ARDL PANEL MODEL OF INTERNATIONAL FINANCIAL SYSTEM AND MONETARY POLICY OF ASIA PASIFIC ECONOMIC COOPERATION

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Abstract
The financial system plays an important role in the economy. An unstable financial system will be vulnerable to various problems that disrupt the rotation of a country's economy and be vulnerable to economic problems such as the global crisis in various countries. The problem that occurs is the occurrence of Covid-19 causing various fluctuations in the level of inflation, money supply, imports, the occurrence of unstable inflation from January 2019 to August 2021, low inflation resulting in a decrease in imports and an increase in the money supply in Mexico, Vietnam, Philippines, Hongkong, Indonesia, Canada, Malaysia, Singapore, Peru, and China. The analytical method in this study uses the ARDL Panel (Autoregression Distributed Lag) approach. The ARDL Panel Model determines which country models from APEC countries are able to control long-term financial system-based economic fundamentals in Mexico, Vietnam, the Philippines, Hong Kong, Indonesia, Canada, Malaysia, Singapore, Peru, and China and the Different Test for modeling the impact of Covid-19 on the economic fundamentals of the financial system. The results of the research found the ARDL Panel prediction model in modeling the impact of Covid-19 on economic fundamentals in the financial system. The main Leading Indicator of variable effectiveness in controlling Inflation In TAPEC is JUB where Vietnam, the Philippines, Hong Kong, Japan, Malaysia, Singapore, Peru and China have a significant influence in controlling Inflation. Then overall in the long term (Long Run) it turns out that only the JUB and CDV variables have an effect on INF In TAPEC, while in the short term (Short Run) it is JUB that influences Inflation In TAPEC.

Keywords: International Finance, ARDL Panel, Economic Fundamentals

Introduction
Monetary policy was pursued until the inflation target was achieved. The transmission of monetary policy to economic growth and inflation has long been recognized as taking place with long and varied deadlines (Friedman and Schwartz, 1963). This is because monetary transmission has a lot to do with the pattern of relationships between various economic and financial variables which are always changing in line with the economic development of the country concerned. The monetary policy of a central bank as a monetary authority is intended to influence real economic activity and prices through the transmission mechanism that occurs. For this reason, the monetary authority must have a clear understanding of the transmission mechanism in the country. Monetary policy transmission mechanisms can work through various channels, such as interest rates, monetary aggregates, credit, exchange rates, asset prices, and expectations (Warjiyo and Agung, 2002). Thus, an understanding of monetary policy transmission is the key in order to direct monetary policy to influence the direction of real economic development and future prices.
Since being declared a covid-19 pandemic on March 11 2020 by the World Health Organization (WHO), the corona virus has spread widely throughout the world. According to data from Worldometers, as of August 17, 2021, more than 200 countries in the world have been infected with Covid-19 with a total of 200.09 million cases and 4.39 million deaths. Not only has it had an impact on the health crisis, the Covid-19 pandemic has also caused the economies of most countries in the world to grow negatively and even recession. Even though the Covid-19 recovery rate continues to increase, the emergence of cases of the spread of Covid-19 has also increased so that uncertainty continues to affect the pace of the global economy. After sinking due to mobility/regional restrictions to suppress the spread of covid 19, in 2021 countries in the world hope to bounce back. Currently, various policy initiatives have been issued and cooperation between countries has been implemented so that economic performance can recover and grow positively starting this year. 

Out of several countries in the world, there are only a few countries with the largest money supply in the world. Among the 22 countries with money supply there are several countries that are included in the APEC countries consisting of Mexico, Vietnam, the Philippines, Hong Kong, Indonesia, Canada, Malaysia, Singapore, Peru and China.

