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The Wealth Effect on Private Consumption Expenditures Using Asymmetric Cointegration Approach

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Abstract:

The objective of this study is the analysis of long-term consumption behavior which can be used for a better understanding of consumption behavior and for a proper view of the effectiveness of monetary policy in Iran. In this study, consumption has been expressed as a function of earnings and stock prices and, also, asymmetric cointegration method has been used. Cointegration tests have proved the long-term relationship existing between consumption and its determinants. In the short-run, also, the causal effects of the stock price change on the consumption were confirmed and the results showed that the negative shocks are corrected after four periods and the wealth effect is totally lost. In contrast, when the stock price shocks cause consumption shift upward the long-term trend, the effect of wealth on the Iranian people consumption behavior is proved. In other words, consumption attaches upward and the positive shocks due to stock price shocks are not corrected. Therefore, the implementation of the expansionary monetary policy may lead to increased total economic production.

JEL classification**: E21**, **C22**

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1. Introduction

During the past years, the growth and increase in stock markets fluctuations which are generally referred to the economic volatility have attracted the interest of financial economists and economic policy makers. While such interests are generally focused on the causal relationship between stock prices and macroeconomic variables such as real GDP, interest rate and money supply, many studies have noticed that the stock market plays a significant role in the private consumption behavior. Although the life cycle hypothesis shows a direct relationship between stock price and consumption, its impact especially upon Iran is not clear.

During 1990s and 2000s the Iran stock market has experienced many ascents and descents (in terms of stock prices). Tehran Exchange Price Index (TEPI) has had an annual growth rate of 43% over 1995-2004[1] (Azizi, 2009). Then, the index of the maximum value over this period, i.e. 123.1% (in 1995) reached to -21.9% in 2005. This index grew 2.65% in 2007. In Tehran Exchange market and followed by recent global financial crises, this index is at ascending trend line but there is still uncertainty in this market. With considering the issues mentioned in the research background (as you will see later) as well as the review on the Iran Stock Market, it appears that the question: "Did the stock market volatilities have effect on private consumption or not?" is a matter to be investigated. In authors' beliefs, the research findings can be effective for stable policy makings in this respect and, on the other hand, it will be useful for other neighboring countries with similar fluctuations in stock market.

The present study attempts to estimate the relationship between total private consumption and stock price through experimental tests which may expand the literate review for this research subject. More accurately, with considering that more recent researches focus on the asymmetric adjustment of consumption this survey, through using Error Correction

[1] Except for 1997

Modeling and Threshold as well as Momentum-Threshold Cointegration [developed by Enders and Siklos (2001)] tries to answer this question that "Is asymmetric consumption adjusted toward its long-term trend or not?"

In sections 2 and 3, existing literature and previous imperial studies are presented. Then, in section 4 the experimental method is described. In section 5, the data and the model estimation results are presented and in the last section the main results are summarized and policy implications are presented.

2. Theoretical Literature Review

Theoretically (life-cycle hypotheses) stock price change may affect private consumption through the effect of wealth. According to this hypothesis, the individual consumption is a part of his/her interests during his/her lifetime including expected income and current value of his/her assets (Ando and Modigiliani, 1963). Consequently, as shown by Liu and Shu (2004), stock price change may be reflected in the value of assets and change in wealth which, according to their finding, may cause change in consumption.

Although life-cycle hypothesis determines the direct relationship between consumption and wealth, the effect of stock price on consumption is still not clear. Stock price fluctuations (reflecting change in return as well as risk assets) may make the relationship between stock price and consumption (or saving) indefinite (Bonser-Neal and Dewenter, 1999). For instance, increased stock price may lead to increased asset return and such increased return is dependent upon the income effect overcoming the substitution effect. That is, increased stock return may reduce the attractiveness of current consumption (substituting effect) and at the same time may lead to increase in wealth and, subsequently in consumption (income effect). But, that how increased uncertainty (or risk) caused by stock price change affect the saving and, subsequently, the consumption is dependent upon the individual risk aversion (Rothschild and Stiglitz, 1971). Therefore, with such existing indeterminate theoretical

expectations, the relationship between stock and consumption is a question still requiring more experimental studies.

