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The Economics of Government Deficits: Some Alternative Formulations with Time Series Evidence

A thesis
presented to the School of Graduate Studies and Research of the
University of Ottawa
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Economics.

by

Atul Sood

September 1998

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ABSTRACT

The dissertation discusses the impact of fiscal policy on the economy and the interaction between monetary and fiscal policies. It examines the reasoning and evidence behind the commonly held belief that public deficits have a retrogressive impact on the economy. The issues being addressed by this dissertation are: whether the recent growth in deficits is due to increase in interest rates or overall government spending; whether the monetary policy response of governments has reinforced or weakened the destabilizing impact of discretionary fiscal policy; and finally, the issue of financing of deficits and its link with inflation. The evidence based on Granger-Sims causality tests, using cointegration and error-correction modeling suggests that the high interest rate regime is largely responsible for the explosion of deficits in the last few decades. Thus, higher deficits do not 'cause' higher interest rates; rather, higher interest rates 'cause' higher deficits because of the central bank control over the rate of interest. In many cases, the high interest rates also 'cause' a decline in public expenditures. Furthermore, the 'monetization' of deficits is not related to the nature of financing of deficits. The evidence supports an alternative notion of 'monetization' (where monetization is associated with aggregate economic activity due to the endogenous nature of the money supply). Such 'monetization', it is argued, has no 'causal' impact on inflation. The analysis of findings for a select group of 11 countries and, in particular for the G-7 countries, strengthen the arguments of heterodox economists, who argue that current fiscal policies of austerity have played a major destabilizing role in contemporary economies. The three essays that constitute this dissertation all highlight the crucial role played by monetary policy in impacting on fiscal indicators in the economy upon which have been fashioned the current policies of fiscal austerity.

Key words: Fiscal Policy; Monetary Policy; Crowding Out; Interest Rates; Inflation; Money Supply; Inflation, Endogenous Money, Granger Causality.

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Acknowledgment

No other 'fact' can be more important in a thesis than acknowledging the support of teachers, friends and family. Encouragement and support of great many people have gone behind the completion of this project. My father is the chief architect of this thesis. He gave me the freedom, encouraged me and supported me to pursue things that I wanted to do. It is only because of his support that I have had the privilege (I think) to remain a student even at an age (given my gray beard) when most people in my country, with my class background, get busy earning and saving for a house or their sons' or daughters' wedding. I have been fortunate not to be 'stuck' with such life challenges. I owe this to my dad and therefore I dedicate this thesis to him. My mother is the epitome of patience and strength. I was able to continue this project, after my father's passing away, only because of her tremendous ability to cope with the new realities of life, with the least help from me. I am grateful to her. My sisters and my brothers-in-law have provided consistent support and fulfilled many responsibilities on my behalf. I am thankful to them. I am also indebted to my father-in-law for his continuous inspiration, by his own deeds, to help me not forget that there ought to be a social purpose behind all human endeavors.

This project could not have been completed but for the unlimited hours that Prof. Mario Seccareccia spent with me. He set the deadlines and worked with me to meet them. As my fellow students tell me, this is a quality greatly missed amongst supervisors these days. I am fortunate that I worked with him. I also learned a good deal of socially responsible economics from him and Prof. Marc Lavoie. I am grateful to Prof. Lavoie for his incisive comments throughout the writing of this thesis. Prof. Simon Power helped me put the econometric methodology on track. Prof. Alain Parguez and Prof. John Smithin gave very helpful and supportive comments in the defense. Prof. Michel Chossudovsky has been a great support, in numerous ways, not only during my stay in the program but even before my coming to Ottawa. I thank them all and look forward to a long-term relationship with all of them in the future.

The Department of Economics at the University of Ottawa and Carleton University provided the regular support as a student. I am thankful to them. I am also thankful to M. D. University, Rohtak, India for giving the necessary leave to complete this project. Prof. Surinder Kumar and Rajinder Choudhary provided tremendous support in the University, as friends, colleagues, confidants and as strategists to pursue matters with the bureaucracy. I am thankful to them. Rajiv, Aunty, Naveen, Ashwani and Padma were always our willing and affectionate hosts in Delhi. I am grateful to all of them. I will always miss Aunty's presence in the gathering of friends.

In the department, Ram and Milan, willingly helped in everything. Prof. Rose Anne Devlin was very helpful and encouraging as a graduate supervisor. I

am thankful to them. I will miss Ottawa not only because of its winter and skating on the canal but also because of Sharan, Tariq, Bakshish and Tejinder. They are now family in Ottawa. I am thankful to them for being willing hosts and for providing support on numerous occasions during our stay. Niku, Buku, Sona, Ashu, Anu, Avi, Munish, Rajiv, Dinesh, Dogra, Ashwani, Bhupinder, Rajinder, Manmohan, Shubha and many other friends are the people taking us back to India. I am grateful to all of them.

Last but not the least, I will like to thank my dear wife, Navsharan, who not only suffered all the turmoils of a graduate student with me but who has been there for me for the last several years.

CHAPTER 1

Introduction

The dominant discourse in the economic press stresses austerity measures. The problem of government deficits and debt has emerged as the key issue in popular discourse on the economy and is also receiving a great deal of attention among academic economists. The focus has been restricted to the role of government spending in driving up the deficit, and the proposed solutions have focused almost exclusively on the need for spending cuts in government programs. Deficit reduction through austerity is nowadays the chief 'mantra' of most governments in OECD countries and developing nations alike. Their obsessive quest is to reduce public expenditure and control public borrowing. It is in a sense axiomatic: we have been consuming our children's future, we need to live within our means, and once that happens other benefits will follow. Unemployment, child poverty, social services and the like could all be possibly tackled once the books are balanced. In the *World Economic Outlook* for 1996, budgetary imbalances have been identified as the most important area that needs to be addressed, to strengthen growth in the medium to longer run. Large fiscal deficits is also perceived as a threat to the reduction of real interest rates and sustainability of reductions in inflation for industrial, developing and transition countries alike.

This thesis implicitly revisits the world of cutbacks, downsizing and privatization. The thesis critically explores the dominant discourse of deficit reduction and looks specifically at the linkage between fiscal deficits, inflation,

public spending, and interest rates. Austerity cannot solve the problem of overhanging debt and, more pertinently, economists owe it to the world to find more appropriate and civilized ways of dealing with the financing crises facing governments internationally.

Budget deficits have been the subject of thousands of studies and innumerable debates. Each study and debate intends to improve the understanding of deficits, their determinants, and their effects on specific sectors and the overall economy. The essays presented in Chapters 2, 3 and 4 continue in this vein by focusing on how the high interest rate, rentier-dominated, global economy, affects deficits (Chapter 2), affects public expenditures (Chapter 3) and impacts on money supply and inflation (Chapter 4). The chapters shed light on these topics and hope to provide a better understanding of the macroeconomic effects of deficits. They focus on a common factor that affects the three areas of study — the high interest rate regime — and take careful account of the time series properties of the data. Ironically, the concern of this thesis is not budget deficits, rather it focuses on the budget deficits to reverse the causation which is erroneously implicit in the prevalent policy discourse.

1.0 Contribution of the Thesis

The dissertation attempts to do two things:

1. To apply the contemporary time series techniques to some aspects of well established macroeconomic theory, in particular to the multifaceted issues related to the macroeconomic effects of government deficits.

2. To situate the prevalent empirical evidence within an alternative macroeconomic framework.

In other words, this dissertation critically evaluates the dominant paradigm on budget deficits and also constructs its alternative discourse. The thesis presents a challenge to the established views on the macroeconomic effects of budget deficits and elaborates their theoretical and empirical limitations. Instead of laying the blame on budget deficits for the economic downturn in most developed and developing countries since the late 1970s, the thesis highlights the importance of restrictive monetary policy which, because of its impact on interest rates (chapter 2) and public expenditures (chapter 3), has negatively affected these economies.

The relationship between variables (deficit and interest rate; deficit and public expenditure; deficit and inflation; and deficit and money supply) is tested in this thesis, using Granger-Sims causality tests with cointegration and error correction modeling. The test of causality is whether the lags of one variable enter the equation for another variable. This helps us to unscramble whether variable X causes Y or Y causes X or both (bi-directional causality), or whether neither hypothesis is valid, implying causal independence. A high correlation between X and Y cannot discriminate among these four alternative, yet equally plausible, hypotheses. An understanding of the inter-temporal links between variables is of obvious importance in order to assess the capacity of various theories to cope with reality. Of course, temporal causality tests do not verify theories directly, but they do allow us to reject them if causality goes in the wrong

direction. The causal connection between variables examined here are mostly bivariate; it does not include other variables, often included in regression-based analysis. In the specific context of each chapter, we present the institutional realities which are the basis of the chosen empirical specification. The possibility of an excluded common cause of changes in all variables, whether classified as exogenous or endogenous, can never be ruled out. The rationale for choosing any particular variable as exogenous thus ultimately rests on other than empirical grounds.

The thesis is unique in its utilization of Granger Causality tests with cointegration and error correction modeling to multifaceted issues relating to the macroeconomic effects of government deficits, both within the conventional and the heterodox macroeconomics literature.

Within the conventional literature the primary contribution of the thesis is the identification of a number of methodological shortcomings in the existing empirical literature on the subject. The thesis proposes a number of constructive alternatives to overcome these shortcomings and implements some of these suggestions. It also identifies many areas within the literature on the impact of budget deficits where the empirical evidence is unclear.

Within the heterodox literature, there hardly exists any literature on the subject using such econometric techniques. Conclusions similar to those discussed in the thesis have been suggested within this literature by many authors. These conclusions have been mostly based on theoretical and logical reasoning and the use of simple statistical techniques.

The strength of this thesis lies in its utilization of the conventional econometric methods to challenge empirically the ideas of the dominant macroeconomic policy discourse on: (i) the macroeconomic impact of budget deficits, (ii) interest rate determination, (iii) fiscal policy reaction functions, and (iv) the monetization of deficits and inflation.

2.0 Organization of the Thesis

This dissertation is composed of three essays, presented in chapters 2 to 4. The thematic and logical connections among the three chapters are built in this chapter. Summary tables of the empirical results related to each chapter are provided within the text or in the appendices at the end of each chapter. The thesis ends with discussion on limitations of the methodology and the possibilities of future research. Details on data sources and construction of variables are provided in a separate appendix at the end of the thesis.

Chapter 2 examines the empirical support (or rather lack of support) for the crowding-out hypothesis. With the change in the nature of deficit financing towards bond financing, the crowding-out hypothesis is now modified to mean financial crowding-out. Investment is predicted to decline in response to the increase in interest rates arising out of growing deficits. The chapter argues that the lack of empirical support for the crowding-out hypothesis can be attributed to the exogenous nature of interest rate determination in the economy. To show that the absence of causal connection from deficits to interest rates is not just due to a large interest payment component of deficits, Granger causality tests

were also done between primary deficits and both nominal and real interest rates as well. The analysis shows whether the deficit is a determinant of interest rates or, rather, that it is the other way around. The latter implies that (i) it is the provision of liquidity regulated by the monetary authorities (the central bank) which ultimately determines the level of interest rates in a monetary economy, (ii) an increase in deficits does not lead to an increase in interest rates and, therefore, does not crowd out private investment.

Chapter 3 is about government deficits and public expenditure. It explores the expenditure response of governments facing increasing deficits, due to high interest rates. The argument that is made in this chapter is simply that any analysis of macroeconomic policy making, especially monetary and fiscal policy, has to recognize the nature of existing institutions, the role of dominant economic thinking, and the social and economic forces which sustain these arguments and specific policies. Conducting such a detailed political economy analysis was beyond the scope of the chapter. However, such is the frame of reference within which the interaction between interest rates and government spending is done in this chapter. The prevalent ideas on public expenditure are mostly rooted in functional finance theory or within the public choice framework. We have argued that the hegemony of neo-conservative thinking, supported by the dominance of financial and rentier interests, precludes the use of interventionist expansionary policies and, therefore, justifies cutbacks in government programs. This chapter shows how the public choice framework (based on methodological individualism, where the public is presented as having

a uniform set of preferences and where antagonistic relations between different social classes are completely denied), and the functional finance framework do not explain the macroeconomic policy behavior of governments. They do not help us to capture the consequences of recent shifts in macroeconomic thinking.

Chapter 3 also briefly examines the feedback behavior of the government in a simple model of interaction between monetary and fiscal policy. Given our understanding that the dominant discourse of restrictive monetary and fiscal policy (high interest rates and restrictive budgetary measures) can be better understood within an alternative macroeconomic framework, we examine the reaction function of governments, as an appendix to chapter 3, where the rate of interest is considered to be exogenous and where, *inter alia*, deficits are endogenous to the process of interest rate determination in the economy.

Chapter 4 looks at the logical and empirical basis to the fears and beliefs that public sector deficits will result in an expansion of the money supply and hence, in financial instability and inflation. The literature review reveals no simple unambiguous relationship, while, empirically, we hardly find any support for the belief that an increase in government debt results in an increase in the monetary base. The relationship between deficits and the money supply is found to be much more complex. The chapter shows that the quantity of money in the economy depends on the level of economic activity and therefore, points to the endogeneity of the money supply and of deficits.

To conclude, the thesis attempts to explore the hypothesized relationship between deficits, interest rates and the money supply. The lack of supporting

evidence for orthodox thinking on this matter is explained by relating it to the class and institutional bases of the economy. The absence of an empirical foundation for the prevalent macroeconomic discourse would seem to make it easier to question its validity and to propose alternatives to orthodoxy. It is hoped that the dissertation will lend further support to those who are critics of the conventional discourse on fiscal policy matters.

CHAPTER 2

Fiscal Deficits and Interest Rates: An International Comparison

1.0 Introduction

Since the appearance of large government budget deficits in the late 1970s, there has been continued concern that these deficits cause higher interest rates. Standard Keynesian and Neoclassical models provide justification for this belief. More recently, the Ricardian equivalence hypothesis has received increasing attention. The hypothesis has been most forcefully advocated by Barro (1974, 1989). One implication of this theory is that budget deficits do not have any relationship with interest rates.

Accordingly, empirical work has been done in an attempt to quantify the link between deficits and interest rates. Reviewing this empirical evidence, Arestis (1985, 122) concludes that "(i)n none of the non-reduced form studies does complete crowding-out occur". In a more recent review, Cebula et al. (1994, 169) suggest that "there exists no true consensus in the literature on budget deficits and interest rates". The empirical literature on the relationship between interest rates and deficits, meanwhile, has covered a lot of ground. One approach consists of structural estimates of consumption or savings functions or of financial sector behavior, and of tests for the statistical significance of taxes, transfers and government debt. The other approach is to utilize the assumption of rational expectations to derive cross-equation restrictions and jointly test debt neutrality with rational expectations and the assumed model of behavior. The

more recent approach has been to do time-series analysis and causality tests to capture empirically the relationship between deficits and other variables.

Although there has been an explosion of the time-series literature in the last couple of years, there have been few studies doing a time-series analysis of the relationship between deficits and interest rates. Only a few studies (Darrat (1990), Stanford (1997), Ibrahim and Kunah (1996), Mutairi (1995), Miller and Russek (1991), Dwyer (1982), Canto and Rapp (1982) and McMillin (1986)) have specifically examined the causal relationship between federal deficits and interest rates. No study has found evidence that deficits cause interest rates. If anything, the evidence supports reverse causation — i.e., interest rates cause deficits. The standard causality tests that these studies employ (with the exception of Mutairi and also Miller and Russek), however, ignore a potential channel of causation that may exist when variables are cointegrated (Granger, 1983).

At the theoretical level, the relationship between deficits and interest rates is also a very contentious issue. For more than two decades, economists have debated whether federal deficits raise interest rates. This debate has employed several different theoretical models. The standard loanable funds and IS-LM models maintain that federal deficits push up interest rates by raising demands for credit or money relative to supplies. However, this conclusion holds only for deficits neither monetized by the central bank nor financed by international capital flows. Portfolio-balance models, unlike those models focusing on flow

variables, indicate that deficits raise interest rates only if the flow of new federal debt raises the stock of federal debt as a proportion of overall asset holdings. Models consistent with the Ricardian equivalence proposition conclude that interest rates do not rise in response to federal deficits - holding federal purchases constant - since these deficits are fully offset by increases in private saving as taxpayers anticipate the future tax increases needed to satisfy the intertemporal budget constraint.

