Original Research Article

Do the Unexpected Price Change and News Affect Price Volatility in Palestine?

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Abstract: Inflation is an essential issue in the economy. Many countries try to target inflation to reduce the erosion of savings for citizens, so many researchers have focused on this topic. The current study attempts to determine whether the news or an unexpected change in the consumer prices index basket affects the volatility of the prices asymmetrically. The result shows that four of twelve sectors are not affected by the news, either because they have a constant variance or because of the not significance of EGARCH. The rest sectors show different responses to high price news and low-price news either by magnitude or signs. Generally, we can notice that high prices with significant negative shocks have a more massive effect on future fluctuation. The shocks that affect its future fluctuation are positive and negative for low prices.

Keywords: Uncertainty, CPI, Asymmetric volatility, News Impact Curve, ARMA- EGARCH, Palestine.

1. INTRODUCTION

Price volatility has gotten one of the hotly debated issues for economists and policymakers in the most recent decade because of its adverse impact on macroeconomic soundness, the efficiency of life costs, and the general prosperity of consumers. Whereas It is well known that the rise in price volatility has distortionary impacts on consumer saving and producer welfare, it influences market participants' ability to predict prices.

Price volatility explains the severity of price movements or the threat of major, sudden shifts in prices. this may lead to The threat of massive price occurrences that will escalate and lead to wider social risks in terms of food security, human development, social culture, and even political stability (Kalkuhl *et al.*, 2016). The Modelling of price volatility indicated by 'uncertainty' has been well documented in the previous literature. The groundbreaking research in this area is that Friedman (1977) described the positive causal link between inflation and inflation uncertainty, That an increase in the average inflation rate results in higher uncertainty about the expectations of the inflation rate later.

Debates are continuing on the trigger of inflation uncertainty; some scholars have argued that monetary policy is essential to assessing inflation uncertainty as it arises from the instability of the monetary policy system, usually referred to as "regime uncertainty". They claimed that when the economy is in a situation of high inflation, there is an opportunity that reducing the inflation may lead to a recession. Some claim that uncertainty arises as a result of unsustainable and unreliable programs adopted by the government (Bamanga *et al.*, 2016). In this line, in Palestine, the economic situation does not differ from other countries. The monetary policy producer has a significant role in price volatility. The monetary policy procedure does not succeed in controlling price volatility in Palestine. The monetary policy is based on the fact that the large portion of international loans and grants is intended to cover current and development costs, not to set up infrastructure investments that will generate future income for the Palestinian economy. (Regep & Hussein, 2012) also, the weakness of the infrastructure and the inability of the Palestinian production sector to meet the needs of the

Palestinian market led to the ambiguity of prices in Palestine due to its dependence on imports and thus became more sensitive to international prices, where hat price volatility in Palestine are sensitive to imports (Abumdallala, 2019).

Although some scholars haven't supported the relationship between inflation and uncertainty, the majority have supported Friedman's hypothesis with different viewpoints on the reasons and economic impacts. Many researchers argue that economic factors trigger increased price volatility. This study employs the asymmetric GARCH model and News Impact Curve to test whether the unexpected price change affects the price volatility asymmetrically for the Palestine CPI basket and answer the following question: Do the unexpected price change and news affect price Volatility in Palestine?

However, the causes of price volatility are not limited to economic factors; the political situation also has its portion in price distortion, at least in the Palestinian economy. Ihle *et al*., (2019) show that some Palestinian commodity price volatility is connected with the Palestinian-Israel conflict, where political stability plays an essential role in stabilizing prices.

