THE PRIVATIZATION PROCESS: 
A SYSTEM DYNAMICS MODEL FOR BRAZIL

by

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ABSTRACT

Privatization is a term that has been used to refer to the process
whereby state-owned enterprises (SOEs) and operations are transferred to the
private sector. The benefits associated with privatization are appealing to
developing countries facing escalating budget deficits, increased bureaucracy
and decreased credibility from the private sector and population. Despite the
long historical dominance of state-owned enterprises in Brazil, privatization
represents an opportunity for the country to modernize and effectively prepare
for the increased global competition.

The currently available literature and research on privatization have
qualitatively addressed the topic in a static and transaction-focused manner.
However, privatization is a dynamic process and should be addressed
dynamically. Unlike previous research, the thesis quantifies the main sectors,
key relationships and variable behaviors involved in the Brazilian privatization
program. Through the development of a basic system dynamics model, a
deeper understanding of how public enterprises can be efficiently transferred to
the private sector is gained.

The results of this thesis are based on twenty-year simulations divided
into historical (1981-1993) and projected (1994-2000) components of the
privatization process in Brazil. This division allows for the validation of the
behavioral assumptions used in the historical component lending greater
validity to the projected component results. Based on the simulation of several
possible scenarios, the model forecasts when the privatization program is
expected to succeed by measuring the magnitude and direction of alignment
among the sectors involved in privatization. Through sensitivity analysis, the
applicability of this model can be extended in future research to include
privatization scenarios of other countries and regions.

Thesis Supervisor: Professor Donald R. Lessard
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1. INTRODUCTION

With the successful privatizations in the United Kingdom and Chile, the appeal and necessity for privatization have increased throughout the world; the fall of communism and the collapse of centrally planned economies have enhanced this appeal. As a result, the transition to market economies through privatizations is expected to become more frequent in the 1990's and beyond. With the total value of assets to be privatized over the next years worth over US$500 billion, politicians, economists and the population alike are increasingly focusing their attention on the cost and benefits of privatization.

In Brazil, where the state-owned enterprises (SOEs) have long been the dominant factor in the local economy, the privatization effort represents a major change to the country's economy, culture and history. While there exist many obstacles to privatization in Brazil, the effort represents an opportunity to revive the Brazilian economy by reducing its hyperinflation, growing external and internal debt and lack of credibility thereby effectively preparing the country for the increasingly global competition.

The currently available literature and research on privatization generally do not address the privatization of state-owned enterprises as a dynamic process. Current research typically exemplified by the World Bank model described in section 2.4 has been focused primarily on static, transaction-based and qualitative descriptions of privatization limited to a specific industry or time period. This static approach restricts their applicability to other cases. Privatization is a dynamic process and should be treated dynamically.
This thesis develops a basic system dynamics model of the privatization process. Based on the Brazilian Privatization Program, the model quantifies dynamically the key sectors, the main infrastructures and the supporting behaviors encountered in privatization. A dynamic modeling approach entails fundamental changes in the understanding of how government institutions and activities are replaced by the private sector [HUM].

Based on twenty-year simulation runs of three different scenarios, the thesis addresses a major obstacle encountered in privatization: the misalignment of the different sectors' goals; section 3.2 analyzes the effect of different SOE ownership structures on alignment goals [SHL]. Essentially, the challenge is not to reestablish antiquated and inefficient regulatory systems; the challenge is to construct new systems which can achieve the necessary congruence among the objectives and goals, often contradictory, of the key players in the different sectors involved in privatization [BON].

The results derived from the twenty-year simulation are divided into historical (1981-1993) and projected (1994-2000) components. This division allows for the validation of the behavioral assumptions used in the historical component lending greater validity to the results in the sensitivity analyses. Through sensitivity analysis, different scenarios can be tested to minimize the sectors' alignment. Minimizing this function leads to a more aligned process for privatizing state-owned enterprises in Brazil and other countries.

The results from this thesis should be of interest to governments, public and private sector enterprises, foreign and domestic investors, labor and academic institutions and students who want to understand the applicability of
system dynamics to issues that have been traditionally analyzed using static methods. This thesis contains eight chapters. Chapter 1 provides an introduction, Chapter 2 discusses the background to the privatization process including the static approach currently used, Chapter 3 describes the system dynamics modeling approach to privatization, Chapter 4 analyzes the model's base case scenario, Chapter 5 analyzes two alternate scenarios, Chapter 6 provides the conclusion to the thesis, Chapter 7 contains the appendices including the model's diagrams and documentation and Chapter 8 provides the references.
2. PRIVATIZATION PHENOMENON

This chapter will provide a background to the current privatization phenomenon. The chapter will address the key developments that led to the increasing number of privatizations in Brazil today. Following a discussion of the key benefits found in privatizing a state-owned enterprise, the types of privatization commonly used will be introduced. This chapter will conclude by depicting a static approach to analyzing privatizations that is typical of the literature available today.

2.1 Growth of State-Owned Enterprises

Over the past decades, the increasing importance of privatizations and the declining number of nationalizations can be observed in Figure 1.

Figure 1: The Increasing Number of Privatizations

*Nationalisation acts ceased by government
The importance of privatization in Brazil today can be better understood by providing the important developments leading to the current demise of public ownership of enterprises and nationalization policies. The key developments that account for the rise and fall of nationalization in Brazil can be classified into perceived market failure and the oil shock effect.

**Perceived market failure:** Essentially, perceived market failure has fostered the existence of many factors explaining the rapid growth in the number of SOEs. Overall, these factors are based on the premise that public ownership is a response to the failure of private markets in securing efficient outcomes. Among the key factors are:

- **Economic development and planning:** Given the underdeveloped nature of resources and markets, public production and ownership were seen as essential for the economy. It can also be argued that the scale of investment required often exceeded the capital-raising capacity of the private sector.

- **Social benefits:** The state-owned enterprises allowed the market to achieve distributional objectives; that is, it provided access to essential goods and services at reasonable prices. Also, public ownership was a mechanism that could be used to create employment or to prevent unemployment.

- **Strategic interests:** For Brazil and many Latin American countries, the state-owned enterprises represented the control of key technologies and industries despite high costs and inefficiencies. Oil, mining,
petrochemical, electric power, steel production and high technology were some of the key industries protected by the government.

Coupled with the above factors, it is important to note that most of the Latin American governments today were recently military dictatorships. Democracy is a relatively new process. In many countries, the military dictators propelled the large-scale growth of the government sector often using nationalistic overtones to justify increased public sector growth. The International Monetary Fund (IMF) statistics indicate that from 1960 to 1980 public expenditures in Latin America rose 2 to 3% per year. In the early 1970's, over twenty countries in Latin America were spending close to 30% of their GNP in the public sector. This number rose to 33% by the end of the 1970's [FLT]. In absolute numbers, Brazil's 150 state-owned enterprises in 1960 expanded to over 700 enterprises by the late 1970's.

Using perceived market failure factors as primary justification, the military government expanded its influence over the economy by shifting significant resources into the public sector; this explained the significant growth of the state-owned enterprises during the period [FLT]. Nationalization also provided the military with political stability since private control of key industries represented a challenge to the government [HEM].

Overall, military dictatorship coupled with the perceived market failure factors described above were key drivers that propelled the government into its SOE explosion by the late 1970's. This explosion is reflected by tracking the ownership structure of Brazil's 30 largest non-financial firms (see Table 1).
Table 1: Ownership Structure of Brazil's 30 Largest Non-Financial Firms

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Source: [VER]

Oil shock effect: During the mid to late 1970's, adverse global developments like the oil shock drastically altered the favorable SOE scenario in Brazil leading to the fall of nationalization policies. It is important to note that while the oil shock had adverse effects on Brazil, it favored countries like Mexico and Venezuela who were oil exporters. Due to Brazil's aggressive economic development program that made the country a major importer of oil, the oil price increases resulted in the significant deterioration in economic performance. The slow subsequent recovery led to the conclusion that the state-owned enterprises were limiting the flexibility required to achieve necessary adjustment to external shocks. Today, the Brazilian government recognizes that the SOEs have not only failed to stimulate growth, but also have required enormous subsidies to remain afloat. Compounding this problem, the Brazilian SOEs by late 1982 had contracted 23% of the country's total external debt which was driven by lending at negative real rates; the high debt level attracted much detrimental attention from foreign officials and private-sector creditors [VER]. With the mounting debt crisis, the Brazilian government turned to privatization as a solution to its widespread problems.
2.2 Key Benefits from Privatization

Few governments have embarked on a program of privatization because they wanted to; the privatization processes in many countries like Brazil have often been a negative and reluctant act undertaken because the existing method of building the economy through SOEs and state control systems was inefficient and costly [HUM]. Given the inefficiencies of the state-owned enterprises, the benefits associated with privatization have functioned as attractive incentives for governments to privatize. Among the benefits derived from privatization, the proponents of privatization consider efficiency improvement as the key benefit.

**Operational efficiency:** The failures of many state-owned enterprises have been primarily attributed to factors such as inefficient allocation of resources (an example of productive inefficiency), high level of bureaucracy and poor management (examples of operational inefficiencies). Considered perhaps the most effective method of increasing overall efficiency in the medium and long run, the privatization of a SOE represents the starting point for an "efficiency drive". A direct short run consequence of privatizing public enterprises is the large scale reduction in employment levels. Addressing the operational inefficiency of public enterprises, the rationalization of employment to an optimum level per unit of output is often the first step in the efficiency drive [HAC]. It is not surprising, therefore, why labor and labor unions are strongly against privatization; this issue is addressed in Chapter 4.

**Productive efficiency:** Without the financial backing of the government, privatization creates strong incentives for the new management to increase
productive efficiency. Among the incentives for management to improve the performance of the enterprise are: (1) the risks of bankruptcy and takeovers derived from inefficient use of resources; that is, another company may have better use for the newly privatized enterprise's resources and is willing to acquire these resources [HEM], (2) management's responsibility to shareholders who monitor the company's performance better than the government and (3) the financial discipline imposed by capital markets creating the need to balance the company's budget [HEM]. Overall, the need to rapidly increase both operational and productive efficiencies is especially applicable to newly privatized enterprises in markets where the degree of competition is very high rather than monopolistically low. Among the other key benefits associated with privatization are:

- **Reducing complexity:** By decreasing its participation in SOEs, the government benefits from the cost savings that is derived from the reduced complexity in managing and funding through subsidies its constellation of diverse state-owned enterprises. The direct effects of privatization are the curbing of growth in public spending and the reduction of government debt. An indirect consequence accrued from the decreased role of the state is the return to the private sector of those firms the government had acquired through bankruptcy.

- **Stimulating the private sector:** Stimulating private sector initiative is a very efficient mechanism to achieve economic growth and develop the country's human resources. By allowing the private sector to develop, both local and global business interests will be fostered giving private enterprises a greater role in the country's economic development.
• **Accessing foreign capital:** With the entrance of new competing emerging markets like that of the former Soviet Union and the plethora of Eastern European nations, privatization in Brazil may represent a critical magnet for foreign investors to consider Brazil over the Eastern European countries.

• **Benefiting the remaining SOEs:** Since privatization is essentially adding a competitive element to the economic environment, the enterprises that remain owned by the state will also be forced to improve their performance. Thus, privatization acts as an incentive and control mechanism for the remaining state-owned enterprises [HEM].

2.2.1 Industrialized versus developing country

It is important to note that the benefits above are inherently associated with privatizations in Third World countries where factors like access to foreign capital play a crucial role in a country's development. Contrary to the privatization processes in First World countries where higher relative political stability and economic growth have supported privatization efforts, the privatization processes in developing countries like Brazil are more volatile due primarily to the lack of political and economic stability. Governmental volatility leads to uncoordinated policies and unclear privatization agendas which can result in the abandonment of the entire process [KAM][VIR].
2.2.2 Complementary policies

In the 1980's, the Brazilian government viewed privatization as the solution to all of its economic troubles. While the benefits discussed above are playing a significant role in propelling the privatization process in Brazil, the government also understands that privatization in itself is not the solution; the process should be complemented by other policies directed at the country's overall development. These policies which include: reducing SOE expenditures and employment level, increasing foreign investor access to Brazilian markets and reducing mounting corruption and bureaucracy are discussed later; they form an integral part of the privatization model developed.

2.3 Types of privatization

Privatization is a term that has been commonly used to refer to all developments in which public enterprises and operations are transferred to the private sector. It is important, therefore, to distinguish among the different types of privatizations. In describing the different types, the continuum of possibilities classification scheme [RAM] provides a useful framework (refer to Appendix A for a diagram of the framework). In this classification, the types of privatization are classified into three categories: ownership, organizational and operational type privatizations. The key features of each category are discussed below.

Ownership privatization: This type of privatization is generally the most common and popular. Essentially, ownership privatization can be classified along two dimensions: degree of privatization (partial to full) and scope of
privatization (management buyout to public sale). The three main forms of ownership privatization which involve different combinations of the above dimensions are: (1) total denationalization: This involves the complete sale of a SOE to the private sector. (2) partial privatization: In a partial privatization, only some of the government’s equity is sold to the private sector; the larger the private equity share, the greater will be the degree of privatization. (3) liquidation: Usually a response to the financial failure of a firm, liquidation essentially involves the dismantling of the SOE with parts of it sold to diverse buyers.

Organizational privatization: As it can be observed in the classification structure, there are many forms of organizational privatization. This discussion will focus on two frequently used methods: leasing and competition. (1) leasing: In this form of privatization, the SOE leases out parts of its assets to the highest bidders while retaining the benefits of ownership (like profits). Due to the motivation and expertise of the private investor, leasing is mutually advantageous as the leased assets can improve both labor and productive efficiency (for example, through lower operating costs) benefiting the government and the private investor. (2) competition: Competition can be generated through the breakup of large SOEs into smaller units, deregulation and promotion of internal competition within the large enterprises. Increasing competition, especially through deregulation, allows private enterprises to compete against the SOEs. Overall, competition may improve efficiency and lower cost structures thereby reducing prices.

Operational privatization: There also exist many different forms of operational privatization. It should be noted that this type of privatization is
usually the least "dramatic", thereby, gaining little support from governments wishing to use privatization as the starting point for major economic modernization programs. However, the specific methods involved in operational privatizations usually precede the more "dramatic" ownership privatizations. This section will focus on two types of operational privatization. 

(1) contracting out: This method is the most common form of operational privatization involving the acquisition of inputs from the private sector through competitive bidding instead of self-production of inputs [HEM]. Contracting out is essentially the privatization of selected activities performed by the state-owned enterprise. Its main advantage lies in the ability of SOEs to tap into the economies of scale of the private sector firm supplying the SOE. (2) use of capital markets: By subjecting the SOEs to the disciplines of capital markets, they become effectively regulated by private investors. Since the capital market represents a primary source of funds, the SOEs are forced to "sell themselves" as attractive investment options [RAM].

Overall, the Brazilian privatization process has focused on the ownership type of privatization. As the privatization process in Brazil becomes more mature and efficient, organizational techniques like leasing and competition, and operational techniques like contracting out are expected to be used more frequently. Today, these techniques are still considered to be "exotic" and are used in a limited scope. Throughout the discussion and analysis of the privatization model developed in this thesis, the total denationalization or full divestiture framework is assumed to be the primary privatization technique used.
2.4 Static approach to privatization

Most of current literature and research available have dealt with privatization in a static and qualitative manner; privatization has been addressed as being a transaction rather than a dynamic process. The World Bank model for privatization is a typical example of the static approach to privatization that is commonly encountered in today's research literature.

The World Bank developed a five-factor model to help developing countries overcome obstacles to privatization; each factor is treated as a separate transaction. While the model does not help devise solutions to the obstacles (a typical limitation of static models), it does propose a structured approach that developing countries can use to implement privatization programs [BER].

**Preparing for privatization:** The first factor involves the government's explicit clarification of its objectives and priorities for privatization. Both political and social opposition to privatization can be reduced if the underlying reasons are well understood and the process is impartial and transparent [BER].

**Systematic strategies and classification:** Problems can be anticipated by designing a comprehensive and systematic privatization strategy. This strategy can be accompanied by the classification of SOEs using objective criteria that takes into account economic and social factors. Classifying SOEs is an important factor to prioritize the privatization process.
Preparing the SOEs: This factor usually involves financial valuation, preparation of legal documents and, in some cases, rehabilitation of the assets to be sold.

Divestiture units: The World Bank also recommends the establishment of a central administrative unit to manage the privatization process. One key advantage for establishing such a unit is that the process becomes separated from the interests of politicians and other special interest groups (these "political" effects are captured in the model developed generating results that are discussed later). The divestiture unit is able to objectively analyze and recommend privatizing actions. Organizational and analytical consistency are other advantages associated with centralized privatization units.

Foreign assistance: Unlike the policies adopted previously by the Brazilian government, the World Bank also recommends foreign assistance as a potential solution to overcome obstacles to privatization. While the bias against foreign capital is still strong in many developing countries, these countries can seek other means of foreign assistance like contracting finance experts (associated with investment banks and consulting firms) to advise the government on issues ranging from valuing assets and identifying potential buyers to structuring and negotiating deals [BER].

This thesis will dynamically expand the structure developed in the World Bank's static model. The basic system dynamics model developed is simple; however, the model addresses many of the limitations found in current literature including its transaction-focus and limited time and location expandability. Through the system dynamics based model, the Brazilian
Privatization Program is addressed as an interdependent process; through twenty-year simulations, the understanding of the key sectors and relationships is facilitated through the use of diagrams and graphs. Using sensitivity analysis, the model suggests key solution areas to enhance the efficiency of the privatization program.
3. SYSTEM DYNAMICS MODELING APPROACH

This chapter will provide an overview to the Systems Thinking method utilized in the privatization model. The chapter will also describe the basic model structure and conventions adopted. And finally, this chapter will address the model's key constructs and assumptions.

3.1 Systems Thinking

As mentioned above, the World Bank model is a typical example of a static and one-dimensional description of the privatization process. Current research on privatization has generally followed this model; while effective in providing a qualitative description, the World Bank approach fails to provide a better understanding of privatization dynamics due to two key factors [CHA]:

**Local spatial focus:** The spatial limitation is demonstrated through two examples: (1) The static model is primarily transaction-based; that is, the World Bank model presents its five factors separately. The model does not consider the interaction, for example, between each factor and the political environment in Brazil, which plays a major role in determining the success of privatization. (2) Static models are generally case-based focusing on particular countries and industries. While the World Bank model has attempted to generalize its applicability, many other static models are plagued by its limited spatial usefulness.

