

The Relationship between Business Cycles Volatilities and Economical Growth

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ABSTRACT

One of the important issues, proposed in each country is reaching to stable growth in long run period. The aim of this research is to examine the effect of Business Cycles Volatilities on economical Growth for 61 countries round the world during 1960-2007. (4 groups of countries with high income, high average income, low average income and finally the countries with low income).

Gross National Product Growth, Business Cycles Volatilities, Inflation, Inflation Uncertainty and financial depth are the considered variables in this research. In this study, firstly, business Cycles Volatilities and Inflation Uncertainty are estimated through Generalized Autoregressive Conditional Heteroskdasticity models, then the effect of cyclic volatilities on long run economical growth are estimated through Panel Data.

In case of two variables of inflation and inflation uncertainty, we can say that in developed and rich countries, inflation have positive effect on long run economic growth while in other income groups, it leaves negative effect on economic growth. Also the relationship between inflation uncertainty and economic growth is negative in all income groups. The outcomes of this study in relation with financial depth indicator on long run economic growth is positive in countries with high income and the countries with high average income. On the other hand this coefficient for countries with high average income is higher than the one for countries with high income. Also the coefficient of this indicator for countries with low average income (such as Iran) and the countries with low income is negative.

KEY VARIABLES: Cyclic Volatilities, Economical Growth, Inflation, inflation Uncertainty, financial Depth Indicator, Gross National Product growth.

INTRODUCTION

Modern economies usually move between a period of booming and stagnation. In other words there is a period in which economy expands and subsequently experiences stagnation and slowness. Such a period of economic booming which is followed by stagnation is called Business cycle. In traditional theories of Macroeconomics, business cycles and economic growth in long run period were examined separately.

Business cycles literature studies production deviation from trend line and growth literature studies the slope line. The examination of relationship between two variables has not been done academically yet. The reason of this negligence is that in economies of countries such as America, England, and France and... which are similar to each other, overall Gross National Production in long run is growing along with trend line and with very small volatility. It means in these countries, there is a kind of growth stability in long run period; consequently, these two variables are examined entirely independent from each other. Another reason is lack of an acceptable and valid growth model which is able to study these two variables beside each other. Due to mentioned reasons a framework has not come to existence which can put business cycles volatilities and long run economic growth beside each other.

Of course numerous endeavors had been done during last two decades. There are some testimonies lately, dealing with the existence of relationship between business cycles and long run economic growth. Based on theoretical principles, it seems that business cycles effect on productivity, investment and Research and Development researches. The variables are among the important and effective factors on long run economical growth. Accordingly the growth theory which is relating factor between cycle and long run economical growth contains endogenous growth models. From 1980s up to now and with emergence of endogenous growth models, different studies had been done about the relationship between volatilities in business cycle and economic growth.

Also some testimonies had been observed lately, dealing with the existence of relationship between cyclic volatilities and long run economic growth, and some endeavors have been done in this case. Hence, in this research the relationship between volatilities in business cycles and economic growth in countries around the world is going to be examined. Volatilities in business cycles, inflation, inflation uncertainty and development of financial markets

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are among the variables which effect on economic growth and are brought to estimating model based on considered model. This study has been done for 4 different income groups (61 countries), consisting of countries with high income, the ones with high average income, the ones with low average income and countries with low income during the period of 1960-2007.

The hypotheses of this research which are going to be tested are as follows:

- 1) The enhancement of volatilities in business cycles in poor countries with low income and the ones with low average incomes leads to decrease in economical growth, but in the countries with high income it leads to increase of economical growth.
- 2) Inflation and inflation uncertainty in countries with low and low average income leaves negative effect on economic growth while in developed countries, inflation leaves positive effect and inflation uncertainty leaves negative effect on economical growth.
- 3) Financial depth indicator in countries with high income and the ones with high average income leaves positive effect on economical growth in long run period but in the countries with low income and the ones with low average income this effect would be negative.

In this study in order to test the mentioned hypotheses we have used Panel Data.

Theoretical principals of Business Cycles Volatilities and Its effect on Economic Growth

Schumpeter, 1927, believes that the progression which leads to long run economical growth effect on cyclic volatilities, since the new shocks cause that the allocations of production factors change. Therefore, Schumpeter considered causation trend from the side of long run growth toward cyclic volatilities.(Zarnowitz, 1981) and(Kormendi and Maguire, 1985)believe in the existence of relationship between business cycles volatilities and economical growth in long run period. (Nelson and Plosser,1982) demonstrated that there is a relationship between long run economical growth and business cycle, so these two subjects should be examined beside each other. They proposed some testimonies which show that the transfer of real trend line of GNP in long run period is permanent and constant. But, if there would be no shock on production, there would not be returning inclination to the primary trend line. There is a group of writers who believe in the existence of a positive and meaningful relationship between business cycles volatilities and economic growth. Also another group believes in the existence of a negative and meaningful relationship between these two variables. Now the opinions of each group are estimated and studied separately. In accordance with the performed studies and we are going to examine it in the continuation, the relationship between cyclic volatilities and economical growth is positive if:

- 1) There is precautionary saving. This group believe that by the enhancement of cyclic volatilities in economy, precautionary savings would increase in the society, consequently investment increases and eventually growth of investment culminates to increase in long run economical growth.

