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TAX REVENUE AND ECONOMIC ACTIVITY: SEASONALITY, COINTEGRATION AND CAUSALITY ANALYSIS

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Abstract

The role of taxation is very important for the financing of development in Indonesia. However, the performance of tax revenue has not been optimal, indicated by the low tax to Gross Domestic Product (GDP) ratio which in 2015 was around 10.7% of GDP. This tax ratio is lower than the tax ratio of neighboring countries such as the Philippines (13.6%), Malaysia (14.3%) and Thailand (16.5%). The objective of this study is to understand the relationship between tax revenue and economic activity that can provide insight into the effectiveness of tax policy to finance development. This study uses monthly realization of tax revenue for both total and sectoral. Period of data being studied is Q1 2010 - Q4 2017. To examine the relationship between tax revenue and economic activity, we carried out several tests such as unit root test, cointegration test and causality test. The main contribution of this study is the empirical testing on the linkage between tax revenue and economic activity. The policy implication of this study is that in order to increase the tax revenue collection, government should formulate policy to increase production, investment and consumption to increase the tax base.

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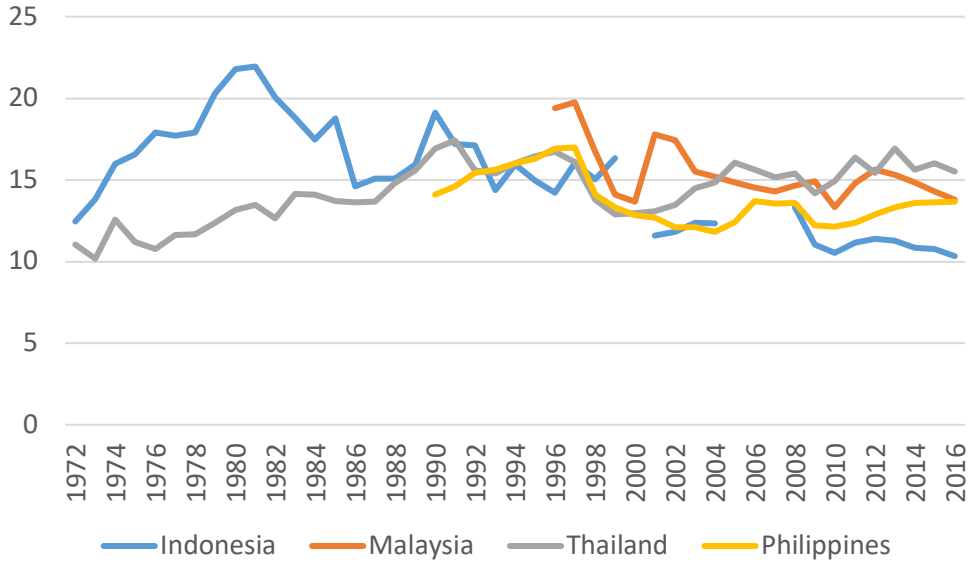
1. INTRODUCTION

1.1. Background

The role of taxation is very important to finance development in most countries, especially emerging market such as Indonesia. However, the performance of tax revenue in Indonesia has not been optimal, indicated by the low ratio of tax to Gross Domestic Product (GDP) which in 2015 was around 10.7% of GDP then decreased to 10.3% of GDP in 2016. This tax ratio is lower than the tax ratio of neighboring countries such as the Philippines (13.7%), Malaysia (13.8%) and Thailand (15.7%) (see Figure-1), although in 2017 the tax ratio slightly increased to 10.7% of GDP. This tax ratio should certainly be increased to 16% of GDP (RPJMN 2015-2019) to provide fiscal space with high demand to finance development programs that can promote growth such as education, health and infrastructure spending.

Other indicators also show that tax revenue performance is not yet optimal. For example, high tax gap where in 2011 the realization of tax revenue was 11.9% of GDP while the estimated tax capacity was 28% of GDP (Poesoro, 2015). In addition, declining elasticity of GDP growth to the growth of tax revenue (tax buoyancy), for example corporate income tax buoyancy from 1.42 (2011) to minus 0.89 (2016); and the most obvious indicator of not reaching the target of tax revenue.

FIGURE-1: Tax Ratio (% GDP)



Source: World Bank Data

1.2.Objectives

With the scope of the study limited to non-oil and gas income tax and VAT which contributes more than 80 percent of the total tax revenue, the objective of this study is to understand the relationship between tax revenue and economic activity that can provide insight of the effectiveness of tax policy to achieve financing for development. The results of this study can be used to see the potential for future tax revenues. The practical objective of this study is to understand the relationship between tax revenue and economic activity: Is tax

revenue a leading indicator of the economic activity? Meaning that we can use tax collection data to predict the economic activity. Otherwise the tax data is lagging or coincidence of the economic activity.

1.3. Method and Data

The method used in this research is to use several tests to examine the relationship between tax revenue and economic activity. These tests, among others, looking at the relationship of seasonal patterns and cycles between tax revenue and economic activity data, as well as tests of cointegration and causality between tax revenue and economic activity.

The tax data used in this study comes from the Ministry of Finance and the data on economic activity comes from the Central Statistics Agency. The data period is January 2010 to December 2017. The tax data does not include receipts from the Amnesty Program in Q3 - Q4 2016 and Q1 2017. The tax data is the monthly realization of income tax and Value Added Tax (VAT). Meanwhile, the economic activity data are GDP, investment and consumption which are quarterly data.