**Local temporal focus:** The key limitation associated with static models lies in its restriction to describe the privatization process only in a particular
year or short time period. Little effort has been attempted to extend the process into the future.

Systems Thinking addresses these two limitations by facilitating the extension of both the spatial and temporal boundaries of the privatization process. Spatially, Systems Thinking focuses on the interdependency of the environment; the key "actors" in the privatization process are highly interconnected. The Organizational Sector is linked to the Labor Sector; the Financial Market Sector is connected to the Privatization Legislation Sector and so forth. Systems Thinking also helps to broaden the applicability of the model to many countries and industries. Temporally, Systems Thinking acts as a privatization "flight simulator" allowing for the compression of time. The ability to simulate and explore different scenarios leads to valuable insights; while attainable using static models, these insights are greatly facilitated using a system dynamics based model which visually presents simulation and sensitivity results shifting the focus to understanding each sector's structure and sector relationships.

Together, the combination of highly interdependent sectors and scenario planning provided by Systems Thinking results in the development of an operational model of the key aspects of privatization. Whereby static models answer questions like, "What factors will influence the Brazilian privatization process?" Systems Thinking-based models answer questions like, "How will the factors within the sectors interact?" and "How can the process be improved to increase its effectiveness and robustness?" [CHA] The system dynamics privatization model considers the internal relationship within an organization, the relationship between the organization and the outside environment, and the
relationship among the sectors in the outside environment. It is this process-based operational view which makes Systems Thinking an important facilitating tool to analyze privatization.

3.2 Basic System Structure

The privatization model developed in this thesis used the *ithink* software developed by High Performance Systems Inc. The model is based mainly on four structural elements: stocks, flows, converters and connectors. An overview of each element is discussed below based on the simplified version of the Labor Sector used in the model [CHA].

*Figure 2: Simplified Labor Sector Diagram*

![Simplified Labor Sector Diagram](image)

**Stocks:** Stocks are accumulations. In Figure 2, the Labor Pro Privatization Index rectangle represents the stock of labor's view in favor of
privatization; the higher the stock, the more labor is in favor of privatization. Initially set to an index of 100 representing the starting "stock", the Labor Pro Privatization Index will vary depending on the input generated by the flow Change in LPPI.

**Flows:** Flows are used to depict changes in stock. In the figure above, Change in LPPI is regulating the flow into the Labor Pro Privatization Index stock; the privatization model is based on bi-directional flows; this signifies that the flow can be either positive or negative. The model is set such that all the stocks will range from 0 to 200. In a twenty period scenario, this signifies that maximum index volatility for each period is 5 (assuming that the stock cannot be negative and that each period carries equal weight); that is, in each period, the flow will range from a minimum of -5 to a maximum of 5. It is important to note that the index and flow ranges selected (including the initial index = 100) are arbitrary and have no effect on the simulation results as long as this selection is consistently used throughout the model.

**Converters:** Converters can represent either information or material quantities. Frequently, they are used as "score-keeping" variables; unlike stocks, converters do not accumulate. In the above figure, Future Unemployment and Favorable Labor Legislation are converters that together determine the flow Change in LPPI. However, Future Unemployment is negatively correlated to Change in LPPI; that is, the higher the future unemployment rate due to privatization, the more negative the Change in LPPI will be resulting in a decrease in the Labor Pro Privatization Index. Favorable Labor Legislation is positively correlated to Change in LPPI whereby the more
legislation favors labor, the more positive the Change in LPPI will be, thereby increasing the stock of Labor Pro Privatization Index.

A key advantage in using the system dynamics modeling approach lies in its ability to facilitate the analysis of the interaction between negative and positive factors like Future Unemployment and Favorable Labor Legislation; the results of the interaction on the Labor Pro Privatization Index can be immediately graphed.

Underlying each converter in the privatization model developed is a graphical plot of its expected behavior during the simulation period. These graphical plots reflect scenario assumptions based mainly on historical data and reports; the plots range from -5 to 5 "index units". In the diagram above, Change in LPPI receives two inputs; the total weighting for the two inputs is 100%. If, for example, Future Unemployment has a greater effect on the Labor Pro Privatization Index, then the Future Unemployment converter can be assigned a greater weight like 75%. In this case, Favorable Labor Legislation is assigned a lower weight of 25%. Thus, it can be seen that, if each converter's graphical plot ranges from -5 to 5 index units, then given the total weighting limit of 100%, the absolute Change in LPPI can only range from -5 to 5 as mentioned above.

Sensitivity analysis can be performed by changing the graphical plot of selected converters (sensitivity analysis using this technique is performed and analyzed in Chapter 5). For example, in the simplified Labor Sector diagram, the behavior of the converter Future Unemployment was graphed as follows:
As it can be observed in Figure 3, Future Unemployment is expected to rise with the increasing number of privatizations in Brazil around year 10 which corresponds to 1990. This plot represents one possible scenario for Future Unemployment. If one believes that Future Unemployment will decrease with future privatizations, then another graphical plot can be entered whereby the Future Unemployment level decreases after year 10; this would create a different scenario. The impact of this change would be readily observable in a graph of the Labor Pro Privatization Index stock (which, with this change, would increase since labor's fears of future unemployment decreases with a lower Future Unemployment trend leading to a higher stock of Labor Pro Privatization Index). It should be noted that the behavioral assumptions of several converters were simplified in order to reduce model complexity while still capturing the main effect of the converters' behaviors.

Connectors: Connectors link stocks to converters, stocks to flows, converters to flows and other possible linkages. Essentially, connectors do not take on numerical values, they only transmit these values. In the simplified
Labor Sector, there are two connectors which link Future Unemployment to Change in LPPI and Favorable Labor Legislation to Change in LPPI.

A final note on basic system structure is the propeller-like symbol opposite of the stock rectangle. This symbol represents the model's boundary; that is, the model does not consider any activity that occurs beyond this propeller symbol.

3.3 Privatization model fundamentals

Sectors: The privatization model developed is composed of 7 main sectors. These 7 sectors are classified into "macro" and "micro" sectors. Table 2 lists each sector by classification type:

<table>
<thead>
<tr>
<th>Classification</th>
<th>Macro Sectors</th>
<th>Micro Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector Name</td>
<td>Economy Sector</td>
<td>Organization Sector</td>
</tr>
<tr>
<td></td>
<td>Political Sector</td>
<td>Labor Sector</td>
</tr>
<tr>
<td></td>
<td>Financial Market Sector</td>
<td>Foreign Investor Sector</td>
</tr>
<tr>
<td></td>
<td>Privatization Legislation</td>
<td></td>
</tr>
</tbody>
</table>

Simulation period: The simulation period or "time compression" for this model is set at 20 periods covering the years 1981 to 2000. Brazil officially embarked on its privatization program in 1981 through its política de desestatizacao or denationalization policy; the first major successful privatization was the auction-based divestiture of Nova America in 1986 [VER]. Former President Fernando Collor established the government's firm
commitment towards privatization at the start of his administration in 1990; however, with his impeachment in late 1992, his vice-president Itamar Franco halted many of the pro-privatization measures that had been in effect thereby slowing the Brazilian privatization program. Given this short history, the simulation period encompassing 1981 to 2000 captures the key dynamics encountered in the Brazilian privatization process allowing both for the validation of a historical component (1981 to 1993) and for the forecast of the projected component (1994 to 2000); these components are also discussed in a later section. Simulating the privatization process beyond the year 2000 in a volatile country like Brazil might prove to be a futile exercise.

Maximizing alignment among sectors: The key index introduced in the model is the Alignment Index contained in the Alignment Index Control Sector. This index calculates the "degree of alignment" among the different sectors; that is, the index aggregates the level of compatibility of each sector's privatization goals. For example, this index will be very high if each of the 7 sectors have different objectives and priorities regarding the privatization program; the alignment index will be zero if all the sectors completely agree on the goals and objectives for privatization program.

As mentioned in the introduction, it is important to note that different SOE ownership structures result in different alignment goals. While in the Brazilian privatization (like in the United Kingdom) the government clearly owns the shares it is selling, privatization in Russia, for example, does not have an unambiguous de facto ownership structure in which the government owns the shares. On the contrary, many stakeholders have existing ownership rights, in the sense of being able to effectively exercise control rights over the
SOE's assets. Privatization, therefore, cannot proceed in Russia unless these stakeholders are appeased, bribed or disenfranchised. Since these stakeholders (local governments, branch ministries and workers) perceive privatization as a redistribution of property rights rather than a government sell-off, the alignment objectives are different than those described above for Brazil. Unlike the Brazilian case where the objective is to maximize the sectors' alignment favoring the Privatization Program, the alignment objectives in Russia become reconciling the control claims of the multiple de facto owners and reducing the damage they do while competing for their SOE shares. One solution is to pay off some stakeholders with privatization proceeds and dividends so that they give up control rights that conflict with those of others [SHL].

Related to the Alignment Index, another important factor is the Change in Alignment Index. This index measures the change in the index from the previous simulated year to the current simulated year. Therefore, if this Change Index is increasing, then the sectors' privatization objectives are diverging; if the Change Index is decreasing, then the sectors' privatization objectives are converging. It is this convergence (or decreasing Change in Alignment Index) that warrants special attention by privatization policy makers and the sectors involved in privatizations where the government is the clear owner of the shares being sold.

Essentially, the Alignment Index is the standard deviation of the indices generated by each sector for each simulated year. During each simulated year, the 7 sector's indices are aggregated in the Alignment Index Control Sector. The average index is calculated; for each index, the Temp converters measure
the index’s deviation from the mean and squares this value. The values in the 7 Temp converters are entered into the Alignment Index converter which sums these Temp values and divides the total by the number of indices (7). The square root of this value is taken yielding the standard deviation or Alignment Index. The Change in Alignment Index is calculated by storing a current simulated year’s Alignment Index into the converter labeled Previous Year Index; this converter was modeled with a one-period delay function. Therefore, for each simulated year, the Change in Alignment Index calculates (Alignment Index - Previous Year Index); this represents the Change in the Alignment Index. The results from this alignment analysis for the base case and other scenario cases are discussed in the next chapters.
4. **MODEL ANALYSIS: BASE CASE**

The base case privatization model will be analyzed by sectors starting with the four macro sectors. Prior to the discussion of these sectors, it is important to understand the current situation of the *Programa Nacional de Desestatizacao (PND)* or National/Brazilian Privatization Program. This importance stems from the fact that the behavioral graph of each variable contains a historical (1981 to 1993) and a projected component (1994 to 2000) as mentioned previously. Therefore, the variation among the different scenarios is primarily based on different projected components, although different interpretation of historical data led to minor adjustments in the validated historical component. Thus, the base and other cases scenario analysis depart from the current situation discussed below.

4.1 **Current Situation**

With economic uncertainties running high and with 1994 being a general election year, the outlook for Brazil may change dramatically over the next two years [GRI]. Together with Brazil's uncertain outlook, the success of the Brazilian Privatization Program is also unclear. Currently, the results from the base case simulation indicate overall dissatisfaction with the privatization program by all sectors.

This dissatisfaction is derived primarily from the large losses being incurred by the Brazilian Privatization Program. Until mid-1993, over 20 SOEs have been privatized under the PND. Table 3 provides a list of companies that have been privatized since the implementation of the privatization program.
Table 3: Privatized Companies under the Brazilian Privatization Program

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Date</th>
<th>Minimum Price</th>
<th>Auctioned Price</th>
<th>Premium Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usiminas (o)</td>
<td>Oct. 24, 1991</td>
<td>973.5</td>
<td>1,112.7</td>
<td>14.3%</td>
</tr>
<tr>
<td>Usiminas (p)</td>
<td>Nov. 18, 1991</td>
<td>264.3</td>
<td>264.3</td>
<td>0.0%</td>
</tr>
<tr>
<td>Celma</td>
<td>Nov. 1, 1991</td>
<td>72.5</td>
<td>90.7</td>
<td>25.0%</td>
</tr>
<tr>
<td>Mafersa</td>
<td>Nov. 11, 1991</td>
<td>18.5</td>
<td>48.4</td>
<td>161.1%</td>
</tr>
<tr>
<td>Cosinor</td>
<td>Nov. 14, 1991</td>
<td>12.0</td>
<td>13.6</td>
<td>13.8%</td>
</tr>
<tr>
<td>SNBP</td>
<td>Jan. 14, 1992</td>
<td>8.0</td>
<td>12.0</td>
<td>50.1%</td>
</tr>
<tr>
<td>Indag</td>
<td>Jan. 23, 1992</td>
<td>6.8</td>
<td>6.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>Piratini</td>
<td>Feb. 14, 1992</td>
<td>42.0</td>
<td>106.2</td>
<td>153.1%</td>
</tr>
<tr>
<td>Petroflex</td>
<td>Apr. 10, 1992</td>
<td>178.6</td>
<td>215.6</td>
<td>20.7%</td>
</tr>
<tr>
<td>Copesul</td>
<td>May 15, 1992</td>
<td>617.1</td>
<td>797.1</td>
<td>29.2%</td>
</tr>
<tr>
<td>CNA</td>
<td>Jul. 15, 1992</td>
<td>78.9</td>
<td>78.9</td>
<td>0.0%</td>
</tr>
<tr>
<td>CST</td>
<td>Jul. 16, 1992</td>
<td>332.3</td>
<td>332.3</td>
<td>0.0%</td>
</tr>
<tr>
<td>Nitreflex</td>
<td>Aug. 6, 1992</td>
<td>26.2</td>
<td>26.2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Fosfertil</td>
<td>Aug. 12, 1992</td>
<td>138.9</td>
<td>177.1</td>
<td>27.5%</td>
</tr>
<tr>
<td>Polisul</td>
<td>Sept. 11, 1992</td>
<td>56.8</td>
<td>56.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>PPH</td>
<td>Sept. 29, 1992</td>
<td>25.1</td>
<td>40.8</td>
<td>62.2%</td>
</tr>
<tr>
<td>Goiasfertil</td>
<td>Oct. 8, 1992</td>
<td>12.7</td>
<td>12.7</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acesita</td>
<td>Oct. 23, 1992</td>
<td>347.7</td>
<td>450.3</td>
<td>29.5%</td>
</tr>
<tr>
<td>Arafertil (1)</td>
<td>Nov. 5, 1992</td>
<td>-Cancelled-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBE</td>
<td>Dec. 3, 1992</td>
<td>10.9</td>
<td>10.9</td>
<td>0.0%</td>
</tr>
<tr>
<td>Poliolefinas</td>
<td>Mar. 19, 1993</td>
<td>86.7</td>
<td>86.7</td>
<td>0.0%</td>
</tr>
<tr>
<td>CSN (2)</td>
<td>Apr. 2, 1993</td>
<td>1.22 million</td>
<td>1.06 million</td>
<td></td>
</tr>
<tr>
<td>Petrocoque (1)</td>
<td>Jun. 7, 1993</td>
<td>-Cancelled-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrafertil</td>
<td>Jun. 24, 1993</td>
<td>199.3</td>
<td>199.3</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Note   
(1): Cancelled due to lack of investor interest  
(2): Not enough demand for all 1.22 million shares  
(3): Auctioned prices reflect shares put for sale, not company value.  
(4): Boldfaced company names indicate particularly important SOEs.  
(5): Minimum prices determined primarily through outside consulting valuations, government modeling assumptions and other sources.

Source: [BND]

While providing the continued impetus for the Brazilian Privatization Program, these privatizations have been costly to the government. Coupled with high administrative costs like legal costs, consulting fees and publicity costs, the level of capital costs like upgrading facilities and other preparations have also been high. Table 4 shows the Brazilian government's losses with its privatization program to date.
Table 4:  Current Losses Accumulated by the Brazilian Privatization Program

<table>
<thead>
<tr>
<th>(In US$ Million)</th>
<th>Total Sales Proceeds</th>
<th>Dividends Received</th>
<th>Total Current Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Investment (1)</td>
<td>5,100.0</td>
<td>941.1</td>
<td>(7,650.0)</td>
</tr>
</tbody>
</table>

Note (1): Includes fix up costs, debt absorption and other administrative costs

Source: [COS]

With over 30 state-owned enterprises scheduled to be privatized in the short run including important SOEs like Embraer and Light, the US$7.6 billion total current loss with these initial privatizations has been considered to be the key factor for the current dissatisfaction with the privatization process. In the long run, it should be noted that the Brazilian government through privatization is actually reducing continued cash drain in the future; however, the population and the sectors alike derive their dissatisfaction from the current book losses recorded and fail to consider the economic gains from privatization. Other sources of dissatisfaction include political interference including the President's interference, constant postponement and delay of auctions and changing regulations. Addressing this unanimous discontentment among all the sectors, the government announced that it will implement several measures to address problems like:

- **Reduction in SOE expenditures**: The government will cut funding to its state-owned enterprises; currently, SOE expenditures for 1993 is US$87 billion and projected 1994 expenditures is US$120 billion [GOV].

- **Reduction in employee level**: The SOEs employ over 450,000 workers.
• **Reduction in the SOE's debt level:** The SOEs have accumulated debt liabilities totaling US$107 billion representing a dominant share of Brazil's total debt. Eletrobras' debt accounts for over 40% of this total [GOV].

The base case scenario analysis models a "middle-of-the-road" set of behavioral assumptions for the outcome of the above measures; it forecasts conservative behaviors for each variable and sub-variable contained in the 7 sectors. For an enhanced visualization of the sector discussions, a full privatization model diagram is included in Appendix C. The complete set of documentation for the base case is provided in Appendix D; the documentation includes all the equations and relationships contained in each sector thus facilitating the discussions below.

4.2 Economy Sector

The Economy Sector is the first of four "macro sectors." The main infrastructure contained in the Economy Sector is shown below. The Economic Stability Index represents the "stock" of economic stability in Brazil; the higher this index, the more stable the Brazilian economic environment.

![Economic Stability Index Diagram]

The Economic Stability Index is regulated by the Change in ESI which is influenced by sub-variable inputs weighted according to the relative importance
and effect on the country's economic stability. In the base case, inflation was modeled to account for 40% of the Change in ESI; the other six inputs account for 10% each. A discussion of the behavioral assumptions for each variable and sub-variable ordered by its importance in the simulation is provided below. Italicized entries indicate that it is a variable and that its behavior like *Budget Surplus* is a function of sub-variables; in this example, the variable *Budget Surplus* is a function of sub-variables Tax Revenues and Public Expenditures.

**Inflation:** Inflation is the key destabilizing sub-variable for the Brazilian economy. Generally very high since the mid-1980's, the inflation rate has varied dramatically with the "economic shocks" implemented by new finance ministers. As a result, inflation in Brazil has ranged from -1% to over 80% per month; currently, the inflation rate is averaging 35% per month. The base case scenario assumes that the inflation rate will decline gradually by 2000 but not significantly.