Mirman, 1981 by considering this idea, believes in a positive and meaningful relationship between business cycles volatilities and economical growth.

- 2) High technology exists beside high risk. The countries in which the aim is to reach to higher average growth rate, higher risks should be accepted, subsequently higher technology is accepted. On the other hand, if in a country volatility is accompanied by stagnation and this stagnation leads to higher research and development expenses and making constructions and high productivity for the company, at least economical growth exists. (Kydland and Prescott, 1982) and (Long and Plosser, 1983) presented new models for analyzing economical volatilities which related growth theory and economical growth to each other. According to this models production volatilities are introduced by random deviation from technology. They believe that technological shock culminates to the enhancement of business cycles volatilities and eventually these volatilities cause increasing of economic growth in long run period. (Black, 1987) argues in his study that countries should choose one of these alternatives, either high variance and technologies with high expected outputs or low variance and technologies with low expected outputs. He emphasizes that countries with high average growth have high economical volatilities.

In these countries accompanied by high economical volatilities, economical growth also increases, therefore turnover rate would be higher, consequently, the rate of investment increases in these countries and eventually economic growth in long run period increases. At last he believes in existence of a positive relationship between cyclic volatilities and long run economical growth. (Blackburn, 1999) by using an endogenous growth model which is proposed through technology and learning during doing the job, noticed that increase in business cycles volatilities leads to increase of long run potential growth in production. From this viewpoint increase in cyclic volatilities leads into increase of technical knowledge accumulation of economy and causes increase in long run economical growth. From these point of view governmental policies in order to make stability in business cycles volatilities causes damage and disturbance on economical growth.

(King, et al,1991) examined the cause of forming business cycles volatilities and its relationship with long run economical growth trend line. They consider productivity as an important and effective factor on short run

business cycles volatilities. Productivity shocks in long run period leads to capital accumulation and movement of the economy forward, from a stable and monotone course toward higher and more stable course. These economists believe in existence of a positive relationship between short run cyclic volatilities and long run economical growth. (Helpman and Tranjtenberg, 1998) formulized business cycles which were proposed by Schumpeter in 1927 and noticed that the rate of stagnation is accompanied by growth positively. That is to say whatever short run volatilities increase in economy, economical growth also increases in long run period. Also the relationship between cyclic volatilities and economical growth would be negative if:

1) Volatility is accompanied by uncertainty. In this situation volatility illustrates uncertainty which leads to increase of economic risk. This increase of risk cause decrease of investment and eventually decreases in long run economical growth.

(Bernak, 1983) and (Pindyck, 1991) in their studies and by this supposition that investment is non-returnable, came to this conclusion that increase in business cycles volatilities in short run period leads to increase of certainty and eventually cause decrease in investing. Therefore, economical growth in long run period decreases. From the viewpoint of these writers there is a negative and meaningful relationship between long run economical growth and business cycles volatility.

