

## BALANCE SHEET CHANNEL OF MONETARY POLICY IN INDONESIAN MANUFACTURING FIRMS<sup>1</sup>

Muhammad Farid Alfarisy  
Nopirin  
Iswardono Sardjono Permono  
Tri Widodo<sup>2</sup>

Fakultas Ekonomika dan Bisnis, Universitas Gadjah Mada  
e-mail: kociwid@yahoo.com

### Abstract

This paper aims to test the hypothesis in a period of monetary tightening. Firms that face liquidity constraint and have limited access from external sources of funds will lower its investment. We use the panel data analysis of Indonesian manufacturing firms and financial variables, LIQ as the ratio between the sum of cash and marketable securities to total assets, and the change in cash flows as a proxy of firm's liquidity constraint. The result provides some supports for the view that inventory in Indonesian manufacturing firms is sensitive toward cash flow during the monetary tightening period, especially for the firms that produce durable goods.

**Keywords:** Monetary tightening, liquidity constraint, inventory investment

**JEL classification numbers:** G32, G38.

### Abstrak

Artikel ini bertujuan untuk menguji hipotesis bahwa pada periode pengetatan moneter sebuah perusahaan akan menghadapi kendala likuiditas dan keterbatasan akses pada sumber dana eksternal akan menurunkan tingkat investasinya. Metode yang digunakan dalam artikel ini adalah model data panel yang menggunakan variabel-variabel finansial yaitu LIQ yang merupakan rasio antara penjumlahan kas dan surat berharga lancar dengan total aset, dan variabel perubahan aliran kas sebagai representasi dari kendala likuiditas. Observasi dilakukan pada perusahaan manufaktur. Hasil studi menunjukkan dukungan terhadap pandangan bahwa persediaan investasi perusahaan manufaktur di Indonesia sensitif terhadap perubahan arus kas selama periode pengetatan moneter. Hal ini terjadi terutama pada perusahaan-perusahaan yang memproduksi barang tahan lama.

**Kata Kunci:** pengetatan moneter, kendala likuiditas, persediaan investasi

**JEL classification numbers:** G32, G38.

### INTRODUCTION

Financial accelerator theory stated that the effect of initial real or monetary shock is amplified and propagated when there is a change in credit market conditions because

of an adverse shock to the economy (Bernanke et al. 1996). Firms with weak financial conditions will face greater agency cost than the healthy one. In other words, a negative shock to the economy will weaken the net worth of firms and companies that do not have access to external financing. Therefore, firms with weak financial conditions will be suffering some difficulties in financing its investment (or when the firms

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<sup>2</sup> Corresponding author.

are liquidity constrained) which resulted in decreasing company's economic activity.

The impact of monetary tightening toward economic activity depends on the ability of firm to face the decreasing cash flow. Firms with having little access to credit markets are likely lowering their production while firms that have any access to credit markets will be able to survive. Gertler and Gilchrist (GG) (1994) examine how manufacturing firms respond to the monetary tightening by dividing them into two different groups. They are large firms and small firms based on their assets. Their findings were, first, when there is monetary tightening period, small firms tend to receive greater impact comparing with large firms. Second, response to the monetary policy is asymmetric over time. It was stronger in the "bad times" than in the "good times". The findings of GG showed that not only the borrower facing agency problem will have limitation to the credit access during the weak economy, but also the company's economic activity is also down which is greater than the borrowers who have any access to external finance. So, it is also true when in good times, the impact of financial variable to the behavior of inventories is larger than in bad times. Fazzari et al. (1987) examined the response of large firms (publicly-traded firms) and assumed that large companies also get some problems of credit access by assuming that the external financing and internal financing are not perfect substitutes.

Studies on how a company responds to the shocks in monetary policy have been widely performed. The approach is mostly done by looking at the changes in inventory. Those studies come from the fact that the company's inventory was sensitive to the company's financial condition. However, problems that arise are financial variables which may mostly affect the change in inventories. GG used coverage ratio (ratio of cash flow to total interest payments) in order to explain the behavior of invento-

ries. Kashyap et al. (1993) or KSW used a financial variable called the mix which is defined as the ratio of the corporate bank borrowing to the commercial paper borrowing. KSW found that the tight monetary policy leads to the fall in mix variable, which increases an issue of commercial paper and also declines the bank borrowings.

