investment and savings represents the financing needs of the government. The latter are also known as the Public Sector Borrowing Requirements (PSBR), although in our case public sector is limited to central government. Disposable income for the Private Sector is defined as GDP at factor cost, plus net subsidies and transfers (domestic and foreign), minus taxes and net interest payments (domestic and foreign). Private saving (S_p) is computed as the proportion of disposable income that is not used for consumption.

In the money market, the given inflation rate and nominal interest rate determine the real interest rate, while real output is determined by the growth assumption. Together with the assumption on money velocity, they determine the trajectory of money demand. This yields the required path of money stock and, through the multiplier, the money base. Foreign reserves and foreign debt of the Banking System, which includes the Central Bank and Analysis Banks, are determined exogenously. In turn, private deposits are given by money demand and the deposit to money ratio. Using the reserve requirements

Figure 1
The Positive and Normative Closures: Credit Flows



coefficient, this yields required reserves. Credit supply is then equal to the Banking System's total free assets (deposits minus reserves). Hence, banks' borrowing from the Central Bank is the residual variable in their budget constraint. In turn, Analysis Banks will use part of this credit, or add to this credit, depending on the interbank account balance.

Given total net domestic credit generated in the economy, the user determines how much of this will be available to the private sector (CR_p). The balance is given to the Central Government (CR_g and GC_g). Foreign borrowing is determined exogenously for the government (F_g). If the level of domestic and foreign borrowing is not enough to cover the PSBR, the government will issue government bonds, treasury bills, or other type of non-bank financing (B_g). Private foreign borrowing (F_p) is then computed as the difference between total borrowing requirements, computed endogenously, minus the borrowing of the government and the Banking System.

Positive Closure

In this closure, the user selects a set of **resources**, and finds its effect on the target values. That is, the objective under this closure is to find the effects of a specified set of fiscal, monetary and exchange rate policies, and limited borrowing requirements, on the target macroeconomic variables (growth, inflation, etc). Thus, the first step is to fix the paths of fiscal policy variables (ie. government consumption and investment). Once this is done, the values for the nominal exchange rate and the money supply must also be entered. These, together with the remaining assumptions will determine the growth rate, inflation and the real exchange rate. In contrast with the normative closure, investment is determined by the level of savings and by the limited amount of foreign borrowing allowed. Real GDP is therefore determined by past investment and the exogenous ICOR. The money supply is determined exogenously. Therefore, the price level is the variable that adjusts money demand to the fixed supply.

The credit flows are also describes by Figure 1, except that the computation will be different. In the foreign assets market both the private sector and the government's external borrowing are now projected as a fraction of their budget imbalance. The balancing item in the foreign asset market is now the level of imports in the economy. This is accomplished in the basic RMSM-X by letting imports of non-food consumption goods move up or down as necessary. There is a danger here that such imports could be reduced to zero or even to a negative value, which is nonsensical. The user must be alert, therefore, to such a possibility in this closure and be ready to change other assumptions and re-run the program. As before, the balance sheet of the Central Bank determines its stock of domestic credit. Similarly, in the Central Bank credit market the flow of credit demanded by the government is now projected as a given fraction of its budget imbalance. Hence, the residual item is credit to the Banking System.

As in the normative closure, the Banking System determines total credit available. However, now the flow of bank credit to the government (CR_g) is determined as a percentage of its budget imbalance. Thus, the adjusting variable that clears the bank credit market is credit to the private sector (CR_p). Finally, the change in the stock of government debt is now determined by the government's budget constraint. Hence, the domestic debt market (B_g) now clears through the appropriate adjustment in the total debt stock held by the private sector.

This completes the mathematical solution process under the normative and positive closures. A full list of the model and closure equations is provided in Appendix C. It is important to keep in mind two important characteristics of our model, which apply to both normative and positive closures:

incompleteness, and recursiveness. The former imply that the model equations and closure rules are not sufficient to determine all relevant economic relationships. For example, in our model there is no explicit link between real interest rates and private demand for domestic debt. Thus, this relationship must be checked ex-post for internal consistency. If the implicit relationship between these two variables is not acceptable, then another iteration, reconsidering some of the assumptions or targets may be necessary. The fact that our model is recursive means that all variables in the model are determined by last year values, and current technological and policy parameters. Thus, no variable is determined as the explicit solution of an equilibrium condition. For example, the nominal exchange rate is not computed to satisfy some real exchange rate equilibrium condition.

The user may modify the model by adding new economic relationships, or by determining some parameters simultaneously as he or she seem fit. However, it is important to maintain a balance between economic realism and model complexity. In our experience, given the uncertainty of future trends and the estimation of model parameters, it is to the advantage of the user to keep a simple, manageable model structure. Another point is worth mentioning. The selection of targets and resources that determine the closures in our model were done arbitrarily. The user may decide to use a different set of targets other than the ones used. For example, in the positive closure the user may decide to use foreign reserves to balance the foreign assets market, instead of imports as it is currently done in our model.

IV. An Application of the Model: The Case of Uruguay

4.1 Introduction

In the last sections we have described how to integrate a detailed monetary sector in the RMSM-X framework. It is, nevertheless, useful to pursue our methodology with a practical application. In this Section we describe how to adapt the data for Uruguay to our own framework to demonstrate how such a model operates. As we argued above, Uruguay represents an interesting case because of its highly dollarized financial sector, which makes it very susceptible to the macro-economic environment. About eighty percent of the assets and liabilities of the banking system are dollarized. In particular, we will concentrate on one bank, The Bank of the Republic (BROU), which allocates around 60 percentage of total credit available to residents, and captures about half of total deposits. We start with a brief discussion of the macro-economic and financial environment in Uruguay in the last ten years or so. Later, we describe the FOF for Uruguay for the year 1991. This will serve as the base for our projections.

In the next Section, after we construct the FOF, we will use our model to carry on some simulations and experiments. Thus will give us a better idea of the scope of our model. It is, however, **important to keep in mind that we do not pretend to make any judgment regarding the possible future path for the Uruguayan economy**. In the same way, the BROU was selected for its dominance and important role in the credit market, and not because we feel it needs to improve its performance. Our simulations are just representative and are intended to give the user a better grasp of our model.

4.2 Macro-economic Outlook and the Financial Sector in Uruguay

With about three million inhabitants, Uruguay is a small country compared to its close neighbors, Brazil to the north, and Argentina to the south. Its economy, although not exempt from problems, has been able to maintain a high per capita income by Latin American standards. As we can see in Table 2, between 1986 and 1991 Uruguay's income per capita has consistently been about 20 percentage higher than that for Latin America as a whole. Nevertheless, beginning n 1991, the Uruguayan economy has lost some ground. Real GDP growth dropped from its high level of above 8 percentage in 1986 to 1 percentage in 1991, while inflation has steadily increased from 70 percentage to 94 percentage during the same period.

The traditional sources of growth in Uruguay have been exports of agriculture and livestock products. More recently, however, the service sector has been one of the most dynamic in the economy, accounting for most of its growth. Since the mid-1970s and up to 1991, GDP has grown at an average of about 1.5 percentage per year (based on a logarithmic regression for the period). With a low annual population growth of about 0.5 percentage, per capita income has grown on the average by a modest 1 percentage per year. Between 1975 and 1990, Agricultural and fishing output grew at an average annual rate of only 0.8 percentage, while manufacturing output grew 0.9 percentage per year. Over the same period, the service sector, (including other output) grew at an average 2.5 percentage per year.

The growth, however, has been uneven. Between 1974 and 1981, GDP grew annually at a brisk 4.3 percentage, supported by relatively high gross fixed investment, while output plunged substantially between 1982 and 1984. By 1984, real GDP was nearly 20 percentage lower than in 1981. The decline was mainly due to a generalized financial crisis, associated with an external debt crisis, and a significant devaluation in November of 1982. The economy started to recover in 1985, and grew sharply in 1986

Table 2
Uruguay: Selected Indicators, 1986-1991

	1986	1987	1988	1989	1990	1991
GNP Per Capita (US$)	1,750	2,020	2,280	2,510	2,620	2,860
GNP Per Capita (Latin America, US$)	1,710	1,720	1,780	1,920	2,130	2,370
Overall Public Sector Deficit (% GDP)	5.2	4.8	5.0	7.8	3.6	1.1
National Accounts (Percentage Growth)						
GDP Market Prices	8.7	8.0	-0.01	1.3	0.9	2.9
GDP Deflator	71.5	72.8	63.9	75.5	98.8	94.0
Private Consumption	10.5	15.0	-0.8	0.0	-5.3	3.6
Government Consumption	8.9	5.4	-2.3	1.6	4.2	4.1
Gross Domestic Investment	17.1	18.4	-7.2	-9.2	5.6	18.2
Exports of G&NFS	11.5	-8.5	9.1	10.3	10.5	-1.0
Imports of G&NFS	29.4	15.8	0.0	1.4	-2.7	16.9
Foreign Sector						
Terms of Trade Change (deterioration -)	12.5	-0.5	1.9	7.8	-5.5	N.A.
Devaluation Rate (NU$/US$)	49.9	49.1	58.5	68.5	93.4	72.4
Real Effective Exchange Rate (Index 1985 = 100)	98.6	96.3	90.7	94.8	85.5	97.3
Total Foreign Debt (% of GDP)	70.3	60.6	52.5	55.0	54.5	45.3
Debt Service Ratio (% of XGS)	32.0	36.4	38.3	30.1	42.5	38.2
Foreign Reserves (Months of MGS)	11.4	11.7	10.2	9.0	8.1	5.9

Source: World Bank Tables and International Financial Statistics.

and 1987 (see Table 2). The recovery was mainly the result of the acceleration of growth in Argentina and Brazil, following the Austral Plan (June 1985), and the Cruzado Plan (February 1986), respectively. In 1987, real GDP just exceeded 1981 real GDP, although real growth has slowed since then. The drop in output can be explained in part because of inadequate gross fixed investment, and in part because of a severe drought experienced in 1989-90. In 1992, preliminary figures indicate that growth exceeded 3 percentage.

