

# **Government Budget Deficits and Inflation**

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## 1. Introduction

The inflation rate is one of the key indices often associated with economic growth and stability. This makes it a cause of some concern for many, as it is thought to be linked to all aspects of the economy and people's lives, including the price level, unemployment, interest and exchange rates, future standard of living, etc. These economic indicators have a social aspect as well, as high inflation has been associated with a host of social problems, such as the terrible dislocation that occurred in Latin American nations such as Argentina and Brazil.

Because of its significance, inflation has been the focus of many studies, as economists try to find its determinants. How many factors cause inflation? What are they? These are not simple questions because of the number of factors that link to or interact with inflation in the real economy, and as a result, various theories exist to simulate and explain inflation. An example is the Phillips curve, which illustrates a straightforward relationship between inflation and unemployment rates, showing how a high inflation rate must be associated with a lower unemployment rate. Most macroeconomic economists accept variants of this curve, while many governments target an acceptable

range of inflation to keep employment high and unemployment low.

Mainstream neoclassical theory claims that money expansion and an excessive demand for goods cause inflation, which means that monetization of government deficits will also lead to inflation. Post-Keynesians do not agree, arguing that demand for goods, money expansion, and government deficits are not necessarily reasons for inflation. Rather, they believe that inflation is a result of the struggle over income distribution. This will be discussed in Section II.

When economists study the causes of inflation, most find the government budget deficit to be a key variable, something both neoclassical and Post-Keynesian economists agree on, although their opinions on whether or not it causes inflation differ greatly. As a matter of fact, orthodox and heterodox monetary theories have never had a common view of the government deficit.

In neoclassical monetary theory, the government deficit is seen to cause inflation if the state decides to finance it by issuing money. The traditional idea being that changes in base money cause changes in the money supply, which leads to changes in the price level. Hence, neoclassical economists consider the relationship between government budget deficits and inflation rate to be one of the main linkages in monetary theory.

Post-Keynesian economists could also associate government deficits with inflation, but see no direct causality between an increase in money supply or base money and inflation.

Rather they see that inflation results from a host of factors that combines budget deficits with other factors such as the existence of full employment, full capacity output, etc.

In this paper, three questions are posed that investigate the link between government budget deficits and inflation.

- 1) What is the real cause of inflation?
- 2) What is the role of government budget deficits?
- 3) What is the relationship between government budget deficits and inflation?

How do they interact?

Through these questions, this paper will address the following concern:

*Does the government budget deficit cause inflation or not?*

To do this, the paper starts by analyzing the differences between traditional neoclassical and heterodox monetary theory. We then summarize each theory's view of the interactions between inflation and government deficits. This is followed by an empirical investigation of this causality, via econometric testing of the competing hypotheses, as discussed in Section III. In the empirical section, data from Canada, Japan and the United States is used because:

1. Canada, Japan and United States are developed members of the G8 with stable and modern economies.
2. They have sophisticated institutional structures compatible with the underlying

structures in the competing theoretical models of the monetary system.

This paper comprises 4 sections. Section I is the Introduction, Section II the Literature Review, Section III presents the Empirical Analysis; and Section IV offers concluding remarks.

## **II. Literature Review**

In this section, the author will summarize the different views on inflation and budget deficits as stated by the two monetary theories, neoclassical and Post-Keynesian. These theories have differing explanations for numerous macroeconomic or monetary phenomena, such as inflation, money supply change, interest rate, monetary circulation, deficit financing, etc.

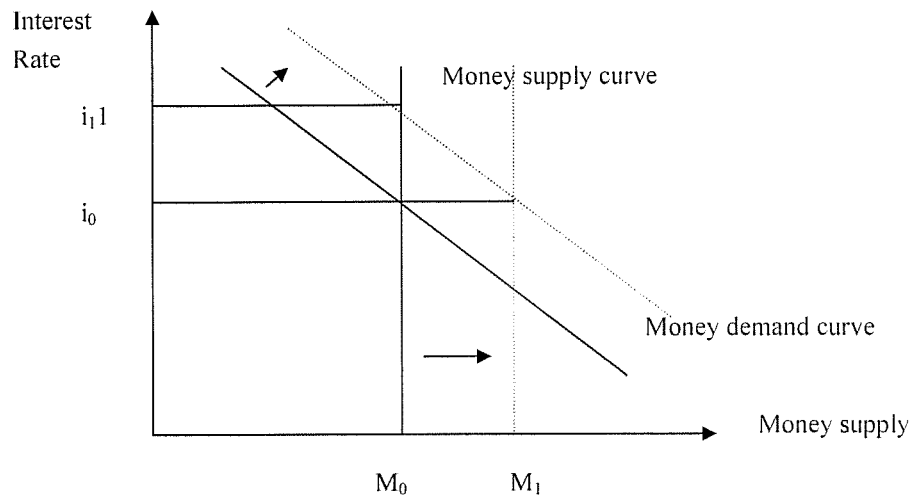
### **2.1 Neoclassical theory, Post-Keynesian theory and the differences between the two**

#### Neoclassical monetary theory

Neoclassical monetary theory or orthodox monetarism is an important pillar of mainstream monetary and macroeconomic theories. Neoclassical economists believe that the money supply is exogenous, independent of demand for money, that the money supply is decided by governments and central banks, who employ different policies to adjust it and achieve their targets. In contrast, they believe interest rates are endogenous. Hence, the money supply curve is vertical (Figure 1), i.e. at a given interest rate, the central bank can change the money supply and base money, thereby shifting the money

supply curve.

**Figure 1: The money supply curve in neoclassical monetary theory**



In Figure 1, we observe a vertical money supply curve. When the money demand curve shifts up, for example, the interest rate will increase ( $i_0$  to  $i_1$ ). To control the interest rate ( $i_1$  back to  $i_0$ ), the central bank has to shift the money supply curve to the right (increasing the money supply from  $M_0$  to  $M_1$ ). In this framework the central bank cannot control interest rate directly, the latter being an endogenous variable.

Most neoclassical economists consider money as a commodity whose intrinsic worth is guaranteed by its relative scarcity and whose role in facilitating trade ensures its long-run neutrality (Bougrine and Seccareccia, 2002). Moreover, neoclassical monetary theory believes that banks are only intermediaries in the monetary system, receiving deposits

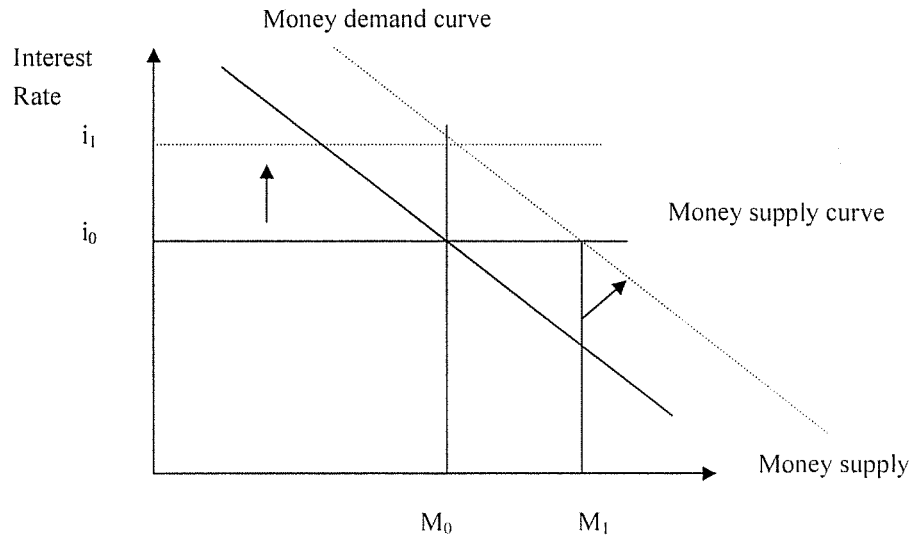
and issuing loans. The amount of loans depends on the amount of deposits, as banks cannot issue loans unless their deposits cover them. Hence, the neoclassical school states that money movement begins with deposits, as money must exist before an economic transfer can occur, and the latter must have originated in a prior change in base money. Nowhere, within neoclassical analysis is the monetary system theorized as a monetary circuit in which the origin of money stems from changes in the demand for loans.

#### Post-Keynesian monetary theory

Another macroeconomic theory emerged in the 1970s, the Post-Keynesian or heterodox theory. Post-Keynesian monetary theory represents a young and distinctive, although less unified, macroeconomic approach. Harcourt stated that, although the Post-Keynesian monetary theory offers 'important and substantial insights', it has yet to reach 'a coherent steady state' (Harcourt, 1982). Its main elements can be traced back to the contributions of its founders, Keynes who provided the monetary perspective, Kalecki providing real analysis and Sraffa providing the value and distribution component (Snowdon, Vane & Wynarczyk, 1994).

Post-Keynesian theory argues that the money supply is endogenous (not exogenous) while the interest rate is exogenous. Hence, governments and central banks can set and adjust interest rates, with the resulting money supply being a by-product of this action.

**Figure 2: The money supply curve in Post-Keynesian monetary theory**



In Figure 2, we can see a horizontal money supply curve. For instance, if the money demand curve shifts up, the money supply will increase ( $M_0$  to  $M_1$ ). To keep the money supply stable ( $M_1$  back to  $M_0$ ), the central bank will increase the interest rate from  $i_0$  to  $i_1$ . Adjusting the interest rate affects the money supply level only because of its effect on demand.

