Quarterly Journal of Quantitative Economics, Summer 2009, 6(2): 21-36

Exports Instability, Capital Accumulation and Economic Growth: The Case of Iran

Shazad Borumand (Ph.D), Mohammad Taghi Ziaiee Bigdeli (Ph.D.) and Ebrahim Rezaei (Ph.D.) *

Received: 2009/4/23 Accepted: 2009/9/15

Abstract:

The aim of this paper is to assess the relation between exports instability investment and economic growth in Iran. The few previous studies have not attempted to utilize the dynamic methods of assessment and the time series techniques and ARCH models. In this study, we found that the variables are unstable in level; therefore, a distorted view on studies was conducted according to regressive formats alone without no concern to the unstable state of variation. Nevertheless, our results indicate that in the long-run export instability has a negative effect on investment and economic growth. However, in the short -run the effects are minimal.

JEL classification**:F41, F43**

Keywords: *Exports instability, capital accumulation, economic growth, ARCH models ,time series technique.*

* Faculty member and vice president Economic of Research Institute, Faculty member of Economic Science and President Economic Research Institute and Faculty member of Oroumieh University, respectively, Iran.
Email: (shahzad_broumand@yahoo.fr**)**

1. Introduction

Some studies in the field of macroeconomics have discussed the relation between indecisiveness and economic growth. In these discussions indecisiveness engulfs the macroeconomics, export, etc. Some researchers have assessed the relation between indecisiveness of macroeconomics and economical growth (Rezaei 2006), and others have examined the indecisive relation among some of macroeconomics variables such as exports vs. growth.(Sinha1999), most of the studies in this field have been based on cross section data (Glezakos (1974), Voivodas (1974), Harigan (1988)). Very few have used the time series data (Wilson (1983), Sinha (1999)). We have used the time series data in this research. The problem using the cross section data is that these estimations investigate the mean relation, and do not provide for information from each and every country. On the other hand they generalize the obtained results. The advantage of applying time series technique in some studies has been the focus on the dynamic relation, rather than the cross section; and due to availability of some tests such as ADF, they assure the non fictitious nature of regressions. Since there is always doubt that the variables at a given level such as the one in this study are unstable. Another distinguishing aspect of this study is its length of time (1971 - 2004). We have also used the export of oil and non -oil data as the real export time series aspect in Iran.

The other outstanding is the application of instability "index" which has never been used in the previous studies; Sinha (1999) has considered the instability as an annual export deviation moving average of five year impeller.

The major deficiency with such grading is assigning a ten year period to exports instability, which is not close to reality. The charts and trends observed in many countries (such as Iran) indicate that the time variable has been subject to noticeable fluctuations (enclosure: diagram 1). In our study, we have used an index which changes in duration.

In the present this paper, the methodology of this research Followed by the results and conclusion will be presented.

2. Literature review

Despite the lack of a unifying theory, there are several partial theories that discuss the role of various factors in determining economic growth. Two main strands can be distinguished: The neoclassical, based on Solow's growth model, has emphasized the importance of investment and, the more recent; theory of endogenous growth developed by Romer (1986) and

Lucas (1988) has drawn attention to human capital and innovation capacity. In addition, There are four theories to justify the export-led growth hypothesis. First following short-run Keynesian arguments, export growth leads to income growth via the foreign trade multiplier. Second, foreign exchangefrom exports can be used to finance imported manufactured and capital goods and technology, which contribute to growth. Third, competition leads to scale economies, technological progress and growth. Fourth, the export sector creates positive externalities, such as more efficient management and production techniques, which lead to growth.(Zamanian et al 2010)

Sinha (1999) has assessed the effects of instability of exports on investment and growth for Asian countries through time series analysis. He has found a negative relation for growth variables and instability for 5 of the countries and verified 4 of them as positive.

Ozler (1988), by using OLS and 2SLS methods has estimated his modified models and approved the negative relation between the growth and instable exports. Mir Shojai (1997), has assessed The two variables, i. e instability and economic growth in OPEC member countries. His findings within 1974 and 1994 indicate an inverse relation between them.

3. methodology

In conventional econometric models, the variance of the disturbance term is assumed to be constant. However, Figure (1) shows that export time series exhibit periods of unusually large volatility, followed by periods of relative tranquility(despite of

low frequencies) . In such condition, the assumption of a constant variance is inappropriate.