Since Israel still controls the land, sea, and air crossings to Palestine, and as the Palestinian economy is still linked to economic agreements such as Commercial supplement to the Oslo agreement, the Palestinian economy is closely related to the Israeli policies. Thus, the Palestinian economy has been linked to the Israeli economy, which led to the transfer of the burden of Israeli inflation to the Palestinian economy. Thus, the rise in prices in Israel is directly reflected in the performance of the Palestinian economy, especially since inflation leads to a decrease in the volume of savings due to the decrease in the purchasing power of money because daily transactions in the Palestinian territories are carried out in the Israeli shekel, so everyone gets rid of what they have of cash, which negatively affects investment and consumption (Rajab, 2011). The price index in Palestine is considered high in light of the decrease in income and high unemployment compared to Israel, and this is a reason for remaining high is due to the high prices of imports from Israel on the one hand in light of the disparity in income and prices between Palestine and Israel, in addition to the shortage of goods and services as a result of the Israeli restrictions on the Palestinian economy. The political, economic, and social role is also vital in the rise in Palestine's prices, which leads to an increase in the volume of public expenditures. A severe shortage of basic foodstuffs, subjecting it to the difficulty of transporting goods to and from the Gaza Strip due to the closure policy imposed on it, complete isolation, and a rise in Transportation and transportation prices that affected prices in the West Bank (Medhat, 2006). Therefore, the study of inflation in Palestine and its trends is considered an important issue that concerns Palestinian policymakers. Therefore, this study is crucial as it shows how the news affects the consumer basket. This study aims to determine whether the unexpected price change affects inflation in Palestine. It also contributes to determining inflation trends for the consumer price basket, which helps policymakers take these sectors into account when targeting inflation.

Although many scholars investigated the effect of unexpected prices on volatility, no one has investigated its effect on the CPI basket. To the best of our knowledge, this is the first time that the impact of an unexpected price change on the CPI basket has been studied

To model inflation's reaction to the news and unexpected price change, many scholars cross-world have employed different symmetric and asymmetric GARCH models to study price volatility, oil price volatility, food volatility, and commodity volatility. The interesting technique employed heavily in studying asymmetric is News Impact Curve, which was introduced for the GARCH model by Pagan & Schwert (1990). To overcome the problem that relates to the ARMA model, we follow Bollerslev, (1986) methodology by combining ARMA-GARCH

Ndiaye & Konte (2017) investigate the role of inflation uncertainty on economic growth. In the West African Economic and Monetary Union during the period from 1970Q1 to 2015Q1. The study employs the VAR-GARCH model; the study finds that inflation uncertainty plays a negative role in Guinea-Bissau and Togo's economic growth, while the relationship is not significant for the rest countries. Chowdhury (2014) investigates the relationship between inflation and inflation uncertainty from 1954:04 to 2010:04 in India. The study employs Granger causality and generalized autoregressive conditional heteroscedasticity. The study result supports Friedman's hypothesis of a positive relationship between inflation level and uncertainty. Hachicha & Lean (2013) test the relationship between inflation and inflation uncertainty and output in Tunisia during the period from 1988 Q3 to 2011 Q4. The study adopts the GARCH-in-mean model and Granger causality. The result finds evidence of the positive relationship between inflation and inflation uncertainty and that inflation uncertainty is a trigger for recession. Rizvi & Naqvi (2009) study investigates a relationship between inflation and inflation uncertainty in Pakistan for the period from the first quarter in 1976 to the second quarter in 2008 by using GJR-GARCH, EGARCH, and News impact Curve and Granger causality. The study result found that inflation uncertainty is asymmetric; the result confirms the Friedman-Ball hypothesis about inflation uncertainty.

Naurin & Qayyum (2016) investigate oil price volatility on the consumer price index in Pakistan for the period from 1980 to 2014. The study employed Box-Cox transformation and EGARCH model; the study found asymmetric news impact of oil price volatility on consumer price index also the result confirms Friedman hypothesis of existence

positive relationship between oil and CPI. Furthermore, that good news increases CPI volatility rather than negative news. Thornton (2006) investigated inflation and inflation uncertainty in India from 1957 to 2005 using the GARCH model; the study found that inflation uncertainty has a negative shock on output. Barimah (2014) has investigated inflation and inflation uncertainty in Ghana during the period from 1963:4 to 2014:2 by using Exponential Generalized Autoregressive Heteroscedasticity and Granger causality; the study result found bi-discretional causality between inflation and inflation uncertainty, the results support the Friedman-Ball hypothesis. Balcilar & Ozdemir (2013) used Granger causality and conditional Gaussian Markov switching vector autoregressive for G-7 countries during the period from 1959:12–2008:10 to test the existence of the relationship between inflation and inflation uncertainty. The study support Friedman's hypothesis for the US and Canada.

