

ASYMMETRIC RELATIONSHIP BETWEEN GOVERNMENT SPENDING AND TERMS OF TRADE VOLATILITY: AN EMPIRICAL ANALYSIS

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ABSTRACT

This article intends to investigate the non-linear relationship between government spending and terms of trade volatility in the selected East Asian and Southeast Asian countries. According to the Rodrik's compensation hypothesis, government spending and trade shocks are positively correlated. On the other hand, conventional hypothesis contends that trade shocks and government spending are inversely related. Applying the Threshold Autoregressive Error Correction Model (TARECM) to annual time series data spanning the years 1980 through 2019 allows us to evaluate the veracity of these hypotheses. For six of the 9 countries we chose, we discover an asymmetric relationship between volatility in terms of trade and government spending. This suggests that the findings support the compensation hypothesis. However, for the other 3 countries, the association between terms of trade volatility and government spending seems to be in line with conventional theory.

JEL Classification: C23; C33; F15; H5; H11

Keywords: Government spending, Terms of trade Volatility, Asymmetric relationship, TARECM, East Asian and Southeast Asian countries.

1. INTRODUCTION

Globalization plays a key role in increasing competition among governments to reduce tax rates. The effects of globalization are different for small and large open economies. It is widely believed that fiscal policy will respond more precisely in a more open economy compared to a less open one. Cameron (1978) was the first to propose a relationship between economic openness of an economy and government size by considering 18 OECD countries. However, Rodrik (1998), who carried out a cross-sectional analysis in the late 1980s and early 1990s, offers empirical proof that the two factors are positively related. According to Rodrik (1998), causality should result from exposure to external risk to public spending. This is because larger government size is a response to increasing income risk caused by more openness of the economy, which is known as the "compensation hypothesis."

The relationship between state size and economic openness appears to be a key issue in this increasingly integrated world. Theoretically, there might be a positive or negative relationship between the degree of openness and the size of the public sector. According to the compensation hypothesis, the government's role as a source of insurance against productivity shocks from transfers increases if the elasticity of substitution between domestic and foreign commodities is high. At a theoretical level, the relationship between the degree of openness and the size of the public sector can be either positive or negative. The compensation hypothesis emphasizes the role of government as an insurance provider against productivity shocks from transfers, and this role of government increases when the elasticity of substitution between domestic and foreign goods is large. Therefore, more open economies have relatively large public sectors, as competitive international markets limit price volatility and reduce stabilizing role of price. Trade openness increases risk and uncertainty, increasing demand for government spending, unemployment insurance and social protection to offset the people's losses from

trade openness. In principle, this hypothesis represents the demand side of government, and this hypothesis applies more to relatively large open economies. The compensation hypothesis also helps to explain the patterns of public spending (Meinhard and Potrafke, 2012). Finally, this hypothesis suggests that governments should implement reforms towards free trade and general trade agreements. However, Martin and Steiner (2013) found several reverse causalities, from trade openness to government spending. They argue that increased government spending provides protection against external and internal risks posed by trade openness.

The conventional hypothesis is another well-known theory that explains the connection between the volatility of terms of trade and the size of the government. The compensation hypothesis is the exact opposite of the conventional hypothesis, which predicts a negative link between government spending and trade openness. According to this hypothesis, the negative relationship between public spending and trade openness is due to competition and budget constraints. In a more open economy, competition will reduce corporate taxes. This is a major budgetary constraint for the financing of public expenditure. As a result, government spending falls when trade opens. The traditional hypothesis also assumes that trade openness will have a larger negative impact on government spending in countries with free capital flows than in countries with restricted capital accounts.

The empirical findings of the majority of studies are, at best, mixed or inconclusive, according to our assessment of the empirical literature. Adsera and Boix (2002) demonstrate the significant positive association between trade openness and government consumption expenditure using time series data for 65 nations, including 22 OECD member countries, from 1950 to 1990. Their results agree with Rodrik's compensation hypothesis. In principle, public spending can support trade liberalization. Hays, Ehrlich, and Peinhardt (2005) examine the role of government in providing insurance and other benefits to compensate those who have suffered losses from free trade. The authors analyzed the relationships between free trade and government spending at the micro and macro levels for 17 OECD countries from 1960 to 2000. They indicate that those who produced imported goods support tariffs, while those who produce exportable goods or non-tradable production do not support tariffs. Government spending has a positive relationship with a country's imports as it increases capital inflows and creates new scope for production and economic growth. Both theoretically and empirically, they show that government involvement increased when the terms of trade tended to be negative.

The compensation theory is supported by a cross-sectional study of Gemmell, Kneller, and Sanz (2008). The study's findings indicate that there is a significantly positive relationship between foreign trade and government spending. The results also emphasized that trade openness shifts public spending from productive spending to spending on social protection and public services. Epifani and Gancia (2009) argued that countries with high trade openness rates tend to have larger governments because they shift tax costs abroad. In a more open economy that produces differentiated goods, public spending has become cheaper. They also found that globalization played a key role in strengthening large, inefficient governments.

More recently, Oyeleke and Akinlo (2016) analyze government spending and trade openness in Nigeria from 1980 to 2013. Their results do not confirm the existence of cointegration between variables. They demonstrate that total spending and exchange rates have strong positive effects on trade openness whereas capital and recurrent spending has considerable negative effects. Additionally, Turan and Karakas (2016) look at how the GDP per person and trade openness in Turkey and South Korea affect the size of the governments there. They measure the size of government using a variety of measures. Only one of the three (four) measures for South Korea's (Turkey's) government size has a consistent, long-term relationship with openness and GDP per capita. Long-term coefficients indicate that South Korea has considerable positive impact on government size while Turkey's trade openness has a significant negative impact on government size.

The relationship between terms of trade, government spending, and trade openness in Nigeria from 1981 to 2019 was explored by Obiakor et al. in 2021. The study discovered that the terms of trade do not significantly affect government spending in the short- or long-term using the ARDL estimate approach. While trade openness had an insignificant short-term effect on governments, it had a negative long-term effect that was statistically significant, supporting the efficiency hypothesis regarding the link between trade openness and government spending.