2. LITERATURE REVIEW

Previous study conducted by (Chigbu, Akujuobi, & Appah, 2012) in Nigeria during the period 1970-2009 suggests a cointegration and causality between tax and economic growth. A study conducted by (Takumah, 2014) in Ghana for the period of 1986-2010 shows that there is a cointegration between economic growth and tax revenue and unidirectional causality from tax revenue to economic growth. (Zakaria & Nabi, 2016) examined the Granger causality relationship between two types of taxes (direct taxes and indirect taxes) and the main macroeconomic variables (consumption, investment, government spending and exports) using Malaysia data 1996-2013. Their research shows that both types of taxes Granger cause household consumption and private investment but did not Granger cause government spending and exports. Different results can be found from research conducted by (Iriqat & Anabtawi, 2016) in Palestine during 1999-2014 that tax revenues does not Granger cause GDP, government spending, consumption, investment and balance of trade. However, GDP, government spending, and consumption have positive impact on tax revenues while balance of trade has negative impact on tax revenues.

2.1 Tax and Economic Activity

2.1.1 Tax

Tax revenues in this paper are revenues from Income Tax (direct tax) and Value Added Tax (indirect tax). Income tax is the tax imposed on income derived or accrued in the tax year. Taxable income is defined as income in the broadest sense or worldwide income, namely that the tax is levied on any additional economic capability received or earned by a Taxpayer from whichever origin may be used for consumption or increase the taxpayer's wealth. The income tax includes corporate income tax and individual income tax (Uppal, 2003) & (Direktorat Jenderal Pajak, 2013). Tax rates applied to Taxable Income for corporate income tax is 28% but for individual income tax depends on taxable income layer, the range between 5% and 30%.

Value Added Tax (VAT) is a tax on the consumption of goods and services in the Indonesian custom region which are charged at various stages in production and distribution line. The imposition of VAT depends on the pattern of consumption in the community and the development of business transactions (Kementerian Keuangan, 2009). The Value Added Tax rate is 10%.

The manufacturing, trade and financial services industries are listed as the three leading sectors that contribute greatly to both the non-oil & gas income tax and value added tax revenues (Table 1 & Table 2 in the Appendix). For the total non-oil & gas income tax, the financial services contributed 30.6 percent of the revenue in 2017. The next position was occupied by the manufacturing sector which contributed 24.7 percent and followed by the trade sector at 12.6 percent. When compared to 2016, the manufacturing, trade and financial services sectors experienced growth at 17 percent, 24 percent and 4 percent respectively (Table 3). For the value added tax, the manufacturing sector contributed 42.4 percent of the revenue in 2017. The next position was occupied by the trade sector which contributed 25.7 percent and followed by the financial services sector at 10.3 percent. When compared to 2016, the manufacturing, trade and financial services sectors experienced growth at 18 percent, 20 percent and 12 percent respectively (Table 4).

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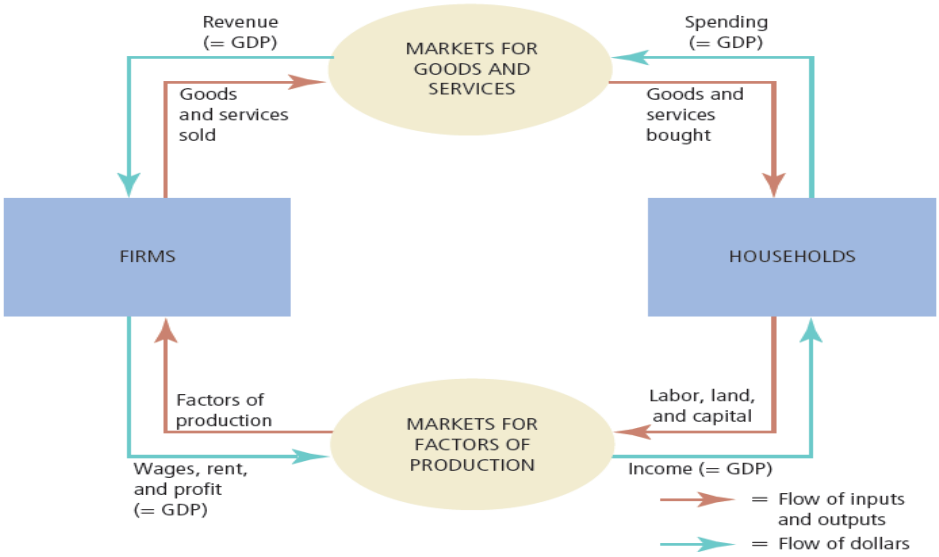
2.1.2 Economic Activity

There are three indicators for economic activity used in this paper. They are production, consumption and investment indicators(see (Iriqat & Anabtawi, 2016), (Saqib, Ali, Riaz, Anwar, & Aslam, 2014) and (Lescaroux & Mignon, 2008)). According to (Badan Pusat Statistik, 2015) the production is economic activity to produce goods and services or output using available resources or input. The proxy used for production activity is Gross Domestic Product (GDP). Consumption activity is an activity of purchasing goods and services conducted by consumers (Mankiw, 2016). Generally, consumption for goods and services are disposable. The data proxy used to reflect consumption activity is the expenditure of Household Consumption in GDP Expenditure. Investment activity is the activity of purchasing goods either by individuals or companies to increase the stock of capital (Mankiw, 2016). In contrast to consumption that tends to be disposable or directly discharged, investment goods have a life period or service life of more than one year. The data proxy used to reflect investment activity is Gross Fixed Capital Formation in GDP by expenditures.

According to (Badan Pusat Statistik, 2015) there are three approaches in measuring GDP: the production, expenditure and income approaches. According to (Mankiw, 2011) these three approaches will yield the same result where GDP Production = GDP Spending = GDP Revenue (Figure 1). Production GDP is the sum of value added by business field plus tax minus subsidy on the product. GDP Spending is the sum of the final demand minus imports. GDP Revenue is the sum of labor compensation, gross business surpluses, taxes minus other subsidies on production plus taxes minus subsidies on products.

FIGURE-2 Circular flow



Source: Mankiw (2011)

The nominal growth of economic activities in the form of consumption and investment in 2017 was lower than the nominal economic growth even though in the previous several years it grew higher (Table 5). The contribution of consumption and investment to nominal GDP reached above 80 percent (Table 6). By sector, there are five sectors that contribute greatly to nominal GDP, namely agriculture, manufacturing, construction, trade and services (Table 7). However, the five nominal growth sectors actually grew by only one digit (Table 8).