Caporale & McKiernan (1997) the study support Friedman's hypothesis that high inflation leads to an increase in inflation uncertainty by using the GARCH model for the period from 1947:11 to 1994:08 for the United States. Bamanga *et al.*, (2016) have investigated inflation and inflation uncertainty in Nigeria from 1960:1 to 2014:07 by using the EGARCH model and Granger causality. The study results support Friedman' hypothesis. Granger causality reveals that inflation causes inflation uncertainty.

2. DATA AND METHODOLOGY
2.1. Data
The study employs the consumer price index (CPI) basket that accounts for changing prices over time. In Palestine, the CPI basket consists of twelve categories that include the Palestinian economy's overall sector.

They are (Food and soft drinks, Alcoholic Beverages and tobacco, Textiles, clothing and footwear, Housing, Furniture, household goods, Medical care, Transportation, Communications, Recreational & cultural goods & services, Education, Restaurants, and cafes, and finally Miscellaneous goods and services). The study covers the period from 1st of Jan 2005 to 31st of Dec 2019. Since the financial series is noisy and has many issues such as autocorrelation, serial correlation, etc., the study converted to continuous price as suggested by Brooks (2019) based on the following equation: (natural logarithm of current price – natural logarithm of the previous price) * 100%.

2.2. Methodology
ARMA model
Financial series is known for having a feature depending on its previous behavior. In our analysis, we consider this issue by employing the ARMA process and expanding the EGARCH(1,1) model to become the ARMA-EGARCH model. Box & Jenkins (1976) introduced the ARMA (p,q) process, which contains two-part. The first one is autoregressive (AR), where the current value depends on its previous value and is written as follows:
$$y_t = \mu + \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + u_t \ldots\ldots\ldots\ldots\ldots.. (1)$$

Where y_t is the dependent variable, μ is a constant, $\phi_p y_{t-p}$ is the previous value of the dependent variable, and u_t is a white noise disturbance term which has a constant mean, constant variance and constant autocovariance. The second part of the ARMA process is the Moving average (MA), and it is based on that the current value of the dependent variable depends on its previous error term and is written as follows:
$$y_t = \mu + u_t + \theta_1 u_{t-1} + \cdots + \theta_q u_{t-q} \ldots\ldots\ldots\ldots\ldots (2)$$

The ARMA (p, q) process is as mentioned before; it is about combining the two-part, AR part and MA part as follows:
$$y_t = \mu + \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=1}^{q} b_j \epsilon_{t-j} + u_t \ldots\ldots\ldots.. (3)$$

Where μ is a constant, the order of AR order is represented by p, the order of MA order is represented by q as $|b| < 1$ then the model is stationary. The order of the ARMA (p,q) process has been chosen based on the AIC criterion. We choose the order based on the lowest value of AIC; we test up for orders up to (3,3).

The financial series has many undesirable properties, such as autocorrelation, and it relies on its past behavior; thus, extending the ARMA model to ARMA-EGARCH can deal with these issues as proposed by Bollerslev, (1986).

GARCH model
ARMA (p,q) process alone cannot detect several financial series features like volatility and leverage effects; for this, scholars usually employ the GARCH model. There are several types of GARCH available, such as normal GARCH, TGARCH, EGARCH AGARCH, GARCH in mean, etc. However, it is essential to notice that not all the GARCH models can detect volatility. Hence, we employ the EGARCH model that can capture asymmetric in financial series.

EGARCH model refers to the Exponential Generalized Autoregressive Conditional Heteroscedasticity model. This model was proposed by Nelson (1991) as follows:

$$ln(\sigma_t^2) = \alpha_0 + \alpha_1 \frac{|\varepsilon_{t-1}| + \gamma_i \varepsilon_{t-1}}{\sigma_{t-1}} + \beta_1 ln(\sigma_{t-1}^2) \dots\dots\dots\dots\dots (4)$$

Where the conditional variance is represented by σ_t^2, γ_i refer to the asymmetric effect, if γ_i is positive, then the relationship between current and future return is positive. If negative, then the relationship is negative. The distinctive feature of the EGARCH model is that the conditional variance responds asymmetrically to positive and negative shocks.

