Mối quan hệ giữa lạm phát và sự bất định lạm phát ở Việt Nam- ứng dụng mô hình E-GARCH

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Nghiên cứu nhằm khảo sát mối quan hệ giữa lạm phát và sự bất định lạm phát ở Việt Nam trong giai đoạn từ tháng 1 năm 1995 đến tháng 6 năm 2016. Mô hình ARCH được ứng dụng để đo lường sự biến động của lạm phát và hành vi bất cân xứng của lạm phát thu được từ Mô hình E-GARCH. Phương sai có điều kiện của lạm phát được lấy làm biến đại diện cho sự bất định lạm phát. Bên cạnh đó, mối quan hệ nhân quả giữa lạm phát và sự bất định lạm phát cũng được xác định bằng kiểm định nhân quả Granger. Kết quả thực nghiệm chỉ ra rằng mối quan hệ giữa lạm phát và sự bất định lạm phát ở Việt Nam trong thời gian nghiên cứu là thuận chiều và lạm phát cao sẽ tăng mức độ bất định của lạm phát.

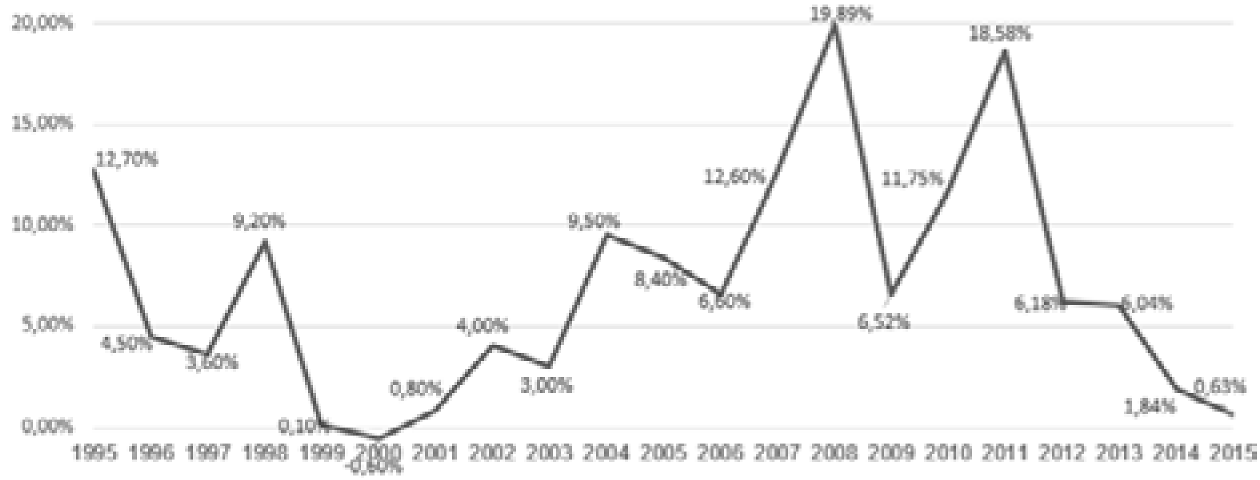
Từ khóa: *Lạm phát, sự bất định lạm phát, mô hình E-GARCH*

1. Introduction

In the last two decades, inflation is one of the hottest macroeconomic issues which have been discussed in Vietnam due to its high volatility, unpredictability and persistence. Vietnam has experienced the hyperinflation period with approximately 300% per year in the late of 1980s, and the high inflation period with approximately 50% per year in the early of 1990s (Hang N. and Thanh N., 2011). The main reasons of high inflation in these periods came from bad weather, weak financial system, and poor governance of the authority (Hang N. and Thanh N., 2011). After the low and stable inflation period from 1995- 2006, high and volatile inflation has come back to Vietnam economy in the period from 2007- 2011 (Graph 1). High inflation has led to high interest rate which had many negative effects on the Vietnam economy. Inflation has sharply surged in this period because of both internal and external reasons, including (i) the government decided increasing in minimum wage, (ii) the central bank implemented easing monetary policy and fixed exchange rate regime (iii) Vietnam has had higher degree of openness economy after becoming a WTO official member, (iv) prices of international commodities strongly surged, mostly crude oil and materials. In the period from 2012- 2015, inflation rate in Vietnam was relatively low and stable with only 0.63% in 2015 (Graph 1), it is the lowest inflation rate recorded over the last 14 years. However, low inflation in this period mostly was caused by low consumption and investment level which is raising concerns for authorities about a future slowing of economic growth.

