

# Privatization ; Iran Power Industry As A Case Study

Ali HasanPour, Mohammad Rasouli, Mohammad Jalalian, Reza Kazemi, S.M.Mahdi Mirhoseini, Masoud Tavazoei

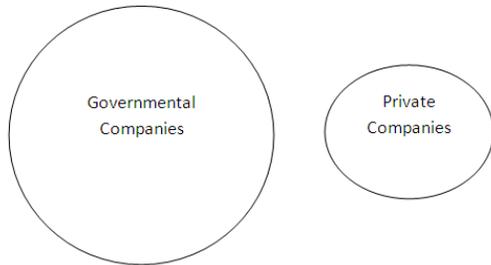


Fig. 1: Graph of Government Money and Private Companies

**Abstract**— As it can be observed in developing countries trend, in these countries there is a huge government possessing enormous money and also cash flows in these countries are mainly within governmental organizations rather than non-governmental (private) sector. Plainly, this trend will not be favorable for those countries and will lead to economical downturn after a while, because given the weakness of private sector; the competition for market share will begin to wane, leading to good quality decline. Consequently investors will lose their motivation for investment and production drop and unemployment rise will be the inevitable consequences. As a result, putting in an effort to foster the process of privatization is one of the most important goals in these countries. Privatization should take place in many fields including electrical power supply. In this paper we will investigate the privatization trend in electrical power supply industry in Iran as a case study and we will also analyze the effect of influential parameters on this trend. At the end, some policies are suggested to accelerate the process and their results are probed.

**Keywords.** Privatization, PortFolio, Power Industry, Government Policy.

## I. INTRODUCTION

In developing countries usually, there is a vast government which has a large amount of money and critical cash flows take place in governmental organization, whereas cash flows in private sector is much less. This fact is illustrated in the Figure. 1.

Obviously, this trend will not be beneficial for the country and the difference between cash flows in governmental and private sector will eventually result in economical recession, because lack of a powerful private sector will gradually eliminate the competition in market and those few private corporation will forfeit in competition with their large governmental rivals that are supported by government budget. As the competition in market fades away, the quality and efficiency will decline because there is no motivation for improvement and

taking the market share. Consequently, investors will gently withdraw their capital from manufacturing factories leading to production drop and unemployment growth. Considering the macro portfolio (See Figure. 2) dominant in the country, the only way to reduce government size is privatization. As a result privatization is one of the critical targets for these countries. The privatization process is required in almost all fields including power supply industry. In this paper we will investigate the privatization trend in electrical power supply industry in Iran as a case study and we will also analyze the effect of influential parameters on this trend. Regarding the consensus over the plan for restructuring power supply industry, and rise in country power supply demand (which is shown in Figure. 3), Privatization has become the focal point of all strategic planning in power supply industry.

## II. STATEMENT OF THE PROBLEM

According to the fourth development plan, the estimated demand for power supply on the year 2016, will be about 73 thousands Megawatt. If the investment on power supply industry follows the trend depicted in Figure. 3, providing the required power on 2016 will be impossible. Here is the problem that the government is facing with and we are looking for a model to provide us with deep insights into the problem. The main problem is the government inability to produce required electrical energy in the following years. In other words the gap between demand and supply in the future should diminish. Our main concern is to fill this gap as soon as possible and consequently the privatization process should be accelerated and improved to attract investors to power supply market in order to increase the production. To deeply understand the problem, a model is tailored using system dynamic approach and the simulation results are investigated to analyze the power supply market during future years.

## III. DYNAMIC HYPOTHESIS

Power Supply industry comprises three main sectors: production, transmission and distribution. They were all undertaken by governmental organization. Because of the population growth as well as industrial development, the demand for electricity power will dramatically increase. Since the government is not capable of building sufficient power plants to meet the growing demand, restructuring power supply industry is taken as a serious strategy to solve the problem. One of the crucial policies in restructuring is privatization. As a result, government tends to modify the rules in favor of private sector, to raise the investment efficiency in this industry to encourage the investment of private sector. In this way, a part of demanded power supply will be provided by private power stations. In addition to the rules and investment efficiency,