News Impact curve Model

Pagan & Schwert (1990) have introduced the News Impact Curve in the GARCH framework, further discussed by Engle & Ng (1993). The News Impact Curve divides the shocks on conditional variance into negative shock and positive shock; the negative shock is bad news; similarly, the positive shock is good news. The bad news 'negative shocks' lead to increased volatility, and the good news 'positive shocks' leads to volatility decreasing.

The News Impact Curve represents a Picture of the degree of asymmetry of volatility to positive and negative shocks. The Curve is plotted using the calculated conditional variance for the given model, with its estimated coefficient, and the lagged conditional variance is set to the unconditional variance. Consecutive values of u_{t-1} are then used in the equation to decide what the equivalent values of σ_t^2 obtained from the formula will be (Brooks, 2019).

3. DISCUSSION THE RESULT

As we mentioned before, to test whether the unexpected price changes or the news affect the Palestinian CPI basket price, we employ ARMA-EGARCH (1,1). We start our analysis by testing the stationary of the variables. We employed the Augmented Dickey-Fuller test for the continuous price. Appendix A. Shows that all variables are stationary at level.

After checking the unit root and ensuring that all variables are stationary, we proceed with our analysis calculating AIC to determine the ARMA process order; we choose the ARMA order based on the lowest Value of AIC. Appendix B. Shows the ARMA process order.

Next and before performing EGARCH analysis, we investigate in existing ARCH effect in the residual under the null hypothesis that there is no arch effect as proposed by Engle (1982). From Appendix C., We can confirm existing of the Arch effect; we reject the null hypothesis for all the variables.

Appendix C. indicates the existence of the arch effect; for that, we proceed with our analysis in estimating the EGARCH model. Table 1. Shows the maximum likelihood result of estimation alpha, beta, and gamma of our ARMA-EGARCH (1,1) model; Table 1 shows that alpha is significant for Transportation, Restaurants, and cafes; it is clear that beta is significant for all variables. At the same time, gamma is significant for all variables except Food and soft drinks sector and the Housing sector. It's clear from the result that four of the twelve sectors are not time-varying. These sectors are Food, and the soft drinks sector, the Housing sector, the Transportation sector, and the Restaurants and cafes sector are not time-varying [1]. These four sectors seem to be related to a mature market where these sectors' entrance is hard due to no extra profit or margin incentive. Hence, the possibility of fluctuating these markets in the short run is weak.

Table 1: Maximum likelihood estimates of the ARMA-EGARCH(1,1)

	alpha	t-static	beta	t-static	gamma	t-static
Food and soft drinks	0.20	1.80*	0.45	1.69*	0.09	0.60
Alcoholic Beverages and tobacco	-0.31	-5.99	0.85	247.31	0.10	3.86
Textiles, clothing and footwear	-0.14	-1092.90	0.97	10967.40	-0.17	-4728.70
Housing	-0.16	-2.57	0.79	6.61	0.10	0.80
Furniture, household goods	-0.12	-2.89	1.00	378.30	0.19	9.73
Medical care	0.26	3.89	0.73	1637.85	-0.17	-2.58
Transportation	0.00	-0.03	0.95	179.22	0.10	2.63
Communications	0.12	3.67	0.97	26890000.00	0.00	-3.81
Recreational, cultural goods & services	-0.15	-1.83*	0.94	33.21	0.60	6.24
Education	-0.07	-574.77	0.90	4432.49	-0.53	-3959.00
Restaurants and cafes	0.09	0.78	0.41	2.43	0.80	4.37
Miscellaneous goods and services	-0.37	-6.32	0.92	2450.93	0.12	2.60

All the variables are significantly at less than 1% unless indicated by others. * indicates to significant level at 10%. The red shadowed cell indicated not significant.

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[1] We consider a sector is not time-varying and have a constant variance if alpha is not significant.