The phenomenon of the problem in this study is by looking at the various responses from macroeconomic variables to the ability of monetary policy transmission in controlling the economy before the Covid19 pandemic and when the Covid19 pandemic occurred in APEC countries, namely:

<table>
<thead>
<tr>
<th>Year</th>
<th>Mexico</th>
<th>China</th>
<th>Peru</th>
<th>Singapore</th>
<th>Japan</th>
<th>Indonesia</th>
<th>Hong Kong</th>
<th>Philippines</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan19</td>
<td>4.36%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec20</td>
<td>2.82%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan21</td>
<td>3.23%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug21</td>
<td>5.59%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Inflation before the occurrence of the covid 19 pandemic

Based on the tables and graphs above, it can be seen that the graphs vary in the form of fluctuations from each country. Inflation in Mexico has increased, which was caused by the depreciation of the exchange rate and rising fuel costs, a weaker exchange rate made the prices of imported goods in Mexico more expensive. High inflation was also driven by an increase in gasoline prices of more than 20% so that the Central Bank of Mexico took steps to raise the benchmark interest rate to 8.5%. Inflation in Mexico before the Covid-19 pandemic occurred in Jan19 at 4.36% and at the end of December 2019 decreased by 2.82%. when the Covid19 outbreak hit Mexico State Inflation in early 2020 was 3.23% and at the end of August 2021 it had increased by 5.59%, whereas in
Vietnam before Covid19 occurred in Jan19. Inflation of 2.56% until the end of December 2019 experienced an increase of 5.23% causing the economy in Vietnam to slow down so that the Vietnamese Government adopted a policy by raising interest rates to 14%. At the beginning of 2020 in January, inflation increased by 1% from the previous month of 6.43% until finally inflation continued to decline until August 2021.

**BASE THEORY**

Money is objects that are approved by society as an intermediary tool to hold trade exchanges (Sadono Sukirno, 2000). Teddy Herlambang et al (2000) stated that the definition of money in Indonesia consists of two parts, namely all currency (notes and coins as people know it every day) and demand deposits (bank account balances that can be used at any time) for payment by check, demand deposit or other order. This currency and demand deposits in monetary terms are called M1 or referred to as money supply in a narrow sense. The explanation above can be summarized through the following equation:

\[ M1 = \text{currency} + \text{demand deposits} \]

In addition to money supply in the narrow sense, there is also money in circulation in the broad sense (M2), which is also known as economic liquidity. M2 is the sum of M1 and quasi money. Quasi money is money that is not denied. This quasi-money consists of time deposits, savings and foreign exchange accounts owned by domestic private companies. The explanation above can be summarized through the following agreement:

\[ M2 = M1 + \text{QM} \]

Another definition of money that needs to be understood is primary money (reserve money/M0), namely money defined as money outlined by the government held by the public and banks. This primary money includes money held by the public as a means of payment (currency) and absorption money held by banks (cash at banks and deposits at BI). The explanation above can be summarized through the following equation:

\[ M0 = \text{currency} + \text{absorption money} \]

The quantity theory of money is also known as the Classical Money theory. Previously, several things that affect the demand for money have been explained, including real income, interest rates and price levels. However, in this quantity theory of money, Irving Fisher assumes that the existence of money is essentially a flow concept, that is, the level of demand for money is not affected by the interest rate, but the size of the demand for money is determined by the velocity of the velocity of money, in addition to the price level in This theory is also influential. This theory is based on SAY’s law, namely that the economy will always be in full employment. For more details, Irving Fisher formulates his theory in a simple equation, which is as follows: \[ MV = PT \]

From the equation above, it can be concluded that the number of units of goods transacted (T) multiplied by the price (P) must always equal the amount of money (M) with the velocity of its
rotation (V). Or in other words, payments made by buyers (total expenditure = MV) are identical or equal to receipts by sellers (value of goods purchased = PT).

In a modern economic system where public financial institutions have experienced very rapid development, it encourages people to use their money for speculative activities, which are stored or used to buy securities, such as government bonds, stocks, or other instruments. Factors that affect the demand for money with this motive are interest rates, securities dividends, or capital gains, the demand function is ( MDs = f(i) ).