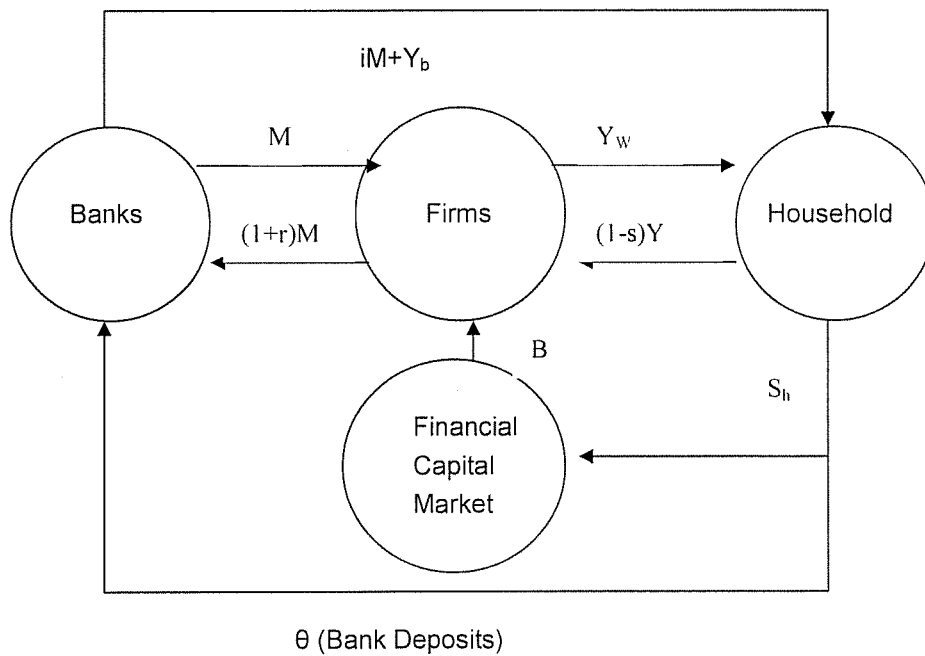
#### Differences between neoclassical and Post-Keynesian monetary theories

There are several main differences between neoclassical and Post-Keynesian monetary theories:

- 1) Neoclassical monetarism believes that money can be treated as a commodity, providing utility for holders wanting consumer goods (Hewitson, 1995). If the money stock rises, consumer utility also rises. Moreover, money also can be treated

as a producer good, neoclassical economists believing that it can minimize transaction costs. The utility of money is therefore derived from spending rather than holding or saving it. In contrast, Post-Keynesian monetary theory sees money as credit. It features in the “monetary circuit”, one of the core aspects of the theory. Figure 3 illustrates the process of money creation and destruction as conceived within the circuit approach (Bougrine and Seccareccia, 2002).

**Figure 3: Money flow among banks, firms, & households (Bougrine & Seccareccia, 2002)**



Bougrine and Seccareccia stated in their paper:

*“Figure 1 illustrates three major sectors of the private economy: banks, firms, and*

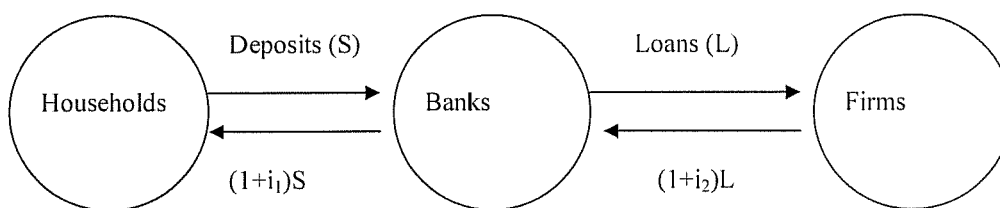
households. In Figure 1,  $M$  presents the initial advances of credit money equivalent, in this case, to household income ( $Y$ ) at the beginning of the circuit's period. In turn,  $Y$  is either spent on consumption goods ( $C$ ) or disposed of as savings ( $Sh$ ) channeled toward the financial markets to purchase new long-term securities ( $B$ ) issued by business enterprises to meet their financial obligations to the banks at the end of the circuit period. The reflux to the banks, equal to the principal of the loans,  $M$ , plus interest,  $rM$ , would appear at first glance as a pure macroeconomic Ponzi system since, unless firms also borrow the interest  $rM$ , they would never be able to pay back the principal plus interest. In reality, however, banks are not only advancing  $M$  to firms but (as shown by the separate arrow flowing directly to households) a sum equal to  $(1+i)M+Y_b$ , where  $i$  is the interest on deposits and  $Y_b$  is the flow of non-interest payments made to households whose income depends on the banking sector (which, in Figure 1, is shown separately from the income  $Y_w$  accruing to income earners in the non-financial business sector)" (Bougrine and Seccareccia, 2002, p. 64).

Figure 3 clearly illustrates the monetary circuit in which money is created when banks lend to firms and destroyed when firms return money to banks. Under credit management, banks can lend firms whatever they demand without constraint other than their respective credit-worthiness. When money flows from banks to firms, firms can pay labour to produce, thus generating household income,  $Y_w$ . It will come back to firms as people consume goods and services. A portion of these wages may go to

the financial market to purchase securities, but firms also benefit from this. Another portion of wages may flow into banks as private savings, which however does not destroy money. Of course, bank employee wages are an additional source of revenue to firms. The monetary circuit is the core feature of Post-Keynesian monetary theory.

Neoclassical theory does not subscribe to this view of the monetary process. It argues that banks play only an intermediate role and money can be treated as if it were a commodity. Figure 4 illustrates the movement of money in neoclassical theory.

**Figure 4: Money stock among banks, firms, and households**



*$i_1$  is the interest rate of deposits and  $i_2$  is the interest rate of loans.*

In Figure 4, we can see that banks have to acquire pre-existing household deposits in order to make loans to firms. In the second step, banks receive repayments from firms, which they then pay back to households. Clearly, money is treated as a stock and cannot be created and destroyed in the process of monetary circulation.

2) Neoclassical monetarism argues that the money supply is exogenous and interest rates endogenous. Hence, the money supply curve is vertical and central banks control the money supply by controlling the quantity of base money. Post-Keynesians disagree. They believe that the money supply is endogenous (Cottrell, 1994) and the interest rate exogenous and hence, central banks should not target the money supply, because any attempt to adjust the money supply will cause economic instability. Instead, Post-Keynesians claim that the only thing central banks can control is interest rates (known as the bank or overnight rate in Canada).

Central banks adjust interest rates based on their own reaction function. For instance, if the Bank of Canada sees that it should target a certain rate, it adjusts the overnight rate by adjusting the liquidity level of commercial banks. This will immediately affect the loan and deposit rates, as the central bank is the last tender of liquidity within the modern financial system, providing liquidity to banks that cannot find funds to balance their books. For example, every day in Canada, all banks go to a clearinghouse after operating hours. Banks in a negative position try to find funds to clear their deficit, while banks in a surplus position try to lend their money. However, if a bank cannot find enough funds to cover its deficit, the Bank of Canada will provide it with funds at the bank rate, a little higher than the inter-bank rate, because the central bank encourages banks to find funds from each other.

- 3) Neoclassical monetarism views money as stock, since they believe it is a commodity and that holding it can bring utility to holders. Post-Keynesian see money as a flow, an idea that is the basis for the Post-Keynesian money circuit (Moore, 1988). In Figures 3 and 4, we clearly observed this difference. Money flow is consistent with the Post-Keynesian money circuit, while emphasis on the stock of money is found in neoclassical monetary theory.
  
- 4) Neoclassical monetarism believes money is the medium of exchange. In a barter economy, two goods can be exchanged when their value is equal. The emergence of money reduces the cost of exchanging. Hence, money is a medium of exchange, but cannot finance the production process. Post-Keynesians believe that money can finance production; according to the money circuit theory in Figure 1, firms get credit from banks to start production.
  
- 5) Neoclassical monetarism believes in the existence of scarcity in the economy, a view that affects every aspect such as funds, labour, and goods. For instance, neoclassical monetarism believes that inflation comes partly from the scarcity of goods, that excess demand for goods increases prices. However, heterodox theorists do not agree with the scarcity view of money, credit, or even labour. In Post-Keynesian theory, banks create money at a rate determined by demand (Hewitson, 1995). Central banks cannot control the volume of money, since they have to accommodate the economy's needs.

- 6) Neoclassical monetarism believes that saving creates investment, with the number of investments or loans depending on the number of deposits. Hence, banks play only an intermediary role in the system. Post-Keynesians see this explanation as inconsistent with the money circuit and the endogenous nature of the money supply. They believe that investment causes savings. Banks lend money to firms, firms transfer money to labour through wages, part of the wages are used to consume goods and another part goes to banks as deposits or to the capital market to purchase securities.
- 7) Neoclassical monetarism believes that the growth of the money supply causes inflation. If central banks create excess money or the rate of money supply growth is faster than the rate of growth of output, inflation will result. Hence, neoclassical monetarism believes that the exogenous nature of money supply leads to economic instability, particularly inflation. On the other hand, Post-Keynesians believe that it is the change in prices which causes changes in the money supply (Lavoie, 1992). If prices go up, demand for money will go up as well. In a credit money economy, increasing the demand for money will cause an increase in the money supply, and possibly in base money, if there exists a non negligible demand for cash.
- 8) Neoclassical theory sees the source of money differently from Post-Keynesian theory. Neoclassical theory does not provide an original source of money while Post-Keynesian theory gives us an explanation of money within the framework of the monetary circuit,

from its origin in the efflux phase to its destruction in the reflux phase. In the efflux phase firms obtain money or credit from banks and in the reflux phase they repay the money to banks after they sell goods on the market or issue securities on the capital market.

## **2.2 Inflation and Government Budget Deficit in Neoclassical and Post-Keynesian monetary theories**

After summarizing neoclassical and Post-Keynesian monetary theories and the difference between them, we will try to answer our key question: Does the government budget deficit cause inflation or not?