The purpose of research is to an-

Graph 1: Inflation rate in the period from 1995- 2015 in Vietnam



Source: General Statistics Office of Vietnam(GSO)

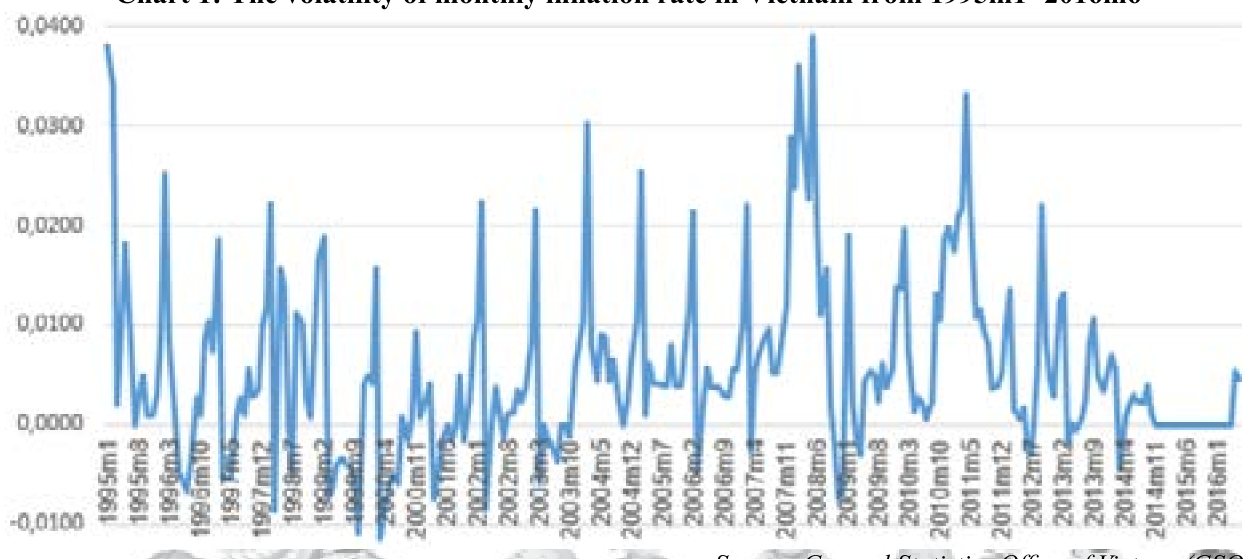
swer for the question: "Whether there is a linkage between inflation and inflation uncertainty in Vietnam over the period from January 1996 to June 2016?".

The remaining of the research is organized as following: section 2 introduces the literature review about inflation and inflation uncertainty, section 3 describes methodology and data, section 4 presents empirical results and the would be end up by section 5.

2. Literature review

One of the major costs of inflation is its uncertainty in the future which has significant impacts on the economy through altering business investment decisions and consumer saving decisions (John E. Golob, 1994). These impacts work through three channels. Firstly, uncertainty inflation increases long- term interest rates because of spreading of risk premium. The higher inflation uncertainty, the risker the return on nominal long term debt. Hence, investors will require higher long- term interest rates, which in turn decrease level of investment and consumption. Secondly, rising in inflation uncertainty increases uncertainty of interest rate and other macroeconomic variables which also play key role in economic decisions. Finally, when inflation becomes uncertain, businesses spend resources to avoid the risks of fu-

Chart 1: The volatility of monthly inflation rate in Vietnam from 1995m1- 2016m6



Source: General Statistics Office of Vietnam(GSO) ture inflation, for example spend more money in improving forecasting and hedging capacities (John E. Golob, 1994).

The hypothesis of the relationship between inflation and inflation uncertainty was firstly mentioned by Milton Friedman in the article, "Inflation and Employment", in 1997. Regarding his hypothesis, due to political pressures, an increase in inflation could force monetary policy makers have reactions for controlling inflation. Correspondingly, monetary policy in the future would be unpredictable for general public, thereby leading to increase uncertainty level of inflation. Moreover, he also predicted that inflation uncertainty would have negative effects on output.

In contrast to Friedman hypothesis, another one given by Pourgerami and Maskus in 1987 argued that high inflation actually decreases inflation uncertainty. In other words, the relationship between inflation and inflation uncertainty is negative. Pourgerami and Maskus explained that in high inflation periods, agents would invest their resources in forecasting inflation, so inflation would become less uncertain.

