

**Dynamic Correlation of Exchange Rate, Export and Import Volatility with
The Global Economic Policy Uncertainty Index
(Application of M-GARCH and DCC Approach)**

Ashena, M.^{1*}, La'1 Khezri, H.²

Abstract

Given the interaction of countries at the global level, the dynamics of international markets can affect the domestic economy of countries. Changes in economic conditions and related uncertainties in different economies of the world affect trade relations and foreign trade variables. In this study, the effect of global economic policy uncertainty on the volatility of export, import and exchange rate variables in Iran has been investigated using monthly data for the period April 2004 to March 2017. The correlation of the mentioned variables in Iran has been investigated using the dynamic conditional correlation model of GARCH (DCC-GARCH). The results obtained from the model show that the use of dynamic conditional correlation model is more appropriate than the fixed conditional correlation model. According to the research results, volatility in global economic policy have a significant effect on volatility of exports, imports and real exchange rates. The results of this article show that fluctuations in global economic policy may have different effects on Iran's trade with other countries. If different firms with different financing need to export or import, then it is acceptable that economic policy fluctuations should have a different impact on their international trade decisions, and ultimately economic activity will be subject to change. Given the impact of global economic policy uncertainty on trade, policymakers must consider the impact of global economic developments on the domestic economy in their decisions, and pay attention to the structure of the correlation between domestic markets and global conditions. In this regard, the necessary support programs should be set for activities that are most affected by global developments.

Keywords: Global Economic Policy Uncertainty, Trade, Exchange Rate, Dynamic Conditional Correlation Model, Iran.

JEL Classification: E30, F31, F36, G11

1. Assistant Professor of Economics, Faculty of Humanities,
Bozorgmehr University of Qaenat, Qaen, South Khorasan,
Iran

Email: Ashena@buqaen.ac.ir

2. Assistant Professor of Economics, Faculty of Humanities,
Bozorgmehr University of Qaenat, Qaen, South Khorasan,
Iran

Email: h.lalkhezri@buqaen.ac.ir

1. Introduction

In recent decades, with increasing interaction between countries and as a result of increasing the influence of different countries on others, the global economic uncertainty index can be considered as an explanatory variable in the study of fluctuations in macroeconomic variables (Ashena and La'l Khezri, 1399).

Economic policy uncertainty may affect trade by influencing firm decisions to invest or preparation international input (Constantines et al., 2020). Depending on the priorities of different forces, trade can increase or decrease with the uncertainty of economic policy. Uncertainty may increase the average and variance of export returns. Uncertainty will lead to risk sharing between countries and lead to more trade (Baley et al., 2020). Also, Krol (2014) showed that economic uncertainty increases exchange rate volatility and can have both negative and positive effects on trade (Smallwood, 2019).

This paper examines the dynamic relationships between the global economic uncertainty index and exchange rate, export and import volatility in Iran. In this regard, the Global Economic Policy Uncertainty Index (GEPU) proposed by Davis (2016) is used. Therefore, a dynamic conditional correlation model is used to investigate the relationship between variables during the period April 2004 to March 2019. The structure of the article is as follows. The next section provides an overview of related studies. Then the research methodology is stated. Section 3 presents the data and empirical results. The last section also states the conclusion.

2. Background

Some recent studies have specifically addressed the relationship between trade policy and trade uncertainty (Handley and Limao, 2017; and Crowley et al., 2018). They found that uncertainty of trade policy had a negative effect on the flow of international trade through various channels.

Constantines et al. (2017) showed the negative effects of the Global Economic Uncertainty Index on trade. Zhang et al. (2018) examined the effect of economic policy uncertainty in China and United States on global markets. Greenland et al. (2019) examining 18 major world economies showed that increasing policy uncertainty reduces the value of trade. Baley et al. (2020) conclude that increasing uncertainty increases the average and variance of export returns. Constantines et al. (2020) showed the negative impact of economic policy uncertainties on exports and imports. Using Iranian data, Abolhasanbeigi and Mahdavi (1398) describe that the effect of exchange rate on trade balance in uncertainty condition is positive, and the effect of macroeconomic instability on this relationship is negative.