In view of policy making, life-cycle hypothesis and permanent income are indirectly related with monetary policies though Keynes's traditional theory generally has a close relationship with monetary policies. Following the implementation of monetary policies (which are generally made through change in money supply or change in interest rate) wealth is affected due to stock market and it affects the consumption through the wealth effect. Therefore, it is expected that monetary policies will affect the economic real activities through affecting consumption. But, the effect of such policies depends on the consumption expenditures changes caused by wealth effect, i.e. on the degree of shocks adjustment caused by wealth effect. Therefore, in recent studies the method of asymmetric cointegration has been applied to analysis the effect of the stock market shocks.

3. Previous Experimental Studies

3.1. Symmetric Adjustment

In a large number of empirical studies the wealth effect due to stock in stock markets in the developed and developing countries have been studied where household data or macro time series have been used and this effect has generally been confirmed. Some of these studies emphasize the consumption symmetric adjust to the stock market fluctuations. Results obtained in the United States of America indicate fairly weak effect of wealth on consumption. Poterba (2000) estimated the marginal propensity to consumption out of wealth to be around 0.03. Using data of the G7 countries, Boone et al. (1998) showed that the wealth effect in these countries is decreasing. Liu and Shu (2004) studied the causal relationship between real private consumption and real stock price for Asian leading markets (Hong Kong, Japan, Singapore, South Korea and Taiwan). Long-run relationship between the two variables of consumption and wealth was confirmed by results for all markets except for South Korea. Although there are different causal patterns in these countries, the

capital market effects in the short-run were more visible than long-term horizon. Cutler (2005) estimated the marginal propensity to consume out of financial wealth in the long-run and short-run for Hong Kong to be around 0.02 and 0.04 which were similar to estimates for developed countries. Bonser-Neal and Dewenter (1999) estimated the relationship between financial development and saving for 16 world accredited financial market. Their research results showed that when outliers of some countries are omitted from the model, the relationship between saving rate and financial development is robust. Azizi (2009) obtained a significant relationship between consumption expenditure and current value fluctuations in the Tehran Stock Exchange (TSE). He estimated marginal propensity to consumption out of wealth to be 0.02.

3.2. Asymmetric Adjustment

Some other researches has emphasized on the consumption asymmetric behavior which may be related with lacking risk aversion, incomplete market, dividend tax and limited liquidity (Patterson, 1993 ; Shirvani and Wilbratte, 2000 ; Stevens , 2004 ; Apergis and Miller, 2006 ; Mansour and Muzafar, 2010; Shirvani and Wilbratte, 2000). Shirvani and Wilbratte (2000) using data from three countries - Germany, Japan and the United States- showed that the consumption adjestment to decreased stock price is higher as compared to increased stock price and consumption in these three countries has an asymmetric behavior. Using error correction modeling, Apergis and Miller (2006) showed the consumption asymmetric adjustments to short-run stock price changes. The results of the study showed a stronger negative output effect of stock on consumption as compared to positive output of stock. Stevens (2004) showed that increasing changes in stock price cause asymmetric consumption behavior. As he addressed, information asymmetric increase and the subsequent decrease in exchange among the consumption of periods when the market is on a downward trend may lead to dualistic consumption expenditures. Using US data he showed that when

the market is in the boom era, the speed of adjustment toward long-term trend is faster.

4. Empirical Method

4.1. Long-term Relationship

The relationship between total consumption and stock market fluctuations is based on the life-cycles hypothesis (Ando & Modigliani, 1963) which determines a relative relationship between consumption and the expected resources earned from the individual's life-cycle income and wealth. More accurately, assumingly with a specific budget for the life cycle and with supposing a time-separable logarithmic utility functions and the lack of other forms of wealth such as heritage, the optimal consumption closely depends on an individual's life-cycle total income and wealth (Starr-McClure, 2002). Assuming that stock composes a part of the individual's wealth, the link between consumption and share price can be established (Mansor and Muzafar, 2010). Therefore, in this research the consumption function is expressed as follows:

$$c_t = \alpha_0 + \alpha_1 y_t + \alpha_2 s_t + \varepsilon_t \qquad (1)$$

Where c_t, y_t and s_t represent total consumption, real income and real stock price, respectively. The positive coefficient of the real stock price (α_2) is generally considered as the long-term effect of the stock market wealth.