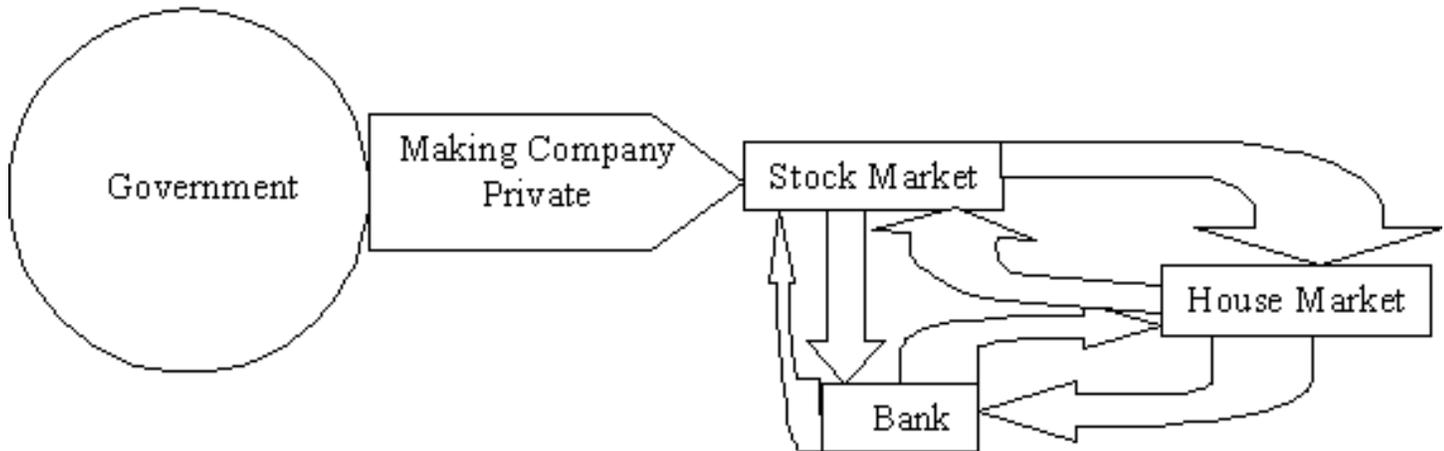


Fig. 2: Structure Of Portfolio & Flow of Money

there is another influential factor called "investment risk" that plays a key role in private sector investment. The greater the investment risk is, the less the investment will be. Changes and instability of rules are decisive factors in investment risk. Numerous changes lead to increase in risk investment. The investment risk as well as investment efficiency are incorporated into one variable called "efficiency to risk ratio" that will affect the production of private sector. The greater the aforesaid ratio is, the more investment will be. As private sector share in production increases, owners' resistance against rule changes will rise and consequently rules will change less than before. In other words, rule stability is determined by the ratio of government share to private sector share. Private sector production is possible in two forms:

- Build-Operate Transfer (BOT): in this kind of production the produced power will be delivered to government after a while.
- Build-Own Operate (BOO): the private sector is totally independent. This kind of production is not frequent in Iran, because it comprises noticeable authority delegation.

#### IV. CAUSAL LOOPS

Regarding the previously mentioned information, three causal loops could be recognized:

##### A. The loop of government production share

In this loop(See Figure. 4), as demand increases, supply shortage will also increase and government will seal the gap by constructing new power plants, hence there will be a negative loop leading to a goal seeking behavior.

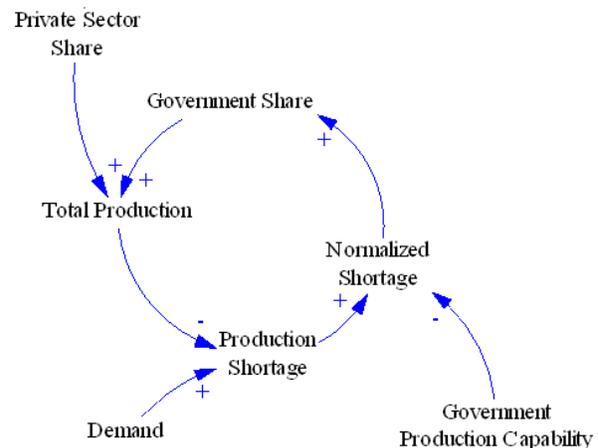


Fig. 4: The loop of government production share

##### B. The loop of efficiency

Based on Figure. 5, As demand rises, capacity shortage will also increase and as a result, rules are modified to encourage private sector investment. Increase in private sector share, will compensate the capacity shortage and it reaches to an equilibrium. Same as before, this is a negative loop, thus it causes a goal seeking behavior.

