

Review Paper:

Relationship among public finance, money, tax and price level

Biswas Shyamapada

School of Business, Ahsanullah University of Science and Technology, Dhaka, BANGLADESH
biswas.sob.aust@gmail.com

Abstract

Public finance is closely associated with Government’s revenue generation and it is a vital issue for ensuring balanced sustainable economic and social development. The object of this study is to investigate the views of academics and researchers about the relationship among public finance, money, tax and inflation using secondary literature. The findings of the study show that regarding the issue, there are contradictory and confusing remarks and conclusions.

The study needs more intensive investigations to understand the relationship among public finance, money, tax and price level determination and propose appropriate solution. This study is a unique one because out of the vast materials with extensive models and identities, brief but precise and understandable proposition have been made.

Keywords: Anticipated inflation, budget constraint, central bank, distortionary taxation, fiscal authority, hyperinflation, inflation tax revenue, monetary authority, open market purchase, partial equilibrium model, portfolio holdings, primary deficits, primary surpluses, public finance, quantity theory, seigniorage, tax revenue, unanticipated inflation.

Introduction

Inflation generates revenue for the Government and distorts private sector. Inflation distorts the demand for money and serves as an implicit tax on consumption. So, higher inflation rate leads to lower labor supply, output and consumption. However, for the Government, any change in inflation has budgetary implications because it affects the revenue. Normally, higher inflation it bound to reduce distortionary taxation which is the cost of the inflation. In this study, the relationship among government budget, revenue and inflation is investigated. In doing this, explicitly more focus is given on the role of inflation in public finance.⁴⁵

It is generally recognized that fiscal and monetary policies are linked with budget constraint. So, change in the inflation rate can influence the decisions of the fiscal authority about expenditures and taxes. Again, decisions taken by the fiscal authority change money growth and create inflation.

Governments in the free economy generate revenue to acquire needed goods and services. For this, Governments can print money and use this money to purchase resources

from the private sector, which can instigate inflation. However, to understand the impact of revenue generation by issuing money on inflation, the budget constraint of the Government must be understood. Government’s budget constraint (income and expenditure) is as follows (Table 1).

Table 1
Government’s Expenditure and Income

| Expenditure | Income |
|--|--|
| <ul style="list-style-type: none"> ▪ expenditures on goods and services, ▪ transfer payment¹ ▪ interest payments on the outstanding debt | <ul style="list-style-type: none"> ▪ tax revenue ▪ new issues of interest bearing debt ▪ receipts from the central bank |

The expenditure of the government contains expenditures on goods and services, transfers payment and interest payments on the outstanding debt. The expenditure of the government includes tax revenue, new issues of interest bearing debt and receipts from the central bank. The monetary authority, i.e. the central bank, has a budget identity that links changes in its assets and liabilities (Table 2).

Table 2
Assets and Liabilities of Monetary Authority

| Assets | Liabilities |
|---|---|
| <ul style="list-style-type: none"> • central bank’s purchases of government debt | <ul style="list-style-type: none"> • central bank’s receipt of interest payments from Treasury |
| <ul style="list-style-type: none"> • receipts from the central bank | <ul style="list-style-type: none"> • change in the central bank’s own liabilities |

The liabilities of the monetary authority are high powered money and sometimes they form the monetary base of the monetary authority. It contains the stock of currency held by the nonbank public and the bank reserves. The reserves of the private banks can be used as deposits under a fractional reserve system. Any changes in the stock of this high powered money change the money supply.²⁹ Considering the stock of government interest bearing debt held by the public, the budget identities of the Treasury and the central bank can be expressed as follows:

(Government’s expenditures on goods, services and transfers + interest payments on the outstanding debt) = (Tax revenue + interest-bearing debt + change in the central bank’s own liabilities)

This means that Government purchases plus its payment of interest on outstanding debt must be funded by revenue which can be generated from different sources: (i) taxes, (ii) borrowing from the private sector and (iii) printing currency that is represented by the change in the outstanding stock of noninterest bearing debt.

The last term of the budget identities above represents the seigniorage² which represents the revenue from money creation. Seigniorage arises from two sources. First, it arises because of the change in real high-powered money and Government has the monopoly to issue high powered money. By increasing in the amount of high-powered money, the government gets real resources. In steady state, if there is no change in high powered money, the seigniorage equals zero.⁴⁵

Even in the steady state seigniorage can be non-zero because to hold a constant level of real money compared to income, the private sector desires to increase its nominal holdings of money at the rate of inflation to offset the effects of inflation on real holdings. By supplying money and meeting this demand, the Government can obtain goods and services or reduce other taxes.

This shows that the relevant tax rate on high powered money depends directly on the nominal rate of interest. When the nominal rate of interest equals to zero, Government collects no revenue from seigniorage. So, any change in seigniorage requires an adjustment in the other components of the budget identity.⁴⁵ It means that if the nominal interest rate is reduced to zero, the lost revenue must be replaced by increasing taxes. It can increase the Government's net indebtedness, or reductions in expenditures.