Investment activity in Uruguay has gone through three phases in the last twenty years, which helps to explain the observed fluctuation in income. From 1970 to 1976, gross investment averaged 11.5 percentage of GDP, 19.5 percentage of GDP during the period 1977 to 1982, and about 11 percentage of GDP from 1983 to 1990. The surge in investment during the period 1977 to 1982, when several hydro-electrical plants were built, was mainly financed by foreign savings. An overvalued exchange rate during the period favored investment by providing incentives to imports in general and capital-goods imports in particular. The level of imports of goods and non-factor services grew from an average 23.7 share of GDP in 1970-76, to 27.6 in 1977-82. As a result, the current account deteriorated substantially,

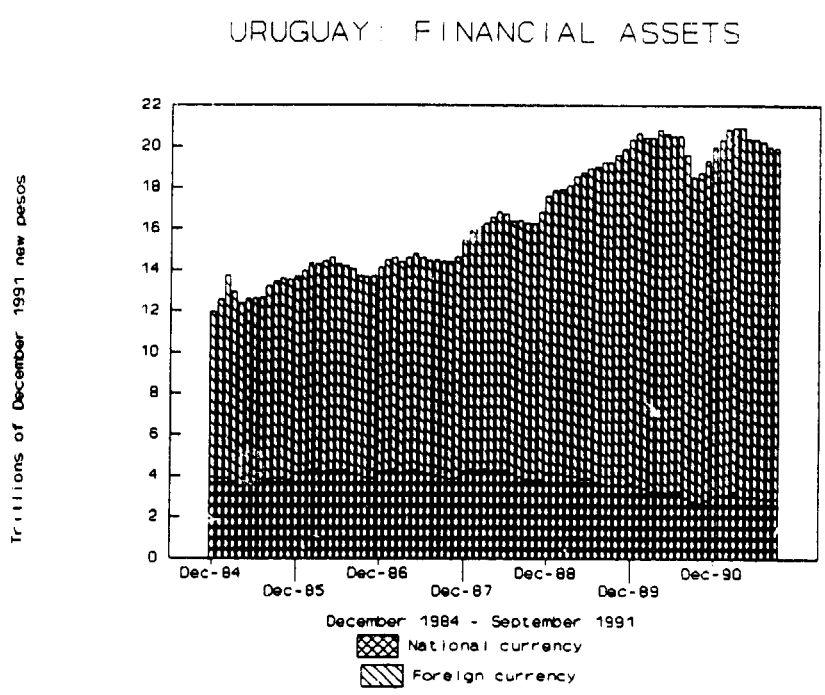
and the country's foreign debt more than tripled, from 998 million US$ in 1978, to 3,393 million US$ in 1983. In 1982 the government devalued the currency and a debt crises ensued, with investment activity dropping dramatically as a result. From its peak of 24.2 percentage of GDP in 1980, investment dropped ten points to 14.3 percentage of GDP in 1983. The investment level in the last years has been low, and at average 11 percentage of GDP barely represents replacement value. As we can see in Table 2, investment growth since 1986 has been mixed, from an increase of about 18 percentage in 1987, to a 9 percentage drop in 1989, and then a recovery in 1991. Low investment implies that Uruguay's capital stock has been relatively older, and thus its plant and equipment is becoming increasingly obsolescent.

The external debt crisis exacerbated inflationary pressure in Uruguay, as in other Latin American countries. Annual inflation averaged 75 percentage after 1982, compared with about 65 percentage from 1970 to 1982. Overseas bank finance enabled Uruguay to sustain an appreciating real effective exchange rate, which resulted in the large current-account deficits of 1978-82. The real effective exchange rate (1988=100) appreciated from 92 in 1978 to 64 in 1982. Beginning in 1982, international financial markets cut back their lending, and at the same time rising world interest rates. This combination of events resulted in an increased debt service schedule for the public sector, which by the end of 1982 had accumulated 1.9 million US$ in debt. The public sector deficit was too large to finance in the narrow domestic financial market, and monetary financing became the only alternative until fiscal adjustment could be made.

The massive devaluation of November 1982 lifted the real effective exchange rate by 76 percentage, above the November 1982 rate. Money creation, together with the devaluation generated inflationary pressure, which subsided somewhat in later years. In the seven years after the devaluation inflation was kept in the 60-80 percentage range. In 1990 consumer prices rose approximately by 130 percentage, compared to 90 percentage in 1989. Inflation peaked at 15.6 percentage in September 1990, associated with an oil price increase--due to the Gulf crisis--and round of wage and public-service price increases. To fight high-inflation new measures were taken. These included steadily diminishing holdings of peso-denominated assets to avoid exposure to the inflation tax, and increasing use of the dollar as a unit of account and store of value. For example, total peso-denominated (liquid) instruments amounted to about 19 percentage of GDP in 1985, dropping to about 13 percentage of GDP in 1990. At the same time, dollar liquidity rose as a percentage of GDP, from 75 percentage to 84 percentage of GDP (see Figure 2).

A new administration took office in 1990 and promptly initiated a stabilization program with new vigorous tax measures, trade liberalization, limited public-sector wages and low public capital spending. In addition, in February 1991 the Government carried out a "Brady" debt reduction agreement cutting down the fiscal deficit further. Economic imbalances improved and the public sector deficit declined from 7.8 percent of GDP in 1989, to 3.6 percent in 1991, and to 1.1 percent in 1991. Basically as a result of these efforts, inflation came down from 130 percent in 1990 to 80 percent in 1991, and possible even less in 1992.

Figure 2



The Banking System in Uruguay

The Uruguayan banking system consists of the Central Bank, two Government-owned banks--Bank of the Republic (BROU) and the Housing Bank (BHU)--and twenty-one commercial banks. Additionally, eighteen financiers and some credit unions also satisfy retail or consumer credit demands. Of the commercial banks, twenty are foreign owned. Two commercial banks that had become insolvent in the mid-1980s were taken over by the Government. They are still in public hands, although their reprivatization is part of the financial sector reform program undertaken by the Uruguayan government.

As we discussed above, foreign currency deposits in Uruguay represent an important element of the monetary scene. Foreign currency deposits grew to about US$7 billion at the end of 1990 from about US$1 billion participation in total currency composition of the banking system in 1980. About four-fifths of the assets and liabilities of the banking system became dollarized. The legalization of unlimited foreign currency holdings and banking credit operations contributed to the currency replacement and dolarization of the economy during the 80s. Another important factor in the increase in foreign inflows was the decline in world interest rates, which made risk-adjusted financial yields more attractive to foreign depositors. This phenomenon was not limited to Uruguay. To a more or less extent, many Latin American countries attracted depositors in this way.

Rates on deposits and loans were positive in real terms for loans but negative for deposits during the 1980s. Nominal interest rates on peso loans have fallen from around 180 percent in June of 1989 to 120 percent in March of 1992. Still they are about 30 percent above inflation. Nominal interest rates

on peso deposits (referring to 90-day operations), which are affected by local and external interest rates and real-effective exchange rate movements, have fallen from near 100 percent in June 1989 to 70 percent in the second half of 1991. However, they stayed below the preceding twelve months' inflation rates in 1990 and 1991 respectively. Interest rates on banking system dollar denominated time deposits are linked to world interest rates, and have been on the same declining course.

Credit and Deposits

Net peso credit of the banking system to the private sector fell from US$777 million in December 1985 to US$486 million in September 1991. That is from a ratio of 56 percent of total credit down to around 26 percent. At the same time, credit in foreign currency increased from around US$1.5 billion to US$2 billion during the same period. Private banks credit to the private sector declined by 20 percent from the end 1984 to December 1990. Of the total, the commercial banks gave half of that in foreign currency. Total private credit as of end-December 1990 was NU$92 billion distributed as follows: manufacturing, 47 percent; commerce, 22 percent; agriculture, 16 percent; services 8.5 percent; construction 5 percent; and consumers 2 percent. The sector with the highest share of the commercial debt was manufacturing. Commercial banks' share of credit has shown a slight increase to about 49 percent with the economic recovery of 1988-89. However, total credit in real terms has remained stationary during 1985-88 at about 5.4 billion pesos of 1978.

On the liability side of the balance sheet of the banking system, deposits in foreign currency increased from US$1.6 billion to almost 5 billion between 1985 and 1991. During the same period, deposits in local currency stayed flat around US$ 650 million. The banks have channelled increased foreign deposits to finance operations abroad, or invested in Treasury bills and bonds or Central Bank notes because of negative real rates for peso deposits and the higher reserve requirements imposed by the Central Bank on peso deposits.