The participation of developing countries in world trade has been rising since the 1970s (Yilmaz (2004)). The ratio of trade to GDP is also increasing due to the use of efficient production techniques.

The trade sectors of developing countries are fluctuating. The problem of fluctuating terms of trade of developing countries is aggravated by variations in the prices of primary commodities relative to manufacturers (Brown and Oli, 2005). The shocks to terms of trade have more effect on the public sector of developing countries because these shocks are hard to adjust. Government can play its role in terms of trade volatility adjustment by adequate decision making and restricting the expenditures that create deficits. The government may respond differently to terms of trade shocks regarding effective policy measures.

According to our review of the literature, few studies have examined the linear and non-linear relationships between terms of trade volatility and government spending. Four developed countries (comprising United States, Canada, Japan, and Australia) are used as the basis for a study by Hatemi and Irandoust (2012) on the asymmetric relationship between public spending and terms of trade volatility over the period of 1960 to 2008. The hidden cointegration test developed by Granger and Yoon is used by the authors to evaluate the asymmetric relationship (2002). The hidden cointegration test examines long-term connections not only between data sets but also between their individual components. In all of the sampled nations, they discover that terms of trade volatility has a positive impact on government spending, although the positive component have a bigger impact than the negative ones.

Examining the nonlinear relationship between terms of trade volatility and government spending is crucial for both developed and developing countries. Therefore, during the chosen period of 1980 to 2019, it is intriguing to see how changes in government spending respond to changes in terms of trade in developing Asian nations with varying trade performances. The asymmetric relationship between terms of trade variability and government spending in nine developing nations (Bangladesh, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand) in South and Southeast Asia is examined in this study using TARECM (Threshold Error Correction Model). The TARECM gauges the effects of both positive and negative terms of trade movements separately. The availability of data is the justification for the period selection. These countries were selected based on volatility in trading conditions and changes in government spending. Fluctuations in government spending can be explained by asymmetries in government spending in the face of changes in the terms of trade.

The structure of the paper is as follows. In Section 2, data and methodology are presented. Section 3 provides the empirical findings and their interpretation. Section 4 provides some concluding remarks.

2. DATA AND METHODOLOGY

The nonlinear relationship between TOT volatility and government spending is examined in this study. A hidden cointegration test between government spending and terms of trade volatility is another name for this analysis. Nine countries of South and Southeast Asia are included in the sample: Bangladesh, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand. Quarterly time series on terms of trade (measured as export prices divided by import prices multiplied by 100) and annual time series on real government expenditure (measured as government consumption expenditure/CPI), real exchange rate (used as a log of real exchange rate), trade openness (measured as sum of total exports (x) and imports (m) divided by GDP) and inflation rate (used as logarithm of inflation rate) are collected from *International Financial Statistics (IFS)* and *World Development Indicator (WDI)* and International Financial Statistics (IFS) for the period 1980-2013. The Quarterly time series data of terms of trade is used to estimate the volatility of terms of trade.

Government consumption expenditures are the current government expenditures. The use of this measure is also consistent with other relatively recent empirical studies. For example, Hatemi and Irandoust (2012) also use government consumption expenditure to analyze the asymmetric behavior of government spending to terms of trade volatility. The exchange rate, trade openness, and inflation rate are used as control variables in this study.

As in Blattman (2007), “volatility is defined as the average deviation of departures from a slow-moving tendency that how much exports are less than mean value of exports”. A GARCH(1, 1) (Generalized Autoregressive Heteroscedasticity) model was used to measure the volatility of terms of trade for all countries in the sample.

The Threshold Autoregressive Error Correction Model (TAR ECM) is used to explore the asymmetric association between terms of trade volatility and government spending. Granger and Yoon (2002) state that the TAR-ECM method not only estimates relationships between series, but also separately measures the effects of positive and negative movements of series. The data series are said to have hidden cointegration if the positive and negative components of the two data series are cointegrated.

For positive components, the following model is estimated for each country included in the model:

$$\Delta GS_t = \theta_1^+ U_{t-i}^+ + \sum_{i=0}^k \beta_{2i}^+ \Delta V_{t-i} + \sum_{i=0}^k \beta_{3i}^+ \Delta LEXC_{t-i} + \sum_{i=0}^k \beta_{4i}^+ \Delta TO_{t-i} + \sum_{i=0}^k \beta_{5i}^+ \Delta LINF_{t-i} + \sum_{i=1}^n \beta_{6i}^+ \Delta GS_{t-i} + \varepsilon_t$$

Likewise, for negative components the following model is estimated.

$$\Delta GS_t = \theta_1^- U_{t-i}^- + \sum_{i=0}^k \beta_{2i}^- \Delta V_{t-i} + \sum_{i=0}^k \beta_{3i}^- \Delta LEXC_{t-i} + \sum_{i=0}^k \beta_{4i}^- \Delta TO_{t-i} + \sum_{i=0}^k \beta_{5i}^- \Delta LINF_{t-i} + \sum_{i=1}^n \beta_{6i}^- \Delta GS_{t-i} + \varepsilon_t$$

where ΔGS_t is the change in real government spending, ΔV_{t-i} is the change in terms of trade volatility, $\Delta LEXC_{t-i}$ is the change in log of real exchange rate, ΔTO_{t-i} is the change in trade openness and $\Delta LINF_{t-i}$ is the change in log of CPI. β_s^+ measures the effect when there is a positive change in the underlying independent variable and β_s^- measure the effect when there is a negative change in the explanatory variable, θ_1^+ is the measure of the speed of adjustment of positive shocks and θ_1^- is the estimate of the speed of adjustment of negative shocks, ε_t is the stochastic error term. If $\beta_s^+ \neq \beta_s^-$ and $\theta_1^+ \neq \theta_1^-$, then there will be asymmetric relationship between government spending and terms of trade volatility.