The budget identities suggest that Governments can generate revenue through money creation, and the revenue has at least three alternative measures. The first measure is the total receipts from the central bank (RCB). King and Plosser²⁸ report that the real value of the receipts that got the USA during 1929–1952 from the central bank (RCB) amounted 0.02% of real GNP. During 1952–1982, it was 0.15% of real GNP. Changes of the ownership of government debt from the private sector to central bank affect the measure of seigniorage even if high powered money remains constant. It means that if the central bank uses the interest receipts to purchase government debt, central bank's purchases of government debt rise and the receipts from the central bank fall.

In this case, the Treasury needs to increase other taxes, reduce expenditures, or issue more debt. It means that the Treasury can issue debt equal to the increase in the central bank's debt holdings, leaving private debt holdings, government expenditures and other taxes unaffected. Any change in the receipts from the central bank does not signify any real changes in the finances of Treasury; so they are not the right measure of seigniorage.⁴⁵

The second measure of seigniorage is the real value of the high-powered money. In the USA, during 1929–1952 seigniorage equaled 1.37% of real GNP; during 1952–1982 it was only but only 0.3% of real GNP. This quantification of seigniorage equals the revenue from money creation. It means that this seigniorage equals the expenditures that could be funded, holding other tax revenues and interest bearing private sector debt of the Government unchanged. Though in the USA, seigniorage during the postwar was quite small, but it was more than 6% of GNP in Argentina and over 2% in Italy in the same time.²⁸

The third definition of seigniorage includes the savings of nominal interests issuing non-interest-bearing debt. In this case, the seigniorage equals the revenue obtained from money creation for a given total interest bearing and non-interest-bearing government debt. With this revenue, Government expenditure could be financed holding other tax revenues and the total private sector holdings of Government real liabilities constant.

To recognize the impact of monetary policy on Government budget, the fiscal policy and other related issues have to be kept unchanged. Let us suppose that the tax revenues of the Government are lump sum taxes³. In this case, one definition of fiscal policy of the Government is the purchases of the Government and the interest-bearing debt. Under this definition, monetary policy changes the total liabilities of the Government. Changes in seigniorage together with the changes in tax revenues are necessary to maintain fiscal policy of the Government. These changes in seigniorage and the changes in tax revenues constitute the contents of the monetary policy.

The monetary policy changes the total liabilities of the Government. Open market purchase of the central bank, *ceteris paribus*, decreases the stock of interest-bearing debt. The Treasury issues additional interest-bearing debt to keep the sequence unchanged. As a result, the Government liabilities rise.⁴⁵

The budget identity shows the relationship among Government's expenditures, taxes, debt and seigniorage. However, if there are no restrictions on the Government's ability to borrow or to raise revenue from seigniorage, there is no real constraint on expenditure or tax choices. If Governments are constrained to borrow, it limits the Government's choices. Ignoring the impact of surprise inflation, the single period budget identity of the government can be written as follows:

$$(\text{Purchases} + \text{payment of interest}) = (\text{tax revenue} + \text{interest-bearing debt} + \text{seigniorage})$$

The budget identity above shows that Government's expenditure and tax plans are to satisfy the requirement of intertemporal budget⁴ balance. The right side of identity presents the discounted value of all current and future tax

and seigniorage revenues. The left side presents the discounted value of all current and future expenditures and current outstanding debt (principal plus interest). It means that Government must raise sufficient revenue at present value to repay the existing debt and finance its expenditures. If the Government has outstanding debt, the present value of deficits must be negative, which can be adjusted through expenditures, taxes or seigniorage.

Government is constrained by the budget. Government must combine monetary and fiscal policies to choose expenditures, taxes and seigniorage to ensure that there is balance for all possible values of the initial price level and interest rates. If there is an equilibrium condition, Government needs only to hold at the equilibrium price level and interest rate⁹.

If the intertemporal budget balance has a constraint, it imposes restrictions on the behavior of government deficits. However, sequences of primary deficits⁵ can be consistent with intertemporal budget balance if the Government is expected to have large primary surpluses in future. Question is, whether a long sequence of primary deficits has any implications for seigniorage and inflation. It is to mention that deficits normally lead to inflation as seigniorage is used to generate the necessary funds.⁴³ Different authors have tested the sustainability of intertemporal budget deficit with mixed results.^{22,23,47} In stochastic environment even apparently cautious fiscal policies such as running a balanced budget could be unsustainable.^{6,7}

Money and Fiscal Policy Frameworks: The nominal money supply could change the financing policy of the Government from tax financed Government expenditures to seigniorage financed expenditures. Money supply could change also, if the central bank purchases interest bearing debt in open market operation holding other taxes constant. These two methods of increasing the money stock have different impacts on taxes and stock of interest-bearing Government debt. They can have different effects on prices and/or interest rates.