These models have been analytically challenged by Marxists, post-Keynesians, and old and particularly "new" Keynesians. The alternative viewpoints are based on allowing for more "realistic assumptions", on alternative theories of interest rate determination, on an endogenous money view with the primacy of net spending in determining an equivalent flow of saving in the system, and on the idea that monetary policy consists in acting on interest rates rather than setting the money supply. Couched in an alternative macroeconomic framework, Smithin (1994b, 155), Wray (1997, 548), Pasinetti (1997, 162), Carvalho (1994, 177) and Seccareccia and Sharpe (1994, 281) have all argued that government deficits seem to cause neither high interest rates nor inflation. They also find that the empirical support for the conventional view is weak. At the empirical level most of these studies use descriptive statistics to defend their viewpoint¹. The present study fills an important gap in the alternative literature

¹ It needs to be pointed out though that during the 1980s there were many econometric studies, rooted in the neoclassical framework, which were compatible with the alternative viewpoint of no crowding-out. For a discussion on these studies, see Seccareccia and Sharpe, 1994, 282.

on government deficits and interest rates by doing a rigorous econometric estimation of the relationship between deficits and interest rates.

This chapter examines the issue of causality with cointegration and error correction modeling for G-7 countries and a select group of developing countries. It conducts Granger causality tests between interest rates and government budget deficits. The test of causality is whether the lags of one variable enter the equation for another variable. The econometric approach used here is more likely to reveal the existence of causality than is the standard Granger test. Thus, this chapter not only departs from most other studies by examining causality rather than correlation, it also differs from the existing time-series literature on deficits and interest rates in many important ways.

First, it applies more comprehensive tests in order to broaden the examination of causality. The existing time-series literature has checked for Granger causality tests between deficits and interest rates either without looking at the possibility of cointegrating relationships between the two variables (except Miller and Russek, 1991; and Mutairi, 1995), or alternately by looking for cointegrating relations after conducting the causality tests:

"The evidence of no causal linkage between structural deficits and corporate interest rates may be given credence if the two variables do not possess any reliable long-run equilibrium relationship. Recent developments in econometrics on cointegrated systems can be used to test for the presence of a long run relationship between a pair of variables..." (Darrat, 1990, 757).

Recent developments in time-series analysis, especially vector autoregression (VAR), cointegration, and common trends analysis have provided the

means for analyzing and establishing the short and long-run relationships among various variables. Engle and Granger (1987), Granger (1988) and many subsequent studies and surveys (Dolado, Jenkinson, and Rivero, 1990; Thornton, 1997; Enders, 1995; Bella and Quinteri, 1995) have established that, in the time-series literature, it is now a standard practice to carry out Granger causality tests augmented with an appropriate error-correction term derived from a cointegration relationship (if found) among variables. The Cointegration approach to Granger causality tests points to an important drawback in the previous literature: the missing error-correction variable from the specifications (Granger, 1988, 203). Cointegration refers to a *linear* combination of non-stationary variables that is stationary. Lack of cointegration implies no long-run equilibrium² among variables, so that they can wander arbitrarily far from each other. In general, both variables in a cointegrated system will respond to a deviation from the long-run equilibrium. Hence, it is necessary to reinterpret Granger causality in a cointegrated system. In a cointegrated system, $\{Z_t\}$ does not Granger cause $\{Y_t\}$ if lagged values ΔZ_{t-i} do not enter the ΔY_t equation and if Y_t does not respond to the deviation from long-run equilibrium. Therefore, the major pitfall of not exploring cointegrating relationships is the problem of identifying spurious causal connection between variables. This study looks at the

² "The term "equilibrium" is used differently by economic theorists and econometricians. Economic theorists usually employ the term to refer to an equality between desired and actual transactions. The econometric use of the term makes reference to any long-run relationship among non-stationary variables. Cointegration does not require that the long-run (i.e. equilibrium) relationship be generated by market forces or the behavioral rules of individuals. In Engle and Granger's use of the term, the equilibrium relationship may be causal, behavioral, or simply reduced-form relationship between similarly trending variables" (Enders, 1995, 358).

causal connection between deficits and interest rates within the cointegration and error correction framework. The other important contribution of this study is to provide a basis for cross-country comparisons for eleven countries, by using comparable data and consistent estimation techniques. The few studies mentioned earlier that examine the causal relationship between deficits and interest rates mostly deal with the United States or with Canadian data.

The chapter is organized as follows. The next section provides a brief theoretical background to the suggested relationship between deficits and interest rates in the macroeconomics literature, especially in the economic policy discourse. This is followed by a discussion of the methodology and results from the existing empirical studies on the subject. Details of our econometric methodology follow next, accompanied by reporting of our findings. The final section discusses the implications of our results for the use of fiscal policy as a stabilizing tool, as well as the plausible alternative explanations in terms of our theoretical preferences for the absence of crowding-out evidence that we have found for the G-7 and the select group of developing countries.

2.0 Deficit-Interest Rate Nexus: The Mainstream Discourse

The mainstream viewpoint on deficits and interest rates can be reviewed under two categories: the neoclassical synthesis, and the recent contributions based on "microfoundations" methodology that dominate contemporary macroeconomics. Traditional economic theory suggests that fiscal deficits affect interest rates, and this causal relationship between deficits and interest rates is often referred to as "crowding out".

In discussions of fiscal policy, the term "crowding out" has several implications. Several years ago, when the simple version of monetarism had its greatest hold on the thinking of decision-makers in public policy, the reasoning was that deficits led to excessive money creation, which in turn raised prices. In this case, the crowding-out of real private spending by price inflation (sometimes called "forced saving") was well recognized. If the supply of goods and services is fixed and resources fully employed, the government can claim more of the economy's output only by depriving the private-sector of its use. If resources are unemployed, by increasing utilization levels government spending can stimulate investment in productive capacity and thereby increase real private spending. Arguments both for crowding out and for crowding in focus, in the first instance, on real sector effects associated with additional government spending and not on the means of financing that spending. Indeed, the direction of these effects follows even if the additional spending is financed by taxes.

Once the huge deficits of 1975 and 1976 failed to elicit a comparable bulge in monetary growth, however, attention turned to the effects of deficits financed not by money but by the issue of interest-bearing government debt. The literature to date has distinguished two different ways in which such "financial crowding out" can occur: one associated with the demand for money for transaction purposes, and one with wealth effects on portfolio behavior. In either case, "financial crowding out" can take place independently of "real crowding out", and therefore can occur even if the economy is at less than full employment. Hence, the financial crowding-out potentially represents an even

stronger argument against deficit spending for expansionary purposes. It is primarily the effect associated with financing the government deficit, especially the presumed consequences for private investment spending, that has recently attracted so much attention.

The "transactions" crowding out associated with a government deficit financed by issuing non-money claims has been a standard part of the Keynesian fiscal policy analysis, at least since Hick's formalization of it in the IS-LM model. In increasing the level of economic activity, the spending increase (or tax cut) that leads to a deficit also increases the demand for money for transaction purposes. If the supply of money remains fixed, and if the money market is to clear, then some other factor must generate a precisely offsetting decrease in money demand. If the public's demand for money balances is sensitive to the rate of interest because of portfolio considerations or simply because of the inventory-theoretic considerations applied to transactions balances by Baumol (1952) and Tobin (1956), the required offset for money demand is brought about by an increase in the "interest rate" earned by financial claims. If aggregate private spending depends negatively on the interest rate, the increase in interest rate that clears the money market also erodes some of the income-expansionary effect of the initial fiscal policy action. In the "transactions crowding out" argument, the slope of LM curve (i.e. the interest sensitivity of money demand), the distinction between several different interest rates, the time period (short run and long run) and the clearing of the money market are the essential components.

The "portfolio crowding out" emphasized by Milton Friedman (1972), and to date most rigorously analyzed by Blinder and Solow (1973) and by Tobin and Buiter (1976), uses a model including three assets— money, government bonds, and real capital. The analysis shows that even the sign of the portfolio effect of bond issuing on private investment depends on the relative substitutabilities among these three assets in the public's aggregate portfolio. Whether this portfolio effect is positive or negative depends on a crucial but simple relative substitutability condition: portfolio crowding out (or crowding in) results when the ratio of the substitution coefficient between bonds and money to the substitution coefficient between bonds and capital is smaller (greater) than the ratio of the respective wealth coefficients of the demands for money and capital. If the two ratios are precisely equal, there is no portfolio effect, and the traditional IS-LM analysis is adequate to describe bond-financed government deficits.

Because an increase in r_b not only helps eliminate net excess demand in the money market (and capital market) but also helps reduce net excess supply in the bond market, r_b unambiguously rises as the result of bond financed government deficit spending. By contrast, while an increase in r_k , which would reduce real investment, helps clear the money market, a decrease in r_k , which would stimulate real investment, helps clear the bond market (and capital market). Hence it is impossible to tell a priori whether r_k rises or falls. Because the effect of interest rates in the goods market depends on r_k , it is impossible to tell a priori whether the portfolio effect will offset or reinforce the income effect of fiscal policy (Friedman, 1978, 617).

Special cases occur in Friedman's (1978) general model: if the wealth elasticity of money demand is zero, portfolio crowding out cannot occur. If bonds and capital are perfect substitutes, portfolio crowding in cannot occur. The well

known Blinder-Solow analysis, with its presumption of a negative effect, is simply the special case associated with the assumption that government bonds and real capital are perfect substitutes. Whether or not the demand for money depends on portfolio wealth has become a key issue in assessing the empirical importance of portfolio crowding out. Do people hold money balances for both transaction and portfolio reasons, i.e. does money demand depend on wealth as well as income?

Friedman (1978) extends the above analysis to include the choice of debt instruments for financing the deficit in determining crucial substitutabilities that make the difference between crowding out and crowding in. He argues that the nominal returns on government debt instruments, together with their relatively short average maturity, suggest strongly that they are not perfect substitutes for real capital. They do not appear to be perfect substitutes for money either, however. The range of different maturities, actually or potentially available, strongly suggests that all government debt instruments are not even perfect substitutes for one another. It is the government's prerogative of choosing among them that facilitates debt-management policy. As long as there exists at least one government debt instrument (a short-term bond) with a relative substitutability index greater than the key ratio of the respective wealth responses of money and capital and at least one (a long-term bond) less than the ratio of wealth response of money and capital, debt-management policy can determine which portfolio-effect, crowding out or crowding in, results from

financing deficits, and how much. Long-term financing leads to crowding out, while short-term financing leads to crowding in.

As a result of recent methodological shifts, the question in terms of deficits that is often posed now is whether a shift from tax finance to bond finance of a given real government expenditure on goods and services with unchanged monetary policy absorbs any private saving. If it does not, "debt neutrality" prevails.

A bond-financed decrease in taxation may lead to "crowding out" of two kinds: lower investment expenditure flow, and a lower desired ratio of the capital stock to real GNP in a long-run steady state. There are two main sources of stock and flow crowding out: supply constraints and monetary constraints. In standard discussions, they cause interest rates to rise, thus lowering both investment expenditure and the desired capital stock. For a given tax cut, the extent of crowding out would be smaller, the larger the interest-sensitivity of desired private saving and of the desired wealth-to-income ratio. These are, of course, standard results in traditional IS/LM and growth models.

A recently popular framework for exhibiting interest sensitivity is the two period life-cycle model in which a representative agent chooses consumption in each period so as to maximize her utility $U(C_1, C_2)$ subject to the constraint that the present discounted value of life time consumption is equal to the labor income received in the first period. In this model, saving responds positively (negatively) to the interest rate if the elasticity of substitution between present and future consumption is greater than (less than) one. Whether desired saving

and wealth-to-income ratios are interest sensitive or not, life-cycle models do not imply infinite interest elasticity. When they are amended to incorporate people's concern for their descendants by allowing the size of bequests to enter the utility function, they still do not imply infinite planning horizons (Summers, 1981 and Mirer, 1979). Expansionary fiscal policies were also proposed to be ineffective in stimulating aggregate demand through the so-called Ricardian equivalence theorem. The theorem consists in the proposition that, because private agents know that current deficits mean future taxes, they simply react to deficit spending by reducing their current purchases, saving now to pay for those future taxes. Thus, when the debt was issued, the private-sector would hold the debt and private saving would increase by an equal amount. Because the government debt is not viewed as net wealth, money demand would not increase. It would ensue that interest rates would be left unchanged. Complete crowding out is, again, the unavoidable result.

Thus, to restate more briefly, one of the important arguments against fiscal policy is based on the idea that either deficits hurt economic performance because of the empirical sensitivity of investment to interest rates with an increase in interest rates due to deficits, or that fiscal policy is ineffective because of the endogenous link between deficits and saving.

3.0 Fiscal Policy and Interest Rates: An Alternative Framework

The above review of the mainstream approaches suggests that the arguments for and against crowding out in the traditional literature are based on the idea of pure fiscal policy (i.e., deficit spending financed by the sale of bonds

with no increase in the money supply) and the determination of interest rates within the loanable funds framework. Furthermore, the underlying assumption of the conventional view, as elaborated in the earlier section, is the belief that actual economies remain much closer to equilibrium positions than it is usually supposed. In addition, agents are assumed to be able to see through any policy (except policies that are randomly applied in such a way as to prevent any consumer from guessing its meaning but that, as a result, cannot aim at any goal anyway) and neutralize any threat to their desired position. The other idea is that the money supply is assumed to be exogenously fixed and investment cannot proceed unless an appropriate amount of savings is already in place to finance it. In other words, investment spending is constrained by a pre-determined fixed pool of savings (Parguez, 1996 and Seccareccia, 1995 provide a critique of the classical savings theory).

From our point of view, the notion of pure fiscal policy itself is rather arbitrary. It is defined by the absence of an accompanying monetary policy, meaning that the money supply is unchanged. There is nothing natural or self-evident in this proposition when compared to the alternative view that monetary policy consists in acting on interest rates. If one accepts the latter notion, pure fiscal policy would be that policy which is associated with constant interest rates rather than a constant money supply. The crowding-out effect would thus no longer be automatically associated with an increase in deficit spending.

There is no reason, thus, to approach the problem as one of adopting pure expansionary fiscal policies without changes in the money stock or pure

monetary policies of showering the public with money thrown from helicopters. These are mistaken and misleading ways to portray the fiscal and monetary policy process. They ignore the channels through which these policies impact on the economy. To avoid crowding-out, what one must do is to prevent significant movements in interest rates. To keep the money stocks unchanged and allow interest rates to vary is not to be construed as the absence of monetary policy but rather as a very specific monetary policy.

The other fundamental basis of the conventional position is the idea that the rate of interest, at its most fundamental level, is a 'real' rather than a monetary phenomenon.³ The argument that the rate of interest is 'real' implies that it is determined in the capital market, where the preferences of borrowers and lenders are reflected in the supply and demand of capital. This market operates without the intervention of money, banks and financial intermediaries. These financial institutions do not have any impact on the motives of those engaged in the supposedly more fundamental barter capital transactions. The natural rate as established by the imaginary barter transactions is then taken to be the most basic determinant of the complex of interest rates actually observed in reality. These premises imply that the influence of the central bank over the level and term structure of interest rates can only be temporary at best, and that in the long run money must be neutral.

³ The following summary on the differing view points on the interest rate determination is mostly drawn from Smithin, 1994a, Chapter 6.

As Smithin argues, the concept of the natural rate of interest takes into account neither the actual historical evolution of capitalism and the market system, nor the internal logic of that system.

In reality, the rise of banking and financial systems, and their continued evolution, has in itself been a main determinant of the type and volume of borrowing and lending that can be carried on at any point in time, and hence also of the type and volume of real economic activity that can be undertaken. ... In this type of environment, fictional natural rates determined in barter markets would seem to have little practical relevance, and it is more likely that causality would actually run from the complex of interest rates determined on the financial markets to real economic activity, and not vice versa (Smithin, 1994a, 98).

There are two competing views on the *monetary* determination of interest rates which may or may not be compatible with one another. Within Keynes's theory of "liquidity preference" the rate of interest are determined by the relative demand for a given quantity of money and the stock of alternative financial assets ('bonds'). The second monetary theory of interest is the "post-Keynesian" theory of the rate of interest, which suggests that it is the provision of liquidity regulated by the monetary authorities (the central bank) in a hierarchical relation with *rentiers* which ultimately determines the level of interest rates in a monetary economy. Once that level is set, all other rates in the financial and industrial spheres would simply adapt to the administered money rate.⁴

All post-Keynesians agree that money is created by agents within the economy. This means that the quantity of money in circulation is the result of endogenous, purposeful actions by particular agents, rather than a constraint

given by nature (e.g. the supply of gold) or a policy decision (i.e. set by the central bank). However, amongst the post-Keynesian authors there are some differences of opinion regarding the ability of the central bank to impose a rate of interest of its choice on the overall financial structure. While horizontalists believe that eventually, through persistence and arbitrage, the short-term rate of interest set by the central bank will become the standard for the whole of the financial system, structuralists believe that various market forces can disjoint the base rate of interest set by the central bank from all other market rates.⁵

Summarizing the post-Keynesian literature, Smithin (1994a, 109) concludes that, "a wide spectrum of opinion suggests that the endogenous money approach with policy-determined short rates does reflect the contemporary institutional realities, at least as a first approximation".