3. RESEARCH METHOD

This study uses monthly realization of tax revenue for both total and sectoral. For economic activity data, we use data derived from national account data or GDP based on expenditure and production approach (sectoral). Monthly tax revenue data is then aggregated into quarterly data to match the frequency of GDP data. Period of data being studied is Q1 2010 - Q4 2017.

The method used in this study consists of several stages. The first stage is to analyze tax data consisting of 21 sectors to see the relationship with GDP data consisting of 17 sectors. Then aggregate the tax data and GDP

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data into 9 sectors (Please see Table 3.1, 3.2 and 3.3). After the aggregation of tax and GDP data, tax revenue and economic activity data needs to be seasonally adjusted and then decomposed into two components of the data, seasonal and cycle. The two components of data are analyzed to examine the relationship between tax revenues and economic activity. The next stage is to conduct cointegration and causality test by firstly testing unit root to see the order of integration of time series data.

3.1 Seasonality and Cyclicality

According to (Enders, 2015), any time series data can be decomposed into four components: trend, seasonal, cyclical and irregular components. Time series data is a sequence of data of economic activity obtained in a regular time span. Data obtained on a monthly or quarterly basis will cause an appeal issue because if the data still contains seasonal elements, then we cannot distinguish whether the increase or decrease in the time series data is caused by the actual underlying behavior and direction of the series or only by seasonal patterns only.† Some examples of seasonal influence are retail sales or consumptions in Indonesia that typically rise significantly during Ramadhan or Eid Al-Fitr, and Christmas or New Year.

Research conducted by (Barsky & Miron, 1989) shows that seasonal fluctuations are an important source of variation across all macroeconomic quantity variables. Seasonal influences are often large enough to mask other characteristics of data that are important for the analysis of economic trends. For example, if every month there are different seasonal factors on the high or low value it will be difficult to detect the general direction of the data whether it is up, down, reversed, no change, or consistent with other economic indicators. Therefore, this seasonal influence should be eliminated from time-varying data to obtain non-seasonal factors that affect data. The process of eliminating seasonal factors is commonly called seasonal adjustment. To make the seasonal adjustment process, we use EViews software programs that already have seasonal adjustment facilities like Census X13.

3.2 Unit Root Test

Testing for unit roots is necessary to prevent spurious regression. According to (Harris & Sollis, 2003) "if a series must be differenced d times before it becomes stationary, then it contains d unit roots." Unit root testing includes testing for the order of integration of the series. A notation $y_t \sim I(d)$ means that a series yt is said to be integrated of order d (Harris & Sollis, 2003).

The most commonly employed methods for unit root testing is Augmented Dickey-Fuller (ADF) test. There are three possible formulations of ADF unit root test that include three different combinations of the deterministic part (Widarjono, 2017).

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_{1t}$$

$$\Delta Y_t = a_0 + \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_{2t}$$

$$\Delta Y_t = a_0 + a_1 T + \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_{3t}$$

where Y_t is the variable under consideration, T is time trend, and k is the number of lagged differences to capture any autocorrelation. If the value of ADF statistic is smaller (more negative) than its critical value, the null hypothesis of nonstationary is rejected.

3.3 Cointegration Test

Cointegration concept has two essential characteristics. First, cointegration requires the variables have the same order of integration, and second, if there are N variables in the model, it is possible that the model has

† *U.S. Census Bureau, "FAQs on Seasonal Adjustment,"* http://www.census.gov/const/www/faq2.html

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N-1 cointegrating vectors (Enders, 2015) and (Harris & Sollis, 2003). For example, if two series are both integrated of order one, I(1), there can be one cointegrating vector. One of the most popular cointegration tests is the Johansen cointegration test (Widarjono, 2017).

(Engle & Granger, 1987) introduce the concept of cointegration as follows: "If x_t is a vector of economic variables, long-run equilibrium occurs when

$$\alpha' x_t = 0.$$

In most time periods, deviations from long-run equilibrium occur, and therefore;

$$z_t = \alpha' x_t ."$$

Then, (Engle & Granger, 1987) present the formal definition of cointegration as follows: "The components of the vector x_t are said to be cointegrated of order d, b, denoted by $x_t \sim CI(d,b)$, if (1) all components of x_t are integrated of order d or I(d); and (2) there exists a vector α such that $z_t = \alpha' x_t \sim I(d-b), b>0$." The vector α is called the cointegrating vector (Enders 1995).

3.4 Causality Test

The Granger causality test applied to the following two series, yt and zt, to answer the following question: does the change in the zt variable cause the variable change yt? if the variable zt Granger causes the variable yt then the lag of the zt variable should be significant in the yt equation. Then the past zt can help to estimate yt or z Granger cause y (Brooks, 2014).

The Granger causality test applied to the following two series, yt and zt, are both vector autoregressive (VAR) equations as follows:

$$y_t = \delta_0 + \alpha_1 y_{t-1} + \gamma_1 z_{t-1} + \alpha_2 y_{t-2} + \gamma_2 z_{t-2} + \cdots$$

and

$$z_t = \eta_0 + \beta_1 y_{t-1} + \rho_1 z_{t-1} + \beta_2 y_{t-2} + \rho_2 z_{t-2} + \cdots$$

Then the past z can help to estimate yt or z Granger cause y with condition:

$$\mathrm{E}(y_t|I_{t-1}) \neq \mathrm{E}(y_t|J_{t-1})$$

The expected value of yt given any values of It-1 is not equal to the expected value of yt given any values of Jt-1. It-1 contains past information on y and z while Jt-1 contains only y information. So that the past information z along with the past y can predict Yt..

