REEXAMINING THE QUANTITY THEORY OF MONEY: AN EMPIRICAL ANALYSIS FROM THE JOINT HYPOTHESIS

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Abstract

The joint hypothesis test is a replicable interpretation of the quantity theory of money (QTM) when used as an inflation theory. This study examined the effect of money supply and gross domestic product (GDP) growth on inflation volatility. We used the cross-country data of 40 countries, both in 2002 and 2014, from the World Bank publications. We analyzed the data using both the unrestricted regression model and joint hypothesis testing (the Wald test). The unrestricted regression results pointed inflation volatility in 40 countries was mostly driven by the monetary side, not by the real sector. Meanwhile, the joint hypothesis test demonstrated Strong Wald and Weak Wald test for the QTM prediction were rejected. These findings implied undesirable results from a monetarist perspective. We proposed an alternative method to confirm the joint hypothesis test from the QTM. It would be interesting to see whether our findings hold in other countries.

Keywords: quantity theory of money, joint hypothesis, inflation, money supply, GDP growth

JEL: C1, E5

1. Introduction

Various economic actors, including governments and societies, always expect to have stable prices of goods and services. Price stability has been crucial in creating sustainable economic growth (Bernanke *et al.*,1999; Mishkin, 2011; Mishkin, 2016). Nowadays, price stability is a monetary as well as a fiscal phenomenon (Lothian, 1985; Karras, 1992; Duck, 1993; McCandless & Weber, 1995; Moazzami & Gupta, 1995; Rolnick & Weber, 1997; Dwyer & Hafer, 1988; Moroney, 2002; Brumm, 2005; Grauwe & Polan, 2005; Hervino, 2011; Doyin & Ikechukwu, 2013; Fujiwara, 2013; Jahan & Papageorgiou, 2014; Shirakawa, 2014; Tutino & Zarazaga, 2014; Kaushal, 2017). Thus, inflation management is important in promoting sustainable economic growth (Moroney, 2002; López-villavicencio & Mignon, 2011; Ha, Kose, & Ohnsorge, 2019; Ha *et al.*, 2019).

From the 1980s to the early 2000s, different inflationary behaviors in Latin America, Asia, and the industrialized economies might be more deeply rooted in those countries' underlying social, economic, and political systems (Kamin & Klau, 2003). Similarly, Moroney (2002) explained between 1980 and 1983, the annual inflation rates averaged 81.5% in Latin America and 12.3% in Africa, but only 6.4% in the 16 Organization for Economic Co-operation and Development (OECD) countries. The inflation rates in Latin America varied from 8.2% in Honduras to around 374.3% in Argentina. Meanwhile, inflation ranged from 0.6% in the Democratic Republic of Congo to 61.6% in Sierra Leone. These differences in inflation across countries may be linked to significant changes in the money supply.

Global inflation rates have been increasingly synchronized over time (Ha, Kose, & Ohnsorge, 2019). Since 2001, the common global factor has explained about 22% of the country-level inflation rate differences. Inflation synchronization has also become more broad-based. Historically, the industrialized economies were more dominant than the emerging and developing economies. Besides, inflation synchronization has been crucial for all inflation measures, while it was previously significant only for tradable products as an inflation measure. After a sharp recession in 2001, the global economy recovered steadily and unevenly in 2002. However, the strength and duration of the upturn had not reached the

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expectations (UN Department of Economic and Social Affairs, 2003). Unfortunately, this condition happened again 12 years later. Several emerging economies entered serious recessions in 2014, presenting new domestic and foreign economic challenges. Consequently, developed and transition economies exhibited different growth rates, with many countries, especially Latin American and the former USSR, experienced sharp recessions (UN Department of Economic and Social Affairs, 2015).