(Aizenman and Marion, 1993) made an equilibrate bi periodical model with the supposition of non-returnable investing. They used endogenous growth model in their work in which the investor is confronted by tax on capital. This fact causes that the investors postpone the process of investing and research on tax regimes in future. According to these processes the model shows that the increase in political uncertainty cause increase in cyclic volatilities and eventually leads to decrease of investment and economical growth in long run period.(King, et, al, 1998) and (Stadler, 1986) integrated endogenous growth in the frame of a business cycle model. They argued that temporal discrepancies in production effect on resources allocation and leaves permanent effects on long run economical production trend. For example, if during stagnation period investment increases but development and sufficient growth would not be formed, the production would not return to its primary trend line. (Bean, 1990) argued that economic stagnation periods come to existence while some actions are done in order to improve and promote productivity. He claims that companies allocate major part of their labor force to these actions during stagnation, the needed input in primary actions decreases and eventually the productivity of whole factors decreases and production also decreases. Bean believes that demand shock leaves negative and long run effect productivity and economical volatilities and these volatilities also leave negative effect on long run economical growth. (Caballero, 1991) mentioned that there is a negative relationship between growth and volatility. Since, whatever the risk be higher, investment decreases, consequently capital accumulation and eventually production growth decreases in long run period. (Ramey and Ramey, 1991) showed that if companies be bounded to higher technology, volatility can lead to decreasing of average production, since companies should produce on the optimized level of previous periods. Therefore, these volatilities leave negative effect on long run economic growth. (Ramey and Ramey, 1995) demonstrated on other studies that if the companies be supposed to use higher technology, economical volatilities would be formed and companies production comes lower than optimized production. It means in long run period, economical volatilities lead to decrease of economical growth. In Ramey and Ramey's model the negative effect of volatility on long run growth is analyzed into two effects: First effect is inefficiency of the market which is formed because of companies' usage from compulsive technology. Second effect is planning effect. This effect is formed when producing companies, produce less than their capacity while eventually leads to formation of uncertainty and economical volatilities. Ramey and Ramey believe the volatilities which are made through productivity shocks lead to decrease in long run economical growth. (Aghion and Saint Paul, 1998) believe that in stagnation period, accompanied by wage decreasing, expenditure chance for workers decreases and eventually causes intense decrease in productivity. (Fatas, 2002) believes that business cycles effect on productivity, investment, and Research and Development expenses in cases that these variables are among important and effective factors on long run economical growth. Business cycles volatilities can change growth process and make permanent effect on economy. Fatas considers investment as a connecting channel between business cycles and long run economical growth. He believes that by increase in business cycles volatilities and uncertainty, the rate of risk increases, therefore, rate of turnover of investment decreases and eventually in long run period economical growth decreases.

He also believes that political uncertainties (such as revolution, coup-d'état and political terrorism) make non symmetrical volatilities in business cycles and in long run period leads to decrease in political growth. (Orlov and Roufagals,2003) by using endogenous growth model of Romer demonstrated that stagnation effects on long run economical growth course. Writers believe that during stagnation, investment in technical knowledge decreases, hence, long run economical growth moves from a stable situation toward a monotone and stable situation in a lower level. All in all, they came to this conclusion that business cycles have negative and reverse relation with long run economical growth.

- 2) Stagnation is accompanied by financial and monetary restrictions. In countries where stagnation is accompanied by financial and monetary restrictions, there is a negative relationship between business cycles volatilities and long run economical growth. (Kose, et, al, 2004) considered investment and credits as connecting channels of business cycle volatilities and long run economical growth. Writers noticed that commercial and financial accumulations intensify the negative relationship between growth and volatility.

Model Introduction

Considering the proposed theoretical studies, different models have been presented from 1980s up to now, in order to examine the relationship between production growth volatilities and long run economical growth. Fatas' model in 2000 is one of the presented studies in this field. He presented the relationship between volatilities and long run economical growth based on endogenous growth models. From his viewpoint volatilities can change growth process and leave permanent effects on economy. He considers investment as the most important connecting channel between volatilities and long run economical growth. Increase in volatilities and uncertainty leads to enhancement of risk and eventually causes decrease in rate of turnover. In order to show the relationship between growth and stability, an endogenous growth model has been used. Consider the economical growth by following production function:

$$1) Y_t = A_t L_t^\alpha K_t$$

In which Y is production, L is labor force, A is technology parameter, and K is knowledge reserves or human resource, while all these parameters are considered equal for all companies for the sake of simplicity.

It is supposed that knowledge is accumulated during learning process and while doing the job, and is shown through followed function form:

$$2) K_t / K_{t-1} = (Y_{t-1} / K_{t-1})\gamma$$

In which Y demonstrates learning rate in economy

Production growth rate in each moment of time would be:

$$3) \Delta y_t = a_t - (1-\gamma)a_{t-1} + \alpha(l_t - (1-\gamma)l_{t-1})$$

Small letters illustrate logarithm forms. Also it is supposed that a_t and labor supply function is static process. Cyclic shocks are introduced by considering random process for technology parameter, that is to say qt. Suppose that qt has AR (1) process like this:

$$4) a_t = \rho a_{t-1} + \mu_t$$

Under this supposition labor force supply has no elasticity and we can write production growth in the form of

function of μ_t

$$5) \Delta y_t = (1 - (1-\gamma)L)C(L)\mu_t$$

In which L stands for delay operator and C (L) stands for production process AR (1) for a_t , in such a way:

$$6) C(L) = (1 + pl + p^2l^2 + p^3l^3 + \dots)$$

From equation (6) cyclic volatilities and long run production effects are observed because of knowledge accumulation effect. One method in order to examine these long run delay effects is measuring the changes of long run production anticipations which are formed because of technological shocks. The answer of aforementioned question is acquired simply through adding up the coefficient of equation (6) for Δy_t

$$7) \Delta y_t = D(L)\mu_t$$

$$\text{In which } D(L) = d_0 + d_1l + d_2l^2 + d_3l^3$$

d_j measures μ_t shock effect on production growth rate during the period t+j.