4. RESULT AND DISCUSSION

4.1. UNIT ROOT TESTS RESULTS

Unit root testing is necessary to determine the order of integration. According to the Engle-Granger definition, cointegration requires that the variables be integrated of the same order. The ADF test includes some lags of dependent variables to eliminate serial correlation from the error terms. Choosing the optimal lag length for the ADF test for a small sample is rather difficult. Too many lags will cause the losing of a degree of freedom and too few lags will cause the test to be incorrect (Wooldridge, 2016). For annual data, (Wooldridge, 2016) suggest using one or two lags. Alternatively, choosing the optimal lag length can be based on the information criterion.

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Table 4.1 in the Appendices shows the result of the ADF test together. The figures are the ADF statistics. If the ADF statistic is smaller than the critical values at the 1% levels; the variables are stationary. The ADF statistics in Table 4.1 indicate all variables are integrated of order one.

4.2. RESULT OF ANALYSIS OF INCOME TAX DATA NON-OIL & GAS

4.2.1. Overall Seasonal Patterns

Based on Table 4.2 we can see that income tax receipts tend to be high on every Q2 & Q4. This seasonal pattern of income tax receipts follows the seasonal pattern of economic data as follows: a) GDP that tends to be high in every Q2 & Q3; b) high tendency consumption in every Q3 & Q4; and c) investments that tend to be high in every Q3 & Q4.

4.2.2. Sectoral Seasonal Patterns

Economic developments on a quarterly basis are heavily influenced by seasonal factors. Table 4.3 in the Appendices shows that almost all sectors have decreased their activities in Q1.

Seasonal pattern of sector GDP 01 (Agriculture, Animal Husbandry, Livestock and Fishery) shows that there is a relatively low activity in Q1 then increases in Q2 and Q3. The activity at Q4 is lower than that of Q1. This pattern is influenced by planting season and harvest pattern of agriculture sector. For example the peak harvest of rice which is a food crop generally occurs in Q1 and Q2 every year. Later on the plantations generally have a harvest period in Q2 and Q3. While in Q4 generally the agricultural sector entered the planting period.

The seasonal pattern of non-oil income tax revenue from sector 01 indicates an increase in revenues in Q2 and Q4. This pattern is slightly different from the seasonal pattern of GDP sector 01. This difference can be caused by quite a lot of tax deposit types whose patterns do not follow GDP seasonal patterns such as income tax article 25 which tends to be flat monthly which is generally based on last year's tax payment or final income taxes such as interest income tax on time deposits and saving accounts that the seasonal pattern does not follow the seasonal pattern of GDP sector 01.

The seasonal pattern of GDP sector 02 (Mining and Quarrying) shows a more uniform seasonal pattern where there is an increase in activity in Q2, Q3 and Q4. Sector 02 is strongly influenced by commodity price movements and global demand. The seasonal pattern of non-oil sector income tax revenues 02 is clearer where there is an increase in revenues in Q2 and Q4.

Similar to the seasonal pattern of GDP sector 02, seasonal pattern of GDP sector 03 (Processing Industry) shows an increase in activity in Q2, Q3 and Q4. The seasonal pattern of sector 03 is also influenced by domestic demand which in turn is influenced by other seasonal patterns such as fasting month, Eid Al-Fitr holidays, Christmas, new school year, school holidays, and year-end holidays. Activity in Q1 is relatively low because at the beginning of the year is the preparation of production process. The seasonal pattern of non-oil income tax revenue sector 03 indicates an increase in revenue in Q2.

The seasonal pattern of GDP sector 04 (Electricity, Gas and Water) shows an increase in activity in Q2 and Q4. Sector 04 as public utility companies that support community activities widely influenced by public utility demand from other sectors so that the seasonal pattern is in line with the production activities of other sectors (Hidayat, 2016). The seasonal pattern of non-oil income tax revenue sector 04 indicates an increase in revenue in Q2.

Seasonal pattern of GDP sector 05 (Construction) shows an increase in activity in Q3 and Q4. Patterns in accordance with the pattern of government infrastructure development tend to be high in the last two quarters each year. The seasonal pattern of non-oil income tax revenues sector 05 indicates an increase in revenues in Q2 and Q4.

Seasonal patterns of GDP sector 06 (Trade, Hotel and Restaurant) show an increase in activity in Q2 and Q3. The trade sub-sector is a sector that distributes goods produced by the goods-producing sector such as

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agriculture and processing industry so that the pattern can be influenced by the seasonal pattern of related industries (Hidayat, 2016). In addition, sector 06 is also influenced by routine community activities such as holidays and school holidays. The seasonal pattern of non-oil income tax revenue sector 06 shows an increase in revenue in Q2.

The seasonal pattern of GDP sector 07 (Transport and Communications) shows an increase in activity in Q3 and Q4. Sector 07 is influenced by seasonal activities such as holidays, school holidays, New Year. The seasonal pattern of non-oil income tax revenue sector 07 indicates an increase in revenue in Q2.

Seasonal patterns of GDP sector 08 (Finance, Real Estate, and Financial Services) indicate an increase in activity in Q1 and Q3. Financial and financial services sub-sectors are affected by the cycle of funding/loan needs. Loan demand has generally increased since March to June then leveled until October. The seasonal pattern of real estate subsector is influenced by seasonal patterns in general such as holidays, new school year. The seasonal pattern of non-oil income tax revenue sector 08 indicates an increase in revenue in Q2.

The seasonal pattern of GDP sector 09 (Services) shows an increase in activity in Q3 and Q4. The seasonal pattern of non-oil income tax revenue sector 08 indicates an increase in revenue in Q4.

The seasonal pattern of non-oil/non-tax revenues that tend to be high in Q2 and Q4 indicates the existence of tax planning in all sectors where the payment and tax refund of both individual and corporate income taxpayers are done before the income tax return is submitted. The deadline for submitting an annual tax return is three months after the end of the tax year.