This study compared two periods in terms of the quantity theory of money (QTM) held in each cross-country (cross-section sample). The QTM investigates the interaction between money supply, gross domestic product (GDP), and inflation (Moroney, 2002; Brumm, 2005). As said by the monetarists, every country experienced inflation as a monetary phenomenon (Friedman, 1968) because money supply grew faster than the national outputs (Jahan & Papageorgiou, 2014). The monetarists labeled this phenomenon “a long-run monetary neutrality.” From their point of view, inflation could be volatile and controlled by controlling money supply. This study analyzed inflation volatility in 40 countries to understand the effects of money supply and GDP growth. In addition, this study also ran Strong Wald test ($\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = -1$) and Weak Wald test ($\beta_1 = 1$, $\beta_2 = -1$) to analyze the QTM.

2. Literature review

The investigation of the relationship between money supply and inflation always started with a discussion of the QTM. The investigation was based on several assumptions (Ajuzie *et al.*, 2008). *First*, money was an exogenous variable. For example, the changes in money stocks (as determined by the Fed) led to changes in spending. *Second*, money velocity was determined by price level fluctuations rather than the amount of money available or current price levels. *Third*, the supplies of labor, money, natural resources, knowledge, and entrepreneurship determined real GDPs. In short, the quantity principle predicted the economy would ultimately achieve full employment. The QTM was often associated with the exchange equation presented in several textbooks (McCallum & Nelson, 2010). It demonstrated the relationship between money supply, money velocity, GDP deflator, and real GDP. Hence, an outline of the exchange equation could initially illustrate the QTM, although both methods could not be used interchangeably. The QTM would lack analytical or theoretical substances if linked to the exchange equation (McCallum & Nelson, 2010). Fisher (1912) attempted to express the QTM by formulating the following exchange equation:

$$MV + M'V' = \sum pQ \qquad (1)$$

where:

M	=	the amount of currency during a given year
V	=	the velocity of money circulation
M'	=	the volume of demand deposit during the year
V'	=	the velocity of demand deposit circulation
$\sum pQ$	=	the sum of a commodity's average price (p) multiplied by the quantity (Q) of its purchased and average price (p') of another commodity purchased during the previous year multiplied by the quantity (Q') of the commodity purchased, and so on for all goods exchanged.

Equation 1 was a direct representation of the following Equation 2:

$$MV + M'V' = pQ + p'Q' \qquad (2)$$

The newly reformulated version of the exchange equation was as follows:

$$MV = PQ \qquad (3)$$

The revised QTM was based on three theoretical assumptions (Ajuzie *et al.*, 2008). *First*, V was constant to money supplies. *Second*, money supplies were determined by exogenous factors. *Third*, the association occurred in a left-to-right direction. The QTM described how classical economists calculated the monetary values of gross income in the nineteenth and early twentieth centuries

(Brumm, 2005; McCallum & Nelson, 2010). The theory also explained the amount of cash is kept for certain total revenue levels. This theory's most important feature indicated interest rates have no impact on money demand (Mishkin, 2016). Based on the above explanations, Equation 4 could explain the QTM (Moroney, 2002).

$$M_i^s V_i = P_i Q_i^D \qquad (4)$$

where:
M_i^s = money supply of country *i*
V_i = velocity of the circulation of country *i*
P_i = aggregate price level (GDP Deflator) of country *i*
Q_i^D = real GDP required of country *i*

The traditional QTM argued a country's long-run inflation rate increased along with its money growth rate. This statement was in line with Friedman's (1968) argument that inflation was a monetary phenomenon occurred everywhere. In the long run, increased money growth rates were not the primary cause of inflation but the most significant one (Friedman & Friedman 1980). A decline in Q's growth rate potentially increased inflation. Therefore, it was important to solve the exchange equation for P and then take logs and first differences (Moroney, 2002). Previous studies have already confirmed the existence of the QTM in both time-series and cross-section data. Using causality techniques, Tang (2010) reexamined the money-prices nexus for Malaysia using the monthly data. He demonstrated a one-way causal relationship between money supply and aggregate prices. Based on the time-varying causality tests, he found the inflation was not always a monetary phenomenon.