By adding up of this coefficient we can determine long run effects of imposed shocks on production level.

$$8) p^J = \sum_{j=0}^J d_j$$

Which illustrates μ_t Shock effect on production level t+j. If we add up d_j coefficient for infinite times, permanent shock effects on production would be acquired. Accordingly P is the added coefficient of d_j to the infinite which is followed in this form:

$$9) \quad p = \lim_{j \rightarrow \infty} P^j = D(1)$$

The added amount of this coefficient equals to:

$$10) \quad P = 1 + (\rho - (1 - \gamma)) + (\rho^2 - \rho(1 - \gamma)) + (\rho^3 - \rho^2(1 - \gamma)) + \dots$$

We can simplify above equation in this way:

$$11) \quad P = \gamma / (1 - \rho)$$

We can see that long run effects of production growth volatilities are augmented functions of stable shocks on variables and parameter γ which illustrates knowledge accumulation velocity through learning and during doing the job. What is important is that long run stability is a criterion from long run stagnation expenses. The origin of these expenses is the effects which stagnation leaves on knowledge accumulation. In fact while the long run growth is zero ($\gamma=0$), production always remains at the same trend line.

His model superiority on other studies is its emphasis on the role of inflation, inflation uncertainty and development of financial markets on relationship between volatilities and long run economical growth. For this reason this study is performed based on Fatas' model.

Fatas examined the relationship between volatilities and long run economical growth by using a Panel method for different countries. His model is as follows:

$$12) \quad Growth = h(Volatility, Inf, UNINF, \frac{M2}{GDP})$$

In which

Growth= Production growth

Volatility= production growth criterion deviation

INF= Inflation

UNINF= Inflation Uncertainty

$\frac{M2}{GDP}$ = Financial Depth Indicator, it means liquidity ratio on Gross National Product.

All in all this study had been performed based on Fatas' model for 61 countries during 1960-2007.

The difference of this study from Fatas' work is at the method of evaluating the volatilities, which is going to be studied entirely.

The Sample under Examination

In this study firstly, based on World Development Indicator (WDI) in 2007, the countries under examination are divided into 4 groups: 1) countries with high income, 2) countries with high average income, 3) countries with low average income, 4) countries with low income.

Of course because of lack of statistics and information in each group, only those countries are chosen that all their data existed during 1960-2007. This categorization is as follows:

- A) Countries with high income: Australia, Barbados, Denmark, Island, Japan, Korea, Kuwait, Malta, New Zealand, Norway, Singapore, Switzerland, America.
- B) Countries with high average income: Argentina, Batswana, Chili, Costa Rica, Malaysia, Mexico, Panama, Trinidad and Topco, Uruguay, Venezuela.
- C) Countries with low average income: Algeria, Bolivia, Honduras, Iran, Jamaica, Morocco, Paraguay, Peru, The Philippines, South Africa, Sri-lank a, Saint Vincent Granada, Thailand, Colombia, Dominican, Ecuador, El Salvador, Guatemala.
- D) Countries with low income: Bangladesh, Burkina Faso, Burundi, Ivory Coast, Hoity, India, Indonesia, Kenya, Madagascar, Nepal, Nicaragua, Nigeria, Pakistan, New Guinea, Ruanda, Senegal, Sierra-Leone, Togo.

Introducing Research Variables:

All the used data in this section for 4 different income groups are acquired from soft wares of World Development Indicators and International Financial Statistics during 1960-2007.

These data are as follows:

- 1) Gross National Production Growth: This variable is counted based on percentage and by considering the Real Gross National Production data for 61 countries. The related data to Real Gross National Production is counted based on Million Dollars.
- 2) Production Growth Volatilities: considering numerous studies which have been done in this field, this variable illustrates some kind of uncertainty in production which has been counted from data of Gross

National Production growth by using Conditional Heteroskdstasticity Variance and we are going to study it in next section.

- 3) Inflation: This variable is acquired for all countries through consumer price indicator based on percentage.
- 4) Inflation Uncertainty: Inflation Uncertainty, like production volatilities is estimated by Conditional Heteroskdstasticity Variance from inflation variable which we are going to study it in next section.
- 5) Financial Depth indicator: Based on numerous studies which have been done from liquidity ration on Gross National Product, it has been used as the Financial Depth Indicator. This ration is counted in the form of percentage for all countries.