Subsequent research was conducted by Kashyap et al. (1994) who introduced a variable called LIQ as the ratio between the sum of cash and marketable securities to total assets. Research which conducted by Carpenter et al. (1998) (CFP) tried to see another financial variable, cash flow, by adding them into the standard inventory model. They also found that cash flow variables can explain the behavior of inventory.

This research aims to test the hypothesis that in a period of monetary tightening, firms who face liquidity constraint that limited them from raising funds from external sources will decrease its investment. We use some of the financial variables above and see how they give impact on changes in inventory investment of manufacturing firms. Furthermore, in line with the findings of Gertler and Gilchrist (1994), regarding of the different impact when economy is in good and weak conditions, this research would also like to see the changes of inventory when economy is in the "bad times" comparing with the "good times". This study is organized as follows; section I contains an introduction and the goals of this study; section II discusses the literature of financial accelerator. Section III will discuss the methodology which be used in this study. Section IV discusses the empirical result and the last section and section V represents the conclusion.

As already slightly alluded in the introduction, the financial accelerator theory was raised in an article entitled Financial Accelerator and The Flight of Quality (Bernanke, et al., 1996). However, one year earlier he wrote a paper called Inside the Black Box: The Credit Channel of

Monetary Policy Transmission (Bernanke, et al., 1995). This paper aims to provide an alternative thinking about the credit channel view in the transmission of monetary policy. The paper emphasized on two possible links on how monetary policy through. First, it is the credit channel. This channel assumes that monetary policy can affect directly on the supply of depository institution's loan. Kashyap and Stein (2000) research by using commercial bank in the United States for the period 1976-1993 found that mechanism transmission of monetary policy through bank lending channel has only worked for banks with low ratio of securities toward assets. Farinha and Marques (2001) by using the panel data regression of commercial bank in Portugal showed similar results as in previous studies, that the transmission mechanism through bank lending channel works in Portugal and the impact of monetary shock is bigger in the less capitalized bank. Afandi (2009) tried to identify the bank lending channel in Indonesia by using vector correction approach of time series analysis. He found that bank lending channel works.

Second, it is the balance sheet channel. Balance sheet channel gives more emphasize on the firm's financial statement, mainly the balance sheet and the income statement including the financial variables like cash flow, sales, net worth and liquid assets. Balance sheet channels of monetary policy state that the external finance premium depends on the firm's financial position. Firms with good financial conditions will face lower external premium which required by the creditor than firms with weak financial conditions. Then, when there is fluctuation in firm's financial condition, it will certainly affect the firm's investment and spending decision.

In line with the transmission of monetary policy through credit channel, this channel works if the firms are financially or liquidity constrained (Buigut, 2010). If the firms are not financially con-

strained, tightening the monetary policy will not have an impact on the behavior of the firms. This is because the firms are able to raise funds externally. Nevertheless, in some developing countries, capital markets are not well developed so the possibility of publicly-traded-firms also faces the same problem with financing constraint.

Then, the theory of balance sheet channel has evolved with the argument that negative shock to the economy will be further strengthened by the presence of imperfect credit market conditions (there is an agency problem). Strengthened shock by the presence of change in credit market conditions is referred as the financial accelerator. The theory of the financial accelerator uses principal-agent framework. Principal-agent framework is existing in the credit markets, that the principals (lenders) cannot acquire information with low cost about the opportunities, characteristics, and also actions from agents (borrowers) (Bernanke et al., 1996). The basis of the financial accelerator theory is that the rise in external finance premium will decrease the firm's net worth and finally decreasing production.