**Currency devaluation:** This sub-variable captures the population's perception towards currency devaluation. Brazilians generally view the historically high devaluation of the *Cruzeiro Real* negatively. Thus, high *Cruzeiro Real* devaluation will undermine the country's economic stability. Reaching a peak in the mid-1980's, currency devaluation is modeled to decrease moderately in the future.

**Consumption:** The consumption variable combines the effect of Favorable Tax Regulation (to a larger extent) and Middle Class Participation (to a lesser extent). Essentially, consumption is the spending of disposable income
by the personal sector. The model assumes that higher consumption levels will increase the Economic Stability Index.

**Favorable tax regulation**: Particular tax regimes may or may not favor privatizations. The tax concessions introduced in Chile included a reduction to the taxable income of investors by 20% of the value of SOE shares purchased as well as tax-free dividends on selected shares. With the increasing deregulation of the once protected market, the Brazilian government has been considering to grant tax advantages to investors in its privatization program and also to selected segments of the population despite aggravating the deficit. The base case model assumes that Favorable Tax Regulation will increase significantly in the near future and decline slightly by 2000 [VUY].

**Middle class participation**  The Brazilian government is interested in guaranteeing a wide distribution base for its SOE shares. In order to achieve this objective, the presence of a financially strong middle class is fundamental. The Middle Class Participation measures the degree of participation of the Brazilian middle class in the privatization process. In this model, the variable is determined by Favorable Tax Regulation. Increased favorable tax regulations will lead to the increased consumption from the middle class leading to the possibility of a more significant participation in privatizations. However, this function is modeled with a "decreasing returns" factor since, beyond a given limit of favorable tax regulation, more favorable regulation will not induce more consumption from the middle class.

**Investment**: Investment contributes positively to the Economic Stability Index. Modeled as a function of Favorable Tax Regulation, more favorable tax
regulations leads to the higher level of investment which is defined as additions to capital stock. As with the Middle Class Participation variable, the investment function is also limited by a "decreasing returns" factor whereby a greater number of favorable tax regulations will not lead to higher and higher investment levels. In some cases, it is interesting to note that following privatizations, it is common for investment to increase significantly in the newly privatized companies [KIK]. This generates a positive feedback loop: high investment level, more privatizations; more privatizations; higher investment level.

**Government subsidies:** The model assumes that heavily subsidized economies are less stable in the long-run than non-subsidized economies. With the increasing deregulation of Brazilian markets, the base case scenario forecasts subsidies to decline by the year 2000.

**Budget surplus:** This variable aggregates the positive effect of Tax Revenues and the negative effect of Public Expenditures; the model assumes that higher budget surpluses will increase the Economic Stability Index. By privatizing SOEs, the government is essentially attempting to decrease the financial burden derived from state-owned enterprises on the strained government budgets [KIK].

**Tax revenues:** If the Brazilian government increases its Favorable Tax Regulations, this will decrease Tax Revenues. However, due to the increased efficiency in the tax collection system, the imposition of stricter penalties for tax evasion and the increased tax revenues generated by the newly privatized
SOEs, the base case model forecasts a moderate increase in Tax Revenues despite more Favorable Tax Regulations [EIU].

**Public expenditures**: The wide-reaching cost cutting measures initiated by the Finance Minister Fernando Henrique Cardoso is expected to reduce the high level of government expenditures discussed in Section 4.1. Base case scenario models a moderate decline in public expenditures.

**Balance of payments**: This key variable combines the positive effect of Net Export with the negative effect of Debt Service Payment. The model assumes that a more positive balance of payments level ensures higher economic stability.

**Net export**: Net export aggregates the effects of Exports, Imports and Mercosul; higher net exports favor the country's Balance of Payments; both Exports and Imports are given greater weight in this variable. Recently, the country's Net Exports reached US$7.8 billion for the first six months of 1993, a new record; this record has been primarily supported by recording-breaking Exports [PRA].

**Exports**: This sub-variable represents the total exports from Brazil to other countries; Brazil's primary exports are soya beans, metallic ore and coffee. Historically, exports decreased in the mid 1980's and early 1990's due to economic recession and political instability. The base case scenario projects a moderate increase in exports by 2000.
**Imports:** The import substituting program implemented by the military government in the 1970's and 1980's resulted in a historical decline in imports; however, with the opening of Brazilian markets, the model projects a surge in imports followed by a gradual decline by 2000; Brazil's primary imports are consumer goods, raw materials and fuels.

**Mercosul:** The *Mercado Comun del Sur* or Mercosul in Brazil establishes a common market among Argentina, Brazil, Paraguay and Uruguay by January 1, 1995. The main goals of Mercosul are fourfold: (1) free circulation of goods, services, financial resources and workers, (2) elimination of non-tariff barriers, (3) establishment of common external tariff and (4) convergence of macroeconomic, trade, agriculture, transportation and communications policies [EIU]. The model assumes that a higher Mercosul factor will favor Brazil's net exports and overall economic development, thereby fostering economic stability.

**Debt service payment:** Due to Brazil's very high foreign debt level, the base case model forecasts Debt Service Payments to remain high throughout the simulation period despite the possibility of increasingly favorable world interest rates; payments can be expected to decline slightly by the late 1990's.

The following graph shows the 20-year simulation results (1981 to 2000) for the Economy Sector. With the assumptions described above for the base case scenario, the Economic Stability Index ranges from 57.81 to 100.00; the Change in ESI only becomes positive after 1995.
Figure 4: Base Case Results for the Economy Sector

Given the current situation, the economic stability in Brazil is predicted to worsen steadily until a moderate upturn after 1995. It can be observed that Change in ESI "flattens" in the mid 1980's and in the early 1990's; these were periods of considerable political and economic uncertainty. Growth in Economic Stability increases strongly after 1992 and is predicted to suffer an adjustment in the late 1990's. Overall, the Economy Sector provides support to the privatization program only beginning in 1995.
4.3 Political Sector

The main infrastructure of the Political Sector contains the Political Stability Index which represents the "stock" of political stability in Brazil and the "flow" Change in PSI which regulates the change in political stability.

![Diagram](image)

The magnitude and direction of Change in PSI is determined by several inputs weighted according to its relative importance and effect on Brazil's political stability. In this sector, Legislative Majority was the key variable modeled accounting for 50% of Change in PSI; the other five sub-variables each received an equal weighting of 10% each.

*Legislative majority:* This key variable represents the interaction between the power of Conservative Parties and Leftist Parties in Brazil’s Senate and House of Representatives. It is important to note that in a recent survey of Congress carried out by the Brazilian Institute of Political Studies (IBEP), the currently conservative Congress strongly favors reducing the role of the state, opening the economy to foreign investment and simplifying the tax system [GOE2]. In this model, a dominant Conservative Parties behavior will make Legislative Majority more positive, which will increase the country's Political Stability Index.
Conservative parties: The Brazilian Conservative Parties are assumed to be the rightist non-labor parties like the Partido da Frente Liberal (PFL) and the Partido Popular Republicano (PPR). Initially strong during the end of the military government years, the conservative parties lost some of their appeal with the population in the mid to late 1980's; in the base case simulation, the power of Conservative Parties are expected to increase gradually from its current majority.

Leftist parties: The Leftist Parties are essentially the Brazilian labor parties led by the Partido dos Trabalhadores (PT). Based on the population's dissatisfaction with unemployment and government policies (including the privatization program), the PT gained much support in the late 1980's and early 1990's as its candidate almost won the 1990 presidential elections. In this base case scenario, the Leftist Parties' influence is modeled to decrease by the year 2000.

Military power: This sub-variable is defined as the amount of influence that the military has on the country's political environment. Naturally, its influence was very high during the military government years; it has decreased steadily during the past decade with the establishment of the first civilian President in 20 years; the military, nonetheless, still possess a significant amount of influence to change the country's political stability.

Corruption: This sub-variable refers to the publicly exposed corruption rather than the hidden corruption (that might actually increase political stability); the higher the level of visible corruption, the lower the Political Stability Index. Corruption became especially evident during the early 1990's
resulting in the impeachment of former President Fernando Collor in 1992. The model projects that practices of bribe solicitation, influence peddling and illegal profiteering in both public and private sectors should decrease with the high profile impeachment process [HUM].

**Plans index:** Economic "shock" programs have been very prevalent during the late 1980's and early 1990's in a futile attempt to control runaway inflation. This index represents the frequency of these destabilizing "shocks"; the more frequent the economic "shocks", the lower the Political Stability Index as the failures of these economic plans seriously undermine political credibility.

**Executive branch stability:** This sub-variable models the stability of the Presidency and its cabinet members. Executive stability was very high during the first year of the Collor Administration, but fell dramatically during his impeachment process. The current executive stability is low due to President Franco's short tenure at the presidency and due to the existence of 39 political parties running for posts ranging from the presidency to state deputies in the upcoming general elections [GOE]. The base case scenario forecasts a gradual increase in Executive Branch Stability which increases the Political Stability Index.

**Localized interests:** This variable is a function of Lobbying Group Power; the model assumes that higher Lobbying Group Power results in more Localized Interests; increased Localized Interests reduces the Political Stability Index.
Lobbying group power: This sub-variable represents the degree of influence by special interest groups on the government. Regarding the privatization process, it is interesting to note that one special interest group led by the Mining and Energy Minister and another group led by the Communications Minister have strongly opposed the privatization of SOEs. This can be explained by the fact that Petrobras is under the Mining and Energy Minister's control, and Telebras is under the Communication Minister's control. Loss of control over these two SOE "crown jewels" due to privatization would signify loss of political influence for the two Ministers [MOR]. Addressing this issue, the government has already proposed to centralize the control of SOEs under one department in order to avoid these localized interests [ABA]. Overall, Lobbying Group Power and Localized Interests play an important role in the country's political stability.

The figure below shows the 20-year simulation results for the Political Sector. With the base case behavioral assumptions described above, the Political Stability Index varies from 84.57 to 111.03; the Change in PSI becomes negative between 1985 and 1996 as a result of significant political change.
The base case results indicate a clear cyclical pattern for the Political Stability Index; it can be observed that in the early 1980's, optimism was high regarding the change from a military to a civilian government as the Political Stability Index peaked in 1985. However, several economic "shock" failures and poor leadership undermined the population's credibility in the new form of government. This resulted in a significant decrease in the country's political stability. While Collor's impeachment compounded this decline, it also helped initiate the restabilization of the political environment as seen in the increasing Change in PSI after 1992. Similar to the Economy Sector, the Political Sector provides support to the privatization program only after 1995. Overall, this points to the strong positive correlation between economic and political stability in Brazil.
4.4 Financial Market Sector

The Financial Market Sector is based on the main infrastructure shown below. The Financial Market Efficiency Index is the stock of efficiency in the Brazilian financial market; the higher this index, the more efficient is the financial market thereby favoring the privatization program.

The Financial Market Efficiency Index is regulated by the Change in FME; this change is affected by six inputs given 20% weight each except for Local Bank Stability and Global Integration Index which were assigned 10% weight each.

*Cost of privatization:* This variable aggregates the effect of 4 inputs; the model assumes that higher privatization costs lead to less efficient financial markets. Each of the inputs into Cost of Privatization were given 30% weight except for Allowable Currency Base which was given 10% weight.

*Transaction costs:* The cost of privatization transactions involves one or more of possible expenditures: administrative costs, financial restructuring, physical rehabilitation and settlement of employment claims [VUY]. Modeled as a function of privatization Complexity, Transaction Costs decrease as the complexity of the privatization process decreases.
**Complexity:** This sub-variable refers to the degree of complexity in planning and implementing privatizations; the model assumes that as the country gains more experience in privatizing state-owned enterprises, the degree of complexity will decrease due to "learning curve" effects. This decrease in Complexity can also be interpreted as the increased capacity of the Brazilian government to handle more sophisticated privatizations.

**Residual costs:** Residual Costs are defined as debt, pension fund losses and other long and short term liabilities associated with privatization. The base case scenario assumes that the quality of assets to be privatized will increase leading to a moderate decrease in Residual Costs by 2000 [VUY].

**Allowable currency base:** This key sub-variable is often a hot topic for discussion among Brazilians involved in the privatization process. Essentially, Allowable Currency Base is the number of "privatization currencies" allowed by the government to pay for the state-owned enterprises being sold. The table below provides a sampling of "privatization currencies" used to date.
**Table 5: List of Privatization Currencies Used in Brazil**

<table>
<thead>
<tr>
<th>Currency type</th>
<th>Used to Date (US$M)</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securitized Debt</td>
<td>1,685.3</td>
<td>31.6%</td>
</tr>
<tr>
<td>*Privatization Certificates</td>
<td>1,247.8</td>
<td>23.4%</td>
</tr>
<tr>
<td>*Siderbras Debentures</td>
<td>902.7</td>
<td>16.9%</td>
</tr>
<tr>
<td>OFNDs</td>
<td>592.3</td>
<td>11.1%</td>
</tr>
<tr>
<td>TDAs (2)</td>
<td>426.4</td>
<td>8.0%</td>
</tr>
<tr>
<td>Mortgage Notes</td>
<td>274.4</td>
<td>5.1%</td>
</tr>
<tr>
<td>*Cruzeiros</td>
<td>145.6</td>
<td>2.7%</td>
</tr>
<tr>
<td>External Debt</td>
<td>42.1</td>
<td>0.8%</td>
</tr>
<tr>
<td>New Cruzados</td>
<td>12.2</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,328.8</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Note (1):** The currency types marked with an asterisk indicate those currencies considered to be highly acceptable by the government under Act #8031 [REB]

**Note (2):** TDAs are state debt resulting from government land purchases [PRO]

**Source:** [BNDES]

The Brazilian government's key objective is to avoid being paid *moeda podre* or "rotten currency." An example of *moeda podre* are notes with low liquidity in the market [FER]. The base case scenario forecasts an increasing Allowable Currency Base due to the government's attempt to support its privatization program [DUR]; the model assumes that the increased usage of a wider base of privatization currency will increase the overall privatization cost especially if the Brazilian government compars to being paid in cash.

**Labor opposition:** The basic assumption is that increased Labor Opposition increases the cost of privatization. Since labor has traditionally opposed privatization policies, costly arrangements with the labor unions are expected in order to privatize critical SOEs; Labor Opposition is modeled to gradually increase and then decline by 2000 [DHI].
Valuation accuracy: This variable represents another key factor; it combines the positive effect of Fair Assumptions and the negative effect of Pricing Error. Higher Valuation Accuracy is assumed to make the financial market more efficient.

Fair assumptions: Aggregating the combined effects of assumptions commonly used in valuations like discount rate, country risk, growth rate and book versus market value, Fair Assumptions is modeled as a function of Valuation Bias where higher bias corresponds to lower Fair Assumptions.

Valuation bias: Bias in valuations can be due to a plethora of factors like lobbying from special interest groups, political motives and profiting for personal gains. The model assumes that valuation bias will decline as experience is gained with the privatization program leading to a more transparent process.

Pricing error: This variable combines the effects of Overprice and Underprice; Valuation Accuracy declines as Pricing Error increases.

Overprice: During the early years of privatization in Brazil, the government tended to overprice its SOEs fearing that the population might perceive a "sell-out" of the country's assets to the private sector. Lack of experience and the "profit-motive" compounded the overpricing which contributed to the Pricing Error index. Eventually, overpricing was corrected since it undermined the investors' credibility in the privatization program due to significant declines in SOE value after the privatization.
Underprice: Having perceived the problems of overpricing, the government decided to underprice its SOEs in an attempt to boost its privatization program. While moderately successful in supporting the privatization process, underpricing attracted many unwanted arbitrageurs and short-term profit seekers. The base case scenario forecasts an overall correction to underpricing leading to more accurate pricing by 2000.

Facilitating regulation: An increased number of regulation favoring the privatization process improves the Brazilian financial market efficiency; a combination of four inputs, this variable is explained in more depth in the next sector.

Stock market development: This sub-variable tracks the development of the Brazilian stock markets' capitalization, namely the Sao Paulo (Bovespa) and Rio de Janeiro stock exchanges. As the stock market develops and become increasingly sophisticated, the Financial Market Efficiency Index increases. The model projects this index to increase significantly by 2000 after suffering a minor decline in the early 1990's due to the recessionary economy and political instability.

Global integration index: This index represents the degree of integration between the Brazilian financial markets and the world markets. This integration can be measured through factors like: profit and dividend remittance, foreign paper issue by domestic institutions, foreign investment in the stock markets, export backed bond issues and issues of ADRs or IDR; the base case scenario forecasts a gradual increase in Brazil's global integration index. Higher global integration signifies more efficient financial markets.
Local bank stability: This variable is modeled as a function of Savings Account Stability; higher stability in the *caderneta de poupança*, the Brazilian savings account, results in greater Local Bank Stability. While domestic bank stability is highly dependent on its savings accounts, the banks are also involved in other operations; therefore, the Local Bank Stability is modeled with a "decreasing returns" to increased Savings Account Stability. Local Bank Stability enhances the efficiency in financial markets.

Savings account stability: Recently destabilized by Collor's liquidity squeezing measures whereby access to all savings accounts were "blocked", the *caderneta de poupança* stability is expected to recover in the future with the government's full support. The government is aware that these savings accounts often represent an average Brazilian's lifetime earnings thus signifying a highly sensitive economic and social issue. The table below indicates the effect of Collor's economic "shock" program whereby gross domestic savings declined from 25.0% of GDP in 1989 to 18.6% by 1991.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS (1)</td>
<td>21.7%</td>
<td>24.0%</td>
<td>25.0%</td>
<td>20.7%</td>
<td>18.6%</td>
<td>19.0%</td>
</tr>
</tbody>
</table>

Note   (1): Gross domestic savings

Source: [EIU]

Figure 6 illustrates the simulation results for the Financial Market Efficiency Index based on the base case assumptions described above. Given the assumptions, the Financial Market Efficiency Index ranges from 86.01 to
106.52; the Change in FME is positive overall but contains two significant declines in 1986 and 1992.

Figure 6: Base Case Results for the Financial Market Sector

Having declined during the period of change from military to civilian government in the mid 1980's, the Financial Market Efficiency Index has increased moderately from 1987 to 1993 and is expected to increase significantly after 1993. The 1986 decline in Change in FME can be primarily attributed to the "Cruzado Plan" during former President Jose Sarney's government; this Plan was the first in a series of economic "shocks" applied to the country. The 1990-1992 decrease in Change in FME was due to the turbulence in the financial market caused by Collor's liquidity squeezing "shocks" and his eventual impeachment. Overall, the Brazilian financial
market is poised to provide a rapidly increasing level of support to the privatization program after 1993-1994.