Calculating Production Growth Volatilities and Inflation Uncertainty

Uncertainty implies to a situation in which the occurrence probability of future events can be designated. Uncertainty is vis-à-vis of risk event that we can attribute a special probability to occurrence of an event. If future changes economical variables are acquired from the total added number of anticipated and unanticipated variables, and uncertainty of economical variables contains unanticipated changes of that variable. Evaluation and measuring uncertainty of an economical variable is an abstract issue. Accordingly different methods of calculating volatilities and uncertainty would be described as follows:

- 1) A criterion for calculating and measuring uncertainty that is currently used in experimental works, especially in primary studies is the distance between variable and the average. (Crowford and Kashmovich,1996) accompanied by determining inflation uncertainty, proposed the imposed criticism on this method.
- 2) The second method is variance or criterion deviation of the variable. All in all variable changes are divided into two groups: anticipatable changes and non-anticipatable changes. Non-anticipatable changes illustrate uncertainty while variance shows anticipatable and non-anticipatable changes of the variable simultaneously. Therefore, calculating uncertainty in this way has some problems, and we are not going to use this method in this research.
- 3) Next criterion expected changes of anticipators (economists and councilors) from the variable during the time.
- 4) Forth method is uncertainty estimation based on economy measuring methods. In this method after model estimation, variable anticipation is formed. Criterion deviation demonstrates anticipated error in measuring model of variable uncertainty. Though there is no agreement on choosing the best model for anticipators. In this situation and in most estimation usually the estimated equation variance is considered as a fixed quantity. But there is a probability that variance changes during the time. In these situations conditional variance of anticipated error is considered as a criterion for uncertainty measuring. In these situations general models of ARCH and more developed forms of them GARCH have superiority. In such models variable uncertainty is acquired through conditional variance of estimated model of error sentence which changes during the time.
- 5) The last model is using Markov-Switching models. In these models parameters are considered variables during the time.

In this study, in order to calculate economical growth volatilities for 61 countries with different income levels during 1960-2007, we have used Generalized Autoregressive Conditional Heteroskdstasticity models, since these models are more comprehensive an applicable than other models of uncertainty calculations.

The simplest GARCH model is GARCH model (1, 1) which has been used in order to estimate production growth volatilities and inflation uncertainty and is as follows:

$$13) \gamma_t = x_t' \theta + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \varpi + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

The first equation is average equation which is in the form of a function from exogenous variables with a disordered sentence. σ_t^2 Is variance anticipation of next period based on previous data, therefore is called conditional sentence and contains 3 parts:

ϖ = Fixed Part

ε_{t-1}^2 = Volatility of previous period which is measured in the form of delay from hysteresis root of average equation (ARCH part)

σ_{t-1}^2 = The anticipated variable of last part (GARCH part)

For the examination of estimated models stability in inflation uncertainty and production growth volatilities estimation, we have used the following tests for hysteresis of model GARCH for all the countries. In order to examine the normality of estimated equations hysteresis, we have used histogram test. This test demonstrated

that the hysteresis of all estimated equations on the level of 5% certainty is normal. Also in order to examine the presence or lack of presence of auto coherence in estimated model, it has been used from statistics of Q.

Performing this test for all countries illustrated lack of auto coherence between disordered sentences in estimated equation. Also this auto coherence test was performed for the root of hysteresis. The outcomes illustrated lack of auto coherence in the root of hysteresis in all equations. At the end in order to determine the level in GARCH model we have used ARCH test. The outcomes showed that GARCH level in all estimated equations is less than 2, so all models are considered GARCH (1, 1).

Examining the Relationship between Production Growth Volatilities and Long Run Economical Growth by Emphasizing on Inflation, inflation Uncertainty and Financial Depth Indicator

The purpose of this section is to examine the relationship between production growth volatilities and long run economical growth by emphasizing on inflation, inflation uncertainty and financial depth indicator between the studied countries with different income level and by using Panel Data. In this section, this question emerges that: Do inflation, inflation uncertainty and financial depth indicator effect on the relationship between the groups under examination?

Since there are many differences between countries under examination (from viewpoint of income situation or the rate of financial market risk), there would be variance heteroskedasticity problem in equation estimation. To solve this problem all models are estimated with generalized least squares and in the frame of Cross section Weights. Also panel models are estimated by considering the outcomes of Housman’s model and with fixed effect method. The outcomes of regression model based on Panel Data are shown between different income groups:

Table (1): The effect of volatilities on long run economical growth by emphasizing on inflation, inflation uncertainty and financial depth indicator:

Variables	Countries with low income	Countries with averaged income		Countries with high income
		Low	High	
Volatilities of (t) statistics	-1/65 (-4/03)	-1/58 (-3/06)	-0/72 (-1/48)	0/47 (2/79)
Inflation of (t) statistics	-0/48 (-2/15)	-0/58 (-1/35)	-0/11 (-2/80)	0/12 (4/29)
Inflation Uncertainty of (t) statistics	-0/06 (-2/19)	-0/05 (-2/01)	-0/07 (-2/19)	-0/07 (-1/33)
Financial depth Indicator of (t) statistics	-0/12 (-1/78)	-0/06 (-2/5)	0/04 (1/63)	0/001 (4/47)
R²	22%	35%	35%	39%
D.W	1/97	2/06	1/96	2/06

