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Shadow Economy and Loss of Potential Taxes in Indonesia: Empirical Study 1990-2018

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Abstract
The presence of a shadow economy may not be a bad thing for an economy that continues to run dynamically, but it will result in a large loss of state income and also a serious violation of labor regulations. This study aims to examine the shadow economy in Indonesia and the potential loss of tax revenue using the Money Demand Approach, based on empirical data from 1990-2018. The measurement of the shadow economy is carried out in two stages: first, estimation using the econometric model of the aggregate equation for money demand. Second, calculate the value of the shadow economy through the quantity theory of money transactions, and the potential for tax loss. The key variables used in this study are currency as total money outside the banking system, gross domestic income (GDP) deflator, 6-month deposit interest rate, annual inflation rate, tax to GDP ratio, and M2 (broad money). The results showed an average of the shadow economy in the 1990-2018 period was 5.44 percent, and the highest in 1998 was 21.75 percent. Tax losses caused by the economic shadow are on average 0.70 percent of GDP.

Keywords: shadow economy, quantity theory of money, tax loss, econometric time series, money demand approach

Economía sumergida y pérdida de impuestos potenciales en Indonesia: estudio empírico 1990-2018

Resumen
La presencia de una economía sumergida puede no ser algo malo para una economía que continúa funcionando dinámicamente, pero dará como resultado una gran pérdida de ingresos estatales y también una grave violación de las regulaciones laborales. Este estudio tiene como objetivo examinar la economía sumergida en Indonesia y la posible pérdida de ingresos fiscales utilizando el Enfoque de Demanda de Dinero, basado en datos empíricos de 1990-2018. La medición de la economía sumergida se lleva a cabo en dos etapas: primero, la estimación utilizando el modelo econométrico de la ecuación agregada para la demanda de dinero. Segundo, calcule el valor de la economía sumergida a través de la teoría cuantitativa de las transacciones monetarias y el potencial de pérdida de impuestos. Las variables clave utilizadas en este estudio son la moneda como dinero total fuera del sistema bancario, el deflactor del ingreso interno bruto (PIB), la tasa de interés de depósitos a 6 meses, la tasa de inflación anual, la relación impuesto / PIB y M2 (dinero amplio). Los resultados mostraron que el promedio de la economía sumergida en el período 1990-2018 fue de 5.44 por ciento, y el más alto en 1998 fue de 21.75 por ciento. Las pérdidas fiscales causadas por la sombra económica son, en promedio, el 0,70 por ciento del PIB.

Palabras clave: economía sumergida, teoría cuantitativa del dinero, pérdida de impuestos, series de tiempo econométricas, enfoque de demanda de dinero.

1.Introduction

Economic activity that is hidden, closed, and cannot be recorded and monitored by official statistics is a major natural characteristic of the shadow economy. Unavailability of official statistics on the size of shadow economy requires the use of an indirect approach of the estimated magnitude of the shadow economy.

Dynamic movements and an increase in the size of the shadow economy are also characterized by increasingly complex and increasingly broad (global) coverage of economic transactions. Shadow economy is

primarily an illegal and hidden activity of companies or various economic agents, in the form of: avoidance of tax payments, illicit trade or underhanded prices. These economic activities are different from the "grey market" in the form of distribution of illegal goods and others on the official distribution network (Nehor & Konderla, 2016). Estimates of the size of the shadow economy and potential tax loss are very important for Indonesia as a developing country. Indonesia needs a condition of fiscal independence to strengthen the ability of government spending and avoid debt traps.

This study uses the Money Demand Approach to estimate the amount of shadow economy in Indonesia in the period 1990-2018. The Money Demand Approach was originally originally proposed by Cagan (1958) and redefined and applied by Tanzi (1983) using economic data in the United States. The current Money Demand approach has been widely adopted and is a reference for estimating the size of the shadow economy (Ferwerda, 2010; Schneider, at.al, 2010). The Money Demand Approach to measure the amount of shadow economy is carried out through two stages: 1). Estimates using the econometric model to estimate the aggregate demand equation for money based on specific variables related to cash transactions in the shadow economy. 2). Calculation of the shadow economy transaction value through the quantity theory of money and then calculation of potential tax loss, The key assumption of the first stage of estimation is that transactions in the shadow economy are established through a cash mechanism to avoid the occurrence of tracking, detection, and the main reason for shadow economy is high tax burden.