Government budget constraint is linked with monetary and fiscal policies because change in the money stock affects the equilibrium price level. So, for budget, the monetary and fiscal policies must be precisely defined. As for instance, an open market purchase increases the stock of money, but reduction of the interest-bearing government debt held by the public has impact for future taxes needed to finance the interest cost of the Government's debt.⁴² It means that an open market operation has a fiscal side. This leads to uncertainty to explain what is meant by proclaiming: change in monetary policy holding fiscal policy constant.⁴⁴

Regarding the relationship between monetary and fiscal policies, there are several alternative assumptions. The most common assumptions is that the fiscal policy has to be adjusted in such a way that the Government's intertemporal

budget is in balance. In this regard, the monetary policy should have the freedom to set the nominal money stock or the nominal rate of interest.^{30,42}

According to quantity theory, changes in the nominal quantity of money led to equal proportional changes in the price level. Even under regimes of monetary dominance, fiscal policy affects the real rate of interest; it means that the price level is not independent of fiscal policy. Increase in expenditures raises the real and nominal interest rate and lowers the real demand for money. Nominal money supply causes the price level to jump up which reduce the real supply of money. Nevertheless, there is an alternative budgetary policy in which the fiscal authority sets expenditure and taxes without considering the requirement of inter temporal budget balance. In this case, if taxes are not sufficient to cover the expenditures, seigniorage ensures that inter temporal budget constraint is satisfied.^{1,42}

Other alternative of the budget policy is the so called fiscal theory of the price level.^{13,48} In this proposition, the intertemporal budget constraint is not satisfied at arbitrary price levels but at equilibrium price level. In determining the price level, Government's nominal debt plays a critical role in this proposition. All these alternative regimes are known as non-Ricardian.⁴⁸

Fiscal Dominance, Deficits and Inflation: Intertemporal budget constraint requires that if any Government has a current outstanding debt, it must have future surpluses in present value terms. Increasing revenues from seigniorage can be the simplest way to create a surplus. For this reason, finance economists are interested in the impact of budget deficits for future money growth. In this respect, accordingly, two questions arise: (i) fiscal deficits eventually cause inflation and (ii) if there is no inflation because of deficit, is it a historical consequence⁶? Regarding the answer of the first question, it has been concluded that if the monetary authority tries to ensure balanced intertemporal budget, eventually there is inflation.²⁵ In this view, fiscal policy is set independently and the monetary authority generates enough seigniorage to satisfy the intertemporal budget balance condition. It is a situation in which there is an active fiscal policy and a passive monetary policy, such a situation is called fiscal dominance.³⁰

The current real liabilities of the government must be financed by either a fiscal primary surplus⁷ in present value or seigniorage. In present value, if the fiscal primary surplus is reduced, the present value of seigniorage must rise to adjust the reduction. If any attempt is made by the monetary authority to reduce inflation and seigniorage today, it leads to higher inflation and seigniorage in the future. The relationship is simple; if current inflation tax revenue⁸ is lowered, the deficit grows and the stock of debt rises. It means that increase in the present value of future tax revenue includes revenues from seigniorage and if the fiscal authority does not adjust, eventually the monetary authority will be

bound to increase money supply and produce higher inflation.

Grier and Neiman²¹ summarize a number of case studies regarding the relationship between budget deficits and money growth and find that the structural deficit⁹ is a determinant of money growth. King and Plosser²⁸ make same findings and conclude that fiscal deficit does help to predict future seigniorage and this is an evidence for fiscal dominance.

Sargent and Wallace³⁹ find that fiscal and monetary policies are coupled. Changes in the nominal quantity of money through changes in lump sum taxes and transfers have different effects than changes induced through open market operations. Metzler³⁴ finds that an open market operation raises the price level less than proportionally to the increase in money. Open market operation affects the real stock of money and leads to a change in the equilibrium rate of interest. According to Metzler³⁴, portfolio holdings of bonds and money of the households depended on the expected return on bonds. As open market operation alters the ratio of bonds to money, it induces households to hold new portfolio composition of bonds and money and there is a change in interest rate.

Nominal money supply would not restore equilibrium price level, because the original ratio of nominal bonds to nominal money is not restored. Open market purchase reduces the stock of interest-bearing debt held by the public which changes the future expected taxes that affect the stock of interest-bearing debt.³⁵

Aiyagari and Gertler¹ investigate whether the price level depends only on the stock of money or whether the debt policy and the behavior of the stock of debt are to be considered for price level determination. For this, they consider the case that Government sets taxes to back a fraction of its interest-bearing debt. If Government interest bearing debt is fully backed by taxes in the sense that the Government commits to maintaining the present discounted value of current and future tax receipts equal to its outstanding debt liabilities, such fiscal policy is called non Ricardian¹. In such policy regime, seigniorage must adjust the present value of taxes and the Government's outstanding debt.

Leeper³⁰ states that even if all debt is backed by taxes used to finance shocks to the Government's budget, it can have important functions. He differentiates between active and passive monetary policies.

According to Leeper³⁰, in an active monetary policy but a passive fiscal policy, monetary policy targeting nominal interest rates does not respond to Government's debt and afterward the fiscal policy must adjust taxes to ensure intertemporal budget balance (Ricardian fiscal policy). If both fiscal and monetary authorities follow active policies,

inflation and debt processes are unstable. If monetary authorities follow passive policies, there is price level indeterminacy.³⁰

Government Budget Constraint and the Nominal Rate of Interest: If there are real liabilities, the monetary authority is forced to finance the difference between these real liabilities and the present discounted value of the fiscal surpluses. Fiscal conditions i.e. deficit or surplus, decide the money supply. Whatever the decision is, the traditional quantity theory holds and the price level changes proportionally to the nominal quantity of money. Suppose initial nominal stock of money is set exogenously by the monetary authority, it does not mean that the price level is determined only by monetary policy decision with no effect of fiscal policy. Fiscal policy can affect the initial equilibrium price level, even when the initial nominal quantity of money is given and the Government's intertemporal budget constraint is satisfied.