The seminal paper in this area is Engle(1982), which proposes the concept of autoregressive conditional heteroskedasticity(ARCH). It says that the variance of the error term at time t depends upon the squared error terms from previous periods. Which we can write:

$$s_t^2 = v + a_1 e_{t-1}^2 + a_2 e_{t-2}^2 + ... + a_p e_{t-p}^2 = v + a(L) e_{t-1}^2$$

Where $a(L)$ is a lag polynominal of order $p-1$. The presence of ARCH errors in a regression or autoregressive model dose not invalidate OLS estimation. Testing for pth-order autoregressive heterokedasticity can be done along the lines of the Breusch-Pagan or LM tests for heterokedasticity. which we'll apply at following sections.

It should be noticed that after examining of some other generalized forms such as several pth-order GARCH models, our assessments showed that the ARCH processes is able to provide our aims and we didn't need to expand research methodology.

3.1. the methodology of this research

In order to analyze the effects of instable export policies on growth, first an index is defined which is changeable during the research period. In fact, there are two issues in this study through econometric. The first, is the fact that the considered index is estimated in a model which obtained time series called V; the second, is the fact that V is assessed along with other variables by application of time series techniques.

3.2. The instability index of exports

Here we have used a self regressive model with a tentative variance in order to measure the fluctuations in the variance (ARCH). The changes in true exports variance and in the duration of time are measured by the following model:

$$X_t = e_t + u_t \quad (1)$$

$$vit = a_0 + a_1 u_{it}^2 + ... + a_k u_{it-k}^2 + u_{it} \quad (2)$$

where in this model:

$X_t =$ true export

$e_t =$ real export trend

$u_t =$ error term

$M_t = i.i.d$ normal error term

V is linear combination of error term of real export forecast. Indeed. the above mentioned forward (equation) is the result of an ARCH process.

Among the variety of specifications, we have replaced the following equation in order to estimate the above model:

$$\log(x_t) = b_0 + b_1 \log(x_{t-1}) + b_3 \log I_t + u_{it} \quad (3)$$

where I is the investment.

Here the lags of ARCH process is determined too. The procedure is to assume that the real export variant is a dependent of a first degree process. The major justification for this assumptions is that the most usual change in the value of variable occurs during ***t*** due to waver of the most recent changes. Also, we did not have enough observation in order to choose any higher degrees thus the index is defined as follows:

$$V_t = a_0 + a_1 u_{t-1}^2 + a_2 dum + u \quad (4)$$

where the dummy variable DUM represents the war years.

3.3. Instability and growth

Export instability may directly influence the growth process via investment or indirectly affect the efficiency of capital accumulation. The estimation of the growth and investment equations are based on the above mentioned cause and effect. The equation of growth for this purpose is based on Neoclassic growth model as presented below:

$$Q_t = F(l_t, k_t) \quad (5)$$

$$q_t = F(k_t) \quad (6)$$

$$q_t^g = b_0 + b_1 k_t^g + g_t^v + e \quad (7)$$

where

$Q_t =$ real GNP

$l_t =$ labor

$k_t =$ capital accumulation

$e_t =$ error term

$q_t^g =$ real per capita GNP growth of the work force

$k_t^g =$ per capita capital accumulation of the labor

The equation of investment is stipulated as follow

$$K_t^g = a_0 + a_1 k_{t-1}^g + w_t^v + u_t \quad (8)$$

3.4. The estimating of a model

Equations (3) and (4) are estimated by ARCH method, while (7) and (8) are analyzed by time series techniques. The outcome is presented through the following equations, respectively: (enclosure, Table 1)

$$Lx = 0.43 + 0.78Lx(-1) + 0.15I \quad (9)$$

$$z - st. \Rightarrow\Rightarrow\Rightarrow\Rightarrow\Rightarrow (0.46)(8.30)(1.93)$$

and its variance equation

$$v=0.009+0.73Vt+0.19Dum \quad (10)$$

$$R^z = 0.75$$

$$\overline{R} = 0.70$$

The obtained time series V and the outcome of the above estimations are entered into other time series techniques for further analysis.

3.4.1. The ARCH test

In order to test the remaining outcomes of the above evaluations we used LM test. to examine the zero assumption which is based on non-existence of ARCH pattern in the residual; the F statistic and its probability (0.01) revealed that this assumption is not accepted; moreover, the residual is correlated to a first degree of regressive process (enclosure, Table 2).

3.4.2. The growth and investment equations assessed in a time series technique method

3.4.2.1. Stability test

Initially. a stability ADF test on variables and on optimized designated pauses based on schwratz-Bayesian criterion was conducted; none of the variables was stable and none produced a significant relation coefficients as far as the trend and intercept were concerned. Their ADF statistics were lower than Mc Kinoon's critical absolute value; therefore, we used the first degree differentials where all variables became stable (Table 3).