Meanwhile, Doyin and Ikechukwu (2013) used the data from Nigeria's quarterly time-series data of 42 years. They revealed money and income growth were weakly related in the long run. In the long run, money supply growth and inflation had a weak, negative and insignificant relationship. They concluded inflation did not always take place everywhere as a monetary phenomenon. Further, Moazzami and Gupta (1995) used the annual time-series data of six developed countries. They documented the neutrality proposition was supported in only three countries, the Fisher theory was supported in six countries, and the monetary approach to exchange rate determination was supported in five countries.

However, these three propositions were supported at the same time in only two countries. Karras (1992) investigated the QTM in the long run in five countries (Canada, Germany, Japan, the United Kingdom, and the United States) and showed money, real income, and price level were cointegrated. Specifically, Germany and Japan exhibited trends consistent with the QTM, but the other three countries contradicted the hypothesis. Lothian (1985) examined the QTM by using the 14-years average inflation and money growth rates of twenty OECD countries to examine the QTM. He investigated the QTM with three theories: the classical neutrality proposition, the monetary approach to exchange rates, and the Fisher equation. The findings supported the theories. Dwyer and Hafer (1988) regressed the average annual economic growth, inflation, and money supply growth rates of 62 countries over a five-year period. They discovered higher money supply growth rates were associated with higher inflation rates. Duck (1993) regressed the average annual inflation and money growth rates of 33 countries over 13 years. For most of the postwar period, the classical monetary forces could explain several countries' long-run inflation and interest rates. Other scholars also demonstrated a strong cross-country correlation between long-term inflation and money growth (McCandless & Weber, 1995; Rolnick & Weber, 1997). These cross-section studies confirm the monetary theory of long-run inflation. Moroney (2002) regressed the 13-years average annual money growth, real GDP, and inflation of 80 countries. He employed a long-run version of the QTM, real GDP, and inflation. He found rapid money growth increased inflation, and the relationship was one-to-one. Additionally, the modern spin implied an increase in real GDP would reduce inflation. Brumm (2005) replicated Moroney (2002) using two-stage least squares (2-SLS) and joint hypothesis.

The results exhibited the modern QTM had two most important features. *First*, there was a positive one-on-one relationship between inflation and money growth. *Second*, there was a negative one-on-one relationship between inflation and aggregate output growth. Friedman (1968) emphasized inflation was exclusively a monetary phenomenon. His argument was empirically supported by Brumm (2005). Therefore, this study replicated Moroney's (2002) and Brumm's (2005) empirical findings.

3. Research methodology

This study analyzed three macroeconomic variables (money supply, GDP, and inflation). The money supply concept referred to M2 (broad money growth) (The World Bank, 2019). In the International Financial Statistics of the International Monetary Fund, this applied to lines 34 and 35. Further, GDP was the annual GDP growth rate (indicator: GDP growth). Meanwhile, inflation was the GDP implicit deflator's annual growth rate representing price changes (indicator: GDP deflator growth).