In perfect foresight equilibrium¹⁰, Government's budget constraint must be satisfied and the real demand for money must equal the real supply of money. Using money in the utility (MIU) function model, the real demand for money can be derived. According to this model, agents equate the marginal rate of substitution between money and consumption to the cost of holding money where this cost depended on the nominal rate of interest.

Equilibrium Seigniorage: Under the condition of fiscal dominance, seigniorage is determined by fiscal deficit. Assume that government has a fiscal deficit that must be financed by money creation. The question is, will it be feasible to raise money to cover the deficit in steady-state equilibrium and in that case what will be the rate of inflation.

If there is a one to one relationship between the revenue generated by the inflation tax and the inflation rate, the inflation rate will be determined by the amount of revenue raised by money creation. However, the inflation rate affects the base against which the tax is levied. On the other hand, for a given base, a higher inflation rate raises seigniorage. Further, higher inflation rate increases the opportunity cost of holding money and thus reduces the demand for money which lowers the base against which the tax is levied.

In other words, revenue can be increased by more than one rate of inflation. That means that the nominal rate of interest may not be unique. To know more about the demand for money, additional structure has to be imposed. The stock of high-powered money is the base for the inflation tax. In most of the analysis, the seigniorage is seen directly as function of demand for money and nominal rate of interest.^{8,10}

Hyperinflation: Hyperinflation is an extremely rapid increase of inflation and it gets progressively worse. It is usually caused by a rapid increase in the money supply. Classic examples are the Hyperinflation of Weimar

Germany and the more recent Zimbabwean Hyperinflation which reached 2.2 million percent. The fiscal source is the chief culprit of hyperinflation. When government is forced to print money to finance real expenditures, it leads to hyperinflations. In other word it means that rapid growth of money leads to hyperinflation. However, money growth is not exogenous; it is endogenously determined by fiscal deficit.⁴⁵

There are two explanations for the development of hyperinflation. First, suppose that there is low inflation and it is stable. Now suppose that an exogenous shock pushes the inflation rate above the high inflation equilibrium. Again, suppose that this equilibrium is unstable and the economy begins to diverge and moves to higher and higher rates of inflation. This explanation represents the situations in which exogenous shocks push the economy into an unstable region.⁴¹

The second explanation is that the growing budget deficit has to be financed by seigniorage. The deficit rises above the maximum and cannot be financed by money creation. Government cannot acquire enough revenues and creates more money which ultimately leads to hyperinflation. Most of the hyperinflations have taken place after wars in the losing countries. Such countries have war devastated economy; tax system in these countries does not function effectively. To rebuild the economy and meet basic needs of the peoples, there is enormous demand for Government expenditures. The demand of the revenue outpaces the capability to have tax revenues. Hyperinflations usually lead to fiscal reform and force the Government to reduce its reliance on seigniorage.⁴¹

With the change of the policy, expected inflation falls, the opportunity cost of holding money sinks and the demand for real money rises. In the mid-1980s, a similar thing at smaller scale happened in the USA. Money supply (M1) grew very rapidly and it was assumed that this would lead to higher rates of inflation. The reason behind was increased demand for money resulting from the decline in inflation in 1979 – 1980. It means that the reduction of growing money demand can cause problems for introducing credible policies to reduce inflation. If disinflation is credible, expected inflation falls; in this case it may be necessary to increase the money supply. When inflation and money supply are closely related and the monetary authority lets money grow, it is seen as signal that the monetary authority has given up its policy of disinflation.⁴⁵

Theories on seigniorage, inflation and hyperinflations are based on rules. If there is a fiscal deficit, it is financed creating money that can lead to hyperinflations. There is an alternative view about hyperinflations which considers hyperinflations as bubbles¹¹ similar in financial markets.

Methods have been developed to explain bubbles. These methods are similar to those that are used to test

intertemporal budget balance. As for example, if the nominal money stock is nonstationary, then there is no bubble. It implies that to avoid bubbles, the price level will be non-stationary but cointegrated with the money supply.^{18,32,46}

The Fiscal Theory of the Price Level: In two ways fiscal policy can matter for the price level. First, equilibrium stresses that the real quantity of money and the real demand for money are equal. If fiscal variables change, the real demand for money and the equilibrium price level change. However, this is not emphasized in fiscal theories of the price level. Instead, multiple price levels may be consistent with a given nominal quantity of money and equality between money supply and money demand. The task of the fiscal policy is to determine which is the equilibrium price level. In some cases, the equilibrium price level can be independent of the nominal supply of money.^{9,12,16,33}

Fiscal theory assumes that the Government's intertemporal budget constraint must hold for all price levels. When the intertemporal budget constraint is violated, the price levels change because such price levels are not consistent with equilibrium. At certain stock of nominal debt, the equilibrium price level ensures that the intertemporal budget is balanced.