Most coefficients in the model are meaningful on the level of 95% certainty. Vastson’s far sight statistics also illustrated lack of auto coherence between disordered sentences in estimated equation. The outcomes of table 1 demonstrate that the effect of production growth volatilities on long run economical growth is positive for countries with high income. In these countries accompanied by increase in volatilities, precautionary savings increase and eventually investment increases, and at last investment growth leads to increase in long run economical growth. In other words we can say that increasing in volatilities is somehow illustrative of higher risks. These high risks culminate to increase in investment and technology improvement and also lead to long run economical growth. (Grier and Tullack, 1989) showed for 113 countries that there is a positive and meaningful relationship between volatilities and long run economical growth in developed countries. The presented outcomes have compatibility with these studies. In other groups under examination that Iran is among them, the effect of volatilities on long run economical growth is negative. The coefficient of production growth volatilities for poor countries is at the highest level after this coefficient is at high level for low average countries and the final group is the countries with high average income. The reason that this coefficient is negative is that in such countries the increase of volatilities and uncertainty leads to decrease of investment, therefore, the volatilities leave negative effect on long run economical growth.

Ramey and Ramey, 1995 in their study for 92 countries showed that there is a negative and meaningful relationship between growth and volatility for developing countries, while this relationship is positive and meaningful for OECD countries. In developed and rich countries inflation leaves positive effect on long run economical growth. That is because of low level of inflation in these countries, but inflation uncertainty leaves negative effect on economical growth, since this uncertainty leads to uncertainty in production and eventually culminates to decrease in long run economical growth in this group of countries. In other income groups (which Iran is among them) both variables of inflation and inflation uncertainty have negative effect on economical growth. Since in these income categories, the level of inflation is higher than the countries with high income, and leaves

negative effect on long run economical growth. The coefficient of inflation rate in this study has compatibility with theoretical principles and is meaningful statistically. (Bang and et, al, 1997) by using simulation method demonstrated that if inflation rate exceeds from level 4, the level of production decreases, therefore, long run economical growth decreases, while in countries where inflation is in lower level, this inflation causes increasing in economical growth in them. Also (Alexander, 1997) showed that for OECD countries, increase in inflation rate has destructive effect on production. (Linsink and et, al, 1997) also demonstrated for 138 developed and developing countries that inflation uncertainty leaves negative effect on long run economical growth. Accordingly all the estimated coefficients in this study are in the course of mentioned studies. The outcomes of this study in relationship with financial depth indicator illustrate that in countries with high income and the ones with high average income, the effect of this indicator on long run economical growth is positive. Also this coefficient for countries with high average income is higher than the countries with high income. In this group of countries accompanied by increase in financial depth indicator, liquidity in the society both in public and private sectors increases. Therefore, these bank sources or liquidity in society moves along with investment in countries and leads to long run economical growth. Since countries with high average income are considered somehow among developing countries, therefore, more portion of their liquidity is allocated to investment and finally the effect of financial depth indicator on long run economical growth in these countries comes higher than the countries with high income. The coefficient of financial depth indicator for countries with low average income (like Iran) and countries with low income was acquired negative. This issue illustrated that the increase of financial depth indicator ratio leaves negative effect on long run economical growth in these group of countries. The reason is that in this income group, the increase of financial depth indicator ratio leads to inflation increase and eventually culminates to long run economical growth. The outcomes of this section of study are compatible with the collection of performed studies in this field. The studies of Rousseau and Washtel, 2000, on 77 countries during 1990-1995, demonstrated that in countries with high inflation, financial depth indicator leaves negative effect on economical growth while the effect of this variable on economical growth in developed countries (in which inflation is lower than the poor countries) is positive. Also Andress and et, al, 1999 studies on OECD countries came to the same conclusion. All together, the outcomes of this study in the course of performed studies are in the same course. At the end it is necessary that, the fixed coefficients which were presented separately at the computer table in attachment part be compared with each other. This fixed coefficient in countries with low average income and countries with low income is higher than other income groups. We can say that in the countries with low income, definitely other variables effect on economical growth which is not mentioned in the model. The variables show themselves at fixed coefficient. Also we can imply to different income structure in these countries and their effectiveness on special variables such as income accrued from single stuff export (like oil for Iran and sugar and coffee for countries in South America) and also the presence of considerable foreign direct investment in South East countries.

