THE EFFECT OF INVESTMENT UNCERTAINTY IN THE HOUSING SECTOR ON ECONOMIC GROWTH IN IRAN

Marjan Daman Keshideh1, Zahra Haghighati2

1Assistant Professor in Department of Economics and Accounting, Islamic Azad University of Tehran-Central Branch
2Master’s in Economic Sciences (IRAN)

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ABSTRACT

The most important objective proposed in every country’s economy is the achievement of a sustainable growth in the longterm. The present study aims to investigate the effect of investment uncertainty in the housing sector on economic growth in Iran during the years 1991-2012.

In this study, we investigated the uncertainty level of private sector’s investment in the housing by using Box Jenkins method, GARCH, and Generalized Method of Moments (GMM) and then estimated a model.

The results from estimation shows that the investment uncertainty in the housing sector has reduced economic growth in long-term. This is because of the fact that uncertainty caused the level of production costs to be increased, thus reduced production leads to the weak growth of production and employment in different economic sectors.

Key words: uncertainty, investment, housing sector, economic growth, exchange rate, GMM

1. INTRODUCTION

Economic growth is considered as a basic objective for all the countries. Given the low and even negative economic growth in the recent years in the country, it is important to investigate the factors affecting this issue.

Capital is the economic growth and development engine, however, developing countries are always encountering to the lack of capital.

Investigation of the national accounts figures worldwide shows that building is one of the greatest and key sectors of economic activities in all of the countries.

Building sector, in most of the countries, constitutes more than half of gross domestic fixed capital of which the share of residential building is about 20 to 50 percent.

Regarding the development of housing market in the country during the recent years and also severe fluctuations in the level of supply and demand of this good, which is mostly due to the changes in the prices of construction, purchase and sale of this good, the attention of economists and policymakers have been drawn toward this sector. On one hand, the downturn of this market negatively affect the investment of private sector in this field and also reduces economic growth, on the other hand, rapid boom of the prices is not owing to the severe effect on increased household costs and social discontent of people and policymakers.

Housing sector is important from two aspects; first, it supplies one of the most fundamental social needs of human, i.e. a shelter. Second, housing is a good having strong early and late links with other markets and economic sectors and it is an important factor to store wealth and income.

In other words, the relationship between housing sector and other economic sectors can be divided into direct and indirect relationship. Direct relationship refers to the two stages of production and exploitation. In production stage, the construction of housing adds value that is incorporated in national accounts as value-added of the building sector. In exploitation stage, the value-added of storing residential units is composed of real and computational rent listed in services section and subsection of services and real estate that is very important in terms of share in GDP. Indirect relationship of housing sector is such that, the construction of housing and its exploitation requires inputs and materials manufactured by other economic sectors and provided to the housing sector; thus increased production of housing sector can enhance the growth of production and employment in other economic sectors.

Knowing the presence of uncertainty in macroeconomic variables in Iran, one of the factors affecting the economic growth could be uncertainty and lack of appropriate decision making and prediction on macroeconomic variables. Investment uncertainty is a situation in which the decision-makers and economic agents are uncertain about the level of investment in the future. Theoretically, uncertainty can affect investment from different aspects such as risk aversion and adjustment costs.

For this purpose, we are going to investigate the effect of investment uncertainty in the housing sector on economic growth of the country during the years 1991-2012.

In the present research, the first chapter reviews theoretical foundations. In the second chapter, some theoretical and empirical researches on this field are provided. The third chapter propose model estimation. The final chapter also conclude the research results.

2. THEORETICAL FOUNDATIONS

One of the major growth factors in different economic growth models is investment and capital accumulation. But the effect of this factor and its strengths or weaknesses in the acceleration of a country’s economic growth depends on various factors. If the series of these factors do not work properly, the effect of investment on economic growth would be unknown. In Iran, some of these factors functions as follows;

1 Time Series of Iran’s Statistics Center
a) Although the rate of physical investment is often high in Iran, there are many fluctuations imposed on the system due to its high dependence on oil resources and subsequent exchange income from petroleum sales. Negative oil moments restrict the products from two sides: one, from import limitations (semi-finished materials needed for production process) due to exchange limitations; second, from the limitation of financial resources needed for investment.

b) Political instability is another characteristic of Iran’s economy that affects the increased risk of investment. Iran has been always suffering from international and regional threats, regional wars (the war of Iraq against Iran, the war in Afghanistan, Iraq, Kuwait, etc.).

c) Complicated regulations and rules and other institutional disorders are considerably important in the inappropriate function of investment. Thus, Most of private investors leave the country because of complex and restrictive administrative regulations or make their investments on non-productive sectors. It leads to the poor competition and is followed by inefficiency and lack of innovation in economic system.