4.2.3. Overall Cycle Patterns

The pattern of income tax cycle follows the pattern of GDP cycle. The pattern of income tax cycle before 2015 follows the consumption cycle pattern but during 2015-2017 the cycle pattern of income tax has the opposite direction to the consumption cycle pattern. The pattern of income tax cycle generally follows the investment cycle pattern although the investment cycle pattern is more volatile than that of the income tax.

4.2.4. Sectoral Cycle Patterns

The conformity of cycle patterns between the sectoral GDP cycle and the sectoral income tax cycle as follows: in general, the pattern of GDP cycle of sector 01, 02, 03, 05, 06, 07,and 09 have similar pattern with income tax sector 01 01, 02, 03, 05, 06, 07, and 09. However, the cycle pattern of income tax for sector 04 and 08 have slightly opposite cycle pattern compare to GDP cycle pattern of sector 04 and 08, meaning that when GDP has an ascending cycle, income tax revenues cycle for sector 04, and 08 are descending.

4.2.5. Overall Cointegration and Causality Test

The cointegration tests show that income tax revenue is cointegrated with GDP, investment and consumption meaning that there are long run relationships amongst those variables. Causality test indicates that income tax revenues have a causal relationship with GDP, investment and consumption where those economic variables Granger cause the income tax so that the income tax is a lagging variable that moves following the variable of GDP, investment and consumption (Please see Table 4.4).

4.2.6. Sectoral Cointegration and Causality Test

The sectoral cointegration tests show that there are cointegration amongst the variables of GDP and income tax receipts sectoral. Sector 01 and 02 have a unidirectional causality from income tax to GDP. Such causality direction is unusual because the process of taxation should be done after economic activity is occurred, not the opposite. A plausible reason for this anomaly is that generally the tax revenue data is only

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able to describe formal businesses and formal workers, whereas, the number of informal businesses and workers in the agricultural sector is relatively high. Another reason is that state revenues from the mining sector are dominated by Non-Tax State Revenues (NTSR) which consist of fixed fees (landrent), production fees (royalties), and sales of mining products. Unfortunately, the tax receipt data used in the study does not include this NTSR data. Sector 04 has a bi-directional causality both from income tax to GDP and from GDP to income tax. Other sectors have a unidirectional causality from GDP to income tax. The direction of causality is more reasonable where economic activity precedes the process of taxation (Please see Table 4.4).

4.3. RESULTS OF SECTORAL VALUE ADDED VALUE DATA ANALYSIS

4.3.1. Overall Seasonal Patterns

Table 4.2 shows that VAT revenues tends to be higher close to Q4. This seasonal pattern follows the seasonal pattern of economic activity data for GDP, consumption and investment.

4.3.2. Sectoral Seasonal Patterns

Table 4.3 shows that all sectoral VAT receipts are increasing in Q4. There are two sectors that have increased VAT revenue in Q1 and Q4 that is sector 02 and sector 04. Meanwhile, there are two sectors that experienced increased VAT revenues in Q2 and Q4 namely sector 03 and sector 07.

4.3.3. Overall Cycle Patterns

The pattern of VAT cycles follows the GDP and consumption cycle pattern although some VAT cycle pattern has the opposite direction to the GDP and consumption cycle pattern. The pattern of VAT cycles generally follows the investment cycle pattern although the investment cycle pattern is more volatile than VAT.

4.3.4. Sectoral Cycle Patterns

The conformity of cycle patterns between the sectoral GDP cycle and the sectoral VAT cycle can be explained as follows: in general, the pattern of GDP cycle for sector 01, 02, 04, 05, 06, and 08 have similar pattern with that of VAT cycle for sector 01, 02, 04, 05, 06, and 08. However, the pattern of VAT cycle for sector 03, 07, and 09 is somewhat opposite to GDP cycle for sector 03, 07, and 09.

4.3.5. Overall Cointegration and Causality Test

Cointegration test shows that there are cointegrations between VAT, GDP, consumption and investment. Granger causality test indicates unidirectional causality from GDP to VAT so that VAT is a lagging variable that moves following the variable of GDP. The lagging variable is still useful to confirm the movement of consumption and investment variables but cannot be used to forecast the economic variable. The bi-directional causality between consumption and VAT indicates that VAT is coincidence variable for consumption. However, the test does not indicate causality between investment and VAT (Please see Table 4.4).

4.3.6. Sectoral Cointegration and Causality Test

The sectoral cointegration tests show that there are cointegration amongst the variables of GDP and VAT receipts sectoral. Almost all sectors have a unidirectional causality from GDP to VAT, except sector 02 which bi-directional causality and sector 03 which unidirectional causality from VAT to GDP (Please see Table 4.4).

4.4. DISCUSSIONS

The econometric results above show a relationship between tax revenue collection and economic activity as evidenced by the existence of cointegration and Granger causality, meaning that the movement between tax revenue collection and economic activity generally moves in line. However, the increase (decrease) in tax revenue collection is higher (deeper) compared to the increase (decrease) in economic activity. For example, VAT revenue collection during 2012-2013 grew above the growth in nominal consumption of GDP. But during 2014-2017 VAT revenue collection growth was far lower than the nominal growth in GDP-GDP. The same thing happened to non-oil & gas tax income collection in 2015 grew by 21.6% higher than economic activity nominal GDP growth of 9.1%.

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These findings are in consonance with the studies of (Chigbu et al., 2012), (Takumah, 2014), (Zakaria & Nabi, 2016), and (Iriqat & Anabtawi, 2016) that suggests a cointegration and causality between tax and economic activity. Previous research above can provide insight into findings in Indonesia, namely changes in tax act and tax code can affect econometric results and there is a need for efforts to improve tax revenue collection through efficient and effective tax administration so that tax evasion can be minimized and the public will benefit from tax.

