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Investigation the Effects of Exchange Rate Fluctuations on the Sub-Sectors Value Added in Iran

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Abstract

According to the expansion of trade and the dependence of the production chain in economic subsectors on international trade, exchange rate fluctuations can have a great effect on the international trade and, consequently, on the value added of economic subsectors. Therefore, the main purpose of this study is to investigate the relationship between exchange rate fluctuations and value added of economic subsectors in Iran. For this purpose, the time series data for three main economic sectors and 12 selected subsections in the period 1971-2017 have been used. To estimate the coefficients, first the exchange rate fluctuations are calculated by TV-GARCH method and the total demand shocks is extracted using the Hedrick-Prescott filter and then the ARDL model is applicated to estimate the short and long run coefficients. The results show that exchange rate fluctuations follow a model with time varying coefficients. Exchange rate fluctuations in the short and long term have a negative and significant relationship with industrial value added, exchange rate fluctuations have no significant relations with value added of the service sector, and in the short and long term have a positive and significant relationship with value added of the mining sector. Also, the relationship between exchange rate fluctuations with some industrial subsectors are not compaitable with theoretical literature, for example food and beverage industries have a positive and significant realtions with exchange rate fluctuations in short and long run. Furthermore, chemical subsector value added in short have a significant negative realtinship with exchange rate fluctuations but insignificant in long run.

Keyword: Exchange Rate Fluctuations, Economic Growth, Value Added, Economy Sub-Sector.

JEL Classification: E23, F31, O16, O40.

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1. Introduction

Study The exchange rate trend in Iranian economy, especially in last 4 decades shows the high level of fluctuations and the fluctuations and the gap between formal and market exchange rate have always been economic and policy challenges. The exchange rate volatility especially from 2009 had spread the uncertainty in the economy and have severe adverse effects on the macroeconomic variables such as inflation, production and investment. The literature indicated on the different effects the exchange rate fluctuation of tradeable and non-tradeable sectors. Therefore, the main purpose of this study is to investigate the effect of exchange rate fluctuations on economic sub-sectors in Iran.

2. Data and Method

The coefficients of the impact of exchange rate fluctuation on the economic sub-sectors are estimated based on the extended model that introduced by Cottani, Cavallo & Khan (1990), according to equation (1):

$$SEVAL = f(PP, ROil, GDP, EXVOL, PRLOAN, DD, DSA) \quad (1)$$

Where, $SEVAL$ is the sub-sector value added, PP is the production price index, $ROil$ shows the revenues of oil export, GDP is the gross domestic production, $EXVOL$ for exchange rate fluctuations, $PRLOAN$ is the financial facilities for private sectors, DD is the demand shocks and DSA is the dummy variables for economic sanctions. The data of this variables during the1971-2017 are extracted and the ARDL method applicated for estimate the coefficients.

To estimate the coefficients, first the exchange rate fluctuations must be calculated. different econometrics methods have been introduced for this purpose. These methods are in a wide range from statistical variance to conditional heteroskedasticity methods (Amado and Terasvirta, 2014).

in this study, Stochastic Volatility in Mean (SVM) model that introduced by Koopman and HolUspensky (2002) and extended by Chan (2015) is applicate to calculate the exchange rate fluctuations in Iran. So, according to Chan (2015), used the Markov chain Monte Carlo (MCMC) method for estimation the time varying coefficients. for this purpose, the Joint Posterior Distribution functions are simulated by using Bayesian method and a Markov Chain Algorithm. So, for y_t :

$$y_t = X_t^{'}\beta_t + \alpha_t e^{h_t} + \varepsilon_t^y, \;\; \varepsilon_t^y \sim \mathrm{N}\left(0, e^{h_t}\right) \quad (3)$$

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$$h_t = \mu + \emptyset(h_{t-1} - \mu) + \varepsilon_t^h,\ \varepsilon_t^h \sim \mathrm{N}(0, \sigma^2) \qquad (4)$$

Where, $X_t$is a $(k \times 1)$ vector of variables and β_t is the $(k \times 1)$ vector of time varying coefficients. $h_t$with respect to $\mathrm{h}_1 \sim \mathrm{N}(\mu, \sigma^2/(1-\emptyset^2))$ and $|\emptyset| < 1$ have a stationary process.