From the eight differences between neoclassical and Post-Keynesian monetary theories discussed above, they provide an indication on how difficult answering this question is. To tackle our main question, we first have to answer the following questions:

- (1) What is the cause of inflation in the two monetary theories?
- (2) What is the view of the government budget deficit in the two theories?

After answering these questions, we can address our central question. Hence, we will study the cause of inflation then analyze the nature and consequences of a budget deficit.

### The cause of inflation

In this section, we will discuss the cause of inflation. Since neoclassical and Post-Keynesian theories do not agree on the cause of inflation, we will discuss both.

In orthodox economics, the level of the money supply determines the aggregate price level because neoclassical economists consider money as a stock variable. Hence, inflation is the result of excessive growth of the money supply. According to the quantity theory of money, the economy is always at full employment or at the natural rate of unemployment (except for short-run shocks). Marc Lavoie pointed out that:

*“In the quantity equation, output or its rate of growth is given, while the velocity of money is assumed to be stable in relation to certain key variables, prices and their growth rate are determined by the level of money stock and its rate of growth, therefore inflation is a demand-led phenomenon”* (Lavoie, 1992, p. 372).

Post-Keynesians reject this and see the money supply as endogenous. It is changes in prices which bring about changes in the money supply. Based on this, excess money is not even a proximate cause of inflation (Lavoie, 1992), money supply only responds to demand.

Before discussing the Post-Keynesian views of inflation, we should understand the Keynesian cause of inflation. Keynes illustrated a three-stage description of the inflationary process in his General Theory (Lavoie, 1992). All three stages can be depicted with the help of the Weintraubian model:

Equation 1: 
$$\hat{p} = \hat{w} - \hat{y} + \hat{k}$$

In the Weintraubian model,  $\hat{P}$  is rate of change in the price level or inflation;  $\hat{W}$  is wage inflation;  $\hat{Y}$  is the productivity growth;  $\hat{K}$  is change in the mark-up factor. The Weintraubian model suggests that if one factor changes (such as  $\hat{W}$ ) when the other two factors remain constant, inflation will be generated.

In the first stage, Keynes believed that an increase in economic activity could lead to inflation because it can diminish productivity. In the model, that means that  $\hat{Y}$  will decrease. This decrease will cause a rise in the price level if the other factors remain constant. In the second stage, before full employment is reached, wage increases will cause inflation. In the model, the rise of  $\hat{W}$  will lead to an increase in the price level. Keynes called this state semi-inflation, where wages and prices rise with neither full employment nor full capacity having been reached (Lavoie, 1992). In the final stage, Keynes believed that real inflation is caused by excess demand and money supply growth. This explanation is exactly the same as that in neoclassical theory.

Post-Keynesian monetary theory does not fully agree with this viewpoint. With regards to the first stage, Post-Keynesians do not view the Keynesian explanation as possible because of their model of the firm and the function of capacity utilization, which does not assume diminishing returns. Regarding Keynes's second stage, Post-Keynesians believe that it is not correct, either. When it comes to the last stage, Post-Keynesians completely reject that explanation that money expansion is a cause of inflation because the money

supply is endogenous in the Post-Keynesian monetary system. However, Post-Keynesian theory does not deny that excess demand might be a cause of inflation, as several Post-Keynesian models of the Kaleckian type include an excess demand term in their inflation function (Taylor, 1985).

How do Post-Keynesians explain the cause of inflation? The main feature of their theory of inflation is based on a conflicting view of income distribution (Lavoie, 1992).

Davidson mentioned that income distribution is both a cause and a consequence of the inflationary process (Davidson, 1972). Some economists also think that the heart of the inflationary process is the relative income distribution (Eichner and Kregel, 1975).

Lavoie also said: *“There are aspiration gaps between what is expected and necessary on the one hand, and what is actually obtained on the other”* and *“this conflict between fair pay and actual pay arises at two junctures of the economy: first there is a conflict between the resources that the firms wish to devote to their workers and that the latter wish to control through their wages; second there is a conflict over what each individual group of workers wishes to receive compared to what other groups are perceived to get. The first type of conflict is known under the term of wage-price spiral, or under the expression of real wage resistance. The second type of conflict is known under the expression of relative wage resistance or, simply, the wage-wage spiral.”* (Lavoie, 1992, p. 378-388)

After pointing to the causes of inflation in both neoclassical and Post-Keynesian

monetary theories, there is a fundamental opposition between these two theories.

Neoclassical economists believe that inflation is a demand side phenomenon because they believe that the excess money supply leads to the excess demand. This excess demand eventually causes the inflation. However, Post-Keynesian views differ. They believe that excess demand for labour and goods does not lead to continuously rising price levels or inflation. Before reaching full employment, excess demand will increase output because wage would not rise. Hence, Post-Keynesians believe that rising price levels or inflation is not a result of scarcity; it is the result of conflict over income distribution (Lavoie, 1992).

Another issue is the relationship between inflation and employment. As we know, the Phillips curve depicts a high inflation rate associated with a low unemployment rate. Although both orthodox and heterodox theories accept the Phillips curve, they have different explanations for it. The neoclassical theory believes that the Phillips curve reflects an aspect of scarcity. When the activity level rises, the demand for labour increases too, putting upward pressures on money wages. On the other hand, "*The Post-Keynesian theory states that a higher level of activity causes lower rates of unemployment, giving labour more bargaining strength*" (Lavoie, 1992, p. 378). Kaldor mentioned that workers have bargaining strength because when times are good firms make more profit and are more likely to yield to wage demands from labour (Kaldor, 1959). Many Post-Keynesian also do not accept that the Phillips curve is vertical in the long run. They believe that the Phillips curve is horizontal over a large range of output

and employment or capacity utilization. Kriesler and Lavoie also pointed that “*Changes in capacity utilization need only be inflationary at levels of capacity near full utilization*” (Kriesler and Lavoie, 2004, p. 15). That is, only under or near full utilization, the Phillips curve has an upward slope between the inflation and the capacity utilization rate. Hence, the neoclassical view of the Phillips curve is based on the principle of scarcity; the Post-Keynesian explanation is based on conflict over income distribution.

### The role of taxation

After the causes of inflation, we come to the concept of government budget deficit. However, we should first examine the varied views of Post-Keynesians and neoclassical economists on the role of two important factors: taxation and bonds. These factors are essential to understanding the concept of government budget deficit, because they play significant roles in the two theories. In this and the next sections, we will analyze their roles.

Because the role of taxes is one of the key differences between neoclassical and Post-Keynesian theories, this section will analyze the role of taxation in both theories. Neoclassical economists see taxation as the state’s only income, to be collected before government can spend, making the government deficit equal to its spending minus existing taxation. This theory maintains that state expenditure must eventually be financed by tax revenue rather than bonds or money creation, since the latter are destabilizing.

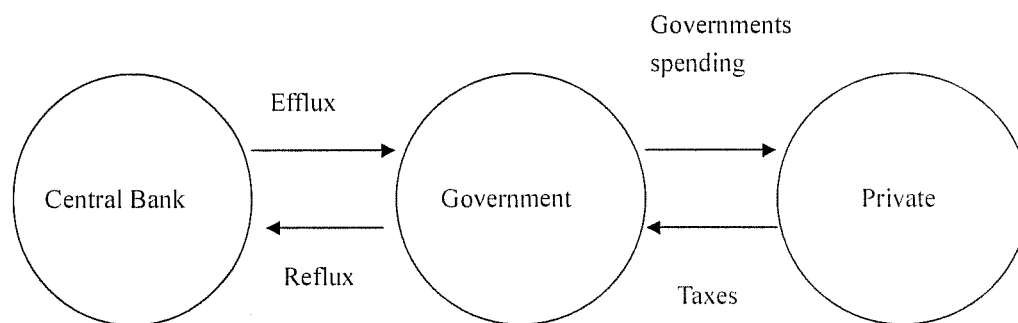
Post-Keynesians have a different view of the role taxation, which is one of the elements in the monetary circuit theory. In the money circuit, government expenditure is associated with initial financing (efflux) while taxes are concerned with the reflux side.

Bougrine and Seccareccia said: *“In that regard, the whole notion of “financing the deficit” is somewhat of a misnomer. The budget deficit, which is the accounting difference between the initial spending and current period tax revenues, can only be considered an ex post accounting identity that has already been finance.”* (Bougrine and Seccareccia, 2002, p. 70)

Post-Keynesian economists maintain that at the beginning of the fiscal year when the government budget is decided and the government starts spending and disbursing, taxes have not yet been collected, since the incomes on which they are levied have not been earned (Bougrine and Seccareccia, 2002). Although the state can forecast tax revenue, its expenditure cannot depend on future tax. In the neoclassical view, government spending must be constrained by taxation, so we call it “limited financed resources”.

Post-Keynesian monetary theory points out those taxes are gathered in the reflux phase when money is destroyed rather than created. Therefore, they believe that taxes cannot pay for public spending. Figure 5 illustrates the money circuit among the central bank, government, and private sector.

Figure 5: Money circuit among the central bank, government, and the private sector



There are fundamental differences in the role of taxation in neoclassical and Post-Keynesian theories. Post-Keynesians believe taxes cannot be used to finance government spending. *“Therefore instead of the budget deficit putting upward pressure on interest rates, either because of Hayekian crowding-out effects or because of their presumed inflationary consequence due to the traditional Fisher effect, budget deficits would actually bring about falling short-term interest rates, unless the central bank intervenes”* (Bougrine and Seccareccia, 2002, p. 72). Post-Keynesians also believe that budget deficits lead to excess bank reserves, thus pushing down interest rates. However, raising taxes can drain excess reserves and increase the overnight rate.