Research on the importance of financial variable on investment financing has been widely applied, such as Fazzari et al. (1988) (FHP) which assumes that the external finance and internal finance are not perfectly substituted. Another study of Carpenter et al. (1998) (CFP) examined the ability of financial variables that can explain the behavior of the firm's inventory. Angelopoulou and Gibson (2007) examined the sensitivity of cash flow by using panel data analysis of UK's manufacturing firms. They found that balance sheet channel works on monetary tightening period. Inventory variable which used by CFP refers to firm's economic activity although in several researches, many researchers used another financial variable like investment in R&D or physical investment (Carpenter et al., 1998). Research which related

to the possibility of a financial propagation mechanism is conducted by Gertler and Gilchrist (GG) in 1994. In their research, GG suggests that there are variations in the response of monetary tightening between firms (small and large) and between time (good time and bad time).

## METHODS

This study uses data which are constructed from financial statement of Indonesian manufacturing firms. These manufacturing firms were getting go public (publicly-traded firms) from the years 2002 to 2010. Not all data are available although the companies are already listed in Indonesia Stock Exchange. It means that there is a possibility of under sampling.

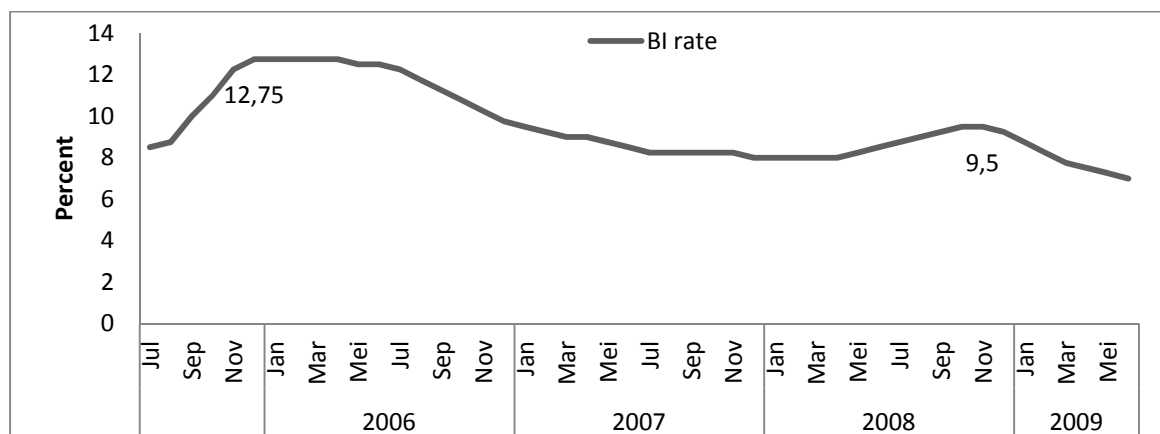
We refer to study conducted by Carpenter et al. (1998) mainly in dividing the manufacture firms into two groups, firms that produce durable goods and firms that produce non-durable goods. There are

23 firms that produced durable goods and 24 firms that produced non durable goods. Total firms which included in this study are 47 firms (summarized in table 1).

In order to strengthen the monetary policy, in mid-2005, Bank Indonesia implemented monetary policy framework with the ultimate goal is price stability (inflation targeting framework) by using interest rate (BI Rate) that replaced the monetary base as an operational target. Rising of oil price and continuing of global monetary tightening cycle put pressure on the exchange rate and consumer price index (CPI). This situation encourages Bank Indonesia to take steps to do tight monetary policy in order to maintain consistency in controlling inflation and maintaining exchange rate stability. One indicator is the rise of interest rate at the end of 2005 from 8.5 percent in July to 12.75 percent at the end of year. This condition is shown in Figure 1.

**Table 1.** Numbers of Firms Differentiate by Durability of Its Product

Durable Goods		Non Durable Goods	
Sub Sector Manufacture	Numbers of Firms	Sub Sector Manufacture	Numbers of Firms
Cement	3	Food and Beverage	9
Metal and Allied Product	3	Tobacco Manufacturers	3
Stone, Clay, Glass, and Concrete Product	1	Textile	2
Cables	2	Apparel and Other Textile Product	3
Electronic and Office Equipment	2	Pharmaceutical	5
Automobile and Allied Products	12	Consumer Goods	2
Total	23	Total	24