Table 1: The results obtained from ADF test for examining the stability of modeled variables

The series	Optimal lag	Quantitative ADF calcualted	McKinoon's critical values		
			%1	%5	%10
DYGN	0	-8/45	-2/63	-1/95	-1/62
DYGK	1	-4/73	-2/63	-1/95	-1/62
DV	0	-5/17	-4/28	-3/56	-3/21

Source: The accumulation test conducted by Eveiws software

3.4.2.2. The impulse functions

The evaluation of equation (7) indicates that the per capita GNP growth (GNY) by endurance of positive shock will result in about three periods of keeping the positive nature within itself thus producing a significant relation. Although it lasts seven periods, it does not represent a statistical significance.

The effect of variable V or instability is negative in short-term, except for the first period. Although the response of the economic growth is negative against the instability shock, there is no evidence of significance relation in short and mid terms as far as the instability in export towards growth is concerned. The effect of variable DUM is also negative in short term. The influence of instable export in capital accumulation growth (gross investment) presented in equation (8) is negative as well, while not having statistical significance except in the first period (enclosure; Graph 2).

3.4.2.3. Determination of long-run relation

In order to assess and specify the relations among a few economic variables, we used Johansson's method. We went through the following three stages to analyze the integration with regard to the above mentioned method.

A) First, we must be sure that the maximum variables in the model consist of I (1). For this purpose, we use the unit root test. In this paper, first we evaluated the stability of the variables and found that all subject variables for this purpose (long-term equilibrium relation) are at least I (1).

B) Then, we examine the long-term relation among variables by using integration tests. If we find such relations, we accept the assumption and begin to evaluate the accumulative regression for long-term equilibrium. Johanssons regressive test is used at this stage to find long-term equilibrium relation between economic growth and other variables.

Table 2: The results obtained from the integration test for economic growth models' variables

Integrated vectors based on the assumption Ho	**H_1 assumption**	**The trace statistics**	**1% critical value**	**5% critical value**
$r = 0$	$r \geq 1$	72/34	54/46	47/21
$r \leq 1$	$r \geq 2$	26/91	29/68	35/65

Source: ibid

Based on ***trace*** statistics there exists only one integrated vector among the variables as follows:

GYN = 4/428Gyk - 36/7v+36/76Dum (11)

The above equation shows that despite instability effect in the short-term, in the long-term the instability effect of exports on growth is negative and has significant relation (Table 4).

To determine the long term equilibrium relation between cumulative capital growth and other variables, Johansson's method was used. Based on ***trace*** statistics, there exist only two integrated vectors among the variables where the first one due to

its accord with theoretical discussions is presented below in its normalized state.

Gyk = -9/167v-7/97DUM (12)

The above equation shows that the exports long-term instability effect on capital growth is negative and has significant relation (Table 5).

Table 3: The results obtained from the integration test for the patterns variable

Cumulative indicator based on the assumption Ho	**H_1 assumption**	**The trace statistics**	**1% critical value**	**5% critical value**
$r = 0$	$r \geq 1$	56/84	35/65	29/68
$r \leq 1$	$r \geq 2$	23/17	20/04	15/41
$r \leq 2$	$r \geq 3$	2/75	6/65	3/76

Source: ibid

C) In the finial stage, we calculate the remaining obtained from regressive integration and obtain the short-term parameters by ECM approximations or the error correction model as follows:

$$\Delta y_t = b\Delta y_{t-1} + b_2\Delta y_{t-2} + ... + b_{p-1}\Delta y_{t-p-1} + py_{t-p} + u_t \quad (13)$$

where: p is the long-term coefficient matrix, Δ is the differential processor, u_t is the shock deductive and b_i is the parameter which can be approximated.

As we see in Table (6), the ECM coefficient in both equations is negative and has a significant relation while indicating a convergence with the model in the long-term. The instability coefficients in both equations are not so significant, thus in general, in the short-term the effects of instability of exports on growth here cannot be accepted.

Table 4: VECM estimation results

Error C	D (GYN)	D (GYK)
ECM	(-0/1) ë (-4/7)	(-0/013) ë (02/31)
D (GYN(-1))	-	- 0/49 ë (-2/76)
D (GYN(-2))	-	-·/57 -·/32
D (GYK(-1))	ë0/27 (0/98)	./44 ë ë (1/84)
D (GYK(-2))	·/56 (1/67)	·/3 (1/14)
D(DUM(-1))	-3/9 (-0/32)	-·/43 (-0/4)
D(DUM(2))	-15/7 (-1/54)	3/2 (0/34)
D(V2(-1))	0/36 ë (2/1)	0/02 (0/17)
D(VX(-2))	0/046 (0/28)	0/04 (0/3)
C	-0/7 (-0/25)	-1/2 (-/53)

*(**) significance at 5% level (10%) and figures in parentheses are the statistical value *t*

3.4.2.3. Variance decomposition

In Table (5), the variance decomposition of GYK and GYN equations (economic growth and capital accumulation) are presented. As it can be noticed, in the first equation at first all changes belong to GYN. In the second place, 84% of changes is explained by GYN. 0.28% of changes belongs to GYK 0.94% belongs to the variable DUM and 14.6% belongs to the instability in exports (V). In the GYK equation, all changes are explained by the variable itself. In the second place, the share of instability variable reaches 21-14% which is a considerable percentage. This effect is increased to 40-23% by the tenth cycle.