The quantity theory of money explains the role of money in price level determination. Using the demand for money, the relationship between the quantity of money and the equilibrium price level that depended on the nominal rate of interest, can be obtained. As the nominal interest rate is an endogenous variable, so it itself may not be enough to determine the equilibrium price level including the nominal interest rate depending on the rate of inflation.

Governments can raise some revenue from printing money; question is how much revenue it should raise from this source. Phelps³⁶ notes that if there are only distortionary sources for revenue available, it is desirable to use all available sources of revenue so that the overall distortions are minimized. It means that an optimal tax package includes some seigniorage. If Government needs to raise a given amount of revenue which causes distortions, then the Government should set its tax structure in such a way that the distortionary cost is equalized across all taxes.

A Partial Equilibrium Model: Changes in revenue sources are predictable and consistent with the model of optimal taxation¹². If the distortionary cost of seigniorage revenue rises, it is optimal to plan to reduce future seigniorage. Mankiw³¹ found a near random walk behavior of inflation which is consistent with US monetary policy having optimal finance considerations. Poterba and Rotemberg³⁷ find cross country evidence for joint movements of inflation and tax revenues. Poterba and Rotemberg³⁷ discover positive relationship between tax rates and inflation for the United States and Japan. However, it is negative for France, Germany and the UK. The evidences are not favorable to

conclude that inflation or seigniorage could be set on the basis of optimal finance considerations.

The optimal financing consideration fails for the USA because seigniorage behaves like the stock of debt and not like general tax revenues. In the USA, temporary variations in Government expenditures are met with debt financing. Variations in seigniorage reflect changes in permanent Government expenditures or stochastic shifts in the distortions associated with raising seigniorage.

Optimal Seigniorage and Temporary Shocks: According to Barro^{4,5}, temporary fluctuations in government expenditures do not necessarily lead to tax adjustments; temporary increases in expenditures are deficit financed. Periods of low expenditures are used to generate surpluses to retire the issued debt. Fluctuation of tax rates in response to temporary fluctuations in expenditures causes a higher total efficiency loss because of the distortions induced by non-lump sum taxes. This implies that seigniorage has to be used because of permanent expenditure needs and not to adjust the unanticipated temporary events.³¹

Distortions induced by the inflation tax are based on anticipated inflation. On the basis of expected inflation, decisions on consumption, labor supply and money holding are made by households. So, variations in expected inflation generate distortions. Unanticipated inflation has wealth effects and serves as lump sum tax. To minimize the costs of distortionary tax, Government may engineer surprise inflation. In this way sufficient revenue could be generated and socially costly distortionary taxes are avoided. Government should inflate only at a rate consistent with the needs of revenue based on average expenditures. It means, that average inflation is set according to permanent expenditures and unanticipated fluctuation in expenditures should be met through socially costless unanticipated inflation³.

Calvo and Guidotti¹¹ show that government commitment to a path for anticipated inflation is the best possible way to respond flexibly to the unexpected disturbances of the unanticipated inflation. Auernheimer³ gives a guideline for seigniorage concluding that an ‘‘honest’’ Government does not generate revenue allowing the price level to jump unexpectedly even though this would generate an efficient lump sum tax.

Friedman’s Rule Revisited: Conclusion made by Phelps³⁶ that if only distortionary sources of tax are available, some revenue has to be raised from the inflation tax. It means in other words the choice of inflation has to be integrated with the choice of tax rates. However, Kimbrough²⁷, Faig¹⁹ and Correia and Teles^{14,15} show that under certain conditions, rule for the optimal inflation rate (a zero-nominal rate of interest) continues to be optimal even in the absence of lump sum taxes. Lastly, the question of the optimal inflation tax has been integrated into the general problem of optimal

taxation. By doing so, situations have been identified in which the structure of optimal indirect taxes is applicable for different final goods to be taxed at the same rate or for the tax rate on goods that serve as intermediate inputs to be zero.^{2,17}

The Basic Ramsey³⁸ Problem: Ramsey³⁸ problem is the problem of determining optimal taxes structure to finance a certain level of expenditures. Ramsey³⁸ problem sets taxes to maximize the utility of representative agent¹³ considering government’s revenue obligation. The utility of representative agent depends on consumption, real money balances and leisure. Considering tax rates as set, representative agent selects consumption, money holdings and leisure to maximize utility. Setting consumption tax and tax on money to maximize the representative agent’s utility are subject to three constraints. First, the tax revenues of the government must be sufficient to finance the expenditures of the Government which are considered to be exogenous. Second, Government must consider that consumption, labor supply and real money are consistent with the choices of private agents. Finally, the Government has to judge the resource constraints.

There are two approaches to solve these problems. The first approach, called the dual approach, assumes utility as a function of taxes and treats these tax rates as the Government’s control variables. The optimal values of the tax rates are found by solving the first order conditions from the optimization problem. The second approach is called the primal approach. In this approach, tax rates are found from the first order conditions of the representative agent to ensure that private agents choose the quantities that solve the maximization problem of the government.