The purpose of this study is to estimate the magnitude of the shadow economy in Indonesia and calculate the potential tax loss as a percentage of GDP. The next structure of this research is: section 2 presents a concise review of the literature and hypotheses to be tested; section 3 provides lay-out of model and data specifications, including model specifications, data characteristics and data analysis; section 4 discusses the results of estimates in the form of the amount of shadow economy and the amount of tax loss in the study period, and finally; Section 5 is the concluding section, summarizing the results of the study and some of the implications of the research results

2. Literature Review and Hypothesis Development

2.1 Shadow Economy and It's Measuring Efforts

For a functioning economy it is very important to understand the whole entity, including the ability to estimate the amount of its shadow economy. The definition of shadow / underground economy is different between experts. Carter (1984) states that the first part of the hidden economy is the informal economy, which is not covered by the GDP definition and no effort is made to measure it properly. Examples are household production, independent work, and similar activities. The second part is activities that can be measured but apart from official records or measurements. Included in this category are the activities of a registered economic actor but taking the action of not reporting with the aim of avoiding taxes and also an undocumented economic actor who does not report his income. The last part of the shadow economy is the criminal economy which carries out its activities against the law.

Smith (1994) defines shadow economy as the production of goods and services based on market mechanisms, both legal and illegal, undetected by official estimates of GDP. In other words the shadow economy also includes income from legal production of unregistered domestic goods and services, both from exchange and monetary transactions.There are several methods of approach that can be used to calculate / estimate shadow economy, namely in the form of approaches: direct, indirect, and through the formation of models (Samuda, 2016).

The direct approach is a micro approach by conducting a survey of a group of samples with a particular sample method. The survey is designed to identify activities that are included in shadow economy activities. Shadow economy estimation through direct approach (survey) is often done in several developed countries. The advantage of the direct approach through surveys is that more detailed information is obtained through the questions in the questionnaire. While the weakness is the accuracy. The quality of survey data is strongly influenced by the respondents' cooperative attitude to answer honestly. Shadow economy actors have a tendency to not want to be known.

The indirect approach estimates the amount of shadow economy by using various macroeconomic variables that are thought to have strong relations as indicators. Indicators that are often used as proxies to measure the amount and growth of shadow economy include:

1) Discrepancy between GDP Expenditure and GDP Revenue. This approach is based on statistical discrepancies between GDP calculated with the expenditure approach and GDP calculated through the income ap-

proach. In theory, GDP calculated using the expenditure and income approach will produce the same figures. The difference between the two GDP values can indicate a shadow economy activity in the country.
2) Discrepancy between work participation in the legal and actual sectors. If the work participation rate is fixed, but the work participation rate in the legal sector decreases, it can be an indication of the existence of shadow economy activities.
3) Monetary Approach (Currency Demand). Estimation method with a monetary approach is one of the methods most often used to measure shadow (underground) economy. This method was developed by Tanzi (1983) who uses it to estimate the underground economy in the United States. This model measures the sensitivity of people's desire to hold currency against changes in tariffs or tax burden. Incentives to avoid taxes by using more cash for transactions can affect people's desire to hold cash.

The approach to forming a model is done by representing one indicator that can cover shadow economy activities. The explicitly formed model consists of several factors that cause the development of shadow economy activities.

2.2 Previous Research

There are several empirical studies that have been conducted to estimate the amount of shadow economy. Gutmann's research (1977) estimated the size of the underground (black) economy in the United States. Based on it's calculations using a monetary approach (the ratio of currency to demand deposits) in the period 1937-1941, it was estimated that underground economy in the United States reaches $ 200 billion (Nizar and Purnomo, 2011).

Subsequent research in the United States, conducted by Tanzi (1983) using data from the 1930-1980 period. Tanzi (1983) used a monetary approach that was the analysis of demand for cash (currency demand). The basic assumptions of Tanzi's research were: (i) underground economy activities as a consequence of high tax rates, and (ii) underground economy activities primarily using cash as a transaction medium. The model used two alternative tax variables namely the weighted average tax rate and the ratio of income tax revenue to GDP. In the study Tanzi also estimated the level of tax avoidance by multiplying the amount of the underground economy by the tax ratio.