We used 40 countries as the sample, namely Albania, Australia, Bahrain, Bangladesh, Bolivia, Brazil, Brunei, Bulgaria, Chile, China, Colombia, Denmark, Ghana, Guatemala, Haiti, Hungary, Indonesia, India, Israel, Japan, Jordan, Korea, Kenya, Liberia, Malaysia, Mexico, Myanmar, Nepal, Nigeria, Pakistan, Paraguay, Peru, Philippines, Qatar, Romania, Singapore, South Africa, Sri Lanka, Vietnam, and the United States. These countries included seven ASEAN countries (Brunei, Indonesia, Malaysia, Myanmar, Philippines, Singapore, and Vietnam), five African countries (Ghana, Kenya, Liberia, Nigeria, and South Africa), seven Latin American countries (Brazil, Bolivia, Colombia, Haiti, Guatemala, Paraguay, and Peru,), nine OECD countries (Australia, Chile, Denmark, Hungary, Israel, Japan, Korea, Mexico, and the United States), three Middle East countries (Bahrain, Jordan, and Qatar), two European Union Countries (Bulgaria and Romania), Albania, Bangladesh, China, India, Nepal, Pakistan, and Sri Lanka. We considered the data from 2002 and 2014 to incorporate the impact of the 9/11 attack in 2001 and the 2014 global slow economic growth. According to the UN Department of Economic and Social Affairs (2002; 2003), the global economic recession and the U.S. terrorist attacks (9/11) led to the lowest world GDP in a decade. A stagnant output growth, sluggish inflation, stagnant employment, low interest rates, decreasing fiscal balances, low and unequal foreign trade growth, reduced international capital flows, many non-fuel commodities' lower prices, and depreciated stock prices were the 2002 global economy's common features to varying degrees. Further, the UN Department of Economic and Social Affairs (2014; 2015) reported the global economy recorded only a marginal increase of 2.6% in 2014. The growth was still being affected by the impact of the global financial crisis. At the same time, new problems appeared, such as geopolitical crises in Ukraine and the Ebola outbreak (UN Department of Economic and Social Affairs, 2015). In addition, this study suggested the unrestricted regression. Taking logarithms from Equation 4 and distinguishing with the function of time, the equation was developed as follows:

$$dlog\ P_i\ /dt = \ dlog\ M_i^s/dt + dlog\ V_i\ /dt - dlog\ Q_i^D\ /dt \qquad (5)$$

Equation 5 gave no basis for statistical estimation. The equation must consider the following five assumptions (Moroney, 2002).

1. $dlog\ V_i\ /dt$: random variable uncorrelated with money and GDP growth in each country
2. $M_i^s = M_i^D$: money supply = money demand
3. M_i^s : exogenous variable
4. $Q_i^s = Q_i^D$: real supply aggregate = real demand aggregate
5. $dlog\ Q_i^D\ /dt$: exogenous variable (long-run super-neutrality)

From these five assumptions in Equation 5, Equation 6 could be developed as follows:

$$dlog\ P_i\ /dt = \ dlog\ M_i^s/dt\ - dlog\ Q_i^s/dt + u_i \qquad (6)$$

Based on Equation 6, the following Equation 7 could be written as a restricted regression model:

$$Y_i = X_i - Z_i + u_i \qquad (7)$$

Moreover, a restricted regression model could develop into an unrestricted QTM regression equation as follows:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 Z_i + \varepsilon_i \quad (8)$$

where:
Y_i = inflation rate of country *i*
X_i = money supply growth of country *i*
Z_i = GDP growth of country *i*
β_0 = intercept
β_1, β_2 = slope
ε_i = error term of country *i*

This study also analyzed the joint hypothesis testing for Strong Wald and Weak Wald tests (2002 and 2014) in 40 countries. Thus, we proposed the following hypotheses:

Strong Wald test
H_0: $\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = -1$
H_1: At least one $\beta_j \neq 0, \neq 1, \neq -1$, where j = 1, 2, 3

Weak Wald test
H_0: $\beta_1 = 1$, $\beta_2 = -1$
H_1: At least one $\beta_j \neq 1, \neq -1$, where j = 1, 2

4. Results and discussion

This study provided two full sample estimates with the Ordinary Least Square estimation method. The first results explained the total sample estimates of 40 countries (2002), the heteroskedasticity-corrected estimates, and Wald test joint hypothesis (Strong Wald test and Weak Wald test). The following part provided the full sample estimates of 40 countries (2014), the heteroskedasticity-corrected estimates, and Wald test joint hypothesis.