The Banking system's net international reserves was about US$ 656 million between December 1990 and September 1991. This included an increase of nearly US$40 million by reserve holdings of the Central Bank, BROU and private banks. It also included the February 1991 debt-reduction transaction, in which the Central Bank paid out some US$263 million from its net reserve position. At the end of September 1991, M1 amounted to about US$450 million and M2 to about US$1,009 million, increasing respectively by 17 and 7 percent over consumer prices in US dollars.

The BROU

The BROU, is Uruguay's largest public bank. It provides an extensive range of credit for trade, industry, and agriculture, often at subsidized interest rates. As of end 1991, it had 107 branches, mostly in Montevideo. It is one of the main suppliers of credit in the economy. BROU's credit to the private sector (outstanding at US$ 1.22 billion at the end of 1991) is around 60 percent of the total credit given to the residents in Uruguay. Of that amount, approximately 70 percent is in foreign currency. BROU also captures almost half of all deposits raised in the country. Around 55 percent of these are time deposits of more than one year. Of that amount, at least 60 percent is in foreign currency. Also, the BROU captures most of the public enterprise deposits, many of which have been exempt from reserve requirements. The Central Bank credit to BROU ran around US$ 500 million in 1991.

Like similar institutions in Brazil and Argentina, the BROU performed central-banking functions until the Central Bank was separated from it. The BROU operated a wide range of credit programs, and

effectively implemented monetary policies of its own. An extensive reform of the BROU is on-going. The Central Bank put ceilings on BROU's credit out of its foreign currency deposits in 1991. As a result, credit outstanding of the BROU to the private sector fell about 10 percent in real terms between November 1990 and November 1991, from US$ 1154 million to US$ 1142 million. The aim was to make BROU compete like that of any other commercial bank. Beginning at the start of the year, the BROU was asked to use the same standard accounting system as other commercial banks. In March 1991 a reserve requirement of 100 percent was placed against public sector deposits at the BROU. Also, reserve requirements equal to those in effect for private commercial bank deposits were placed against the accounts of municipal governments, state enterprises, and decentralized agencies.

As of December 31, 1991, BROU listed total assets of pesos 8418 billion and total liabilities of 7556 billion, including a debt of 488 billion to the BCU, and 944 billion to foreign institutions (see Table 3). BROU showed a relatively sound solvency condition with a Debt-to-Equity ratio of 4.3:1; not of profits that have gathered but of periodical capital infusions that the Government has provided.
BROU does not classify loans by quality, and it is not possible to accurately estimate an adequate level of provisions.

Table 3
BROU: Balance Sheet for end of 1991

ASSETS	In US $	In Pesos	Total in LC
CASH AND BANKS	1412.7	393.8	3909.9
Cash	0.0	308.4	308.4
Domestic Banks & Other Dep.	525.1	68.8	1375.7
Foreign Corresp. & Other Dep. (Net)	571.6	0.0	1422.6
Reserve Requirements	126.8	16.6	332.2
International Reserves	189.2	0.0	470.9
SECURITIES	45.0	14.8	126.7
Public Enterprises	0.0	0.0	0.0
Private	45.0	14.8	126.7
NET CLAIMS ON GOVERNMENT	170.8	37.0	462.2
GROSS LOAN PORTFOLIO	1025.4	861.1	3413.3
Public Enterprises	135.2	41.6	378.2
Private	890.2	819.5	3035.1
LOAN PROVISIONS	-266.1	-223.5	-885.7
NET FIXED ASSETS	0.0	384.2	384.2
OTHER ASSETS	252.7	275.7	904.6
TOTAL ASSETS	2640.5	1743.1	8418.1
LIABILITIES			
DEPOSITS	1807.2	1338.4	5836.4
Demand	127.8	732.0	1050.1
Saving	436.7	187.3	1274.2
Time & Other	1242.7	419.1	3512.1
BORROWING REQUIREMENTS	560.9	36.4	1432.5
O/w Long-Term Foreign Liabilities	429.0	0.0	1067.8
OTHER LIABILITIES	41.1	185.0	287.4
TOTAL LIABILITIES	2409.2	1559.8	7556.3
CAPITAL	0.0	862.1	862.1
TOTAL LIABILITIES & CAPITAL	2409.2	2421.9	8418.4

11.4 11.7 10.29.0 8.1 5.9

Source: BROU Published Finacial Statements.

4.3 A Flow-of-Funds for Uruguay

Table 4 shows the FOF constructed for Uruguay for the period 1991. The sectors included in the current and capital account matrices are the Central Government, the Private Sector, the Balance of Payments, the Production Accounts, and the Monetary Sector, which includes the Central Bank, the BROU, and Other Financial Institutions. The latter represents the rest of the banking system in Uruguay. For each of the sectors, the row and columns represent the income and expenditure breakdowns respectively. The balancing item for each sector's account is saving, shown in the last row of the current account matrix. In the capital account, the investment and other uses of financing is equal to the sources of domestic and foreign financing, including own savings.

The construction is basically standard, except for the more detailed monetary system. For this reason, we will only describe the construction of the Central Government, Central Bank, and BROU accounts. The algebraic representation of the budget constraints for all sectors is shown in Appendix C, together with a description of the variables used. The sources of information for of the macro-economic data were the Boletin Estadistico, an official publication of the Central Bank of Uruguay, and the World Tables, published by the World Bank. Information of external debt was taken from the World Debt Tables, also published by the World Bank. The data for the BROU was taken from the published balance sheet report for 1991.

The Central Government

Under this heading we include only the fiscal authorities. Ideally, we would include the complete non-financial public sector. That is, all public sector except for the Central Bank and publicly-owned financial institutions. However, for convenience we are not going to use this concept in this paper. The rest of the non-financial public sector will automatically be included in the Private Sector, which is calculated as the residual.

In Table 4 we see that for 1991 the government collected 466.6 billion pesos in direct taxes (*TD*), 2,789 billion in indirect taxes (*TI*), and 377 billion in non-tax revenue (*NTR*). Additionally, it received 81 billion in the form of foreign transfers or grants (*COG*). Total fiscal revenues then amounted to 3,714 billion pesos. Of this, the government paid 315 billion to the Private Sector in the form of transfers and subsidies (*Tgp*), and 263 billion as interest payments on non-bank financing (*iB*Bgp*). The government paid only 3.6 billion to the banking sector as interest payments (*iC*CGab*), and 78.5 billion of interest payments on foreign debt (*iF*Fg*). For consistency, the estimate for government consumption, 2633.7 billion, was taken from the government accounts, and not from the national accounts, which is slightly lower.

The data for interest payments was only available as an aggregate, without the breakdown needed for our FOF system. The government interest payments reached 345.1 billion pesos in 1991. An estimate for interest paid on foreign debt was obtained from the debt stock of government foreign debt, and the implicit interest rate obtained by dividing total interest payments in 1991, from the World Debt Tables, by the total debt stock at end-of-period 1990. Interest payments on the government domestic (bank) debt was assumed at a highly subsidized interest rate, resulting in payments of 3.6 billion to BROU. The rest is considered as interest payments for non-bank debt.

Table 4

URUGUAY: MATRIX OF SOURCES AND USES OF FUNDS, 1991 (BILLION PESOS)

CURRENT ACCOUNT	*Central Government*	*Private Sector*	*Central Bank*	*Bank of the Republic*	*Other Financial Institutions*	*Balance of Payments*	*Production Account*	*Total*
Central Government		*TD* 466.6 *NTR* 377.4	*Ecb* 0.0	*Tdab* 0.0		*COG* 81.0	*TI* 2789.3 *-Sub*	3714.3
Private Sector	*Tgp* 315.3 *iB*gp* 263.0		*P&Lcb* 88.7	*P&Lab* 28.0 *iD*DPab* 1398.5 *iB*BNab* 0.0	*P&Lob* 33.9 *iD*DPob* 1361.9 *iB*BNob* 0.0	*NTfp* 0.0 *NPRfp* -120.3	*GDPfc* 16346.2	19715.2
Central Bank	*iC*CGcb* 0.0	*iC*CPcb* 0.0		*iL*LNab* 10.0	*iL*LNb* 8.9	*iREScb* -120.3		76.8
Bank of the Republic	*IC*CGab* 3.6	*iC*CPab* 1463.1 *iS*SCab* 0.0 *F&Cab* 0.0	*iR*RRab* 221.2		*iD*DBab* 0.0 *iI*INab* 0.0	*iF*DFab* 0.0 *iRESab* 22.6		1710.5
Other Banks	*iC*CGob* 0.0	*iC*CPob* 1254.9	*iR*RRob* 23.9	*iLdaob* 0.0		*iF*DFob* 133.1		1411.9
Balance of Payment	*iF*Fg* 78.5	*iF*Fp* 263.8	*iF*Fcb* 189.1	*iF*Fab* 22.9	*iF*Fob* 9.0		*IMt* 3793.4 *-XT* 4347.9	8.7
C & S Account	*Cg* 2633.7 *Sg* 420.2	*Cp* 13467.2 *Sp* 2422.2	*Scb* -446.1	*Sab* 251.1	*Sob* -1.8	*Sf* -165.5		18580.9
Total	3714.3	19715.2	76.8	1710.5	1411.9	8.7	18580.9	

Table 4 (Continued)