We obtained positive and negative components/shocks of the data series to estimate hidden cointegration. According to Granger and Yoon (2002), negative and positive components for two data series X and Y can be obtained through the following method:

$$\varepsilon_t^+ = \max(\varepsilon_t, 0), \quad \varepsilon_t^- = \min(\varepsilon_t, 0), \quad \eta_t^+ = \max(\eta_t, 0), \quad \eta_t^- = \min(\eta_t, 0) \quad (1)$$

$$\varepsilon_t = \varepsilon_t^+ + \varepsilon_t^- \quad \text{and} \quad \eta_t = \eta_t^+ + \eta_t^-$$

We took the first difference ($\Delta X_t = X_t - X_{t-1}$) for all the data series and separated the data components into positive and negative series. After obtaining positive and negative components we took the cumulative sum of all the data series. The method is given below:

$$\sum \Delta X_t^+ = \varepsilon_t^+, \quad \sum \Delta X_t^- = \varepsilon_t^-, \quad \sum \Delta Y_t^+ = \eta_t^+, \quad \sum \Delta Y_t^- = \eta_t^- \quad (2)$$

$\sum \Delta X_t^+, \sum \Delta X_t^-, \sum \Delta Y_t^+, \sum \Delta Y_t^-$ are cumulative sum of positive and negative components of data series for 9 selected countries.

3. ESTIMATION RESULTS

We obtain the negative and positive for the terms of trade volatility, real government spending, trade openness, real exchange rate, and inflation rate as described in equation (1) and (2). In order to check stationary Augmented Dicky Fuller (ADF) test results are given in Table 1, which shows that all data components are integrated of I(1).

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The GARCH(1,1) model is used to estimate the terms-of-trade volatility of 9 selected countries. The model checks whether the current volatility of the series depends on the past volatility process. The GARCH model is best used for high frequency data. Therefore, quarterly terms of trade volatility data is used to estimate volatility using the GARCH(1,1) model. The terms of trade are measured by the price of exports divided by the price of imports multiplied by 100. Annual TOT and government spending data are taken and TOT data are interpolated over four quarters from Q1 1980 to Q4 2019 using SAS (Statistical Analysis System) to estimate TOT volatility.

The results of GARCH model for terms of trade volatility of each country are given Appendix A. For application of GARCH model there are two necessary conditions, volatility clustering and existence of ARCH effect. Volatility clustering shows that volatility is conditional on past period volatility and ARCH effect considers the serial correlation of heteroskedasticity. The presence of ARCH effect is a necessary condition to apply GARCH model. We test the presence of ARCH effect in the series by applying the ARCH-LM test. Our results strongly confirm both conditions for each country including in the sample. The ARCH-LM test is applied again after applying GARCH (1,1) model to check that the ARCH effects have significantly been removed from the series.

Table 2 provides the results of the hidden cointegration test for the positive and negative underlying series components for each of the nine countries. Government spending (GS) serves as the dependent variable in our model for each country, while terms of trade volatility (V), trade openness (TO), the rate of inflation (INF), and the real exchange rate (EXC) serve as the explanatory variables. Positive and negative signs indicate the positive and negative components of each data series.

We use the AIC (Akaike Information Criterion) to determine the best lag order for each estimated model because the results of the cointegration test are highly sensitive to lags. The cointegration between the positive and negative components of the underlying variables is tested using the Johansen test. Both maximum Eigen value and trace test statistics are used. Table 2 shows the results. For all of the sample countries, the results offer compelling evidence that there are more than one cointegrating vectors between the positive and negative components of the variables. The existence of cointegration is proof that the underlying variables have a long-term relationship. These results suggest that both positive and negative components have a long-term stable relationship. Although we find more than one cointegrated vectors, we only consider the first one as it has the highest eigenvalue.

We estimate the cointegrating parameters and the speed of adjustment coefficient once the long-run steady-state relationship between the positive and negative components has been established. Table 3 presents the results. The error term's coefficient, which measures the speed of adjustment, should be negative and significant to support the presence of a long-run association. We can see from the table that for all the sample countries, the estimated coefficient of the error term is not only significant at the acceptable level of significance but also it is less than one in absolute term, confirming the presence of cointegration in both negative and positive components. However, the estimated coefficient is quite different for positive and negative components almost in case of all countries. Specifically, the estimates indicate that except the Philippines, Nepal, and Sri Lanka, the speed of adjustment in the case of positive components is higher as compared to the case of negative components. However, in the case of these three countries, the speed of adjustment for the negative components is higher. This implies that for most of the sample countries, the government expenditures adjust to the deviation of the long-run equilibrium at the higher speed in the case of positive components. The estimated cointegrating parameters also provide strong evidence of the differential effect of the positive and negative change in terms of trade volatility on the government expenditures.¹

¹ The positive and negative changes of other variables have also very different impact on the government expenditures. However, to economize on the space, we only discuss the effects of terms of trade on the government expenditures.

	BNG	PAK	SRL	INDO	NPL	PLP	TLD	MLS	INDIA
G⁺	-1.342	1.513	-1.843	-1.837	1.734	-2.013	1.053	1.431	-1.083
G⁻	-1.239	0.534	-0.517	-1.317	-0.184	-1.173	-1.948	-1.476	1.294
V⁺	-0.771	-1.135	-1.349	-2.288	-1.312	-1.692	-1.736	-1.421	-1.322
V⁻	-0.341	-1.362	-0.487	-0.7952	-1.7i1	-0.524	-1.621	-1.165	2.163
TO⁺	2.117	2.0158	-0.081	-0.935	-0.745	-1.536	1.571	-1.238	-2.142
TO⁻	2.0i6	0.044	1.035	-0.491	0.311	2.0181	1.432	1.682	-1.014
EXC⁺	1.881	2.347	1.473	-0.132	1.027	-1.168	-1.645	2.132	1.287
EXC⁻	1.987	-1.011	2.017	0.783	1.383	0.869	1.572	-1.731	-2.321
INF⁺	-1.099	-0.816	-1386	1.831	0.871	1.013	2.107	-1.275	1.539
INF⁻	-1.346	-0.732	-0.935	-1.572	-2.132	-1.211	-1.215	1.821	-1.309