Source: SEKI BI

**Figure 1.** Bank Indonesia Rate

Domestic economic condition showed improvement after the period of the rise in oil price in 2005, which is reflected by a stable exchange rate and low inflation. Thus, in 2007, Bank Indonesia lowered its benchmark rate (BI rate) and indicates that monetary policy is ease. At the end of 2007 Bank Indonesia set the BI rate at 8 percent level. In 2008, Bank Indonesia's monetary policy strategies were more directed toward the achievement of medium-term inflation that targeted by the government. Increases of open economy raised the concern of the impact from global financial crisis. Inflationary pressure in the first period in 2008 originated from imported inflation, a rise in energy commodity and foods prices. Yet, the impact is still not magnificent toward domestic inflationary pressures. Thus, the monetary authority maintained the BI Rate fixed at from January to April at the level 8 percent. In the second quarter, the foreign prices continually raise that give more pressure on inflation in developing countries, including Indonesia. In an effort to restrain the expectation of future inflation and to control strong domestic demand, Bank Indonesia raised the BI rate gradually from 8 to 9.5 percent in October 2008. Tight monetary policy was also done in some emerging markets of Asian countries.

The 2002 to 2010 periods are employed to see the financial propagation mechanism that was shown previously by GG's study. As mentioned before, GG's studies showed that variation in how firms' response is not only across firms (small and large firms) but also across time (good time and bad time). Firms that have a weaker financial condition in the bad time period (period of tight monetary policy) because of a declining in their net worth due to monetary tightening should have better performance in the good times. The good time period is shown from 2007 to 2010, while the bad time period is 2002 to 2006.

Study related to investment inventory behavior widely used the standard model

of inventory from Blinder and Maccini (1991) and augmented the financial variables to the model (Carpenter et al. 1998). We use the baseline specification that used by Kashyap et al. (1994) in estimating investment inventory behavior study. Baseline specification is illustrated as follows

$$\Delta \log INV_{it} = \beta_{0it} + \beta_{1it} \log\left(\frac{INV}{Sales}\right) + \beta_{2it} \Delta \log Sales + \beta_{3it} \Delta \log Sales_{-1} + \beta_{4it} LIQ + \varepsilon_{it} \quad (1)$$

Dependent variable in the model is a change in the log of inventories over the year. Independent variables on the right side are constant terms, log of inventory-sales ratio, change in log of firm sales over both the current and preceding year, and financial variables. Financial variable included in this study is LIQ (ratio between cash and cash equivalent to total assets as the same variable that used in Kashyap et al. (1994).

Inventory to sales ratio gives information about the cash flow. Increasing value of the inventory to sales is caused by two factors. First, it is because of inventory that increases faster than sales. Second, it is caused by declining in a firm's sales. Inventory to sales ratio indicates that firms experience cash flow shortages. Thus, an increase in inventory to sales ratio leads to decrease in inventory investment.

LIQ variable tries to explain that when there is a period of monetary tightening; firms will experience a fall in their cash, and make them harder to finance its investment. Using simple accounting identity, Bernanke et al. (1996) illustrated the basic of financial accelerator as follows: Suppose there are two periods, present and future periods. Firms use its input in the present period to produce output in the future periods. There are two kinds of inputs, fixed input  $K$  and variable input  $x_1$ . Output in future period is  $a_1 f(x_1)$  where  $a_1$  is parameter for technology. Firms begin in the present period with gross cash flow from

previous production,  $a_0f(x_0)$ , and an obligation to pay its previous debt,  $r_0b_0$ , where  $r_0$  is the interest rate and  $b_0$  is past borrowing. Thus, an accounting identity that links the firm's purchase of input  $x_1$  is:

$$X_1 = a_0f(x_0) + b_1 - r_0b_0 \quad (2)$$

Then, suppose that there is a possibility of the firms to default in paying their debt and creditors cannot monitor the activity of the firms with low cost. A creditor may ask for firm's fixed assets  $K$  at price  $q_1$  as collateral when there is the possibility of default. Then the amount of credit that will be received by firms is at least same as the present value of its collateral:

$$b_1 \leq (q_1/r_1) K \quad (3)$$

After combining both equations, we get:

$$x_1 \leq a_0f(x_0) + (q_1/r_1) K - r_0b_0 \quad (4)$$

Spending on  $x_1$  cannot exceed the firm's net worth which is equal to the sum of gross cash flow  $a_0f(x_0)$  and net discounted assets  $(q_1/r_1) K - r_0b_0$ . When there is a tight monetary policy, it will raise the interest rate ( $r_1$ ) and decrease the value of collateral then it decreases the firm's net worth. Firms that do not have access to another resource of funding will decrease its spending on  $x_1$ . In this situation we called that firm is liquidity constrained. In this paper, we use some financial variables to serve as proxies of liquidity constraints. First, it is LIQ variable and second, it is cash flow. LIQ variable is used by Kashyap et al. (1994) to introduce the financial variable that could explain the behavior of inventory in the monetary tightening period, while Carpenter et al. (1998) and Moyen (2004) used cash flow variable to explain it.

## RESULTS

Table 2 summarizes our regression results for the period 2002-2006, 2007-2010, and

2002-2010. In each regression, the dependent variable is the change in inventory and variables on the right hand side include a constant term, log of IS ratio (inventory to sales ratio) at the beginning of the year, change in log of sales both in the beginning and previous years, and the dummy variable (in regression (1,2,5,6,9 and 10)). A dummy variable is used to capture the size of the firms. The size of the firms is measured by total asset. The idea behind this dummy size is that large firms which is shown by own very high total asset have most likely had greater access to capital market than firms with low asset. Then, the equation is estimated by OLS.

The first column on the table shows the sample that used in regression estimation. "All firms" rows are divided into two different groups. The first group is firms that produce non-durable goods, and the second group is firms that produce durable goods. "Excluding the big firms" rows are group of sample used in this study which excludes the firm that has larger asset than the average firms. For example, a firm that produces non-durable goods and has total assets beyond the average value is named as "big firm". So, it is not included in regression 3.

From the table we can see that sales are the driving force of change in inventory. Then, we find that the financial variable (LIQ) in the regression of inventory at "bad time" period (as period of monetary tightening 2002 to 2006) is weakly significant in firms that produce durable goods. This finding is similar with results from Kashyap et al. (KLS) (1994). KLS finds that LIQ is one of the financial variables to determine the cyclical behavior of inventory in the period where monetary is tightened. Our findings are consistent with the notion that in a period of monetary tightening firms, especially firms that produce durable goods, experience liquidity constraint. We then try to compare the result from other periods, there are 2007-2010 as a period

“good time”. The table shows that none of the LIQ variable is significant in explaining the change in inventory. Then we can see that in period of weaker monetary tighten-

ing, there are no firms which experience liquidity constraint. Dummy size of the firm’s asset seems have no impact on inventory behavior in our results.

**Table 2: Regression Results**

Sample	Log (INV/Sales)	$\Delta$ log (Sales)	$\Delta$ log (Sales) <sub>-1</sub>	LIQ	Dummy Asset	Adj. R <sup>2</sup>	N
Period: 2002-2006							
1. All Firms (non durable)	0.049** (1.297)	0.73* (7.92)	0.008 (0.11)	0.056 (0.338)	-0.007 (-0.159)	0.46	72
2. All Firms (durable)	-0.016 (-0.255)	1.20* (8.94)	-0.32* (-2.217)	0.73** (1.526)	0.026 (0.327)	0.55	66
3. Excluding Big Firms (non-durable)	0.059 (1.29)	0.669* (7.01)	0.038 (0.511)	0.071 (0.42)	-	0.466	57
4. Excluding Big Firms (durable)	-0.12** (-1.37)	1.02* (6.04)	-0.35** (-1.73)	0.34 (0.759)	-	0.48	45
Period: 2007-2010							
5. All Firms (non durable)	0.0287 (0.502)	0.45* (2.262)	-0.469* (-2.14)	0.109 (0.455)	-0.045 (-0.605)	0.14	44
6. All Firms (durable)	0.018 (0.28)	0.42** (1.562)	-0.716* (-3.09)	-0.12 (-0.266)	0.019 (0.19)	0.27	36
7. Excluding Big Firms (non-durable)	0.041 (0.63)	0.482* (2.211)	-0.469* (-1.885)	0.228 (0.831)	-	0.14	36
8. Excluding Big Firms (durable)	0.05 (0.45)	0.31 (0.78)	-0.81* (-2.63)	-0.12 (-0.23)	-	0.30	22
All Periods (2002-2010)							
9. All Firms (non durable)	0.12* (3.75)	0.709* (7.06)	-0.002 (-0.02)	0.17 (1.17)	-0.008 (-0.19)	0.25	164
10. All Firms (durable)	0.023 (0.599)	1.103** (10.34)	-0.32** (-3.04)	0.323 (1.15)	-0.005 (-0.09)	0.45	124
11. Excluding Big Firms (non-durable)	0.157* (4.025)	0.667* (6.08)	0.022 (0.23)	0.17 (1.103)	-	0.25	131
12. Excluding Big Firms (durable)	0.04 (0.08)	0.944* (6.77)	-0.405* (-3.001)	0.0004 (0.0013)	-	0.40	82