The legitimacy of the austerity view, discussed above, is also fundamentally linked to how money is integrated within the macroeconomic framework. Parguez (1996), suggests that both Hayek and today's Neoclassical advocates of austerity are incapable of integrating money within their framework because they miss the major characteristics of a fully developed capitalist economy, the principle of the "essentiality of money".

The circulation approach to monetary theory directly addresses the legitimacy of the austerity view of a thriftiness-led world economy. Questioning the role of thriftiness requires a reappraisal of its theoretical

⁴ This view is associated with the work of the post-Keynesians, like, Moore, 1988b, Kaldor, 1986, Lavoie, 1984, 1992a and also that of the "circuit school", Graziani, 1990, Parguez 1996, Lavoie 1992b, Le Bourva, 1992.

⁵ See Kaldor, 1986, 21-4; Lavoie, 1984, Moore, 1988a, 171-208, 1988b, Davidson 1991, 55-72, Dow, 1985, 184-95, Chick, 1984, Dow and Dow, 1989, Lavoie, 1992b, 197-203, and Wray, 1990, 155-92, 1992

foundation, the Hayekian theory of money and credit (Parguez, 1996, 157).

The essentiality of money is central to the circulation approach. Money is the *sine qua non* of a capitalist economy, its existence condition. The monetary circuit exists to match the requirements of production and, therefore, accumulation. The implication of the circuit view of credit money for the government deficit is that governments with large budget deficits are seen as providing stability to the fragile credit system because of their spending powers and their impact on aggregate demand (Seccareccia, 1996, 413).

Differing insights as to the credit-driven nature of the money supply process has led to diverse viewpoints within the group of endogenous money theorists. Post-Keynesians view money, not as a means of circulation, like the circulationists, but as credit (as an asset). The post-Keynesian arguments are based on the idea that in a modern credit-money system, in which virtually all money is created independently through the actions of the banking system, the supply of finance adjusts automatically to meet the volume of credit demand by borrowers at any given interest rate. Deleplace and Nell (1996, 25) provide a useful summary of the similarities and differences between post-Keynesians and circulationists. For the purpose of this study, the essential issue is that both post-Keynesians and circulationists share the view that economic behavior is demand driven, that the economy does not typically operate at full employment, that the interest rate is determined by the policy actions of the central bank given the endogenous and credit-driven nature of money. Members of both schools of

thought believe that the idea that the nature of financing deficits determines the money supply is problematic. Post-Keynesians have argued that there is little evidence that fiscal deficits generate inflation that needs to be fought through tight monetary policy, and in fact it is the tight monetary policy which is largely responsible for pervasive and persistent fiscal deficits.

The implications for the crowding-out thesis are obvious, the main point being that interest rates are set by the monetary policy actions of the central bank, rather than by fiscal policy. Although the monetary policy instrument is the nominal rate, central bank officials can and do form expectations about the inflation rate and thereby the central bank's power to target the short rate of interest should be thought of as indirectly targeting the real rates. In the absence of a natural rate of interest, it can also be argued that central bank control over short real rates will ultimately influence the entire structure of interest rates in the economy, including long rates. The general upshot of this approach would be that, given a firm stance on interest rate policy by the central bank, and even in the closed economy or large economy context, it would not be sensible to worry about crowding-out effects via the impact of budget deficits on the rate of interest.

The purpose of this essay, of course, is not to examine the conservative counter-revolution in economic policy as such; rather its purpose is to examine an important argument of this resurrected view, for whom problems like involuntary unemployment or deficiency of effective demand did not exist. One of the most important aspects of the counter-revolution in economic policy is the

resurrection of the Treasury view that Keynes attacked in the 1930s. Crowding-out arguments were revived against both budget deficits and public debt increases to show the ineffectiveness of aggregate demand policies. As argued above, an important foundation of much of the criticism of stimulative fiscal policy in the modern economy is based on the assumption of a causal link between fiscal deficits and aggregate demand and income i.e., government profligacy has increased fiscal deficits; this led to increases in the interest rates and/or caused inflation; and this in turn decreased private investment and lowered growth.⁶

The dominant view suggests the above mentioned causal link as a 'universal dictum': a law or a logical necessity and not a causal connection related to the institutions or historical regimes. What we have found in this dissertation is that the causal linkage suggested by the dominant viewpoint does not stand the scrutiny of facts for the post 1950s reality of the developed (G-7) world and a select group of developing countries. This reinforces our methodological standpoint that applied economics is inherently historical in nature. As Nell (1996, 151) argues:

The structure and functioning of markets and other economic institutions must be studied in the historical period where they are located. If markets and institutions change, guiding principles and policies that work well in one period may be completely inappropriate or ineffective in another.

The above discussed viewpoints, on interest rate determination, on the credit-driven nature of money supply and on the monetary policy basis of fiscal deficits, inform the framework used in this chapter to conduct the empirical tests.

⁶ This is echoed in a recent survey article, Cunningham Stever R., and Jon Vilasuso (1994-95).

The idea, that the endogenous money approach with policy-determined short rates does reflect the contemporary institutional realities, has crucial implications for framing the empirical tests for this chapter. The choice of short-term interest rates is one such obvious implication. Another implication of this outlook is that, given a firm stance on interest rate policy by the central bank, it would not be sensible to worry about crowding-out effects via the impact of budget deficits on the rate of interest. Therefore, to examine the relationship between deficits and interest rates, it is important to depart from studying correlation and test for causation. The institutional determination of interest rate also implies that we need to move from stylization of an economy, of autonomous consumer/producer family units that trade the surpluses of goods they produce over their own needs to increase their satisfaction. We need to work within an economic theory that would recognize that production and investment decisions are made by firms oriented by the expectation of money profits to be earned in future market operation surrounded by uncertainties. In these economies money plays a part of its own and affects motives and decisions. We need to recognize that we do not live in a 'free market' system. This is not because such a system has become overburdened, or because labor unions and monopolies have usurped its functions, or because the market has become tangled in regulations and red tape. It is because the fundamental institutions of economic society have changed: crafts have become industries, small independent firms have become corporations, and markets are administered. These are not 'imperfections' or examples of 'market failure'; as the basic institutions changed, the market itself

came to work differently. Therefore, in this study we recognize the institutional realities of our times before formulating the structure of empirical tests.

4.0 Deficits and Interest Rates: (Re)examining the Empirical Studies

As the above discussion suggests, many theories that subscribe to crowding out argue that the budget deficit works through higher interest rates (among other things) to crowd out private-sector spending. That is, deficits in part create financial market pressures that elevate interest rates; those higher interest rates in turn act to discourage interest-sensitive private expenditures (especially investment). A decline in the latter expenditures, in turn, acts to reduce real GDP growth. In view of the above observations, it is not surprising that many studies on the economic impacts of federal budget deficits empirically investigate the effect that such deficits may exercise over interest rates. Those who have found no evidence in support of crowding out suggest the use of stabilization policies and those who find evidence for the crowding-out thesis conclude the contrary. This literature using diverse estimation techniques has focused on short-term rates of interests, long-term rates of interest, nominal interest rates and real interest rates.

A typical approach is to regress some measure of the nominal interest rate on a variety of independent variables, including real government spending, the real money stock and measures of government debt and deficits. While the results of these studies are mixed, the preponderance of evidence seem to suggest that there is no relationship between deficits and interest rates. Hoelscher (1983), Kormendi (1983), Aschauer (1985), Monadjemi (1989), Darrat

(1989, 1990), Mascaro and Meltzer (1983), McMillin (1986), Giannaros and Kolluri (1989) and Findlay (1990) have found an insignificant relationship between government deficits and nominal interest rates. In contrast, for evidence of a positive linkage between (1) nominal rates and deficits, see Barth et al. (1984-1985), Tanzi (1985), and Cebula (1990a, 1991b); (2) nominal rates and deficits (long-term rates or the spread between short and long rates) see Barth et al. (1985), Cebula (1988, 1990b, 1990c, 1991a), Cebula et al. (1988, 1992) and Hoelscher (1986); (3) nominal rates and unanticipated deficits and three-month Treasury bill rates, see Makin and Tanzi (1984); (4) anticipated deficits and interest rates, see Thomas and Abderrezak (1988a, 1988b); (5) excessive government deficits and long rates, see Tran and Sawhney (1988); (6) deficit announcement and interest rates, see Wachtel and Young (1987).

Though most of these studies do a reduced form regression of deficits and interest rates, there exist important differences between them. For example, Evans(1985), Bernheim (1988), Deravi, Hegji, Moberly (1990), Barth, Iden and Russek (1984-85) and Gulley (1994) argue that regressions that link deficits and interest rates are misleading because any link between government debt and interest rates can be marked by inflows and outflows of foreign capital and/or a Federal Reserve policy that targets interest rates. They suggest an alternative methodology which entails estimating money demand functions that include a measure of government debt. As Evans (1985) points out, if increases in government debt do tend to cause higher interest rates, money demand and government debt should be positively related. This would be true even in the

presence of a monetary policy that targets interest rates. Also, if the private-sector does not behave in accordance with the Ricardian equivalence theorem, increases in government debt will raise money demand even if foreign capital flows offset any resulting changes in interest rates. However, they do not find evidence to support the positive relationship between government debt and money demand for the period between 1981-89 in the United States.

Cebula (1988) argues that the relationship between federal deficits and interest rates should distinguish between cyclical deficit (the counter-cyclically endogenous component of the total deficit) and the structural deficit (the exogenous component of the deficit). Conventional theory suggests that both the cyclical deficit and the structural deficit are supposed to generate upward pressure on interest rates. Since cyclical deficits are counter-cyclical in nature and interest rates pro-cyclical, this inverse relation is given. The important thing is to look at structural deficits. His conclusion is that deficits have a positive impact on bond rates. Laumas (1989) finds a positive link between nominal rates and cyclically adjusted federal deficits.

A large body of literature during the past decade has examined the behavior of real interest rates. No strong evidence of a positive association between deficits and *ex post* real rates are reported by Dewald (1983), Makin (1983) and Motley (1983), while Kolluri and Giannaros (1987) report a negative and significant relationship in an IS-LM framework between a real *ex ante* rate generated by the Livingstone inflation survey and the NIPA deficit for the 1966-83 period. Positive evidence between deficits and real interest rates are reported

by Hutchison and Pyle (1984) for pooled data for seven major countries from 1973 to 1982 and for the USA by Zahid (1988) and Cebula (1990a, 1990b).

A group of papers has investigated the effect of government debt on interest rates. Plosser (1982, 1987) tests for the effect of monetized debt, privately held federal debt, and government purchases, and finds no relationship between the excess return on government bills and bonds for period t to $t+1$ and the actual values of these three variables in his 1982 article and unanticipated values of these three variables in his 1987 article. In both cases the quantitative effect is quite small and inconsistent with the view that large increases in debt are responsible for the rise of real interest rates in the 1980s. De Leeuw and Holloway (1985) using annual data find evidence from a reduced form equation that suggests that changes in the ratio of cyclically adjusted debt to GNP are positively related to nominal rates. Allen (1990, 1991, 1992) using quarterly data reports a positive association between real *ex post* rates and various measures of the federal debt as a ratio of potential GDP.

The findings of most of the studies dealing with shorter term rates imply that budget deficits exercise no significant effect [e.g., Evans (1985, 1987a), Hoelscher (1983), Makin (1983), Tanzi (1983), Ostrosky (1990)], although there are a few notable exceptions [Barth and Brandley (1989), Barth, Iden and Russek (1984, 1985), Tanzi (1985)]. On the other hand, nearly all of the empirical studies on budget deficits and long-term interest rates find that deficits do exercise a significant impact on such rates [e.g., Al-Saji (1991, 1993), Barth, Iden, Russek and Wohar (1989), Belton and Cebula (1992), Cebula (1988, 1991,

1993), Hoelscher (1986), Thomas and Abderrazak (1998a, 1988b)]. The differing impact on short and long term rates is interpreted as telling us about how the Treasury finances most of the deficit and the substitutability between short and long-term interest rates (Friedman, 1978).

Given that there exists no true consensus in the literature on budget deficits and interest rates, some studies have examined the impact of budget deficits on private-sector spending in a different way. For example, Cebula, Killingsworth and Belton (1994, 171) have examined the possible relationship between investment (expressed as percent of GDP) and the federal budget deficit and/or national debt as a percentage of GDP "to capture the net impact that the budget deficit exercises over investment, an impact that may well transcend simply the interest rate mechanism". The other source of influence on investment, from budget deficits and a growing government debt, could potentially be through the adverse impact on the expectations of firms, i.e., deficits may act to erode business confidence in the health of the economy. They find evidence in support of the crowding-out thesis.

Barro (1974) and, following him, many other scholars have examined how private consumption/saving reacts to deficits when government expenditures are financed by changes in taxes or, more directly, the effect of government expenditures upon private consumption expenditures. Chan and Gustafson (1991) examine the *ex ante* crowding-out effect of government expenditures upon private consumption expenditures for the British economy and find no support of the *ex ante* crowding-out hypothesis. Fazzari (1994-95) examined the

interest sensitivity of investment and saving to study the consequences of deficits when the economy has unemployed labor and underutilized productive capacity. The evidence suggests that higher real rates cause investment to fall only for the negative and slow growth firms. They also find that, for the moderate and high growth firms, there is little empirical support for the view that capital investment will decline, even if expansionary fiscal policy pushes interest rates up. Cebula and Hung (1992) estimate a structural model, using a loanable funds equilibrium and behavior relationships hypothesizing domestic demand and supply of long-term bonds. They find evidence supporting crowding out.

To test the conventional view that large federal deficits cause higher interest rates, most studies mentioned above regress interest rates against contemporaneous values of a number of variables, including federal deficits. These variables are: money stock, expected rate of inflation, government budget deficit, government spending, structural deficits, trend GNP, cyclical deficits, change in the monetary base, etc. The significance of the coefficient on the deficit measure is the basis of different conclusions relating interest rates and deficits. We believe that correlation-based regressions like these are inadequate to test the conventional view regarding the causal relationship between deficits and interest rates.⁷ Indeed the hypothesis being tested does not merely contend

⁷ The causal relation between deficits and interest rates tested in this chapter does not include other variables, often included in regression based analysis of crowding-out, like money stock, expected rate of inflation etc. This is based on an understanding of institutional realities of interest rate determination, discussed in this chapter. Nevertheless, the possibility of an excluded common cause of changes in all variables, whether classified as exogenous or endogenous, can never be ruled out. The rationale for choosing any particular variable as exogenous must thus ultimately rest on other than empirical grounds (Moore, 1988a, 144). Findings in a recent paper

that deficits and interest rates are positively correlated, but also that the former causes the latter without significant feedback. A high correlation between deficits and interest rates cannot discriminate among four alternative, yet equally plausible, hypotheses. These are that (1) budget deficits cause interest rates (the conventional view), (2) interest rates cause budget deficits (the alternative viewpoint), (3) both hypothesis are valid, implying bi-directional causality, and (4) neither hypothesis is valid, implying causal independence.

Under the preceding situations, it is clearly problematic to characterize the observed high correlation between budget deficits and interest rates, of the kind reported by many of the studies mentioned above, as one in which the former causes the latter. If both hypotheses (1) and (2) above are valid, then hypothesis (3) is the correct interpretation of the data. However, under hypothesis (3), most interest rate equations that implicitly treat the deficit measure as an exogenous variable would be plagued with simultaneity bias, thus rendering the results both biased and inconsistent. Finally, the alternative hypothesis (4) contends, also quite plausibly, that changes in deficits and interest rates are primarily caused by other factors. In sum, a significant positive coefficient on the deficit variable in an interest rate equation is not a reliable evidence to support the conventional hypothesis that expansionary fiscal policies have caused rising interest rates. A more appropriate test to this and other alternative hypotheses is to focus on the

reinforce our institutional understanding for Canada (See, Lavoie and Seccareccia, 1998). The regression results for the determination of long-term rates, in this paper, suggest that the key explanatory variable for the long-term rates is the short-term rate of interest.

direction of causality between two variables and not on the correlation between them.