The relationship between the demand for money for speculation with interest rates is negative. This means that every time there is an increase in interest rates, the demand for money for speculation will decrease. And vice versa, if the interest rate decreases, the demand for money for speculation will increase. From this explanation it can be written by the equation ( N = R/i ), where N is the price/value of securities, R is income from securities and also i is the interest rate on securities.

MD = MDt + MDp + MDs

Of the three motives above, the formula for total money demand according to Keynes is:

Or it can also be formulated as follows:

\[ L = L_1 + L_2 \]

\[ L_1 = L_1 (Y) \]
\[ L_2 = L_2 (i) \]
\[ L = L_1 (Y) + L_2 (i) \]
\[ L = L (Y, i) \]

METHOD

In this study using panel data, namely by using inter-temporal data and data between regions or countries. ARDL panel regression is used to obtain estimation results for each individual characteristic separately by assuming cointegration in the long run lag of each variable. This technique examines each variable lag located at I(1) or I(0). On the other hand, the ARDL regression result is a test statistic that can compare two asymptotic critical values. Panel Regression Testing with the formula:
The following is the panel regression formula based on country:

\[ \text{INFit} = a + \beta_1 \text{JUBit} + \beta_2 \text{CDVit} + \beta_3 \text{EKSPit} + \beta_4 \text{IMPit} + \beta_5 \text{KURSit} \]

**RESEARCH RESULTS**

The most appropriate analysis for testing pooled data is a combination of cross section (country) data with time series data (annual) is an analysis using a panel model with Auto Regressive Distributin Lag (ARDL). This is because the results of ARDL panels are better than ordinary panels, because they are capable of long-term cointegration and have the most theoretical lag distribution. The following is the output of the ARDL Panel model analysis:

<table>
<thead>
<tr>
<th>Dependent Variable: D(INF)</th>
<th>Method: ARDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 11/22/21 Time: 20:52</td>
<td>Sample: 2006 2020</td>
</tr>
<tr>
<td>Included observations: 150</td>
<td>Maximum dependent lags: 1 (Automatic selection)</td>
</tr>
<tr>
<td>Model selection method: Akaike info criterion (AIC)</td>
<td>Dynamic regressors (1 lag, automatic): JUB CDV EKSP IMP KURS</td>
</tr>
<tr>
<td>Fixed regressors: C</td>
<td>Number of models evaluated: 1</td>
</tr>
<tr>
<td>Selected Model: ARDL(1, 1, 1, 1, 1)</td>
<td>Note: final equation sample is larger than selection sample</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long Run Equation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JUB</td>
<td>0.150023</td>
<td>0.055309</td>
<td>2.712437</td>
<td>0.0081</td>
</tr>
<tr>
<td>CDV</td>
<td>0.521415</td>
<td>0.257469</td>
<td>2.025153</td>
<td>0.0460</td>
</tr>
<tr>
<td>EKSP</td>
<td>0.015892</td>
<td>0.038766</td>
<td>0.409938</td>
<td>0.6829</td>
</tr>
<tr>
<td>IMP</td>
<td>-0.033297</td>
<td>0.015573</td>
<td>-2.138057</td>
<td>0.0354</td>
</tr>
<tr>
<td>KURS</td>
<td>0.095089</td>
<td>0.248539</td>
<td>0.382592</td>
<td>0.7030</td>
</tr>
<tr>
<td><strong>Short Run Equation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COINTEQ01</td>
<td>-0.688084</td>
<td>0.115585</td>
<td>-5.953039</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(JUB)</td>
<td>-0.087224</td>
<td>0.073874</td>
<td>-1.180722</td>
<td>0.0110</td>
</tr>
</tbody>
</table>
The ARDL Panel Model is accepted if it has a cointegrated lag, where the main assumption is that the coefficient value has a negative slope with a significant level of 5%. The results above show that the requirements for the ARDL Panel model used have been fulfilled: with a negative value, namely -0.68 and significant with a prob value <0.05, which is worth 0.000, it can be stated that the ARDL panel model used in this study is accepted. Based on the acceptance of the model, data analysis was carried out by panel per country.