- Investment literature:
Most of studied carried out on the investment theory are related to the maximization of the present value in a single firm. In other words, the question arises here is that how a firm responds to the expected pattern of prices and future interest rates regarding the constant production facilitates and initial assets? These studies have achieved two approaches: the first approach is known as “explicit approach” and developed by Dale Jorgenson (1963). It links investment with determinant factors of profitability, especially production function parameters. Another model that he have considerably contributed to explain and interpret is the theory of acceleration in investment already introduced by Aflation and Clark. According to this theory, investment demand is directly related with changes in total product.

In contrast to this approach, “implicit approach” was proposed by James Tobin (1969) and known as Tobin’s q model. This approach aims to directly measure the profitability based on market value of assets. In this model, investment level at each interval is a function of the ratio of market value of a capital unit to the substitution cost of this capital unit. Whenever this ratio, which is Tobin’s final q, is greater than 1, the capital stock is likely to increase and thus, investment will be increased.

General feature of the above theories, called traditional investment theories, is that they are related to the present and future variables such as sale, profit, price, interest rate, and capital stock. Meaning that, they are going to find a way for achieving desired level of capital stock under certain conditions by making the role of prices rational to determine long-term desired capital stock and also by the help of a static maximization hypothesis. These models often overlook two important features of investment expenditures: first, these expenditures are mostly irreversible and the costs are not recyclable after investment. Second, investment can be postponed until receiving new information of the prices, costs, and other conditions of the market. The ability to postpone irreversible investment expenditures influences making decision on investment. In other words, this feature causes the investment to react toward different types of risks including uncertainty, prices, and future costs of production, future interest rates, cash flow and the time of investment.

Considering the uncertainty conditions in the investment theories, economic literature has observed the emergence of stochastic investment models. Stochastic investment models have been developed by Robert E. Lucas & Edward C. Prescott, Richard Hartman, Robert S. Pindyck, and Andrew B. Abel considering the modification costs. In most of these models based on the assumption of investment neutrality to risk, the effect of uncertainty basically depends on the relationship between expected earning of the final capital product and uncertain variables such as price of the product or input.

Hartman (1972), in discrete mode, and Abel (1983), in continues mode, have considered a model in which return is constant and capital is the only constant factor proposed for a competitive firm, and there is no modification cost for other inputs at the time of change in prices. Therefore, price shocks caused the firm to change the optimal composition of capital to work, so that the change in final capital income will be more than change in relative price of the product. In such conditions, final profitability is a convex function of price, the more uncertainty of price will increase expected capital profitability and leads to the increased desired capital reserve and subsequently investment.

Traditional literature, based on the assumption of investment irreversibility, proposes a positive effect arisen from uncertainty of investment. Other researches emphasize on the interests from reduced investments in uncertain environments by questioning the irreversibility of investment expenditures and utilizing the theory of option value. If the assumption of risk aversion replaces with the neutrality to risk, then uncertainty will have independent and inverse effect on the investment decisions leading to the increased probability of negative effect of uncertainty. Lee and Shin (2000) emphasized that the greater is the share of variable inputs, the convexity of profit function will be stronger and the probability of investment will be increased due to the increased uncertainty. On the other hand, Sarkar (2000) believes that the relationship between investment and uncertainty might indicate threshold effects; means that, the relationship is positive at low levels of uncertainty, but it will be negative when the uncertainty goes higher than a critical level.

Another analytical approach that has been particularly considered in the recent literature is the role of modification costs induced by using capital with emphasis on the irreversible nature of most investment projects. Although the effect of
uncertainty on irreversible decision was first investigated in the fields such as the environment economics, Arrow and Fischer\(^2\) extended it to the field of protection of irreplaceable natural resources.

Dixit and Pindyck (1994) propose the asymmetry of investment modification costs by focusing on irreversibility. According to them, modification cost for reduction is significantly greater than modification cost for increase. In other words, this asymmetry may create a passive area under optimal investment curve. In fact, Caballero\(^5\), Abel and Aberly (1994) showed that under asymmetrical cost conditions, optimal investment by a competitive firm can be a non-descending function of uncertainty. Caballero believes that adding assumptions such as incomplete competition or descending return to the scale is necessary to get inverse results. When irreversibility is combined with this, the final income of capital will be a descending function of capital reserve and a negative relationship will be established between uncertainty and investment. So, the investment threshold will be increased by uncertainty level under such conditions. If this effect is strong enough, it may neutralize the increased expected profitability due to the convexity of profit function and leads to the decrease of investment.