Furthermore, Faal (2003) estimated the amount of underground

economy value in Guyana in the period 1964-2000, by modifying the Tanzi model (1983), namely by using the sensitivity of currency demand. The model measures whether changes in tax burden will change the demand for currency. Because currency demand is part of the money demand, this model uses the standard money demand model by adding tax variables. From the estimation results it is known that the magnitude of the underground economy in Guyana during the study period was around 54.06% of GDP and the average potential tax contained was around 19.58% of GDP.

Recorded several studies conducted in Indonesia to estimate the magnitude of the shadow economy. Research by Wibowo and Sharma (2005) estimated that the average value is 22.21% of GDP, estimates were made for the period 1976 to 1999. While Panjaitan's research (2007) used the Shadow Economy Size Base Model approach to estimate the size of shadow economy. The result was, the shadow economy on average average was 40% of GDP in the period 1969 to 2004. Research Tatariyanto (2014), estimated shadow economy in the period between 2000-2008, and got a smaller value, which was an average of 15.6% and a potential tax loss of 3.8%.

This study uses an indirect approach to the demand for currency based on a definition developed by Schneider & Enste (2002) which was later modified by Faal (2003), that shadow economy covers all activities based on the market economy from the production of official goods and services that intend to be hidden from the authorities public for the following reasons: 1). avoidance of paying taxes on income, value added or other taxes; 2) avoidance of payment of health and labor insurance contributions; 3) avoidance of official labor standards regulations, such as minimum and maximum wages of workers' working hours, and; 4) avoidance of compliance with administrative procedures, filled in statistical questionnaires and other administrative reports.

3. Research Methodology and Hypothesis Development

3.1 Research Data and Variables

To estimate the value of Indonesia's shadow economy activities and potential loss of tax revenue, this study uses yearly time series data for the period 1990 to 2018, sourced from the World Bank website, Indonesia Central Bank or Bank Indonesia (BI), and the Central Statistics Agency (BPS)

This study estimates the shadow economy by using the monetary approach to the demand for money equation as introduced by Tanzi (1980) and modified by Schneider & Enste (2002) and Faal (2003). The economic variables used in this study are:

a. Demand for Currency (C)
Is the amount of currency both in the form of banknotes and coins in circulation or in the hands of the public. To reflect the true value, the currency used is real currency, namely nominal currency that has been adjusted to the general price level.
b. Inflation (I)
Reflect changes in the price of a group of goods and services consumed by the community or as a proxy for people's purchasing power. Inflation in theory has a positive influence on demand for currency.
c. Tax expense
As a proxy for the tax burden the ratio between tax revenue and nominal GDP is used. This is in accordance with the definition of the tax burden according to the Organization for Economic Co-Operation and Development (OECD). In this study, the variable tax burden is expected to have a positive effect on demand for the money supply.
d. 6-month deposit interest rate
Deposit interest rates are assumed to be the opportunity cost of holding money. Deposit interest rates in theory have a negative relationship with the demand for currency because the higher the interest rate, the greater the desire for someone to save.
e. Gross Domestic Product (GDP) Deflator
The data used is the Indonesian Gross Domestic Product Deflator taken from the World Bank website in the form of annual data from 1990-2018. The GDP deflator is expected to have a positive influence on quarterly money demand.

3.2 Model Analysis and Model Specifications

This study applies the money demand approach and uses five annual observation variables (time-series), namely: currency, GDP deflator, 6-month deposit rates, inflation rates, and the tax to GDP ratio as stated earlier. Because one of the assumptions of the approach based on money demand is the high tax burden that will stimulate the high falsification of tax reporting (tax evasion), which in turn will increase cash demand, the

expected sign of the tax variable is a positive and significant sign. The results of previous studies (Schneider 1994; 2000) and Johnson, Kaufmann and Zoldo-Lobaton (1998), all show strong evidence of the magnitude of the effect of taxes on the shadow economy.

This study aims to confirm the validity of the relationship based on empirical studies in 1990-2018. Shadow economy estimates in this study were carried out using a monetary approach, based on the regression equation model constructed by Faal (2003). Shadow economy activity is measured through the sensitivity of currency demand. The main reason for this research is to use currency instead of other types of money because economic actors prefer to use cash in conducting transactions. The aim is that the activities carried out are not easily trace or detected by the government, especially the tax authorities. Unlike the case with transactions involving banks and other financial institutions, the tax authorities will be relatively easier to detect. In addition, when someone transfers cash to savings or time deposits, within certain limits, interest on deposits or savings will be taxed.