4.5 Privatization Legislation Sector

The final "macro sector" is the Privatization Legislation Sector; the main infrastructure contained in this sector is illustrated below whereby the Pro Privatization Legislation Index represents the "stock" of legislation favoring privatization in Brazil; the higher this index, the more favorable legislation is towards the privatization process.

The Pro Privatization Legislation Index is regulated by Change in PPLI which is influenced by inputs weighted according to their relative importance and effect on Brazil's privatization legislation. In the model, Facilitating Regulation was given the highest weight (25%) followed by Privatization Accessibility (15%). The other six inputs were weighted equally at 10% each.

*Facilitating regulation:* This variable aggregates four sub-variable inputs of which Foreign Ownership Quota is weighted most heavily at 70%; the others are weighted 10% each. The model assumes that more privatization facilitating regulation will lead to a higher Pro Privatization Legislation Index; clear and specific legislation together with mandatory rules also facilitate privatization regulation.
Foreign ownership quota: This key sub-variable represents another very sensitive issue for the government. While allowing a greater ownership quota for foreign investors will provide support to the privatization program, this increase will also give the government the image of "selling-out" to foreigners. During the military government, Foreign Ownership Quota was very low; the base case simulation forecasts a significant increase in this quota by 2000. While the Brazilian Constitution still prohibits foreign ownership in mining and other strategic industry companies (which makes it very difficult to domestically privatize "crown jewels" like the Companhia Vale do Rio Doce valued at US$9 billion) [LEI], the government has presented a bill to Congress, the Medida Provisória 362, that will give foreign investors the right to purchase a 100% share (up from the current 40%) of select companies to be privatized; the President, however, still has the power to veto full foreign ownership [EIU2].

Profit repatriation: Together with the increased Foreign Ownership Quota, the model expects the government to concurrently facilitate profit and dividend repatriation thus increasing foreign investors' interest in the Brazilian privatization program due to more favorable regulation.

Long term commitment: This sub-variable represents the government's adherence to its privatization program. Despite suffering significant setbacks during President Franco's administration, the Long Term Commitment towards the privatization program is expected to increase moderately. The US$2.4 billion SOE budget cut announced in July 1993 shows the government's determination to restructure its SOEs preparing them for future privatizations [SAF].
Allowable currency base: This sub-variable was already discussed in the Financial Market Sector; the increased number of "privatization currencies" allowed facilitates privatization regulation.

Privatization accessibility: This variable represents the "reaching ability" of the privatization program to small and middle class-type investors. Assuming the government is attempting to secure a wide distribution basis for its SOEs, higher accessibility signifies more favorable legislation towards privatization. Privatization Accessibility aggregates the effects of four inputs weighted according to their impact on the variable.

Private sale: Private sales were primarily used in the mid to late 1980's. Restricting the access of small investors to the privatization program, private sales were considered to be very non-transparent and thus quite unpopular with the population since the door was wide open to a wide range of irregularities [VUY]. The number of privatizations conducted through private sales is modeled to decrease as investors and the population participate more actively in the privatization program.

Auctioning: Modeled as a function of Pre Qualification, the frequency and efficiency of using Auctioning as a privatization mechanism increases with more Pre Qualification; as the Pre Qualification procedure becomes more and more stringent, however, the Auctioning frequency and efficiency is expected to start decreasing. The base case model assumes that more Auctioning increases (although to a limited extent) the accessibility of the privatization program to smaller investors.
**Pre qualification:** The Pre Qualification of buyers and other factors is expected to decrease as the privatization process becomes more transparent and efficient over time. Among the key Pre Qualification criteria are: owners' experience, financial capacity to purchase and restructure the enterprise and, if necessary, the technical or scientific capacity of the buyers; pre qualified candidates are usually allowed to visit the company, examine its books and audit its reports [VUY].

**Public share offering:** This sub-variable is expected to increase by the year 2000 as the Brazilian financial market becomes more developed and sophisticated and the SOEs become better prepared for stock market flotation [KIK]. It is important to note that through Public Share Offerings, small investors have good access to privatization in a well functioning financial market.

**Time constraints:** This constraint tracks the degree of "pressure to meet the scheduled timetable" to privatize selected SOEs; the model assumes that the higher the time pressure to privatize, the less accessible privatization becomes to many investors as the privatizations are cancelled, postponed or mismanaged. Targets and deadlines for the completion of SOE sales have been historically shown to be counterproductive to the privatization process. Deadlines often give unfair bargaining advantage to either the buyer or seller prompting hasty sales that rely too heavily on concessions and other "sweeteners" [KIK].

**Transparency:** A high degree of transparency is crucial for a successful privatization program. Transparency can be ensured through the clear and
simple selection of criteria for evaluating bids, clearly defined competitive bidding procedures, disclosure of purchase price and buyer, well-defined institutional responsibilities and adequate monitoring and supervision of the program. Lack of transparency can lead to political backlash and is often associated with poorly structured and very costly sales [KIK]. While the process in Brazil was less transparent in the 1980's due to the dominance of Private Sales, it is expected that transparency will be one of the government's primary goals in order to attract both foreign and domestic investment.

**Bureaucracy:** This sub-variable significantly reduces the Pro Privatization Legislation Index. The government is committed to its "debureaucratization program" signifying administrative reform to simplify procedures and methods, rationalization of the state machinery and red tape, implementation of cost-effective procedures, technological modernization and organizational change [GLA]. Thus, it is expected that much of the bureaucratic processes existent today will decrease by 2000.

**Privatization critical mass:** This variable combines the effects of First Generation, Second Generation and Crown Jewels sub-variables; the model assumes that as the critical mass of privatizable companies increase, legislation towards privatization becomes more favorable.

**Critical mass sub-variables:** In the mid to late 1980's, the First Generation of smaller privatizations (like *Nova America*) provided the initial critical mass for the young privatization program in Brazil. The Second Generation of privatizations under the PND (listed in Table 3) is expected to provide the continuing mass in support of the program. The Crown Jewels...
"generation" of expected privatizations in Brazil involving strategic industry SOEs like Petrobras, Telebras and Companhia Vale do Rio Doce would consolidate the Brazilian Privatization Program.

**BNDES ownership:** The Banco Nacional de Desenvolvimento Econômico e Social (BNDES) or the National Bank for Economic Development was founded in 1952 with the United States's support to provide long-term debt and venture capital to Brazilian entrepreneurs. Because the BNDES has been virtually the only source of project financing in Brazil, the bank's credit allocation decisions have been decisive in shaping the trajectory of Brazil's economic development. Today, BNDES has a very prominent role in the privatization program; this role was due primarily to the bankruptcies and failures of several companies supported by BNDES. As a result, the bank has acquired over the years many bankrupt firms from the private sector thus largely increasing the number of state-owned enterprises [VER]. Currently, in addition to the larger SOEs, the government (through its Banco do Brasil, BNDESpar and FINEP entities) owns minority shares in over 1,000 companies, some of which are considered to be very difficult to sell due to their lack of attractiveness and the government's very small share in the enterprise; the aggregate value of these 1,000-plus minority holdings totals over US$12 billion [LEI]. As the rate of privatizations accelerates through the 1990's, the number of SOEs under BNDES, its subsidiary BNDESpar and the other entities is expected to decrease. As BNDES Ownership decreases, the pressure to implement pro privatization legislation declines.

**BNDES efficiency index:** This variable has been modeled as being dependent on Centralization of Functions; it is assumed that the greater
centralization of functions involved in privatization will increase the efficiency of BNDES and other government entities. The proposed creation of a specialized Privatization Department will increase this centralization from the currently lethargic performance of the PND Directing Committee. Excessive centralization, however, has been modeled to decrease this efficiency index; overall, increased efficiency due to the greater Centralization of Functions will facilitate the implementation of favorable privatization legislation.

Centralization of functions: The model expects that the government will increase the degree of centralization for its privatization-related functions; a slight decline in centralization is modeled by late 1990's. The degree of centralization encountered today represents a significant change from the early 1980's whereby three ministers presided over a tripartite Special Commission on privatization; political and personal conflicts warranted this Commission ineffective [GLA].

SOEs GNP share: This sub-variable refers to the share of GNP attributed to SOEs; the higher this share, the greater the incentives for the government to implement privatization favoring legislation in an attempt to reduce its burdensome share. Since the early 1980's, the SOE's share of Brazilian GNP has been declining steadily; the model expects this decline to continue through 2000.

Figure 7 depicts the base case simulation results for the Privatization Legislation Sector. The base case assumptions yield a Pro Privatization Legislation Index that ranges from 100.00 to 127.29; of the four macro sectors, this represents the strongest index increase. Change in PPLI is constantly on
the positive side with one significant decline from 1986 to 1988 due to the lack of definition by the new civilian government regarding its privatization policy. A second smaller decline in 1992 represents President's Franco retreat from his predecessor's (Collor) bold privatization program.

Figure 7: Base Case Results for the Privatization Legislation Sector

While the Pro Privatization Legislation Index is expected to suffer an adjustment in the late 1990's, overall, the Privatization Legislation Sector has been strongly supporting the privatization program. Given the base case assumptions, this support is expected to continue beyond 2000.
4.6 Organization Sector

The first of the three "micro sectors" is the Organization Sector. The main infrastructure contained in this sector is illustrated below. The Organizational Readiness Index represents the "stock" of how ready the state-owned enterprises are for privatization; that is, the higher this index, the more ready the SOEs are for privatization.

The Organizational Readiness Index is regulated by Change in ORI which is affected by inputs weighted according to their relative importance and effect on organizational readiness. Technology Priority was given primary weight at 20%; the remaining eight factors were assigned 10% weight each.

*Technology priority:* This key variable combines the effect of four sub-variables of which Technology Transfer Priority and Obsolete Technology are the most important with 40% weight contributions each. The model assumes that higher Technology Priority given by SOEs corresponds to greater Organizational Readiness for privatization.

*Technology transfer priority:* This important sub-variable represents an underlying motive behind the expansion of SOEs in Brazil during the 1970's. A key objective of the military government was to transfer critical technology to its strategic firms in the petrochemical, mining, telecommunications and
transportation sectors. Through the control of the key technologies, the
government was assured of continued power and influence [KIK]. Currently,
this objective has changed; the civilian government is interested in using the
SOEs' technologies as attractive "baits" for the private sector including foreign
investors. The government is leveraging on its SOEs' technology base to
support the privatization program. The model assumes that the Technology
Transfer Priority to the private sector will increase through the year 2000
resulting in the greater Organizational Readiness for privatization.

Obsolete technology: Not all of the technologies controlled by the SOEs
are attractive. Unfortunately, many governments have failed to realize this as
they continue to divert a considerable part of their resources to rescuing SOEs
with obsolete technologies or in obsolete industries [VER]. The Brazilian
government is expected to liquidate its outdated SOEs thereby giving modern
technologies higher priority.

Strategic industries: This sub-variable represents the importance of
Strategic Industries to the country. During the military government, several
industries were considered strategic due primarily to political control factors
discussed above. While the Strategic Industries index declined during the late
1980's and early 1990's because of considerable economic and political
turmoil, the government has refocused its attention on Strategic Industries
controlled today mainly by the private sector; this has been accomplished by
providing incentives to companies developing key technologies.

SOE diversification: Many of the larger SOEs in Brazil like Petrobras
have created several specialized subsidiaries to focus on specific technologies
and industries. This has been a typical strategy adopted by larger SOEs; in the mid-1960's, Petrobras was a single domestic company whose primary activity was exploration. Today, it controls or is a dominant partner in over 70 other companies many of which are slated for privatization like Petroquisa [AYU]. Increased SOE diversification has been modeled to increase Technology Priority. The base case scenario assumes that the SOE diversification index will increase after the mid 1990's due to the newly privatized companies' renewed focus on technology whereby former SOE subsidiaries like Petroquisa now use technology as a competitive tool.

**Labor union influence:** A high degree of labor union influence over the workforce reduces the organizational readiness of the SOE especially since labor unions have traditionally opposed privatization. Over the past years, labor unions have been gaining support as exemplified in the 1990 presidential elections. The base case assumption forecasts continued high Labor Union Influence through 2000.

**Product desirability:** Organizations (including SOEs) responding to the increasingly important customer demands will develop more desirable products and services; the model assumes that Product Desirability will increase due to the greater competitiveness found in the marketplace; increased Product Desirability increases the Organizational Readiness Index.

**Managerial autonomy:** The top management of many large Brazilian SOEs is commonly depicted as politically-backed puppet managers; therefore, they are restricted in their managerial role to maximize profits and shareholders' wealth. The model assumes that greater Managerial Autonomy
and flexibility will lead to a higher degree of organizational readiness. As SOEs become increasingly privatized, it is expected that Managerial Autonomy will increase significantly by 2000.

**Incentives to privatize:** The Brazilian government has overall provided strong incentives to privatize (since the implementation of its privatization program). While the Franco Administration has temporarily reduced these incentives, the model assumes that Incentives to Privatize will increase through the year 2000.

**Access to infrastructure resources:** Investors' concerns about whether they can raise sufficient capital to modernize and expand a SOE may be a stumbling block to the sale of large public enterprises. From a foreign investor's perspective, this is particularly true when dealing with infrastructure, where sales income is in local currency, thereby raising worries about convertibility and exchange risks. The model assumes that the easier it is to improve the SOE's or privatized SOE's infrastructure, the more privatizable the organization becomes. Base case scenario forecasts a gradual increase in Access to Infrastructure Resources in Brazil [KIK].

**Profitability:** The basic assumption behind Profitability is that more profitable SOEs are more easily privatized. Loss incurring public enterprises suffering from debt overhang require significant pre-privatization "cleanup" and intense marketing to make it desirable by the private sector. Together with the Brazilian economy, overall profitability is expected to recover by 2000 after a significant decline the late 1980's and early 1990's. It should be noted that the added financial discipline resulting from the absence of government financial
backing should help propel companies to maximize efficiency leading to greater profitability [HEM].

*Debt subsidy:* The government has often subsidized the debt of "strategic" SOEs. This variable is modeled as function of Profitability; the model assumes that more profitable organizations require less Debt Subsidies.

*Market competition index:* This variable aggregates the effect of Monopolistic Market and Competitive Market. The model assumes that a greater Market Competition Index results in a higher Organization Readiness Index. It is important to note, however, that in any developing country setting, privatization of SOEs that operate as natural monopolies is more difficult than privatization of firms in competitive markets due to factors like: larger size enterprises, higher stakes and more sensitive foreign ownership issues. However, the privatization of these monopolistic enterprises can also yield significant benefits if a well developed regulatory framework that clarifies the new competitive environment is established [KIK].

*Monopolistic market:* Essentially, with the increased impetus of the privatization program, the existence of monopoly-based markets is expected to decline in Brazil by 2000.

*Competitive market:* On the other hand, the model assumes that the markets in Brazil will become increasingly competitive as industries are deregulated and SOEs are privatized.
The graph shown below in Figure 8 indicates the simulation results for the Organization Sector. Given the base case forecasts described above, the Organizational Readiness Index varied from 91.60 to 106.38; Change in ORI only becomes significantly positive after 1993.

Figure 8: Base Case Results for the Organization Sector

The results above are very similar to those of the Financial Market Sector indicating that organizations in Brazil are very sensitive to the highly inflationary financial market conditions; the Change in ORI exhibits similar behavior as Change in FME with two significant declines: in 1986, the decline was due mainly to the "Cruzado Plan"; and in 1992, the decline was due to Collor's impeachment process. It is interesting to note that both the Organization Sector and the Financial Market Sector recover from the 1990-1992 economic recession and political turmoil faster than the Economy Sector.
and the Political Sector, an indication of the inefficiency and bureaucracy embedded in the recession and impeachment plagued sectors. Both the Organization and the Financial Market Sectors seem more adept and efficient at adapting to changes in a country dominated by continuous change. Overall, the Organization Sector provides support for the privatization program starting in 1994-1995.

4.7 Labor Sector

The main infrastructure contained in the Labor Sector is illustrated below. The Labor Pro Privatization Index represents the "stock" of labor favoring privatization in Brazil; that is, the higher this index, the more favorable labor is towards the privatization program.

![Diagram of Labor Pro Privatization Index]

The Labor Pro Privatization Index is regulated by the Change in LPI which is influenced by eight inputs weighted according to their relative importance on the stock of labor favoring privatization. In the base case, the prospect of Future Unemployment was modeled to account for 25% of the Change in LPI; Labor Union Influence, Public Support, Favorable Labor Legislation and Pro-SOE Position each accounted for 15% of Change in LPI; the other three inputs received 5% weight each.
**Future unemployment:** This key sub-variable is often referred to as the primary obstacle to privatization. Labor and labor unions strongly favor lower Future Unemployment whereby the post privatization scenario is characterized by comparable pre-privatization employment levels and job security. However, due to the private sector's Efficiency Drive factor (discussed below), the new owners are primarily interested in improving productivity which often signifies employment reductions in the overstuffed SOEs. The base case scenario assumes that Future Unemployment will gradually increase as privatization intensifies; this increase will significantly reduce the Labor Pro Privatization Index.

**Labor union influence:** This sub-variable was already discussed in the previous Organization Sector. The model expects greater Labor Union Influence to decrease the Labor Pro Privatization Index due to the labor unions' opposition to the privatization program.

**Public support:** Public support has been modeled as a function of Pension Fund Usage; the higher the usage of pension funds as "privatization currency", the greater the Public Support for privatization. However, excessive use of pension funds is modeled to decrease Public Support whereby the opposition to this excessive use will come mainly from the business community. Overall, higher Public Support for privatization will increase the labor favoring privatization index.

**Employee ownership option:** This variable was also modeled as a function of Pension Fund Usage; as pension funds become an increasingly common type of privatization currency, the Employee Ownership Option index
increases. As with Public Support, the increased use of pension funds will start decreasing Employee Ownership Option as the "supply" of pension funds become greater than the "supply" of Employee Ownership Option allowed. The table below illustrates percent of SOE ownership typically allotted to employees in the Brazilian privatization process.