In the past two decades, several empirical researches have been conducted about the relationship between inflation and inflation uncertainty in different countries as well as regions. However, the results are still quite controversial with two different points of view about this relation. While most studies have indicated that there is positive relationship between inflation and inflation uncertainty, others have suggested the negative linkage. While the result of Bhar and Hamori (2001) showed that high inflation increased inflation uncertainty in G7 countries over the period from 1961q1 to 1999q4, two researches conducted by Cukierman and Melzer (1986) and Perry and Grier (1998) for Japan and France implied that inflation uncertainty causes inflation. The study which was conducted by Rizvi and Naqvi (2008) also explored the positive correlation between inflation and its uncertainty in Pakistan. In this study, T-GARCH and EGARCH models were used with quarterly data from 1976q1 to 2008q8. Other study of Rizvi and Naqvi (2009) used GARCH specifications to test the relationship between inflation and inflation uncertainty in ten Asian countries, including China, Hong Kong, India, Malaysia, Pakistan, Philippines, Singapore, South Korea, Indonesia and Thailand. Their results indicated that inflation causes inflation uncertainty in Pakistan, India, Indonesia and Thailand, in other countries there exists bidirectional causality between inflation and inflation uncertainty.

3. Methodology and data description

The data of Consumer Price Index (CPI) is collected from International Financial Statistics (IFS) over the period from 1995m1 to 2016m6 and transferred into monthly inflation rate by following equation:

$$\pi_t = [(CPI_t - CPI_{t-1})(CPI_{t-1})^{-1}]$$

In which,

π_t is monthly inflation rate

CPI_t is Consumer Price Index at month t

CPI_{t-1} is Consumer Price Index at month t-1

The Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) methods are used to test unit root of inflation data. The null hypothesis of these methods is the time series are non-stationarity hypothesis.

In order to identify the heteroscedasticity in inflation, this paper used Autoregressive Conditional Hetroscedastic (ARCH) model which was firstly introduced by Engle in 1981 to model and forecast conditional variance. In the second step, the author uses the Exponential Generalized Autoregressive Conditional Hetroskedastic (E-GARCH) which was developed by Nelson (1991) to identify the relationship between inflation and inflation uncertainty. The advantage of this model is that it doesn't have to satisfy the non-negativity constraints on the parameters as conventional GARCH models (Khalil Ahmad,et al. 2011). Hence, this model is able to test both negative and positive shocks. The relationship is expressed through

Table 1: Summary Statistics for Inflation (Monthly Data): 1995m1- 2016m6

Mean	Median	Maximum	Minimum	Std. Dev	Skewness	Kurtosis
0.005515	0.003781	0.038971	-0.011410	0.008842	1.245574	2.018033

Source: General Statistics Office of Vietnam(GSO) & Author's Calculations

Table 2: Unit root test for inflation

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.178052	0.025
Phillips-Perron test statistic	-9.617746	0.0000

**MacKinnon (1996) one-sided p-values*

Table 3: Estimated Coefficients of Inflation

	Coefficient	Std. Error	z-Statistic	Prob.
		Mean Equation		
C	0.002314	0.000364	6.359542	0.0000
INF(-1)	0.535624	0.052509	10.20063	0.0000
		Variance Equation		
ω	-5.217682	0.842413	-6.193735	0.0000
σ	0.722191	0.117300	6.156797	0.0000
γ	0.468394	0.077289	6.060288	0.0000
β	0.543405	0.082087	6.619896	0.0000

Table 4: Unit root test for inflation

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-14.76666	0.0000
Phillips-Perron test statistic	-14.76636	0.0000

Table 5: Granger Causality Test

	F-Statistic	Prob.
INF does not Granger Cause INFUN	46.8883	5.E-18
INFUN does not Granger Cause INF	0.90186	0.4071

two equations, namely mean equation and variance equation.

Mean equation:

$$\pi_t = \mu + \sum_{j=1}^{p} \theta_j \pi_{t-1} + \varepsilon_t$$

$$\varepsilon_t \sim \text{iid } N(0, h_t)$$

Variance equation:

$$\ln(h_t) = \omega_0 + \sum_{i=1}^{p} \beta_i \ln(h_{t-1}) + \sum_{j=1}^{q} \alpha_i \left|(\varepsilon_{t-j})(h_{t-j})^{-1}\right| + \sum_{j=1}^{q} \gamma_j (\varepsilon_{t-j})(h_{t-j})^{-1}$$

In which: is conditional variance which is regarded as a proxy of inflation uncertainty; , , and are coefficients to be estimated. When is non-zero, the effect of inflation on inflation uncertainty is asymmetric and when is positive, a higher inflation leads to greater inflation uncertainty and vice versa. Specifically, in this paper, I employ the AR (1)-EGARCH(1,1) model to estimate inflation uncertainty.