Source: calculated data

Note: Dependent variable is change in inventory; t statistics are in parenthesis; \* shows significance at least 5%; \*\* shows significance at least 10%).

**Table 3: Regression Results**

Sample	Log (INV/Sales)	$\Delta$ log (Sales)	$\Delta$ log (Sales) <sub>-1</sub>	LIQ	$\Delta$ log (Cash Flow)	Adj. R <sup>2</sup>	N
Period: 2002-2006							
1. All Firms (non-durable)	0.041 (0.98)	0.77* (5.77)	-0.063 (-0.57)	0.035 (0.19)	0.054 (0.53)	0.45	60
2. All Firms (durable)	-0.002 (-0.03)	1.13* (5.87)	-0.339* (-1.99)	0.349 (0.58)	0.18** (1.63)	0.62	42
3. Excluding Big Firms (non-durable)	0.04 (0.71)	0.71 (5.07)	-0.027 (-0.23)	0.064 (0.33)	0.011 (0.089)	0.42	45
4. Excluding Big Firms (durable)	-0.076 (-0.83)	0.90* (4.00)	-0.072 (-0.3)	0.078 (0.16)	0.19** (1.99)	0.60	30

Source: calculated data

Note: Dependent variable is change in inventory; t statistics are in parenthesis; \* shows significance at least 5%; \*\* shows significance at least 10%).

We are also interested in looking of some other financial variables that influence the behavior of inventory. In this study, we use the same method that also used in Carpenter et al. (CFP) (1998). Table 3 summarizes the results. We add variable, called change in cash flow, together with LIQ variable onto inventory-sales model and compare it with previous results. The result is shown in table III. Our results find that cash flow variable is significant in both groups of "all firms" and "excluded big firms" especially in firms that produce durable goods. These findings are in line with CFP finding, firms that produce durable goods are more financing constrained than firms that produce non-durable goods. Compared with LIQ variable, it seems that cash flow variable is the determinant of the firm's inventory in the monetary tightening period.

## CONCLUSION

This research aims to test the hypothesis that in a period of monetary tightening, firms who face liquidity constraint that limited them from raising funds of external sources will lower its investment. This is

because when the monetary policy is tight, it is too expensive for the firms to finance its investment. We use some financial variables that developed in previous studies as a proxy to liquidity constraint, LIQ, and changes in cash flow variable. By using the individual manufacturing data, we found that in the period of monetary tightening, firms are liquidity constraint, especially firms that produce durable goods. From those variables, it seems that the change in cash flow variable is more successful to explain the behavior of inventory investment.

In line with the transmission of monetary policy through a balance sheet channel, this channel works if the firms are financially constrained. If firms are not financially constrained, tightening the monetary policy will not have an impact of the behavior of the firms. This is because firms are able to raise funds externally. But in some developing countries, capital markets are not well developed so there is also the possibility of publicly-traded-firms also face the same problem of financing constraint. This study uses publicly-traded-firms and show that those firms are also facing financing constraint.



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