Table 7: Employee Participation in the Privatization Process

<table>
<thead>
<tr>
<th>Company</th>
<th>% Allotted</th>
<th>% Subscribed</th>
<th># Employees</th>
<th>Subscribed Value (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usiminas</td>
<td>10.0</td>
<td>9.6</td>
<td>17,826</td>
<td>34.5</td>
</tr>
<tr>
<td>Celma</td>
<td>10.0</td>
<td>3.0</td>
<td>342</td>
<td>0.4</td>
</tr>
<tr>
<td>Mafersa</td>
<td>10.0</td>
<td>9.5</td>
<td>2,290</td>
<td>0.1</td>
</tr>
<tr>
<td>Cosinor</td>
<td>10.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SNBP</td>
<td>10.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Piratini</td>
<td>9.9</td>
<td>9.5</td>
<td>1,106</td>
<td>1.4</td>
</tr>
<tr>
<td>Petroflex</td>
<td>10.0</td>
<td>10.0</td>
<td>1,027</td>
<td>6.0</td>
</tr>
<tr>
<td>Copesul</td>
<td>10.0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CNA</td>
<td>10.0</td>
<td>0.1</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>CST</td>
<td>12.4</td>
<td>12.2</td>
<td>6,086</td>
<td>15.2</td>
</tr>
<tr>
<td>Fosfertil</td>
<td>10.0</td>
<td>10.0</td>
<td>1,971</td>
<td>4.9</td>
</tr>
<tr>
<td>Goiasfertil</td>
<td>10.0</td>
<td>10.0</td>
<td>676</td>
<td>0.4</td>
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<tr>
<td>Acesita</td>
<td>10.0</td>
<td>10.0</td>
<td>13,191</td>
<td>15.1</td>
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<tr>
<td>CSN</td>
<td>10.0</td>
<td>10.0</td>
<td>30,108</td>
<td>48.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>74,648</td>
<td>126.6</td>
</tr>
</tbody>
</table>

Note (1): In US$ Million

Source: [BNDES]

It is interesting to note that the employees' reaction to the Employee Ownership Option has varied significantly from the high enthusiasm displayed in the privatizations of CSN, Usiminas and CST to the complete indifference found in Cosinor, SNBP and Copesul. One explanation for the indifference displayed in these privatizations is the presence of strong anti-privatization labor unions which prevented employees in subscribing to the SOEs' shares.
Pension fund usage: The legalization of pension funds as accepted "privatization currency" will increase labor's support for privatization as the possibility of becoming an employee-owner of the company (illustrated in the table above) is enticing for labor. Pension Fund Usage is forecasted to increase gradually in the base case scenario.

Favorable labor legislation: This sub-variable represents labor-favoring job termination legislation including severance package, unemployment benefits, retraining, job search assistance and includes the employee ownership option discussed above. Favorable Labor Legislation, however, creates a situation that is potentially "messy" and costly for private investors thereby reducing the attractiveness of privatization to the private sector. The government can balance this reduced attractiveness by solving these messy and highly visible labor disputes prior to privatization [KIK]. Overall, Favorable Labor Legislation is modeled to increase moderately; this increases the Labor Pro Privatization Index.

Pro SOE position: This variable refers to how favorable the SOEs are in remaining a public entity; Pro SOE Position combines the effect of three sub-variables whereby High Salary was assigned 40% weight and the other two factors were assigned 30% weight each. The model assumes that higher Pro SOE Position results in lower Labor Pro Privatization Index.

High salary: High salaries in public enterprises increase labor's satisfaction with their employment thereby increasing the Pro SOE Position. Since the mid 1980's, SOE labor costs have been increasing significantly warranting a closer look by government officials. The government has recently
announced several measures to reduce labor costs in SOEs. Among these measures are: (1) a downward adjustment to the "inflation plus 30%" salary increases existent today in some SOEs, (2) the implementation of incentive mechanisms for managers negotiating salaries with their SOE employees; currently, no formal incentive mechanisms exist for SOE managers to lower their labor costs and (3) the reduction in the total SOE employment level from 450,000 to 380,000 employees [SAF2][SAF3]. The model expects that these measures will result in a moderate decline in High Salary by 2000.

**Strategic industry:** The Franco Administration's determination to retain its Crown Jewels in strategic industries favors the continued public ownership of enterprises; this policy is strengthening the Pro SOE Position. However, the model expects that the Crown Jewels will eventually be privatized thereby reducing the Strategic Industry index and undermining the Pro SOE Position.

**Management cooperation to privatize:** The model assumes that stronger Management Cooperation to Privatize results in a weaker Pro SOE Position as top management's cooperation in the privatization process in crucial for success; management can provide support to prepare and to implement the privatization plan and to provide extensive assistance and facilitating knowledge [VUY]; this sub-variable is expected to increase by 2000.

**Efficiency drive:** The privatization process is often viewed by the public and private sectors as an "Efficiency Drive" to lower costs and improve productivity in SOEs. A direct consequence of these Efficiency Drives is employment reduction. Therefore, a higher Efficiency Drive index leads to a lower Labor Pro Privatization Index. The model expects Efficiency Drive to
increase significantly by 2000 due to the increased competitiveness in the market forcing organizations to lower costs.

**Labor force size:** This demographic sub-variable models the dynamics of the Brazilian labor force size. The Labor Force Size in Brazil is expected to increase by 2000 as the result of higher birth rates, larger population size and increased frequency of Efficiency Drives.

The graph below shows the results of the base case simulation for the Labor Sector. Given the assumptions described above, the Labor Pro Privatization Index ranges from 100.00 to 115.90; initially positive through the mid 1980's, the Change in LPI becomes "neutral" after a significant decline in 1986-1988.

**Figure 9: Base Case Results for the Labor Sector**
It is interesting to note that the results displayed above are very similar to the results obtained in the Privatization Legislation Sector; this suggests the high correlation and strong relationship existent between labor and privatization legislation in Brazil; that is, as legislation became increasingly favorable towards privatization between 1982-1986 (see Figure 7), Change in LPI experienced a sudden decline in 1986 signifying labor's dissatisfaction with the accumulating pro-privatization legislation. Since 1988, the Change in LPI has been "neutral" primarily the result of the counterbalancing effects of pro-labor and against-labor factors. The overall positive Labor Pro Privatization Index illustrates labor's support towards the privatization program despite strong labor union opposition which, as mentioned, is expected to intensify leading to the "flattening" of the Index by the late 1990's.

4.8 Foreign Investor Sector

This last "micro sector" contains the main infrastructure illustrated below. The Pro Foreign Investment Index represents the "stock" of factors attracting foreign investment into Brazil's privatization program; that is, the higher this index, the higher the attractiveness of the Brazilian Privatization Program for foreign investors.
The Pro Foreign Investment Index is regulated by the Change in PFII which is influenced by several inputs weighted according to their relative effect on the Index. BNDES Regulations with 25% weight and Foreign Direct Investment with 15% weight are the most important factors modeled to affect Change in PFII.

**BNDES Regulations:** As discussed previously, the BNDES plays a prominent role in the Brazilian Privatization Program; as the privatization process gains momentum, the model forecasts BNDES Regulations to become increasingly favorable to foreign investors. The proposal to increase the maximum foreign ownership quota to 100% in some industries is an example of attractive regulation for foreigners.

**Foreign direct investment (FDI):** This sub-variable represents the level of foreign investment in the country. After a sudden decline due to Collor's impeachment process, FDI is expected to increase gradually by the year 2000. The inclusion of debt-equity swaps into the allowable set of "privatization currencies" can ease financing constraints and help improve Brazil's overall investment climate. The table below provides an indication of how the Brazilian privatization program has the potential to reduce the country's external debt like it was done in Argentina.
Table 8:  **External Debt Reduction through Privatization**

<table>
<thead>
<tr>
<th></th>
<th>Argentina (1/90-12/92)</th>
<th>Brazil (1/91-7/93)</th>
<th>Chile (1/83-1/85)</th>
<th>Mexico (1/88-12/92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenues fr. privatization</td>
<td>17,604</td>
<td>5,334</td>
<td>1,800</td>
<td>21,427</td>
</tr>
<tr>
<td>- Cash payment</td>
<td>5,789</td>
<td>147</td>
<td>1,620</td>
<td>21,427</td>
</tr>
<tr>
<td>= Total debt contribution</td>
<td>11,815</td>
<td>5,187</td>
<td>180</td>
<td>0</td>
</tr>
<tr>
<td>Internal debt</td>
<td>2,300</td>
<td>5,145</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>External debt</td>
<td>9,515</td>
<td>42</td>
<td>180</td>
<td>0</td>
</tr>
<tr>
<td>% External debt</td>
<td>54.0%</td>
<td>0.8%</td>
<td>10.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Source: [ABA]

Swaps represent a method used by heavily indebted countries to bring foreign investors, including commercial banks, into transactions (that might not go without the bank's participation). A significant proportion of swaps under privatization are believed to have involved the original commercial bank lenders. While swaps can be beneficial, governments should use them carefully as critics of swaps argue that governments may be better off selling SOEs and using the proceeds of the sale to repay or repurchase the debt on the secondary market [KIK]. Nonetheless, this model assumes that debt-equity swaps facilitate foreign participation in Brazil's privatizations.

**Domestic investor power:** It is expected that greater Domestic Investor Power results in lower Pro Foreign Investment Index since the existence of powerful domestic investors will deter excessive foreign presence in Brazil. However, Domestic Investor Power is highly correlated with the economic and
political well-being of the country. While Domestic Investor Power has fluctuated recently, the base case scenario forecasts a gradual increase by 2000 together with the Brazilian economy.

**Global growth saturation:** This sub-variable represents the level of growth saturation in the world's markets; it is modeled to increase steadily as new growth market opportunities are becoming increasingly extinct. The model assumes that increased Global Growth Saturation will increase the attractiveness of the Brazilian market to foreign investors.

**Information efficiency index:** This index measures the amount and quality of information on Brazil available to foreign investors; information can include general market data, historical data and financial data like spread curves for Brazilian bond issues. With the increased globalization of the world's markets and the increased Global Growth Saturation, the model expects that this index will increase significantly by 2000 thus also increasing the attractiveness of Brazil to foreign investors.

**Foreign government incentives:** From a domestic perspective, an increase in the incentives given by foreign governments to invest abroad threatens national sovereignty as the population and government of less developed countries (LDCs) fear foreign control. It has been suggested that the best way for foreign governments to avoid this defensive perception is for them to "lead by example" through the implementation of an "ideal privatization process" in their countries [VER]. However, this model assumes that higher Foreign Government Incentives are welcome in LDCs needing foreign
investment (which are most of the LDCs). The incentives are expected to grow moderately by the year 2000.

**Adherence to the IMF plan:** Brazil's suspension of interest payments to its creditors represented a low point in its Adherence to the IMF Plan. The model expects the adherence to increase in the future thereby leading to the increased attractiveness of Brazil's privatization program to foreign investors.

**World Bank participation:** Given the World Bank's pro-privatization philosophy, an increased level of World Bank Participation in the Brazilian privatization program lends more credibility to the program thus increasing the attractiveness of privatization in Brazil. The World Bank's primary role in privatization has been to help establish an appropriate policy environment in which ownership change will produce efficiency gains [KIK]. The model forecasts a decline in the World Bank's advisory support as the country gains experience with privatization.

**Asset quality:** Initially, the Brazilian government privatized smaller and less attractive SOEs with relatively low asset quality (high amount of debt, outdated equipment and strong unions); however, the government has been consistently increasing the quality of assets to be privatized. As discussed previously, it is expected that the government's Crown Jewels with the highest asset quality will be privatized in the future.

The graph below illustrates the results of the base case simulation for the Foreign Investor Sector. Given the behavioral assumptions discussed
above, the Pro Foreign Investment Index varies from 83.34 to 112.23; the Change in PFII only becomes positive after 1988-1989.

**Figure 10: Base Case Results for the Foreign Investor Sector**

The results above are similar to the results obtained in the Economy and Political Sectors indicating a strong relationship among the three sectors; however, whereas the Economic and Political Stability Indices reached a low in 1996, the Pro Foreign Investment Index "bottomed" earlier in 1988-1989. One possible explanation for this difference is that although the Brazilian government's economic and political environments are still quite unstable, the government has, nonetheless, perceived the importance of foreign investment into the country and has initiated an effort directed at attracting these investments. While foreign investment has decreased due to the country's currently uncertain future, the government expects that the growth in foreign
investment will support Brazil's economic and political recovery. With the stabilization of the economic and political sectors forecasted for 1996, the Foreign Investor Sector will play a critical role in supporting the Brazilian Privatization Program through 1996 and beyond.

4.9 Alignment Index Control Sector

This control sector aggregates each sector's yearly index into an Alignment Index (discussed in section 3.3). The results below indicate three key conclusions that can be derived from the privatization model's base case simulation.

Conclusion 1: The results shown in Figure 11 are for Alignment Index and Change in Alignment Index; Previous Year Index is the graph of a one-year lag in Alignment Index. The model assumes that the initial Year 0 scenario is perfectly aligned; therefore, starting from zero.
The results indicate the overall growing misalignment among the sectors; the Alignment Index starts at 0.00 and increases to almost 20.00 by the year 2000. As it can be observed by the "flattenings" in the Index, the rate of alignment divergence among sectors decreases twice: in 1987-1990 and after 1996. This reduced divergence is supported by the results in Change in Alignment Index whereby it declines significantly in 1986-1989 indicating the decreased misalignment among the seven sectors. This decreased misalignment is more significant after 1996 whereby the decline in Change in Alignment Index approaches zero; from the above results, it is expected that Change in Alignment Index will become negative in the early 2000's; this would signify the start of true convergence among the sectors' goals towards privatization.
Conclusion 2: By analyzing Change in Alignment Index together with Average Index, a better insight can be gained from the alignment results. Average Index is the average of all the sectors' indices calculated for each simulated year.

Figure 12: Base Case Results for Change in Alignment Index & Average Index

The results above indicate that as Change in Alignment Index declines from 1983 to 1989 indicating a convergence of "thought" among sectors, the Average Index is also declining. This signifies that the sectors are converging in their dissatisfaction with the privatization program. The converging dissatisfaction "peaks" in the early 1990's; this is the period when the Collor Administration began to implement bold measures to privatize the SOEs. Due to the destabilizing effects caused by Collor's impeachment and the privatization halting policies implemented by Franco, the positive results of
Collor’s aggressive privatization agenda is only expected to start in the mid 1990’s when the Average Index begins to increase (indicating the increasingly favorable environment for privatization in Brazil) and Change in Alignment Index begins to decrease (indicating convergence of the sectors’ increased satisfaction with the privatization program). Given the current situation discussed and the base case assumptions described, the model forecasts the Brazilian Privatization Program to “take-off” starting in early 1995.

**Conclusion 3:** By analyzing the individual sectors’ results, it is interesting to note that, other than the macro and micro classification given, the sectors can be clustered by “results similarities” whereby three clusters can be proposed:

- **Cluster 1:** Economy Sector, Political Sector and Foreign Investor Sectors
- **Cluster 2:** Financial Market Sector and Organization Sector
- **Cluster 3:** Privatization Legislation Sector and Labor Sector

As supported by the model results, the relationships within the clusters have been traditionally very strong in Brazil. The Brazilian economy is highly sensitive to the political situation; Brazil’s economic and political stability are primary concerns for foreign investors. The performance of Brazilian public and private organizations are highly dependent on financial market stability; Collor’s 1990 “liquidity squeezing” program bankrupted several large companies in Brazil. And finally, Brazilian labor and labor unions are highly concerned that privatization favoring legislation will reduce employment and consequently job security.
4.10 Validation

The importance of validation has been stressed throughout the thesis. By validating the results of the historical component (1981-1993), a more effective policy sensitivity analysis can be conducted. The validation process contained two components: comparison and adjustment.

**Comparison:** The base case results discussed in this chapter have been primarily validated based on "key events" whereby the simulation results were compared to the significant economic, political and legislative occurrences in Brazil during the historical component period. Among the key events used for validation were: (1) economic events: Sarney's 1986 Cruzado Plan and Collor's 1990 liquidity squeezing shock, (2) political events: military government period, 1985 election of Jose Sarney as president, 1990 election of Fernando Collor as president, 1992 impeachment of Collor and replacement by his vice-president Itamar Franco, (3) legislative events: establishment of the política de desestatizacao and implementation of the 100% foreign ownership quota allowance. The results obtained for each index and change in index were compared to the general trend created by these key events. External indices from sources like the Economist Intelligence Unit were also used to confirm the simulation results.

**Adjustment:** Based on the comparison of the results to actual historical data, adjustments to the behavioral assumptions were occasionally made where it was deemed that the simulation was not capturing the main effect of a key event. Because the set of factors included in the model is unique, the model's historical component is not expected to track perfectly historical data.
However, this validation process inherits a fundamental role to generate greater validity and accuracy to the results discussed in the next chapter.
5. MODEL ANALYSIS: ALTERNATE SCENARIOS

This chapter will identify the key sensitivity factors to run alternate privatization scenarios answering questions like, "What if the Brazilian Inflation rate increases beyond the current 35% monthly rate?" or "What if the Labor Union Influence decreases instead of increases?" After analyzing two specific scenarios, the chapter will also address the relevance of sequencing in privatizations.

5.1 Key Sensitivity Factors

This section will identify the variables and sub-variables that are the key factors underlying two alternate scenarios: an Optimistic Case scenario and a Pessimistic Case scenario. Table 9 will list each factor that was adjusted in the sensitivity runs and will describe how their behavioral assumptions have been changed when compared to the base case behavior. The figure below illustrates an example of a change in behavioral assumption.

Figure 13: Change in Behavioral Assumption for Inflation
In the Optimistic Case, Inflation will decrease when compared to the Base Case behavior described in the previous chapter; in the Pessimistic Case, Inflation will increase and remain high through the year 2000.

Table 9: Assumptions for Key Variable/Sub-Variables in Sensitivity Analysis

<table>
<thead>
<tr>
<th>Economy Sector</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable/Sub-variable</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Inflation</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Exports</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Imports</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Tax revenues</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Public Expenditures</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Political Sector</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable/Sub-variable</td>
<td>Majority increases</td>
<td>Majority decreases</td>
</tr>
<tr>
<td>Conservative parties</td>
<td>Majority decreases</td>
<td>Majority increases</td>
</tr>
<tr>
<td>Leftist parties</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Corruption</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial Market Sector</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable/Sub-variable</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Transaction costs</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Residual costs</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Labor opposition</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Valuation bias</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Stock market development</td>
<td>Speeds up</td>
<td>Slows down</td>
</tr>
<tr>
<td>Global integration index</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Privatization Legislation Sector</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable/Sub-variable</td>
<td>Base increases</td>
<td>Base decreases</td>
</tr>
<tr>
<td>Allowable currency base</td>
<td>Strengthens</td>
<td>Weakens</td>
</tr>
<tr>
<td>Long term commitment</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Private sale</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Public share offering</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Transparency</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Bureaucracy</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Centralization of functions</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>
### Organization Sector

<table>
<thead>
<tr>
<th>Variable/Sub-variable</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology transfer priority</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Labor union influence</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Access to infrastructure resources</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>

### Labor Sector

<table>
<thead>
<tr>
<th>Variable/Sub-variable</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future unemployment</td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td>Labor union influence</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>Favorable labor legislation</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>

### Foreign Investor Sector

<table>
<thead>
<tr>
<th>Variable/Sub-variable</th>
<th>Optimistic Case</th>
<th>Pessimistic Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNDES regulations</td>
<td>More favorable</td>
<td>Less favorable</td>
</tr>
<tr>
<td>Foreign direct investment</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
</tbody>
</table>

### 5.2 Dual Scenario Analysis

This section will summarize the results obtained in the Optimistic Case and Pessimistic Case scenarios; the key differences are concentrated primarily in the years after 1993.