Conclusion

This research examined the relationship between production volatilities and long run growth by emphasizing on inflation and financial depth indicator in 61 different countries by different income level during 1960-2007. The considered study is done based on Antonio Fatas' model, 2002. Antonio proposed the relationship between production volatilities and long run economical growth based on endogenous growth models. In his viewpoint volatilities can change growth process and leave permanent effect on economy. Antonio examined simple relationship between volatilities and long run economical growth by emphasizing on inflation, inflation uncertainty and the related indicator to financial markets development. By paying attention to the considered model, in this study it has been used from Gross National Production Growth Variables, production Growth Volatilities, Inflation, Inflation Uncertainty, and Financial Depth Indicator. The ratio of liquidity on Gross National Production is considered as the Financial Depth Indicator in this study. The volatilities of production growth and inflation uncertainty are also calculated by Generalized Autoregressive Conditional Heteroskdasticity (GARCH). The reliability of estimated models is examined by using histogram, auto coherence and ARCH tests. The examined countries are categorized into 4 groups: countries with high income, the ones with high average income, the ones with low average income, and finally the countries with low income. All the Panel Data are estimated because of the presence of heteroskdasticity variance by using Generalized Least Square (GLS) and also by considering the outcomes of Housman's test through Fixed Effect Process. The accrued outcomes from equation estimation are as follow:

- 1) There is a positive and meaningful relationship between production volatilities and long run economical growth in countries with high income, since in these countries accompanied by volatilities, precautionary savings increase, subsequently, investment increases and eventually investment growth leads to the increase of long run economical growth. From another viewpoint we can say that in this situation volatilities are somehow illustrative of higher risks. These high risks culminate to increase of investment

and production technology improvement in these countries and at the end causes increase in long run economical growth.

- 2) In countries with high and low average income and countries with low income, there is a negative and meaningful relationship between volatilities and long run economical growth. The reason of being negative of this coefficient is that in these countries the uncertainties lead to decrease of investment and finally lead to decrease in long run economical growth.
- 3) In countries with high income, inflation leaves positive and meaningful effect on long run economical growth. We can say that inflation in countries with high income is at the lower level than the other countries, therefore, low level of inflation leaves positive effect on growth. While high level of inflation on other countries leaves negative effect on economical growth.
- 4) Inflation uncertainty in all examined groups has negative effect on long run economical growth. This coefficient for countries with low income is higher than the other income groups.
- 5) Financial depth indicator has negative and meaningful effect on long run economical growth for the countries with low average income (such as Iran) and for the countries with low income. The reason is that in the countries the increase of this indicator leads to increase of inflation and eventually decrease of long run economical growth.
- 6) This indicator is positive and higher for countries with high average income than countries with high income. Since in these countries increase in liquidity in both private and public sectors is used through managed process. Therefore, investment increases and long run economical growth increases. On the other hand since countries with high average income are progressing with higher speed, consequently, the effect of financial depth indicator on long run economical growth in these countries is higher than countries with high income.

It is needed to be mentioned that the outcomes of this study has compatibility with the hypotheses of the research. In relationship with this issue and the accrued outcomes, the following political recommendations are as proposed:

- 1) The governments should always consider proper monetary policies, since taking expansive monetary policies in the countries which are in low level of financial development, cause increase of inflation and decrease of long run economical growth. On the other hand these kinds of policies intensify uncertainty in the society and in this way (indirectly) long run economical growth decreases in these societies.
- 2) Considering the presented model and acquired outcomes, we can see that taking policies by governments which lead to increase in inflation and inflation uncertainty directly causes the decrease of long run economical growth. On the other hand these kinds of policies increase uncertainty in society, especially uncertainty in production and eventually indirectly causes decrease of long run economical growth.

REFERENCES

- 1-Aghoin, P. and Saint Paul, G. (1998). "Uncovering Some Causal Relationships Between Productivity Growth and the Structure of Economic Fluctuations: A Tentative Survey". *Labor*. Vol 12. PP: 279-303.
- 2-Aizenman, J. and Marion, N. (1993), "Policy Uncertainty Persistence and Growth". *Review of International Economic*. January. Vol I (2). PP: 145-163.
- 3-Alexander, R. (1997). "Inflation and Economic Growth: Evidence From A Growth Equation". *Applied Economics*. Vol 29. pp: 233-238.
- 4-Andress, X. & Hernando, I. & Lopes. (1999). "The Role Of Financial System In The Growth-Inflation Link: OECD Euperiece". No 20.
- 5-Bang, M. & Bernhard, W. & Granato, J. & Jones, L. (1997). "The Effect Of Inflation On The Natural Rate Of Output: Experimental Evidence". *Applied Economics*. Vol 29. pp: 1191-1199.
- 6-Bean, C. (1990), "Endogenous Growth and the Pro-Cyclical Behaviour of Productivity". *European Economic Review*. Vol 34. PP: 355-363.
- 7-Bernanke, B. (1983), "Irreversibility and Cyclical Investment". *Quarterly Journal of Economics*. February. Vol 98(1). PP: 85-106.
- 8-Black, F. (1987),. "*Business Cycles and Equilibrium*".Cambridge. MA: Blackwell.
- 9-Blackburn, K. (1999). "Can Stabilisation Policy Reduce Long-Run Growth". *The Economic Journal*. Vol 109. January. PP: 67-77.