Table 2: News effects on the CPI sector

sectors	High price		Low price	
	news $\alpha + \gamma$	t-stat. $(\alpha + \gamma)$	news $\alpha - \gamma$	t-stat. $(\alpha - \gamma)$
Al coholic Beverages and tobacco	-0.21	-2.13	-0.41	-9.85
Textiles, clothing and footwear	-0.31	-5821.60	0.03	3635.80
Furniture, household goods	0.07	6.84	-0.31	-12.62
Medical care	0.09	1.31	0.43	6.47
Communications	0.12	-0.14	0.12	7.48
Recreational, cultural goods & services	0.45	4.41	-0.75	-8.07
Education	-0.60	-4533.77	0.46	3384.23
Miscellaneous goods and services	-0.25	-3.72	-0.49	-8.92

Table 2 shows the column, the first column, and the third column are the coefficients of high and low-price news of the CPI basket, respectively. The table explores the symmetric and asymmetric volatility of increasing and decreasing prices based on the following period volatility news. We can see from the previous table different reactions to price news. For example, we can notice an increase in Al coholic Beverages and tobacco sector volatility in response to high price news and low price news is -21% and -41%, respectively. They have different magnitude but symmetric rection, the volatility for low price news seems to be greater than high price news, so the negative shocks on low price will have a more significant effect on the future fluctuation. For the Textiles, clothing, and footwear sector price, the volatility reaction to high price news and low price news is -30% and 3%, respectively; in this case, the negative shock of high price news will have a more significant effect on a future fluctuation. The reaction to high price news and low price news is asymmetric for Furniture, and the household goods sector; the reaction to low price news is greater than the response to high price news. For the Medical care sector, the response to high price news and low price news is 9% and 43%, respectively. For communication, we can notice that the response to volatility in high price news and low price news is symmetric and has the same magnitude, which is 12%; this implies that the positive shock on high price and low price will have the same magnitude the future. We notice that the Recreational, cultural goods & services sector is asymmetric, and the response to low price news is more significant than high price news. We can see the volatility response to high prices by -60% for education. For Miscellaneous goods and services, the response to volatility is symmetric for both high and low prices [2]. Generally, we can notice for high prices that large negative shocks have a more massive effect on future fluctuation, while for low price, the shocks that affect it's future fluctuation is positive and negative. The table results are evident in Appendix D, which shows the news impact curve for the CPI basket. We classify the previous result in the following table (Table 3), which shows the classification of the CPI basket based on news.

Table 3: Classification of CPI sector

News effects		No news effects	
symmetric effect	Asymmetric effect	No news effect	constant variance
Medical care Communications Miscellaneous goods and services	Alcoholic Beverages and tobacco Textiles, clothing, and footwear Furniture, household goods Recreational, cultural goods & services Education	Food and soft drinks Housing	Transportation Restaurants and cafes

Note that 4 of 12 sectors have no news effect, and they either have no news effect or constant variance. This may arise that this sector is essential for Palestinian consumers, and so the demands for these products and service is constant, which mean that it has a fixed elasticity. Also, the sectors that have constant variance may have their price constricted by fixed price by the government, like the Transportation sector, hence there a little adjusting for Transportation price.

Since the inference in the GARCH form of models relies on the proper specification of the variable and the consistency of the methods employed to describe the conditional mean and the conditional variance, we perform an additional asymmetry test using the regression as follows:

$$s_t^2 = \delta_0 + \delta_1 s_{t-1} + \delta_2 s_{t-2} + \delta_3 s_{t-3} + \eta_t$$

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[2]We follow Chadwick & Bastan (2017, p61) that 'an unexpected price increase measured by a unit increase in the standardized residual with $\varepsilon_{t-1} > 0$ increases volatility, … and an unexpected price decrease with $\varepsilon_{t-1} < 0$ decreases volatility'

Where $s_t = \left(\varepsilon_t / h_t^{1/2}\right)'$ denotes to the estimated standardized residual from equation (4), this test proceeds by testing a joint significance test for the null hypothesis of $\delta_1 = \delta_2 = \delta_3 = 0$, accepting the null hypothesis will mean that the model is misspecified, and there is a remaining asymmetric effect [3]. In Table 4, we report the result of testing the null hypothesis. The result indicated that the models are wee-specified.