##### C. The loop of investment risk

As the private sector share increases comparing to governmental share, rules become more stable resulting in investment risk decline and consequently the private sector investment increases. It is crystal clear that this is positive loop that will increase private sector investment(See Figure. 6).

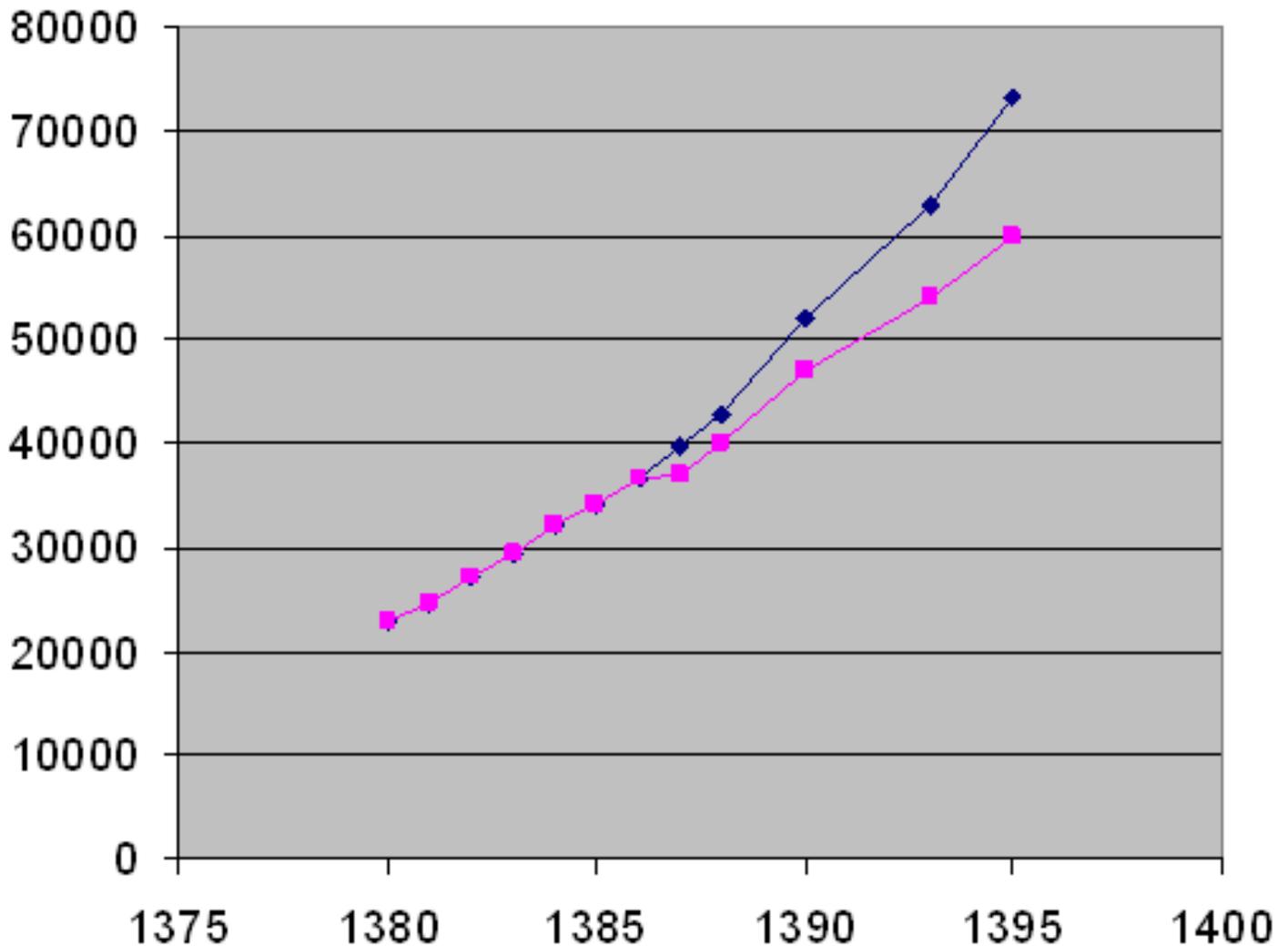


Fig. 3: Axis Y label is Mega-Watt,Produced Power(red),Needed Power(blue)

#### D. Stock Flow Diagram

In this part we combine the above expressed loops and make the stock-flow diagram to simulate and run the model.(See Figure. 7)

#### V. ANALYZING THE RESULTS

The model comprises a negative loop as well as a positive loop and the limited capacity will be a confining factor. As it can be observed in Figure. 8 up to Figure. 13 as the required capacity increases during future years, governmental and private production will also increase, however their ratio and the capacity shortage will remains constant. Accordingly rules facilitating private sector investment will reach to equilibrium. As we were expecting, at the outset, rules are in favor of private sector and after private sector share escalation, rules will reach to a balance point between governmental and private share.