An understanding of the inter-temporal links between variables is of obvious importance in order: (i) to evaluate how different policies might, or might not, help to reduce the public deficit and (ii) from a theoretical point of view, to evaluate on an empirical basis the capacity of various theories to cope with reality. Of course, temporal causality tests do not verify theories directly, but they do allow us to reject them if causality goes in the wrong direction.

As mentioned earlier, there are a few empirical studies (Darrat (1990), Stanford (1997), Ibrahim and Kumah (1996), Mutairi (1995), Miller and Russek (1991), Dwyer (1982), Canto and Rapp (1982) and McMillin (1986)) that have specifically examined the causal relationship between federal deficits and interest rates. Most studies found no evidence that deficits cause interest rates. If anything, the evidence supports reverse causation - i.e., interest rates cause deficits. Ibrahim and Kumah (1996, 117), studying Germany, Japan, Sweden and United Kingdom, and using a VAR approach, find "that a larger portion of variations in the interest rate differential between financial centers as well as of variations in current account balance of countries is accounted for by monetary innovations rather than by fiscal innovations", between 1974 to 1992. Stanford (1997, 57) finds it hard to support "the current confidence of financial pundits and policy makers that high interest rates are created by risks of inflation and government default", for Canada between 1970 to 1996. Darrat's (1990, 758) paper failed to uncover any significant causal relationship between structural

deficits and interest rates for the United States, between 1955 and 1987. His model had an equation for each of these two variables, and he used maximum likelihood estimation since the equations' lag lengths were not identical. Darat included the 10-year government bond rate, expected inflation, expected real short-term interest rates, and the change in real GNP per capita. Dwyer (1982) used a six variable VAR system consisting of the three-month nominal Treasury bill rate, the inflation rate, and the growth rates of nominal gross national product, the money supply, federal debt held by the Federal Reserve, and privately held federal debt. Based on Sims causality test, Dwyer found no evidence to support the view that federal deficits cause interest rates. Canto and Rapp (1982) used both the Granger and Sims causality tests to examine the causal relationship between annual changes in the one-year Treasury security rate and annual changes in either the nominal or the real federal deficit. Canto and Rapp did not include other variables. The sample period was 1929-80. Neither test provided support for a causal effect of deficits on interest rates. Tests for reverse causality indicated that changes in interest rates caused changes in the nominal deficit but not the real deficit. McMillin (1986) used a single-equation, multivariate Granger causality test to examine the causal relationship between federal deficits and short-term interest rates. The other variables were the three-month nominal Treasury bill rate, the real output gap, the M1 growth rate, inflation rate, interest rate volatility, and a measure of supply shocks — the percentage change in the import price deflator relative to the

percentage change in the GNP price deflator. McMillin found no feedback from deficits to interest rates.

The standard causality tests that the above studies employ, however, ignore a potential channel of causation that may exist when variables are cointegrated (Granger, 1983). Miller and Russek (1991) employ cointegration and error-correction methodology to reexamine the temporal causality between fiscal deficits and interest rates — both long and short term. They find cointegration among the long-term interest rate, the federal deficit, and the short-term interest rate. Miller and Russek's findings show dramatic differences for Granger causality based on error-correction models. Two-way Granger causality exists between federal deficits and interest rates, which is a different result from most of the previous studies which found no causal effect from deficits to interest rates. It is important to note that all these studies which examine the causal relationship between deficits and interest rates are for the United States, with the exception of Stanford (1997) and Mutairi (1995). Stanford (1997) investigates the causal relationship for the Canadian economy. The latter investigates the causal relationship between budget deficits and interest rates using quarterly data of the Japanese economy over the period 1966 to 1990. Both budget deficits and interest rates are taken in nominal terms and the study finds that deficits possess a long run equilibrium relationship with the short-term interest rate. Bi-variate causality is found between deficits and interest rates. It is important to note here that, instead of the Johansen test, both Mutairi and Miller et al. subject the

residuals obtained from cointegrating regression to unit root testing to look for a cointegrating relationship.

5.0 Methodology for Estimating the Hypothesized Relationship⁸

Given the economic motivation (discussed in the previous section) behind the relationship between the government deficits and interest rates, this chapter investigates the Granger causality⁹ between government deficits and interest rates in selected countries. The results of these causality tests will be useful to draw inference about the degree of belief in the conventional wisdom i.e., increases in government deficits cause increases in interest rates. Commenting on the scope of inference from causality tests, Granger suggests that:

Thus, one starts with a 'degree of belief' that Y_t causes X_{t+1} , measured as a probability, and after using a causality test based on these definitions, one's 'degree of belief may change'. ... Naturally, using just statistical techniques, it is unlikely that the probability will go to one, or to zero, and if one does not like the definitions being used, then the tests are irrelevant and the degree of belief cannot change (Granger, 1988, 201).

In defining causality, we shall follow Granger (1969): X causes Y if and only if $Y(t)$ is predicted better by using the past history of X , together with the

⁸ The discussion in this section is greatly influenced by Giles *et al.* (1992), Atukeren (1995) and Enders (1995).

⁹ The most commonly used causality test is Granger's test and its extensions. The second most frequently used test is due to Sims (1972), and its variants which involves both lags and leads of a variable. Other tests of causality include Hoover (1991) and Holmes and Hutton (1992). In this chapter we have only tested for Granger causality. Guilkey and Salemi (1982) conducted a Monte-Carlo study of the power of causality tests, especially in small samples, and concluded that Granger tests consistently outperform the modified Sims procedure by small amounts. Since "the Granger test is computationally the least expensive of the three and results in fewest degrees of freedom lost from formation of lags and leads, we recommend it confidently to the practitioner" (Guilkey and Salemi, 1982, 679). The choice of Granger tests also means that the question of expectations is not addressed in this chapter. This choice seems satisfactory not only for econometric reasons but also since there is no economic reason to believe that expectations of

past history of Y itself, rather than by using just the past history of the Y variable. If X causes Y and Y does not cause X, we say that unidirectional causality exists from X to Y. If X does not cause Y and Y does not cause X, we say that either X and Y are statistically independent or they are contemporaneously related, but they are not related in any other way. Finally, if X causes Y and Y causes X, we say that there is bi-directional causality (or feedback) between these two variables.

However, before detailing the exact form of the Granger causality testing framework, some consideration has to be given to the possibility that the time series data that we shall be using may be non-stationary. This is a likely situation, with several implications for our analysis. These can best be seen by considering two concepts associated with time series data - the 'order of integration' of each series, and the possibility of 'cointegration' between two (or more) of the series.

5.1 Modeling with Non-Stationary Time Series

If a stochastic process is stationary, then its probability distribution is the same at all points in time, and many of its characteristics can be inferred by looking at a histogram of observations from the process. In our case, these observations are temporally ordered — the process is a time series. Standard methods of statistical inference are generally valid only if the data are

future deficits impact on present interest rates or that expectations of future interest rates impact on current deficits.

stationary.¹⁰ While many economic time series are non-stationary, most are 'homogenous non-stationary', which means that they can be reduced to stationary processes by differencing the data an appropriate number of times. A series which is stationary after being differenced d times is said (Granger, 1981) to be 'integrated of order d ', or $I(d)$. An $I(0)$ series is stationary, and it remains stationary if differenced further. Accordingly, such data can be used in either level or differenced form in a regression model. However, many economic time series have been found to be $I(1)$ or $I(2)$, and so care must be taken if such data are to be used in those regressions which underlie tests for Granger causality.

Two tests, often used, to check stationarity of the series are the Dickey-Fuller test and the Phillips-Perron test (Dickey and Fuller, 1979, 1981; Phillips and Perron, 1988). Dickey and Fuller actually consider three different regression equations that can be used to test for the presence of a unit root: $\Delta X_t = \gamma X_{t-1} + \varepsilon_t$, $\Delta X_t = a_0 + \gamma X_{t-1} + \varepsilon_t$ and $\Delta X_t = a_0 + \gamma X_{t-1} + a_2 t + \varepsilon_t$. The difference between the three regressions concerns the presence of the deterministic elements a_0 and t . The first is a pure random walk, the second adds an intercept or drift term, and

¹⁰ In regressions, with lagged dependent variables as regressors, the inference procedure based on least square estimation can only be given an asymptotic justification, since the dependent variables are correlated with previous disturbances. This asymptotic justification requires two assumptions: the disturbance term is independently and identically distributed and $\{X_t\}$ is stationary. $\{X_t\}$ is stationary if the mean, variance and covariance of X series are constant and independent of time. This stationarity condition is met when $|\beta| < 1$ in AR(1) process: $X_t = \beta X_{t-1} + \varepsilon_t$. If $\beta = 1$, then an AR process has unit roots, i.e. it is a random walk and $\{X_t\}$ is non stationary and the asymptotic results do not hold. When $|\beta| > 1$, then the X series has explosive behavior. Alternatively, the unit root condition can also be stated as being $\gamma = 0$ for a regression equation, $\Delta X_t = \gamma X_{t-1} + \varepsilon_t$, where $\gamma = \beta - 1$ and therefore $\gamma = 0$ or $\beta = 1$ are alternative ways of expressing the unit root condition. In general, Sims, Stock and Watson (1990, 113-114) have shown that the main problems in conducting usual ordinary least squares regressions when series are random walk is that: regression coefficients do not converge to constants with increasing sample size, as

the third includes both drift and linear time trend. Fuller shows that the t-statistic cannot be used to test whether γ in $\Delta X_t = \gamma X_{t-1} + \varepsilon_t$ is equal to zero or not. He provides critical values to be used in this case. The easiest way to introduce this test is to consider the model $\Delta X_t = \gamma X_{t-1} + \varepsilon_t$, where ε_t is stochastic error term that follows the classical assumptions, namely, it has zero mean, constant variance σ^2 and is non-autocorrelated. Such an error term is also known as a white noise error term. Now if the coefficient of X_{t-1} is in fact equal to zero, we face what is known as the unit root problem, i.e. a non-stationary situation. Not all time series can be well represented by the first-order autoregressive process, $\Delta X_t = \gamma X_{t-1} + \varepsilon_t$. Johnston and DiNardo (1997, 226) show that the effect of moving from an AR(1) specification to an AR(2) specification is the addition of a lagged first difference in X to test the regression. This process extends in a straightforward fashion to higher-order AR processes, $\Delta X_t = \gamma X_{t-1} + \sum_{i=2}^p \beta_i \Delta X_{t-i} + \varepsilon_t$. The critical values provided by Dickey and Fuller are unchanged if the three equations are replaced by the autoregressive processes with lagged differences in X . Tests using lagged changes in the $\{\Delta X_t\}$ sequence are called augmented Dickey-Fuller tests (ADF). With two lagged difference terms, a typical ADF regression is $\Delta X_t = \gamma_1 X_{t-1} + \gamma_2 \Delta X_{t-1} + \gamma_3 \Delta X_{t-2} + \gamma_4 t + \varepsilon_t$. In each case, the test for a unit root is a test on the coefficient of X_{t-1} in the regression.¹¹ If the coefficient is

in standard cases; the t-distribution does not possess a limiting distribution, but diverges with increasing sample size; and that wrong inferences are drawn based on the t-statistic.

¹¹ The test statistic to test the coefficient of X_{t-1} in the most general case, i.e. the one which includes a constant and a time trend, is τ_τ and, given the coefficient on X_{t-1} is zero, statistic $\tau_{\alpha t}$ and $\tau_{\beta t}$ are used for testing if the constant and time trend are equal to zero respectively. In case of a regression involving only a constant, the corresponding test statistic are τ_μ and $\tau_{\alpha\mu}$ and, in

significantly different from zero, then the hypothesis that X contains a unit root is rejected. If the value of the computed ADF test statistic is more negative than the critical value, it implies that the series is stationary; otherwise it is non-stationary. The estimated t statistic usually has a negative sign and therefore a larger negative t value is generally an indication of stationarity.

In order to avoid the danger of rejecting the null hypothesis of a unit root because of a misspecification concerning the deterministic part of the regression, I have followed the procedure suggested by Enders (1995, 256). This involves starting with the least restrictive of the plausible models and then proceeding by successive elimination of possibilities.¹²

The other problem in testing for unit roots relates to the appropriate lag length. Including too many lags reduces the power of the test to reject the null of a unit root since the increased number of lags necessitates the estimation of additional parameters and a loss of degrees of freedom. The degrees of freedom decrease since the number of parameters estimated has increased and because the number of usable observations has decreased. On the other hand, too few

case of the regression with no constant and time trend, the test statistic is τ (Dickey and Fuller, 1991).

¹² Start with the least restrictive of the plausible models (which will generally include a trend and drift) and use the τ_τ statistic to test the null hypothesis $\gamma = 0$. If the null hypothesis is not rejected, it is necessary to determine whether too many deterministic regressors were included in the first step above. Then the significance of the trend term is tested under the null of a unit root, i.e. using the $\tau_{\beta\tau}$ statistic to test the significance of α_2 . If the trend is significant, then a test for unit root is done using standardized normal distribution. If the trend is not significant, then the test for the presence of a unit root is done in the model without the trend, using the τ_μ statistic. If the null hypothesis is now rejected, it suggests that the model does not contain a unit root. If the null hypothesis of a unit root is not rejected, then the significance of the constant is tested using $\tau_{\alpha\mu}$ statistic. If the drift is significant, the presence of a unit root is tested using standardized normal. If the null hypothesis of a unit root is rejected, it suggests that the sequence does not contain a unit

lags may not appropriately capture the actual error process, so that γ and its standard error may not be well estimated. I have followed Enders to select the appropriate lag length:

One approach is to start with a relatively long length (four) and pare down the model by the usual t-test and/or F-tests. For example, one could estimate equation $[\Delta Y_t = \gamma Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i} + \varepsilon_t]$ using a lag length of n^* .

If the t-statistic on lag n^* is insignificant at some specified critical value, re-estimate the regression using a lag length of n^*-1 (Enders, 1995, 227).

Dickey and Pantula (1987) suggest a simple extension of the basic procedure if more than one unit root is suspected. In essence, the methodology entails nothing more than performing Dickey-Fuller tests on successive differences of $\{X_t\}$, starting with the highest degree of differencing and then testing down.

Another test for stationarity is the Phillips-Perron Test. The distribution theory supporting the Dickey-Fuller tests assumes that the errors are statistically independent and have a constant variance. The P-P test allows the disturbances to have heterogeneous distribution and to be weakly dependent. The critical values are the same as those used for the Dickey-Fuller tests. The power of ADF tests is probably low when moving average terms are involved in the error term. The Phillips-Perron correction, and hence the P-P test, may raise the power of unit tests in case of non-spherical disturbances. Perman (1991, 10-11), suggests that, "... if [tests for] normality, autocorrelation or heterogeneity statistics are significant, a prima-facie case exists for adopting the Phillips and Perron

root. Otherwise, it does contain a unit root. If the drift is not significant, then the model without the trend or drift is estimated.

approach". In this chapter, we have used the P-P test to check the stationarity of the series.

From our earlier discussion, it may seem that data which are $I(d)$ should be differenced d times prior to being used in a regression model. While this is often the case, there is also an important exception to this. It is readily established that adding a series that is $I(0)$ to one which is $I(1)$ results in an $I(1)$ series. Similarly (e.g. Engle and Granger, 1987), a linear combination of two series which are each $I(1)$ will usually produce another $I(1)$ series. However, this need not be so. In particular, it is possible that there exists a linear combination of two $I(1)$ series which is $I(0)$. If such a combination exists then it is unique up to a scalar constant, and in this case the two original series are said to be "cointegrated" (Granger, 1981; Granger and Weiss, 1983).

Therefore, in case the unit root tests reveal that the deficits and interest rates are integrated of order one, then the next step is to test for cointegration between government deficits and interest rates. One approach is using the maximum likelihood approach, laid out in a series of papers by Johansen (1988, and 1991 and Johansen and Juselius, 1990). Under the Johansen test, there are two statistics for testing the hypothesis that the cointegrating rank is at most r ($< k$). In one case, the alternative hypothesis is that the rank is k (the maximum number of cointegrating relation) and the test statistic is known as the trace statistic. In the second case, the alternative hypothesis is that the rank is $r+1$. The test statistic is known as max statistic. Some cases may be unresolved if the two statistics give conflicting indications. Another approach is testing whether the

error term is $I(0)$ is the alternative idea behind the cointegration tests. The ADF test and P-P test can be applied for testing both integration and cointegration. The latter results when the tests are applied to the residuals from the levels regression or the cointegrated regression. In this chapter, we have applied all three tests of cointegration to the variables; however, in case of conflicting results, precedence is given to the Johansen test.