CAPITAL ACCOUNT	Central Government	Private Sector	Central Bank	Bank of the Republic	Other Financial Institutions	Balance of Payments	Savings Account	Total
Central Government		dBgb 192.5	dCGcb -594.8	dCGab 159.6	dCGob 185.7	dFG -20.4 KOG 0.0	Sg 420.2	342.8
Private Sector	KTgp 0.0		dCPcb 43.5 dNOAcb 58.3	dCPab 491.3 dSECab -167.2 dGFAab 216.1 dNOAab 362.6	dCPob 330.8 dNOAob 0.0	dFp 516.3 DFI 0.0 OTHKF 0.0	Sp 2422.2	4273.9
Central Bank	KPcb 0.0	dCU 431.1		dRRab 1.0	dRRob 91.7	dFcb -1321.1	Scb -446.1	-1243.4
Bank of the Republic		dDPab 1404.2 dBNab 0.0 dKPab 0.0	dLNab -199.7		dDAob -19.	dFab 74.7	Sb 251.1	1510.9
Other Banks		dDPob 108.8 dBNob 0.0 dKPob 0.0	dLNob -1.2	dDBab -296.9 dINab 0.0		dFob 935.4	Sb -1.8	744.3
Balance of Payment			dRESeb -549.5	dRESab 10.6 dDFab 723.8 dNOFA 10.7	dDFob 154.8		Sf -165.5	184.9
Investment Account	Ig 342.9	Ip 2137.2						2480.1
Total	342.9	4273.8	-1243.4	1511.6	743.6	184.9	2480.0	

Government savings in 1991 amounted to 420 billion pesos. Government investment amounted to 343 billion pesos (*Ig*), about 77 billion less than savings. In that year, the government repaid 20 billion in foreign debt (*dFg*), and it raised 193 billion in non-bank financing (*dBgp*). In 1991, the government had a net outflow of 595 billion with the Central Bank (*dCGcb*), or 3.1 percent of GDP. Also, it borrowed 160 billion from the BROU (*dCGab*), and 186 billion from the rest of the banking system (*dCGob*).

The Central Bank

Current revenues of the Central Bank consist of interest receipts on banks' credit, and interest on foreign reserves. Total revenues amounted to 76.8 billion pesos. In 1991 the Central Bank current paid 189 billion in interest payments on foreign debt (*iF*Fcb*), and 88.7 billion on expenditures on monetary regulation bills. The latter is shown in the FOF as a transfer from the Central Government to the Private Sector (*P&Lcb*). In computing interest payments on reserves, 221 billion to BROU, and 24 billion to OFI, we assumed that the Central Bank paid almost market interest rates on its reserve requirements. The net result, the quasi-fiscal deficit of the Central Bank, amounted to 446 billion pesos in 1991.

In the capital account, the liabilities of the Central Bank are composed of savings (*Scb*), the net issue of foreign debt (*dFcb*)--a net repayment of 1321 billion pesos--and the net increase in the monetary base (currency in circulation 431 billion (*dCU*), and reserve requirements 92.7 billion (*dRR*)). In order to maintain consistency for the macro-economy, the figure for currency in circulation, 431 billion, represents currency outside of the banking system, and not currency outside of the Central Bank. In 1991 the paid-in capital of the Central Bank was zero. Total change in liabilities in 1991 was -1243 billion pesos.

On the assets side, the Central Banks has a net repayments of 504.8 billion from the government (*dCGcb*), net credit to the Private Sector, mostly para-statal enterprises, of 43.5 billion (*dCPcb*), net repayments of 199 from BROU (*dLNab*), and 1.2 from OFI (*dLNob*), and a net drop in foreign exchange reserves of 549.5 billion (*dREScb*). Net other assets of the Central Bank are 58.3 billion (*dNob*).

The BROU

The only data available to us were published BROU end-of-year balance sheets. The profit and loss statement for the BROU was not available. Therefore, all the current account flows for the BROU had to be estimated. For interest payments we used last year's stocks, and current interest rates. Thus, the BROU receives 3.6 billion from government interest payments, 1463 billion in interest receipts from domestic private credits (*iC*CPab*). For simplicity, and because we did not have the information, we assumed that interest on securities is zero. Other estimated receipts of the BROU are 221 billion in receipts on reserves from the Central Bank (*iR*RRab*), and 22.6 billion on receipts on foreign deposits (*iRESab*). The latter was estimated that the BROU was paid LIBOR rates on its international reserves.

The BROU pays 28 billion in net non-interest income. This includes operating expenses and payments of taxes and dividends, minus fees & commissions and extraordinary income. The BROU pays depositors 1398.5 billion (*iD*DPab*). This includes demand, saving and time and other deposits. We

assume interest on bonds is zero. The BROU pays 10 billion to the Central Bank, based on estimated credits received from that institution. Finally, the BROU pays 22.9 billion in interest payments on its foreign debt. We assume that the BROU paid the same interest rates as the government and the private sector.

In the capital account, the flows were computed applying the methodology described in Section II. The resulting accounting flows are considerable, as a big proportion of the assets and liabilities of the BROU are issued in foreign currency. The BROU has a net flow of 1404.2 billion in total deposits (*dDPab*), which include demand, saving, and time deposits. We assume there are no bond flows and no paid-in capital changes during the period. The BROU has a net outflow of 199.7 billion to the Central Bank (*dLNab*), and 19.4 with other domestic banks (*dDAob*). Net foreign disbursements in that year amounted to 74.7 billion (*dFab*).

The financial sources of the BROU are used to provide 159.6 billion credit to the central government (*dCGab*), and 491.3 billion to the private sector (*dCPab*). We assume all credit issued are performing loans. Later on, in one of the experiments we assume an initial component of non-performing loans. There is a drop of 167.2 billion in the flow of securities (*dSECab*). Gross fixed assets increase by 216.1 billion (*dGFAab*). These include offices, land and other equipments. Net other assets increase by 362.6 billion (*dNOAab*), which includes precious metals, and art objects on sale. Reserve requirements with the Central Bank increase by only one billion (*dRRab*). The BROU reports a net receipt form other banks of 269.9 billion pesos (*dDBab*). We assume all the interbank flows are zero. The BROU increased its international reserves by 10.6 billion (*dRESab*), and 723.8 billion in other foreign deposits (*dDFab*). Net other foreign assets increased by 10.7 billion (*dNOFA*).

V. Model Simulations

The purpose of this chapter is to perform simulations that will show the user the type of questions that may be addressed within our model. We perform three representative simulations. First, we assess the effect on the BROU and the economy of two policy actions: devaluation and a subsidized loan to BROU from the Central Bank. Also, we perform a loan re-classification simulation. The first two simulations are intended to show how government policies affect not only the BROU, but the macro-economy at large. The third experiment will assess the impact on the BROU of a hypothetical increase in non-performing loans.

We start by generating a base projection path, or benchmark, against which all the experiments will be compared. The projections cover the period from 1991 to 1996. The values for 1991 are historical and will not change with the experiments. Any deviations from benchmark indicators will be explained and monitored. The benchmark projections represent our own assumptions about the Uruguayan economy. Therefore, these are arbitrary and do not reflect our judgement on the possible path in the real economy. Table 5 shows selected benchmark indicators for the macro-economy and the BROU. We will refer to these when we discuss the result of our simulations.

According to our figures, in 1992 GDP grows by 5 percent, figure compatible with preliminary estimates. After that, the economy grows at a steady 3 percent per year. We also assume that the inflation rate decreases steadily, from its value of 80 percent in 1992, to 20 percent in 1996. The assumption is made that the real exchange rate is approximately kept at its 1991 value. The real exchange rate moves from a 1.3 percent increase in 1992, to 0.4 percent in 1996. Since the profit and loss statement of the BROU was not available, the base case and projection values of all profit related indicators represent an estimate.

Simulation (1): Currency Devaluation

A nominal devaluation will have an immediate impact on most sectors in the economy. While the qualitative ramifications of a devaluation are well understood, it is difficult to foresee its quantitative impact on the real economy. Whether a devaluation is actually effective depends to a large extent on the initial state of the economy and on the accompanying macroeconomic policies. If prices are slow to adjust and for some reason the real exchange rate is initially out of line with respect to its long-run equilibrium (that is, the real exchange rate is misaligned), a nominal devaluation can be quite powerful. Under these assumptions, supplemented by appropriate policies, a nominal devaluation will result in a real devaluation and will generate an improvement in the external position of the country. However, the increase in the relative price of the intermediate input will tend to reduce aggregate output and employment.

In our devaluation experiment, we assume a 100 percent nominal devaluation in 1993, compared to 48 percent in the base case. Under the normative closure we determine both the nominal exchange rate and the domestic rate of inflation, which means that the real exchange rate is assumed to be exogenous. Inflation is assumed to reach 57.4 percent in 1993, resulting in an almost 31 percent change in the real exchange rate. In later years we assume the real exchange rate remains basically unchanged (See Table A.7 in Appendix B). The assumed size and duration of the real devaluation is arbitrary but is consistent with empirical evidence for many countries. Usually, an official nominal devaluation quickly generates a real devaluation, and is maintained only if appropriate policies are implemented. (See eg. Edwards [1988]). We assume the nominal devaluation is "successful" in that generates a real devaluation

that persists into the middle run.