	BNG	PAK	SRL	INDO	NPL	PLP	TLD	MLS	INDIA
G⁺	-4.143 ***	-6.5318 ***	-5.631 ***	-6.429 ***	-5.215 **	-7.217 ***	-6.912 ***	-7.160 ***	-3.311**
G⁻	-5.115 ***	-5.2172 ***	-6.759 ***	-5.4830 ***	-4.374 ***	-5.7998 ***	-3.132 **	-5.342 ***	-5.521***
V⁺	-4.198 ***	-4.992 ***	-4.4237 ***	-4.103 ***	-4.524 ***	-4.278 ***	-4.594 ***	-5.180 ***	-5.527***
V⁻	-5.476 ***	-5.142 ***	-4.097 ***	-3.843 **	-5.310 ***	-5.412 ***	-4.657 ***	-6.211 ***	-3.647**
TO⁺	-4.993 ***	-4.211 ***	-4.163 ***	-6.021 ***	-3.116 **	-4.745 ***	-4.9342 ***	-4.743 ***	-3.789***
TO⁻	-5.024 ***	-5.564 ***	-5.025 ***	-5.115 ***	-4.783 ***	-5.145 ***	-5.612 ***	-5.932 ***	-5.674***
EXC⁺	-3.141 *	-5.132 ***	-5.163 ***	-4.324 ***	-5.034***	-4.976 ***	-3.874 ***	-5.013 ***	-7.315***
EXC⁻	3.015 *	-3.692 **	-5.116 ***	-6.322 ***	-4.284 ***	-3.619 **	-5.753 ***	-3.139 *	-5.137***
INF⁺	-4.513 ***	-5.543 ***	-6.549 ***	-5.204 ***	-6.012 ***	-3.743 **	-5.924 ***	-5.621 ***	-4.692***
INF⁻	-5.663 ***	-6.945 ***	-8.927 ***	-6.113 ***	-5.473 ***	-6.472***	-3.895 ***	-5.462 ***	-6.219***

Note: ADF test statistics are presented in the table. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

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In the case of positive components in Bangladesh, the estimated speed of adjustment coefficient shows that about 35.1 per cent of disequilibrium is corrected in one year. However, in the case of negative components, the estimated speed of adjustment is only 23%. The estimated cointegrating parameters indicate that the negative change in terms of trade volatility has more negative impact on government expenditures as compared to the positive change in terms of trade volatility. These findings imply that regardless of the direction of the change in terms of trade volatility, the terms of trade volatility is detrimental to the government expenditures in Bangladesh. This implies that terms of trade volatility has a negative relationship with government spending in both positive and negative components. The finding strongly supports the conventional hypothesis that states that government spending decreases due to increases in TOT volatility. The finding also confirms the asymmetric response of the government spending to the change in terms of trade volatility.

For Pakistan, the speed of adjustment is about 62.6% in the case of positive components, whereas, it is only 2.9% in the case of negative components. These findings suggest that the disequilibrium is considerably corrected in the case of positive components only. The estimated coefficient of $V+$ is -4.731 showing the significant negative relationship between the positive change in terms of trade volatility and the government spending in Pakistan. In contrast, the estimated coefficient of $V-$ is 7.31 showing the significant positive relationship between terms of trade volatility and government spending. These findings suggest that positive and negative components of TOT volatility have very different impact on the government expenditures.

In the case of Sri Lanka, the government spending corrects the long-run disequilibrium at the speed of 29.2% in one year in the case of positive components, whereas, the speed of adjustment towards the equilibrium is about 36.4% in the case of negative components. The coefficient of $V-$ is negative and significant showing the negative relationship between GS and the negative change in TOT volatility. However, the estimated coefficient of $V+$ is positive and significant, suggesting that the positive component of TOT volatility is positively related to GS. These findings provide strong evidence of the asymmetric response of government spending to increases and decreases in TOT volatility.

The estimated results for Indonesia suggest that the speed of adjustment is high in the positive components (27.5%) than in the negative components (18.1%). The estimated cointegrating parameters suggest that although both components of TOT volatility have a positive impact on GS, the impact of negative components is higher than that of the positive components. These findings are not consistent with the asymmetric hypothesis. The estimated speed of adjustment parameters indicate that in the case of Nepal, GS adjust towards the equilibrium at the higher rate in the negative components than in the positive components. Similarly, the estimated cointegrating parameters indicate that both components of TOT volatility have positive and significant impacts on GS. However, the impact of the positive change in the TOT volatility is much higher as compared to the impact of the negative change in TOT volatility. Like Nepal, in the case of the Philippines, the speed of adjustment parameter

Table 2: Hidden Cointegration Test Results

Country	Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value		Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value	
(G+, V+, EXC+, TO+, INF+)						(G-, V-, EXC-, TO-, INF-)						
<i>Bangladesh</i>	$r = 0$	$r \geq 1$	85.311		0.002	<i>Bangladesh</i>	$r = 0$	$r \geq 1$	920.133		0.000	
	$r = 1$	$r = 2$	32.119		0.502		$r = 1$	$r = 2$	48.320		0.026	
	$r = 2$	$r = 3$	16.032		0.645		$r = 2$	$r = 3$	15.397		0.753	
	$r = 3$	$r = 4$	5.211		0.796		$r = 3$	$r = 4$	3.221		0.934	
	$r = 4$	$r = 5$	1.611		0.210		$r = 4$	$r = 5$	0.381		0.512	
	$r = 0$	$r = 1$		53.530	0.000		$r = 0$	$r = 1$		38.481	0.009	
	$r = 1$	$r = 2$		18.061	0.584		$r = 1$	$r = 2$		32.922	0.005	
	$r = 2$	$r = 3$		12.532	0.555		$r = 2$	$r = 3$		13.176	0.520	
	$r = 3$	$r = 4$			0.914		$r = 3$	$r = 4$		2.839	0.956	
	$r = 4$	$r = 5$			0.210		$r = 4$	$r = 5$		0.381	0.536	
					3.2430							
					1.776							
	<i>Pakistan</i>	$r = 0$	$r \geq 1$	108.437			0.000	<i>Pakistan</i>	$r = 0$	$r \geq 1$	136.948	
$r = 1$		$r = 2$	73.233		0.000	$r = 1$	$r = 2$		56.576		0.006	
$r = 2$		$r = 3$	31.799		0.019	$r = 2$	$r = 3$		25.780		0.135	
$r = 3$		$r = 4$	11.118		0.271	$r = 3$	$r = 4$		8.802		0.384	
$r = 4$		$r = 5$	0.406		0.539	$r = 4$	$r = 5$		0.297		0.585	
$r = 0$		$r = 1$		75.214	0.000	$r = 0$	$r = 1$			80.372	0.000	
$r = 1$		$r = 2$		31.533	0.017	$r = 1$	$r = 2$			30.795	0.018	
$r = 2$		$r = 3$		23.680	0.021	$r = 2$	$r = 3$			16.977	0.173	
$r = 3$		$r = 4$			0.224	$r = 3$	$r = 4$			8.504	0.329	
$r = 4$		$r = 5$			0.579	$r = 4$	$r = 5$			0.297	0.585	
					9.811							
					0.306							
<i>Sri Lanka</i>	$r = 0$	$r \geq 1$	100.577		0.000	<i>Sri Lanka</i>	$r = 0$	$r \geq 1$	106.273		0.000	
	$r = 1$	$r = 2$	54.532		0.006		$r = 1$	$r = 2$	62.610		0.001	
	$r = 2$	$r = 3$	26.941		0.130		$r = 2$	$r = 3$	28.866		0.063	
	$r = 3$	$r = 4$	13.536		0.096		$r = 3$	$r = 4$	12.748		0.124	