4.1 Full sample (OLS) and heteroskedasticity-corrected estimates of 40 countries in 2002

As shown in Table 1 below, the first results explained full sample estimates and heteroskedasticity-corrected estimates (White test) for 40 countries (2002). Table 1 denoted the model had an $\bar{R}^2$ = 0.52. The growth coefficient of money supply of 0.473 was remarkably close to one, consistent with the quantity principle. Then, its standard predicted error was relatively small (0.087692). The $\hat{\beta}_1$ appeared to be significantly close to one at $p < 0.05$ (the *t*-statistic was 5.395, and the critical *t* to reject H_0: $\beta_1 = 1$ was 1.697). However, the heteroskedastic and non-normal residuals made this test less accurate (Greene, 2012). The GDP growth coefficient ($\hat{\beta}_2$) was 0.499944 ($p > 0.05$) which was not substantially greater than the money constraint quantity principle β_2 **= -**1 (the *t*-statistic was 1.596 and the critical *t* did not reject H_0: $\beta_2 = -1$ is 1.697). Further, the heteroskedastic and non-normal residuals also made this test less accurate. To solve the heteroskedastic problem, we assumed $\sigma_1^2 = \sigma^2 X_i$ and divided all observations by $\sqrt{x_i}$ (Brumm, 2005; Moroney, 2002). The heteroskedasticity-corrected β1 estimates (White test) did not vary substantially from one value. The results pointed projections already resulted in the homoskedastic and normal residuals.

4.2 Joint hypothesis estimates of 40 countries in 2002

The joint hypothesis was tested using the Wald test (Wald, 1943). Strong Wald test and Weak Wald test were used to form the joint hypothesis. Wald test results are provided in Table 2. Table 2 indicated Strong Wald test ($\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = -1$) had a Chi-square (χ^2) statistic of 90.38664. For any traditional degree of importance, this critical value of the test statistic had exceeded. Therefore, Strong Wald test for the QTM's prediction was not supported (rejecting H_0). Similarly, Weak Wald test ($\beta_1 = 1$, $\beta_2 = -1$) had a Chi-square (χ^2) statistic of 52.46439, which exceeded the test statistic's critical value of any conventional level of significance. Weak Wald test for the QTM's prediction was also not supported (Brumm, 2005).

4.3 Full sample (OLS) and heteroskedasticity-corrected estimates of 40 countries in 2014

Table 3 pointed the entire sample estimates and heteroskedasticity-corrected estimates (White test) for 40 countries in 2014. Table 3 demonstrated the model had an $\bar{R}^2$ = 0.4. Following the quantity principle, the money supply growth coefficient of 0.366 is strikingly close to one. Besides, its approximate standard error is relatively small (0.069685). The $\hat{\beta}_1$ appears to be significantly close to one at $p <$

0.05 (the *t*-statistic is 5.252, and the critical *t* to reject H_0: $\beta_1 = 1$ is 1.697). However, this test was considered unreliable due to the heteroskedastic and non-normal residues. The GDP growth coefficient ($\hat{\beta}_2$) of -0.220459 ($p > 0.05$) did not seem to be substantially greater than the money restriction quantity principle $\beta_2 = -1$ (the *t*-statistic is -0.918961 and the critical *t* to do not reject H_0: $\beta_2 = -1$ is 1.697). The heteroskedastic and non-normal residuals made this test less accurate (Greene, 2012). To solve the heteroskedastic, we assumed $\sigma_1^2 = \sigma^2 X_i$ and divided all observations by $\sqrt{x_i}$ (Brumm, 2005; Moroney, 2002). The heteroskedasticity-corrected estimates (White test) of β_1 did not vary significantly from one another. The results revealed projections already resulted in the homoskedastic and normal residuals.