3. Research model

The dynamic conditional heterogeneity variance (DCC-GARCH) model is used to investigate the correlation between the research variables. A multivariate DCC-GARCH pattern is as follows:

$$r_t = \mu_t + \varepsilon_t \tag{1}$$

so that, $\varepsilon_t | \Omega_{t-1} \rightarrow N(0, H_t)$, r_t is a $(k \times 1)$ vector of variables, ε_t is a $(k \times 1)$ vector of the variable variations with zero average. For the two-variable case, the variance-covariance matrix H_t in the DCC model can be defined as follows:

$$H_t = D_t R_t D_t \tag{2}$$

D_t represents a $(k \times k)$ diagonal matrix of the variable conditional volatility, and R_t represents the $(k \times k)$ conditional correlation matrix. In the first step, the average equation of each variable is estimated by creating a univariate GARCH model of its conditional variance. In the second step, variable variations with a standardized zero average as a multivariate GARCH (m, n) are considered to show the time-varying correlation matrix (Engle and Sheppard, 2001).

4. Data and empirical results

In this study, the monthly data of Global Economic Policy Uncertainty Index (GEPU), the value of non-oil exports (EX) and imports (IM) of Iran at a fixed price of 2010 (million dollars) and the real exchange rate (RER), during 1383-1398 is used (Source: selected economic indicators of the Central Bank). The results of the unit root test show that all variables are stationary with a single differentiation. The GARCH (1,1) model has been selected by confirming the existence of ARCH effects and using the Akaike and Schwartz-Bayesian criterion. The DCC-GARCH model estimation results are shown in Table (1). Based on the results, the parameters α and β are non-negative and significant, and the condition " $\alpha + \beta < 1$ " is also met. The results of the correlation stability test indicate the rejection of the null hypothesis that the conditional correlation is constant over time. As a result, a model should be used that takes into account the conditional correlation over time.

Table 1: DCC model estimation results and correlation stability test

	IIMP	IEX	RER	DCC-GARCH
ARCH (α)	0.05 (0.00)	0.43 (0.00)	0.82 (0.00)	$\alpha = 0.021$ (0.0000)
GARCH (β)	0.9 (0.00)	0.56 (0.00)	0.17 (0.01)	$= 0.712$ (0.0000)
Engle and Sheppard (2001) Test for Dynamic Correlation: 17.0812				P-value(0.0001)

Figure (1) to (3) shows the trend of dynamic conditional correlation between variables. The dynamic conditional correlation between the GEPU index and real exchange rate fluctuations is positive except for a few periods.

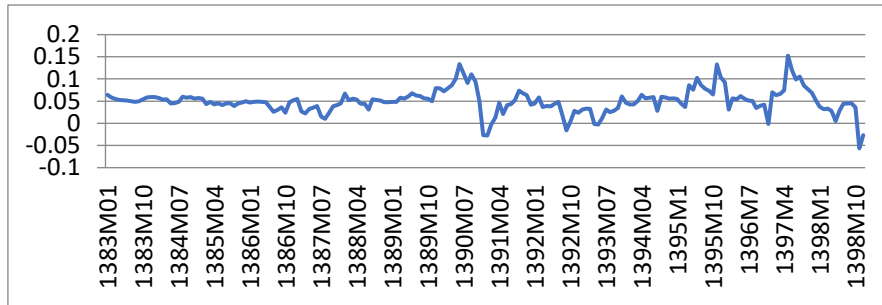


Figure 1: Dynamic conditional correlation between GEPU and real exchange rate volatility

The dynamic conditional correlation between the GEPU index and Iran's import volatility has always been positive. The reason for the positive correlation, according to theoretical principles, may be the increase in expected costs of import for households and firms.

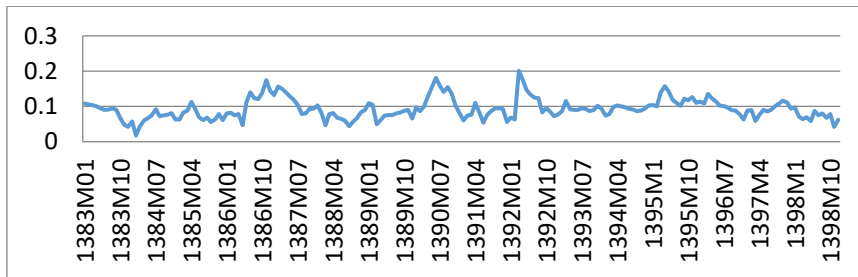


Figure 2: Dynamic conditional correlation between GEPU and import volatility

The dynamic conditional correlation between the GEPU index and the volatility of Iran's non-oil exports is negative. For the negative correlation, it can be said that various channels force affect export in both direction of decrease or increase simultaneously, and cause less volatility in export.