4.2. Threshold Cointegration Test

Previous empirical studies show that the variables of interest in this research are generally non-stationary, *I*(1). Therefore, on the basis of the concept of cointegration, the cointegration of such variables depend upon the stationarity of their linear combination, i.e. error term. Enders and Siklos (2001) method makes it possible that short-term shocks adjustment and its return to long-run trend be asymmetric behavior. Apergis and Miller (2006) argued that consumption reacts asymmetrically to good

and bad news occurred due to capital market imperfections. They recognized the asymmetric adjustment for short-term consumption. But, Mansor and Muzafar (2010) analyzed the consumption asymmetric adjustment toward long-run trend with using error correction process and showed that only positive shocks due to stock fluctuations are corrected.

Asymmetric Cointegration Test of Enders and Siklos (2001) is based on the following equation:

$$\Delta\varepsilon_t = \rho_t I_t \varepsilon_{t-1} + \rho_2 (1 - I_t)\varepsilon_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta\varepsilon_{t-1} + u_t \quad (2)$$

Where, Δ refers to a first difference, I_t is an indicator defined to separate positive and negative shocks as follows:

$$I_t = \begin{cases} 1 & if \quad \varepsilon_{t-1} \geq 0 \\ 0 & if \quad \varepsilon_{t-1} < 0 \end{cases} \quad (3)$$

$$I_t = \begin{cases} 1 & if \quad \Delta\varepsilon_{t-1} \geq 0 \\ 0 & if \quad \Delta\varepsilon_{t-1} < 0 \end{cases} \quad (4)$$

The lagged first-difference terms are included to whiten the noise process. Therefore, k is determined so that the error terms to be uncorrelated. In Equation (2) the change of the current period error term $(\Delta\varepsilon_t)$ is so shown as to depend upon the direction of the previous period $[(\varepsilon_{t-1})$ which has normal distribution]. Equations (2) and (3) are Threshold Autoregressive (TAR) Model. In addition, if we believe that the speed of this shock movement in one direction is faster than other direction, Equation (4) will be a better (two standard) indicative function Enders and Dibooglu, 2001). Equation (2) and the indicator (4) are called Momentum-Threshold Autoregressive Model (MTAR).

[2] i.e. increase and decrease in stock price.

Engle and Granger assume that the adjustment of positive and negative shocks towards long-term trend always occurs at the same speed. But, Enders and Siklos suggested asymmetric cointegration method. In this method the stationarity ε_t is required to be $-2<(\rho_1,\rho_2)<0$. Any view of this assumption will lead to a view of the cointegration of TAR and MTAR models which is made using the F-test and the null hypothesis of H_0: $\rho_1=\rho_2=0$. Here *F*-statistic does not have usual distribution so Enders and Siklos (2001) referred to it as Φ. Under conditions where asymmetric cointegration exists, the null hypothesis of H_0: $\rho_1=\rho_2$ can be tested using the usual *F*-statistic. For the existence of the asymmetric adjustment towards the long-term trend, it is required that the both hypotheses of H_0: $\rho_1=\rho_2$ and H_0: $\rho_1=\rho_2=0$ are rejected.

4.3. Threshold Error Correction Models

Under conditions where an asymmetric cointegration relationship is expected, threshold error correction models are used to show asymmetric dynamic consumption. Threshold error correction model corresponding to Model (1) is shown as follows:

$$\Delta c_t=\Phi_0+\Phi_1 I_t\varepsilon_{t-1}+\Phi_2(1-I_t)\varepsilon_{t-1}+\sum_{i=1}^{k}\theta_1\Delta c_{t-i}+\sum_{i=1}^{k}\theta_2\Delta y_{t-i}+\sum_{i=1}^{k}\theta_3\Delta s_{t-i}+\nu_{2t} \quad (5)$$

Parameter Φ_1 measures the speed of consumption adjustment for upward shocks and Φ_2 measures the consumption adjustment to downward shocks. The significant of at least one of the coefficients of $\theta_1,\theta_2,...,\theta_k$ indicates the short-term effects of stock price on consumption.