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	$r = 4$	$r = 5$	1.071		0.241		$r = 4$	$r = 5$	0.426		0.513
	$r = 0$	$r = 1$		49.434	0.001		$r = 0$	$r = 1$		45.662	0.002
	$r = 1$	$r = 2$			0.022		$r = 1$	$r = 2$		31.744	0.000
	$r = 2$	$r = 3$		31.712	0.509		$r = 2$	$r = 3$		17.117	0.218
	$r = 3$	$r = 4$			0.104		$r = 3$	$r = 4$		13.322	0.099
	$r = 4$	$r = 5$		13.153	0.241		$r = 4$	$r = 5$		0.426	0.513
				12.164							
				1.411							

Continues....

Table 2. Hidden Cointegration Results of Sample Countries (Continues).

Country	Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value	Country	Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value	
(G^+ , V^+ , EXC^+ , TO^+ , INF^+)						(G^- , V^- , EXC^- , TO^- , INF^-)						
Indonesia	$r = 0$	$r \geq 1$	1566.09		0.000	<i>Indonesia</i>	$r = 0$	$r \geq 1$	75.346		0.011	
	$r = 1$	$r = 2$	3		0.000		$r = 1$	$r = 2$	43.121		0.129	
	$r = 2$	$r = 3$			0.000		$r = 2$	$r = 3$	22.478		0.272	
	$r = 3$	$r = 4$	993.822		0.041		$r = 3$	$r = 4$	8.093		0.455	
	$r = 4$	$r = 5$	49.451		0.205		$r = 4$	$r = 5$	2.721		0.099	
			18.036									
	$r = 0$	$r = 1$	1.602	75.729	0.000		$r = 0$	$r = 1$		33.225	0.045	
	$r = 1$	$r = 2$			0.000		$r = 1$	$r = 2$		19.642	0.298	
	$r = 2$	$r = 3$		47.405	0.001		$r = 2$	$r = 3$		12.384	0.334	
	$r = 3$	$r = 4$			0.047		$r = 3$	$r = 4$		5.372	0.694	
$r = 4$	$r = 5$		33.648	0.205	$r = 4$	$r = 5$		2.721	0.099			
			15.437									
			1.602									
Nepal	$r = 0$	$r \geq 1$	131.811		0.000	Nepal	$r = 0$	$r \geq 1$	124.246		0.000	
	$r = 1$	$r = 2$	89.529		0.000		$r = 1$	$r = 2$	58.045		0.004	
	$r = 2$	$r = 3$	51.640		0.000		$r = 2$	$r = 3$	25.522		0.143	
	$r = 3$	$r = 4$	20.058		0.004		$r = 3$	$r = 4$	6.353		0.653	
	$r = 4$	$r = 5$	0.922		0.336		$r = 4$	$r = 5$	0.006		0.936	

	$r = 0$	$r = 1$		55.433	0.000		$r = 0$	$r = 1$		62.200	0.000
	$r = 1$	$r = 2$			0.000		$r = 1$	$r = 2$		31.522	0.010
	$r = 2$	$r = 3$		37.476	0.001		$r = 2$	$r = 3$		18.169	0.092
	$r = 3$	$r = 4$		23.763	0.003		$r = 3$	$r = 4$		6.347	0.569
	$r = 4$	$r = 5$		20.01	0.336		$r = 4$	$r = 5$		0.006	0.936
				0.922							
Philippines	$r = 0$	$r \geq 1$	133.324		0.000	Philippines	$r = 0$	$r \geq 1$	93.908		0.000
	$r = 1$	$r = 2$	52.432		0.004		$r = 1$	$r = 2$	49.434		0.035
	$r = 2$	$r = 3$	17.856		0.432		$r = 2$	$r = 3$	19.547		0.454
	$r = 3$	$r = 4$	6.650		0.618		$r = 3$	$r = 4$	4.808		0.828
	$r = 4$	$r = 5$	0.003		0.950		$r = 4$	$r = 5$	0.019		0.887
	$r = 0$	$r = 1$		71.464	0.000		$r = 0$	$r = 1$		45.243	0.001
	$r = 1$	$r = 2$			0.001		$r = 1$	$r = 2$		29.887	0.024
	$r = 2$	$r = 3$		35.794	0.433		$r = 2$	$r = 3$		13.738	0.307
	$r = 3$	$r = 4$			0.531		$r = 3$	$r = 4$		5.788	0.768
	$r = 4$	$r = 5$		11.206	0.950		$r = 4$	$r = 5$		0.059	0.887
				6.646							
				0.003							

Continues

Table 2. Hidden Cointegration Results of Sample Countries (Continues).