#### VI. SUGGESTED POLICIES

Considering the short term and long term effect , some policies are suggested to improve the status quo. Firstly, the parameters that could be adjustable should be identified and their effects on key variables behavior must be probed, afterwards, we will be able to suggest an effective policy. In this model there are 5 parameters that government managers could decide about and changing each of them through legitimating certain rules, could affect the system output behavior.

- Rule function.
- Stabilizing function.
- Delegation authority.
- BOO production.
- BOT delivery time. function

Changing each of the variables above while keeping the others unchanged will manifest the effect of each policy. Figures below show the simulation result as the aforesaid variables are changed. The results for changing the fourth and the fifth variable are not illustrated because of their negligible effect

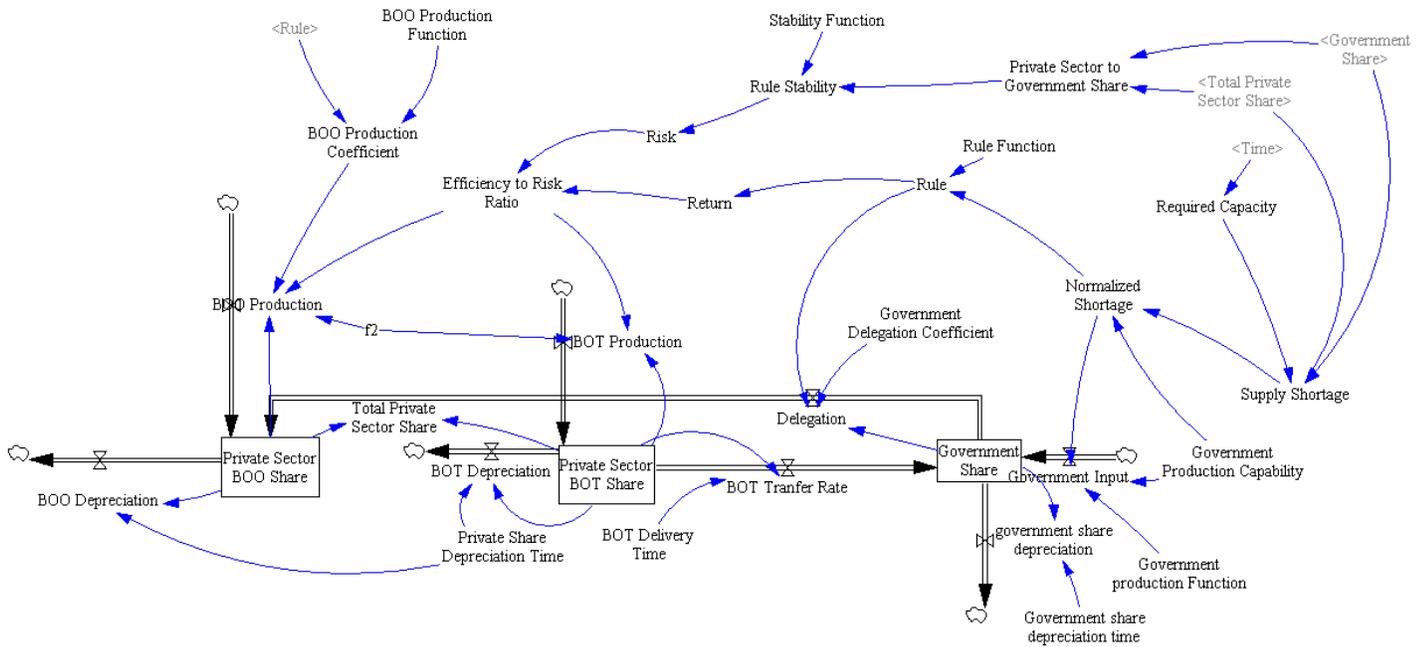


Fig. 7: Stock Flow Diagram of Model

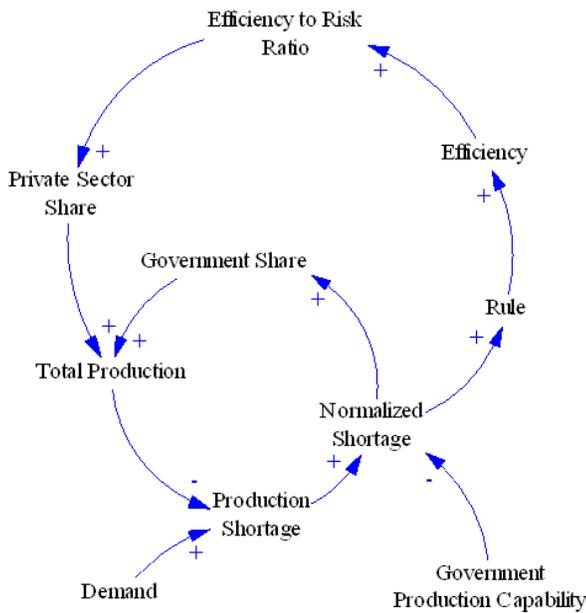