4.4 Joint Hypothesis Estimates of 40 Countries in 2014

The joint hypothesis consisted of Strong Wald test and Weak Wald test. Both results of Wald tests are shown in Table 4. Table 4 explained Strong Wald test ($\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = -1$) had a Chi-square (χ^2) statistic of 70.57296, which achieved the critical value for any traditional significance level of the statistical test. Therefore, Strong Wald test for the QTM's prediction was not supported (rejecting H_0). Similarly, Weak Wald test ($\beta_1 = 1$, $\beta_2 = -1$) had a Chi-square (χ^2) statistic of 66.44752. For any normal significance level, this satisfied the essential value statistics of the test. Therefore, Weak Wald test for the QTM's prediction was also not supported (Brumm, 2005). The increase in the money supply affected prices at the same time (Khan, 1993). It was expected money supply remained unchanged, and the economy was under full employment conditions (Mishkin, 2011; 2016). The monetarists might also address the relationship between inflation and money supply from the long-run neutrality of money perspective. This theory emphasized any country could experience a blast because the increase in money supply was often faster than the increase in total income. Thus, inflation rate was determined by money (Lothian, 1985; Karras, 1992; Duck, 1993; McCandless & Weber, 1995; Moazzami & Gupta, 1995; Rolnick & Weber, 1997; Dwyer & Hafer, 1988; Moroney, 2002; Brumm, 2005; Hervino, 2011; Jahan & Papageorgiou, 2014). These results underlined inflation volatility in 40 countries was mostly driven by the monetary side rather than the real sector. The findings were also in line with Hervino (2011) who demonstrated the monetary side affected inflation volatility greater than the real sector. Tang (2010), Doyin, and Ikechukwu (2013) also confirmed the results. They found monetary growth and sales growth were weakly correlated in the long run. These findings pointed monetary policy instruments would not be effective in controlling and managing the macroeconomic aggregates. The real economic activities were largely outside the monetary sector (Fama, 1982; Moroney, 2002). In other words, governments could not use the monetary policy instruments to maintain price stability to achieve their long-term monetary policy objectives. So, inflation was more than a long-run monetarist theory (Hafer & Wheelock, 2001). The increases in short-run general price levels were not clarified. It was impossible to stabilize short-run inflation. Therefore, monetary policies must be limited to focus on concerns about reasonably long-term inflation. The findings supported prediction of the money quantity principle that inflation was a monetary phenomenon (Grauwe & Polan, 2005; Jahan & Papageorgiou, 2014). As stated by Friedman (1968), the economists believed price stability in general (wherever and whenever) was a monetary phenomenon. They have long agreed that inflation resulted from high money supply growth (Mishkin, 2016). Therefore, it was understandable inflation management had long been considered a monetary policy (Bofinger, 2001). We also have already solved the heteroskedasticity and non-normal residual problems using the White heteroskedasticity-corrected estimates (2002 and 2014). Based on the observations from 40 countries in 2002 and 2014, we also empirically defined both Wald tests for the QTM's predictions were not supported (rejecting H_0). This study supported Brumm (2005) who found similar results when he examined 76 countries in 2005. However, our findings were in contrast to Moroney (2002) who defined both Wald tests for the QTM's predictions were not rejected (supporting H_0) from the observations of 81 countries in the 1980-1993 period.

Table 1. *The OLS and Heteroskedasticity-corrected estimates of 40 Countries (2002)*

Variable	OLS Estimates			H-C*		
	β	t-Stat.	*p*	β	t-Stat.	*p*
C	-0.515146	-0.331064	0.7425	-1.836350	-5.168449	0.0000**
X	0.473175	5.395878	0.0000**	0.554248	6.619301	0.0000**
Z	0.499944	1.596604	0.1189	0.415548	1.843206	0.0749
$\bar{R}^2$	0.520012			0.731019		
Log-likelihood	-125.3123			-76.52754		
F-statistic	22.12604			45.84273		
Prob(F-stat.)	0.000000			0.000000		

Note: * Heteroskedasticity-corrected estimates (all variables are divided by $\sqrt{x_i}$), ***p* < 0.05
Source: Authors' calculation

Table 2. *The χ2 of Strong Wald ($\beta_0 = 0, \beta_1 = 1, \beta_2 = -1$) and Weak Wald ($\beta_1 = 1, \beta_2 = -1$)*