Furthermore, Post-Keynesian economists criticize the neoclassical view of the role of

taxes, because the state would have to eliminate public services if government expenditures were higher than tax revenue. Bougrine and Seccareccia state that if taxes were the only legitimate source of government revenue and since they are to be kept as low as possible in accordance with the view defended neoclassical writers, policymakers would refrain from engaging in any type of public spending, including on social programs and infrastructure projects. This attitude clearly hinders economic growth and keeps millions in poverty because government spending is arbitrarily tied to taxes and therefore arbitrarily kept low (Bougrine and Seccareccia, 2002). Otherwise, the state could increase taxation to maintain social programs, but this could hinder economic growth, as higher taxes absorb a larger portion of private sector incomes and reduce total spending unless the government returns to the economy an amount equivalent to what it collected in taxes.

### The role of bonds

Neoclassical theory sees issuing bonds as a way for the government to borrow money from banks and the public, as they are the ones who purchase bonds issued by central banks for the government; however, this method causes problems when used to finance the government deficit. Households hold bonds as a share of their saving. If the government finances deficits by issuing bonds, the increase in the supply of bonds is exogenous to private agents' rational choices. An increase in the supply of bonds will lead to a rise in interest rates, which brings about the "crowding-out" of private expenditure (Parguez, 2002). Parguez stated that the neoclassical "crowding-out"

theorem is a mere corollary of the budget constraint postulate (Parguez, 2002). The amount of savings and their distribution are determined, so issuing bonds will increase the demand for money, leading to a fall of private spending. Parguez affirms that *“Equilibrium is restored by a fall in the private demand for funds (lower investment) and, for a given income, by a fall in consumption that generates higher savings”* (Parguez, 2002, p. 83). Hence, neoclassical economists find issuing bonds a bad way to finance the deficit because of the negative “crowding-out” effect on investment and growth.

Post-Keynesians believe that bonds cannot finance government deficits since bonds are part of the reflux process. In the Post-Keynesian money circuit, issuing bonds can eliminate excess reserves, so the central bank issues or sells securities to eliminate excess reserves if the government runs a budget deficit. *“During the efflux phase, the central bank must continuously credit the treasury while selling government securities on the open market to eliminate excess reserves that would otherwise accumulate within the banking system”* (Bougrine and Seccareccia, 2002, p. 71). After eliminating excess reserves, interest rates will be pushed up again.

On the other hand, if the government has a budget surplus, the banking system will face a reserve shortage and an increase in interest rates. Central banks will then buy government securities in order to increase reserves in the banking system, after which interest rates will return to normal levels. The central bank can target certain short-term interest rates through buying and/or selling government securities on the open market. That is to say,

open market operations manage commercial bank reserves so as not to jeopardize the central bank's control of the interest rate (Bougrine and Seccareccia, 2002). Therefore, central banks use bonds as an efficient tool to adjust the overnight rate, the core target rate for central banks.

### Government Budget Deficit

After looking at the varying opinions on the roles of tax and bonds, we will discuss government budget deficits. Again, neoclassical and Post-Keynesian economists do not agree, so we will have to discuss each explanation separately.

Neoclassical economists do not accept the monetary circuit approach. Hence, they define the government budget deficit as the discrepancy between expenditures and existing taxes. Based on this, neoclassical economists believe that there are three ways an economic agent can finance a budget deficit: earning an income generated by the expenditures of other agent, borrowing money from other agents, or borrowing money from banks. Similarly, the government can finance its deficit in three ways: it can raise its income, or tax rate; it can borrow the money from the public by issuing bonds; and finally, it can borrow money from the central bank. However, all three methods are problematic.

The government can raise taxes to finance its deficit, but since taxes already exist, they are levied before the state undertakes expenditures; therefore, logically speaking, the

expenditure level is independent of the taxation level. Parguez writes: “*Much like private sector revenues, taxes pay the part of firms’ receipts. They provide the state with money that it can spend to finance its outlays. The more the state raises taxes, the more its resources are increased, and the greater its expenditures can be.*” And, “*Aggregate income, upon which taxes are levied, therefore both precedes government expenditures and is independent of their level*” (Parguez, 2002, p. 83). Hence, raising taxes cannot finance a deficit.

Within the neoclassical framework, we know that issuing bonds will cause “crowding out” and cannot be used to finance the government deficit. In neoclassical theory, creating money is seen as an efficient means to finance the government budget deficit, known as monetization of government deficit. Central banks can issue high-powered money to finance the deficit. As a result, this method leads to an increase in base money and the money supply, because base money includes bank reserves and cash. We have previously noted that the neoclassical cause of inflation is money expansion arising from changes in base money. That is, the monetization of government deficit causes inflation.

We can use the following scheme to depict this procedure:

$$\text{Deficit} \rightarrow \Delta B \rightarrow \Delta M \rightarrow \Delta P$$

$\Delta M$  is the change in the money supply;  $\Delta B$  is the change in the base money and  $\Delta P$  is inflation.

Post-Keynesian theory has another concept of the government deficit, consistent with the money circuit theory. In the previous section, we described the role of banks, firms and households in the money circuit. In the “efflux” phase, firms get credit from banks to finance their production. After that, enterprises hire labors, pay them wages, and then households spend wages to consume goods. Following that, the money flows back to firms again as revenues. Finally, within the “reflux” phase firms repay their loans to banks, therefore, destroying the money.

In the Post-Keynesian view, the government also can be involved in the money circuit, where its expenditure must be financed by the central bank. Indeed, just as firms are unable to “finance” their initial spending because their future revenues rely on bank credit, the state sector would behave similarly. In both cases, when firms or the state spend, money must be created (Bougrine and Seccareccia, 2002). The state cannot finance its expenditure with taxes or bonds because they are in the reflux phase of the money circuit. Therefore, all government expenditure must be initially financed by the central bank.

#### Does the government budget deficit cause inflation?

From the above analysis, we know there are no common views on inflation and budget deficits between neoclassical and Post-Keynesian theories.

Post-Keynesian economists think that, by itself, the monetization of deficits cannot cause

inflation, although government deficits might cause inflation under certain conditions. For instance, a government deficit means that demand is increasing, not only for goods but also labour. High levels of activity give rise to low unemployment, giving labour increased bargaining strength as firms make more profits (Kaldor, 1959). If an economy is at full employment, government deficit causes rising demand and can lead to rising prices or wages. Eventually, these upward pressures on wages and prices will generate inflation. However, if the economy is not close to full employment, a government deficit will increase output, but may not cause inflation. Therefore, full employment is an important index for inflation within the Post-Keynesian view. The following illustrates the relationship between inflation and budget deficits.

Neoclassical view:  $Deficit \rightarrow \Delta B \rightarrow \Delta M \rightarrow \Delta Y \rightarrow \Delta P$

Post-Keynesian view:  $Deficit \rightarrow \Delta Y$  if below full employment;

Or  $Deficit \rightarrow \Delta Y \rightarrow \Delta W$  if close to full employment

Or  $Deficit \rightarrow \Delta Y \rightarrow \Delta P$  if at full employment.

### III Empirical Analysis

In this section, we will use the empirical approach to investigate the relationship between government budget deficits and inflation rate. The result will answer our central question:

Do government budget deficits cause inflation or not?

In the last section, we analyzed the different views on the cause of inflation and government budget deficits in both neoclassical and Post-Keynesian theories. In neoclassical monetary theory, monetization of government budget deficit will cause money expansion and inflation. Post-Keynesians completely disagree with the neoclassical explanation, believing that the money supply is endogenous as shown in the monetary circuit, so the monetization of deficits will not cause inflation. However, Post-Keynesians believe that the deficit might cause inflation if close to full employment or capacity.

#### Method, Software, Sample and Hypothesis

The empirical analysis will follow the econometric approach. In the next part, we will do the causality tests using the Granger approach, which can test the causality between any two variables. *“The Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant. Note that two-way causation is frequently the case; x Granger causes y and y Granger causes x. It is important to note that the statement "x Granger causes y" does not imply that y is the effect or the result of x. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term” (Help file for Eview 5.0).* The

outcomes of these tests will show if there is a Granger causal link between them.

As we known, Granger causality approach is only valid for stationary series. Therefore, before using Granger causality test, we have to check whether series are stationary by employing unit root test – ADF (Augmented Dickey-Fuller) Test. ADF Test is one of most important tests for unit root tests in econometrics.

In the empirical analysis, we will use a statistical software, Eview 5.0. Eview is a popular statistical software in economic studies. It can do most econometric tests including the Granger and ADF. For the Granger Causality Test, our sample includes three countries: Canada, Japan and the United States, developed countries with relatively stable economies.

We collected both quarterly and annual data for all countries. The variables include base money, CPI (Consumer Price Index), government budget balances, and unemployment rates. The quarterly and annual data of CPI, government budget balances and unemployment rates for the period from 1960 to 2005 except for Canada (1970 – 2005) can be collected from the OECD (Organization for Economic Co-operation and Development). We will compare the results from the two kinds of data. The data for Canadian base money is found in Statistics Canada. The Japanese base money is taken from the Bank of Japan. The Federal Reserve, the central bank of the United States, offers the American base money. The inflation rate can be calculated from the CPI using

Inflation	-1.406822	-2.954021	I(1)
(1-L)Inflation	-4.683736	-2.957110	
Ratio	-1.575018	-2.954021	I(1)
(1-L)Ratio	-3.643985	-2.954021	
Canadian Quarterly Data			
Base	1.603573	-2.883579	I(1)
(1-L)Base	-3.417099	-2.883579	
Deficit	-0.715023	-2.882279	I(1)
(1-L)Deficit	-11.14470	-2.882433	
Inflation	-2.443622	-2.882748	I(1)
(1-L)Inflation	-11.36645	-2.882910	
Ratio	-0.971704	-2.882279	I(1)
(1-L)Ratio	-11.06653	-2.882433	

1. Base is base money.
2. Ratio is equal to Deficit/GDP
3. I(0) means series are stationary; I(1) is integrated of degree one; I(2) is integrated of degree two.
4. (1-L) means first-difference.
5. We choose the 5% significant level.
6. Canadian annual and quarterly data is from 1970 to 2005.