There are several implications (e.g. Granger, 1983; Engle and Granger, 1987) of cointegration that are important for this study. First, if the cointegrating vector is $[1 \ -1]'$, then there is a tendency for them to move together in the long run. If there are shocks which drive them apart, then there are common characteristics which bring the series back together. Second, if X and Y are both $I(1)$ and cointegrated, then there is either unidirectional or bi-directional (Granger) causality between X and Y . Third, in case of $I(1)$ series which are cointegrated, the Granger Representation Theorem tells us how to model the relationship between such variables in the form of a VAR model. This theorem shows that we can either construct the VAR in terms of the *levels* of the data, or construct a long-run VAR in terms of the *first differences* of the variables, but include an 'error correction' term in each equation to capture short run dynamics. If the series are cointegrated, the usual practice of first differencing to detrend the series causes the loss of valuable long-run information. The error correction term comprises the lagged residuals from an OLS regression of X on Y (or vice versa). The regression is generally termed the 'cointegrating regression', and the

associated coefficients form the 'cointegrating vector' which combines X and Y into an $I(0)$ series.

5.2 Testing for Causality

The common practice is to test the order of integration of the natural logarithm of the variables. However, since government deficits or surplus will most likely include positive and negative numbers and interest rates already involve a percentage change, in this chapter the order of integration is tested without taking the natural logarithm of the variables. As discussed above, we first test the order of integration of each of the series being used. If government deficits and interest rates are both $I(1)$, then we test for cointegration between them, using the Johansen test, the ADF test and the P-P test. Otherwise, both variables are used in first difference form in the equations of the VAR models given below, as is also the case if they are found not to be cointegrated.¹³ On the other hand, if the two variables are found to be cointegrated, then the VAR equations below are augmented with the appropriate 'error correction' terms prior to estimation and testing for Granger causality.

So, in any case, the variables in the VAR model, except for possible error correction terms, are in first difference form. The standard way to then test for Granger causality between government deficits and interest rates is to estimate the following VAR model¹⁴:

¹³ As discussed earlier, differencing an $I(1)$ series renders it stationary and differencing an $I(0)$ series does not alter its stationarity.

¹⁴ Often identical lag structures on each variable are used in VAR model, i.e., $m=n=p=q$. However, based on the principle of completeness, in this chapter we have used different lag lengths on each variable.

$$\Delta X_t = \delta_1 + \sum_{i=1}^m \alpha_{1i} \Delta X_{t-i} + \sum_{i=1}^n \beta_{1i} \Delta Y_{t-i} + u_t$$

$$\Delta Y_t = \delta_2 + \sum_{i=1}^p \alpha_{2i} \Delta X_{t-i} + \sum_{i=1}^q \beta_{2i} \Delta Y_{t-i} + v_t$$

Where, u_t and v_t are serially uncorrelated random disturbances with zero mean.

Estimation of these equations can be done by OLS. Each of these equations will also include error correction terms if X and Y are both $I(1)$ and cointegrated, i.e. - $\gamma_i Z_{t-1}$, where $Z_t = X_t - \alpha Y_t$ and Z_t is $I(0)$. This is a new and significant approach to testing for causal relationships among economic variables. For the purpose of causality tests, Granger explains the significance of the error correction term as follows:

... in the error correction model, there are two possible sources of causation of X_t by Y_{t-j} , either through the Z_{t-1} term, if $\delta_1 \neq 0$, or through the lagged ΔY_t terms, if they are present in the equation... Without Z_t being explicitly used, the model will be mis-specified... [where Z_{t-1} and δ_1 are as defined above] Thus, many of the papers discussing causality tests based on the traditional time-series modeling techniques could have reached incorrect conclusions about non-causality... It does seem that many of the causality tests that have been conducted should be reconsidered (1988, 203-204).

More specifically, the error correction alternative to the standard Granger causality test considers the possibility that the lagged level of a variable Y , may help explain the current change in another variable X , even if past changes in Y do not. The notion is that if X and Y have a common trend, then the current change in X results partly from its moving into alignment with the trend value of Y . The standard Granger test, which examines only whether past changes in a variable help explain current changes in another variable, may not explain such causality. As with the standard Granger test, one may find reverse or even two-

way causality. So long as X and Y have common trends, however, causality must exist in at least one direction. As such, this rules out the finding of no causality in either direction - one possibility with the standard Granger test.

Given the values for the lag lengths m, n, p and q, we test to see if Y (Granger) causes X by testing the hypothesis $H_0: \beta_{11} = \beta_{12} = \beta_{13} = \dots \beta_{1n} = 0$ against the alternative H_a : otherwise. Similarly, we test if X (Granger) causes Y by testing the hypothesis $H_0: \alpha_{21} = \alpha_{22} = \alpha_{23} = \dots \alpha_{2p} = 0$ against the alternative H_a : not otherwise. To do this under OLS estimation we form the usual F-statistics (F_1 and F_2 respectively) for testing the significance of a subset of regressors.¹⁵ However, as Giles et al. (1992, 202) argue, 'given the presence of lagged dependent variables in the equations, these statistics are not F-distributed under the null'. Schmidt (1976, 99) shows that the Wald statistics nF_1 and pF_2 are asymptotically χ^2 with n and p degrees of freedom respectively.

The application of these tests assumes that the lag lengths associated with the causality regressions are known. Therefore, in both VAR and VECM models, an important issue is the criterion that is used to decide the order of the models. Russell Davidson and James G. MacKinnon suggest that

the best approach is probably to settle the question of lag length first, by starting with a very large value of q [the lag length] and then seeing whether the fit of the model deteriorates significantly when it is reduced without imposing any restrictions on the shape of the distributed lag (Russell Davidson and James G. MacKinnon, 1993, 675-676).

¹⁵ "... this is equivalent to constructing the Wald test of these zero restrictions on the coefficients" Giles et al. (1992, 202),

Choosing fewer lags will lead to the "omission of relevant variable bias," whose consequences can be very serious. On the other hand, choosing more lags than necessary will lead to the "inclusion of irrelevant variable inefficiency," whose consequences are less serious. Minimizing the Schwarz criterion yields a unique lag specification for each variable in each equation. Granger's (1969) model imposes the same lag structure on all variables. In a more general case, they may not be the same. This gives a modified version of Granger's (1969) and Sims (1980) approaches, popularized by Hsiao (1979, 1981). The idea behind specifying different lag lengths is the principle of parsimony. Given the limited sample sizes in economics, imposing identical lag structure on each variable in a VAR model quickly exhausts the available degrees of freedom, especially when more than two variables are involved. To ease this problem, Hsiao (1979, 1981) suggested the determination of lag lengths in a VAR model using a statistical model selection criterion. Under this approach, it is even possible to exclude a variable completely from an equation. Therefore, the individual equations of a model need not contain all the variables in the model. This is called the constrained-VAR approach. However, one still faces the problem of determining whether a variable appears in an equation and, if it does, selecting the appropriate lag length. Based on the review of different criteria by Atukeren (1995, 61-64), we have used the Schwarz (1978) criterion in this chapter. Other criteria include: Akaike's (1969) final prediction error criterion, Akaike's (1974) information criterion, Schwarz Bayesian information criterion (BIC), Shibata (1981) criterion (SHIBATA), Hannan and Quinn (1979) criterion (HQ), Craven

and Wahba's (1979) generalized cross validation criterion (GCV), among others. All the above criteria have a similar structure, i.e. $(ESS/T) g(K, T)$, where ESS is the error sum of squares, T is the sample size and k is the number of estimated parameters. Hannan (1980) suggests that the AIC criterion has a tendency to overparameterize, while FPE gives biased inferences as identified by Charemza and Deadman (1992, 295) and Hsiao (1981, 88). Lutkepohl (1985), Nickelsburg (1985) and Mills and Prasad (1992) examined the small sample properties of several model selection criteria using Monte-Carlo simulations. Lutkepohl (1985, 35) concluded that the Schwarz criterion chooses the correct autoregressive order most often and leads to the smallest mean squared forecasting error in samples of the size usually available in practice. Mills and Prasad (1992, 221-222) suggested that the Schwarz criterion should probably be the first choice of applied researchers.

6.0 Estimation Results

To recapitulate, the algorithm that we follow to test causality between deficits and interest rates is as follows:

1. First, we tested for unit roots using the Phillips-Perron test. Lags for the P-P test are chosen by SHAZAM version 8.0. It sets the order as the highest significant order from either the autocorrelation function or the partial autocorrelation function of the first differenced series.
2. Next we tested for cointegration between the variables, for countries, where both deficits and interest rates are $I(1)$. I have used ADF and P-P tests on the residuals of the regressions as well as the Johansen test to examine the

possibility of cointegration. For the Augmented Dickey-Fuller test and Phillips-Perron test lags were chosen by default of SHAZAM, and for the Johansen test, lags were chosen by default of EVIEWS. In case of conflicting results from the Johansen test and the ADF/PP test on cointegration, precedence was given to the Johansen test.

3. In case cointegration was found between variables, a cointegrating equation was estimated using a constant and a time trend.¹⁶ The residual from this regression are used as the error correction term in estimating the error correction models.

4. Lag selection for the VAR or VECM, as the case may be, was based on Hsiao's idea of establishing the order of multivariate VAR models. This involves, as a first step, determining the order of the one-dimensional autoregressive process, say Y , using some criterion. We used the Schwarz criterion. Hsiao used the Final Prediction Error criterion. The next step was to take Y as the only output of the system and assume X as the manipulated variable which controls the outcome of Y and, using the Schwarz criterion, determine the lag order of X , assuming the order of the lag operator Y to be one specified in step 1. If the former is greater than the latter, we say $X \Rightarrow Y$, and the optimal model for predicting Y is one including, say, n lagged Y and p lagged X . If the converse is true, we say X does not imply Y (at order p, n), and a one-dimensional

¹⁶ The inclusion of the time trend is based on the idea that "since modern capital markets came into existence, there have never been such high long-term rates as we recently have had all over the world" (Homer and Sylla, 1991, 1, cited in Pasinetti, 1997, 166), and therefore the relationship

autoregressive representation for Y is tentatively used. We repeat these steps for the X process, treating Y as the manipulated variable. We conducted this procedure of lag selection with the error correction term when the variables were found to be cointegrated. In the case of non-cointegrated variables, the procedure was implemented without the error correction term.

5. Based on the suggested causality in step 4, we checked for the significance (using the modified F (χ^2) test of the relevant coefficients) to test the null hypothesis of zero restrictions on the subset of regressors.

Data for the study are taken from *International Financial Statistics*, Department of Finance, Government of Canada, *CitiBase* database for the USA and the Statistics Canada database, *CANSIM*. For actual deficits we have used the series from summary statistics of government statistics in section 80 of *International Financial Statistics*. Line 80 gives the surplus or deficit on a cash flow basis for the central government. Here, Government deficit is defined as the difference between revenue and expenditure. Interest rates are nominal short term interest rates, line 60b or 60c in *International Financial Statistics*. The GDP series used is from section 90 of *International Financial Statistics*, where the data are based on the United Nations System of National Accounts. The price index is taken from line 64 of *International Financial Statistics*. The choice of countries and time period of study is based on the dictates of availability of consistent and

between deficits and interest rates is expected to grow over time. We also estimated the cointegrating equation without the time trend to see the robustness of our results.

comparable data series. For more details on data sources and construction of variables, see Appendix 1.

6.1 Unit Root and Cointegration Test Results

The methodology employed to investigate the relationship between deficits and interest rates follows three steps. The first step is to test the order of integration of the levels of actual deficit (DEF), actual deficit-GDP ratio (DEFGDP), nominal interest rate (IR) and real interest rate. Table 2-1 above gives the results of standard Phillips-Perron (P-P) tests. Based on the Phillips-Perron test, actual deficit (DEF), actual deficit-GDP ratio (DEFGDP) and nominal interest rate (IR) appears to be integrated of order $I(1)$ in the level form but $I(0)$ in first differences, except for Germany. Interestingly, real interest rates are $I(0)$ for all countries, except Thailand. The fact that real interest rates are found to be stationary while nominal interest rates are non-stationary implies that real interest rates have been relatively stable during the last three decades or so. At a theoretical level, in a somewhat different context, Seccareccia (1997) explains this. He argues how the hybrid postwar Wicksellian model in favor of price stabilization, adopted by central banks since the mid-1970s has led to "stabilized real interest rates and rates of unemployment at historically high levels" Seccareccia (1997, 2).

Table 2-1: Test For A Unit Root: Phillips-Perron Test For Deficits and Interest Rates in Levels and First Differences

Country	Phillips			Perron		Tests		(1-L) RIR
	DEFGDP	IR	DEFICIT	(1-L) DEFGD P	(1-L) IR	(1-L) DEFICI T	RIR	
Canada 1950-96	-2.67 [1]	-2.01 [1]	-0.53 [1]	-6.51* [1]	-6.16* [1]	-4.4* [1]	-4.15* [1]	...
United States 1950-97	-2.92 [1]	-2.02 [1]	-0.99 [1]	-8.4* [1]	-4.8* [1]	-6.06* [1]	-4.07* [1]	...
France 1990-95	-2.22 [1]	-2.22 [1]	1.21 [1]	-7.8* [1]	-5.50* [1]	-6.54* [1]	-7.06* [1]	...
Germany 1950-96	-5.58* [1]	-3.3* [1]	-2.11 [1]	...	...	...	-5.3* [1]	...
Italy 1969-96	-3.10 [1]	-2.36 [1]	0.97 [1]	-4.67* [1]	-5.09* [1]	-3.76* [1]	-3.3* [1]	...
Britain 1950-96	-3.10 [1]	-2.32 [1]	2.36 [1]	-4.78* [1]	-5.2* [1]	-2.6* [1]	-2.7* [1]	...
Japan 1957-93	-1.58 [1]	-3.0 [1]	-1.64 [1]	-4.7* [1]	-5.6* [1]	-4.5* [1]	-3.6* [1]	...
India 1952-95	-2.5 [1]	-1.79 [1]	1.83 [1]	-6.69* [1]	-5.29* [1]	-5.72* [1]	-5.1* [1]	...
Pakistan 1953-96	3.34 [1]	-1.84 [1]	1.69 [1]	-7.17* [1]	-7.89* [1]	-4.32* [1]	-3.3* [1]	...
S.Africa 1960-96	-2.34 [1]	-1.23 [1]	-2.51 [1]	-4.9* [1]	-3.67* [1]	-3.55* [1]	-4.0* [1]	...
Thailand 1966-96	-1.27 [1]	-3.03 [1]	-0.51 [1]	-5.11* [1]	-6.01* [1]	-3.9* [1]	-2.2 [1]	-4.3* [1]

Note: The 10 percent critical value is -2.57 and -3.13 for constant with no trend and with trend, respectively. The numbers in brackets show truncation lags. IR: Interest rate; RIR: Real Interest Rate; DEFGDP: Deficit-GDP ratio.

Given the results of the unit root tests, the second step is to test for cointegration between deficits and nominal interest rates in each country, where the two variables are $I(1)$, using the Johansen (1988) maximum likelihood approach and the unit root tests on the residuals of the cointegrating equation. This would help us identify, if there exists, an equilibrium relationship between deficits and short-run nominal interest rates and between deficit-GDP ratio and short-run nominal interest rates. The cointegration results are presented in Table

2-2. A single significant cointegrating vector was identified using the trace statistic in six out of eleven countries.

For Canada, the United States, South Africa and Pakistan, nominal interest rates and deficit-GDP ratios were found to be cointegrated. In the case of India and Japan both deficit-GDP ratios or deficits and interest rates were found to be cointegrated. Therefore, in these six countries, deficit-GDP ratios and nominal interest rates have a long-term relationship. This is to be expected given the realities of macroeconomic management in these countries. As has been argued by many scholars, for example, Wray 1997, Smithin 1994b, Foster 1994, Seccareccia and Sharpe 1994, Stanford 1997, Pasinetti 1997, high interest rate regimes have been the primary contributor to the increasing deficits since the 1970s, both for direct and indirect reasons. A high interest rate increases government interest expenditures, adding directly to the government deficit. If high interest rates slow down the economy, then the deficit is indirectly increased as tax revenues fall and certain types of spending rise. In fact, based on such an understanding of the relationship between deficits and interest rates, this chapter includes a time trend in estimating the cointegration equations¹ (Table 2-3). Interestingly, mainstream scholars would also expect an equilibrium relationship between deficits and interest rates, based on the idea that since deficits lead to higher interest rates, the two ought to move together. The real

¹ Cointegration equations are also estimated without the time trend. This does not affect the overall conclusions of the chapter.

issue at stake would, therefore, be to find out which of these hypotheses is confirmed by our causality tests.