Table 4: Diagnostic regression

Sectors	F-statistic	P-value
Food and soft drinks	0.04381	0.9878
Al coholic Beverages and tobacco	0.8715	0.4571
Textiles, clothing and footwear	1.385	0.2491
Housing	0.7786	0.5074
Furniture, household goods	0.627	0.5985
Medical care	2.515	0.06004
Transportation	0.6066	0.6116
Communications	0.8198	0.4845
Recreational, cultural goods & services	0.4597	0.7108
Education	1.928	0.1268
Restaurants and cafes	0.4432	0.7224
Miscellaneous goods and services	0.8172	0.486

4. CONCLUSION

Inflation and inflation uncertainty are considered essential subjects to scholars. Although there is a massive study of inflation, a limited study is concerned about inflation uncertainty in small economies. This study investigates the effects of the price change on price volatility for cpi basket in a small closed economy- the case of Palestine. The study uses monthly data for the CPI basket from Jan 2005 to Dec 2019. The study utilizes ARMA-EGARCH (1,1) to capture volatility asymmetric. We perform further regression tests for standardized residuals to check the adequacy of the model specification.

Although many scholars investigated the effect of unexpected prices on volatility, no one has investigated its effect on the CPI basket. To best of our knowledge, this is the first time that the impact of an unexpected price change on the CPI basket has been studied.

The result shows that four of twelve sectors are not affected by the news, either because they are constant variance or because of the not significance of EGARCH. This may arise that this sector is essential for Palestinian consumers, and so the demands for these products and service is constant, which mean that it has a fixed elasticity also, the sectors that have constant variance may its price is constricted by fixed price by the government like Transportation sector, hence there a little adjusting for Transportation price. The Transportation sector shows asymmetric response by magnitude and signs of volatility. The rest sectors show a different response to high price news and low price news either by magnitude or signs. Generally, we can notice high prices that large negative shocks have a more massive effect on future fluctuation, while for low prices, the shocks that affect future fluctuation are positive and negative.

Policymaking is used to take inflation as an indicator of how the economy is healthy, but ignoring the future of inflation is uncertain. This paper provides policymakers with important information about inflation uncertainty in Palestine's CPI basket that helps them consider the policymaker about sectors that have a largely negative and positive shock, which could help them determine the sector that needs reform. The study is considered fundamental for further investigation of these shock cases to CPI sectors.

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[3]For more details see Enders (2008)

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Appendix
Appendix A

Vars	Intercept	Trend and Intercept	Non
Food	-10.37	-10.00	-11.28
cholic	-13.50	-13.46	-13.05
Textiles	-14.30	-14.40	-14.28
Housing	-11.40	-11.47	-11.21
Furniture	-15.16	-15.20	-14.95
Medica	-14.71	-14.73	-14.01
Transportation	-10.90	-11.04	-10.84
Communications	-11.65	-11.96	-11.64
Recreation	-13.22	-13.52	-13.00
Education	-14.37	-14.34	-14.04
Restaurants	-14.83	-14.85	-13.65
Miscellaneous	-13.51	-13.48	-13.05

Source: Author's calculation

Appendix B

Variables	ARIMA order	AIC
Food	(2,0,2)	589.94
cholic	(0,0,0)	704.27
Textiles	(1,0,1)	514.20
Housing	(0,0,1)	407.35
Furniture	(1,0,0)	409.89
Medica	(0,0,0)	370.38
Transportation	(0,0,1)	466.09
Communications	(0,0,0)	289.50
Recreation	(0,0,0)	526.21

Variables	ARIMA order	AIC
Education	(0,0,0)	491.69
Restaurants	(2,0,2)	434.07
Miscellaneous	(0,0,0)	512.42

Source: Author's calculation

Appendix C

Variabiles	LM-test (Chi squared, df)	p-value
Food	(164.98,12)	2.20E-16
coholi	(166.67,12)	2.20E-16
Textiles	(163.98,12)	2.20E-16
Housing	(166.30,12)	2.20E-16
Furniture	(166.27,12)	2.20E-16
Medica	(167.03,12)	2.20E-16
Transportation	(161.25,12)	2.20E-16
Communications	(162.87,12)	2.20E-16
Recreationa	(164.22,12)	2.20E-16
Education	(166.71,12)	2.20E-16
Restaurants	(167.36,12)	2.20E-16
Miscellaneous	(166.24,12)	2.20E-16

Source: Authors' calculation

Appendix D