## Japan

Japanese Annual Data			
Variable	t-Statistic	5% Level	
Base	4.518807	-2.951125	I(1)
(1-L)Base	-3.104918	-2.954021	
Deficit	-0.645046	-2.951125	I(1)
(1-L)Deficit	-4.057906	-2.954021	
Inflation	-1.720351	-2.981038	I(1)
(1-L)Inflation	-5.927017	-2.951100	
Ratio	-1.388801	-2.954021	I(1)
(1-L)Ratio	-3.977489	-2.954021	
Japanese Quarterly Data			
Base	4.002350	-2.883930	I(1)
(1-L)Base	-2.866287	-2.884109	
Deficit	-1.416829	-2.881978	I(1)
(1-L)Deficit	-6.083096	-2.882279	

Inflation	-2.621986	-2.882590	I(1)
(1-L)Inflation	-6.347534	-2.883073	
Ratio	-1.070252	-2.882279	I(1)
(1-L)Ratio	-5.831918	-2.882279	

1. Base is base money.
2. Ratio is equal to Deficit/GDP
3. I(0) means series are stationary; I(1) is integrated of degree one; I(2) is integrated of degree two.
4. (1-L) means first-difference.
5. We choose the 5% significant level.
6. Japanese annual and quarterly is from 1960 to 2005.

## US

American Annual Data			
Variable	t-Statistic	5% Level	
Base	6.922066	-2.931404	I(2)
(1-L)Base	1.631513	-2.951125	
(1-L-2L)Base	-3.390241	-2.951125	
Deficit	-4.256523	-2.931404	I(0)
(1-L)Deficit	-4.312101	-2.933158	
Inflation	-1.788583	-2.935001	I(1)
(1-L)Inflation	-6.734848	-2.935001	
Ratio	-3.524329	-2.931404	I(0)
(1-L)Ratio	-4.264555	-2.931404	
American Quarterly Data			
Base	9.001721	-2.877363	I(2)
(1-L)Base	-1.876051	-2.877919	
(1-L-2L)Base	-11.18727	-2.877919	
Deficit	-3.600142	-2.877544	I(0)
(1-L)Deficit	-3.986878	-2.877544	
Inflation	-2.677594	-2.877636	I(1)
(1-L)Inflation	-15.23491	-2.877544	
Ratio	-3.280696	-2.877544	I(0)
(1-L)Ratio	-4.764565	-2.877544	

1. Base is base money.
2. Ratio is equal to Deficit/GDP
3. I(0) means series are stationary; I(1) is integrated of degree one; I(2) is integrated of degree two.
4. (1-L) means first-difference.
5. We choose the 5% significant level.
6. United States of American annual and quarterly data is from 1960 to 2005.

According to the above results, all Canadian and Japanese data series are integrated of degree one. We have to take first-difference of each series, before using the Granger Causality Test. Since the series of American annual and quarterly base money is integrated of degree two, we have taken second-difference of this series. Of course, we ought to take the first-difference for the series of the American annual and quarterly inflation rate.

#### Canadian Quarterly data

We will use Canadian Quarterly data from 1970-2005. In the first step, we will investigate the interrelationship between two variables, the budget deficit and base money. In the second step, we will test whether Canadian government budget deficits cause inflation. However, we do not use the series of government budget deficit directly in the second test. We use the ratio of Deficit/GDP, since inflation rates are ratio as well. Since we know that both series are integrated of degree one, we have to take first-difference for them before undertaking the Granger Causality Test. Table 1 shows results of the first test. Table 2 gives us the second. All results come from Eview 5.0.

**Table 1: Granger Causality Test between government budget deficits and base money using Canadian quarterly data (1970 – 2005)**

The number of lags	Result	F-statistics	P-value
1	Yes	5.13526	0.02504
2	No	2.13333	0.12251
3	Yes	3.58651	0.01564
4	Yes	3.45730	0.01023
5	Yes	3.08958	0.01159
6	Yes	2.89651	0.01132

7	No	1.98298	0.06309
8	Yes	2.92361	0.00526
9	Yes	3.15334	0.00201
10	Yes	3.07012	0.00181
11	Yes	2.79711	0.00312
12	Yes	2.07431	0.02503

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money.

4. The quarterly data of Canadian budget deficits is collected from the OECD. The data of Canadian base money is collected from the Statistic Canada.

5. We choose 5% significant level.

**Table 2: Granger Causality Test between Deficits/GDP and inflation rate using Canadian quarterly data (1970 – 2005)**

The number of lags	Result	F-statistics	P-value
1	No	0.79824	0.37322
2	No	0.41216	0.66307
3	No	2.08720	0.10513
4	No	1.82433	0.12825
5	No	1.90033	0.09909
6	No	1.82092	0.10064
7	No	1.90973	0.07406
8	No	1.61951	0.12961
9	No	1.82378	0.07170
10	No	1.66444	0.09860
11	No	1.67116	0.09026
12	No	1.70045	0.07756

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The ratio is equal to Deficit/GDP.

4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.

5. The quarterly data of Canadian government deficits and inflation rate is collected from the OECD.

6. We choose 5% significant level.

### Canadian annual data

In such the same way, our previous tests are done on Canadian annual data. Since the series of quarterly data are still integrated of degree one, we have taken their first-difference as well. Table 3 and 4 show results from Eview for two tests.

**Table 3: Granger Causality Test between government budget deficits and base money using Canadian annual data (1970 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.15906	0.69285
2	Yes	5.24782	0.01188
3	No	2.87706	0.05704
4	No	2.62733	0.06355

1. Results from Eview 5.0
2. All series are taken first-difference.
3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money.
4. The annual data of Canadian government deficits is collected from the OECD. The annual data of Canadian base money is collected from the Statistic Canada.
5. We choose 5% significant level.

**Table 4: Granger Causality Test between Deficit/GDP and inflation rate using Canadian annual data (1970 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	2.71902	0.08283
2	No	2.92569	0.07145
3	No	1.76848	0.18126
4	No	1.44722	0.25536

1. Results from Eview 5.0
2. All series are taken first-difference.
3. The ratio is equal to Deficit/GDP.
4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.
5. The annual data of Canadian government deficits and inflation rates is collected from the OECD.
6. We choose 5% significant level.

Regardless of the data we used, we find that there is a causality from government budget deficits to base money. However, we cannot obtain that the government budget cause the inflation.

The neoclassical theory would posit that a causality between government budget deficit and a change in base money means that the government “monetizes” its deficits and those deficits will cause inflation. Based on our results, we find that the government budget deficits do not cause inflation even if the government “monetizes” its deficit. Hence, we have to reject the neoclassical monetary theory.

#### Japanese quarterly and annual data

In this section, we use Japanese quarterly data and annual data for the tests. Since all series are integrated of degree one, we have taken their first-difference for them. Table 5 and 6 show results using quarterly data. Table 7 and 8 uses Japanese annual data.

**Table 5: Granger Causality Test between government budget deficits and base money using Japanese quarterly data (1960 – 2005)**

The number of lags	Result	F-statistics	P-value
1	No	0.05017	0.82309
2	No	0.17626	0.83859
3	No	0.09436	0.96304
4	No	0.59108	0.66969
5	No	0.74211	0.59334
6	No	1.20556	0.30793
7	Yes	2.73079	0.01153
8	No	1.80630	0.08258

9	No	1.91033	0.05722
10	Yes	2.75096	0.00457
11	Yes	2.43427	0.00946
12	Yes	2.88404	0.00178

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money; "Yes" is causality.

4. The quarterly data of Japanese government budget deficits is collected from the OECD. The quarterly data of Japanese base money is collected from Bank of Japan.

5. We choose 5% significant level.

**Table 6: Granger Causality Test between Deficit/GDP and inflation rate using Japanese quarterly data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.86866	0.35297
2	No	0.85633	0.42703
3	No	1.14984	0.33158
4	No	0.70590	0.58932
5	No	0.56783	0.76991
6	No	0.50448	0.80399
7	No	0.43822	0.87632
8	No	0.47591	0.87109
9	No	0.56769	0.82104
10	No	0.51354	0.87747
11	No	0.44896	0.92979
12	No	0.41089	0.95644

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The ratio is equal to Deficit/GDP.

4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.

5. The quarterly data is collected from the OECD.

6. We choose 5% significant level.

**Table 7: Granger Causality Test between government budget deficits and base money using Japanese annual data (1960 – 2005)**

The number of	Results	F-statistics	P-value
---------------	---------	--------------	---------

lags			
1	No	0.00377	0.95147
2	No	0.08763	0.91636
3	Yes	7.62873	0.00095
4	Yes	5.30529	0.00410

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money.

4. The annual data of Japanese government budget deficits is collected from the OECD. The annual data of Japanese base money is collected from Bank of Japan.

5. We choose 5% significant level.

**Table 8: Granger Causality Test between Deficits/GDP and inflation rate using Japanese annual data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.23286	0.63303
2	No	0.07206	0.93066
3	No	0.22882	0.87536
4	No	0.15007	0.96079

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The ratio is equal to Deficit/GDP.

4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.

5. The quarterly data is collected from the OECD.

6. We choose 5% significant level.

From Table 5, 6, 7 and 8, we find that there is a causality from the government deficits to base money again, but there is causality is from the government deficits to inflation.