Some of the policies that have been taken by the government to encourage economic activities through tax instruments include tax holiday for pioneer industries, tax allowance for certain industries in certain areas (priority industries), and VAT exemptions.

5. CONCLUSIONS AND RECOMMENDATIONS

The main contribution of this research is empirical testing on the linkage between tax revenue and economic activity. Several conclusions that can be drawn from the results are: a) Seasonal patterns and cycles of Income Tax and VAT revenues data generally follow economic data; and b) The Income Tax and VAT revenues data are cointegrated with economic data but the tax data is lagging against economic data so that it can only be used to confirm the development of economic data rather than for forecasting economic activity.

Based on the seasonal variations and their relationship with the economic activity, the policy recommendations from this study that can be provided in order to increase the collection of tax revenues is to expand the personal and corporate income tax base, minimize VAT exemptions and special tax base, promote formalization of businesses and workers, and improve tax administration. The general recommendation is that the government must formulate policies to increase production, investment and consumption which in turn will increase tax revenue. And as mention by (Tanzi, 1988) that sound macroeconomic policies have a good impact on tax policies to raise tax revenues.

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APPENDICES

TABLE-1 Sectoral Non-Oil & Gas Income Tax Revenue Share/Proportion* (%)

	2011	2012	2013	2014	2015	2016	2017
1. Agriculture, livestock, forestry, and fisheries	2.9	3.1	2.7	2.3	2.5	1.5	2.0
2. Mining and quarrying	18.1	15.1	11.4	10.1	9.3	6.7	9.8
3. Manufacturing	26.1	26.5	26.4	25.1	23.2	19.9	24.7
4. Electricity, gas, and clean water	2.7	2.2	3.2	2.7	4.1	4.3	3.0
5. Construction	2.3	2.5	2.5	2.8	2.6	2.2	2.6
6. Trade, hotels, and restaurants	9.6	10.5	10.6	11.2	10.7	9.5	12.6
7. Transport and communications	6.0	6.4	6.8	6.9	6.5	6.3	7.4
8. Finance, real estate and financial services	25.5	26.1	28.5	30.5	32.6	42.4	30.6
9. Services	6.7	7.8	8.1	8.4	8.4	7.2	7.3

Source: Ministry of Finance
* Proportion to total non-oil and gas tax revenue.

TABLE -2 Sectoral Value Added Tax Revenue Share/Proportion* (%)

	2011	2012	2013	2014	2015	2016	2017
1. Agriculture, livestock, forestry, and fisheries	1.5	1.2	1.0	1.2	1.3	1.4	1.7
2. Mining and quarrying	3.3	2.8	3.1	3.8	2.7	2.0	1.8
3. Manufacturing	47.8	49.7	48.4	47.7	42.4	42.4	42.4
4. Electricity, gas, and clean water	0.4	0.5	0.5	0.5	0.6	0.7	1.2
5. Construction	6.5	8.0	9.0	8.8	10.5	10.0	8.7
6. Trade, hotels, and restaurants	19.9	21.3	21.1	21.4	24.0	24.5	25.7
7. Transport and communications	6.0	6.1	5.9	5.8	6.6	7.0	6.8
8. Finance, real estate and financial services	13.8	9.4	9.8	9.7	10.5	10.3	10.3
9. Services	0.8	1.0	1.1	1.1	1.3	1.8	1.5

Source: Ministry of Finance
* Proportion to total value added tax revenue

TABLE -3 Sectoral Tax Revenue Growth (%)

Non Oil & Gas Income Tax	2013	2014	2015	2016	2017
1. Agriculture, livestock, forestry, and fisheries	-2	-5	30	-32	24
2. Mining and quarrying	-16	-3	13	-20	39
3. Manufacturing	11	4	13	-4	17
4. Electricity, gas, and clean water	58	-6	82	18	-31
5. Construction	12	23	15	-5	6
6. Trade, hotels, and restaurants	13	16	16	-1	24
7. Transport and communications	19	12	15	8	13
8. Finance, real estate and financial services	23	17	30	-9	4
9. Services	15	14	23	-5	6

Source: Ministry of Finance

TABLE -4 Sectoral VAT Revenue Growth (%)

VAT	2013	2014	2015	2016	2017

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1. Agriculture, livestock, forestry, and fisheries	-2	33	10	9	36
2. Mining and quarrying	25	33	-27	-28	1
3. Manufacturing	11	7	-8	0	18
4. Electricity, gas, and clean water	20	11	18	19	122
5. Construction	29	6	24	-5	7
6. Trade, hotels, and restaurants	13	10	16	2	20
7. Transport and communications	10	6	17	7	10
8. Finance, real estate and financial services	23	4	12	-3	12
9. Services	21	10	28	36	3

Source: Ministry of Finance

TABLE-5 Nominal Growth of Economic Activity (in percent)

	2011	2012	2013	2014	2015	2016	2017
GDP	14.1	10.0	10.8	10.7	9.1	7.6	9.5
Consumption	12.8	12.0	12.0	11.1	10.1	7.8	8.0
Investment	15.2	15.0	8.2	12.6	10.0	6.8	8.2

Source: BPS - Statistics Indonesia

TABLE-6 Economic Activity (Proportion of Nominal GDP, in percent)

	2010	2011	2012	2013	2014	2015	2016	2017
Consumption	65.2	64.5	65.6	66.3	66.6	67.2	67.3	66.4
Investment	31.0	31.3	32.7	32.0	32.5	32.8	32.6	32.2