The absence of cointegrating relationship in some countries between deficit-GDP and interest rates, when deficits and interest rates are cointegrated, or vice-versa, probably can only be explained in terms of the behavior of GDP. GDP may have grown either to reinforce or neutralize the long-run relationship between non-stationary variables. No cointegrating relations were found in France, Thailand, United Kingdom and Italy. For Germany, cointegrating relations were not tested since the two series were stationary. Table 2-2 also reveals that the cointegration test results, based on the unit root tests of the residuals of the cointegration equation, are not always the same as with the Johansen test. The results are similar for Canada, the United States, the United Kingdom, France, Japan, India and Pakistan, thus reinforcing our conclusions about the long-run behavior of deficit-GDP and interest rates.

Table 2-2

Tests For Cointegrating Relationship Between Deficits and Interest Rates

(P-P: Phillips-Perron test; ADF: Augmented Dickey Fuller test the residuals of the cointegrating equation)

Country		Johansen Test Results	P-P Test	ADF Test
Canada 1950-94	IR-DEFGDP	1 C. Eqn at 5 % significance level	CI	No CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	CI	CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
United States 1950-97	IR-DEFGDP	1 C. Eqn at 5 % significance level	No CI	No CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	CI	No CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
United Kingdom 1950-96	IR-DEFGDP	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEGDP-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
France 1950-95	IR-DEFGDP	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEGDP-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
Italy 1969-96	IR-DEFGDP	Rejects C.Eqn at 5% significance level	CI	CI
	DEGDP-IR	Rejects C.Eqn at 5% significance level	CI	CI
	IR-DEF	Rejects C.Eqn at 5% significance level	CI	CI
	DEF-IR	Rejects C.Eqn at 5% significance level	CI	CI
Japan 1957-97	IR-DEFGDP	1 C. Eqn at 5 % significance level	CI	No CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	No CI	No CI
	IR-DEF	1 C. Eqn at 5 % significance level	CI	No CI
	DEF-IR	1 C. Eqn at 5 % significance level	No CI	No CI
India 1952-95	IR-DEFGDP	1 C. Eqn at 5 % significance level	CI	No CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	CI	No CI
	IR-DEF	1 C. Eqn at 5 % significance level	CI	CI
	DEF-IR	1 C. Eqn at 5 % significance level	No CI	CI
South Africa 1960-96	IR-DEFGDP	1 C. Eqn at 5 % significance level	CI	CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	No CI	No CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	CI	No CI
Pakistan 1953-96	IR-DEFGDP	1 C. Eqn at 5 % significance level	CI	CI
	DEGDP-IR	1 C. Eqn at 5 % significance level	CI	CI
	IR-DEF	Rejects C.Eqn at 5% significance level	No CI	No CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
Thailand 1966-96	IR-DEFGDP	Rejects C.Eqn at 5% significance level	CI	CI
	DEGDP-IR	Rejects C.Eqn at 5% significance level	No CI	No CI
	IR-DEF	Rejects C.Eqn at 5% significance level	CI	CI
	DEF-IR	Rejects C.Eqn at 5% significance level	No CI	No CI

Note: Johansen test is based on intercept and trend in the cointegrating equation. IR: Interest rate; Def: government deficit; DefGDP: Deficit-GDP ratio; CI: Cointegration; and CE: Cointegrating equation.

Table 2-3**Regressions Results of the Cointegrating Relationship in Levels**

(To find the residuals for Vector error correction model estimation)

Country	DEFICIT / GDP	DEFICIT	C	T	INTEREST RATE
Canada 1950-94	D.V.	---	0.01 [2.375]	-0.001 [-4.640]	-0.009 [-1.132]
United States 1950-97	D.V.	---	0.004 [1.05]	-009 [-5.821]	-0.003 [-0.436]
India 1952-95	D.V.	---	-0.0321 [-7.72]	-0.001 [-4.89]	0.001 [1.57]
	---	D.V.	115.49 [3.505]	-13.437 [-5.926]	5.185 [0.757]
Japan 1957-97	D.V.	---	-0.010 [-0.474]	-0.001 [-2.06]	0.0003 [0.160]
	---	D.V.	-236.47 [-0.040]	-360.51 [-2.906]	80.383 [0.143]
South Africa 1960-96	D.V.	---	-0.030 [-1.96]	-0.006 [-5.23]	0.003 [1.191]
Pakistan 1953-96	D.V	---	33.18 [-5.18]	0.433 [-1.77]	2.839 [1.847]

Note: D.V. stands for dependent variable. C, T are constants and time trend in the regressions

On the basis of the cointegration test results, we conclude that deficit-GDP ratios and interest rates are cointegrated and, therefore, causally related in at least six out of 11 countries examined in this chapter. The third step is to carry out a test for lag identification in the vector autoregressive (VAR) or vector error correction (VEC) models. Based on the above cointegration results, for deficit-GDP and interest rates, we use VAR models for France, Germany, the United Kingdom, Italy and Thailand and VEC models for Canada, Japan, the United States, South Africa, Pakistan and India. As described in the methodology section, the lag selection is based on Hsiao's (1979, 1981)

procedure for determination of lag lengths in a VAR model using the Schwarz criterion. This is a constrained VAR approach where it is possible to exclude a variable completely from an equation. The details are described in Step 4 of the algorithm presented above. In the case of countries with cointegrated variables, the lagged error term from the cointegrating regression was added to the univariate specification. The results of the lag selection procedure are presented in Table 2-4. Based on Engle and Granger (1987), the error correction term is the lagged residual derived from estimating the cointegration equation. The cointegration equations are reported in Table 2-3.

The causal connection, from interest rate to deficit-GDP, suggested by lag selection procedure is reported in Table 2-4. It suggests the following lags: Canada (2,4), the United States (1, 2), the United Kingdom (4, 1), Germany (4, 2), Italy (1, 1), France (1, 1), and Japan (3, 1). Here the numbers in brackets give the selected lags for DEFGDP and interest rate respectively. For India, Pakistan and South Africa no bi-variate causality is suggested between the deficit-GDP ratio and interest rates in spite of the cointegration relationship between deficit-GDP and interest rates. At the same time, for Italy, a causal connection is suggested between deficit-GDP and interest rates within the VAR model.

Table 2-4: Lag Selection Results Based On Minimum Log-Schwarz Values I

Country	Lags	Int.	Int. - Defgdp	Defgdp	Defgdp - Int.
Canada 1950-94	1	1.48*	1.56	-8.84	-8.73
	2	1.58	1.68	-8.92*	-8.76
	3	1.68	1.75	-8.81	-8.85
	4	1.68	1.85	-8.69	-8.95**
United States 1950-97	1	0.87	0.96	-9.01*	-9.08
	2	0.83*	1.03	-8.92	-9.37**
	3	0.94	1.16	-8.87	-9.3
	4	1.03	1.28	-8.76	-9.28
United Kingdom 1950-96	1	1.22	1.23	-8.2	-8.33**
	2	1.14*	1.24	-8.21	-8.06
	3	1.23	1.36	-8.2	-7.93
	4	1.3	1.45	-8.29*	-7.84
Germany 1950-96	1	1.54	1.46	-8.73	-8.85
	2	1.39*	1.53	-8.61	-8.92**
	3	1.47	1.65	-8.82	-8.82
	4	1.54	1.73	-8.90*	-8.74
France 1950-95	1	1.34	1.45	-8.76*	-8.94**
	2	1.34*	1.52	-8.71	-8.69
	3	1.45	1.63	-8.61	-8.58
	4	1.54	1.56	-8.6	-8.5
Italy 1969-96	1	2.24*	2.36	-7.78*	-8.03**
	2	2.4	2.48	-7.69	-8.16
	3	2.58	2.6	-7.62	-8.02
	4	2.76	2.72	-7.5	-8.04
Japan 1957-97	1	1.8	1.77	-8.79	-8.96**
	2	1.76	1.83	-8.7	-8.71
	3	1.83	1.91	-8.84*	-8.63
	4	1.67*	1.98	-8.79	-8.5
India 1952-95	1	2	1.97	-9.07	-9.02
	2	1.92	2.03	-9.11*	-8.95
	3	1.88*	2.1	-8.99	-8.82
	4	1.96	2.23	-8.89	-8.7
South Africa 1960-96	1	2.08	2.22	-8.60*	-8.5
	2	2.01*	2.32	-8.5	-8.46
	3	2.09	2.45	-8.26	-8.36
	4	2.04	2.52	-8.15	-8.28
Pakistan 1953-96	1	0.66*	0.54**	-7.62*	-7.54
	2	0.73	0.65	-7.59	-7.55
	3	0.8	0.41	-7.47	-7.46
	4	0.88	0.91	-7.31	-7.44
Thailand 1966-96	1	2.62*	2.7	-7.92*	-7.89
	2	2.68	2.86	-7.78	-7.89
	3	2.79	2.89	-7.61	-7.78
	4	2.93	3.04	-7.43	-7.78

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively.

6.2: Granger Causality Test Results

Based on this, the relevant regressions for bi-variate Granger causality are presented in Table 2-5 and 2-6. Note that no error correction term is included in the case of Germany, Italy, the United Kingdom and France because of the lack of a cointegrating relationship between deficit-GDP ratios and interest rates. The results confirm that it is changes in interest rates which affect the deficit to GDP ratio in Canada, the United States, Italy, Japan and the United Kingdom. For Canada, and Japan only the error correction terms are significant¹⁸. And for the United States, the United Kingdom and Italy, only the interest rate coefficients are significant. In the case of Germany and France the suggested causality by the lag selection procedure is not confirmed by testing the significance of interest rate coefficients using the modified F-test.

In the case of deficits and interest rates, Table 2-2 reports a cointegrating relation between the two in the case of India and Japan. The countries with causal connection going from interest rates to deficits are Canada and India. The VAR model is used for the United States, Canada, and South Africa.

For India, a VEC model is used (Table 2-6). For South Africa the suggested causality is not confirmed by the testing the significance of error correction term or the coefficients of interest rate. In the case of Pakistan, the suggested bi-variate causality (Table 2-7) is not confirmed by the F-Test.

¹⁸ Thornton (1997, 238), argues that Granger causality is indicated in two-ways: First, F-statistics are calculated under the null hypothesis that the coefficients on independent variables are insignificant and, secondly, if the error correction term is statistically significant.

Table 2-5
Regression Results I: Deficits and Interest Rates in First Differences

Country	D.V	DEF/DEFGDP	C	ECT(-1)	D(INTEREST RATE)	Adj. R-Square / D.W
Canada 1950-94	D(DEFGDP)	(-1): 0.1517 [0.85] (-2): -0.25 [-1.46]	-0.0004 [-0.21]	-0.381 [-2.26] F=5.10*	(-1): -0.001 [-1.87] (-2): -0.005 [-0.555] (-3): -0.0016 [-1.73] (-4): -0.002 [-2.48] F=2.24	0.524 / 2.14
	D(DEF)	(-1): 0.218 [1.496]	-0.019 [-0.052]	---	(-1): -0.638 [-3.167] (-2): -0.351 [-1.772] (-3): -0.852 [-4.489] (-4): -0.760 [-3.230] F= 9.651*	0.524 / 1.89
United States 1950-97	D(DEF)	(-1): 0.458 [2.39]	1.16 [0.27]	---	(-1): -2.66 [-0.77] (-2): -10.56 [-3.36] (-3): 3.93 [1.05] F=4.86	0.747 / 1.04
United States 1950-97	D(DEFGDP)	(-1): -0.192 [-1.294]	-0.001 [-0.349]	-0.250 [-1.172]	(-1): 0.002 [2.425] (-2): -0.005 [-4.136] F=12.99***	0.514 / 1.987
United Kingdom 1950-96	D(DEFGDP)	(-1): 0.15 [0.83] (-2): -0.31 [-1.79] (-3): 0.99 [0.5] (-4): -0.29 [-1.7]	0.001 [0.43]	---	(-1): 0.002 [0.34] F= 4.43*	0.20 / 1.72
Germany 1950-96	D(DEFGDP)	(-1): -0.180 [-1.24] (-2): -0.10 [-0.71] (-3): -0.11 [-0.83] (-4): 0.12 [0.96]	-0.0002 [-0.17]	---	(-1): -0.008 [-0.993] (-2): -0.001 [-2.0] F=2.68	0.135 / 2.04
Italy 1969-96	D(DEFGDP)	(-1): -0.473 [-2.27]	0.001 [0.068]	---	(-1): -0.0035 [-3.06] (-2): -0.0037 [-2.7] F= 10.45**	0.508 / 1.88
France 1950-95	D(DEFGDP)	(-1): -0.128 [-0.861]	-0.0004 [-0.244]	---	(-1): -0.001678 [-1.747]	0.048 / 1.90
Japan 1957-97	D(DEFGDP)	(-1): 0.281 [1.57] (-2): -0.106 [-0.57] (-3): 0.60 [3.18]	-0.005 [-0.326]	-0.204 [-2.26] F=5.1*	(-1): 0.0006 [0.77]	0.208 / 2.07

Note: DV: dependent variable, D: first difference; C: Constant; ECT: Error Correction term; ***, **, * shows significance at 1, 5 and 10 % respectively. Numbers in [..] are t values and in (..) are lags.

Table 2-6
Regression Results II: Deficits and Interest Rates in First Differences

Country	D.V	DEF/DEFGDP	C	ECT(-1)	D(INTEREST RATE)	Adj. R-Square / D.W
India 1952-95	D(DEF)	(-1): -0.095 [-0.564] (-2): -0.247 [-1.707] (-3): 0.789 [3.612] (-4): 0.781 [3.105]	-5.528 [-0.845]	-0.0039 [-0.067]	(-1): 5.310 F=5.11**	0.480 / 2.21
South Africa 1960-96	D(DEF)	(-1): -0.059 [-0.289] (-2): 0.020 [0.066] (-3): -0.27 [-0.89] (-4): 0.33 [3.77]	-347.76 [-1.33]	---	(-1): 118.94 [1.34] (-2): -179.33 [-2.05] F=5.2**	0.454 / 2.02

Note: DV: dependent variable, D: first difference; C: Constant; ECT: Error Correction term; ***, **, * shows significance at 1, 5 and 10 % respectively. Numbers in [..] are t values and in (..) are lags.

Table 2-7: Lag selection Results Based On Minimum Log-Schwarz Values II

Country	Lags	Int.	Int.-Def.	Def.	Def.-Int.
Canada 1950-94	1	1.43*	1.44	2.3*	2.23
	2	1.51	1.55	2.39	2.34
	3	1.61	1.64	2.35	2.14
	4	1.67	1.75	2.32	1.99**
United States 1950-97	1	0.788	0.882	7.01*	7.04
	2	0.769*	0.778	7.11	6.89
	3	0.878	0.899	7.22	6.95**
	4	0.959	1.01	7.17	6.82
United Kingdom 1950-96	1	1.22	1.1	17.02*	17.11
	2	1.04*	1.1	17.1	17.21
	3	1.23	1.22	17.25	17.29
	4	1.3	1.37	17.12	17.3
Germany 1950-96	1	1.52	1.42	5.07*	5.13
	2	1.30*	1.5	5.18	5.13
	3	1.4	1.61	5.28	5.24
	4	1.47	1.72	5.4	5.35
France 1950-95	1	1.35	1.4	7.75*	7.82
	2	1.34*	1.44	7.86	7.93
	3	1.45	1.54	7.96	8.04
	4	1.54	1.54	7.93	8.16
Italy 1969-96	1	2.22*	2.3	5.27*	5.37
	2	2.36	2.39	5.28	5.45
	3	2.51	2.5	5.39	5.33
	4	2.67	2.61	5.51	5.82
Japan 1957-97	1	1.8	1.77	16.47	15.95
	2	1.76	1.87	16.5	16.09
	3	1.83	1.98	15.92*	16.18
	4	1.67*	2.08	15.94	16.33
India 1952-95	1	2.08	2.06	7.52	7.17**
	2	2.01	2.05	7.53	7.24
	3	1.97*	2.14	7.31	7.34
	4	2.03	2.21	7.23*	7.43
South Africa 1960-96	1	2.03	2.22	14.58	14.53
	2	1.98	2.32	14.64	13.44**
	3	2.05	2.52	14.78	14.58
	4	1.97*	2.63	14.15*	14.7
Pakistan 1953-96	1	0.60*	0.45*	18.15*	18.26
	2	0.66	0.51	18.22	18.37
	3	0.74	0.56	18.33	18.45
	4	0.84	0.67	18.46	18.56
Thailand 1966-96	1	2.62*	2.73	19.98*	20.14
	2	2.67	2.82	20.08	20.27
	3	2.79	2.87	20.13	20.34
	4	2.93	2.91	20.22	20.32

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively.