Granger Causality Test

Granger Causality will be used to determine whether the causality between inflation (inf) and inflation uncertainty (infun) exists in Vietnam in the period from 1995m1 to 2016m6. In other words, this method will test whether one variable is useful in forecasting the other variable or not (Granger, 1969). The regression function is given as following:

$$inf_t = c_0 + \sum_{t=1}^{n} inf_{t-1} + \sum_{t=1}^{n} infun_{t-1} + \varepsilon_t \quad (1)$$

$$infuc_t = c_0 + \sum_{t=1}^{n} infuc_{t-1} + \sum_{t=1}^{n} inf_{t-1} + \mu_t \quad (2)$$

In which, c_0 is the constant term in the Granger regression, n is the lag length chosen from the causality analysis. The null hypothesis in function (1) is that inflation uncertainty does not Granger cause inflation and in function (2) is that inflation does not Granger cause inflation uncertainty.

4. Empirical results

Unit Root Test

The results of ADF test in table 2 indicate that the t-value is-3.178052. It is significant less than the critical value of-2.873 at the 5% significant level. Besides, the t-value that is derived from PP test equals-9.617746 which is also significant less than the critical value of-2.872 at the 5%

level. Therefore, both tests reject the null hypothesis of a unit root in the inflation series at the 5% significance level. It means that inflation data is stationary at 5% significance level.

E-GARCH

The results from AR(1) and EGARCH(1,1) show that all coefficients are significant at 1% level. Specifically, the coefficient of equals 0.543405 which indicates that the effect of inflation on inflation uncertainty is asymmetric and a higher inflation leads to greater inflation uncertainty. In other words, it is clear that the movements inflation and inflation uncertainty in Vietnam have the same direction. This is in line with Friedman hypothesis.

Granger Causality Test

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Summary

The relationship between inflation and inflation uncertainty in Vietnam- Evidence from E-GARCH model

This research aims to investigate the linkage between inflation and inflation uncertainty in Vietnam over the period 1995m1- 2016m6. ARCH model is applied to measure the volatility of inflation and the asymmetric behavior of inflation is derived through E-GARCH model. Conditional variance of inflation is regarded as a proxy of inflation uncertainty. Besides, the causality between inflation and its uncertainty also is estimated by the Granger- Causality test. The empirical results indicate that there is strong positive relationship between inflation and inflation uncertainty in Vietnam, and inflation have Granger- cause inflation uncertainty.
Keywords: inflation, inflation uncertainty, E-GARCH model.

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Summary

The determinants of gold prices in Vietnam

This research aims at testing the correlation between the price of gold and many macroeconomic variables in Vietnam. Multiple Linear Regression is employed to determined significant relationship between dependent and independent variables, covering the data collected from January 2010 to June 2016. Five independent variables that affect the gold prices are crude oil prices, CPI, USD exchange rate, VN-Index and HNX-Index. The results shows that there is negatively significant relationship between VN-Index, HNX-Index and gold prices, meanwhile crude oil price is positively significant. However, CPI and USD exchange rate have no role in affecting the price of gold.

Keywords: CPI, crude oil prices, determinant, gold prices, USD exchange rate.

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The Granger causality test is conducted to answer for the questions whether inflation is useful in forecasting inflation uncertainty and whether inflation uncertainty is useful in forecasting inflation. In order to do that test, inflation uncertainty firstly must be checked stationarity. Similarly, ADF and PP test also are used with results of t-statistic are-14.76666 and-14.76636 respectively, which are smaller than the critical value of 1% level. Hence, inflation uncertainty is stationary at 1% significance level.

It is easily realized that the p-value of the first hypothesis is less than 0.01, or the fist null hypothesis is rejected at 1% level. This result suggests a positive causal relation from inflation to inflation uncertainty. In the second hypothesis, the p-value is larger than 0.01, so it can't be rejected. It means that there doesn't exist causal relation from inflation uncertainty to inflation. This result is completely consistent with Friedman hypothesis.

5. Conclusion

The research applied AR(1) and EGARCH(1,1) to determine inflation uncertainty and test the relationship between inflation and inflation uncertainty in Vietnam over the period from January 1995 to June 2016. Then, Granger causality was used to test causality between inflation and inflation uncertainty. The empirical results provided concrete evidence that there is positive relationship between inflation and inflation uncertainty in Vietnam, and inflation causes inflation uncertainty.

In order to stabilize inflation as well as minimize negative impacts of inflation uncertainty in Vietnam, this may be archived through following. Firstly, the central bank should continue to prioritize the inflation objective and synchronously implement the inflation targeting policy. Secondly, the central bank should have quick policy responses to inflation developments, thereby reducing inflation uncertainty both in the short and long run. Thirdly, inflation in Vietnam much stems from inflation expectations, so government should establish suitable channels to share information of domestic inflation with the general public in order to reduce inflation expectations, thereby reduce inflation uncertainty. ■