5. Data and Results of the Model Estimation

As a result of the lack of the sufficient annual or seasonal observations, monthly data of the period 1996:1 to 2007:12 were used in this study. For this purpose, seasonal data from 1996:1 to

2007:4 were converted to monthly data with using quadratic match sum. The variable of consumption is private consumption expenditures the seasonal data of which has been obtained from Central Bank's statistical yearbook. GDP has been used as a substitute for labor force earnings. The figure of the end of the TEPI month was used as stock price the statistics of which were obtained from Tehran Stock Exchange portal. Using consumer price index, all variables were adjusted prices of 1997. As stated by Byrne and Davis, using the logarithmic form of variables instead of their level is required for the stationarity of the variable income. Therefore, all variables of the model, except for stock price index, were used in logarithmic form.

The Augmented Dickey-Fuller (ADF) and Philip Peron (PP) test were used to test the statonarity of variables. The results are as depicted in Table 1. As expected, all variables are non-stationary at level and stationary after first time differencing, I (1), and the results of one test is confirmed by the other.

According to Enders and Siklos (2000), stationarity test with intercept without trend should be used for decision making.

Table 1: Unit root test

Variables		ADF			PP		
		(1)	(2)	(3)	(1)	(2)	(3)
C	Level	1.90	1.72	-1.73	6.83	3.1	-0.92
	Difference	-3.55*	-3.59*	-3.69*	-5.75***	-9.89***	-10.91***
Y	Level	3.43	1.07	-1.01	3.89	1.41	-1.20
	Difference	-3.79***	-6.09**	-6.28***	-8.89***	-10.22***	-10.55***
S	Level	0.95	-0.31	-1.65	0.85	-0.38	-1.71
	Difference	-9.5***	-9.69***	-9.68***	-9.46***	-9.66***	-9.71***

Indicating no intercept and no trend; (2) indicating with intercept and (3) indicating with intercept and trend

*, ** and *** indicate the significance at the 10%, 5% and 1% level, respectively.

5.1. Long-term Relationship

When all variables are I(1), it will be possible to use TAR and MTAR cointegration test. Two-step Engle and Granger procedure was applied to compare the above-mentioned methods with Engle-Granger classical method (1987). Table (2) illustrates the results of these tests [in this table, critical values of TAR and

MTAR for Model (1) have been presented by applying the Enders and Siklos (2001)].

As noted, on the basis of Engle-Granger classical test, there is no long-term relationship between variables level. Therefore, testing the long-term relationship between levels of the variables has been made using TAR and MTAR cointegration test. Table (2) shows that null hypothesis $H_0: \rho_1 = \rho_2 = 0$ and $H_0: \rho_1 = \rho_2$ are rejected for MTAR model at the 5% level. These results show that consumption asymmetrically reacts to both positive and negative stock price fluctuations. In other words, long-run upward and downward shocks to the consumption are adjusted asymmetrically. Therefore, imposing symmetric adjustments as in the Engle-Granger symmetric adjustment can be misleading. This result is supported by Shirvani and Wilbratte (2000) for three countries – Germany, Japan and the United States.

Table 2: Cointegration test results

Model	EG	MTAR		TAR	
		F-statistic	F-statistic	F-statistic	F-statistic
		H0: $\rho_1 = \rho_2$	H0: $\rho_1 = \rho_2$.	H0: $\rho_1 = \rho_2$	H0: $\rho_1 = \rho_2 = 0$
(1)	1.81	3.796**	8.150**	1.38	4.482
TAR statistics و Critical Value for MTAR					
(1)	0.05	3.07	6.20	3.93	6.28
	0.10	2.35	5.20	2.75	5.20

For the TAR model the number of observations was 132 and the number of lags was 2 and for the MTAR model the number of observations was 132 and the number of lags was 4.
** Indicating the significance at the 5% level.