The results are pretty consistent. The causality results as described in Table 2-5 and 2-6 are consistent even when we use real interest rates (Table 2-8), instead of nominal interest rates and also when we do not use time trend in the cointegrating equations. We do not find any causal connection going from deficits or the deficit-GDP ratio to interest rates for any country. Also for G-7 countries we mostly find causality going from interest rates to the deficit-GDP ratio. For Canada and the United States we also find evidence for causality going from interest rates to deficits.

Granger causality tests were also performed between deficits (net of interest payments) and nominal or real interest rates. A summary of these results is provided in Table 2-9. These results suggest temporal precedence of real interest rates to primary deficit to GDP ratio for Canada, Germany, France, India, Pakistan and the United States. We also get temporal precedence for nominal interest rates to primary deficit for the United States, Canada, Germany, France and Pakistan. These results imply that high interest rates 'cause' deficits not only when deficits include interest payments but also when they are excluded from the measure of deficits.

Table 2-8
Regression Results III: Deficits and Interest Rates in First Differences

Country	Causality	DF^a	Wald Test
Canada	Δ real interest rate $\rightarrow$ Δ Deficit-GDP ratio	1	8.03**
US	Δ real interest rate $\rightarrow$ Δ Deficit-GDP ratio	1	13.5**
UK	No Causality	....	....
Germany	Δ real interest rate $\rightarrow$ Δ Deficit-GDP ratio	2	9**
France	Δ real interest rate $\rightarrow$ Δ Deficit-GDP ratio	1	12.2**
India	Δ real interest rate $\rightarrow$ Δ Deficit-GDP ratio	1	3.84*
S.Africa	No Causality	....	....
Pakistan	No Causality	....	....
Thailand	No Causality	....	....

Note: ***, **, * shows significance at 1, 5 and 10 % respectively.
a χ^2 degrees of freedom for Wald test.

Table 2-9: Regression Results IV: Primary Deficits and Interest Rates in First Differences

Country	Causality	DF ^a	Wald Test
Canada	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	1	6.44**
	Δ real interest rate $\rightarrow$ Δ Primary Deficit	1	7.11**
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit	4	12.12**
U S	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	4	8.12*
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit-GDP	2	9.6**
	Δ real interest rate $\rightarrow$ Δ Primary Deficit	1	7.11**
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit	2	6.34*
Germany	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	3	14.7***
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit-GDP	2	12.3***
France	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	1	32.3***
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit-GDP	2	22.36***
	Δ real interest rate $\rightarrow$ Δ Primary Deficit	1	8.77***
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit	1	4.16*
India	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	2	7.0*
Pakistan	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	3	10.71**
	Δ Primary Deficit-GDP $\rightarrow$ Δ real interest rate	3	10.5**
	Δ nominal interest rate $\rightarrow$ Δ Primary Deficit-GDP	2	6.56*
Thailand	Δ real interest rate $\rightarrow$ Δ Primary Deficit-GDP ratio	1	3.45
	Δ Primary Deficit-GDP $\rightarrow$ Δ real interest rate	4	1.4
S. Africa	No Causality		

^a χ^2 degrees of freedom for Wald test

***, **, * shows significance at 1, 5 and 10 % respectively.

7.0 By Way Of Conclusion

This study differs from most other studies by examining causality rather than correlation between actual deficits and interest rates. By examining causality within the cointegration and error correction framework the study also differs from the existing time-series literature, by safeguarding against erroneously identifying spurious causal connections between variables. For Canada, the United States and South Africa, nominal interest rates and deficit-GDP ratio were found to be cointegrated. In the cases of India and Japan, both deficit-GDP ratio or deficits and interest rate were found to be cointegrated. Therefore, in six countries deficit or deficit-GDP ratios and short-term interest rates reflect an equilibrium relationship. This seems to be reasonable given the fact that during the 1970s high interest rate regimes were the primary contributor to the increasing deficits. A high interest rate increases deficits both due to direct and indirect reasons. Interestingly, mainstream scholars also expect an equilibrium relationship between deficits and interest rates, based on the idea that since deficits lead to higher interest rates, the two ought to move together. The real issue at stake, therefore, is to find out if the tests of causality confirm either one of the two hypotheses.

Temporal causality from fiscal deficits to interest rates is rejected by Granger causality tests in this chapter. Therefore, the results of the chapter clearly suggest that the mainstream notion of crowding-out of private expenditures due to increase in interest rates is not supported by the evidence from G-7 and a select group of developing countries. The increase in public

deficits does not cause interest rates to increase. In fact, the Granger tests in this study do not reject the hypothesis of interest rates causing deficits. The results confirm that it is changes in interest rates which affect the deficit to GDP ratio in Canada, the United States, Italy, Japan and the United Kingdom. For Germany and France, the suggested causality by the lag selection procedure is not confirmed by testing the significance of interest rate coefficients using the modified F-test. In the case of deficits and interest rates, the countries with causal connection going from interest rates to deficits are Canada, India, South Africa and the United States.

For primary deficits and interest rates, we get temporal precedence of real interest rate to primary deficit to GDP ratio for Canada, Germany, France, India, Pakistan and the United States. We also get temporal precedence for nominal interest rates to primary deficit for the United States, Germany, France and Pakistan.

This result implies that high interest rates 'cause' deficits even when the measure of deficit excludes interest payments. This reinforces the ideas of heterodox macroeconomists who argue that it is the provision of liquidity regulated by the monetary authorities (the central bank) which ultimately determines the level of interest rates in a monetary economy. Furthermore, the fear of crowding out of private investment, because of higher interest rates from increasing deficits, is also not supported by the results of this chapter.

CHAPTER 3

The Fiscal and Monetary Policy Link: Implications for Government Expenditure and Deficits

1.0 Introduction

This chapter is about government deficits and public expenditure. It is a sort of universal dictum nowadays that government profligacy in the past has led to the upsurge in government deficits, especially in the 1980s. This chapter examines this belief. In Chapter 2, we found evidence suggesting that deficits temporally follow interest rates and, in fact, changes in interest rates explain changes in deficits. This chapter explores rigorously the expenditure response of governments in face of increasing deficits, due to high interest rates.

The argument that is being made in this chapter is simply that any analysis of macroeconomic policy making, especially of monetary and fiscal policy, has to recognize the nature of existing institutions (role of central banks and their interaction with other arms of the government), the role of dominant economic thinking (the rise of monetarism as a social doctrine and institutionalization of restrictive fiscal and monetary policy) and the social and economic forces which sustain these arguments and specific policies (the relationship between workers, entrepreneurs and rentiers, the relation between national governments and international financial capital and finally the 'unequal interdependence' among the capitalist economies and the pre-capitalist and semi-capitalist economies of the outlying regions). Conducting such a detailed political economy analysis is beyond the scope of the chapter. However, such is

the frame of reference within which we shall examine the interaction between interest rates and government spending.

In what follows, we will briefly establish the overarching characteristics of the prevalent dominant discourse on macroeconomic policy. We then specifically look at the existing approaches to explain fiscal policy and suggest our point of view to explain the prevalent fiscal behavior of governments. This helps us to identify the specifics for empirical examination. We then explain our empirical model, and this is followed by the results from the empirical tests. Since fiscal policy issues are closely connected to interest rate determination, we also examine, in the appendix those aspects of monetary policy which help us to understand the interaction between monetary and fiscal policy.

2.0 Dominant Macroeconomic Policy Discourse: Conventional Principles

Monetarism in present-day practice, if not necessarily in theory¹, is associated with restrictive monetary and fiscal policy (high interest rates and restrictive budgetary measures). Starting in the mid-1970s, in the midst of crises of fiscality and governability, the discipline of money became the defining attribute of contemporary post-Bretton Woods politics within the OECD countries. In England, monetarism had appeared on the state agenda following the

¹ Bhaduri and Steindl (1985) suggest that "in 1929 the proto-monetarists Foster and Catchings were inveighing against the Federal Reserves' policy of stopping the stock market boom by tight credit policy" (75). They suggest, that this stance of bygone times is still reflected in Milton Friedman's monetary history. Also, Aschheim (1975), comparing monetarism vs. fiscalism, suggests that Friedman's controverted preliminary assumption of cash distribution by helicopter involves the combination of an expansionary fiscal policy with an expansionary monetary policy. Furthermore, an expansionary fiscal-policy component is prominently allowed for in the Chicago tradition, as illustrated in the contributions of Simons, Patinkin and Buchanan.

devaluation crises of the 1960s and had blossomed in the 1970s and 1980s into broad controls of money growth and a systematic attack on state spending (Leys, 1980 and Clarke 1987). In France, the public commitment to monetary targeting began in earnest in 1976 with the publication of targets for the growth of M2 (Galbraith, 1982). In Germany, the Bundesbank publicly announced targets for monetary growth in 1974. These targets were broadened in 1975 and again in 1979, activating a wide range of monetary instruments (Dudler, 1980). The Italian experience with monetarist targeting began in 1974 with a commitment by the Bank of Italy to the International Monetary Fund following an exchange rate crisis (OECD, 1985). In the United States, the Open Market Committee of the Federal Reserve Bank adopted its informal monetary targets as early as the spring of 1970 (IMF, 1975). In the late 1970s, the Federal Reserve moved beyond using monetary targets as intermediate policy objectives and, in 1979, it moved to "base control", through the control of bank reserves and bank credit (Lindsey, 1980). In Canada, with the Saskatoon Manifesto², the Bank of Canada publicly committed itself to a monetarist policy of "gradualism", based on the progressive reduction of the growth rate of M1 (Drainville, 1995). Above and beyond the technical effort of central banks to control national money growth, monetarism was also an event in the world economy, i.e. part of a global monetarist "reading" of the conditions of accumulation constructed by the organs of management of the world economy. This reading (or the way in which the

² Remarks by Gerald K. Bouey, Governor of Bank of Canada, to the 46th annual meeting of the

organs of management identified the changing constraints to accumulation in the world economy), the diagnosis they established, and their policy prescriptions had severe implications for the national monetarist experiences of not only developed countries but developing countries as well (Fleming, 1975).

In terms of economic theory, monetarist thinking is rooted in a particular understanding of the "Keynesian intervention" in the economy³, and in particular notions about the dynamics of the real and monetary sectors. In the last two decades, the practice of monetary and fiscal policy has been dominated by contributions made by both monetarism⁴ and supply-side economics (Gilder, 1981; Wanniski 1978, Meyer, 1981). These schools agree on the crucial importance of reducing inflation to modest, very low levels by ultimately containing the growth of money, drastically reducing the size and role of government, balancing the budget, at least in the medium run, and following simple long-run fiscal rules.

The supply-siders differ from Friedman's brand of monetarism in several important respects. Supply-side economists attach tremendous importance to policy designed to correct 'supply-side' weaknesses: improving incentives to

Canadian Chamber of Commerce, September 1975, quoted in Drainville (1995).

³ Following Joan Robinson, Seccareccia (1995), characterizes this conception of Keynesian macroeconomic intervention as 'bastard Keynesianism'. It is argued that this hybrid and *ad hoc* Keynesianism of the early post-war period rested on a primitive hydraulic model of the macro-economy that integrated important Keynesian concepts that had no basis in neoclassical economics. Such internal inconsistencies made it an easy target for the monetarist and new classical attacks that were to emerge in the seventies and eighties.

⁴ Tobin (1981) made the distinction between monetarism I and monetarism II. The first was Friedman's brand of monetarism and the second is the new-classical school. Some early

work, save, invest, innovate, and assume risk. With this aim in mind, their stress has been on cutting income taxes and regulations. Some supply-siders believe that the best way for any single country to contain money growth in the long run, and at the same time maintain a credible stance on inflation, is to adopt a domestic 'gold standard' and even return to fixed exchange rates by restoring a world-wide gold standard (Waniski, 1978, Laffer, 1980). Monetarism rejects this, believing instead that unmanaged exchange rates would serve the world economy better. Supply-siders appear to be less concerned about budget deficits over a span of, say, two years or so than monetarists. They believe that a policy of cutting taxes to stimulate the supply side may eventually restore revenue (Gilder, 1981, 267). Supply-side economists see the size and role of the public sector, and more particularly the level of taxes and regulations, as lying at the heart of the inflation problem.

Typically, the solutions to the two-equation, aggregate demand, aggregate supply system, offer crucial policy implications for the new-classical school. The aggregate supply (eqn1) and aggregated demand (eqn2) equations take the form:

$$U_t - U_N = \alpha_1(p_t - p_e) + \alpha_2 U_{t-1} + v_t \quad (1)$$

$$U_t = a_{0t} + \alpha_3(m_t - p_t) + n_t \quad (2)$$

references for the new-classical school are Lucas(1972), Sargent and Wallace (1975), Barro (1976), McCallum (1980), and Buiter (1980).

In these equations, U = the unemployment rate, UN = the natural unemployment rate, p = the log of rate of change in the price level, p_e = the log of rate of change in the expected price level, a_0 = other influences on real demand (assumed here to be fiscal policy), m = the log of rate of change in the money stock, v and n are assumed to be random errors with mean value of zero. Assuming rationally based expectations:

$$p_e = 1/\alpha_3 a_{0et} + m_{et} + 1/\alpha_3 n_{et} - 1/\alpha_3 UN - \alpha_2/\alpha_3 U_{t-1} - 1/\alpha_3 V_{et} \quad (3)$$

The subscript 'e' in the equation is used to represent expected values. Since the means of n and v are zero, their expected values must also be zero.

Solving these three equations and substituting in eqn 1 we finally get:

$$U_t - UN = (\alpha_1/\alpha_1 + \alpha_3) (a_{0t} - a_{0et}) + (\alpha_1\alpha_3/\alpha_1 + \alpha_3) (m_t - m_{et}) + (\alpha_1/\alpha_1 + \alpha_3) n_t + (\alpha_3/\alpha_1 + \alpha_3) v_t + \alpha_2 U_{t-1}$$

$$p_t = (1/\alpha_1 + \alpha_3) a_{0t} + (\alpha_1/\alpha_3 (\alpha_1 + \alpha_3)) a_{0et} + (\alpha_3/\alpha_1 + \alpha_3) m_t + (\alpha_1/\alpha_1 + \alpha_3) m_{et} + (1/\alpha_1 + \alpha_3) n_t - (1/\alpha_1 + \alpha_3) v_t - (1/\alpha_3) UN - (\alpha_2/\alpha_3) U_{t-1}$$

where $a_{0t} - a_{0et}$ and $m_t - m_{et}$ represent, respectively, unanticipated fiscal and monetary policies. These solutions carry important policy implications.

Fully anticipated monetary and fiscal policies ($a_{0et} = a_{0t}$ and $m_t = m_{et}$) can have no real (and only price effects). Hence, credible restrictive monetary policies can secure rapid reductions in inflation without substantial, if any, real costs. A consistent policy of fine tuning (stabilization) will also fail ultimately because it will become anticipated (errors in forecasting policy will be random). It follows that only unanticipated policies can have real effects, but these may

persist for a while because of adjustment costs on the supply side (α_2). The theoretical underpinning of equation 1 is also to explain the long-term increase in the unemployment rate in terms of an increase in the natural rate of unemployment (NRU). If $p-p_e$ is itself a random term, it follows that the actual unemployment rate is determined by the NRU, the lagged unemployment rate and a random error term. Since the lagged unemployment term is hardly likely to account for a persistent upward trend in U , given an unanticipated shock, nearly all of such a trend must be accountable in terms of the NRU (Hall, 1975). Consequently, the problem of long-term unemployment has to be attacked by policies designed to reduce NRU.

Friedman's version of monetarism shies away from these policy implications, either on the grounds of rejecting rational expectations as defined by the new-classical school, or by questioning the assumption of continuous market clearing, or both. As already demonstrated, new-classical economists argue that, if restrictive monetary growth is announced, anticipated and made convincing, inflation may be brought down with little or no unemployment. This is because, in a world where wages are flexible and determined by expectations of inflation that, in turn, are determined by money growth, wages and prices will adjust quickly downwards. Friedman has, however, indicated in numerous places (Friedman and Friedman, 1980, Friedman 1974b) that the costs would be substantially reduced by the adoption of widespread indexation of wages, taxes and financial contracts, at the same time as money growth is reduced. Friedman

favors indexation, to begin with, because it makes inflation less attractive to governments and so reduces political resistance to the adoption of an anti-inflation strategy. Inflation would be less attractive because indexation reduces gains to governments on two fronts: it reduces the windfall tax yields (bracket creep) and it reduces the gains from the fall in the real value of outstanding debt. At the same time, Friedman contends that widespread indexation will reduce the associated unemployment costs of an anti-inflationary policy.