Country	Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value	Country	Null Hypothesis	Alternative Hypothesis	J_{trace}	J_{max}	p- value
(G+, V+, EXC+, TO+, INF+)						(G-, V-, EXC-, TO-, INF-)					
Thailand	$r = 0$	$r \geq 1$	103.784		0.000	Thailand	$r = 0$	$r \geq 1$	101.167		0.000
	$r = 1$	$r = 2$	51.211		0.014		$r = 1$	$r = 2$	41.267		0.180
	$r = 2$	$r = 3$	22.534		0.178		$r = 2$	$r = 3$	20.091		0.416
	$r = 3$	$r = 4$	5.634		0.699		$r = 3$	$r = 4$	8.201		0.444
	$r = 4$	$r = 5$	0.743		0.454		$r = 4$	$r = 5$	0.109		0.740
	$r = 0$	$r = 1$		59.285	0.000		$r = 0$	$r = 1$			
	$r = 1$	$r = 2$			0.035		$r = 1$	$r = 2$		59.900	0.000
	$r = 2$	$r = 3$		30.751	0.109		$r = 2$	$r = 3$		21.175	0.265
	$r = 3$	$r = 4$			0.690		$r = 3$	$r = 4$		11.890	0.558
	$r = 4$	$r = 5$		19.573	0.454		$r = 4$	$r = 5$		8.091	0.369

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				6.403 0.560						0.109	0.740		
Malaysia	$r = 0$	$r \geq 1$	101.782		0.000	Malaysia	$r = 0$	$r \geq 1$	166.958		0.000		
	$r = 1$	$r = 2$	40.876		0.161		$r = 1$	$r = 2$	33.767		0.514		
	$r = 2$	$r = 3$	19.716		0.510		$r = 2$	$r = 3$	20.179		0.410		
	$r = 3$	$r = 4$	6.482		0.598		$r = 3$	$r = 4$	8.116		0.453		
	$r = 4$	$r = 5$	1356		0.209		$r = 4$	$r = 5$	1.792		0.180		
	$r = 0$	$r = 1$		66.035	0.000		$r = 0$	$r = 1$		133.19	0.000		
	$r = 1$	$r = 2$			0.168		$r = 1$	$r = 2$		1	0.850		
	$r = 2$	$r = 3$		27.130	0.554		$r = 2$	$r = 3$		13.587	0.541		
	$r = 3$	$r = 4$			0.710		$r = 3$	$r = 4$		12.063	0.572		
	$r = 4$	$r = 5$		12.933	0.209		$r = 4$	$r = 5$		6.323	0.180		
				5.154						1.792			
				1.375									
	India	$r = 0$	$r \geq 1$	129.786			0.000	India	$r = 0$	$r \geq 1$	90.957		0.000
		$r = 1$	$r = 2$	67.424			0.000		$r = 1$	$r = 2$	59.509		0.002
$r = 2$		$r = 3$	38.533		0.001	$r = 2$	$r = 3$		30.680		0.039		
$r = 3$		$r = 4$	14.885		0.030	$r = 3$	$r = 4$		10.817		0.222		
$r = 4$		$r = 5$	2.890		0.027	$r = 4$	$r = 5$		0.063		0.801		
$r = 0$		$r = 1$		60.361	0.000	$r = 0$	$r = 1$			34.448	0.094		
$r = 1$		$r = 2$			0.004	$r = 1$	$r = 2$			29.828	0.034		
$r = 2$		$r = 3$		31.890	0.010	$r = 2$	$r = 3$			20.862	0.074		
$r = 3$		$r = 4$			0.001	$r = 3$	$r = 4$			11.754	0.166		
$r = 4$		$r = 5$		23.647	0.027	$r = 4$	$r = 5$			0.563	0.801		
				10.095									
				3.890									

Table 3: Estimated Cointegrating Vectors

	G_t^+	V_t^+	EXC_t^+	TO_t^+	INF_t^+	G_t^-	V_t^-	EXC_t^-	TO_t^-	INF_t^-	Const	Adjustment Parameter
BAN	1.000	-0807*	-0.566	-0.003	2.479***						2.657	-0.351**
		(0.396)	(0.383)	(0.022)	(0.,322)							(0.127)
						1.000	-1.481***	-2.156	3.995***	5.725***	-2.725	-0.230**
							(0.566)	(5.976)	(0.848)	(1.232)		(0.102)
PAK	1.000	-4.268***	4.387***	2.079	6.349***						1.621	-0.626**
		(0.550)	(0.930)	(4.904)	(1.871)							(0.272)
						1.000	8,041***	5.913***	1.925	0.154	1.823	-0.029***
							(2676)	(1448)	(1.726)	(0.207)		(0.004)
SRL	1.000	0.294***	6.713***	0.013	-8.510***						2.001	-0.292*
		(0.040)	(1.071)	(0.057)	(3.069)							(0.165)
						1.000	-0.024***	0.014	0.066**	2.336**	-0.112	-0.364**
							(0.002)	(0.009)	(0.011)	(0.110)		(0.166)
INDO	1.000	0.006***	-0.467***	-0.007**	1.542						-8.241	-0.275*
		(0.001)	(0.127)	(0.004)	(7.232)							(0.134)
						1.000	3.317***	-0.163***	2.721	-1.352	-7.286	-0.181**
							(0.529)	(0.035)	(4.406)	(1.217)		(0.081)

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Note: Standard errors are given in parentheses.