Based on these results, we have to reject the null hypothesis again.

### American quarterly and annual data

In this section, we will re-investigate the relationship among the three variables using American quarterly and annual data. However, based on the results of ADF tests, series of American deficits and Deficits/GDP are stationary; the series of inflation is integrated of degree one; on the other hand, American base money series is integrated of degree two. Therefore, in the first test, we take second-difference for the series of base money and deficits. Meanwhile, we take first-difference for ratio of Deficits/GDP and inflation in the second test. Table 9 and 10 show results for tests on American quarterly data. Table 11 and 12 are for annual data.

**Table 9: Granger Causality Test between government budget deficits and base money using American quarterly data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.13437	0.71438
2	No	2.89940	0.05772
3	No	0.50720	0.67782
4	No	0.71386	0.58345
5	No	0.67076	0.64617
6	No	0.76998	0.59457
7	No	0.53760	0.80502
8	No	1.19315	0.30648
9	No	1.23860	0.27548
10	No	1.22053	0.28219
11	No	1.16432	0.31677
12	No	1.68425	0.07594

1. Results from Eview 5.0
2. All series are taken second-difference.
3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money; "Yes" is causality.
4. The quarterly data of American government budget deficits is collected from the OECD. The quarterly data of American base money is collected from Federal Reserve.
5. We choose 5% significant level.

**Table 10: Granger Causality Test between Deficits/GDP and inflation rate using American quarterly data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	Yes	4.80588	0.02967
2	Yes	3.93156	0.02138
3	Yes	3.84695	0.01069
4	Yes	3.12162	0.01651
5	Yes	2.71808	0.02177
6	Yes	2.24956	0.04113
7	No	2.04749	0.05233
8	Yes	2.22362	0.02844
9	No	1.81029	0.07049
10	No	1.61699	0.10672
11	No	1.60226	0.10360
12	No	1.61374	0.09377

1. Results from Eview 5.0
2. All series are taken first-difference.
3. The ratio is equal to Deficit/GDP.
4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.
5. The quarterly data is collected from the OECD.
6. We choose 5% significant level.

**Table 11: Granger Causality Test between government budget deficits and base money using American annual data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.01163	0.91468
2	No	0.43028	0.65363
3	No	0.55935	0.64560
4	No	2.16000	0.09776

1. Results from Eview 5.0
2. All series are taken second-difference.
3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the government budget deficit to base money.
4. The annual data of American government budget deficits is collected from the OECD. The American annually base money comes from Federal Reserve.
5. We choose 5% significant level.

**Table 12: Granger Causality Test between Deficits/GDP and inflation rate using American annual data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	1.84265	0.18244
2	No	0.22659	0.79838
3	No	0.99026	0.40941
4	No	1.59905	0.20027

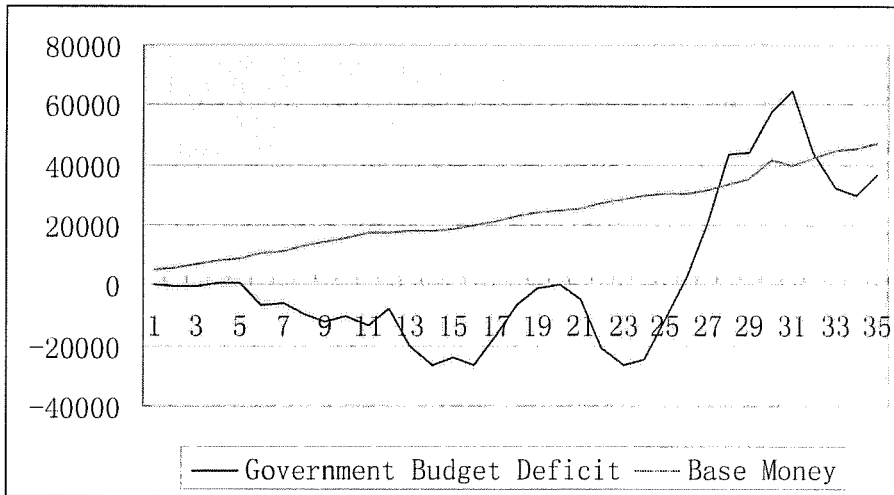
1. Results from Eview 5.0
2. All series are taken first-difference.
3. The ratio is equal to Deficit/GDP.
4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to inflation rates.
5. The annual data is collected from the OECD.
6. We choose 5% significant level.

From Table 9, we see there is no causality between government budget deficits and changes in the base money using American quarterly data. However, Table 10 shows that there is a causality from the government deficits to inflation. These results are not fully consistent with neoclassical theory, since base money changes need to precede changes in prices. When we repeat the tests using American annual data, there is still no link among the three variables as shown in Table 11 and 12. That is to say, the results for annual and quarterly data are not identical. The problem of stationary of series may cause this problem. Based on results from the quarterly data, we have to reject the neoclassical theory. On the other hand, the results would be consistent with Post-Keynesian theory, if the American economy was close to full capacity. For this reason, we will analyze American unemployment rates in the next section. Nevertheless, in American annual sample, we cannot easily prove or disprove any of the two competing approaches.

Using the three countries' quarterly and annual data, we can find no causal link between deficits and inflation, with the exception for American quarterly data. We also confirm that there is a causality from the government budget deficits to changing in base money. That is to say, government budget deficits are not associated with inflation when the government "monetizes" its deficits. We also test whether a causality is from the ratio of Deficits/GDP to the growth rate of base money in the appendix. On the basis of these results, we have to reject neoclassical theory and accept Post-Keynesian theories. Is our conclusion right? To answer this, we draw some diagrams to see what those variables are and how they interact.

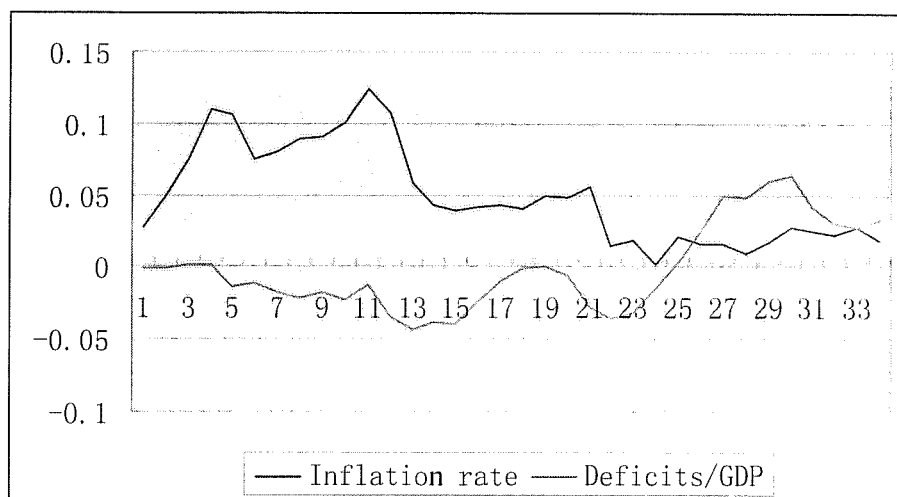
Canada

**Figure 6: Canadian government deficits and base money over the period 1970 – 2004**



*The data of base money is collected from Statistic Canada. The data of government budget deficits comes from OCED.*

**Figure 7: Canadian Deficits/GDP and inflation rate, 1970 – 2004**

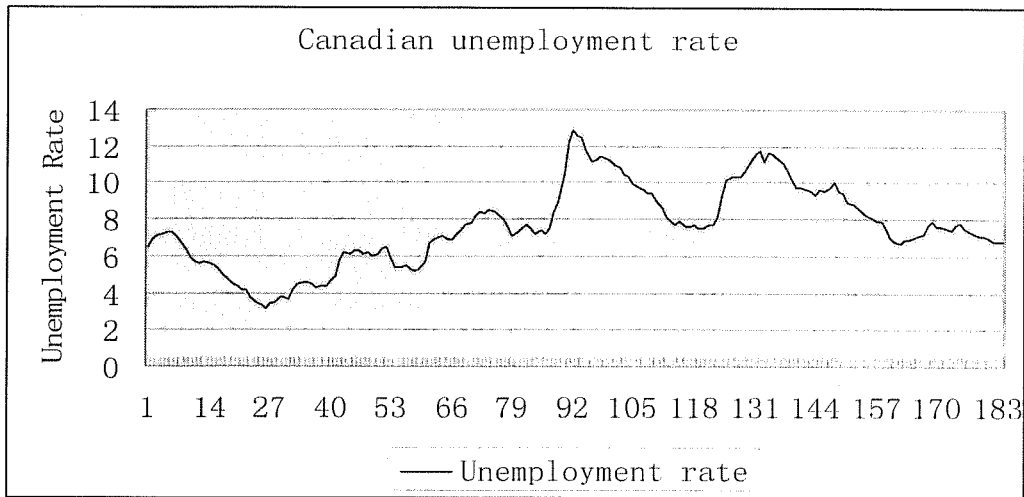


*The data is collected from the OECD.*

In Figure 6, we drew two curves: one for Canadian government budget deficits and one for the Canadian base money. Figure 7 shows curves of Canadian Deficits/GDP and inflation rate. In Figure 6, we cannot observe a correlation between the government deficit and changes in base money.

Is there a causal link between Deficits/GDP and the inflation rate in Figure 7? Clearly, there is no causal link between the two variables during the whole period. However, during some short period, from 1974 to 1984, there exists a causal link. Is this result consistent with Post-Keynesian theory? It is here that it is important to see the Canadian unemployment rate. Figure 8 illustrates the Canadian unemployment rate.

