Taylor Rule's accuracy in determining the countries short-term nominal interest rate

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Abstract

The purpose of this study was to observe the difference between the rates determined using the Taylor rule and the rate determined by the monetary authorities of each country. This study used quantitative methods. As a result, the Taylor rule's accuracy in determining the optimal interest rate is better in countries with inflation conditions that tend to be low and stable. This result implied that the Taylor rule is accurate in determining nominal interest rates in developed countries. In conclusion, as for developing countries, the accuracy of the Taylor rule depends on the country's inflation situation.

Keywords: Taylor rule, Nominal interest rate

La precisión de la regla de taylor al determinar la tasa de interés nominal a corto plazo de los países

Resumen

El propósito de este estudio fue observar la diferencia entre las tasas determinadas utilizando la regla de Taylor y la tasa determinada por las autoridades monetarias de cada país. Este estudio utilizó métodos cuantitativos. Como resultado, la precisión de la regla de Taylor para determinar la tasa de interés óptima es mejor en países con condiciones de inflación que tienden a ser bajas y estables. Este resultado implica que la regla de Taylor es precisa para determinar las tasas de interés nominales en los países desarrollados. En conclusión,

en cuanto a los países en desarrollo, la precisión de la regla de Taylor depende de la situación de inflación del país.

Palabras clave: Regla de Taylor, Tasa de interés nominal

1. INTRODUCTION

One of the indicators in macroeconomic that used to see/measure a country's economic stability is inflation. Changes in this indicator will have an impact on the dynamics of economic growth. From an economic perspective, inflation is a monetary phenomenon in a country where the rise and fall of inflation tend to result in economic turmoil.

One of the policies that can be used to control inflation at a stable level is monetary policy. Through monetary policy, the government can maintain, increase, or reduce the money supply to maintain economic capacity to grow and control inflation. If what is done is to increase the money supply, then the policy taken is expansive, while contractionary monetary policy is carried out by reducing the money supply or what is known as tight money policy (WARJIYO, 2004).

Although inflation is an economic cost that must be paid, many countries choose an inflation-focused monetary policy as a means to achieve other goals, such as economic growth and employment (HUBBARD, 2008). Even so, the priority for maintaining price stability as a focus of monetary policy remains in the most central

bank in the world (LOAYZA & SCHMIDT-HEBBEL, 2002). Inflation targeting is done by announcing to the public, about the medium-term inflation target and the commitment of the central bank to achieve price stability, as a long-term goal of monetary policy (HAMMOND, 2012: ZINNATULLINA et al, 2019).

However, in monetary policy often occurs as a problem of the instability between the development of the monetary magnitude and the ultimate goal of the policy (development of output). Then raises the form of the monetary policy rule, namely the interest rate rule or Taylor rule, where the development of interest rates reflects the response from the development of output and inflation (TAYLOR, 1993). The Monetary Policy Rule is increasingly gaining attention today.

Taylor rule was originally raised for the economy of the United States, as a function of linear interest rates which in this function is to see the definition of the inflation rate and the definition of output which is different from its potential level. This function indicates how the Federal Reserve System or the Fed should change its interest rate, responds to changes in price levels and or changes in real GDP (TAYLOR, 2000). The Taylor rule has been adjusted to the economies of other countries and also used in both developed and developing countries. Besides, the Taylor rule is also used by countries that adopt the inflation targeting framework that uses short-term interest rates as an operational instrument of monetary policy.

Some experts agree that price stability can be achieved by using rules of monetary policy. This is based on an argument that states the rule can reduce errors in a policy (policy error), increase the transparency of monetary policy, and prevent political influence on policymakers. Besides, discretionary monetary policies can cause instability in the economy. This leads to a bias in the inflation rate and is exposed to special interest rate politics. In time, many monetary policies that are rules are applied (VAN LEAR, 2000).

Besides, there are three main instruments used to regulate the money supply, namely open market operations (discount market), discount facilities (discount rate), and mandatory reserve ratio. The strategy for selecting instruments to achieve the final policy objectives can be carried out in several ways. In the context of implementing a stabilization policy, efforts to influence policy variables can be done well by basing on rules. These rules can take into account the existence of permanent feedback in the relationship between economic variables. The policy strategy is an alternative to the active policy strategy or discretion, which is based more on the fine-tuning of policymakers.