The asymmetry of investment modification costs such as irreversibility is important from policymaking aspect. The difference between uncertainty of the firm and industry will be important at the industry level. Again, the effect of uncertainty on the firm is positive (or non-negative); but general shocks on the industry have asymmetrical effect, because positive effects from favorable shocks will be limited by the entry of new firms, while irreversibility inhibits the firm from exiting at the time of unfavorable shocks. Since competitive firms inhibit the firm from exiting at the time of unfavorable shocks and also individual competitive firms are aware of this fact, the general uncertainty will be increased, profitability threshold will be higher, leading to the decreased investment at the firm and industry level.\(^6\)

Most of the studies performed by Tourin (1973), Colson and Kim (1997), Change and Nieh (2004) and Limner (2007) investigate the information of 14 European countries and concluded that residential building has been the Granger reason for GDP both in long-term and short-term periods. Viren and Wilhelmson (2007) investigate the information of 14 European countries and concluded that residential building has been the Granger reason for GDP both in long-term and short-term. When unemployment has been in a high rate, residential investment has had significant effect on economic growth. The findings also indicate that when the accumulated housing reserve has been in a lower level, residential building has had greater effect on economic growth. The speed of modification toward long-term equilibrium has been significantly different between the countries with lower housing capital stock and those with higher housing capital stock.

Seron (2003) and Nax (2001) investigated the relationship between uncertainty of real exchange rate and private investment in the developing countries. In their model, the Generalized Moment Method was used to estimate the equation of private investment. This type of estimator uses instrumental variables as the explanatory variables to estimate the model. Seron has used interrupted explanatory variables as the tool. The results indicate the severe negative effect of uncertainty of real exchange rate on the private investment, but he mentioned the threshold effect of exchange rate. Therefore, uncertainty occurs when its value exceeds the threshold level.

Colson and Kim (2000) examined the causality and effect of housing and non-housing investment with respect to GDP using VAR method. They indicated that the shocks of housing investment are more important than non-housing investment to determine GDP.

Most of the studies performed by Tourin (1973), Colson and Kim (1997), Change and Nieh (2004) and Limner (2007) consider the investment in housing as a factor to strengthen the economic growth. So the direction of relationship is from housing investment on economic growth; meaning that investment in housing sector can lead to the economic growth and is important from policymaking aspect.

3. LITERATURE REVIEW

Bisping and Patron (2008) investigated the effect of housing investment and stock exchange investment on economic growth of the U.S. They showed by using Impulse Response Functions that the shocks for the housing investment have greater effects on GNP rather than stock exchange investment in a closed economy without net exports; and this effect will be reduced in an open economy.

Jen and Zhou (2008) have investigated the relationship between housing investment and economic growth in China for the seasonal data of the provinces during 1999 to 2007 using Panel Error Correction Model\(^7\). The results showed a Granger bilateral causal relationship between housing investment and economic growth in China in both long-term and short-term periods.

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4. MODEL ESTIMATION

The main purpose of the present study is to investigate the effect of investment uncertainty in housing sector on the economic growth in Iran. In order to achieve this objective, first we introduce the variables of the model. The dependent

\(^{1}\)Kenneth J. Arrow & Stanley Fischer, (1974)

\(^{2}\)Threshold

\(^{3}\)Rich

\(^{4}\)R. Caballero & Robert S. Pindyck, (1996)

\(^{5}\)Zeira

\(^{6}\)Panel Error Correction Model
variable of the research is economic growth in Iran, and the explanatory variables are uncertainty of private sector investment in housing, exchange rate, and economic growth rate.

To estimate the mode, the reliability of the variables are examined by Augmented Dickey-Fuller test. Then, the optimal model of private sector investment in housing is estimated using ARIMA model. Finally, Generalized Moments Method will be used to estimate the effect of uncertainties in the primary model.

In the following, we have checked the stability of variables in order to prevent from the problem of false regression. The results of data stability have been presented according to the Augmented Dickey-Fuller statistic.