Table 5
Base Case: Selected Indicators

	1991	1992	1993	1994	1995	1996
(Percentage Growth)						
GDP at Market Prices		5.0	3.0	3.0	3.0	3.0
Total Consumption		5.3	3.1	3.1	3.1	3.1
Total Investment		5.7	3.0	3.0	3.0	3.0
Exports of G&NFS		3.2	3.8	3.6	3.6	3.6
Imports of G&NFS		4.7	4.2	3.9	3.9	3.9
Inflation		80.0	51.1	34.2	24.3	20.0
Devaluation Rate		77.0	48.1	31.2	21.3	17.0
Real Exchange Rate		1.3	1.0	0.7	0.5	0.4
(As % Share of GDP)						
Budget Deficit (- Surplus)	-0.4	0.4	-3.1	-3.0	-2.7	-2.7
Operational Deficit	-0.4	-10.3	-9.6	-6.4	-4.7	-3.9
Primary Deficit	-2.2	-0.6	-4.1	-3.9	-3.6	-3.6
Inflationary Tax (Base)	3.1	2.9	1.8	1.2	0.9	0.7
QFD of Central Bank	-2.3	-2.4	-3.1	-2.3	-1.8	-1.5
Current Account Deficit	0.9	-0.8	-0.7	-0.6	-0.5	-0.5
Foreign Debt/Exports GNFS	343.7	326.8	308.8	292.1	276.0	260.6
Performance Indicators (%)						
Average Spread	3.9	0.3	0.1	0.0	-0.1	-0.1
Net Interest Margin: II-IE / TA	3.3	0.3	0.1	0.0	0.0	-0.1
NIM (US$)	1.4	0.8	0.8	0.8	0.7	0.7
NIM (LCU)	1.9	-0.5	-0.7	-0.8	-0.7	-0.7
Efficiency: NOM/Employees	1.6	0.2	0.1	0.0	-0.1	-0.1
Return on Assets (ROA): NIBT/TAA	-3.0	2.0	0.1	0.1	3.0	0.7
Leverage: 1/Capital Adequacy (times)	9.76	6.45	6.80	7.16	4.8	4.1
Return on Equity: ROA*Leverage	-29.7	13.0	0.9	0.6	13.1	2.8
Equity / Total Assets	10.2	15.5	14.7	14.0	22.7	23.7
Cash & Banks / Total Assets	46.4	40.0	38.6	37.7	43.7	44.5
Net Loans / Deposits	73.7	60.0	60.9	61.2	61.6	61.5
Reserve Req. / Total Deposits	5.7	6.6	6.6	6.6	6.6	6.6
Non-Int. Exp./Total Op. Expense	0.0	1.0	0.9	0.8	0.7	0.6

In the model, the impact of the real exchange rate on trade will depend on the size of export and import price elasticities. The price elasticities for exports and imports are assumed to be 0.1 and 0.8 respectively. Again, these are arbitrary but represent "stylized" values for developing countries. Thus, the impact of the devaluation on trade is the following: exports increase 6.8 percent, from 3.8 percent in the base case, while imports drop by 19.7 percent, compared to an increase of 4.2 percent in the base case. The net result is a surplus of 6 percent in the current account, compared to a deficit of 0.7 percent in the base case. While the volume of exports increases and imports drop in the devaluation experiment, total real GDP is left unchanged. The latter represents an assumption, since we are running the model under the normative closure (see Section III). The rationale is that the drop of imports will also affect domestic absorption, which drops by almost 2 percent, compared to an increase of 3 percent in the base case. The quasi-fiscal deficit (QFD) of the Central Bank, on the other hand, basically doubles, from 3.1 percent of GDP in the base case, to 6.1 percent in the devaluation experiment. The main reason for this is that one of the main components of the QFD is the servicing of foreign debt, accounting for about half of the deficit in 1991. The inflationary tax slightly increases to 2 percent of GDP, compared to 1.8 percentage in the base case.

The impact of a devaluation on any bank will depend on its asset-liability exposure in foreign currency. As we have discussed in previous sections, a devaluation of the exchange rate will result in an increase in net foreign liabilities (assets), but will not imply an immediate disbursement (payment) until the debt is serviced. Thus, while capital gains or losses are part of true income, they will be reflected only as they are realized. In principle, the accounting flows of the bank should capture only the accrued capital gains or losses arising from converting stocks of assets and liabilities denominated in a foreign currency to local currency. The sign of the accounting flows may be positive or negative, depending on the value of net foreign assets.

The impact of a devaluation on the profitability of a bank also depends on many factors. In the case of the BROU, it is important to distinguish revenues and expenditures denominated in dual currency. In our model, as we discussed in Section III, the domestic base interest rates are affected by the rate of devaluation. An increase in the exchange rate will therefore increase domestic interest rates, but without affecting the spreads. If the bank has a negative net interest income, in the short-term a devaluation will reduce it even more. Net interest income in dollars should not be immediately affected by a devaluation. Its value in local currency, nevertheless, will increase in proportion to the devaluation. On the other hand, assets will also increase, depending on its foreign exchange component. Thus, the net interest margin, defined as the ratio of net interest income to total assets, may increase or decrease depending on the relative effect of these changes.

Throughout the projection period, the BROU's dollar denominated total assets exceed dollar denominated liabilities. In the model, dollar denominated assets grow with GDP expressed in dollars. For dollar deposits, we assume an equivalent money velocity equation, similar to the one we use to compute money demand for local currency. Foreign liabilities are assumed to grow exogenously. Thus, a real devaluation will initially reduce net foreign assets, but they will be positive throughout the period. A devaluation should then result in increased profits for the BROU. In 1993, however, the year of the devaluation, BROU's profits actually **drop**. We now describe the cause of this drop.

In the base case, the net interest margin (NIM) of the BROU, defined as net interest revenue divided by assets, has a value of 0.1 in 1993. The dollar NIM, that is the NIM for dollar-denominated assets and liabilities, is equal to 0.8 in the same year, while it is -0.7 for peso-denominated revenues. Adding the two results in the 0.1 overall NIM observed in the base case. After devaluing the currency,

the NIM drops to -0.3 in 1993. The dollar NIM remains basically at the base value of 0.8--this because four fifths of assets are dollar-denominated--while the peso NIM drops to -1.1. The drop in the peso NIM is a direct result in the uniform increase in domestic interest rates.

Nevertheless, as expected, BROU's profits increase substantially in later years. Even though the dollar NIM decreases, the drop is more than compensated by an increase in the peso NIM. The main reason for the increase in the NIM is the revenues from the interbank account. After the devaluation, the BROU uses its "surplus" in peso assets for interbank credit, which is residual in our model. In a more realistic scenario, the analyst may decide to use the assets in more profitable or just different investments. Our model, however, captures all the important trade-offs associated with a devaluation

Simulation (2); Subsidized Loan from Central Bank

The objective of this experiment is to assess the macro-economic repercussions of efforts to increase the profitability of the BROU through a hypothetical subsidized loan. We want to show how is that our model allows us to capture the economic cost of bailing-out inefficient financial institutions. By making this link more transparent, we may be able to factor in the costs that are usually not directly associated with this kind of operation. In the experiment we assume that in 1992 the BROU receives a one-time 2,000 billion peso loan from the Central Bank. The loan is assumed by the BROU at a subsidized interest rate. We assume that the interest spreads on the loan are negative, having values of -15 percent in 1993, when inflation is higher, and -10 percent in 1994 and thereafter. For purposes of the simulation, the assumption is made that to finance the loan the Central Bank just prints more money.

As expected, the profitability of the BROU increases. In 1993, one year after the loan, the NIM increases to 1.2, compared to 0.1 in the base, and stays above base case values thereafter. The average spreads also increase with respect to the base case. However, the improvement in performance has its costs for the economy at large. In order to pay for the loan, the Central Bank has to print more money, which has an immediacy inflationary impact in our model. Inflation in 1992 increases to 242 percent, compared to 80 percent in the base case. Inflation comes down after the initial shock, but it recovers to its base year values after 1994.

In order to avoid a re-valuation of the exchange rate, we assume a nominal devaluation of 239 percent in 1992, the year of the inflationary shock. As a result, the Quasi-Fiscal deficit of the Central Bank increases to 3.5 percent of GDP in 1992, compared to 2.4 percent in the base case, although it improves later. The overall government deficit increases slightly in 1992, to 0.7 percent of GDP, compared to 0.4 percent of GDP in the base case. The revenues, then, to pay for the loan are raised through an inflationary tax (defined as the rate of inflation applied to the monetary base). In 1992, the inflationary tax reached 8.7 percent of GDP, compared to 2.9 percent in the base. The cost of the loan is then passed to the population at large.

Simulation (3): Loan Classification

Loans classified as lost and non-performing do not yield any income in the projections. Consequently, solid view of the income-earning power of the bank's assets, particularly the loan and investment portfolio becomes essential. To recognize the lack of performing capacity of loans and other investments with problem borrowers, the criteria used for assessing asset quality has to be rigorous, and the assessment process done by qualified independent professionals. In the banks the criteria to estimate

the recovery and income generation potential of problem loans is usually a management decision.

Nevertheless, if any doubts exist on the accuracy of the estimation, the model includes features that allow for strengthening loan classification, and provisioning and interest suspension effect, in a compatible way with conservative regulatory standards. BROU, as a state bank, has large a amount of loans to other financial or non-financial public entities. If we estimate that a certain percentage of the BROU's loan portfolio is non-performing and suspend interest on it, the bank's equity gets washed out. We can clearly differentiate and quantify the negative effect of this action on the estimated minimum average yield on interest earning assets, on the estimated profitability indicated by net interest margin, and on return on equity and return on assets.