Fig. 5: The loop of efficiency

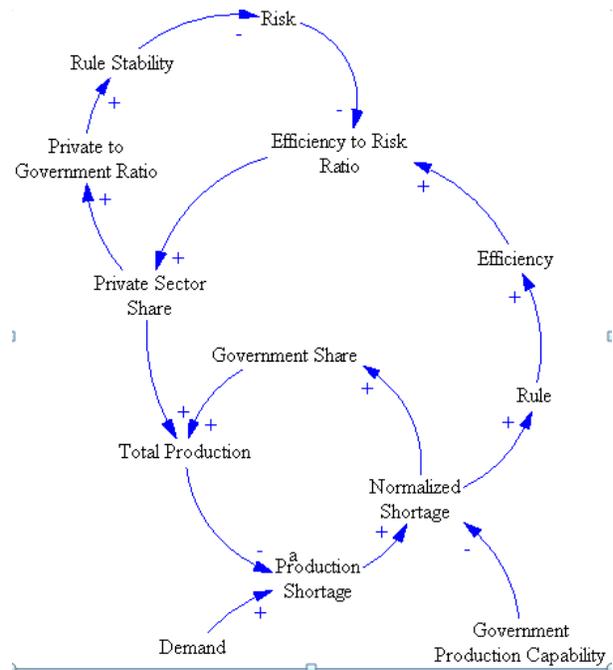


Fig. 6: The loop of efficiency

on the outputs.

As the Figure. 14 , Figure. 15 & Figure. 16 manifest, more stability in government’s rules accelerates the process of reaching to equilibrium and this could be considered as the crucial government policy. To state the matter differently, as politicians keeps the rules stable for a longer time, the production of private sector will increase and the system will reach to equilibrium faster and consequently, the supply shortage will be compensated in a shorter time. Besides increasing the

government delegation will hasten the privatization process.

REFERENCES

- [1] Ali Naghi Mashayekhi, The impact of exchange rate policy on inflation rate in an oil-exporting economy.
- [2] Ali Naghi Mashayekhi, Transition in the New York State solid waste system: a dynamic analysis.
- [3] Jac A. M. Vennix, Jay Wright Forrester Prize Lecture, Group model-building: tackling messy problems , 1999.