Money as an intermediate: As money facilitates transactions, it can be viewed as an intermediate good. That means, money has to be considered as a good which is used as an input in the production of the final goods enter directly the utility function. For the determination of the optimal taxation structure, the distinction between final goods and intermediate goods is important because under certain conditions it is optimal to tax only final goods.¹⁷ Government levies taxes on each final good, but intermediate goods are not taxed.

Kimbrough^{26,27} and Faig¹⁹ suggest that the Friedman rule¹⁴ is applicable even in the absence of lump sum taxes. They conclude that problem arises when money is treated as final good that directly enters the utility function. Under the conditions of constant returns to scale, money and labor inputs should not be taxed. In practice, every final good is not taxed and the properties of the transactions technology of the economy are yet to be better understood. Further, there is no clear case for assuming constant returns to scale.

Non indexed Tax Systems: It has been assumed that taxes are levied on real income i.e. tax system is indexed and

onetime change in nominal quantities and the price levels do not change the equilibrium. It means that price changes have no effect on the real tax revenues of the government and on the tax rates of the individuals and firms in the private sector. However, most of the actual tax systems are not completely indexed; so the price level variations change the real tax rates and real tax revenue. Contrary to the assumption of the authors, the distortion generated by the interaction between inflation and the tax system is much larger than the revenue related effects.

Feldstein²⁰ estimates the net benefits of reducing inflation from 2% to zero and concludes that the effects due to reducing distortions related to the tax system are roughly twice to those associated with the change in government revenue. One important distortion arises when nominal interest income but not real interest income is taxed.

As nominal return is taxed, higher inflation distorts the individual's decisions, but taxation of nominal returns generates revenue for the Government. It allows with a constant level of expenditure and other taxes to be reduced. The distortions caused by higher inflation are offset by the reduction in the distortions caused by other tax sources. Feldstein²⁰ claims that the offset is only partial; a large net annual cost of inflation remains unaffected. Feldstein²⁰ finds that the effective tax rate on capital increases because of the treatment of depreciation and the increased subsidy on housing related with deductibility of nominal mortgage interest in the USA. These are significant distortions generated by higher inflation interacting with a non-indexed tax system. Together with these effects, Feldstein²⁰ analyses the impacts of government revenues and other distortionary taxes on welfare. He estimates that if inflation is decreased 2%, from 2% to zero, the net welfare increases from 0.63% to 1.01% of the annually GDP.²⁰

Conclusion

The literature regarding money and public finance is full of disappointing and confusing suggestions and conclusions. To explain simple relationships among the public finance and related variables, unnecessary complex models and identities without proper definitions and explanations have been used which have practically little usage. It has been felt that immense important practical issue of national economic and social welfare progress has to be studied more systematically with concrete propositions and alternatives made. Some deficiencies and shortcomings of the exiting literature are as follows:

- Government's budget constraint is associated with the monetary and fiscal policies. With the changes in the money stock or with the growth rate of money and other variables like taxes, expenditures and borrowings have to be adjusted, which can instigate inflation; and for price level determination, the relationship between fiscal and monetary policies must be specified.

- Some authors give emphasis on budget constraints for price level determination without appropriate suggestions.
- Monetarists, generally, ignore the implications of the budget constraint for price level determination which is socially costly and has long run serious consequence like income disparity.
- Some other authors give emphasis on fiscal theory expressing that attention has to be given to the fiscal implications of any monetary policy because changes in the quantity of money have implications for tax, liabilities and inflation.
- Remark of some author that the optimal tax policy does not distort the relative price of cash and credit goods or money, does not hold. Studies of some other authors lead to different results.
- Friedman²⁰ rule that the preference and technology restrictions required for a zero nominal interest rate to be optimal do not hold.
- It has been suggested that Government should combine monetary and fiscal policies to choose expenditures, taxes and seigniorage to ensure balance for all possible values of the initial price level and interest rates. And if there is equilibrium, Government needs to hold at the equilibrium price level and interest rate, whether it is practical, is not explained.
- Intertemporal budget constraint imposes restrictions on the behavior of Government deficits. Long sequence of primary deficits has implications for seigniorage and inflation. Deficits generally lead to inflation as seigniorage is used to generate the necessary funds. No suggestions regarding the issue have been made.
- Testing of the sustainability of intertemporal budget deficit has mixed results; in stochastic environment even under cautious fiscal policies, budget could be unsustainable. It means in other word unsustainability is the nature of the issue.
- Open market operation has a fiscal side; this invalidates the requirement changing monetary policy holding fiscal policy constant.
- Fiscal deficits cause eventually inflation; initiatives of the monetary authority to ensure balanced intertemporal budget lead to inflation. If monetary authorities attempt to reduce inflation and seigniorage today, it leads to higher inflation and seigniorage in the future. If the fiscal authority does not adjust, eventually the monetary authority is bound to increase money supply and produce higher inflation. It means actually, inflation is the ultimate rule of the game.
- Monetary and fiscal policies are said to be coupled. Changes in the nominal quantity of money through different instruments have different effects. An open market operation raises the price level less than proportionally to the increase in money. Nominal money supply does not restore equilibrium price level because the original ratio of nominal bonds to nominal money is not restored. The price level changes proportionally to

the nominal quantity of supply money. Open market operation leads also to a change in the equilibrium rate of interest.