#### 5.2.1 Optimistic case scenario

The alignment results for the optimistic case scenario is illustrated in Figure 14. Given the adjustments described in the table above, the key result derived from these adjustments is that Change in Alignment Index becomes negative after 1995. As seen in the upper graph, this leads to the decrease in Alignment Index which peaks in 1995 signifying actual convergence among the sectors in the model after 1995. Since Average Index is rising quickly starting in 1993-1994, this convergence is "positive"; that is, the sectors are actually...
converging in their satisfaction and goals for the privatization program, unlike in the base case where the convergence was primarily a decrease in divergence rate. In this best-case policy scenario, the privatization program is a success with increased sector alignment and increased sector satisfaction.

5.2.2 Pessimistic case scenario

Especially in the post-1993 years, the differences between the two scenarios are clear in Figure 15; in the upper graph, the Alignment Index is continuously increasing through 2000 as the cyclical pattern of the Change in Alignment Index seems to stabilize around +0.75 to +1.00. Therefore, the alignment among sectors is constantly decreasing. In this pessimistic case, it is interesting to note that while the alignment is decreasing, the Average Index also declines from 100.0 to 85.0 by 2000 representing a worst-case policy scenario of decreased sector alignment and increased sector dissatisfaction at privatization. Two possible effects can result from this worst-case combination: (1) the continued "spiraling down" whereby the Alignment Index continues to increase and Average Index continues to decrease leading to the possible abandonment of the privatization program or (2) the decreased alignment and average index might spur a reaction from the government to take bold measures that could result in an Optimistic Case scenario outcome.
Figure 14: Optimistic Case Scenario Results for the Alignment Index Sector
Figure 15: Pessimistic Case Scenario Results for the Alignment Index Sector
While an actual future scenario for the Brazilian privatization program might involve a combination of adjustments from both the Optimistic and Pessimistic Case scenarios, this section isolated the positive from the negative factors allowing for a clearer understanding of the specific best-case and worst-case policy dynamics involved in privatization despite the subjective limitations of modeling. Overall, the sectors involved in privatization and especially the government should understand that while the Optimistic Case scenario should be the primary goal, a final scenario between the Optimistic and Base Case scenarios represents a more realistic short to medium run target given the current situation in Brazil.

5.3 Sequencing Privatization

One final caveat to the Brazilian privatization model involves the specific sequencing to be utilized in the process; that is, is there a particular sequence of steps that is most effective in privatizing SOEs? This section will address some of the sequential approaches suggested that may result in more effective privatizations.

**Deregulate and then privatize:** Maximizing short-run government revenues should not be the primary consideration. This can lead to privatizations that are detrimental to the economy like sales of competitive or potentially competitive SOEs as monopolies in order to raise the selling price and thus revenues. The economy will be best off if the government first deregulates potentially competitive activities, establishes adequate tariff regulation and then privatizes, even if this means a lower sale price. In the
long run, the privatization program and therefore all sectors involved in privatization will gain [KIK].

**Privatize small and medium-size SOEs before large SOEs:** When initiating its privatization program, governments should give first priority to small and medium-size SOEs in competitive sectors. Such sales are usually quick and simple requiring little prior restructuring and institutional capacity, minimal political risk and reduced foreign ownership controversies since small SOEs are more easily absorbed by domestic investors. Experience with small sales helps prepare the government for the privatization of larger and more complex SOEs [KIK].

**Partial sale before full privatization:** Sales of minority shares can have positive effects on efficiency provided that: (1) managerial control is transferred to competent core investors and (2) the government's voting rights are limited so as to curtail its day-to-day interference. Partial sales are particularly beneficial when competition is introduced and management is strengthened thus preparing the SOEs for full privatization, since partial share offerings are often a prelude to a majority share offering at a later stage. In the initial years of a privatization program, partial sales also provide a "cushion" for the absorptive capacity of domestic investors [KIK][VUY].

**Step-based approach to privatization:** A review of today's literature on privatization often suggests a step-based approach to privatization. As discussed, although this approach is dynamically limited, the following transaction-based steps are typically recommended:
• Diagnosis of an SOE through examination of its finances and operations
• Satisfaction of legal requirements
• Financial restructuring like debt restructuring and recapitalization
• Physical rehabilitation and modernization (by the public or private sector)
• Cooperation of management and employee commitment

It is clear that an effective privatization sequencing would involve a combination of the approaches described above. The cluster-based conclusion derived from this thesis' model results (described in section 4.9) suggests another possible sequence for privatization. Through this approach, the government should focus on: (1) the Economy and Political Sectors since these govern foreign investment, (2) the Financial Market Sector since this largely determines organizations' success in Brazil and (3) the Privatization Legislation Sector since this governs the well-being of labor. Since the Financial Market and Privatization Legislation Sectors are inherently dependent on the Brazilian Economy and Political Sectors, the model developed suggests the following priority-based sequencing for privatization in Brazil:

I. Economic and political sectors
II. Financial market and privatization legislation sectors
III. Foreign investor sector
IV. Organization and labor sectors

This cluster-based sequencing suggests that the Brazilian government should focus primarily on improving the country's economic and political situation since these two sectors are the driving forces behind the privatization
process. The government should implement policies directed at containing the runaway inflation and reducing the growing level of corruption and bureaucracy. Most importantly, however, the Brazilian government needs to restore its credibility vis-à-vis the population who have lost faith in the government and in themselves due to the country’s continued disarray. Without a solid credibility foundation, the government cannot expect its stability restoring measures to succeed.
6. CONCLUSION

The Brazilian Privatization Program represents a unique opportunity for the country to regain its competitiveness by reinstating economic growth, political credibility and overall country stability. Driven by the benefits of privatization, the country has nonetheless encountered many obstacles in privatizing its state-owned enterprises. In developing solutions to these obstacles, the public and private sectors have been limited by the static approaches developed to date.

This thesis traced the growth of state-owned enterprises in Brazil, the key benefits derived from privatization and the types of privatizations. After discussing the limitations of the static World Bank type models, the thesis proposed the utilization of a system dynamics modeling approach that expands both the spatial and temporal dimensions involved in the privatization process. This approach led to the development of a base case model whereby the key sectors and variables involved in a privatization process were introduced and discussed. Validation of the results contained in the model's historical component lent greater validity to the simulation results obtained in the two alternate case scenarios. This thesis concluded with a discussion of the possible sequencing mechanisms that can be used in privatizations.

The model developed facilitates the understanding of the behavioral dynamics involved in the privatization process. Through the development of model diagrams and sector mappings, Systems Thinking helps focus the analysis on relationships and time-varying behaviors. Using this modeling
approach, a deeper knowledge of the importance of sector alignment in privatization could be gained.

The creation of alternate scenarios through sensitivity analysis probed the impact of Brazil's future on its privatization program enhancing the understanding of the overall process. The applicability of sensitivity analysis can be broadened to include other country scenarios in Latin America or in regions where privatization is gaining increased importance and visibility; the door is open for future follow-up studies to this thesis.

Given the current situation in the country, the model concluded that the Brazilian Privatization Program will succeed starting in 1995. Although economic and political instability are expected to hamper the privatization process through 1996, the simulation results indicate that privatization in Brazil is supported by factors like favorable legislation, financial market efficiency and organizational readiness. Restoring credibility in the government remains the initial step to be taken in order to consolidate the privatization process in the country.

In a global economy that is becoming increasingly dominated by economic clusters, this thesis hopes to facilitate the privatization effort of developing countries like Brazil; successful privatization in these countries may signify the creation of a new order in tomorrow's global economic balance.
APPENDIX C: PRIVATIZATION MODEL DIAGRAM

The following is the complete system dynamics model diagram using the *think* software for the Brazilian privatization process:

The Economy Sector
The Political Sector

Political Index Graph

Change in PSI

Political Stability Index

Military power

Executive branch stability

Corruption
Legislative majority
Localized interests
Plans index

Conservative parties
Leftist parties
Lobbying group power
The Financial Market Sector

Financial Market Sector

Transaction costs

Residual costs

Allowable currency base

Complexity

Cost of privatization

Labor opposition

Financial Market Efficiency Index

Change in FME

Valuation accuracy

Stock market development

Fair assumptions

Pricing error

Facilitating Regulation

Global integration index

Valuation bias

Overprice

Underprice

Local bank stability

Savings account stability
The Privatization Legislation Sector

Diagram:

- Legislation Index Graph
- Pre qualification
- Auctioning
- Public share offering
- Time constraints
- BNDES ownership
- Pro Privatization Legislation Index
- Change in PPLI
- BNDES efficiency index
- Centralization of functions
- SOEs GNP share
- Privatization critical mass
- Crown jewels
- First generation
- Second generation

Private sale
- Transparency
- Bureaucracy
- Allowable currency base
- Facilitating Regulation
- Long term commitment
- Profit repatriation
- Foreign ownership quota
The Organization Sector

Organization Index Graph

Obsolete technology
SOE diversification
Technology priority
Technology transfer priority
Organizational Readiness Index

Change in ORI

Labor union influence
Product desirability
Managerial autonomy
Incentives to privatize

Profitability
Access to infrastructure resources

Market competition index
Competitive market
Monopolistic market
The Labor Sector

Labor Index Graph

High salary Strategic industry Management cooperation to privatize

Pro SOE position

Change in LPI

Labor Pro Privatization Index

Favorable labor legislation

Future unemployment

Labor force size

Employee ownership option

Labor union influence

Pension fund usage

Public support
The Foreign Investor Sector

Foreign Investor Sector

Foreign investor Graph

Domestic investor power BNDES Regulations

Pro Foreign Investment Index

Change in PFI

Foreign direct investment

Global growth saturation

Information efficiency Index

Foreign government incentives

Asset quality

World Bank participation

Adherence to IMF plan
The Alignment Index Control Sector

Alignment Analysis Graph 1

Alignment Analysis Graph 2

Previous year index

CHANGE IN ALIGNMENT INDEX
APPENDIX D: PRIVATIZATION MODEL DOCUMENTATION

The following is the complete documented set of equations and data used for the base case model. The documentation is presented by sectors which are alphabetically classified.

Alignment Index Control Sector

ALIGNMENT_INDEX = SQRT(SUM(TempESI, TempFME, TempLPI, TempORI, TempPFII, TempPPLI, TempPSI)/7)
DOCUMENT: ALIGNMENT INDEX
This index calculates the standard deviation for each simulated year's sector indices; the index receives 7 inputs from the temporary converters.

Average_Index = MEAN(Economic_Stability_Index, Financial_Market_Efficiency_Index, Labor_Pro_Privatization_Index, Organizational_Readiness_Index, Political_Stability_Index, Pro_Foreign_Investment_Index, Pro_Privatization_Legislation_Index)
DOCUMENT: Average index
For each simulated year, this index calculates the average of all the sectors' indices.

CHANGE_IN ALIGNMENT_INDEX = ALIGNMENT_INDEX-Previous_year_index
DOCUMENT: CHANGE IN ALIGNMENT INDEX
This index subtracts Previous Year Index from Alignment Index calculating the Change in Alignment Index from simulated year to simulated year.

Previous_year_index = DELAY(ALIGNMENT_INDEX, 1, 0)
DOCUMENT: Previous year index
This index stores for one period a current simulated year's Alignment Index; the delayed index is used to calculate the Change in Alignment Index. Previous year index is initialized at 0.

TempESI = (Economic_Stability_Index-Average_Index)^2
DOCUMENT: TempESI
Temporary deviation calculating converter for ESI

TempFME = (Financial_Market_Efficiency_Index-Average_Index)^2
DOCUMENT: TempFME
Temporary deviation calculating converter for FME

TempLPI = (Labor_Pro_Privatization_Index-Average_Index)^2
DOCUMENT: TempLPI
Temporary deviation calculating converter for LPI

TempORI = (Organizational_Readiness_Index-Average_Index)^2
DOCUMENT: TempORI
Temporary deviation calculating converter for ORI

TempPFII = (Pro_Foreign_Investment_Index-Average_Index)^2
DOCUMENT: TempPFII
Temporary deviation calculating converter for PPI.

TempPPLI = (Pro_Privatization_Legislation_Index-Average_Index)^2
 DOCUMENT: TempPPLI
Temporary deviation calculating converter for PPLI.

TempPSI = (Political_Stability_Index-Average_Index)^2
 DOCUMENT: TempPSI
Temporary deviation calculating converter for PSI.

**Economy Sector**

\[ \text{Economic	extunderscore Stability	extunderscore Index}(t) = \text{Economic	extunderscore Stability	extunderscore Index}(t - dt) + (\text{Change	extunderscore in	extunderscore ESI}) \times dt \]
INIT Economic	extunderscore Stability	extunderscore Index = 100

DOCUMENT: Economic Stability Index
This index represents the stock of economic stability. Initially set at 100, the higher this index becomes, the higher the economic stability in the country. The index ranges from 0 to 200.

INFLOWS:
Change in ESI = (-0.4*Inflation)-
(0.1*Currency_devaluation)+(0.1*Consumption)+(0.1*Investment)-
(0.1*Goverment_subsidies)+(0.1*Budget_surplus)+(0.1*Balance_of_payments)
DOCUMENT: Change in Economic Stability Index (ESI)
This flow controls the stock of Economic Stability Index. The Change in ESI is determined by 7 inputs weighted according to their relative importance and effect on Brazil's economic stability.

Balance of payments = (0.5*Net_export)-(0.5*Debt	extunderscore service	extunderscore payment)
DOCUMENT: Balance of payments
Balance of payments combines the net export and debt service payment factors; the more positive the balance of payments, the higher the Economic Stability Index will be.

Budget surplus = (0.5*Tax	extunderscore revenues)-(0.5*Public	extunderscore expenditures)
DOCUMENT: Budget surplus
This aggregates the negative effect of Public Expenditures with the positive effect of Tax Revenues; higher Budget Surplus increases the Economic Stability Index.

Consumption = (0.75*Favorable	extunderscore tax	extunderscore regulation)+(0.25*Middle	extunderscore class	extunderscore participation)
DOCUMENT: Consumption
This represents the interaction between Favorable Tax Regulation and Middle Class Participation. The higher the consumption level, the higher the Economic Stability Index.

Net_export = (.4*Exports)-(0.4*Imports)+(.2*Mercosul)
DOCUMENT: Net export
Net export aggregates the interaction among exports, imports and the Mercosul factor. The 3 inputs are weighted according to their relative importance on Net Export.

Currency_devaluation = GRAPH(TIME)
(0.00, 0.00), (2.00, 0.00), (4.00, 0.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 0.00), (16.0, 0.00), (18.0, -2.50), (20.0, -2.50)
DOCUMENT: Currency devaluation
Closely linked to inflation, currency devaluation is expected to decrease in the future. High currency devaluation is assumed to lower the Economic Stability Index.

Debt_service_payment = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Debt service payment
Due to Brazil's very large foreign debt level, debt service payments will remain very high throughout the model. The payments can be expected to decrease in the late 1990's.

Exports = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 0.00), (8.00, 0.00), (10.0, -5.00), (12.0, -5.00), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)

DOCUMENT: Exports
This represents the total exports from Brazil to other countries. Historically, exports decreased in the mid 1980's and early 1990's, but is expected to increase again.

Favorable_tax_regulation = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -2.50), (6.00, 0.00), (8.00, 0.00), (10.0, 2.50), (12.0, 2.50), (14.0, 2.50), (16.0, 5.00), (18.0, 5.00), (20.0, 2.50)

DOCUMENT: Favorable tax regulation
With the increasing "opening" of the Brazilian market, the government will continue to make its tax regulation increasingly favorable for economic growth and foreign investment.

Government_subsidies = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 2.50), (10.0, 2.50), (12.0, 0.00), (14.0, 0.00), (16.0, -2.50), (18.0, -2.50), (20.0, -5.00)

DOCUMENT: With the increasingly "open" Brazilian market, Government Subsidies are expected to decrease to a minimal level by 2000. The model is based on the assumption that a subsidized economy is less stable in the long-run than a non-subsidized economy.

Imports = GRAPH(TIME)
(0.00, 5.00), (2.00, 0.00), (4.00, 0.00), (6.00, -5.00), (8.00, -5.00), (10.0, 0.00), (12.0, 5.00), (14.0, 5.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Imports
This represents the total imports into the country. Having decreased in the mid 1980's, imports are expected to increase significantly with the government's opening of the Brazilian market.

Inflation = GRAPH(TIME)
(0.00, 2.50), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 2.50), (18.0, 0.00), (20.0, 0.00)

DOCUMENT: Inflation
The inflation rate in Brazil is expected to remain high during most of the 1990's. Modeled as one the key factors affecting economic stability, the higher the inflation rate, the lower the Economic Stability Index.

Investment = GRAPH(Favorable_tax_regulation)
(-5.00, -4.30), (-4.00, -1.65), (-3.00, -0.05), (-2.00, 1.05), (-1.00, 1.90), (0.00, 2.55), (1.00, 3.20), (2.00, 3.75), (3.00, 4.15), (4.00, 4.40), (5.00, 4.50)
DOCUMENT: Investment
Investment is modeled as a function of Favorable Tax Regulation; the more favorable tax regulations are, the greater the level of investment; however, there are decreasing "returns" to more favorable tax regulations; that is, investment will increase at a decreasing rate with more and more favorable regulations.

Mercosul = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 0.00), (10.0, 0.00), (12.0, 5.00), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)
DOCUMENT: Mercosul
The Mercado Comun del Sur or Mercosul in Brazil establishes a common market in the south among Argentina, Brazil, Paraguay and Uruguay; it is expected to increase comparatively favorable trade among the countries therefore favoring Brazil's trade balance.