Several previous studies related to the validity of this method both in the economies of other countries or other periods have been carried out, both in developed and developing countries. Taylor rule is one of the optimal methods in determining nominal short-term interest rates. The response obtained in using this method is the stability of two variables, namely inflation and the output gap, with one condition that the output gap variable can be defined properly (TELES & ZAIDAN,

2010). Besides, monetary policy has made a major contribution to the central bank in achieving its goals and objectives for the stable economy in both developed countries and developing countries.

However, some of these studies only examine the application of the Taylor rule in developed countries or developing countries only. Research related to the accuracy of the application of Taylor rule in developed and developing countries is still rare. Therefore, in this study, we analyzed the accuracy of the application of the Taylor rule in determining the nominal interest rate in developed and developing countries. Is there a difference between the rates determined using the Taylor rule and the rates determined by the monetary authorities of each country? Besides, can the rate determined using the Taylor rule method be used as a guide in determining a good interest rate rule in the country studied?

Taylor said that the Taylor rule is effectively used in developing countries as well as developed countries (KÜHN & MUYSKEN, 2012). This means that the Taylor rule is proven accurate in various developing countries. Therefore, we assume that the Taylor rule can be used as a guide in determining the optimal interest rate. Besides, each country has a different instrument with the Taylor rule in determining monetary policy. Besides that, each country has an inflation rate that varies each period. Therefore, we assume that there are differences in interest rates determined by the Taylor rule and the monetary authorities of each country in developed and developing countries.

This study is important to provide information about the accuracy of a rule in determining final interest in developed and developing countries so that it can be used in developed countries and developing countries. There are 2 objectives of this study. The first objective is to find out to compare the Taylor interest rates with actual in these countries. The second objective is the accuracy of the application of the Taylor rule in determining the nominal interest rate in developed and developing countries.

2. METHODOLOGY

This study was a quantitative approach with the Taylor rule method. Besides, this study also used the Hodrick-Prescot Filter in determining the value of the output gap variable. We used Taylor rule to calculate interest rates from America, Britain, Japan, Indonesia, China, and Russia during 1998-2014. Inflation and output gap data were obtained from the World Development Index, World Bank, Organization for Economic Co-operation and Development (OECD).

There were two variables in this study, namely the inflation variable and the variable output gap. Inflation in this study used the GDP deflator. The GDP deflator is an instrument for observing the average price level in the economy (MANKIW, 2006). In economics, the GDP deflator is a ratio between real GDP and nominal GDP, multiplied by 100. The GDP deflator shows the magnitude of the price change of all new goods, local goods, finished goods, and services.

The GDP deflator, along with the CPI, is often used to measure inflation in a country. While the output gap is the difference between the actual outputs, (output produced) and the potential output (output that should be produced in the full employment situation). Measuring the output gap is not easy, unlike actual GDP. The output gap cannot be measured directly because potential GDP and the Output gap can only be estimated.

Both of these variables were used to compile the nominal short-term interest rate using the Taylor rule method. Using the equation in the Taylor rule method, we get the equation by entering the inflation variable and the output gap of each country as follows:

Developed Country

Trade (Developed) = 1 + 1,5(INFdeveloped) + 0,5 (GAPdeveloped)

1. Developing Country

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By substituting the value of the inflation variable and output gap, we will get the Taylor rule interest rate value.

3. DISCUSSION

The inflation rate in developed countries is very volatile, in some periods there are also conditions where the inflation rate is close to 0% and some even reach a negative inflation rate or known as deflation. Besides, one of the characteristics of developed countries is having a fairly low inflation rate.

The inflation rate in developed countries tends to be low with a range between 0% - 3.5% and in certain conditions deflation. The highest inflation rate in the research range from 1998 to 2014 and in the subject of this study were American countries with a value of 3.2%, namely in 2005. Besides that, the lowest inflation rate in the same year was experienced by the German state which was -0.45% in the 2000 period or called deflation.

For the calculation of the output gap, in developed countries, the value fluctuations are very high. All three countries have experienced conditions where their output gap values were positive and also negative. The level of the output gap in developed countries in this study in the period 1998-2014 ranged from -4.8% - 4.8%. The highest condition of the output gap was felt by the UK in the 2007 period where the output gap reached a positive 4.8%. On the other hand, the condition of the lowest output gap was experienced by American countries in the 2009 period where the value of the output gap reached negative -4.8%.