Currency demand is part of the overall money demand. The demand for currency is thus influenced by changes in the level of income (Y), the price level (Inf), and the interest rate as opportunity cost (R). Another factor that also influences and is introduced in the Faal model (2003) is people's preference for holding currency, represented by financial innovation and banking development variables, are not included in this study. In general, the currency demand model is written in the following functions:

$$C_y = f(Y, O, Inf, T) \quad [1]$$

Cy is currency used for transactions in the official economy. Therefore, the demand for currency in the shadow economy (CSE) is determined by the income in the shadow economy, or it can be written in the following function:

$$C_{SE} = f(Y_{SE}) \quad [2]$$

Based on the equations above, the model specifications that will be used in this study are:

$$\text{Ln}\, C = \beta_0 + \beta_1 \text{LnPDB}\, Deflator + \beta_2 O + \beta_3 Inf + \beta_4 T + e \quad [3]$$

Where β0 is a constant, C = demand for currency; GDP Deflator = Deflator of GDP; O = opportunity cost represented by the interest rate for 6-month deposits; Inf = percentage change in price (inflation); T = tax burden = tax ratio divided by GDP at current prices; e = error term.

Some important things related to the specification model are, an increase in the interest rate on deposits will cause individuals to save and invest their money in the Bank and reduce the amount of cash held. An increase in the GDP deflator will cause people to hold more money for their transaction needs. Meanwhile, the average increase in taxes will cause businesses to keep their cash in private and avoid using the banking system for transactions to avoid taxes.

In the first stage, the estimation results of equation [1] will be converted from logs to nominal values and used to calculate the monetary value of the Shadow Economy (CSE). Then in the second stage the velocity of money of shadow economy is calculated using the Fisher equation. The quantity theory of Money Fisher states that there is a stable relationship between the quantity of money and the price level. In other words, changes in money supply over the long term will result in changes in nominal value but not significantly (Friedman (1956; 1968).

Fisher's equation is as follows:

$$M_t \times V_t = P_t \times Y_t \qquad [4]$$

Where Mt refers to the nominal money supply M2, Vt represents the average price level (inflation), and Yt represents the real GDP. From the Fisher equation the velocity of money equation is obtained as:

$$V_t = \frac{P_t \times Y_t}{M_t} \qquad [5]$$

It is assumed here that the velocity of money value is the same between the regulatory conditions and the shadow economy. This as-

sumption is used as a proxy for portraying the shadow economy conditions that are naturally not observed.

The final stage of the first part of the purpose of this study is to calculate the underground (shadow) economy as a product of the velocity of money with the currency value of the shadow economy (CSE) in equation [3].

$$Shadow\ GDP = C_{SE} \times V_t \qquad [6]$$

The size of the shadow economy (% of GDP) can then be calculated as the ratio of shadow GDP to official GDP

This study, as a second objective, calculates the level of tax evasion (tax manipulation). In other words, the value of lost tax revenue as a result of shadow economy activities is calculated as multiplication between tax burden (ratio of tax to GDP) and shadow GDP according to the following equation [7]:

$$\text{Loss of tax income} = \text{Tax Burden} \times \text{Shadow of GDP} \qquad [7]$$

4. Results and Discussion

4.1 Interpretation of Research Model Results and Diagnostic Tests

The results of the study using the OLS (ordinary Least Square) equation show the results that all variables that allegedly influenced the value of currency in 1990-2018 were proven statistically significant (See Table 1).

Table 1: OLS with Ln C as Variable Dependent, using observation years 1990-2018 (T = 29)

Variable	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	
const	32,8969	0,541982	60,70	<0,0001	***
GDP deflator	1,96651	0,217005	9,062	<0,0001	***
6 Months Deposits interest rate	−4,41488	2,06069	−2,142	0,0425	**
Inflation (annual)	3,16258	1,13600	2,784	0,0103	**
Tax burden	−12,7531	3,68403	−3,462	0,0020	***

Mean dependent var	32,18210	S.D. dependent var	1,363586
Sum squared resid	2,304606	S.E. of regression	0,309879
R-squared	0,955734	Adjusted R-squared	0,948356
F(4, 24)	129,5432	P-value(F)	7,06e-16
Log-likelihood	−4,429616	Akaike criterion	18,85923
Schwarz criterion	25,69571	Hannan-Quinn	21,00033
rho	0,156627	Durbin-Watson	1,636353

Source: Processing results using GRETL software

Estimation test results for all coefficients using the p-value criterion showed very strong significance (1%) and strong (5%).
The results of the overall model test to represent the shadow economy phenomenon using the F-test criteria are also significant. R-squared of 0.95 indicates the strength of the variables in the model describing the phenomenon of a problem of 95% in line with the results of the strong and good Durbin-Watson test at 1.64. Both of these information indicate that the model is very feasible as a good model predictor.