- 10-Caballero, R. (1991). "On the Sign of the Investment Uncertainty Relationship". *American Economic Review*. Vol 81.PP: 279-288.
- 11-Crawford, A. & Kaskmovich, M. (1996). "Does Inflation Uncertainty Vary With The Level Of Inflation". Bank Of Canada. Ottawa Ontario Canada
- 12-Fatas, A. (2000), "Do Business Cycles Cast Long Shadows Short-Run Persistence and Economic Growth". *Journal of Economic Growth*. Vol 5(2). PP:147-162.
- 13-Fatas, A. (2002), "The Effects of Business Cycles on Growth". *Working Paper*. No 156. May.
- 14-Grier, K. and Tullock, G. (1989), "An Empirical Analysis of Cross- National Economic Growth, 1951-80". *Journal Of Monetary Economics*. Vol 24. PP: 259-276.
- 15-Helpman, E. and Trajtenberg, M. (1998). "A Time to Sow and a Time to Reap: Growth Based on General Purpose Technologies". *NBER Working Paper*. Series 4854.
- 16- International Financial Statistics (IFS).
- 17-King, R. & Plosser, C. & Rebelo, S. (1988), "Production, Growth and Business Cycles, II. New Directions". *Journal of Monetary Economics*. Vol(21). PP: 195-232.
- 18-King, G. and Plosser, C. & Stock, J. & Watson, M. (1991), "Stochastic Trends and Economic Fluctuations". *American Economic Review*. Vol 81(4). PP: 819-840.
- 19-Kormendi. R. and Maguire P. (1985). "Macroeconomic Determinants of Growth". *Journal of Monetary Economics*. Vol 16. PP: 141-163.
- 20-Kose, M. and Prased, E. and Terrones, M. (2004). "How Do Trade and Financial Integration Affect the Relationship Between Growth and Volatility?". Vol (31). May.
- 21-Kydland, F. and Prescott, E. (1982), "Time to Build and Aggregate Fluctuations". *Econometrica*. November. Vol 50(6). PP: 1345-70.
- 22-Lensink, R. & Bo, H. & Sterken, E. (1999). "Does Uncertainty Affect Economic Growth: An Empirical Analysis". *Financial Markets and Institutions*.
- 23- Long, J. and Plosser, C. (1983), "Real Business Cycles". *Journal of Political Economy*. February. Vol 91(1).PP: 39-69.
- 24-Mirman, L. (1981). "Uncertainty and Optimal Consumption Decessions" *Econometrica*. January. Vol 39(1). PP: 179-185.
- 25-Nelson, C. and Plosser, C. (1982). "Trends and Random Walk in Macroeconomic Time Series". *Journal of Monetary Economics*. Vol 10(2). September.PP: 139-162.
- 26- Orlov, A. & Roufagalas, J. (2003). "Costs of Recessions In the Context of An Endogenous Growth Model". March . Version 1.02.
- 27-Pindyck, R. (1991), "Irreversibility, Uncertainty and Investment". *Journal of Economic Literatures*. September. Vol 29(3). PP: 1110-1148.
- 28-Ramey, G. and Ramey, V. (1991). "Technology Commitment and the Cost of Economic Fluctuations". *NBER Working Paper*. No 3755. June.
- 29-Ramey, G. and Ramey, V. (1995). "Cross Country Evidence on the Link Between Volatility and Growth". *The American Economic Review*. December. Vol 85. PP: 1138-1151.
- 30-Rousseau, P. & Washtel, P. (2000). "Inflation Financial Development and Growth". No2033.
- 31-Schumpeter, J. (1927). "The Explanation of the Business Cycle". *Economica*. PP: 286-311.
- 32-Stadler, G. (1986), "Real Versus Monetary Business Cycle Theory and the Statistical Characteristics of Output Fluctuations". *Economic Letters*. Vol 22. PP: 4-51.
- 33-World Development Indicators (WDI).
- 34-Zarnowitz, V. (1981). "*Business Cycles and Growth*". Zarnowitz: Business Cycles. Theory, History, Indicators and Forcasting. Chicago 1992. University of Chicago Press for the NBER.