**Figure 8: Canadian unemployment rate over the period 1970 – 2005 (Quarterly)**

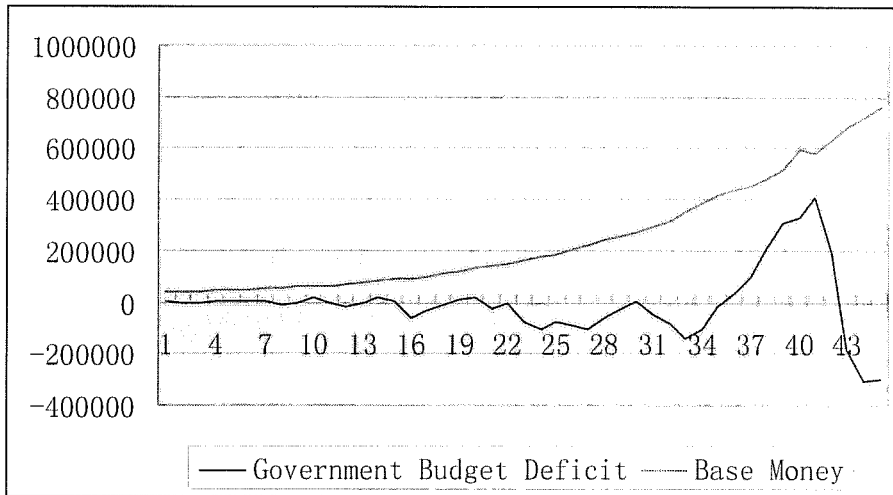


*The data is obtained from the OECD.*

In Figure 8, though all of Canadian unemployment rates are relatively high, we can find that Canadian economy was under the relatively low unemployment rate during 1974 to 1984 (Between 4 and 6 percent). Was Canada under or close to full employment during this period? Since Canada is a large country, we can consider that Canada was close to full employment during that period. This result is the supportive of the Post-Keynesian monetary theory. Do other two countries have the same results? We draw diagrams for the United States and Japan.

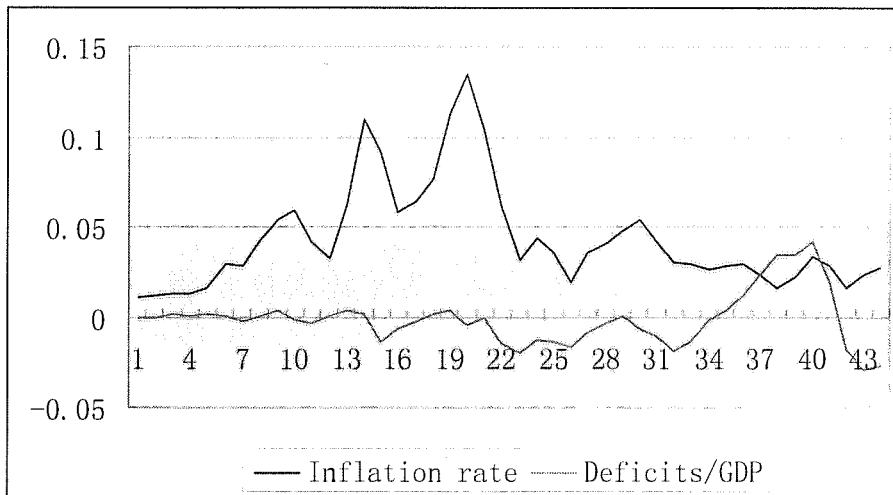
United States

**Figure 9: American government deficits and base money, 1960 – 2005**



*The data of base money is collected from the Federal Reserve. The data of government budget deficits come from the OECD.*

**Figure 10: American Deficits/GDP and inflation rate, 1960 – 2005**

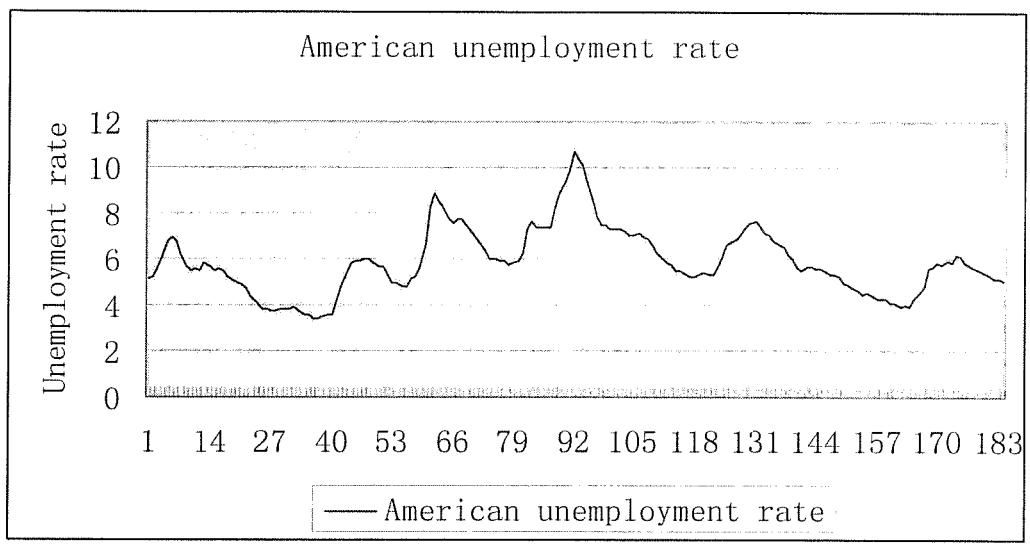


*The data is collected from the OECD.*

In the American case, Figure 9 shows there is not a link between the government deficit and changes in base money. That is to say, we cannot get any causal link between these

two variables. Figure 10 depicts the American Deficits/GDP and inflation rate. Before we study Figure 10, we also draw the curve for the American unemployment rate in Figure 11.

**Figure 11: American unemployment rates over the period 1960 – 2005 (Quarterly)**



*The data is collected from the OECD.*

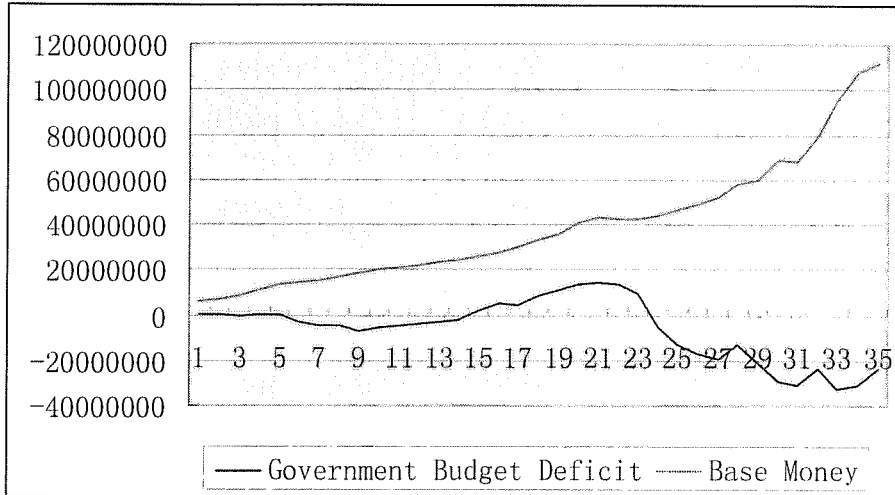
In Figure 10, connecting to Figure 11, we can find a causal link between Deficits/GDP and the inflation rate in a short period, about 1965-1975 (From 5 – 15 in Figure 10).

Coming back to Figure 11, we find that period had relatively low unemployment (Mostly under 5%) in American history. This result is, in fact, supportive of the Post-Keynesian view.

## Japan

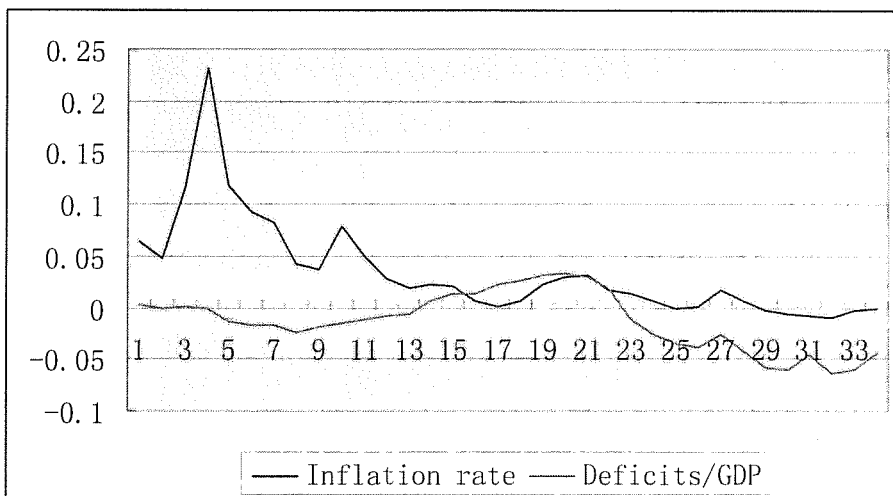
In Japanese case, we use annual data to draw the following figures:

**Figure 12: Japanese government deficits and base money, 1960 – 2005**



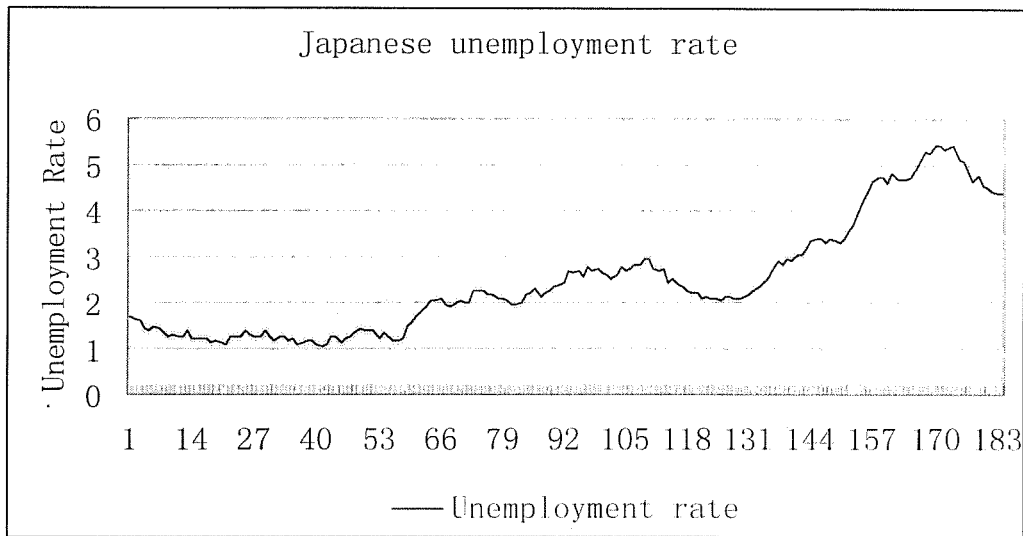
The data of government budget deficit is collected from the OECD. The data of base money is collected from Bank of Japan.