Based on the statistical test information, an interpretation can be given that a One percent increase in GDP deflator will increase 1.97 percent in total currency. A one percent increase in the 6-month deposit rate will reduce 4.41 percent of the currency. While an increase in inflation by an average of One percent annually will increase the amount of currency by 3.16 percent. The coefficient of a negative tax burden is something that is the question in this study. It is suspected that the negative coefficient occurs because many cash transactions using ATMs (automatic teller machines) began operating since 2004 and are increasingly widespread and widespread at

this time, and are not included in the scope of this study. In general, the prediction figures for a shadow economy from 1990-2018 illustrate the alleged phenomenon of cash transactions using ATMs (automatic teller machines).

To ensure that the model proposed in this study meets the quality criteria as a basis for the use of research results, diagnostic tests are carried out to ensure the classical requirements on model specifications, residual distribution, heterocedasticity, autocorrelation and so on are met. Diagnostic test results are as follows Table 2.

Table 2 Diagnostic Tests for OLS Models

Variable	P-value	Decision
Specification test	F(2,22)>32,098=2,99398e-007	Specification is adequate
Breusch-Pagan test for Heterokedastisticity	LM=11, 2731 P(Chi-square(4) > 11,2731) = 0,0236601	Heterokedasticity not present
Test for normality of residual	Test statistic: Chi-square(2) = 4,79506 with p-value = 0,0909422	error is normally distributed
Chow test for structural break at observation 2004 -	Test statistic: F(5, 19) = 8,07556 with p-value = P(F(5, 19) > 8,07556) = 0,000315861	no structural break
LM test for autocorrelation	Test statistic: LMF = 1,03485 with p-value = P(F(1, 23) > 1,03485) = 0,319605	no autocorrelation

Source: Processing results using GRETL software

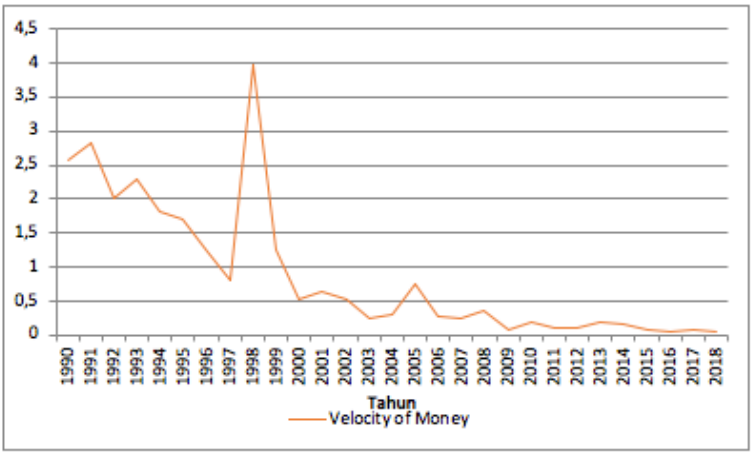
4.2 Speed of velocity of money in Indonesia for the period 1990-2008

The velocity of money can be defined as how often the velocity of money supply or how many times the rupiah is used to buy goods and services is reflected in the amount of GDP in a certain time period. The speed of money can also be said as the average frequency of money used for spending or how many times the available rupiah is spent by consumers who spend it as part of the operation of the Indonesian economy in a certain period. The concept of money cir-

culation is discussed in several macroeconomic textbooks a.l Barro (1997) and Mankiw (2000).

Figure 1 shows the results of the velocity of money used in the shadow economy as in the equation model [5].