Middle_class_participation = GRAPH(Favorable_tax_regulation)
(-5.00, -4.90), (-4.00, -2.15), (-3.00, 0.55), (-2.00, 2.20), (-1.00, 3.50), (0.00, 4.20), (1.00, 4.65), (2.00, 4.85), (3.00, 4.90), (4.00, 4.50), (5.00, 3.50)
DOCUMENT: Middle class participation
This variable is a function of Favorable Tax Regulation; the more favorable the tax regulation is, the higher the consumption level of the middle class in Brazil leading to a greater participation in the privatization process; however, this function is modeled with decreasing "returns" since beyond a given limit, more favorable tax regulation will not induce more consumption from the middle class.

Public_expenditures = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 0.00), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)
DOCUMENT: Public expenditures
Government expenditures are modeled to decrease by the year 2000 due to cost-cutting measures that have just started to emerge with Minister Cardoso's plan.

Tax_revenues = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 0.00), (10.0, 0.00), (12.0, 0.00), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
DOCUMENT: Tax revenues
The government's tax revenues are expected to rise with the increased efficiency in tax collection and the increased tax revenues generated by the newly privatized SOEs.

Financial Market Sector

Financial Market Efficiency_Index(t) = Financial Market Efficiency_Index(t - dt) + (Change_in_FME) * dt
INIT Financial Market Efficiency_Index = 100

DOCUMENT: Financial Market Efficiency Index
This index represents the stock of financial market efficiency. Initially set at 100, the higher this index becomes, the higher the efficiency in the Brazilian financial market. The index ranges from 0 to 200.

INFLOWS:
Change in FME = -
(0.2*Cost_of_privatization)+(0.2*Valuation_accuracy)+(0.2*Facilitating_ Regulation)+(0.1
*Local_bank_stability*+(0.1*Global_integration_index)+(0.2*Stock_market_development)

**DOCUMENT:** Change in Financial Market Efficiency (FME)
This flow controls the stock of Financial Market Efficiency Index. The Change in FME is determined by 6 inputs weighted according to their relative importance and effect on the Brazilian financial market.

Cost_of.privatization = (0.3*Transaction_costs)+(0.3*Residual_costs)-(0.1*Allowable_currency_base)+(0.3*Labor_opposition)
**DOCUMENT:** Cost of privatization
This aggregates the effects of 4 inputs; the higher the costs of privatization, the lower will be the Financial Market Efficiency Index.

Pricing_error = (0.5*Overprice)+(0.5*Underprice)
**DOCUMENT:** Pricing error
This combines the effects of Overprice and Underprice as Pricing Error; the higher this error, the lower the Valuation Accuracy will be.

Valuation_accuracy = (0.5*Fair_assumptions)-(0.5*Pricing_error)
**DOCUMENT:** Valuation accuracy
This combines the positive effect of Fair Assumptions and the negative effect of Pricing Error; the higher the Valuation Accuracy, the more efficient are the financial markets.

Complexity = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 2.50), (8.00, 2.50), (10.0, 0.00), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)
**DOCUMENT:** Complexity
Privatization process complexity is modeled to decline as the country gains more experience with the overall process of privatizing SOEs.

Fair_assumptions = GRAPH(Valuation_bias)
(-5.00, 5.00), (-4.00, 1.70), (-3.00, -0.35), (-2.00, -1.75), (-1.00, -2.80), (0.00, -3.40), (1.00, -3.80), (2.00, -4.00), (3.00, -4.10), (4.00, -4.20), (5.00, -4.30)
**DOCUMENT:** Fair assumptions
The higher the Valuation Bias, the lower will be the Fair Assumptions contained in the valuation.

Global_integration_index = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 2.50), (10.0, 5.00), (12.0, -2.50), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)
**DOCUMENT:** Global integration index
The more globally integrated the Brazilian financial markets are, the more efficient the market will become.

Labor_opposition = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 0.00), (8.00, 0.00), (10.0, -2.50), (12.0, -2.50), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 0.00)
**DOCUMENT:** Labor opposition
Increased labor opposition increases the costs of privatization.

Local_bank_stability = GRAPH(Savings_account_stability)
(-5.00, -4.95), (-4.00, -1.30), (-3.00, 0.55), (-2.00, 1.75), (-1.00, 2.70), (0.00, 3.45), (1.00, 3.95), (2.00, 4.35), (3.00, 4.75), (4.00, 4.95), (5.00, 5.00)
**DOCUMENT:** Local bank stability
The higher the Savings Account Stability, the higher will the Local Bank Stability become.

Overprice = GRAPH(TIME)
(0.00, 0.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, -5.00), (12.0, -5.00), (14.0, -5.00), (16.0, -5.00), (18.0, -5.00), (20.0, -5.00)
DOCUMENT: Overprice
This model assumes that, initially, the government tended to overprice its assets to be privatized due to lack of experience and to the profit factor.

Residual_costs = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 0.00), (10.0, 0.00), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)
DOCUMENT: Residual costs
Residual costs or costs associated with SOE liabilities, debt and pension funds are expected to decline as higher asset quality SOEs are privatized.

Savings_account_stability = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 0.00), (10.0, -5.00), (12.0, 0.00), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
DOCUMENT: Savings account stability
Recently destabilized in 1990 by Collor's liquidity squeezing program, Savings Account Stability is expected to recover in the future; savings accounts often represent a Brazilian's lifetime savings and is an important index of economic and social stability.

Stock_market_development = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 0.00), (8.00, 2.50), (10.0, 2.50), (12.0, -2.50), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)
DOCUMENT: Stock market development
The more developed the Brazilian stock markets are, the more efficient will be its financial markets.

Transaction_costs = GRAPH(Complexity)
(-5.00, -5.00), (-4.00, -4.80), (-3.00, -4.50), (-2.00, -4.10), (-1.00, -3.60), (0.00, -3.00), (1.00, -2.15), (2.00, -1.15), (3.00, 0.00), (4.00, 1.90), (5.00, 5.00)
DOCUMENT: Transaction costs
As the complexity in the privatization process increases, the transaction costs also increases.

Underprice = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, -5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, -5.00), (18.0, -5.00), (20.0, -5.00)
DOCUMENT: Underprice
This model assumes that in the later stages of the privatization process, the government was underpricing to ensure the success of the program thus avoiding the failure associated with overpricing.

Valuation_bias = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 0.00), (8.00, 0.00), (10.0, 0.00), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)
DOCUMENT: Valuation bias
This model is based on the assumption that the valuation bias decreases as experience is gained in the privatization process.
Foreign Investor Sector

\[ \text{Pro}_{\text{Foreign Investment Index}}(t) = \text{Pro}_{\text{Foreign Investment Index}}(t - dt) + \]
\[ \text{(Change in PFII)} \times dt \]
\[ \text{INIT Pro}_{\text{Foreign Investment Index}} = 100 \]

DOCUMENT: Pro Foreign Investment Index
This index represents the stock of Pro Foreign Investment. Initially set at 100, the higher this index becomes, the higher the attractiveness for foreign investment in Brazil's privatization program. The index ranges from 0 to 20.

INFLOWS:
Change in PFII = \(0.25\times\text{BNDES_Regulations}\times\)
(0.1\times\text{Domestic investor power})\times(0.15\times\text{Foreign direct investment})\times(0.1\times\text{Global growth saturation})\times(0.1\times\text{Information efficiency index})\times(0.1\times\text{Adherence to IMF plan})\times(0.05\times\text{World Bank participation})\times(0.05\times\text{Asset quality})

DOCUMENT: Change in Pro Foreign Investment Index (PFII)
This flow controls the stock of Pro Foreign Investment Index. The Change in PFII is determined by 9 inputs weighted according to their relative importance and effect in determining the attractiveness for foreign investment in Brazil.

Adherence to IMF plan = \(\text{GRAPH(\text{TIME})}\)
(0.00, 2.50), (2.00, 2.50), (4.00, 2.50), (6.00, -2.50), (8.00, -5.00), (10.0, -5.00), (12.0, 0.00), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Adherence to IMF Plan
Brazil's suspension of interest payments to its creditors represented the low point in its adherence to the IMF plan. The model expects the Adherence to increase in the future thus leading to the increased attractiveness of Brazil's privatization process to foreign investors.

Asset quality = \(\text{GRAPH(\text{TIME})}\)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 0.00), (10.0, 0.00), (12.0, 0.00), (14.0, 5.00), (16.0, 5.00), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Asset quality
Initially, the Brazilian government privatized smaller, less attractive SOEs with relatively low asset quality; however, the government's "crown jewels" are starting to be privatized leading to an increase in asset quality in the short run.

BNDES_Regulations = \(\text{GRAPH(\text{TIME})}\)
(0.00, -5.00), (2.00, -2.50), (4.00, -2.50), (6.00, -2.50), (8.00, 0.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 2.50)

DOCUMENT: BNDES Regulations
The regulations governing privatization in Brazil is largely determined by the BNDES; these regulations are expected to ease foreign participation in the Brazilian privatization program.

Domestic_investor_power = \(\text{GRAPH(\text{TIME})}\)
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 0.00), (8.00, -5.00), (10.0, -5.00), (12.0, -5.00), (14.0, 0.00), (16.0, 0.00), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: The higher the domestic investor power, the lower will be the Foreign Investment Index in favor of privatization; powerful domestic investors will deter excessive foreign presence in the country.

Foreign direct investment = \(\text{GRAPH(\text{TIME})}\)

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This represents the level of foreign investment in the country. After a decline due to Collor's impeachment, it modeled to rise by the year 2000.

**Foreign government incentives**

From a domestic perspective, an increase in the incentives given by foreign government threatens national sovereignty; population and government in LDC's fear a sell-out to foreigners. However, this model assumes that higher foreign government incentives are welcome in LDC's in need of foreign investment, which are most of the LDC's.

**Global growth saturation**

This represents the level of saturation in the world's markets; it is modeled to rise as new growth markets are becoming increasingly extinct.

**Information efficiency index**

This index measures the amount and quality of information available on Brazil; higher information efficiency index leads to a higher Pro Foreign Investment Index.

**World Bank participation**

Given the World Bank's pro-privatization policy, an increased level of World Bank Participation in the privatization program increases the attractiveness for foreign investors as the Bank's participation lends more credibility.

**Labor Sector**

**Labor Pro Privatization Index(t) = Labor Pro Privatization Index(t - dt) +**

\[ \text{Change in LPI} \times dt \]

**INIT Labor Pro Privatization Index = 100**

This index represents the stock of labor favoring privatization. Initially set at 100, the higher this index becomes, the higher is labor's support for privatization in Brazil. The index ranges from 0 to 200.

**INFLOWS:**

\[ \text{Change in LPI} = -(0.25*Future_unemployment)-(0.05*Labor_force_size)-(0.15*Labor_union_influence)+(0.05*Employee_ownership_option)+(0.15*Public_support)+(0.15*Favorable_labor_legislation)-(0.15*Pro_SOE_position)-(0.05*Efficiency_drive) \]

**DOCUMENT:** Change in Labor Pro Privatization Index (LPI)
This flow controls the stock of Labor Pro Privatization Index. The Change in LPI is determined by 8 inputs weighted according to their relative importance and effect on labor's view towards privatization.

\[
\text{Pro\_SOE\_position} = (0.4\times\text{High\_salary}) + (0.3\times\text{Strategic\_industry}) - (0.3\times\text{Management\_cooperation\_to\_privatize})
\]

**DOCUMENT: Pro SOE position**

This refers to how favorable the SOEs are towards remaining a government entity; it aggregates 3 inputs: high salary, strategic industry and management cooperation to privatize. The higher the Pro SOE Position, the lower will the Labor Pro Privatization Index.

\[
\text{Efficiency\_drive} = \text{GRAPH}(\text{TIME})
\]

(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, -2.50), (10.0, 0.00), (12.0, 0.00), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)

**DOCUMENT: Efficiency drive**

The more privatization is seen as an "efficiency drive" to make SOEs more efficient, the lower the support from labor.

\[
\text{Employee\_ownership\_option} = \text{GRAPH}(\text{Pension\_fund\_usage})
\]

(-5.00, -5.00), (-4.00, -1.95), (-3.00, 0.5), (-2.00, 2.35), (-1.00, 3.90), (0.00, 5.00), (1.00, 5.00), (2.00, 3.85), (3.00, 1.75), (4.00, -1.00), (5.00, -5.00)

**DOCUMENT: Employee ownership option**

As the Pension Fund Usage increases, the Employee Ownership Option also increases; however, after a limit, the increased use of pension funds will start decreasing Employee Ownership Option as supply of pension fund becomes greater than the demand for employee ownership.

\[
\text{Favorable\_labor\_legislation} = \text{GRAPH}(\text{TIME})
\]

(0.00, 2.50), (2.00, 2.50), (4.00, 2.50), (6.00, 2.50), (8.00, -2.50), (10.0, -2.50), (12.0, 0.00), (14.0, 0.00), (16.0, 0.00), (18.0, 2.50), (20.0, 2.50)

**DOCUMENT: Favorable labor legislation**

This is defined as job termination legislation that includes severance package, unemployment benefits, retraining and job search assistance. The above legislation, however, creates a situation that is potentially messy for private investors and thereby reduces the attractiveness of privatization for the private sector; but Favorable Labor Legislation increases the Labor Pro Privatization Index.

\[
\text{Future\_unemployment} = \text{GRAPH}(\text{TIME})
\]

(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, -2.50), (10.0, -2.50), (12.0, 0.00), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

**DOCUMENT: Future unemployment**

This is commonly referred to as the primary obstacle to privatization. Higher future unemployment will result in a lower Labor Pro Privatization Index since labor and labor unions want to guarantee future employment and job security despite privatization efforts to increase efficiency through employment reduction.

\[
\text{High\_salary} = \text{GRAPH}(\text{TIME})
\]

(0.00, 2.50), (2.00, 0.00), (4.00, -2.50), (6.00, 0.00), (8.00, 2.50), (10.0, 5.00), (12.0, 2.50), (14.0, 2.50), (16.0, 0.00), (18.0, 0.00), (20.0, -2.50)

**DOCUMENT: High salary**

High salary to SOE employees increase their satisfaction with SOE employment thereby increasing their Pro-SOE Position.
Labor_force_size = GRAPH(TIME)
(0.00, -4.90), (2.00, -4.60), (4.00, -4.15), (6.00, -3.75), (8.00, -3.10), (10.0, -2.45), (12.0, -1.80), (14.0, -0.95), (16.0, -0.05), (18.0, 1.45), (20.0, 4.20)

DOCUMENT: Labor force size
The labor force in Brazil is expected to increase in the future as the result of increased birth rate, larger population size and increased "efficiency drives".

Labor_union_influence = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, 5.00), (10.0, 5.00), (12.0, 2.50), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Labor union influence
This represents the power of the labor unions on labor itself; It has been historically increasing and is modeled to remain high.

Management_cooperation_toPrivatize = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, -2.50), (10.0, 2.50), (12.0, 2.50), (14.0, -2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Management cooperation to privatize
The higher the SOE management's cooperation level in the privatization process, the weaker will be the Pro-SOE Position by the SOEs; it is expected that cooperation will increase in the future.

Pension_fund_usage = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, 2.50), (10.0, 2.50), (12.0, 2.50), (14.0, 0.00), (16.0, 0.00), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Pension fund usage
The ability to use pension funds as "privatization currency" will increase labor's support for privatization as the possibility to become employee owners is enticing.

Public_support = GRAPH(Pension_fund_usage)
(-5.00, -4.85), (-4.00, -2.05), (-3.00, 0.05), (-2.00, 2.10), (-1.00, 3.20), (0.00, 4.10), (1.00, 4.80), (2.00, 4.95), (3.00, 4.50), (4.00, 3.85), (5.00, 2.20)

DOCUMENT: Public support
Public support for privatization increases as the usage of pension fund for privatization increases; excessive use of pension funds is modeled to generate a public opposition coming mainly from the business community. The higher the public's support for privatization, the higher the Labor Pro Privatization Index will be.

Strategic_industry = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 2.50), (10.0, 0.00), (12.0, 0.00), (14.0, -2.50), (16.0, -5.00), (18.0, -5.00), (20.0, -5.00)

DOCUMENT: Strategic industry
The non-privatization of strategic industry SOEs favors public ownership of enterprises thereby strengthening the Pro-SOE Position; as the government increases its privatization efforts, the number of strategic industries is expected to decline.

Organization Sector

Organizational_Readiness_Index(t) = Organizational_Readiness_Index(t - dt) + (Change_in_ORI) * dt
INIT Organizational_Readiness_Index = 100

DOCUMENT: Organizational Readiness Index
This index represents the stock of Organizational Readiness for privatization. Initially set at 100, the higher this index becomes, the more ready the state-owned enterprise is for privatization. The index ranges from 0 to 200.

**INFLOWS:**

\[
\text{Change\_in\_ORI} = (0.2\text{Technology\_priority}) - \\
(0.1\text{Labor\_union\_influence}) + (0.1\text{Product\_desirability}) + (0.1\text{Managerial\_autonomy}) + (0.1\text{Incentives\_to\_privatize}) - \\
(0.1\text{Access\_to\_infrastructure\_resources}) - \\
(0.1\text{Debt\_subsidy}) + (0.1\text{Profitability}) + (0.1\text{Market\_competition\_index})
\]

**DOCUMENT:** Change in Organizational Readiness Index (ORI)

This flow controls the stock of Organizational Readiness Index. The Change in ORI is determined by 9 inputs weighted according to their relative importance and effect on the organization's readiness for privatization.

\[
\text{Market\_competition\_index} = -(0.5\text{Monopolistic\_market}) + (0.5\text{Competitive\_market})
\]

**DOCUMENT:** Market competition index

This combines the effects of Monopolistic and Competitive market. The greater the Market Competition Index, the less difficult is the privatization process although the benefits to privatize are greater in a monopolistic market.

\[
\text{Technology\_priority} = (0.4\text{Technology\_transfer\_priority}) + (0.1\text{Strategic\_industries}) - \\
(0.4\text{Obsolete\_technology}) + (0.1\text{SOE\_diversification})
\]

**DOCUMENT:** Technology priority

This aggregates the effects of 4 inputs; the higher the Technology Priority, the greater the Organizational Readiness Index stock.

\[
\text{Access\_to\_infrastructure\_resources} = \text{GRAPH(TIME)}
\]

\[\begin{align*}
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 5.00), (10.0, 5.00), (12.0, -2.50), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
\end{align*}\]

**DOCUMENT:** Access to infrastructure resources

The easier it is to improve the SOE's or post-privatization SOE's infrastructure, the more privatizable the organization becomes. It is interesting to note that pre-privatization restructuring is assumed to be more beneficial for larger SOEs than for the smaller and medium-sized SOEs.

\[
\text{Competitive\_market} = \text{GRAPH(TIME)}
\]

\[\begin{align*}
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, 5.00), (10.0, 5.00), (12.0, -2.50), (14.0, -2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
\end{align*}\]

**DOCUMENT:** Competitive market

The model's basic assumption is that the markets are becoming increasingly competitive in Brazil.

\[
\text{Debt\_subsidy} = \text{GRAPH(Profitability)}
\]

\[\begin{align*}
(-5.00, 4.00), (-4.00, 1.75), (-3.00, -0.05), (-2.00, -1.25), (-1.00, -2.05), (0.00, -2.60), \\
(1.00, -3.20), (2.00, -3.65), (3.00, -4.10), (4.00, -4.50), (5.00, -4.80)
\end{align*}\]

**DOCUMENT:** Debt subsidy

Defined as the government's willingness to either forgive or finance the SOE's debt burdens and other liabilities; the higher the level of profitability, the lower the debt subsidies required to keep the organization afloat. High debt subsidies lower the Organizational Readiness Index.

\[
\text{Incentives\_to\_privatize} = \text{GRAPH(TIME)}
\]

\[\begin{align*}
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 0.00), (14.0, 0.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)
\end{align*}\]
DOCUMENT: Incentives to privatize
The higher the incentives to privatize, the higher will be the Organizational Readiness Index; Incentives to Privatize is expected to remain high.

