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Volatility In Gold Market: Model Recommendation For Turkey

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Extensive Summary

Gold has an important place in World economy especially in the age of mercantilism which is the economic health of a nation based on the amount of precious metal that it owned. With the collapse of Bretton Woods System, gold considered as an investment tool in finance. The worst financial crisis in 2008, since the Great Depression, gold prices rose to 905 $/ons. Then it has great role in monetary economics.

Gold plays a prominent role in Turkish culture; also it is perceived as a store of wealth and also considered as a monetary asset and a safe heaven. In 2013 report of KPMG it is estimated that Turkey's total under-the-pillow gold stock in the rage of 3-5 thousand tones. Gold is a reserve tool for central banks, investment tool for investors, strategical financial tool for funds, and input for producers and jewelry for individuals. According to these features, it has an effect on the economic agents' economic decisions.

In this context volatility of Turkish gold price is investigating using İstanbul Gold Exchange (USD/Ons) daily data for the period of 01.01.2010 – 28.10.2016. This paper aims to detect to asymmetric effects then asymmetric volatility models which are APARCH, TARCH and EGARCH are used, and GARCH model is used.

There are many papers to investigate gold prices in academic literature. It can be categorized under three types of research. The first type of research investigates the relationship between macroeconomic variables and gold prices (Koutsoyiannis 1983, Dooley vd. 1992, Smith 2001, Ghosh vd. 2002, Vural 2003, Capie vd. 2005, Mishra vd. 2010, Toraman vd. 2011, Kutan ve Aksoy 2004, Demireli ve Torun 2010, Do vd. 2009, Öztürk ve Açıkalın 2008, Menase 2009, Taşçı 2010, Aksoy ve Topçu 2013, Sefa 2013, Deveci 2013, Yüksel ve Akkoç 2016, Du 2012, Gencer ve Musluoğlu 2014, Yurdakul ve Sefa 2015); the second type of research is the safe heaven feature of gold (Ghosh vd. 2002, Capie vd. 2005, İpekten ve Aksu 2009, Bali ve Cinel 2011, Aksoy ve Topçu 2013, Contuk, Burucu ve Güngör 2013, Tomak 2013, Gencer ve Musoğlu 2014, Gürgün ve Ünalmış 2014, Akel ve Gazel 2015) and third is modeling volatility of gold prices

(Erer 2011, Erer 2011, K.Cihangir ve Uğurlu 2013, Şencan 2017, Ahmad ve Ping 2014, Karabacak, Meçik ve Genç 2014) .

Let y_t, be a time series of asset returns with mean equation $y_t = E(y_t / I_{t-1}) + u_t$ and $u_t = \sigma_t z_t$. Engle (1982) proposed the autoregressive conditional heteroskedasticity (ARCH) models to estimates the variance of returns of the asset by the equation below.

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i u_{t-i}^2 \quad (1)$$

Bollerslev (1986) proposes GARCH (p,q) model

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i u_{t-i}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-i}^2 \quad (2)$$

Ding (2011) states that the GARCH model has drawbacks in application for asset pricing. It cannot explain the negative correlation between the fluctuations in stock returns and asymmetric conditional variance. In order to explain asymmetry, many models were developed which called a leverage effect. Three of them, EGARCH, TARCH and APARCH, are used in this paper.

EGARCH model:

$$\log(\sigma_t^2) = \omega + \sum_{i=1}^{p} \alpha_i \left| \frac{u_{t-i}}{\sigma_{t-i}} \right| + \sum_{j=1}^{q} \beta_j \log(\sigma_{t-i}^2) + \sum_{k=1}^{r} \gamma_k \frac{u_{t-k}}{\sigma_{t-k}} \quad (3)$$

γ_k coefficients show the leverage effect and if it is positive it means negative information has stronger impact than the positive information.

TARCH model:

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i u_{t-i}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-i}^2 + \sum_{k=1}^{r} \gamma_k u_{t-k}^2 I_{t-k} \quad (4)$$

APARCH model:

$$\sigma_t^{\delta} = \omega + \sum_{i=1}^{p} \alpha_i (|u_{t-i}| - \gamma_i u_{t-i})^{\delta} + \sum_{j=1}^{q} \beta_j \sigma_{t-i}^{\delta} \quad (5)$$

İstanbul Gold Exchange (USD/Ons) daily data for the period of 01.01.2010 – 28.10.2016 is used in this paper. GOLD is the price of gold and RGOLD is the return of it.

$$RGOLD_t = \ln\left(\frac{GOLD_t}{GOLD_{t-1}}\right) \quad (6)$$

Figure 1 shows GOLD and RGOLD series.

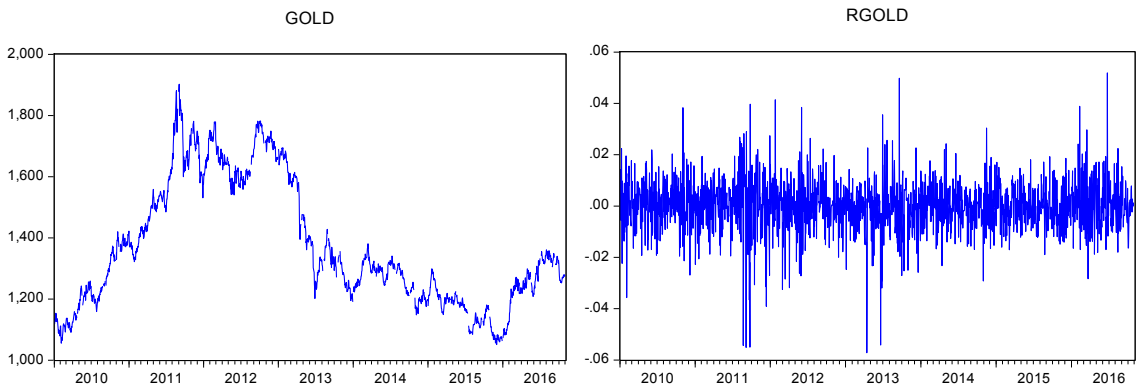

Figure 1: GOLD and RGOLD Series

Based on Alberg vd. (2008)' we use three steps. To isolate the seasonality these two following regression models are estimated, where r_t is return and $\hat{r}_t$ is the fitted values of return.

$$r_t = \alpha_1 Pzt_t + \alpha_2 Sal_t + \alpha_3 Çar_t + \alpha_4 Per_t + \alpha_5 Cum_t + \varepsilon_t \quad (7)$$

$$(r_t - \hat{r}_t)^2 = \beta_1 Pzt_t + \beta_2 Sal_t + \beta_3 Çar_t + \beta_4 Per_t + \beta_5 Cum_t + w_t \quad (8)$$

At last step returns are standardized using the equation below:

$$y_t = (r_t - \hat{r}_t) \ / \sqrt{\hat{\eta}_t} \quad (9)$$

Based on model comparison criteria APARCH model is chosen as a best model to explain volatility of returns of gold price. Result of APARCH model shows that the leverage effect exists and found that negative. According to the result, it is found that the volatility in the Turkish gold price is more affected by positive shocks than negative shocks.