As for developing countries, the inflation rate is also very volatile. The inflation rate in developing countries is much higher than in developed countries because of the characteristics of developing countries, one of which has a greater inflation rate than in developed countries. The inflation rate in developing countries tends to be high with a range between 0% - 20% and in certain conditions deflation. The highest inflation rate in the range of research from 1998 to 2014 and in the subject of this study was the country of Indonesia with a value of 75.2%, namely in 1998. Besides, the lowest inflation rate in the same year was experienced by China at -1.2% in the 1999 period or called deflation.

Also, all three countries have experienced conditions where their output gap values were positive and also negative. The level of the output gap in developing countries in this study in the period 1998 - 2014 ranged from -8% - 9%. The highest condition of the output gap was felt by the Russian state in the 2008 period where the value of the output gap reached a positive 9%. On the other hand, the condition of the lowest output gap was experienced by Indonesia in the 1999 period where the output gap reached negative -8%.

4. RESULT

The results show that Taylor determined the interest rate in America in the range between -0.28% - 7.24% in the range from 1998 to 2014 (see table 1). The highest rate determined by Taylor was in the

2005 period with a value of 7.24%. Instead, the lowest rate determined by Taylor is in the 2009 period with a value of -0.28%.

Furthermore, in Table 1, Taylor for Germany determined the interest rate in the range between 0.64% - 4.67% in the range from 1998 to 2014. The highest rate determined by Taylor was in the 2007 period with a value of 4.67%. Instead, the lowest rate determined by Taylor is in the 2000 period with a value of 0.64%.

Then, for the United Kingdom, Taylor determined the interest rate in the range between 2.03% - 7.72% in the range from 1998 to 2014. The highest rate determined by Taylor was in the 2007 period with a value of 7.72%. On the contrary, the lowest rate determined by Taylor was in the 2009 period with a value of 2.03% (see table 1).

As for developing countries, Taylor determined Indonesia's interest rate in the range between -1.29% - 13.60% in the range of 1998 to 2014 (see table 1). The highest rate determined by Taylor is in the 2007 period with a value of 13.60%. Instead, the lowest rate determined by Taylor was in the 1999 period with a value of -1.29%. As for China, in table 1 shows that Taylor determines the interest rate in the range between 6.92% - 110.96% in the range from 1998 to 2014. The highest rate determined by Taylor was in the 1998 period with a value of 110.96%. Instead, the lowest rate determined by Taylor was in the 2003 period with a value of 6.92%.

Besides, for Russia, Table 1 shows that after substituting the inflation and output gap data, Taylor determined the interest rate in the range between 2.45% - 106.65% in the range of 1998 to 2014. The highest rate determined by Taylor is in the 1999 period with a value of 106.65%. On the contrary, the lowest rate determined by Taylor is in the 2009 period with a value of 2.45%.

The results showed that the biggest inequality between the rates determined by Taylor and those determined by the monetary authorities in America occurred in the 2004 period (see graph 1). In that year, FED determined interest of 1.15%. However, Taylor determined interest at 6.09% with a difference of 4.94%. In that period the condition of the American output gap is in a positive position which indicates that the actual output is greater than expected, which is equal to 1.95 (0 indicates the condition of the actual output with potential output at the same value). Taylor proposes to raise the interest rate higher so that the economy does not run beyond its maximum capacity.

In graph, 1 also shows that in Germany, the biggest inequality between the rates determined by Taylor and those determined by the monetary authority occurred in the period 2000. At that time, the German monetary authorities determined interest at 4.39%. However, Taylor determines the interest of 0.64%. This shows a difference of around 3.75%. Taylor considers the German monetary authority to determine interest too high from its optimal value.

In addition, in that period, the German country's output gap was in a positive position. This means that the actual output is greater than expected, which is equal to 0.63 (0 indicates the condition of the actual output with a potential output at the same value). Taylor proposes to lower the interest rate lower so that the economy can run better and the country can use its resources more.