In our loan classification experiment we, arbitrarily, classify 30 percent of the loan portfolio as non-performing in 1992, compared to none in the base case. This is done purely for hypothetical purposes and in no way reflects on the soundness of BROU's assets. Net interest margin, which indicates profitability, becomes negative for all the projected years. Return on asset falls from 2 percent down to negative 0.1 percent and the return on equity plunges even further from a positive thirteen percent in the base year. The estimated efficiency indicators also go down. Ratio of total operating income to total assets fall from 7 percent down to nearly 4 percent at the end of the projected period.

VI. Conclusions

In this paper we described the development of a simulation model which allows the user to examine in detail the interaction between a financial system and its economic environment. The model allows the user to compute and project indicators that are necessary to monitor the performance of a financial institution, and to examine how these indicators change in response to changes in the macro-environment. The model should be useful to financial analysts that need to plan and forecast for growth and profits of a financial institution, or a group of them, and that are interested in capturing the linkages with the macro-economy in a fully consistent framework. It should also be valuable to economists interested in assessing the viability of the financial system, and in particular in assessing the impact of financial restructuring. When major financial restructuring is involved, model simulations can help policy makers and supervisors to quantify the impact. The approach in this paper may be applied to most countries and different financial institutions with minor modifications. The model which is implemented in Javelin has been designed to be used as a "template" that can be adapted to a particular country. The model may be used as an independent financial analysis model in which the user examines the performance of a bank, but without necessarily being "connected" to the macro-economy. Other option is to use the model as a macro-economic framework without a very detailed monetary system.

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Table A.1
Consolidated Monetary Sector

I. **Current Account**

INTEREST RECEIPTS

- Government Credit
- Domestic Private Credit
- Public Enterprise Credit
- Net Foreign Assets

INTEREST EXPENDITURES

- Long-Term Foreign Debt
- Deposits
- Bonds & Other

DISTRIBUTED NET PROFITS & OTHER NET

NET CASH FLOW

II. **Capital Account**

ASSETS

- Net Foreign Assets
- Net Domestic Credit
  - Net Claims on Private Sector
  - Net Claims on Public Enterprises
  - Net Claims on Central Government
- Net Other Assets

LIABILITIES

- Money Stock
  - Currency in Circulation
  - Demand Deposits
  - Savings & Time Deposits
- Long-Term Foreign Liabilities
- Bonds & Notes

EQUITY

- Paid-In Capital
- Net Worth

Table A.2
Central Bank Accounts

I. Current Account

INTEREST INCOME

Interest on Loans
Non-Financial Public Enterprises
Treasury
Domestic Banks
Foreign Exchange Reserves

INTEREST EXPENSE

Reserve Requirements
Foreign Liabilities

OPERATING EXPENSES

Excess Fiscal Earnings

Net Worth

II. Capital Account

ASSETS

Credit to Treasury (Net)
Interbank Net Accounts
Net Credit to SOEs
Foreign Exchange Reserves
Net Other Assets

LIABILITIES

Long-Term Foreign Capital
Currency in Circulation
Reserve Requirements

CAPITAL

Paid-In Capital
Retained Earnings
Revaluation Account

Table A.3
Analysis Banks : Profit & Loss Account

INTEREST INCOME
Central Bank (Reserve Requirements)
Deposits on Banks
Foreign Banks
International Reserves
Portfolio of Loans
Non-Financial Public Sector
Private
Government
Securities
Non-Financial Public Sector
Private
Interbank Account (Net)

INTEREST EXPENSE
Deposits (Sight, Savings & Time Dep.)
Central Bank
Other Domestic Banks
Bonds & Notes
Long-Term Foreign Borrowing

FEES & COMMISSIONS
Letters of Credit
Client Guarantees & Other

NET OPERATING INCOME

OTHER EXPENDITURE
Compensation
Depreciation

NET OPERATING MARGIN

Net Extraordinary Income
Provisions (Loans, Securities, Cash)

NET INCOME BEFORE TAXES

Income Taxes

NET INCOME AFTER TAXES

Dividends

NET INCOME (CASH FLOW = NET INC. + DEPRECIATION + PROVISIONS)

Table A.4
Analysis Banks : Balance Sheet (Assets)

CASH AND BANKS
Cash
Reserve Requirements
Domestic Banks & Other Domestic Deposits
Foreign Correspondent Banks
Other Foreign Deposits (Net)
International Reserves
Net Interbank Account

SECURITIES
Non-Financial Public Enterprises
Private

NET CLAIMS ON CENTRAL GOVERNMENT

GROSS LOAN PORTFOLIO
Non-Financial Public Enterprises
Performing
Non-Performing
Lost
Private
Performing
Non-Performing
Lost

LOAN PROVISIONS (-)
Non-Financial Public Enterprises
Performing
Non-Performing
Lost
Private
Performing
Non-Performing
Lost

NET FIXED ASSETS
Gross Fixed Assets
(-) Depreciation

OTHER DOMESTIC ASSETS

OTHER FOREIGN ASSETS

Table A.5
Analysis Banks : Balance Sheet (Liabilities)

DEPOSITS
Demand
Savings
Time & Other

BORROWING REQUIREMENTS
Central Bank (Red. & Other)
Domestic Banks
Long-Term Foreign Liab. & Other Fund.
Bonds & Notes

OTHER LIABILITIES
Provisioning for Securities
Non-Financial Public Sector
Private
Other

CAPITAL
Paid-in Capital
Retained Earnings
Revaluation

OFF-BALANCE SHEET ITEMS
Letters of Credit
Documentary
Non-Documentary
Client Guarantees
Other

Memo Items

Personnel
Number of Branches

Table A.6
Analysis Banks : Performance Indicators

(i) Profit & Loss Structure (As % of Total Interest & Other Income)

Interest Income
Other Net Income
Interest Expense
Non-Interest Expense
Net Operating Margin (NOM)
Net Provision Effort
Taxes Paid
Dividends Paid

(ii) Spread Indicators (As % of Earning Assets)

Average Yield
Average Cost
Average Spread

(iii) Profitability

Net Margin: Net Income Before Taxes (NIBT) / Total Gross Income (TGI)
Efficiency: TGI / Total Average Assets (TAA)
Return on Assets (ROA): NIBT / TAA
Leverage: 1 / Capital Adequacy
Return on Equity: ROA * Leverage

(iv) Capital Adequacy Indicators

Equity / Total Assets
Equity /(Total Ass. + Off Bal. Sheet)
Equity/Weighted Risks

(v) Liquidity Indicators

Net Loans/ Deposits
Reserve Req. / Total Deposits
Fixed Assets + Investments / Capital
Rediscounts / Gross Loans

Table A.6 (Cont'd)
Analysis Banks : Performance Indicators

(vi) Efficiency Indicators

NOM / Employees
Total Assets + OBS / Branches
Total Assets + OBS / Employees

(vii) Credit Quality Indicators

Classified Loans / Total Loans
Specific Provision / Classified Loans

Table B.1
Simulation (1): Currency Devaluation

	1991	1992	1993	1994	1995	1996
(Percentage Growth)						
GDP at Market Prices		5.0	3.0	3.0	3.0	3.0
Total Consumption		5.3	-3.3	3.7	3.1	3.0
Total Investment		5.7	3.0	3.0	3.0	3.0
Exports of G&NFS		3.2	6.8	3.2	3.5	3.6
Imports of G&NFS		4.7	-19.7	6.8	4.5	3.9
Inflation		80.0	57.4	39.2	25.2	20.0
Devaluation Rate		77.0	100.0	31.2	21.3	17.0
Real Exchange Rate		1.3	30.9	-2.9	-0.2	0.4
(% Share of GDP)						
Budget Deficit (- Surplus)	0.4	-0.4	12.1	11.4	10.4	10.4
Operational Deficit	-0.4	-10.3	-19.1	-13.8	-10.1	-8.9
Primary Deficit	-2.2	-0.6	-13.4	-12.6	-11.5	-11.5
Inflationary Tax (Base)	0.0	2.9	2.0	1.4	0.9	0.7
QFD of Central Bank	-2.3	-2.4	-6.3	-2.8	-2.2	-1.9
Current Account Deficit	0.9	-0.8	6.0	5.8	6.3	6.9
Foreign Debt/Exports GNFS	343.7	326.8	277.5	241.4	205.4	169.6
Performance Indicators (%)						
Average Spread	3.9	0.3	-0.3	5.9	4.2	4.1
Net Interest Margin: II-IE / TA	3.3	0.2	-0.3	4.7	2.9	2.8
NIM (US$)	1.4	0.7	0.8	-0.5	-0.3	-0.3
NIM (LCU)	1.9	-0.4	-1.1	5.2	3.3	3.2
Efficiency: NOM/Employees	1.6	0.2	0.1	0.0	-0.1	-0.1
Return on Assets (ROA): NIBT/TAA	-3.0	2.0	-0.2	3.3	2.7	2.5
Leverage: 1/Capital Adequacy (times)	9.76	6.63	7.83	7.30	3.83	3.62
Return on Equity: ROA*Leverage	-29.7	11.8	0.8	10.6	18.3	4.0
Equity / Total Assets	10.2	15.8	12.8	13.7	26.1	27.6
Cash & Banks / Total Assets	46.4	41.3	49.3	47.8	54.8	54.7
Net Loans / Deposits	73.7	59.6	49.1	51.1	51.7	52.5
Reserve Req. / Total Deposits	5.7	6.5	6.5	6.5	6.5	6.5
Non-Int. Exp./Total Op. Expense	0.0	1.0	0.6	0.7	0.6	0.5