Figure 1, Shadow Economy of the Indonesian Economy Speed (Velocity of Money) 1990-2018



Source: Research data processing results

There are several reasons which explain the fluctuation of the velocity of money in the period 1990 to 1999, and a continuous declining in the research period of 2000-2018 and specifically in 2009-2018. The 1990-1997 period was a period in which the Indonesian economy was in good condition, with an economic growth rate of around 6-7 percent and a relatively stable and under controlled inflation rate. The Asian financial crisis in early July 1997, and that was ended in the first quarter of 2000, was the cause of the high velocity of money driven by high inflation and a crisis of public distrust at that time.

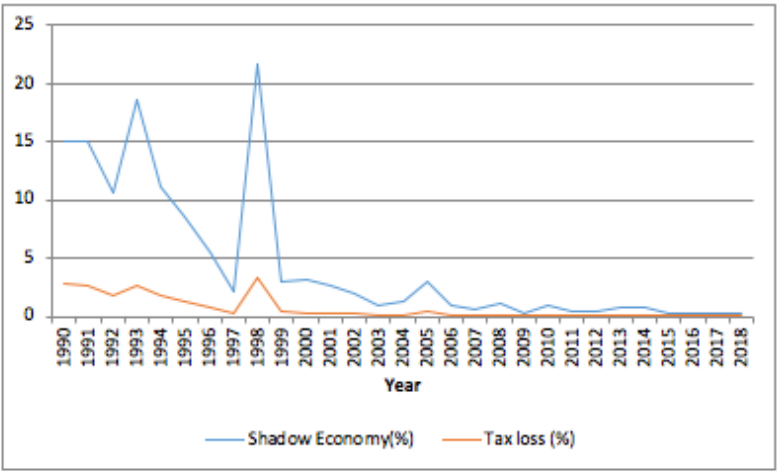
The declines in economic turnover in the period 2000-2008 was caused by relatively high inflation rate, the rate of economic growth returning to normal at around 5-6 percent, and the start of a dynamic balanced budget policy through financing government spending using foreign debt (external debt). While the period 2009-2018 was a period in which the Indonesian economy grew at a stable range of 5-6 percent and a very low inflation rate at the level of 3-4

percent, and the growing proportion of foreign debt to GDP.

4.2 The magnitude of the shadow economy and the level of manipulation of tax evasion in Indonesia for the period 1990-2018

Figure 2 shows the estimated amount of shadow economy as a percentage of GDP and the estimated amount of tax loss due to the shadow economy activities. The results showed a downward trend in shadow economy in Indonesia based on the selected model specifications.

Figure 2. Magnitude of Shadow Economy and Loss of Indonesian Tax Revenue (% of GDP), 1990-2018



Source: Research data processing results

The results showed the average amount of shadow economy in the period 1990-2018 was 5.4%. The highest shadow economy period occurred at the height of the Asian Economic Crisis in 1998, amounting to 21.75 percent. High shadow economy period occurred in 1990-1995, which ranged from 10.56-18.63 percent. The magnitude of the shadow economy in the period 1990-1995 was far below the empirical study of Wibowo & Sharma (2005) which estimated between 21.21-35.38 percent, and Panjaitan (2007) which estimated between 88.77-104.98 percent using Economic Based Model ap-

proached.

The results of this study indicate the magnitude of the shadow economy shrank in the period 2000-2008, to an average of 1.75 percent of GDP and loss of tax revenue by 0.2 percent. The magnitude of the shadow economy and loss of tax revenue is far lower than Tatariyanto (2010) estimates in the same period of 15.6 percent for shadow economy and 3.8 percent for loss of tax revenue.

5. Conclusions

This study uses official empirical data used by governments and international institutions to measure the economic and financial performance of the country. The research using money demand and Fisher's quantity theory of money to calculate and analyze the amount of shadow economy in Indonesia and carry out further calculations of loss of tax revenue caused by the shadow economy. A paramount conclusions is obtained, a declining amount of shadow economy in the period after 2008. There are some interesting things to follow up on from the research results obtained: a) theoretically, the slowdown in shadow economy could be caused by the higher burden on the government to pay off foreign debt which results on reduced demand for money; b) possibly the Indonesia economic structure, which is 42 percent contributed by informal sector reflects the condition of untxing economi activities. To reexamine the size of shadow economy in the future research it is important to include varaible that measure financial development into the model specification. The development of banking technology and innovation related to cash payments through ATMs and e-money and starting in 2004 is belief will influence money demand. So that it is necessary to include the variable for the research in the near future.

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