According to the importance effects of demand shocks on the economic value added in economic sectors, in this study the monetary shocks is used to considering the demand shocks and the hodrick-prescott filter is applicated to decompose the monetary shocks.

3- Results

In this section, at first the exchange rate fluctuations and demand shocks are calculated. Exchange rate fluctuations calculated by using a TVGARCH method with 20000 maximum iterations. Estimated Coefficients of equations (3), (4) using the exchange rate monthly data are reported in table (1) and figure (1).

Table 1. distribution of estimated coefficients

coefficient	mean	90% Confidence interval
μ	0/358	(0/127, 1/014)
β	0/3	(0/084, 0/516)
$\emptyset$	0/763	(0/697, 0/831)
σ^2	0/098	(0/057, 0/121)

Source: author calculations.

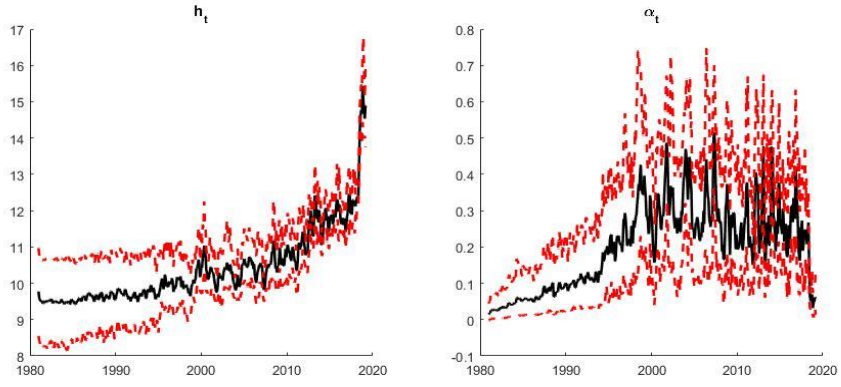

Figure1. Estimated α_t and h_t

Figure (1) shows that the coefficient of conditional heteroskedasticity (α_t) are time varying. The estimated values of (h_t) is used for exchange rate fluctuation variable.

The monetary shocks is extracted using hodrick-prescott filter where Lamda is selected using Raven Uhlig Frequency Rule equal 6/25.

After calculation the exchange rate fluctuations and demand shocks, next stationarity of variables is examined using the Augmented Dicky Fuller unit root test. Results shows in table (2).

Table 2. results of unit root test

variable	level	First difference	Result
GDP	0/62	-4/81	I(1)
roil	-1/61	-7/12	I(1)
prloan	0/067	-3/57	I(1)
exvol	1/52	-4/75	I(1)
DD	2/38	-4/13	I(1)
pp	0/63	-3/45	I(1)
indust	2/06	-4/80	I(1)
service	0/42	-3/87	I(1)
mineral	0/72	-8/02	I(1)
build	-1/97	-7/28	I(1)
chemical	-0/12	-3/55	I(1)
food	-1/23	-6/64	I(1)
machine	-0/92	-3/68	I(1)
metal	-0/12	-5/31	I(1)
nonmetal	-0/87	-3/58	I(1)
plastic	-1/17	-5/55	I(1)
publish	1/38	-3/58	I(1)
realstate	1/88	-5/88	I(1)
textile	-0/20	-4/67	I(1)
transport	1/53	-3/06	I(1)
wood	-2/74	-4/05	I(1)

Source: author calculations.

The unit root results show that but all the research variables are nonstationary in level and stationery in the first differences. So, the ARDL approach is applicated to estimate the coefficients.

Table 3. estimated coefficients for exchange rate fluctuations on economic sectors

sector	Short run			Bound test	Long run
	current	Firs lag	Second lag		
industrial	76/14 (0/635)	-626/09 (0/043)	-1544/17 (0/001)	7/11	-4462/93 (0/001)
service	249/66 (0/509)	440/31 (0/247)	-	8/36	2004/36 (0/101)
mineral	-1/39 (0/928)	33/42 (0/051)	-	8/22	21/23 (0/082)

Source: author calculations.