Table B.2
Simulation (2): Subsidized Loan from Central Bank

	1991	1992	1993	1994	1995	1996
(Percentage Growth)						
GDP at Market Prices		5.0	3.0	3.0	3.0	3.0
Total Consumption		5.3	3.1	3.1	3.1	3.1
Total Investment		5.7	3.0	3.0	3.0	3.0
Exports of G&NFS		3.2	3.8	3.6	3.6	3.6
Imports of G&NFS		4.7	4.2	3.9	3.9	3.9
Inflation		242.2	26.9	-16.0	24.3	20.0
Devaluation Rate		239.2	23.9	-19.0	21.3	17.0
Real Exchange Rate		2.1	0.6	-0.7	0.5	0.4
(% Share of GDP)						
Budget Deficit (- Surplus)	-0.4	-0.7	2.8	0.2	2.7	2.6
Operational Deficit	-0.4	-16.3	-6.5	2.3	-5.0	-4.1
Primary Deficit	-2.2	-0.4	-3.9	-1.1	-5.0	-4.1
Inflationary Tax (Base)	0.0	8.7	0.9	-0.6	0.9	0.7
QFD of Central Bank	-2.3	-3.5	-2.0	0.8	-1.8	-1.5
Current Account Deficit	2.9	2.6	2.6	2.5	2.5	2.5
Foreign Debt/Exports GNFS	343.7	326.8	308.8	292.1	276.0	260.6
Performance Indicators (%)						
Average Spread	3.9	0.0	1.6	1.1	1.0	0.9
Net Interest Margin: II-IE / TA	3.3	0.0	1.2	0.9	0.7	0.6
NIM (US$)	1.4	0.8	0.9	0.7	0.7	0.7
NIM (LCU)	1.9	-0.8	0.3	0.2	0.0	-0.1
Efficiency: NOM/Employees	1.6	5.8	3.6	1.0	2.6	2.2
Return on Assets (ROA): NIBT/TAA	-3.0	2.3	0.3	0.3	0.3	0.8
Leverage: 1/Capital Adequacy (times)	9.76	7.4	6.82	6.75	4.26	4.0
Return on Equity: ROA*Leverage	-29.7	17.4	1.9	2.1	12.6	3.3
Equity / Total Assets	10.2	13.4	14.7	14.8	23.4	24.8
Cash & Banks / Total Assets	46.4	45.1	37.0	42.1	47.0	44.4
Net Loans / Deposits	73.7	56.5	67.8	61.5	61.9	61.8
Reserve Req. / Total Deposits	5.7	6.8	6.5	6.6	6.6	6.6
Non-Int. Exp./Total Op. Expense	0.0	1.1	0.5	-1.3	0.6	0.6

Table B.3
Simulation (3): Loan Classification

	1991	1992	1993	1994	1995	1996
(Percentage Growth)						
GDP at Market Prices		5.0	3.0	3.0	3.0	3.0
Total Consumption		5.3	3.1	3.1	3.1	3.1
Total Investment		5.7	3.0	3.0	3.0	3.0
Exports of G&NFS		3.2	3.8	3.6	3.6	3.6
Imports of G&NFS		4.7	4.2	3.9	3.9	3.9
Inflation		80.0	51.1	34.2	24.3	20.0
Devaluation Rate		77.0	48.1	31.2	21.3	17.0
Real Exchange Rate		1.3	1.0	0.7	0.5	0.4
(% Share of GDP)						
Budget Deficit (- Surplus)	-0.4	0.4	-3.1	-3.0	-2.7	-2.7
Operational Deficit	-0.4	-10.3	-9.6	-6.4	-4.7	-3.9
Primary Deficit	-2.2	-0.6	-4.1	-3.9	-3.6	-3.6
Inflationary Tax (Base)	3.1	2.9	1.8	1.2	0.9	0.7
QFD of Central Bank	-2.3	-2.4	-3.1	-2.3	-1.8	-1.5
Current Account Deficit	0.9	-0.8	-0.7	-0.6	-0.5	-0.5
Foreign Debt/Exports GNFS	343.7	326.8	308.8	292.1	276.0	260.6
Performance Indicators (%)						
Average Spread	3.9	-2.5	-4.2	-5.1	-5.5	-6.1
Net Interest Margin: II-IE / TA	3.3	-2.1	-3.4	-4.1	-3.9	-4.1
NIM (US$)	1.4	0.2	0.2	0.1	0.1	0.1
NIM (LCU)	1.9	-2.3	-3.5	-4.2	-3.9	-4.2
Efficiency: NOM/Emp'[illegible]	1.6	-2.1	-4.1	-6.0	-7.3	-9.0
Return on Assets (ROA). [illegible]/TAA	-3.0	-0.1	-1.1	-1.2	2.1	-0.5
Leverage: 1/Capital Adequacy (times)	9.76	11.1	17.94	48.56	8.89	9.40
Return on Equity: ROA*Leverage	-29.7	-1.6	-19.4	-59.4	19.1	-4.4
Equity / Total Assets	10.2	9.0	5.6	2.1	11.2	10.6
Cash & Banks / Total Assets	46.4	40.7	37.6	34.9	40.6	40.3
Net Loans / Deposits	73.7	67.5	68.5	68.9	69.4	69.3
Reserve Req. / Total Deposits	5.7	6.6	6.6	6.6	6.6	6.6
Non-Int. Exp./Total Op. Expense	0.0	1.0	0.9	0.8	0.7	0.6

I. Public Sector

Current Account

$$DT + TI + NTR + E\cdot\overline{COG}^{*} - \overline{SUB} + \bar{T}_{fg} = \bar{T}_{gf} + \bar{T}_{gp} + \bar{i}_{B}\cdot B_{g-1} + \bar{i}_{C}\cdot CR_{g-1} + i^{*}\cdot E\cdot F^{*}_{g-1} + p_{C}\cdot C_{g} + S_{g} \quad (5)$$

Capital Account

$$E\cdot\overline{KOG}^{*} + \Delta CR_{g} + \Delta B_{g} + E\cdot\Delta F^{*}_{g} + S_{g} = p_{I}\cdot I_{g} + \overline{KT}_{gp} + \overline{KT}_{gm} \quad (6)$$

II. Private Sector (Including Public Ent.)

Current Account

$$Y_{fc} + \bar{T}_{gp} + E\cdot(\bar{T}^{*}_{fp} + \overline{PR}^{*}_{fp} + \overline{WR}^{*}) + \bar{i}_{B}\cdot B_{g-1} + \overline{P\&L}_{m} + \bar{i}_{D}\cdot DD_{p-1} + \bar{i}_{T}\cdot TD_{p-1} = DT + NTR + \bar{i}_{L}\cdot LN_{p-1} + \bar{i}_{C}\cdot CR_{P-1} + E\cdot(i^{*}\cdot F^{*}_{P-1} + \overline{PR}^{*}_{pf} + \bar{T}^{*}_{pf}) + p_{C}\cdot C_{p} + S_{p} \quad (7)$$

Capital Account

$$E\cdot\Delta F^{*}_{p} + E\cdot\Delta\overline{DFI}^{*} + \Delta LN_{p} + \Delta CR_{p} + \overline{KT}_{gp} + S_{p} = p_{I}\cdot I_{p} + \Delta B_{g} + \Delta CU_{p} + \Delta DD_{p} + \Delta TD_{p} \quad (8)$$

III. Central Bank

Current Account

$$\bar{i}_{C}\cdot CR_{g-1} + \bar{i}_{L}\cdot LN_{p-1} + \bar{i}_{L}\cdot LN_{b-1} + E\cdot\bar{i}^{*}_{R}\cdot R^{*}_{m-1} = E\cdot i^{*}\cdot F^{*}_{m-1} + \overline{P\&L}_{CB} + \Delta NW_{CB} \quad (9)$$

Capital Account

$$\Delta CR_{g} + \Delta LN_{p} + \Delta LN_{b} + \Delta VAC_{g} = E\cdot(\Delta F^{*}_{m} - \Delta R^{*}_{m}) + \Delta CU_{p} + \Delta RR + \Delta DEP_{g} + \overline{KT}_{gm} + \Delta NW_{CB} \quad (10)$$

IV. **Commercial Banks**

Current Account

$$\bar{i}_C \cdot CR_{p-1} = \bar{i}_L LN_{b-1} + \bar{i}_D \cdot DD_{p-1} + \bar{i}_T \cdot TD_{P-1} + \overline{P\&L}_{PB} + \Delta NW_{PB} \tag{11}$$

Capital Account

$$\Delta CR_p + \Delta RR = \Delta LN_b + \Delta DD_p + \Delta TD_p + \Delta NW_{PB} \tag{12}$$