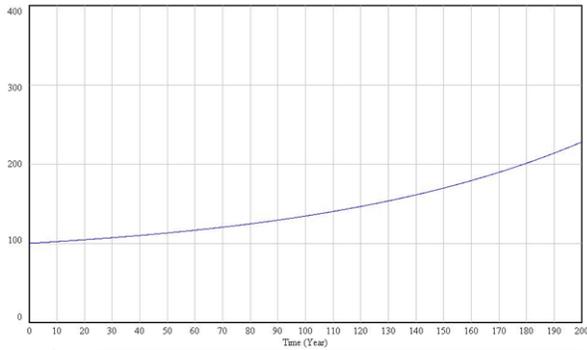


Fig. 8: Required Capacity

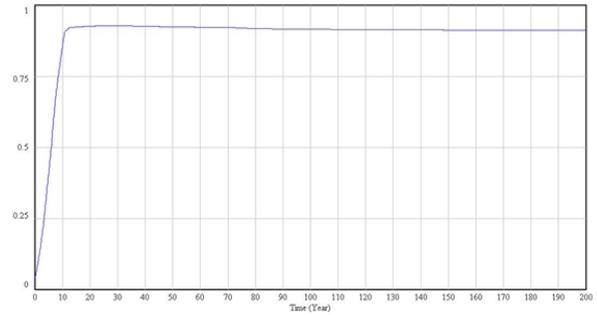


Fig. 12: Rule Stability ;it means the rate stability of privatization

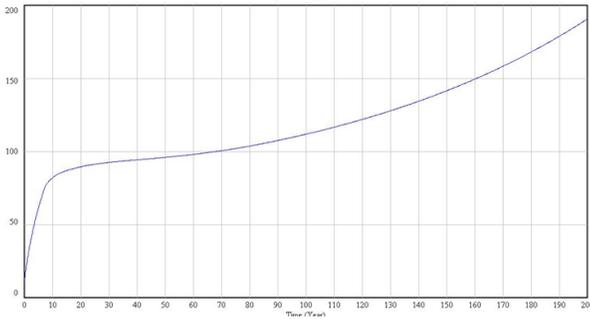


Fig. 9: Total Private Sector Share

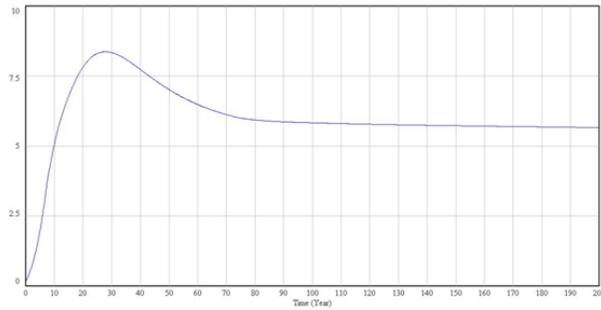


Fig. 13: Private Sector to Government Share

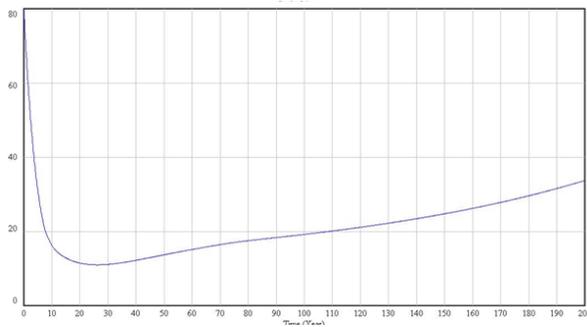


Fig. 10: Government Share

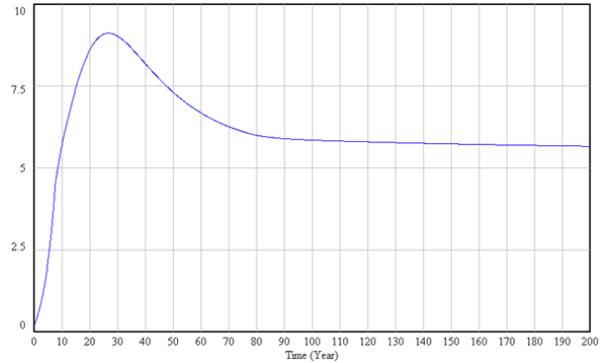


Fig. 14: The effect of changing rule function and optimizing it for the private sector.

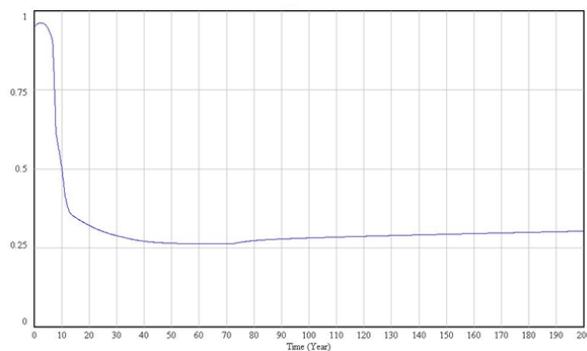


Fig. 11: Rule it means the rules which set rate of privatization

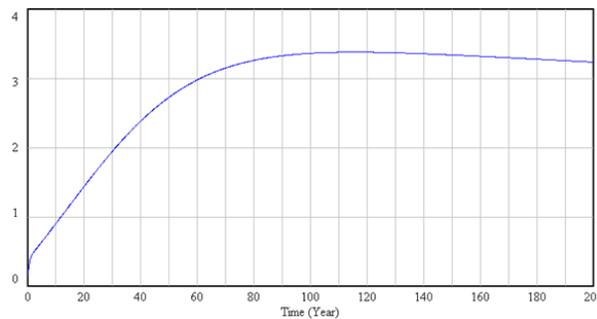


Fig. 15: The effects of changing the rule stabilizing function In favor of private sector