Managerial_autonomy = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 0.00), (10.0, 0.00), (12.0, -2.50), (14.0, -2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)

DOCUMENT: Managerial autonomy
The greater the degree of managerial autonomy, the greater will be the Organizational Readiness Index.

Monopolistic_market = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 0.00), (10.0, -5.00), (12.0, 0.00), (14.0, 0.00), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)

DOCUMENT: Monopolistic market
The model's basic assumption is that monopoly-based markets are declining in Brazil.

Obsolete_technology = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 2.50), (8.00, -2.50), (10.0, -2.50), (12.0, 2.50), (14.0, -2.50), (16.0, -2.50), (18.0, -5.00), (20.0, -5.00)

DOCUMENT: Obsolete technology
The higher the obsolescence of the SOE's technology, the lower the "privatizability" of the organization as the private sector interest is reduced.

Product_desirability = GRAPH(TIME)
(0.00, -2.50), (2.00, -2.50), (4.00, -2.50), (6.00, -2.50), (8.00, 0.00), (10.0, 0.00), (12.0, 2.50), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Product desirability
Organizations responding to the increasingly important customer demands will develop desirable products; the model expects Product Desirability to increase due to the increased competitiveness in the marketplace; increased Product Desirability increases the Organizational Readiness Index.

Profitability = GRAPH(TIME)
(0.00, 2.50), (2.00, 2.50), (4.00, 2.50), (6.00, -5.00), (8.00, -5.00), (10.0, -5.00), (12.0, 0.00), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Profitability
The basic assumption used is that the more profitable the SOE is, the more privatizable the SOE becomes. Loss-incurring SOE's need much marketing and pre-privatization cleanup to make it desirable to the private sector. Negative profitability incurs damages through debt overhang problems.

SOE_diversification = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, -5.00), (8.00, -5.00), (10.0, -5.00), (12.0, 0.00), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)

DOCUMENT: SOE diversification
Larger Brazilian SOEs like Petrobras have in the past typically created several specialized subsidiaries that focused on specific technologies; higher diversification signifies higher technology priority. Today, this "technology focus" through diversification is being carried out by private sector companies that depend on technology to maintain their competitiveness; it is expected to increase by 2000.

Strategic_industries = GRAPH(TIME)

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Strategic industries
This sub-variable represents the importance of strategic industries to the country. During the military government, several industries were considered strategic due mainly to political control reasons. Today, the government has refocused its attention on cultivating its strategic industries that are controlled mainly by the private sector.

Technology transfer priority = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -5.00), (8.00, 0.00), (10.0, 5.00), (12.0, -2.50), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)
DOCUMENT: Technology transfer priority
The higher the priority to transfer technology to the private sector, the higher the technology priority index will be. In addition, high technology transfer priority might lead to the entrance of foreign sources of technology through the acquisition of SOEs by foreign investors.

Political Sector

Political Stability Index(t) = Political Stability Index(t - dt) + (Change in PSI) * dt
INIT Political Stability Index = 100

DOCUMENT: Political Stability Index
This index represents the stock of political stability. Initially set at 100, the higher this index becomes, the higher the political stability in the country. The index ranges from 0 to 200.

INFLOWS:
Change in PSI = -(0.1*Plans index)+(0.1*Executive branch stability)-(0.1*Localized interests)-(0.1*Military power)-(0.1*Corruption)+(0.5*Legislative majority)
DOCUMENT: Change in Political Stability Index (PSI)
This flow controls the stock of Political Stability Index. The Change in PSI is determined by 6 inputs weighted according to their relative importance and effect on Brazil's political stability.

Legislative majority = (0.5*Conservative parties)-(0.5*Leftist parties)
DOCUMENT: Legislative majority
This converter represents the interaction between the conservative parties and leftist parties' influence; a dominant conservative parties factor will make Legislative Majority more positive which will increase the Political Stability Index stock.

Conservative parties = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 0.00), (8.00, -5.00), (10.0, -5.00), (12.0, -5.00), (14.0, 0.00), (16.0, 0.00), (18.0, 0.00), (20.0, 0.00)
DOCUMENT: Conservative parties
Conservative parties are assumed to be the more rightist non-labor parties in Brazil like the PFL (Partido da Frente Liberal) and PPR (Partido Popular Republicano).

Corruption = GRAPH(TIME)
(0.00, 0.00), (2.00, 0.00), (4.00, 0.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 0.00), (18.0, -2.50), (20.0, -2.50)
DOCUMENT: Corruption
Corruption refers to the publicly exposed corruption rather than the hidden corruption that might actually increase political stability. The higher the level of visible corruption in the country, the lower the political stability index. Corruption became especially evident during the late 1980's and early 1990's resulting in the impeachment of former President Fernando Collor.

Executive_branch_stability = GRAPHTIME
(0.00, 5.00), (2.00, 0.00), (4.00, 0.00), (6.00, -5.00), (8.00, -5.00), (10.0, 5.00), (12.0, 5.00), (14.0, -5.00), (16.0, -5.00), (18.0, 0.00), (20.0, 0.00)

DOCUMENT: Executive branch stability
This index represents the stability of the Presidency and its cabinet; stability was very high during the first year of the Collor Administration, but plunged after his impeachment.

Leftist_parties = GRAPHTIME
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 0.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 0.00), (16.0, 0.00), (18.0, 0.00), (20.0, 0.00)

DOCUMENT: Leftist parties
The leftist parties in Brazil are essentially the labor parties led by the PT (Partido dos Trabalhadores). The PT gained much support in the late 1980's and early 1990's when its candidate almost won the 1990 presidential elections.

Lobbying_group_power = GRAPHTIME
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 0.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 0.00), (18.0, -2.50), (20.0, -2.50)

DOCUMENT: Lobbying group power
This represents the influence of special interest groups on politicians; high lobbying group power results in a higher degree of localized interests.

Localized_interests = GRAPHTIME(Lobbying_group_power)
(-5.00, -5.00), (-4.00, -3.90), (-3.00, -3.20), (-2.00, -2.45), (-1.00, -1.50), (0.00, -0.55), (1.00, 0.4), (2.00, 1.10), (3.00, 2.10), (4.00, 3.45), (5.00, 5.00)

DOCUMENT: Localized interests
Localized interests is graphed as a function of lobbying group power; high lobbying power will result in higher localized interests. Increased localized interests is assumed to reduce the Political Stability index.

Military_power = GRAPHTIME
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 0.00), (8.00, 0.00), (10.0, -5.00), (12.0, -5.00), (14.0, 0.00), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)

DOCUMENT: Military power
Military power is defined as the amount of influence that the military has on the country's political environment. The military's power was very high during the military government years until the mid-1980's when the first civilian government in 20 years was established in Brazil.

Plans_index = GRAPHTIME
(0.00, -5.00), (2.00, -5.00), (4.00, 0.00), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 5.00), (14.0, 0.00), (16.0, 0.00), (18.0, -2.50), (20.0, -2.50)

DOCUMENT: Plans index
This index represents the frequency of destabilizing economic "shocks" that have been applied to the country. Economic "shock" programs have been especially prevalent during the late 1980's and early 1990's in a futile attempt to control runaway inflation; the higher the number of "shocks", the lower the Political Stability Index.
Privatization Legislation Sector

Pro_Private_Legislation_Index(t) = Pro_Public_Legislation_Index(t - dt) +
(Change_in_PPLI) * dt
INIT Pro_Private_Legislation_Index = 100

DOCUMENT: Pro Privatization Legislation Index
This index represents the stock of legislation in favor of privatization. Initially set at
100, the higher this index becomes, the higher the degree of legislation favoring
privatization in Brazil. The index ranges from 0 to 200.

INFLOWS:
Change_in_PPLI =
(0.25*Facilitating_Regulation)+(0.1*Privatization_critical_mass)+(0.1*SOEs_GNP_share)
+(0.1*BNDES_ownership)+(0.1*BNDES_efficiency_index)+(0.15*Privatization_accessibility)
+(0.1*Transparency)+(0.1*Bureaucracy)
DOCUMENT: Change in Pro Privatization Legislation Index (PPLI)
This flow controls the stock of Pro Privatization Legislation Index. The Change in PPLI
is determined by 8 inputs weighted according to their relative importance and effect on
the country's pro privatization legislation.

Facilitating_Regulation =
(0.7*Foreign_ownership_quota)+(0.1*Profit_repatriation)+(0.1*Long_term_commitment)
+(0.1*Allowable_currency_base)
DOCUMENT: Facilitating Regulation
This converter aggregates 4 weighted inputs; the more regulation facilitates
privatization, the higher the Pro Privatization Legislation Index will become.

Privatization_accessibility = -
(0.3*Private_sale)+(0.2*Auctioning)+(0.3*Public_share_offering)-(0.2*Time_constraints)
DOCUMENT: Privatization accessibility
Accessibility refers to the reaching ability of the privatization program to small
investors and middle-class investors. The higher the accessibility, the more favorable
the legislation is towards the privatization program, assuming the government is
attempting to secure a wide distribution basis.

Privatization_critical_mass =
(0.5*First_generation)+(0.3*Second_generation)+(0.2*Crown_jewels)
DOCUMENT: Privatization critical mass
This aggregates the effect of the First Generation, Second Generation and Crown
Jewels on the Pro Privatization Legislation Index; the higher the critical mass, the
more favorable legislation becomes.

Allowable_currency_base = GRAPH(TIME)
(0.00, -2.50), (2.00, -2.50), (4.00, -2.50), (6.00, -2.50), (8.00, 2.50), (10.0, 2.50), (12.0, -
2.50), (14.0, -2.50), (16.0, 0.00), (18.0, 2.50), (20.0, 5.00)
DOCUMENT: Allowable currency base
This represents the number of "privatization currency" types like pension funds,
sovereign debt and others allowed in the privatization program; it is expected to
increase as the government attempts to boost its privatization program to a wider
populational base.

Auctioning = GRAPH(Pre_qualification)
Initially, increasing Pre Qualification increases the efficiency of auctions as a privatization mechanism; as the pre-qualification process becomes more and more stringent, however, the auctioning efficiency is decreased; it should be noted that smaller investors have limited access to auctions.

\[
\text{BNDES\_efficiency\_index = GRAPH(Centralization\_of\_functions)}
\]
\[
(-5.00, -5.00), (-4.00, -2.70), (-3.00, 0.00), (-2.00, 2.05), (-1.00, 3.35), (0.00, 4.30), (1.00, 4.90), (2.00, 4.95), (3.00, 4.15), (4.00, 2.70), (5.00, 0.00)
\]

DOCUMENT: BNDES efficiency index
The higher the centralization of functions, the higher the BNDES's efficiency. However, excessive centralization may hamper efficiency reducing it significantly.

\[
\text{BNDES\_ownership = GRAPH(TIME)}
\]
\[
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 2.50), (8.00, 2.50), (10.0, 2.50), (12.0, 0.00), (14.0, 0.00), (16.0, -2.50), (18.0, -2.50), (20.0, -5.00)
\]

DOCUMENT: BNDES ownership
The number of SOEs under the control of the BNDES is expected to decrease with the increased rate of privatization expected; the lower the number of SOEs under the BNDES, the lower the pressure to implement pro privatization legislation.

\[
\text{Bureaucracy = GRAPH(TIME)}
\]
\[
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 2.50), (10.0, 2.50), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -2.50), (20.0, -2.50)
\]

DOCUMENT: Bureaucracy
High levels of bureaucracy lower the Pro Privatization Legislation Index; it is expected that much of the bureaucratic processes existent today will be reduced by 2000.

\[
\text{Centralization\_of\_functions = GRAPH(TIME)}
\]
\[
(0.00, -5.00), (2.00, -5.00), (4.00, 2.50), (6.00, 2.50), (8.00, 2.50), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
\]

DOCUMENT: Centralization of functions
The government expects to increasingly centralize its privatization effort into one Privatization Department that will increase the efficiency of the entire process.

\[
\text{Crown\_jewels = GRAPH(TIME)}
\]
\[
(0.00, 0.00), (2.00, 0.00), (4.00, 0.00), (6.00, 0.00), (8.00, 0.00), (10.0, 0.00), (12.0, 0.00), (14.0, 2.50), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)
\]

DOCUMENT: Untouchables
Brazil's "crown jewels" like Petrobras are expected to provide the final and consolidating boost to the Brazilian privatization program.

\[
\text{First\_generation = GRAPH(TIME)}
\]
\[
(0.00, 0.00), (2.00, 0.00), (4.00, 2.50), (6.00, 5.00), (8.00, 5.00), (10.0, 5.00), (12.0, 2.50), (14.0, 2.50), (16.0, 0.00), (18.0, 0.00), (20.0, 0.00)
\]

DOCUMENT: First generation
The first generation of privatizations in Brazil between the mid and late 1980's generated an initial critical mass for the privatization program in Brazil.

\[
\text{Foreign\_ownership\_quota = GRAPH(TIME)}
\]
\[
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, 0.00), (10.0, 0.00), (12.0, 2.50), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)
\]
Foreign ownership quota
The maximum allowable foreign ownership of SOEs has been increasingly steadily; the "100% Ownership" decree is expected to be approved.

Long_term_commitment = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, -5.00), (10.0, 5.00), (12.0, -5.00), (14.0, 0.00), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)

DOCUMENT: Long term commitment
This refers to the government's adherence to its Destatization Program; despite having suffered sudden decreases due to President Franco's policies, it is expected to increase by 2000.

Pre_qualification = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 2.50), (12.0, 0.00), (14.0, 0.00), (16.0, 0.00), (18.0, 0.00), (20.0, 0.00)

DOCUMENT: Pre Qualification
The Pre Qualification process for auctioning is expected to decrease as the privatization process in Brazil becomes more "efficient" over time.

Private_sale = GRAPH(TIME)
(0.00, 2.50), (2.00, 2.50), (4.00, 5.00), (6.00, 5.00), (8.00, 5.00), (10.0, 2.50), (12.0, 0.00), (14.0, -2.50), (16.0, -2.50), (18.0, -5.00), (20.0, -5.00)

DOCUMENT: Private Sale
The number of privatizations conducted through private sales is expected to decrease as investors become more knowledgeable about the privatization process; it should be noted that small investors have little or no access to private sales.

Profit_repatriation = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, -2.50), (8.00, 0.00), (10.0, -5.00), (12.0, -5.00), (14.0, 5.00), (16.0, 5.00), (18.0, 5.00), (20.0, 5.00)

DOCUMENT: Profit repatriation
Repatriating profits and dividends to other countries is expected to be facilitated by 2000 to increase foreign investors' interest in Brazil's privatization program.

Public_share_offering = GRAPH(TIME)
(0.00, -5.00), (2.00, -5.00), (4.00, -5.00), (6.00, 2.50), (8.00, -5.00), (10.0, -5.00), (12.0, 0.00), (14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 5.00)

DOCUMENT: Public share offering
Public share offerings are expected to increase in the future as the financial markets become more developed; it is important to note that through public share offerings, small investors have good access to privatization in a well functioning local market.

Second_generation = GRAPH(TIME)
(0.00, 0.00), (2.00, 0.00), (4.00, 0.00), (6.00, 0.00), (8.00, 2.50), (10.0, 5.00), (12.0, 5.00), (14.0, 5.00), (16.0, 2.50), (18.0, 2.50), (20.0, 0.00)

DOCUMENT: Second generation
The second generation of privatizations in Brazil between the early 1990's and now is expected to provide the continuing support to the privatization program.

SOEs_GNP_share = GRAPH(TIME)
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 2.50), (10.0, 2.50), (12.0, 2.50), (14.0, 0.00), (16.0, 0.00), (18.0, 0.00), (20.0, -2.50)

DOCUMENT: SOEs GNP share
The higher the share of GNP associated with SOEs, the higher the Pro Privatization
Legislation Index will be as the government faces pressure to unload this burdensome
share.

\[
\text{Time constraints} = \text{GRAPH(TIME)} \\
(0.00, -5.00), (2.00, -5.00), (4.00, -2.50), (6.00, 0.00), (8.00, 5.00), (10.0, 0.00), (12.0, -
2.50), (14.0, -2.50), (16.0, 0.00), (18.0, 0.00), (20.0, 0.00)
\]

DOCUMENT: Time constraints
Time constraints refers to the amount of "deadline pressure" to privatize selected
SOEs; the higher the pressure to privatize, the less accessible privatization becomes to
investors as many privatizations are cancelled, postponed or mismanaged.

\[
\text{Transparency} = \text{GRAPH(TIME)} \\
(0.00, 5.00), (2.00, 5.00), (4.00, 5.00), (6.00, 5.00), (8.00, 0.00), (10.0, 2.50), (12.0, 2.50),
(14.0, 2.50), (16.0, 2.50), (18.0, 2.50), (20.0, 2.50)
\]

DOCUMENT: Transparency
A high degree of transparency is important for a successful privatization program;
while the process in Brazil was less transparent in the late 1980's, it is expected that
transparency will be a primary goal of the government in order to attract foreign
investors.
8. REFERENCES

[ABA] ABAMEC and FIPE. (1993): Seminario: Privatizacao do Estoque e as Moedas, Sao Paulo, Brazil.