IV. **Foreign Sector**

Current Account

$$\begin{aligned} p_{IM} \cdot IM - p_X \cdot X + E \cdot (i^* \cdot F^*_{t-1} + \overline{PR}^*_{pf} + \bar{T}^*_{gf} + \bar{T}^*_{pf}) \\ = E \cdot (\bar{i}^*_R \cdot R^*_{m-1} + \overline{PR}^*_{FP} + \bar{T}^*_{fp} + \bar{T}^*_{fg} + \overline{WR}^* + \overline{COG}^*) + S_f \end{aligned} \tag{13}$$

Capital Account

$$E \cdot \Delta R^*_m + S_f = E \cdot \overline{KOG}^* + E \cdot \Delta \overline{DFI}^* + E \cdot \Delta F^*_t \tag{14}$$

V. **Equilibrium Conditions** :

$$\Delta M = \Delta CU_p + \Delta DD_p + \Delta TD_p$$

$$\Delta F_t^* = \Delta F_p^* + \Delta F_g^* + \Delta F_m^*$$

$$\Delta CR_t = \Delta CR_p + \Delta CR_g$$

$$p \cdot Y = p_C \cdot (C_p + C_g) + p_I \cdot (I_p + I_g) + p_X \cdot X - p_{IM} \cdot IM \qquad (9)$$

$$Y = C_p + C_g + I_p + I_g + X - IM$$

$$Y_{fc} = p \cdot Y - TI + \overline{SUB}$$

$$p_I \cdot I_t = S_g + S_p + S_f + S_m = p_I \cdot (I_p + I_g)$$

Indirect Tax Detail:

$$TI = XT + MT + OTI$$

Where Export Taxes:

$$XT = \sum_i p_{X_i} \cdot X_i \cdot tx_i$$

Import Taxes:

$$MT = \sum_{nf} p_{IM_{nf}} \cdot IM_{nf} \cdot tm_{nf} + \sum_{nf} (1 + tm_{nf}) \cdot p_{IM_{nf}} \cdot IM_{nf} \cdot tvad + te_{fl} TON_{fl} + p_{IM_c} \cdot IM_c \cdot tc_c$$

Other Indirect Taxes:

$$OTI = \gamma_{OTI} \cdot p \cdot Y$$

VI. **Behavioral Equations. (Variables or parameters with a "hat" (^) denote growth rates):**

$$\hat{Y} = \frac{Y_t}{Y_{t-1}} - 1 = \beta_t \cdot \left(\frac{I_{t-1}}{Y_{t-1}}\right)$$

$$C_p = \frac{c_p \cdot Y_d}{p}$$

$$\hat{X} = \epsilon_X \cdot \hat{q}_X + \rho_X \cdot \hat{Y}^*$$

$$\nu \cdot M = p_e \cdot Y$$

$$F_m^* = \frac{\theta_m \cdot Y_t}{E_e} \qquad (20)$$

$$DT = \gamma_{DT} \cdot Y_{fc}$$

$$TI = \gamma_{TI} \cdot p \cdot Y$$

$$NTR = \gamma_{NTR} \cdot p \cdot Y$$

$$DD_p = \psi_{DD} \cdot M$$

$$TD_p = \psi_{TD} \cdot M$$

$$CU_p = \psi_{CU} \cdot M$$

Where, household disposable income:

$$Y_d = Y_{fc} + \bar{T}_{gp} + E \cdot (\bar{T}_{fp}^* - \bar{T}_{pf}^* + \overline{WR}^*) + \bar{i}_B \cdot B_{g-1} + \overline{P\&L}_n + \bar{i}_D \cdot DD_{p-1} + \bar{i}_T \cdot TD_{p-1} - DT - NTR - \bar{i}_C \cdot CR_{p-1} - E \cdot (i^* \cdot F_{p-1}^* - \overline{PR}_{pf}^* + \overline{PR}_{fp}^*) \qquad (21)$$

Import, export real exchange rates:

$$q_M = \frac{\bar{p}_{IM}^* \cdot E}{p} \quad , \quad q_X = \frac{\bar{p}_X^* \cdot E}{p} \qquad (22)$$

ICOR:

$$ICOR_t = \frac{I_{t-1}}{Y_t - Y_{t-1}} = \frac{1}{\beta_t} \qquad (23)$$

VII. Closure Equations :

Normative Model:

$$p_c = \bar{p}_c \quad \text{Target GDP Deflator}$$

$$Y = \bar{Y} \quad \text{Target GDP Growth}$$

$$E = \bar{E} \quad \text{Exchange Rate Policy}$$

$$CR_p = \overline{CR}_p \quad \text{Private Credit Rationing} \qquad (24)$$

$$F_g^* = \theta_g \cdot \frac{Y}{E_c} \quad \text{Government Foreign Borrowing}$$

$$I_p = \sigma_p \cdot Y \quad \text{Private Investment}$$

$$\hat{IM} = \epsilon_M \cdot \hat{q}_M + \rho_M \cdot \hat{Y} \quad \text{Import Growth}$$

Positive Model:

$$M = \bar{M} \quad \text{Target Money Supply}$$

$$E = \bar{E} \quad \text{Exchange Rate Policy}$$

$$F_t^* = \bar{F}_t^* \quad \text{Foreign Borrowing Constraint}$$

$$\Delta B_g = \Delta \bar{B}_g \quad \text{Targeted Government Bonds} \qquad (25)$$

$$F_p^* = \theta_p \cdot \frac{Y}{E_c} \quad \text{Private Foreign Borrowing}$$

$$C_g = c_g \cdot Y \quad \text{Government Consumption}$$

$$I_g = \sigma_g \cdot Y \quad \text{Government Investment}$$

VIII. Price and Interest Rate Equations :

$$p = \frac{1}{2}\cdot(p_t + p_{t-1})$$

$$p_I = (1-\lambda)\cdot p + \lambda\cdot p_{IM}$$

$$p_{IM} = E\cdot\bar{p}^{*}_{IM} \quad , \quad p_X = E\cdot\bar{p}^{*}_{X}$$

$$p_C = \frac{(p\cdot Y + p_{IM}\cdot IM - p_I\cdot I_t - p_X\cdot X)}{C_p + C_g} \qquad (26)$$

$$i^{*} = \frac{(\bar{i}_{id}\cdot F^{*}_{id-1} + \bar{i}^{MC}_{n}\cdot(F^{*}_{t-1} - F^{*}_{id-1}))}{F^{*}_{t-1}}$$

$$E = \frac{1}{2}\cdot(E_t + E_{t-1})$$

IX. **Stocks and Flows Accounting**:

$$TD_p = TD_{p-1} + \Delta TD_p$$

$$DD_p = DD_{p-1} + \Delta DD_p$$

$$CU_p = CU_{p-1} + \Delta CU_P$$

$$CR_i = CR_{i-1} + \Delta CR_i \quad , \quad i = t,g,p$$

$$F_i = F_{i-1} + \Delta F_i \quad , \quad i = t,g,p,m$$

$$R_m = R_{m-1} + \Delta R_m$$

Variable Definitions:

Variables with an asterisk are defined in US$. All the variables are expressed in local currency at current prices except otherwise specified. Variables with bars are, in general, exogenous. The subscripts g,p,f, and m refer to the government, private, foreign, and monetary sectors respectively, and the order specifies the flow of funds (eg. pf is private to foreign). The time subscripts are denoted as t-1 or -1.

B_g	Bonds
C	Consumption (constant prices)
COG^*	Current Official Grants
CR	Credit from the monetary sector
CU_p	Currency in circulation
DD_p	Demand deposits
DFI^*	Direct foreign investment
DT	Direct taxes
E	Average exchange rate
E_e	End-of-period exchange rate
F^*	Foreign credit
I	Investment (constant prices)
i^*	Nominal foreign interest rate on foreign credit
i_R^*	Nominal foreign interest rate on reserves
i_C	Nominal interest rate on monetary sector credit
i_D	Nominal interest rate on demand deposits
i_T	Nominal interest rate on time deposits
IM	Imports (constant prices)
KOG^*	Capital official grants
KT	Capital transfers
LN	Credit From Central Bank
M	Money
NTR	Non-tax revenue

p	Average GDP Deflator
$p_{C,I}$	Consumption-Investment Deflator
p_e	End-of-period GDP Deflator
$p_{IM,X}$	Import (export) price index
$P\&L_m$	Distributed profits of monetary sector
PR^*	Profit remittances to-from abroad
R^*	Foreign reserves
S	Savings
SUB	Subsidies
T	Current transfers
TD_p	Time deposits
TI	Indirect taxes
WR^*	Workers' remittances from abroad
X	Exports
Y	GDP at market prices
Y^*	Income main trading partners
Y_{fc}	GDP at factor cost

Parameter Definitions:

β	Incremental output-capital ratio (inverse ICOR)
δ	Depreciation rate
v	Money velocity
c	Consumption propensity
σ	Investment propensity
θ	Borrowing propensity
λ	Import component in gross investment
$\epsilon_{X,M}$	Export (import) demand RER elasticity
$\rho_{X,M}$	Export (import) demand income elasticity
γ_{TD}	Average direct tax rate
γ_{TI}	Average indirect tax rate
γ_{NTR}	Average non-tax rate
ψ_{DD}	Share of Demand deposits
ψ_{TD}	Share of Time deposits
ψ_{CU}	Share of Currency-in-circulation
$\bar{P}^{*}_{X,M}$	Export (import) world price index

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