Based on the overall results, it is known that the only thing that significantly influences inflation in TAPEC in the long term is the money supply. Then in the short term what affects inflation are world oil prices, international reserves, interest rates, and exchange rates. The following is a summary table of the Ardl panel results:

### Table 3. Ringkasan Hasil PANEL ARDL

<table>
<thead>
<tr>
<th>Variabel</th>
<th>Mex</th>
<th>Viet</th>
<th>Filip</th>
<th>Hnk</th>
<th>Ind</th>
<th>Jep</th>
<th>MLY</th>
<th>SNP</th>
<th>Peru</th>
<th>Cina</th>
<th>Short run</th>
<th>Long run</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUB</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CDV</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EKSP</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>IMP</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>KURS</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Sumber: Data diolah penulis, 2021
The following is a summary of In Tapec's long-term and short-term stability:

![Figure 2 Stability of Inflation Control Period In TYPE C](image)

The ARDL Panel analysis results prove:

Leading Indicator of State effectiveness in controlling the country's trade balance in TAPEC, namely Mexico where inflation control is carried out by two variables (Exports and Imports) except for JUB, CDV and exchange rates, the country has a significant effect on Inflation. The State of Vietnam controls inflation by two variables (money supply, and exports) except for foreign exchange reserves, imports, and the country's exchange rate which has a significant effect on inflation. Inflation control in the Philippines is carried out by four variables (JUB, EKSP, IMP, and exchange rate) except for foreign exchange reserves, the country has a significant effect on inflation. For Hong Kong, inflation control is carried out by all variables (JUB, CDV, EKSP, IMP, and exchange rates) where all of these variables have a significant effect on inflation. Inflation control in Indonesia is not carried out by the five variables (JUB, CDV, EKSP, IMP, and exchange rate). Inflation control in Japan is carried out by three variables (JUB, EKSP, IMP) except for foreign exchange reserves, and the country's exchange rate has a significant effect on inflation. Inflation control in Malaysia is carried out by three variables (JUB, EKSP, IMP) except foreign exchange reserves and exchange rates. The country has a significant effect on inflation. Inflation control in Singapore is carried out by five variables (JUB, CDV, EKSP, IMP, and Exchange Rate). The country has a significant effect on inflation. Inflation control in Peru is carried out by four variables (JUB, EKSP, IMP, and Exchange Rate) except for foreign exchange reserves, the country has a significant effect on inflation. Meanwhile, inflation control in China is carried out by one variable (JUB) except for foreign exchange reserves, EXP, IMP, and exchange rates. The country has a significant effect on inflation. Bank Indonesia's monetary policy is aimed at managing price pressures originating from the aggregate demand side (demand management) relative to supply side conditions. Monetary policy is not intended to respond to rising inflation caused by surprise and temporary factors that will disappear by themselves over time. Meanwhile, inflation can also be influenced by factors originating from the supply side or shocks, such as rising world oil prices and crop disturbances or floods. Of the weights in the CPI basket,
the inflation weight which is influenced by supply and shock factors is represented by the volatile food and administered prices groups which account for approximately 40% of the CPI weight. Thus, Bank Indonesia's ability to control inflation is relatively limited when there are very large shocks, such as when the fuel price hike occurred in 2005 and 2008, causing a spike in inflation. Considering that the inflation rate is also influenced by these shock factors, achievement of the inflation target requires cooperation and coordination between the Government and Bank Indonesia through integrated macroeconomic policies, including fiscal, monetary and sectoral policies. Furthermore, the characteristics of Indonesia's inflation which is quite vulnerable to shocks from the supply side require special policies for this problem (BI, 2021).

Closing

The main Leading Indicator of variable effectiveness in controlling Inflation In TAPEC is JUB where Vietnam, the Philippines, Hong Kong, Japan, Malaysia, Singapore, Peru and China have a significant influence in controlling Inflation. Then overall in the long term (Long Run) it turns out that only the JUB and CDV variables have an effect on INF In TAPEC, while in the short term (Short Run) the JUB that influences Inflation In TAPEC.

REFERENCE