Table 5: Variance analysis on variables in the equations

Due to positive shock				Time Horizon	Variable
V	**DUM**	**GYK**	**GYN**		
1	100	0	0	0	GYN
2	84	0/28	0/94	14/06	
10	89	0/59	1/43	8/49	
1	___	100	0	0	GYK
۲	___	77/9	0/96	21/14	
10	___	54/7	5/06	40/23	

Source: ibid

4. Conclusion

This paper has attempted to present a criterion in order to measure the exports instability that changes periodically. In fact, the presented research criterion is different from all other studies in this regard, which have had a local investigation approach. This approach seems to be a peculiar one, especially for Iran, since the exports data in some periods vary and in others (though little) have been stabilized with a very small change rate. We analyzed and evaluated the capital accumulation and economic growth vs. the changes of this index. This analysis has adopted the neoclassic growth model. We have used the time series technique to assess the effects of instability on growth. We also have used the reaction functions in order to assess the dynamic relation among the variables, in other words, the economic and investment growth vs. the shocks were inflicted by instability in exports. The outcome of these functions application showed that there were not many reactions to be considered significant regarding growth vs. shocks caused by this instability. Johansson's test was applied as well, which showed that both the economic growth and investment diminish in the long-term due to instable exports.

In general, the major finding in this study is that, in the long-term, the negative effect of exports instability has influenced the economic growth while in the short-term the influence has been very minor.

Now that the exports instability in Iran is defined and goes through vacillations by having significant effect, the policy makers in economic sector should prevent the execution of any procedure that may enhance the existing instability.

5. Recommendations:

1) Other studies could pay special attention to this main question: what factors can lead to export instability or aggregate it?

2) Trade policies should be designed in a way not to cause instability and fluctuations in export, because as discussed in this paper, this situation causes the capital accumulation and slows the economic growth in Iran.

3) In developing countries such as Iran, economic growth will not be justified only in neo-classical frame; the other factors that will affect the demand side of the economy will affect the long-run growth. Therefore, suitable economic policies in order to lower fluctuations and market clear should be pursued accurately from the government economic team.

Reference:

Abrishami, H. & M. Mehran. (2000). Applied Evaluation of Economy. Tehran University Publication, First Print.

Constantic, G. (1973). Export Instability and Economic Growth: A Statistical Verification. Economic Development and Cultural change. 21 670-78.

Constatine, S. V. (1974). The Effect of Foreign Exchange Instability on Economic Growth. Review of Economic and Statistics, 56: 410-12.

Enders, W. (1995). Applied Econometric Time Series. John Wilegsons, Inc.

James, L. (1992). Export Instability and the Domestic Economy: Questions of Causality. Journal of Development Studies 28: 735-42.

Mir Shojai, F. (1997). Exports Instability and Economic Growth in OPEC Member Countries. Trade Research Magazine.

Nofresty, M. (1999). Unit Radicals and Cumulative Assessing the Economy. Institute of cultural services, first print.

Peter, W. (1994). Export Earnings Instability of Singapore, 1957-1988: A Time Series Analysis. Journal of Asian Economics, 5: 399-412.