Results shows that in short run and in first and second lags have a significant negative relationship with industrial vale added. These results indicated on the negative effects of uncertainty of exchange rate and trade on the industrial tradable sectors. In short run exchange rate uncertainty didn't have a significant effect on the service sector value added. It shows that service as a non-tradable sector didn't have any response to the exchange rate fluctuations and uncertainty in the trade. In short run, mineral sector value added have a significant positive relationship with exchange rate fluctuations.

In this study the Bound test is used to examine the cointegration and long run relationship. Calculated F_Bound test for industrial, service and mineral sector are 7/11, 8/36 and 8/22 respectively, and are greater than the upper critical value bound test (4/19). Results of Bound test indicate on the existence of long run relationship between variable in the model. So. The long run coefficients can be estimated.

Long run estimated coefficient for industrial sector is negative and statistically significant. These results indicate on the adverse effects of exchange rate fluctuations and uncertainty in trade on the industrial sector. Such as the short run, the exchange rate fluctuations didn't have a significant relationship with the service sector value added. The relationship between exchange rate fluctuations and mineral sector value added is positive but statistically insignificant.

The effects of exchange rate volatility on the sub-sectors are estimates following. The estimated coefficients are reported in table (4).

Table 4. estimated coefficients for exchange rate fluctuations on economic sub-sectors

Sub-sector	Short run			Bound test	Long run
	current	Firs lag	Second lag		
food	162/52 (0/005)	15/82 (0/285)	107/72 (0/002)	34/13	86/35 (0/000)
textile	115/59 (0/033)	-44/01 (0/011)	-44/161 (0/075)	5/42	-154/34 (0/042)
machine	-44/79 (0/292)	-50/95 (0/108)	-342/02 (0/016)	21/17	-134/42 (0/001)
Non-metal	-29/74 (0/020)	27/86 (0/025)	-15/56 (0/135)	13/58	-134/18 (0/197)
metal	-42/45 (0/026)	-	-	11/66	-16/25 (0/017)
plastic	-10/93 (0/006)	2/31 (0/472)	-16/89 (0/000)	28/27	-14/78 (0/000)
publish	-3/14 (0/398)	4/07 (0/329)	-4/11 (0/171)	9/17	-2/88 (0/462)
wood	97/98 (0/185)	-89/57 (0/130)	-26/73 (0/156)	2/64	-
chemical	-22/73 (0/619)	104/83 (0/037)	-124/26 (0/038)	13/22	770/80 (0/856)
building	76/94 (0/042)	89/37 (0/031)	-	4/52	167/46 (0/086)
transport	67/52 (0/271)	136/65 (0/044)	71/75 (0/279)	13/40	2306/77 (0/047)
realstate	284/15 (0/054)	-268/54 (0/118)	-	5/51	-565430/0 (0/983)

Source: author calculations. (the upper critical value of bound test is 4/19)

4. Conclusion

Results shows that the coefficients are exchange rate volatility are time varying and not fixed during the time. This indicate that on the different behaviors of exchange rate during the research time and the structural breaks in exchange rate movements. For theses variables the simple GARCH models couldn't have accuracy in calculating the volatilities and the models with time varying coefficients are proposed.

Results shows that the negative impact of exchange rate fluctuations are gradual over the time. the price of import goods increases with increase in exchange rate uncertainty, so, the import decreases, and it make an increase in domestic production and price of that's goods. But the negative effects of increase in capital good and row material in industrial sectors Gradually revealed.

According to the results, the reaction of the food and beverage subsector to exchange rate fluctuations was similar to a non-tradable sector and with the increase in exchange rate uncertainty, the value added of this sector has increased. The investigation of this subsector in Iran shows that the market for the products of this subsector is almost relies on domestic products. Due to the

lack of effective presence of foreign producers in this sector, in practice, imports are mostly in the form of raw materials and not final goods, because of this, domestic producers have monopolistic power. So, with increase in the raw material and capital good price the price of domestic goods in this subsector increase, because of the low-price elasticity for products of this subsector, increase the price of production without the decreases in amount make an increase in value added of the subsector.

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