- If both fiscal and monetary policies are active, inflation and debt processes become unstable. If there is passive monetary policy, there is price level indeterminacy.
- Fiscal deficit or surplus decides the money supply. If there are real liabilities, the monetary authority is forced to finance deficit and the traditional quantity theory holds, the price level changes proportionally to the nominal quantity of money. If a fiscal deficit is financed through creating money, it leads to inflation.
- Growing budget deficit has to be financed by seigniorage. Raise the deficit above the maximum which cannot be sustained by money creation, it leads ultimately to social costly hyperinflation. Hyperinflations lead to fiscal reform and forces the Government to reduce its reliance on seigniorage.
- Multiple price levels are consistent with a given nominal quantity of money and there is equality between money supply and money demand. Under this condition, the task of the fiscal policy is to determine what the equilibrium price level is. It means that increase is to be preplanned.
- In some cases, it has been found that the equilibrium price level can be independent of the nominal supply of money. That means that the theory does not sustain.
- It is desirable to use all available sources of revenue, so that the overall distortions are minimized. If raising revenue causes distortions, then tax structure has to be set in such a way that the distortionary cost is equalized across all taxes. That means that distortions are the rules.
- There are evidences for joint movements of inflation and tax revenues. Relationship between tax rates and inflation for the United States and Japan is positive. It is negative for France, Germany and the UK. Out of these evidences it cannot be concluded that inflation could be set on the basis of optimal finance considerations.
- It has been concluded that engineering surprise inflation costs of distortionary tax could be minimized. In this way, revenue could be generated and socially costly distortionary taxes are avoided. However, Government has to inflate at a rate consistent with the needs of revenue to accommodate expenditures.
- Despite, it has been concluded that “honest” Government does not generate revenue allowing the price level to jump unexpectedly and it is estimated that if inflation is decreased 2%, from 2% to zero, the net welfare increases from 0.63% to 1.01% of the annually GDP.
- With the changes of fiscal variables, the real demand for money, the equilibrium and price level change. This is not emphasized in fiscal theories of the price level.
- It has been concluded that inflation possesses a near random walk behavior in monetary policy with consistent optimal finance considerations.

References

1. Aiyagari S.R. and Gertler M., The Backing of Government Bonds and Monetarism, *Journal of Monetary Economics*, **16(1)**, 19–44 (1985)
2. Atkinson A.B. and Stiglitz J.E., The Structure of Indirect Taxation and Economic Efficiency, *Journal of Public Economics*, **1(1)**, 97–119 (1972)
3. Auernheimer L., The Honest Government’s Guide to the Revenue from the Creation of Money, *Journal of Political Economy*, **82(3)**, 598–606 (1974)
4. Barro R.J., Inflation and Growth, *Federal Reserve Bank of St. Louis Review*, **78(3)**, 153–169 (1996)
5. Barro R.J., On the Determination of the Public Debt, *Journal of Political Economy*, **87(5)**, 940–971 (1979a)
6. Bohn H., The Sustainability of Budget Deficits in a Stochastic Economy, *Journal of Money, Credit and Banking*, **27(1)**, 257–271 (1995)
7. Bohn H., The Sustainability of Budget Deficits with Lump-Sum and with Income-Based Taxation, *Journal of Money, Credit and Banking*, **23(3)**, 5581–604 (1991d)
8. Bruno M. and Fischer S., Seigniorage, Operating Rules, and the High Inflation Trap, *Quarterly Journal of Economics*, **105(2)**, 353–374 (1990)
9. Buiter W., The Fiscal Theory of the Price Level: A Critique, *The Economic Journal*, **112(481)**, 459–480 (2002)
10. Cagan P., The Monetary Dynamics of Hyperinflation, In Friedman M., ed., *Studies in the Quantity Theory of Money*, Chicago, University of Chicago Press, 25–117 (1956)
11. Calvo G.A. and Guidotti P.E., On the Flexibility of Monetary Policy: The Case of the Optimal Inflation Tax, *Review of Economic Studies*, **60(3)**, 667–687 (1993)
12. Christiano L.J. and Fitzgerald T.J., Understanding the Fiscal Theory of the Price Level, NBER Working Paper No. 7668 (2000)
13. Cochrane J.H., *A Frictionless View of U.S. Inflation*, NBER Macroeconomics Annual, Cambridge, MA, MIT Press, 323–384 (1998a)
14. Correia I. and Teles P., Is the Friedman Rule Optimal When Money Is an Intermediate Good?, *Journal of Monetary Economics*, **38(2)**, 223–244 (1996)
15. Correia I. and Teles P., The Optimal Inflation Tax, *Review of Economic Dynamics*, **2**, 325–346 (1999)
16. Daniel B., The Fiscal Theory of the Price Level in an Open Economy, *Journal of Monetary Economics*, **48(2)**, 293–308 (2001)
17. Diamond P.A. and Mirlees J.A., Optimal Taxation and Public Production I: Production and Efficiency and II: Tax Rules, *American Economic Review*, **61(3)**, 8–27, 261–278 (1971)