Continues

	G_t^+	V_t^+	EXC_t^+	TO_t^+	INF_t^+	G_t^-	V_t^-	EXC_t^-	TO_t^-	INF_t^-	Const	Adjustment Parameters
NPL	1.000	17.689*** (2.578)	-13.454*** (1.835)	-11.580*** (1.924)	5.435** (2.279)						5.345	-0.229* (0.143)
						1.000	1.243** (0.580)	-0.441 (0.473)	-2.810*** (0.453)	81.860*** (16.377)	-20.014	-0.282*** (0.062)
PHL	1.000	-0.052 (0.024)	6.372*** (0.396)	-0.794*** (0.296)	-0.307 (0.522)						9.543	-0.209*** (0.081)
						1.000	0.131*** (0.013)	13.598*** (1.587)	-0.078*** (0.014)	0.910 (0.717)	3.001	-0.733*** (0.212)
THL	1.000	-0.001 (0.000)	0.014*** (0.004)	0.002*** (0.000)	0.071*** (0.018)						0.021	-0.549*** (0.178)
						1.000	1.043*** (0.064)	0.693*** (0.154)	-2.985 (5.342)	-1.472 (1.429)	4.352	-0.201*** (0.055)
MLS	1.000	11.826*** (1.170)	4.065*** (0.649)	-1.562*** (0.322)	-5.563*** (0.913)						5.154	-0.908*** (0.321)
						1.000	-0.425 (0.374)	3.634 (7.543)	-0.327*** (0.090)	9.039*** (1.645)	4.043	-0.178* (0.100)

INDIA	1.000	-6.853***	-0.180*	4.585	0.557***					-20.765	-0.558	
		(2.354)	(0.109)	(1.001)	(0.073)						(0.200)***	
						1.000	0.275***	0.003	- 0.007	-0.002**	9.274	-0.100
							(0.010)	(0.100)	(1.205)	(0.001)		(0.030)***

Note: Standard errors are presented in parentheses.

is significantly greater in the case of negative components. Further, we find that although the impact of the positive components of TOT volatility on GS is negative, it is statistically insignificant. On the other hand, the impact of the negative components of TOT volatility is positive and significant at the conventional level. We find the same results for the effects of the both components of TOT volatility on GS for the case of Thailand. However, the estimated adjustment parameters reveal that the correction in the disequilibrium occurs more rapidly in case of the positive components. For both these countries, the results suggest that the government spending increases with a decline in TOT volatility.

For Malaysia, the estimated adjustment coefficients indicate that GS adjust rapidly to the deviation of the steady-state relationship in the case of positive components than the case of the negative components. The results regarding the asymmetric effects of TOT volatility indicate that the positive components of TOT volatility are positively and significantly related to GS, whereas, the negative components of TOT volatility are negatively but insignificantly related to GS. These results suggest the asymmetric relationship between GS and TOT volatility. In case of India, the estimated adjustment parameters are negative and appear statistically significant. The estimated cointegrating parameters suggest that the positive components of TOT volatility are negatively and significantly related to GS. However, the negative components of TOT volatility are negatively and significantly related to GS. These results strongly support the asymmetric effects of TOT volatility on GS.

In sum, the results suggest that there is long-run stable relationship between both positive and negative components in the case of all sample countries. The estimated adjustment parameters are negative and significant confirming the presence of the cointegration. The results also suggest that both positive and negative components of TOT volatility have quite opposite effects on GS in case of most of the sample countries. These findings support the hypothesis of asymmetric response of GS to changes in TOT volatility. However, the results for some countries are consistent with conventional hypothesis.

4. CONCLUSIONS

In this study, we look at the asymmetric relationship between government spending and terms of trade volatility in East Asian and Southeast Asian countries (Bangladesh, Pakistan, Sri Lanka, Indonesia, Nepal, the Philippines, Thailand, Malaysia, and India). Our research spans the years 1980 to 2013. The TARECM is used in our analysis. All of the series are split into positive and negative values. The two hypotheses that serve as the foundation of our empirical investigation are the conventional and compensation hypotheses. The compensation hypothesis, which asserts that rising terms of trade volatility increases government spending, supports the concept that there is an asymmetric link between government spending and TOT volatility. In contrast, the conventional hypothesis suggests a negative link between TOT volatility and government spending.

The findings of our study suggest that terms of trade volatility significantly affect the government expenditures. For six out of 9 selected countries, there exists asymmetric relationship between TOT volatility and the government spending. These countries are India, Sri Lanka, Pakistan, the Philippines, Thailand, and Malaysia. The results of these countries support the compensation hypothesis. For remaining three countries, the both positive and negative components of TOT volatility have a similar impact. Yet, the size of the impact is quite different for both types of components. These results are in line with the conventional hypothesis.

Our findings suggest that the stability of TOT is an important factor for smoothing government expenditures. Another important policy implication emerging from the findings is that the countries having higher external risk may use the size of government as a risk-reducing instrument.

REFERENCES

- Adsera, A., & Boix, C. (2002). Trade, democracy, and the size of the public sector: the political underpinnings of openness. *International Organization*, 56(02), 229-262.
- Akyuz, Yilmaz (2004). Developing Countries in World Trade, Discussion Paper, Turkish Economic Association, No. 2004/9
- Blattman, C., Hwang, J., & Williamson, J. G. (2007). Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the Periphery 1870–1939. *Journal of Development Economics*, 82(1), 156-179.

- Bretschger, L., & Hettich, F. (2002). Globalisation, capital mobility and tax competition: theory and evidence for OECD countries. *European Journal of Political Economy*, 18(4), 695-716.
- Brown, O. (2005). EU trade policy and conflict: *International Institute for Sustainable Development, Institut international du développement durable*, 1(1), 20-45.
- Cameron, D. R. (1978). The expansion of the public economy: A comparative analysis. *American Political Science Review*, 72(04), 1243-1261.
- Epifani, P., & Gancia, G. (2009). Openness, government size and the terms of trade. *Review of Economic Studies*, 76(2), 629-668.
- Gemmell, N., Kneller, R., & Sanz, I. (2008). Foreign investment, international trade and the size and structure of public expenditures. *European Journal of Political Economy*, 24(1), 151-171.
- Granger, C. W., & Yoon, G. (2002). Hidden cointegration. *University of California, Economics Working Paper* (2002-02).
- Hatemi-J, A., & Irandoust, M. (2012). Asymmetric interaction between government spending and terms of trade volatility: New evidence from hidden cointegration technique. *Journal of Economic Studies*, 39(3), 368-378.
- Hays, J. C., Ehrlich, S. D., & Peinhardt, C. (2005). Government spending and public support for trade in the OECD: An empirical test of the embedded liberalism thesis. *International Organization*, 59(02), 473-494.
- Ijaz, K., Zakaria, M., & Bashir, A. (2014). Terms-of-Trade Volatility and Inflation in Pakistan. *Internal Journal of Economics*, 23(3), 24-45.
- Martin, C. W., & Steiner, N. D. (2013). Public Spending and Trade Liberalization: The Compensation Hypothesis Revisited. Available at SSRN 2245595.
- Meinhard, S., & Potrafke, N. (2012). The globalization–welfare state nexus reconsidered. *Review of International Economics*, 20(2), 271-287.
- Molana, H., Montagna, C., & Violato, M. (2004). On the causal relationship between trade-openness and government size: Evidence from 23 OECD countries. Available at SSRN 716164.
- Obiakor, R.T., Okwu, A.T and Akpa, E.O. (2021). Terms of Trade, Trade Openness and Government Spending in Nigeria. *Nigerian Defence Academy Journal of Economics and Finance*, 5(2), 55-62
- Oyeleke, J. O. and Akinlo T. (2016). Trade Openness and Government Expenditure Nexus in Nigeria: A Bounds Test Cointegration. *British Journal of Economics, Management & Trade*, 12(2),1-10.
- Rodrik, D. (1998). Trade policy and economic performance in Sub-Saharan Africa: *National Bureau of Economic Research*. 6(17) 495-9454.
- Turan T. and Karakas M. (2016). The Effect of Trade Openness And Income on the Size of A Government, *Transylvanian Review of Administrative Sciences*, 47,164-178.