Using asymmetric cointegration method, the long-term relationship between consumption, income and stock price was obtained as follows:

$$c_t = 1.10 + 0.83 y_t + 0.096 s_t \quad (6)$$

t: (3.91) (28.85) (5.51)

As noted, the stock price with respect to income has the expected sign and is significant at the 1% level. In addition, the long-term relationship has also been estimated after adding the dummy variables of 1995 and 1997 which were eliminated from the model because they were insignificant. As we will see later, these variables also have no effect on short-term consumption. In Equation (6) it is noted that the wealth elasticity of consumption is about 1%. Therefore, in Iran, the consumers' sensitivity to long-run real stock price changes is relatively low which at the same time indicates the existing wealth effect due to stock.

5.2. Threshold Error Correction Models

With considering the asymmetric cointegration existing between consumption expenditures and the determinants thereof, the Momentum-Threshold Autoregressive Model (MTAR) was estimated to assess the short-term dynamic adjustment. For this reason, 6 was selected as the highest lag length of the first order difference terms.

On the basis of the Generaal to Specific Method and also using SC, AIC criteria, the optimal lag length was determined and the results were obtained as follows:

$$\Delta c_t = 0.49 - 0.057 I_t \Delta\hat{\varepsilon}_{t-1} - 0.253(1-I_t)\Delta\hat{\varepsilon}_{t-1} - 0.055\Delta y_{t-1}$$

$$(0.000)\quad (0.289)\qquad (0.098)\qquad\qquad (0.041)$$

$$+ 0.03\Delta y_{t-2} + 0.034\Delta y_{t-3} + 0.07\Delta y_{t-4} + 0.055\Delta s_{t-1} + 0.03\Delta s_{t-2}$$

$$(0.898)\qquad (0.098)\qquad (0.039)\qquad (0.095)\qquad (0.089)$$

$$+ 0.93\Delta s_{t-3} + 0.028\Delta s_{t-4} + 0.057\Delta s_{t-5} + 0.55\Delta s_{t-6}$$

$$(0.005)\qquad (0.293)\qquad (0.057)\qquad (0.051)$$

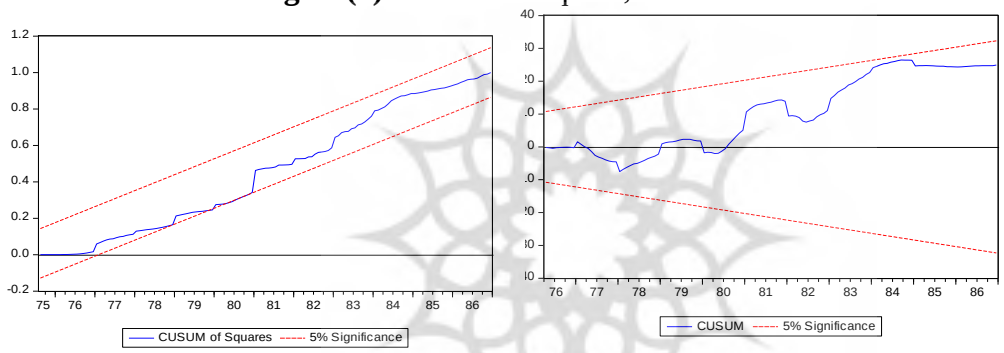
The results of the model and robustness tests are as shown in Table (3). Jarque-Bera Test for Normality (in residuals), Breush-Godfrey Lagrange Multiplier test for serial correlation and the Engle test for the Autoregressive Conditional Heteroskedasticity were applied. Also, the specification error for assessing the

goodness of the functional form of the model was made by Ramsey test. The results of all tests above are depicted in Table (3). In addition, the standards of the cumulative sum of residuals and the cumulative sum of squared residuals were used to study the stability of model structure as shown in Figure (1). As seen in Table (3), the model robustness is proved.