**Figure 13: Japanese Deficits/GDP and inflation rate, 1960 – 2005**



The data is collected from the OECD.

**Figure 14: Japanese unemployment rates over the period 1960 – 2005 (Quarterly)**



*The data come from the OECD.*

Figure 12 shows that there is no correlation between government budget deficits and the changes in base money in Japan. That is to say, the Japanese government does not “monetize” its deficits. In figure 13, we also cannot find there is a causality between Deficits/GDP and inflation rates during the whole period. From Figure 14 (Japanese unemployment rate), we see that Japan always keeps a relatively low unemployment rate. Most years, Japanese unemployment rates were less than 2 or 3%, particularly during 1960 to 1972. Going back to Figure 13, the period of 1960–1972 is depicted as 1 to 12 in the diagram. From 1 to 12 (during 1960–1972), we can observe a causal link between Deficits/GDP and the inflation rate. From The distance between the two curves is around one or two years. This result is thus largely supportive of the Post-Keynesian monetary theory once again.

#### **IV Conclusion**

In the empirical section, we investigated the causal links among three variables, government budget deficits, the changes in base money and inflation rates. That is, we tested whether government budget deficits cause changes in base money and inflation. The second causal link is one of the central issues debated between neoclassical and Post-Keynesian monetary theorists. Neoclassical economists believe that if the government monetizes its own deficits, the base money should increase, and this increase leads to inflation. Therefore, neoclassical theory is correct, if we would get positive results in both tests. However, Post-Keynesian economists have a different view: government deficits may not cause inflation in this endogenous money world, depending on the state of the labor market, the key is whether the economy is under or close to full employment. That is to say, if the economy is close to full employment, government budget deficits will increase demand, which will cause inflation. Otherwise, the government deficit cannot lead to inflation.

The empirical analysis is divided into two parts and the hypothesis is based on the neoclassical view. In the first part, we used the econometric approach – Granger Causality Test – to test causal relations in three countries: Canada, Japan and the United States. Regardless of the kind of data we used, results show a Granger causal link from the government deficits to changing in base money except for American data. We also find no Granger causality between the government budget deficits and inflation except for American quarterly data. Based on these results, we have to reject our null hypothesis

– neoclassical monetary theory. On the neoclassical side, if the government “monetizes” its deficits, the deficits will cause inflation. That is to say, these results are consistent with Post-Keynesian theory.

In the second part of empirical testing, we observed visually the curves of the three variables. From those diagrams, we obtained further insights not provided by the econometric approaches. When we study these curves, there is not a correlation between government deficits and changes in base money for all countries. Nevertheless, we can find a causal link between budget deficits and the inflation rate for several short periods which have a relatively low unemployment rate. The results of the second empirical section appear to be consistent with Post-Keynesian theory once again.

From the above analysis, we can now conclude that the government budget deficit does not cause inflation except when the economy is close to full employment. This conclusion agrees with Post-Keynesian monetary theory.

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## Appendix

### ADF Test for Series of the Growth Rate of Base Money

	t-Statistic	5% Level	
Canadian Quarterly Data			
Rate	-2.967165	-2.883579	I(0)
Canadian Annual Data			
Rate	-3.592286	-2.954021	I(0)
American Quarterly Data			
Rate	-12.73397	-2.877363	I(0)
American Annual Data			
Rate	-6.452097	-2.931404	I(0)
Japanese Quarterly Data			
Rate	-2.905253	-2.883239	I(0)
Japanese Annual Data			
Rate	-3.256925	-2.954021	I(0)

1. We choose 5% significant level.

2. Rate is the growth rate of base money:  $\frac{Base - Base_{-1}}{Base_{-1}}$ . Here, Base is base money.

3. I(0) means the series is stationary.

Canadian Quarterly Data

**Table 13: Granger Causality Test between Deficits/GDP and the growth rate of base money using Canadian Quarterly data (1970 – 2005)**

The number of lags	Result	F-statistics	P-value
1	No	1.69423	0.19528
2	No	0.69253	0.50213
3	No	2.24346	0.08638
4	No	1.71907	0.14988
5	No	1.52709	0.18627
6	No	1.67470	0.13304
7	No	0.98260	0.44739
8	No	1.56702	0.14255
9	No	1.53027	0.14609
10	No	1.34081	0.21838

11	No	0.99665	0.45459
12	No	0.85839	0.59098

1. Results from Eview 5.0
2. All series are taken first-difference.
3. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.
4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from Deficits/GDP to the growth rate of base money.
5. The quarterly data of Canadian budget deficits is collected from the OECD. The data of Canadian base money is collected from the Statistic Canada.
6. We choose 5% significant level.

#### Canadian Annual Data

**Table 14: Granger Causality Test between Deficits/GDP and the growth rate of base money using Canadian annual data (1970 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.11082	0.74161
2	No	0.61583	0.54789
3	No	0.43755	0.72825
4	No	0.63948	0.64046

1. Results from Eview 5.0
2. All series are taken first-difference.
3. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.
4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to the growth rate of base money.
5. The annual data of Canadian government deficits and inflation rates is collected from the OECD.
6. We choose 5% significant level.

#### American Quarterly Data

**Table 15: Granger Causality Test Deficits/GDP and the growth rate of base money using American quarterly data (1960 – 2005)**

The number of lags	Result	F-statistics	P-value
1	No	0.36495	0.54654

2	No	0.87921	0.41693
3	No	0.53419	0.65944
4	No	0.52218	0.71955
5	No	0.45119	0.81199
6	No	0.46439	0.83392
7	No	0.79782	0.59020
8	No	0.76748	0.63189
9	No	0.69625	0.71155
10	No	0.60141	0.81087
11	No	0.65677	0.77717
12	No	0.72851	0.72179

1. Results from Eview 5.0

2. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.

3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from Deficits/GDP to the growth rate of base money.

4. The quarterly data of American government budget deficits is collected from the OECD. The quarterly data of American base money is collected from Federal Reserve.

5. We choose 5% significant level.

American Annual Data

**Table 16: Granger Causality Test Deficits/GDP and the growth rate of base money using American annual data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.20972	0.64947
2	No	0.15299	0.85868
3	No	0.19421	0.89961
4	No	2.54457	0.05927

1. Results from Eview 5.0

2. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.

3. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to the growth rate of base money.

4. The annual data of Japanese government budget deficits is collected from the OECD. The annual data of Japanese base money is collected from Bank of Japan.

5. We choose 5% significant level.

Japanese Quarterly Data

**Table 17: Granger Causality Test Deficits/GDP and the growth rate of base money using Japanese quarterly data (1960 – 2005)**

The number of lags	Result	F-statistics	P-value
1	No	0.05676	0.81205
2	No	0.09722	0.90742
3	No	0.58565	0.62546
4	No	0.48240	0.74862
5	No	0.76079	0.57975
6	No	1.20693	0.30729
7	No	0.60423	0.75144
8	No	0.72404	0.66997
9	No	0.68509	0.72105
10	No	0.86728	0.56591
11	No	1.01149	0.44140
12	No	1.15970	0.32191

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.

4. The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from Deficits/GDP to the growth rate of base money.

5. The quarterly data is collected from the OECD.

6. We choose 5% significant level.

Japanese Annual Data

**Table 18: Granger Causality Test Deficits/GDP and the growth rate of base money using Japanese annual data (1960 – 2005)**

The number of lags	Results	F-statistics	P-value
1	No	0.00047	0.98287
2	No	0.00571	0.99431
3	No	2.63177	0.07420
4	No	3.08132	0.03956

1. Results from Eview 5.0

2. All series are taken first-difference.

3. The ratio is equal to Deficit/GDP; the rate is the growth rate of base money.

4. *The second row shows the outcome of Granger Causality Test. Here, "No" means no causality from the ratio of Deficit/GDP to the growth rate of base money.*

5. *The annual data of Japanese government budget deficits is collected from the OECD. The annual data of Japanese base money is collected from Bank of Japan.*

6. *We choose 5% significant level.*

Regardless of results we have, we find these results are not consistent with our previous ones. However, when we did Granger Causality Tests, we find that the growth rate of base money actually cause the ratio of deficits/GDP. These results do not obey neither neoclassical nor Post-Keynesian theory. The reason may include:

1. Since GDP is endogenous, it could affect the result.
2. The accounting problem also may bring this result.