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The Pattern of Long-Term Volatility Transferring to the Industry Sector in the Tehran Stock Exchange Using the Mixed Data Model (GARCH-MIDAS Approach)

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Abstract

In this research, it is attempted to identify the pattern of uncertainty transferring of variables affecting the long-term volatility of the industrial sector in the Tehran Stock Exchange. In this regard, the mixed data model (MIDAS) and data of different internal and external variables with daily, monthly, seasonal and annual frequencies in the period 2009-2010 have been used. In the selection part of variables, by estimating different models, the variables affecting the volatility of industry sector in the long run were selected and finally the results of the selected model were presented. From various domestic and foreign variables, uncertainties of inflation, exchange rate, gold price and oil prices have significant effect in long run volatility of industry sector in the stock exchange. In addition, the results of the final model show that inflation is the most effective source of volatility in the industry sector in the Tehran Stock Exchange, which indicates that the capital market is more sensitive to domestic variables. According to the final model estimates, inflation, exchange rate and gold price uncertainty in the short and long term have had a positive and significant effect on industry sector volatility. However, the effect of oil price uncertainty on the volatility of the industry price index be Negative in the long run.
Keyword: Industrial Sector Stock Price Index Volatility, Exchange Rate, Gold Price, GARCH-MIDAS Model.

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1. Introduction

Analysis of stock market volatility as one of the main components of the financial market is very important in the economies of countries and a large group of economic actors, from producers and stockbrokers to households that have invested their savings in this market are directly related to these fluctuations. . (Fama and French, 1993). Macroeconomic variables are particularly important in asset pricing patterns and stock price volatility. Changes and fluctuations in macro variables have a direct effect on the price and stock returns of companies and the price index of the entire stock market.

On the other hand, the industry and mining sector is one of the most important economic sectors in the country, which has an important role in production and employment. The industrial sector, in the light of strong anterior and posterior connections with other sectors, plays an important role in the growth of production and productivity of other economic sectors.

In this study, the effect of macroeconomic uncertainty on the volatility of industrial sector returns on the Tehran Stock Exchange is investigated. In this regard, in order to more accurately investigate the pattern of fluctuations in different time horizons (short-term and long-term) and the use of data with different frequencies (daily, monthly and seasonal) the GARCH-MIDAS model has been used.

2. Specify the model and introduce the data

In this research, we try to investigate the effect of different indices of uncertainty of domestic and foreign variables on the volatility of the industrial sector in the Tehran Stock Exchange. In this regard, daily data on industrial sector returns and monthly and quarterly data of uncertainty variables due to inflation, oil price changes, and gold and currency price fluctuations as variables affecting the output volatility of the industrial sector in the long run over the Tehran Stock Exchange are examined. Took. Since the frequency of the dependent variable (industrial sector volatility) is daily and the frequency of these uncertainty indicators is monthly, in this study, the MIDAS-GARCH model presented by Engel et al. (2013) is used. EVIEWS10 and MATLAB 2018a software were used in estimating statistical models.

2-1. Research model

In this research, the GARCH-MIDAS model presented by Engel et al. (2013) is used. The general form of this model can be presented as Equation (1):

$$r_{i.t} = \mu + \sqrt{\tau_t \times g_{i.t}}\varepsilon_{i.t} \ldots\ldots \forall_i = 1. \ldots\ldots N_t \qquad \varepsilon_{i.t}|\Phi_{i-1.t} \sim N(0.1)$$

Equation (1) consists of two components, the short-term conditional variance of git and the long-term component (Engel et al., 2013). The conditional variance of git is specified in Equation (2)

$$g_{i.t} = (1 - \alpha - \beta) + \alpha \frac{(r_{i-1.t-\frac{1}{4}})^2}{\tau_t} + \beta g_{i-1.t}$$

Where $\alpha + \beta < 1$ ، $\alpha > 0$ and $\beta \geq 0$. In the following, the long-term component of the GARCH-MIDAS model is expressed as a function of a low-frequency explanatory variable (in this monthly study) as Equation (3).

$$log\ log\ (\tau_t) = (m + \theta \sum_{k=1}^{k} \delta_k(\omega) X_{t-k})$$

And the parameters of the model are GARCH-MIDAS, which are estimated using the maximization of the maximum likelihood function in Equation (5).

$$\boldsymbol{LLF = -\frac{1}{2}\sum_{i=1}^{T}\left[\sum_{t=1}^{N_t}\left[log(2\pi) + log(g_{i,t}\tau_t) + \frac{(r_{i,t-\mu})^2}{g_{i,t}\tau_t}\right]\right]^{-}}$$

In this model, μ width of origin, α and β are the parameters of the short-term conditional variance component and θ is also a parameter that shows the effect of independent variables on the long-term conditional variance component.

3. Research findings

In this study, inflation uncertainty and oil prices, exchange rates and gold prices have been calculated using the GARCH family models. The GARCH-MIDAS model is estimated below. The results of model estimation show that the uncertainty indices of inflation, oil prices, gold prices and exchange rates in the long run affect the volatility of industry returns. In addition, the turmoil in industry returns has a negative impact on oil price uncertainty and a positive

impact on uncertainty (inflation, gold and currency prices). The results also show that among the indicators of macroeconomic uncertainty, inflation uncertainty has the greatest impact on the output turmoil of the industrial sector.

Table (5). Estimation results of GARCH-MIDAS models using uncertainty indices

	INFU	OGU	EGU	GGU
μ	0.00032761 (1.9829)	0.00027151 (1.7133)	0.00030619 (1.9233)	0.00028421 (1.7129)
α	0.14552 (15.554)	0.17409 (15.377)	0.15953 (15.41)	0.15534 (15.743)
β	0.84335 (123.22)	0.80362 (97.701)	0.82357 (121.08)	0.82988 (123.19)
θ	2.7706 (2.1779)	-0.013305 (-3.056)	0.0054773 (2.5503)	0.02121 (2.4678)
ω	4.8902 (5.4465)	4.3197 (11.049)	2.6794 (5.8563)	4.8113 (3.7282)
LLF[1]	7442.62	7440.21	7442.42	7437.75
AIC[2]	-14873.2	-14868.4	-14872.8	-14863.5
BIC[3]	-14837.4	-14832.6	-14837	-14827.6

Source: Research Calculations

4. Conclusions

In this study, macroeconomic uncertainty indices including uncertainty due to inflation, oil prices, exchange rates and gold prices have been used as explanatory variables with monthly frequency and return of industrial stock price index with daily frequency in the period 2009-2010. The results of this study show that the uncertainty caused by inflation, exchange rate and gold prices have a positive and significant effect on the volatility of industry returns in the long run. However, the effect of oil price uncertainty on the volatility of industry returns is negative. In addition, according to the results of this study, among the indicators of uncertainty used, inflation uncertainty had the greatest impact on stock market volatility, which indicates that the capital market in the industrial sector is more sensitive to domestic variables and these results show the destructive effect of inflation. It is a channel for influencing the country's productive sector, and in this regard, it is suggested to

۱. Logarithmic likelihood

۲. Akaike info criterion

۳. Bayesian info criterion

those in charge to help create a safe environment for the country's productive sector to flourish by adopting regular monetary policies and controlling inflation. In addition, according to the results of this study, the uncertainty of parallel markets (gold and foreign exchange) has a positive effect on the volatility of industrial sector returns on the stock exchange, so capital market participants are advised to consider the situation of parallel markets in their analysis. Finally, researchers in the economic and financial fields are suggested to study the mechanism of transmission of uncertainty shocks in different sectors of the economy as well as different capital market industries using other econometric models.

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