Appendix A

Table A.1: Estimates for Terms of Trade Volatility (Bangladesh)

Variance Equation

MA(1)	0.984	0.010	97.46	0.000
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.333	0.267	1.246	0.212
ARCH(1)	0.639	0.313	2.038	0.041
GARCH(1)	0.345	0.220	1.566	0.007

ARCH LM Test

F-Statistics	p-value
0.005	0.725

Table A.2: Estimates for Terms of Trade Volatility (Pakistan)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.183	1.168	-0.156	0.875
AR(1)	0.696	0.117	5.920	0.000

Variance Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	1.016	0.428	2.372	0.017
ARCH(1)	0.242	0.108	2.241	0.025
GARCH(1)	0.703	0.099	7.036	0.000

ARCH LM Test	
F-Statistics	p-value
0.002	0.957

Table A.3: Estimates for Terms of Trade Volatility (Sri Lanka)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.081	0.754	-0.107	0.914
AR(1)	0.682	0.120	5.682	0.000

Variance Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.834	0.409	2.035	0.041
ARCH(1)	0.261	0.098	2.655	0.007
GARCH(1)	0.634	0.136	4.645	0.000

ARCH LM Test	
F-Statistics	Probability
0.012	0.910

Table A.4: Estimates for Terms of Trade Volatility (Indonesia)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.545	0.440	-1.240	0.214
AR(1)	-0.138	0.114	-1.216	0.223
MA(1)	0.988	0.004	214.1	0.000

Variance Equation				
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	Coefficient	Std. Error	Z-Statistic	p-value
Constant	1.492	0.772	1.932	0.053
ARCH(1)	0.631	0.258	2.446	0.014
GARCH(1)	0.365	0.167	2.186	0.028
ARCH LM Test				
F-Statistics			p-value	
0.019			0.889	

Table A.5: Estimates for Terms of Trade Volatility (Nepal)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-1.117	0.927	-1.205	0.228
AR(1)	0.697	0.126	5.519	0.000
AR(2)	-0.274	0.105	-2.601	0.009
AR(3)	0.170	0.130	1.310	0.190
MA(1)	-0.076	0.050	-1.517	0.129
MA(2)	0.999	0.016	61.16	0.000
Variance Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.525	0.375	1.400	0.161
ARCH(1)	0.358	0.191	1.872	0.061
GARCH(1)	0.532	0.187	2.845	0.004
ARCH LM Test				
F-Statistics			p-value	
0.012			0.909	

Table A.6: Estimates for Terms of Trade Volatility (Philippines)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.222	0.374	-0.595	0.551
AR(1)	0.865	0.323	2.673	0.007
MA(1)	0.178	0.357	0.500	0.616
MA(2)	-0.821	0.347	-2.364	0.018
Variance Equation				

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	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.287	0.225	1.275	0.202
ARCH(1)	0.520	0.189	2.752	0.005
GARCH(1)	0.445	0.127	3.506	0.000
ARCH LM Test				
F-Statistics			p-value	
0.019			0.632	

Table A.7: Estimates for Terms of Trade Volatility (Thailand)

	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.317	0.417	-0.761	0.446
AR(1)	-0.229	0.173	-1.319	0.186
AR(2)	-0.088	0.153	-0.579	0.562
AR(3)	0.130	0.104	1.249	0.211
AR(4)	-0.269	0.088	-3.048	0.002
MA(1)	1.060	0.008	122.0	0.000
MA(2)	0.962	0.017	53.52	0.000
MA(3)	0.880	0.020	43.08	0.000
Variance Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.478	0.233	2.050	0.040
ARCH(1)	0.423	0.165	2.562	0.010
GARCH(1)	0.432	0.155	2.772	0.005
ARCH LM Test				
F-Statistics			p-value	
0.007			0.933	

Table A.8: Estimates for Terms of Trade Volatility (Malaysia)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	-0.551	0.915	-0.602	0.546
AR(1)	0.634	0.175	3.609	0.000
AR(2)	0.229	0.320	0.716	0.074
AR(3)	-0.073	0.256	-0.284	0.076
Variance Equation				

	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.436	0.173	2.521	0.011
ARCH(1)	0.342	0.138	2.474	0.013
GARCH(1)	0.586	0.109	5.338	0.000

ARCH LM Test	
F-Statistics	p-value
0.125	0.723

Table A.9: Estimates for Terms of Trade Volatility (India)

Mean Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
C	0.291	0.614	0.474	0.635
AR(1)	0.706	0.059	11.88	0.000

Variance Equation				
	Coefficient	Std. Error	Z-Statistic	p-value
Constant	0.732	0.882	0.830	0.406
ARCH(1)	0.015	0.023	0.691	0.489
GARCH(1)	0.784	0.257	3.051	0.002

ARCH LM Test	
F-Statistics	p-value
0.042	0.836