As for the United Kingdom, the biggest imbalance between the rates determined by Taylor and those determined by the monetary authority occurred in 1998. In that year, the British monetary authorities determined interest of 7.34%. However, Taylor said differently. Taylor determines the interest of 3.72%, with a difference of around 3.62%. In that period the condition of the UK's state output gap was in a positive position. So, the actual output is greater than expected, which is equal to 0.58. Therefore, Taylor proposes to lower the interest rate so that the economy can run better and the country can use its resources more.

As with developed countries, in developing countries, the biggest imbalance between the rates determined by Taylor and those determined by the monetary authority occurred in the 2007 period (see graph 2). China's monetary authority that year determined the interest of 3.51%. However, Taylor determines an interest of 13.60%, so there is a difference of around 10.9%. In that period China's output gap was in a positive position. This indicates that the actual output is greater than expected, which is equal to 1.7. Therefore, Taylor proposes to

raise the interest rate higher so that the economy does not run beyond its maximum capacity.

The data results also showed that the biggest inequality between the rates determined by Taylor and those determined by the monetary authority occurred in the period 1999. The Russian monetary authority that year determined interest of 22.97%. However, Taylor determined interest at 106.65%. There is a difference of around 83.68%. Besides, the condition of the Russian state output gap in 1999 was in a negative position, indicating that the actual output was smaller than expected at 5.85. Taylor proposes to raise the interest rate higher so that the economy does not run beyond its maximum capacity.

The results show that the determination of the interest rate uses two methods, namely the method used by each of the country's monetary authorities with Taylor rule shows a difference. Hypothesis 2 is accepted. A very significant difference occurred in developing countries with 13.60% in China, 110.96% in Indonesia, and 22.97% in Russia. The difference between the two methods in developed countries does not show a significant difference. Using the rule monetary policy in developing economies has many benefits similar to those found in developed countries. Based on the Taylor statement, interest should be determined using Taylor with interest determined by the monetary authority that has no significant difference in developed and developing countries. However, based on our findings, in the second period, the interest rate had a very large difference especially in its application in developing countries.

This can be caused by several factors. In the Taylor rule, determining the interest rate takes into account two important variables, namely inflation and the difference between actual output and potential output (Output gap). When inflation is too high than the target set, the interest rate must be raised above the increase in the inflation rate, for example, an increase of 1% inflation, so in maintaining the economic balance the interest rate must be increased above that increase. When the economic condition is deflationary, the interest rate must be lowered greater than the deflationary value.

Related to Taylor's output gap variable states that rising or falling interest rates must pay attention to the economic gap value. When the condition of the actual output exceeds its potential output, the interest rate must be lowered so that the economy does not run above its maximum capacity. However, when the condition of the actual output is below its potential output condition, the interest rate must be lowered so that the economic machine can run better and the resources can be maximized (Taylor).

From the explanation above, it can be seen that the differences between the Taylor rule and the authority of each country, especially developing countries are caused by high inflation rates. For example, in the country of Indonesia, in the 1998 period, the monetary authority determined an interest rate rule of 40%. On the other hand, Taylor determines 110%. This difference is very big. However, if you look at the inflation rate of Indonesia in that period, which is equal to 75%, then it will reflect on the Taylor equation the result will be high.

Different in the 2012 - 2014 period. In this period, the measurement of the two methods showed interest rates in almost the same conditions.

This is different from developed countries. In developed countries, there is no similar differences are found even almost accurately using Taylor's method of determining interest rates. This is partly because the inflation rate in developed countries tends to be low compared to developing countries. The determination of the Taylor method in developing countries has the same results in developed countries when the inflation rate in developing countries is stable. Taylor rule can be used as a guide in determining the nominal interest rate, both in developed and developing countries. Hypothesis 1 is accepted. Therefore, the use of the Taylor method has the same benefits in developed and developing countries if the inflation rate can be maintained in a stable condition. In Turkey, the Taylor rule is also effective in targeting inflation (FRIEDMAN & SCHWARTZ, 1983).

5. CONCLUSION

Determination of nominal interest rates using Taylor rule and monetary authorities have differences in both developed and developing countries. In developed countries, Taylor's projections tend to be accurate than in developing countries, especially in periods where the inflation rate in developing countries tends to be high. However, the accuracy of Taylor's method increases in developing countries when inflation in the country is stable. So, the Taylor rule

can be used as a guide in determining the nominal interest rate, both in developed and developing countries.

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