<table>
<thead>
<tr>
<th>Hypothesized No. of CEs</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.968391</td>
<td>158.1619</td>
<td>47.8613</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.797894</td>
<td>60.27222</td>
<td>29.79707</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.519372</td>
<td>15.90312</td>
<td>15.90312</td>
<td>0.5099</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.118431</td>
<td>4.466008</td>
<td>4.01466</td>
<td>0.8626</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesized No. of CEs</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.968391</td>
<td>37.98663</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.797894</td>
<td>21.31627</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.519372</td>
<td>13.27222</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.118431</td>
<td>3.84146</td>
<td>0.8626</td>
</tr>
</tbody>
</table>

According to the results of the above table, all the variables have become fixed by one subtraction. In order to ensure the lack of false regression using co-integration method based on the effect test and maximum eigenvalues test, it was concluded that there is a long-term vector between variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNBMI</td>
<td>4.090614</td>
<td>0.190088</td>
<td>2.085174</td>
<td>0.0000</td>
</tr>
<tr>
<td>UNRER</td>
<td>0.584844</td>
<td>0.030906</td>
<td>2.085174</td>
<td>0.0000</td>
</tr>
<tr>
<td>ROSHD(1)</td>
<td>14.89194</td>
<td>2.085174</td>
<td>7.2085174</td>
<td>0.0000</td>
</tr>
<tr>
<td>R Squared</td>
<td>0.550973</td>
<td>0.219211</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Adjusted R Squared</td>
<td>0.547341</td>
<td>0.0000</td>
<td>6.219211</td>
<td>0.0000</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>2.906846</td>
<td>0.0000</td>
<td>6.219211</td>
<td>0.0000</td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td>1.970333</td>
<td>0.0000</td>
<td>6.219211</td>
<td>0.0000</td>
</tr>
<tr>
<td>Instrument rank</td>
<td>12</td>
<td>0.0000</td>
<td>6.219211</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

In the following, we will estimate the model based on GMM. The regression model proposed is as follows:

\[ \text{ROSHD} = \beta_0 + \beta_1 \text{UNRER} + \beta_2 \text{UNBMI} + \beta_3 \text{ROSHD(-1)} + \epsilon_i \]

ROSHD: economic growth
UNRER: exchange rate
UNBMI: uncertainty of investment in the housing sector

Next, we will investigate the estimation results in GM mode.

According to the results:

The effect of uncertainty of real exchange rate on the economic growth is negative, so that by each percent increase in exchange rate uncertainty, the level of economic growth has been reduced by 0.88%.

The effect of uncertainty of investment in the housing sector on the economic growth is negative, so that by every percent increase in the growth rate of investment uncertainty in housing sector, the economic growth has been increased by 0.40%.

The effect of first interrupt in economic growth on itself has been evaluated to be positive, so that by every percent increase in the first interrupt of the economic growth, the economic growth has been increased by 0.68%. In the following, Sargan test will be discussed in order to examine the validity of the tools incorporated in the model.
Sargan test
The generalized moments are necessary to use due to the utilization of the tools which are not related to the disorder component. If the tools are separated from this relationship, they are called valid tools. Checking the validity of the tools is related to all the estimators using instrumental variable. We can test the hypotheses $E(x_t u_t)=0$ about the instruments used in the study, and also ensure the lack of relationship between these two variables. For this purpose, Sargan test is used:

<table>
<thead>
<tr>
<th>Table 5. Sargan Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>$J$ statistic value</td>
</tr>
<tr>
<td>4.09</td>
</tr>
</tbody>
</table>

As it can be seen, $H_0$ hypothesis about the independency of the tools from disorder terms cannot be denied regarding the $P$-value obtained. Therefore, the instruments have been recognized to be appropriate and valid for estimation.

5. CONCLUSION AND RECOMMENDATIONS

In this paper, the effect of investment uncertainty in the housing sector on the Iran’s economic growth has been estimated using Generalized Moments Method, the results of the estimation are as follows:

The effect of investment uncertainty in the housing private sector on the economic growth is significant and negative. Accordingly, investment in the housing sector is not only solve the problem of lack of housing, but also will create considerable number of jobs both directly in the housing sector and indirectly in other sectors. It will be also followed by strengthening the national capitals. Under uncertain conditions to invest in the housing sector, the real profit rate has been reduced because of high production costs, and it leads to the capital to be attracted by competitive markets such as stock exchange, bank deposits, currency, gold, and other non-productive sectors. Given that building and construction sector is a pioneer sector and its economic movement causes other sectors to be moved, the reduction of housing production can weaken the growth of production and employment in other economic sectors, and eventually reduce the economic growth rate across the country.

The effect of real exchange rate on economic growth is negative and significant. In Iran, as a country importing intermediate and capital goods, the production costs will be increased by the increased exchange rate, then the profit margin of economic agencies will be reduced, and subsequently, the investment in economy will be declined. It will cause the economic growth of the country to be reduced. Therefore, uncertainty on macroeconomic variables would lead to the lack of appropriate decision-making by economic agencies. It will cause fluctuations and damage to the economic body. Regarding the results obtained in this research, it is recommended for economic decision-makers to reduce these uncertainties by measuring these uncertainties and discovering increasing factors of uncertainty and pave the way of creating economic stability in the country.

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