Test Statistic	Strong Wald Test			Weak Wald Test		
	Value	df	*p*	Value	df	*p*
F-statistic	30.12888	(3, 31)	0.0000**	26.23220	(2, 31)	0.0000**
χ^2	90.38664	3	0.0000**	52.46439	2	0.0000**
H_0	C(1) = 0,C(2) = 1, C(3) = -1			C(2) = 1, C(3) = -1		
	Value	S.E.		Value	S.E.	
C(1)	-1.836350	0.355300		-	-	
-1 + C(2)	-0.445752	0.083732		-0.445752	0.083732	
1 + C(3)	1.415548	0.225448		1.415548	0.225448	

Note: ***p* < 0.05
Source: Authors' calculation

Table 3. *The OLS and Heteroskedasticity-corrected estimates of 40 Countries (2014)*

Variable	OLS Estimates			H-C*		
	β	t-Stat.	*p*	β	t-Stat.	*p*
C	0.800004	0.769512	0.4465	0.709610	2.101199	0.0433
X	0.366032	5.252688	0.0000**	0.315730	2.732140	0.0100**
Z	-0.220459	-0.918961	0.3641	-0.153834	-0.499027	0.6211
$\bar{R}^2$	0.405811			0.327428		
Log-likelihood	-99.81053			-69.93482		
F-statistic	14.31786			9.519529		
Prob(F-stat.)	0.000025			0.000545		

Note: * Heteroskedasticity-corrected estimates (all variables are divided by $\sqrt{x_i}$), ***p* < 0.05
Source: Authors' calculation

Table 4. *The χ2 of Strong Wald ($\beta_0 = 0, \beta_1 = 1, \beta_2 = -1$) and Weak Wald ($\beta_1 = 1, \beta_2 = -1$)*

Test Statistic	Strong Wald Test			Weak Wald Test		
	Value	df	*p*	Value	df	*p*
F-statistic	23.52432	(3, 33)	0.0000**	33.22376	(2, 33)	0.0000**
χ^2	70.57296	3	0.0000**	66.44752	2	0.0000**
H_0	C(1) = 0,C(2) = 1,C(3) = -1			C(2)= 1,C(3) = -1		
	Value	S.E.		Value	S.E.	
C(1)	0.709610	0.337717		-	-	
-1 + C(2)	-0.684270	0.115561		-0.684270	0.115561	
1 + C(3)	0.846166	0.308267		0.846166	0.308267	

Note: ***p* < 0.05
Source: Authors' calculation

5. Conclusion

This study denoted money supply growth strongly influenced the inflation rates of 40 countries in 2002. It demonstrated money supply could be used as an efficient public policy tool to maintain price stability. However, GDP growth did not influence inflation rates, implying that GDP development was not considered an important public policy tool to maintain price stability.

Similarly, money supply growth strongly influenced the inflation rates of 40 countries in 2014, suggesting that money supply could be used as an efficient public policy tool to maintain price stability. However, GDP growth did not influence inflation rates. Hence, governments did not use GDP growth as an efficient public policy instrument to maintain price stability.

In addition, from our observations on 40 countries in 2002 and 2014, we also demonstrated both Wald tests for the Quantity theory's predictions were not supported (rejecting H_0). Due to current limitations, this study only compared the QTM from 40 countries in 2002 and 2014. Thus, the results should be interpreted and used cautiously, especially for QTM-related public policies in these 40 countries during the periods. A possible explanation for these results was that a long-run theory was the monetarist theory of inflation. Therefore, we advised future studies to use the long-run cross-section samples. We also recommended the new cross-section samples to evaluate the generalizability of our findings. Future studies are also encouraged to classify countries based on their income (high, middle, and low-income countries). It would be exciting to see whether our results necessarily apply in many other countries. We also leave for future studies to use alternative methods such as Two-Stage Least Squares (2SLS) to confirm the QTM's joint hypothesis testing.

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