18. Evans G.W., Pitfalls in Testing for Explosive Bubbles in Asset Prices, *American Economic Review*, **81(4)**, 922–930 (1991)
19. Faig M., Characterization of the Optimal Tax on Money When It Functions as a Medium of Exchange, *Journal of Monetary Economics*, **22(1)**, 137–148 (1988)
20. Feldstein M., The Costs and Benefits of Going from Low Inflation to Price Stability, In Romer C. and Romer D., eds., *Monetary Policy and Inflation*, Chicago, University of Chicago Press, 123–156 (1998)
21. Grier K.B. and Neiman H.E., Deficits, Politics and Money Growth, *Economic Inquiry*, **25(2)**, 201–214 (1987)
22. Hakkio C. and Rush M., Is the Budget Deficit ‘Too Large?’, *Economic Inquiry*, **29(3)**, 429–445 (1991)
23. Hamilton J. and Flavin M., On the Limitations of Government Borrowing: A Framework for Empirical Testing, *American Economic Review*, **76(4)**, 808–819 (1986)
24. US budget deficit, December 06, 2020, <https://www.thebalance.com/budget-deficit-definition-and-how-it-affects-the-economy-3305820>, December 05, 2020 (2020)
25. Joines D.H., Deficits and Money Growth in the United States 1872–1983, *Journal of Monetary Economics*, **16(3)**, 329–351 (1985)
26. Kimbrough K.P., Inflation, Employment, and Welfare in the Presence of Transaction Costs, *Journal of Money, Credit, and Banking*, **28(2)**, 127–140 (1986a)
27. Kimbrough K.P., The Optimum Quantity of Money Rule in the Theory of Public Finance, *Journal of Monetary Economics*, **18(3)**, 277–284 (1986b)
28. King R.G. and Plosser C.I., Money, Deficits, and Inflation, *Carnegie-Rochester Conference Series on Public Policy*, **22**, 147–196 (1985)
29. Klein M. and Neumann M.J.M., Seigniorage: What Is It and Who Gets It?, *Weltwirtschaftliches Archiv*, **126(2)**, 205–221 (1990)
30. Leeper E.M., Equilibria Under ‘Active’ and ‘Passive’ Monetary and Fiscal Policies, *Journal of Monetary Economics*, **27(1)**, 129–147 (1991)
31. Mankiw N.G., The Optimal Collection of Seigniorage: Theory and Evidence, *Journal of Monetary Economics*, **20(2)**, 327–341 (1987)
32. Matthey J. and Meese R., Empirical Assessment of Present Value Relationships, *Econometric Reviews*, **5(2)**, 171–233 (1986)
33. McCallum B.T., Indeterminacy, Bubbles, and the Fiscal Theory of Price Level Determination, *Journal of Monetary Economics*, **47(1)**, 19–30 (2001a)
34. Metzler L., Wealth, Saving, and the Rate of Interest, *Journal of Political Economy*, **59(2)**, 93–116 (1951)
35. Patinkin D., *Money, Interest and Prices: An Integration of Monetary and Value Theory*, 2nd ed., New York, Harper & Row (1965)
36. Phelps E.S., Inflation in the Theory of Public Finance, *Swedish Journal of Economics*, **75(1)**, 67–82 (1973)
37. Poterba J.M. and Rotemberg J.J., Inflation and Taxation with Optimizing Governments, *Journal of Money, Credit, and Banking*, **22(1)**, 1–18 (1990)
38. Ramsey F.P., A Mathematical Theory of Saving, *The Economic Journal*, **38(152)**, 543–559 (1928)
39. Sargent T.J. and Wallace N., Some Unpleasant Monetarist Arithmetic, *Federal Reserve Bank of Minneapolis Quarterly Review*, **5(3)**, 1–17 (1981)
40. Sargent T.J., Beyond Supply and Demand Curves in Macroeconomics, *American Economic Review*, **72(2)**, 382–389 (1982)
41. Sargent T.J., The Ends of Four Big Inflations, In *Rational Expectations and Inflation*, New York, Harper & Row, 40–109 (1986)
42. Sargent T.J., *Dynamic Macroeconomic Theory*, Cambridge, MA, Harvard University Press (1987)
43. Trehan B. and Walsh C.E., Testing Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits, *Journal of Money, Credit and Banking*, **23(2)**, 206–223 (1991)
44. Wallace N., A Modigliani-Miller Theorem for Open-Market Operations, *American Economic Review*, **71(3)**, 267–274 (1981)
45. Walsh C.C., *Monetary Theory and Policy*, Third Edition, The MIT Press, Cambridge, Massachusetts, London, England, 9–43 (2010)
46. West K.D., Dividend Innovation and Stock Price Volatility, *Econometrica*, **56(1)**, 37–61 (1988)
47. Wilcox D.W., The Sustainability of Government Deficits: Implications of the Present-Value Borrowing Constraint, *Journal of Money, Credit and Banking*, **21(3)**, 291–306 (1989)
48. Woodford M., Price Level Determinacy without Control of a Monetary Aggregate, *Carnegie-Rochester Conference Series on Public Policy*, **43**, 1–46 (1995).

(Received 19th January 2020, accepted 20th March 2020)