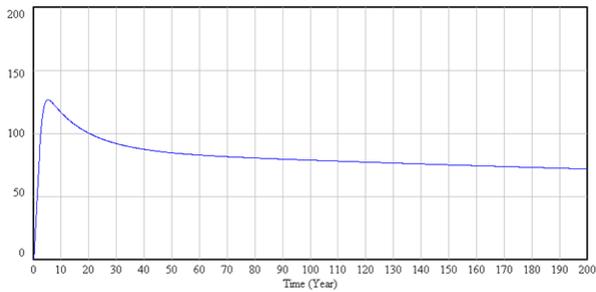


Fig. 16: The effect of increase in government delegation coefficient

- [4] Yaman Barlas and Stanley Carpenter, Philosophical roof of model validation: two paradigms.
- [5] Barry Richmond, Systems thinking: critical thinking skills for the 1990s and beyond.
- [6] John D. Sterman, System Dynamics Modelling: Tools for learning in a complex world.
- [7] James M. Lyneis, System dynamics for market forecasting and structural analysis.
- [8] James M. Lyneis, a Kenneth G. Cooper and Sharon A. Elsa, Strategic management of complex projects: a case study using system dynamics.
- [9] George P. Richardson, Problems in causal loop diagrams revisited.
- [10] Sterman J. D., Business Dynamics: System Thinking and Modeling for a Complex World, Boston, MA, McGraw-Hill Companies, 2000.
- [11] Jay W. Forrester, System Dynamics and the Lessons of 35 Years, MIT Working Paper, 1991.



**Ali HasanPoor** was born in Tehran, Iran, on June 12, 1987. He received B.S. degree in electrical engineering from Sharif University of Technology, Tehran, Iran in 2009. He is currently working toward MBA in Sharif University of Technology (SUT), Tehran, Iran. Since summer of 2007, he has been working with Dr. Mashayekhi.



**Mohammad Jalalian** was born in Tehran, Iran, on October 17, 1988. He received B.S. degree in electrical engineering from Sharif University of Technology, Tehran, Iran in 2008. He is currently working toward M.S. Degree in Sharif University of Technology (SUT), Tehran, Iran. Since summer of 2008, he has been working with Dr. Mashayekhi and passed some courses such as Introduction to economy and System Dynamics I, also have an experience in Managing some Projects. Also he would be director of the big seminar in Sharif University of Technology about reconstruction in Power Industry.



**Reza Kazemi** was born in Ilam, Iran, on August 27, 1986. He received B.S. degree in electrical engineering from Sharif University of Technology, Tehran, Iran in 2008 (with honor, third rank). He is currently working toward M.S. degree in Sharif University of Technology (SUT), Tehran, Iran. Since summer of 2007, he has been working with Dr. Mashayekhi and passing a lot of courses about Management such as System Dynamics I & II, Learning Organization and Project Management. Also have an experience of Teacher Assistant in both System Dynamics I & II, nowadays working on some research project such as How a Technology Growth and the other like that.



**Mohammad Rasooli** was born in Tehran, Iran, on June 19, 1988. He received B.S. degree in electrical engineering from Sharif University of Technology, Tehran, Iran in 2008 (with Honor third rank). He is currently working toward M.S. degree in Sharif University of Technology (SUT), Tehran, Iran. Since summer of 2007, he has been working with Dr. Mashayekhi and passed some courses such as Introduction to economy and System Dynamics I, also have an experience in Managing some Projects.



**Masood Tavazoei** was born in Tehran, Iran, on June 27, 1986. He received B.S. degree in electrical engineering from Sharif University of Technology, Tehran, Iran in 2008. He is currently working toward MBA in Sharif University of Technology (SUT), Tehran, Iran. Since summer of 2007, he has been working with Dr. Mashayekhi.