Source: BPS - Statistics Indonesia

TABLE-7 Share of Sectoral growth to Nominal GDP, in percent

	2012	2013	2014	2015	2016	2017
1. Agriculture, livestock, forestry, and fisheries	13.7	13.7	13.7	13.9	14.0	13.7
2. Mining and quarrying	11.9	11.3	10.1	7.9	7.4	7.9
3. Manufacturing	21.9	21.6	21.6	21.7	21.3	21.0
4. Electricity, gas, and clean water	1.2	1.1	1.2	1.2	1.3	1.3
5. Construction	9.6	9.7	10.1	10.5	10.8	10.8
6. Trade, hotels, and restaurants	16.5	16.7	16.9	16.8	16.7	16.5
7. Transport and communications	7.4	7.7	8.1	8.8	9.1	9.6
8. Finance, real estate and financial services	8.1	8.4	8.4	8.8	9.0	9.1
9. Services	9.7	9.9	9.9	10.3	10.4	10.2

Source: BPS - Statistics Indonesia

TABLE-8 Growth of Nominal Sectoral GDP, in percent

GROWTH	2013	2014	2015	2016	2017
1. Agriculture, livestock, forestry, and fisheries	10.7	10.6	10.3	7.5	6.9
2. Mining and quarrying	5.0	-1.1	-15.2	1.0	15.5
3. Manufacturing	8.6	11.0	8.6	5.2	7.6
4. Electricity, gas, and clean water	3.6	15.9	12.7	9.3	13.7
5. Construction	12.5	15.0	13.0	9.4	9.5
6. Trade, hotels, and restaurants	11.5	12.2	7.7	6.6	7.9
7. Transport and communications	14.7	16.8	17.7	11.1	14.3

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8. Finance, real estate and financial services	13.5	11.6	13.0	10.2	9.9
9. Services	11.9	11.1	12.9	7.9	7.3

Source: BPS - Statistics Indonesia

Table 3.1 Tax Data Consisting of 21 Sectors

A. Agriculture, Forestry, and Fishing
B. Mining and quarrying
C. Manufacturing
D. Electricity, gas, steam and air conditioning supply
E. Water Supply, Sewerage, Waste Management, and Remediation Activities
F. Construction
G. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
H. Transportation and Storage
I. Accommodation and Food Services Activities
J. Information and Communication
K. Financial and Insurance Activities
L. Real estate
M. Professional, scientific and technical activities
N. Rental, Employment, Travel Agents and Other Business Supporting Activities
O. Public Administration and Compulsory Social Security
P. Education
Q. Human Health Services and Social Work Activities
R. Culture, Arts, Entertainment And Recreation
S. Other Services Activities
T. Activities of Households as Employers; Undifferentiated Goods- and Services-Producing Activities of Households for Own Use
U. Activities of Extraterritorial Organizations and Bodies

Source: Ministry of Finance

Table 3.2 GDP Production Approach Data and Its Correspondence with Tax Data

1. Agriculture, Forestry, and Fishing = A
2. Mining and quarrying = B
3. Manufacturing = C
4. Electricity and Gas Supply = D
5. Water Supply, Sewerage, Waste Management, and Remediation Activities = E
6. Construction = F
7. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles = G
8. Transportation and Storage = H
9. Accommodation and Food Services Activities = I
10. Information and Communication = J

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11. Financial and Insurance Activities =K
12. Real estate = L
13. Business Activities = M + N
14. Public Administration and Defense; Compulsory Social Security = O
15. Education = P
16. Human Health Services and Social Work Activities = Q
17. Other Service Activities = R + S + T + U

Source: BPS - Statistics Indonesia

Table 3.3 Aggregation Tax Data and GDP into Nine Sectors

1. Agriculture, livestock, forestry, and fisheries =1 = A
2. Mining and quarrying = 2 = B
3. Processing industry = 3 = C
4. Electricity, gas, and clean water = 4 + 5 = D + E
5. Construction = 6 = F
6. Trade, hotels, and restaurants = 7 + 9 = G + I
7. Transport and communications = 8 + 10 = H + J
8. Finance, real estate and financial services = 11 + 12 + 13 = K + L + M + N
9. Services = 14 + 15 + 16 + 17 = O + P + Q + R + S + T + U

Source: Ministry of Finance, BPS - Statistics Indonesia and Author's Calculation

Table 4.1 Augmented Dickey-Fuller Test Results

No	Variables	ADF Statistics	Critical Values 1% level	Stationarity
1	GDP_NOM	--8.97	-4.32	1st
2	CONS_NOM	-6.32	-4.31	1st
3	INV_NOM	-7.26	-4.30	1st
4	PPH_NOM	-27.04	-4.30	1st
5	PPN_NOM	-9.23	-4.30	1st
6	PDB_01	-5.31	-4.47	1st
7	PDB_02	-3.77	-2.67	1st
8	PDB_03	-4.97	-4.44	1st
9	PDB_04	-5.21	-4.50	1st
10	PDB_05	-5.14	-4.47	1st
11	PDB_06	-9.45	-4.47	1st
12	PDB_07	-8.01	-4.47	1st
13	PDB_08	-7.01	-4.44	1st
14	PDB_09	-8.87	-4.50	1st
15	SEK_01_PPH	-10.51	-4.44	1st
16	SEK_02_PPH	-7.84	-4.44	1st
17	SEK_03_PPH	-7.36	-4.50	1st
18	SEK_04_PPH	-10.56	-4.44	1st
19	SEK_05_PPH	-18.50	-4.44	1st
20	SEK_06_PPH	-6.42	-4.50	1st
21	SEK_07_PPH	-13.1	-4.44	1st
22	SEK_08_PPH	-14.65	-4.44	1st
23	SEK_09_PPH	-13.98	-4.50	1st
24	SEK_01_PPN	-6.29	-4.44	1st
25	SEK_02_PPN	-7.38	-4.44	1st
26	SEK_03_PPN	-5.38	-4.49	1st
27	SEK_04_PPN	-8.55	-4.47	1st

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28	SEK_05_PPN	-19.02	-4.49	1st
29	SEK_06_PPN	-10.43	-4.49	1st
30	SEK_07_PPN	-5.45	-4.49	1st
31	SEK_08_PPN	-11.49	-4.49	1st
32	SEK_09_PPN	-23.89	-4.49	1st