Table 3: Robustness test results

Test	Test Statistics	p-value
JB	1.272	0.102
RESET	0.747	0.388
LM(3)	0.642	0.288
ARCH(1)	0.11	0.73
ARCH(3)	0.19	0.90
SC	-7.85	-
AIC	-7.58	-

Figure(1): CUSUM- Square, CUSUM Tests



In Equation (7), the error correction term associated with negative shocks is significant and for the positive shocks is insignificant but at the same time they both have the expected signs. Thus, downward shocks of consumption are corrected and nearly four periods of adjustment are required. This means that the effect of decreasing wealth effect increase the current consumption attractiveness (substitution effect) and at the same time may lead to decrease in wealth and, thereafter, its effect on consumption (income effect). Therefore, the downward shocks adjustment indicates the substitution effect overcoming the

income effect. Insignificance of the error correction coefficient of the stock price positive shocks indicates the consumption appealing upward and the wealth's income effect overcoming the substitution effect. That is, the upward shocks are never adjusted and its income effect remains ever.

6. Since only the adjustment of negative shocks is significant, it seems that the obtained results are consistent with the asymmetric nature of data on stock prices, of course this asymmetry is due to the asymmetry of the business cycles. (Neftci, 1984; Domian and Louton, 1997; Mansor and Muzafar, 2010). Therefore, the symmetric cointegration can lead to misleading results. Results also indicated that a rise in stock price may result in increased consumption and if such increased consumption is not offset by imports it can result in increased economic activities and, consequently, in the total economic production. Of course, it should be noted that as a result of the lack of the previous researches (according to the authors) regarding Iran, it is not possible to make a certain declaration about a causal relation existing between increased price in stock market and domestic real product.

6. Conclusion and Suggestions

The present study empirically analyzed the total consumption behavior in Iran. The main objective of this study was to reply to the question: "Does the stock price change have effect on the short-run and long-run behavior of total consumption?". This survey was dealt with the possibility of consumption asymmetric behavior against short-run shocks with using asymmetric cointegration tests and asymmetric error correction model suggested and developed by Enders and Siklos.

The tests results indicated the existence of cointegration and asymmetric adjustment. As a result, any empirical study on Iran's consumption function imposing symmetric error correction [e.g. Azizi's research (2009)] may lead to misleading results. The research results showed that in the long-run there is a positive relationship between total consumption expenditures, stock price and real GDP. On the basis of research findings, the negative

shocks in consumption expenditures are corrected after four periods and the positive shocks are not lost. That is, the impact of increased stock prices on the consumption expenditures is not lost and the consumption is attaching upward. On the other hand, short-term model results showed that consumption reacts to stock price changes indicating the wealth effect in the consumption function. The research results showed the wealth effect as an increasing dynamic consumption behavior in the short-run.

In view of policy making, the Keynes's traditional theory is suited to understand the effectiveness of financial policies. But, life-cycle hypotheses and permanent income are more related to monetary policies because the implementation of these policies will affect the financial wealth due to stock market and such policies will affect the consumption through the wealth effect. According to the authors, the effect of monetary policies (which are generally made through change in money supply or change in interest rate) on the stock prices trend in Iran was not clear in previous researches. But, if the stock prices are affected by the expansionary monetary policies it will be expected that, on the basis of the present research findings, in the short-run the monetary policies will affect the real economic activities through its effect on consumption. But, the effect of a contractionary monetary policy is offset by the consumption expenditures changes due to the wealth effect and, thus, such policies should be taken with complete consideration.

There are some noteworthy points regarding the findings of this research and its policy ideas. Like other studies of the consumption, the main concern is the measurement. While the theories represent the consumption as the sum of non-durable goods consumption and the use of durable goods services, in the present survey we have used the total private consumption expenditures instead which was an inevitable problem. In addition, GDP was used as a substitute for the labor force earnings which was inevitable too. Finally, it should be noted that other forms of wealth such as housing and gold, which compose major part of individuals' wealth in Iran, were ignored as a result

of the lack of reliable data and only the stock price has been used to measure the wealth effect.

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