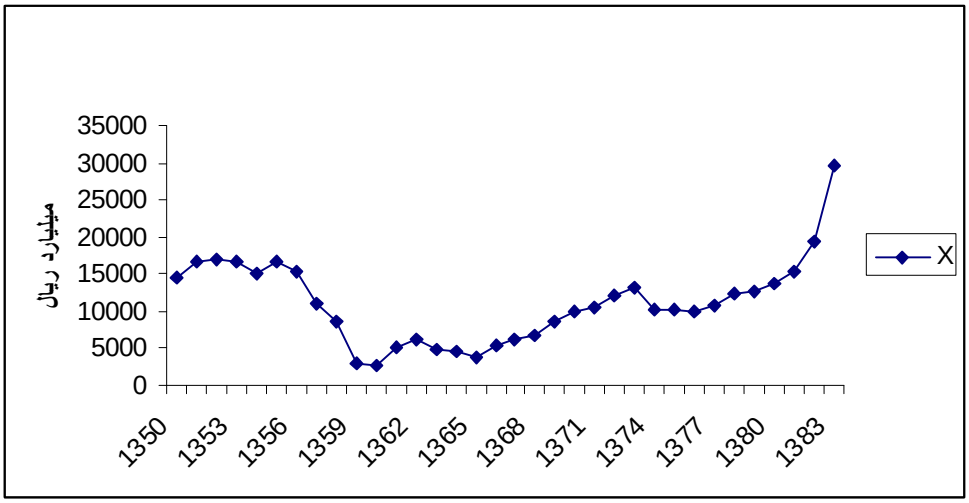
Rezaei, E. (2000). The Influence of Macroeconomic Instability on Capital Accumulation and Economic Growth, The Case of : Iran. 2nd International Conference on Business, Management and Economics, yashar university, Izmir, Turkey.

Sule, O. & H. James. (1988). Export Instability and Growth. Department of Economics Working Paper No. 486. (University of California, Los Angeles.

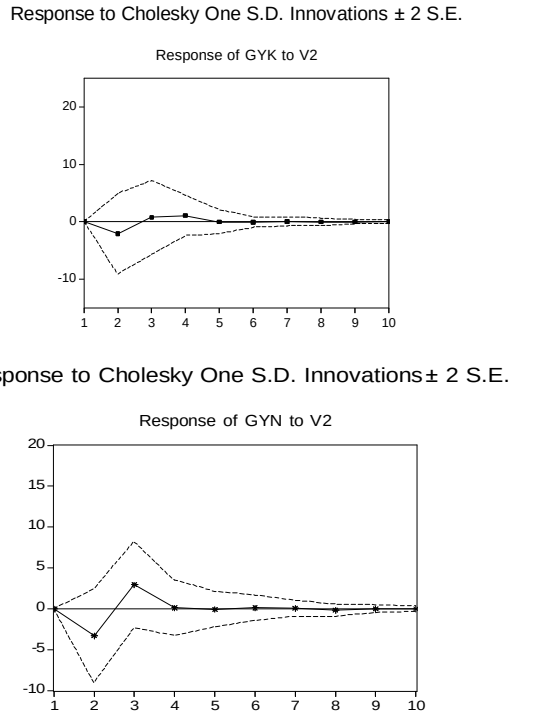
The economic data and papers bank of Iran, Economical studies center, Iran, University of Alame Tabatabai, school of economics (IELDB3)

Enclosure:

graph 1: Exports



Graph 2: GYN and GYK reaction vs. V shocks:



Dependent Variable: LX
Method: ML - ARCH (Marquardt)
Date: 12/09/06 Time: 15:56
Sample(adjusted): 1351 1383
Included observations: 33 after adjusting endpoints
Convergence achieved after 22 iterations
Variance backcast: ON

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.439309	0.952769	0.461087	0.6447
LX(-1)	0.782759	0.094332	8.297920	0.0000
LI	0.150578	0.077836	1.934551	0.0530
	Variance Equation			
C	0.009579	0.006908	1.386628	0.1656
ARCH(1)	0.727539	0.513353	1.417228	0.0512
DUM	0.191455	0.107035	1.788712	0.0737
R-squared	0.748364	Mean dependent var		9.169033
Adjusted R-squared	0.701765	S.D. dependent var		0.567407
S.E. of regression	0.309866	Akaike info criterion		-0.077164
Sum squared resid	2.592459	Schwarz criterion		0.194929
Log likelihood	7.273198	F-statistic		16.05957
Durbin-Watson stat	1.151557	Prob(F-statistic)		0.000000

Tables 1 & 2: Estimation of Equations (3),(4) and ARCH test

ARCH Test:

F-statistic	7.556360	Probability	0.010027
Obs*R-squared	6.438417	Probability	0.011168

Test Equation:
Dependent Variable: STD_RESID^2
Method: Least Squares
Date: 12/09/06 Time: 15:21
Sample(adjusted): 1352 1383
Included observations: 32 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.686186	0.476661	1.439569	0.1603
STD_RESID^2(-1)	0.451411	0.164216	2.748883	0.0100
R-squared	0.201201	Mean dependent var		1.199814
Adjusted R-squared	0.174574	S.D. dependent var		2.730344
S.E. of regression	2.480598	Akaike info criterion		4.715338
Sum squared resid	184.6011	Schwarz criterion		4.806947
Log likelihood	-73.44541	F-statistic		7.556360
Durbin-Watson stat	1.912085	Prob(F-statistic)		0.010027