Source: Author's calculation

Table 4.2 Average Seasonal Factor per Quarter for the GDP, Consumption, Investment and Non-Oil & Gas Income Tax and VAT

	GDP	Consumption	Investment	Income Tax	VAT
Q1	0.98	0.95	0.97	0.88	0.82
Q2	**1.00**	0.98	0.99	**1.14**	0.94
Q3	**1.03**	**1.02**	**1.01**	0.89	0.96
Q4	0.99	**1.05**	**1.04**	**1.09**	**1.28**

Source: Author's calculation

Table 4.3 Average Seasonal Factor per Quarter for the Sectoral of GDP Production, Non-Oil & Gas Income Tax and VAT

		GDP	Income Tax	VAT
Sek01 (Agriculture, Livestock, Forestry and Fisheries)	Q1	**1.05**	0.90	0.98
	Q2	**1.11**	**1.20**	0.97
	Q3	0.86	0.92	0.89
	Q4	0.98	0.98	**1.16**
Sek02 (Mining and Quarrying)	Q1	**1.00**	0.93	**1.03**
	Q2	**1.00**	**1.08**	0.93
	Q3	**1.02**	0.89	0.92
	Q4	0.99	**1.11**	**1.11**
Sek03 (Processing Industry)	Q1	**1.01**	0.91	0.84
	Q2	**1.00**	**1.19**	**1.05**
	Q3	**1.00**	0.94	0.96
	Q4	0.98	0.97	**1.16**
Sek04 (Electricity, Gas and Water Supply)	Q1	**1.01**	0.98	**1.05**
	Q2	0.99	**1.22**	0.93
	Q3	**1.02**	0.86	0.84
	Q4	0.97	0.92	**1.18**
Sek05 (Construction)	Q1	0.98	0.87	0.69
	Q2	**1.01**	**1.10**	0.75
	Q3	**1.04**	0.90	0.90
	Q4	0.98	**1.12**	**1.66**
Sek06 (Trade, Hotel and Restaurant)	Q1	**1.01**	0.93	0.92
	Q2	**1.02**	**1.19**	0.92
	Q3	0.99	0.89	0.96
	Q4	0.98	0.99	**1.20**
Sek07 (Transportation and Communications)	Q1	0.99	0.85	0.91
	Q2	**1.02**	**1.26**	**1.01**

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	Q3	**1.01**	0.91	0.98
	Q4	**1.00**	0.98	**1.10**
Sek08 (Finance, Real Estate, and Financial Services)	Q1	**1.00**	0.92	0.95
	Q2	**1.01**	**1.25**	0.93
	Q3	**1.00**	0.88	0.94
	Q4	0.95	0.96	**1.18**
Sek09 (Services)	Q1	0.98	0.67	0.67
	Q2	**1.02**	0.86	0.71
	Q3	**1.05**	0.97	0.78
	Q4	0.98	**1.49**	**1.85**

Source: Author's calculation

Table 4.4 Cointegration and Causality Test Results

No	Variables	Lag	Cointegration	Causality
1	GDP_NOM & PPH_NOM	2	Yes	GDP_NOM → PPH_NOM (1%)
2	CONS_NOM & PPH_NOM	2	Yes	CONS_NOM → PPH_NOM (1%)
3	INV_NOM & PPH_NOM	2	Yes	INV_NOM → PPH_NOM (1%)
4	GDP_NOM & PPN_NOM	2	Yes	GDP_NOM → PPN_NOM (10%)
5	CONS_NOM & PPN_NOM	6	Yes	PPN_NOM → CONS_NOM (1%) CONS_NOM → PPN_NOM (5%)
6	INV_NOM & PPN_NOM	5	Yes	No
7	GDP_01 & SEK_01_PPH	1	Yes	SEK_01_PPH → GDP_01 (5%)
8	GDP_02 & SEK_02_PPH	1	Yes	SEK_02_PPH → GDP_02 (5%)
9	GDP_03 & SEK_03_PPH	2	Yes	GDP_03 → SEK_03_PPH (1%)
10	GDP_04 & SEK_04_PPH	2	Yes	GDP_04 → SEK_04_PPH (1%) SEK_04_PPH → GDP_04 (10%)
11	GDP_05 & SEK_05_PPH	2	Yes	GDP_05 → SEK_05_PPH (1%)
12	GDP_06 & SEK_06_PPH	2	Yes	GDP_06 → SEK_06_PPH (1%)
13	GDP_07 & SEK_07_PPH	1	Yes	GDP_07 → SEK_07_PPH (1%)
14	GDP_08 & SEK_08_PPH	2	Yes	GDP_08 → SEK_08_PPH (5%)
15	GDP_09 & SEK_09_PPH	2	Yes	GDP_09 → SEK_09_PPH (10%)
16	GDP_01 & SEK_01_PPN	4	Yes	GDP_01 → SEK_01_PPN (5%)
17	GDP_02 & SEK_02_PPN	3	Yes	GDP_02 → SEK_02_PPN (1%) SEK_02_PPN → GDP_02 (5%)
18	GDP_03 & SEK_03_PPN	4	Yes	SEK_03_PPN → GDP_03 (5%)
19	GDP_04 & SEK_04_PPN	2	Yes	GDP_04 → SEK_04_PPN (5%)
20	GDP_05 & SEK_05_PPN	2	Yes	GDP_05 → SEK_05_PPN (1%)
21	GDP_06 & SEK_06_PPN	2	Yes	GDP_06 → SEK_06_PPN (1%)
22	GDP_07 & SEK_07_PPN	4	Yes	GDP_07 ←→ SEK_07_PPN (1%)
23	GDP_08 & SEK_08_PPN	2	Yes	GDP_08 → SEK_08_PPN (10%)
24	GDP_09 & SEK_09_PPN	2	Yes	GDP_09 → SEK_09_PPN (5%)

Source: Author's calculation

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