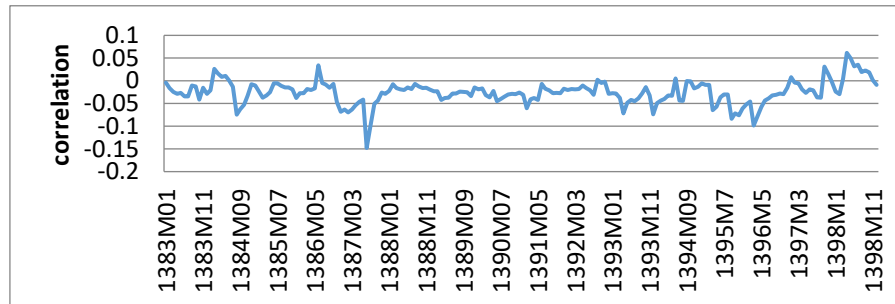


Figure 3: Dynamic conditional correlation between GEPU and export volatility

6. Conclusion

The dynamic correlation of export and import with the global economic policy uncertainty shows that the uncertainty of global economic policy has affected the volatility of export and import. The results of this study show a statistically significant, but small negative relationship between global economic policy uncertainty and export volatility, and a positive relationship between global economic policy uncertainty and import and exchange rate.

Given the impact of global economic policy uncertainty on trade, policymakers must consider the impact of global economic changes on the domestic economy in their decisions, and pay attention to the structure of the correlation between domestic markets and global conditions. In this regard, the necessary support programs should be set for activities that are most affected by global changes.

References:

- Abolhasanbeigi, H., Mahdavi, A. (2020). "The Effect of Exchange Rate on Iranian Trade Balance under Uncertainty". *Journal of Applied Economics Studies in Iran*, 8(32), 1-17.
- Ashena, M., La'l khezri, H. (2020). "The dynamic correlation of global economic policy uncertainty index with stock, exchange rate and gold markets in Iran: Application of M-GARCH and DCC approach". *Journal of Econometric Modelling*, 5(2), 147-172.
- Central bank of Islamic Republic of Iran. (2004-2019). Selected economic indicators. https://cbi.ir/simplelist/LatestEconomicData_fa.aspx
- Baley, I., Laura, V., & Michael, W. (2020). "Can Global Uncertainty Promote International Trade". *Journal of International Economics*, 126, 103347.
- Constantinescu, C., Mattoo, A., & Ruta, M. (2020). "Policy Uncertainty, Trade and Global Value Chains: Some Facts, Many Questions". *Review of Industrial Organization*, 57(2), 285–308.

- Crowley, M., Song, H., & Meng, N. (2018). "Tariff Scares: Trade policy uncertainty and foreign market entry by Chinese firms". *Journal of International Economics*, 114(3), 96-115.
- Davis, S.J. (2016). An Index of Global Economic Policy Uncertainty. *Becker Friedman Institute for Research in Economics*, Working Paper, No. 2016-24. Available at: SSRN: <https://ssrn.com/abstract2852531>.
- Engle, R.F., & Sheppard, K. (2001). Theoretical and empirical properties of dynamic conditional correlation multivariate GARCH. NBER Working Paper, 8554.
- Greenland, A., Ion, M., & Lopresti, J. (2019). "Exports, investment and policy uncertainty". *Canadian Journal of Economics*, 52 (3), 1248–1288
- Handley, K., & Limao, N. (2017). "Policy Uncertainty, Trade, and Welfare: Theory and Evidence for China and the United States". *American Economic Review*, 107 (9): 2731-83.
- Krol, R. (2014). "Economic Policy Uncertainty and Exchange Rate Volatility". *International Finance*, 17(2), 241–256.
- Smallwood, AD. (2019). "Analyzing exchange rate uncertainty and bilateral export growth in China: A multivariate GARCH-based approach". *Economic Modelling*, 82(3), 332-344.
- Tsay, R. (2010). *Analysis of Financial Time Series*. Wiley series in probability and statistic.
- Zhang, D., Lei, L., Ji, Q., & Kutan, A.M. (2018). "Economic policy uncertainty in the US and China and their impact on the global markets". *Economic Modelling*, 79(3), 47-56.