Recent literature⁵ on monetary and fiscal policy has extended the traditional approach where the economic policy questions have traditionally been posed as once-and-for-all choices of economic policy instruments or policy rules. Actual policy making is better described as an ongoing process, where policy makers set and revise policy instruments sequentially, than as once-and-for-all choices of policy instruments or policy rules. The equilibrium monetary and fiscal policies that are chosen seek to maximize a given objective function subject to well defined constraints. Some of the constraints are traditional and obvious, such as private agents must act optimally, and conventional conditions for market equilibrium must be satisfied. The additional constraints that are considered by this 'new' literature are the incentive constraints that reflect the specific nature of the policy-making process. These incentive constraints are of two kinds. One, the incentive constraint that emanates from the sequential nature of policy-making, particularly from the possibility to deviate from earlier

plans or announced policy rules. Within this framework, once private agents recognize that policy-makers have clear incentives in this direction, they may start to base their current behavior on expectations that deviations may occur. This can drive policies with desirable long-run properties into serious credibility problems. Thus, this literature discusses how credibility problems arise, how such problems may generate bad policy outcomes, and how a number of mechanisms may help relax the underlying incentive constraints and generate better social outcomes. The second incentive constraint emanates from the political nature of the policy-making process. Political incentive constraints that influence equilibrium policies may relate to a policy-maker's desire to be reelected, to a majority's desire to redistribute in its own favor, or to the equilibrium behavior of a future government. How the political system shapes the political incentives and how these incentives, in turn, shape equilibrium monetary and fiscal policies are some of the issues discussed in the literature, which focuses on the political incentive constraint. Notwithstanding all this, within this framework, policy decision solves an explicit choice problem of a rational incumbent policy-maker or a rational voter (and thus remains within the confines of the neoclassical paradigm).

Thus the conventional principles of macroeconomic policy, in general, involve an inherent faith in efficient market clearing, in reducing the size and role of the government, in balancing the budget and on controlling the growth of

⁵ Persson and Tabellini (1994) provide a representative collection of such contributions in their

money. In the following discussion we look at the specifics of fiscal policy in some detail.

Since fiscal policy issues are closely connected to interest rates (this is supported empirically for eleven countries as evidenced in Chapter 2), we also discuss in the appendix those aspects of monetary policy which help us to understand better the interaction between monetary and fiscal policy.

2.1 Fiscal Policy

On the fiscal side, Monetarists and supply-side economists share the view that the public sector is too large and government involvement in the economy excessive. The public sector and taxes need to be cut back. When the 'optimal' size of the public sector is reached, government expenditure and taxes will be allowed to grow over time at a rate equal to the normal growth of output. Monetarism I holds strong views both about the real effectiveness of fiscal policy, given the money supply, and also about the use of discretionary fiscal policy stabilization. Fiscal policy is assumed to have either no real effects or weak effects in the short run. Fiscal policy, therefore, cannot be used to offset shocks to the real economy. In support of this proposition, monetarists have at various times spelled out various crowding-out mechanisms that might make fiscal policy impotent⁶. Over the longer-time horizons, price-wage adjustments will serve to weaken substantially the real effects. Some monetarists argue that fiscal policy

two edited volumes.

⁶ The crowding out thesis is not supported empirically as evidenced by the Granger causality tests in chapter 2 of this thesis.

can, in principle, have real effects in the short run; hence fiscal policy could be used to speed up adjustment to the NRU. In itself, this does not necessarily justify fine-tuning for them; it does, however, weaken the case against fine tuning.

Apart from the monetarists, the other prevalent ideas on fiscal policy are based on the principle of functional finance.⁷ The argument here is that government tax and spending policy should be primarily responsible for keeping both the unemployment rate and the inflation rate at low levels. Further, the government should generate additional spending through tax cuts and through increases in expenditure; and government borrowing should take place when times are bad, and in good times the government should reduce its borrowing or incur budget surpluses. This theory of fiscal policy rejects the contention though, that governments should balance their budget on a cyclical basis.

Many authors have also tried to explain the growth of public expenditure over time, within the public choice framework, by examining either the trends in absolute levels of public expenditure or, more frequently, changes in the ratio of public expenditure to a measure of income, usually GNP. Here, two central themes have provided guidelines for organizing the thinking about the relative share of the public sector in the economy: Wagner's Law (1958) explaining the ever-increasing state expansion and the displacement effect associated with Peacock and Wiseman (1961). The conventional interpretation of Wagner's

thesis implies continuous relative expansion of public spending as a consequence of the development process. On the other hand, the Peacock-Wiseman thesis aimed at an "explanation of the time pattern of expenditure growth rather than upon the absolute magnitude of public expenditure" (Peacock and Wiseman, 1961, Introduction, p. vii). Their analysis of the British expenditure data found that what might be called the permanent influences on growth, such as population and employment trends, could not explain the observed time pattern. They found that, during periods of social disturbance (war, famine, or some natural disaster), the citizenry's level of tolerance for taxation is reviewed upward and public expenditure expands. The jump in the public expenditure was referred to as the displacement effect. This ratchet effect coupled with their inspection effect (i.e., during the social disturbance, groups and individuals in society become aware of the need for expanded public expenditure) provided an explanation of the time pattern of public expenditure that occurred after the social disturbance subsided.

These two hypotheses have been critically reworked and modified. The Buchanan and Wagner (1977) hypothesis on government deficits and level of spending suggested a framework for social and economic order in which "some set of fiscal principles must be restored" (Buchanan and Wagner, 1977, 182). They suggested two distinct steps that need to be taken in moving toward genuinely effective fiscal reform.

⁷ Based on writings of Keynes, Lerner and others, Pressman (1995) has succinctly presented the

The first is that of recognizing explicitly that a meaningful constitutional norm is required The elected politicians, who must be responsive to their constituents, the governmental bureaucracy as well as the electorate, need something by way of an external and "superior" rule that will allow them to forestall the persistent demands for an increased flow of public-spending benefits along with reduced level of taxation. ... Decisions concerning the amount of resources to be allocated governmentally will be made through the ordinary political processes, with or without the existence of a rule for budget balance. (Buchanan and Wagner, 1977, 175-177)

The public choice framework, the functional finance framework and the market-clearing rational expectations framework have all motivated various empirical studies to explain government expenditure behavior.

The standard approach, when considering an empirical test of the Buchanan and Wagner (1977) hypothesis on government deficits and levels of spending, is to follow Niskanen (1978). The model adopts a public choice approach to collective decision making and assumes a demand function for government services by the average voter-taxpayer: $\ln Q = A + \beta \ln R + \gamma \ln V$, where Q is the quantity of government services consumed by the average voter, R is the perceived price paid, usually expressed as CF where C is the unit cost of a bundle of government services and F is the tax share of government services paid for by the average voter-taxpayer, V is per capita real income. Tridimas (1992), Craigwell (1991) and Ashworth (1995) have modified the Niskanen framework to bring in the issue of dynamic adjustments, i.e., the possibility of differences between short-run and long-run responses to demand.

Wagner's law has also been the subject of extensive research and empirical tests (Bird, 1971, Buchanan and Tullock, 1977, Ram, 1986, 1987, Abizadeh and Gray, 1985, Courakis *et al.*, 1993, Georgakopoulos and Loizides, 1994) adopting the following model:

$$\ln G = a + b \ln Y + (1-b) \ln N \text{ or}$$

$$\ln (G/N) = a + b \ln (Y/N) \text{ or}$$

$$\ln (G/Y) = a + (b-1) \ln (Y/N),$$

where G is public expenditure, Y is GDP and N denotes the size of the population. The first equation constitutes the per capita formulation of Wagner's law and the second constitutes the share-of-income formulation. Most of these studies do not indicate a unique pattern of behavior across countries and over time. Many investigators argue that the traditional formulation of Wagner's law is quite simplistic. For that reason, they attempt to improve the specification of the law, by using alternative or other explanatory variables to per capita income such as agricultural and manufacturing output, the degree of modernization of the economy, the openness of the economy to international trade, etc. (Cameron, 1978, Mann, 1980, Mann and Schulthess, 1986, Georgakopoulos *et al.*, 1992, 1994). Courakis *et al.* (1993) tested Wagner's law in the case of Greece and Portugal and found income elasticities greater than unity only in the case of transfer expenditures in Greece and in the case of consumption expenditures in Portugal (the validity of Wagner's law is sought in terms of whether or not the income elasticity of demand for public expenditures is greater than unity). Georgakopoulos and Loizides (1994) estimated a model using the per capita

formulation and did not find support for Wagner's hypothesis. Georgakopoulos and Loizedes (1994) used a dynamic model and other determinants than real income such as population size and urbanization. They obtained results indicating that the urbanization variable and population size give statistically significant results. Using the two step Engle-Granger cointegration methodology, Chletsos and Kollias (1997) find a statistically significant causal connection only between GDP and defense expenditure. Thus, they conclude that the growth of government expenditure is not directly dependent on and determined by economic growth as Wagner's law states.

Within the time series literature, the relationship between public expenditure and national income is often formulated as a test between Keynes versus Wagner. The hypothesis that public expenditure is an exogenous or control variable, which can be used as a policy instrument to influence growth, is associated with Keynes. On the other hand, the hypothesis that public expenditure is endogenous or is an outcome, not a cause of growth in national income, is associated with Wagner. The standard approach used to evaluate the two different hypotheses has been to apply causality testing techniques in the Granger framework (Granger, 1969, 1988). These tests have been carried out extensively for developed and developing countries with mixed results, in some cases, detecting unidirectional causality from expenditure to income (or conversely), or detecting no causal relationship or, even yet, detecting bi-directional causality between the two aggregates (Ansari et al., 1997, Oxley,

1994, Khan, 1990, Ram, 1986, Singh and Sahni, 1984, Beck, 1979, 1981, Bird, 1970, 1971, Gandhi, 1971).

In the context of government deficits, the empirical issue vis-à-vis public expenditure has been whether changes in expenditure explain the changes in deficits, or is it the changes in revenues which better explain the changes in deficits. For example, Bohn (1991) examining U.S. budget data from 1792-1988 concluded that, about 50 to 65 percent of all deficits due to tax cuts and about 65 to 70 percent of all deficits due to higher government spending, have been eliminated by subsequent spending cuts, while the remainder was eliminated by subsequent tax increases. Miller and Russek (1993) find evidence, from their study of 44 countries between 1975 to 1984, that higher taxes today lead to either higher or lower federal spending tomorrow and higher spending leads to higher taxes tomorrow. From this, he concludes that the political system "somehow" determines how much to spend and then looks for revenue sources to finance that level of spending, including direct taxation, borrowing and money creation.

Another perspective from which deficits and expenditures have been studied is the intertemporal solvency condition, the present value of the debt in the long run. This condition focuses on the long-run paths of interest-inclusive expenditures and revenues. It is suggested that, unless revenues and expenditures trend together over the long run, the government will have an incentive to default on the debt, losing the confidence of investors. From the standpoint of the intertemporal solvency condition, do the recent deficits

represent boundless growth of government debt or deficits? As an empirical proposition, boundless growth of debt corresponds to non-stationarity of the deficit (or the first difference of the debt). Recent developments in time series econometrics (similar to those discussed in Chapter 2) have provided ways to examine the intertemporal solvency condition. For example, Hamilton and Flavin (1986) and Trehan and Walsh (1991) apply stationarity tests to the US federal deficit. Similarly, Hakkio and Rush (1991) and Tanner and Liu (1994) test for cointegration between interest-inclusive expenditures and revenues, while Bohn (1991) tests for cointegration of debt, non-interest expenditures and revenues.

3.0 Alternative Views on Fiscal Behavior of Governments

In this study, we do not approach the issue of government deficits and levels of spending within the public choice framework. The public choice approach is based on methodological individualism. The public is presented as having a unified set of preferences so that there is no political conflict. The antagonistic relations among different social classes are completely denied within this approach. The intertemporal solvency condition approach is also problematic since it stops short of examining the causal connections between deficits and expenditures. It approaches the long-term behavior of revenue and expenditure in a social and economic void. The testing of the trending together of these two variables, over the long run, is done without any regard towards the social forces or the policy decisions which move the two variables. Failing to recognize this, there are no causality issues raised in this literature. Our chapter's approach to analyze policy changes (i.e., changes in expenditure level

/ deficit level by governments, etc.) is informed by macro-processes, changes in institutional structures and the identification of dominant social and economic forces providing impetus to policy changes.

Public policy, including macroeconomic policy, is the outcome of conflict and contestation amongst different economic interests for control of the policy agenda. Keynes's monetary view of public policy placed much emphasis on the institutional characteristics of the economy. These institutional characteristics pertained to the fluctuations in investment, the monetary nature of the rate of interest, the institutional nature of inflation, and the rentier opposition to full employment (via increases in government expenditure) based on fears of inflation, in direct opposition to the interests of more dynamic and active classes of entrepreneurs and workers. M. Kalecki (1971), in his analysis in 1943, also moved beyond the traditional approach of concentrating on purely economic aspects of government spending policy, and the traditional construction of the conflict surrounding it only in terms of labor and capital. This approach to macro policy has nowadays been labeled the 'contested terrain' approach (Palley, 1997,163). The distinction between labor, industrial capital and financial capital has sometimes been used to analyze the interaction between monetary and fiscal policy (Kalecki, 1971; Bhaduri and Steindl, 1985; Lavoie and Seccareccia 1988; Seccareccia, 1995; Smithin, 1996 and Palley, 1997). Most of this literature, however, has focused on the monetary policy implications of the rise to dominance of rentier interests. We intend to explore, instead, the implications for fiscal policy.

At the level of economic theory as well, the conventional wisdom, discussed earlier, on monetary and fiscal policy, has been questioned. The proposal that the central bank must offset any expansionary effect of fiscal deficits relies on the belief that, in the absence of fiscal deficits, the economy would produce full employment of all resources. Otherwise, such deficits should not automatically produce inflation through an overheated economy. Furthermore, there must be some sort of mechanism whereby monetary policy affects significantly and primarily nominal prices. Two decades ago, as shown earlier, it was commonly believed that the central bank determines the money supply, which then directly determines prices. This may no longer be tenable, as shown by the fact that attempts by central bankers around the world to target monetary aggregates were overwhelmingly unsuccessful. As suggested above, the conventional wisdom now seems to be that the central bank directly determines the rate of inflation. The transmission mechanism between monetary policy and inflation has yet to be identified, but as Wray (1997, 545) suggests, "it seems to be based on the older Keynesian notion that tight money leads to restrictive credit conditions, which translates to less lending and lower spending". Seccareccia (1997, 1) does a historical re-construction of the zero inflation policy and shows that:

... while mainstream economists have generally taken heed of the quantity theory of money as a theoretical framework that establishes a link between the quantity of money and the level of prices, historically those who have theorized about the central bank behavior have normally treated the quantity of money as an endogenous variable dependent on central bank discount rate policy.

He argues that the central banks follow an appropriate bank rate policy that secures equilibrium in the capital market by ensuring that the bank rate would always closely track the vagaries of the “natural” rate of interest. It is further argued that, in the post war period, owing to the conceptual difficulties with the notion of the natural rate of interest, an alternative formulation replaced it with the Friedmanite one — the natural rate of unemployment.

Furthermore, the theory of the natural rate of unemployment now dominates the economic thinking of central banks. As shown earlier, the new-classical macroeconomics has accomplished an intellectual transformation that has rendered inflation as an unmitigated bad with no palliative effect on unemployment. As Lavoie (1996) and Palley (1997) suggest, rather than supplementing existing inflation theory with a multi-causal theory of inflation, the economics profession adopted a novel mono-causal theory known as the natural rate of unemployment. The policy message from the natural rate theory is clear: the unemployment rate should not be allowed to fall below its natural rate (otherwise inflation will increase and accelerate as long as unemployment remains below the natural rate). Thus, as macroeconomic performance has faltered over the last two decades, this has led to the notion of a rising natural rate. In the face of persistently rising unemployment, policy makers have subscribed to laissez-faire, since actual unemployment represents the natural

working of the free market, and trying to reduce unemployment would only contribute to higher inflation.

Whatever be the reasons of this policy shift to the natural rate theory with its accompanying notion of a binding inflation constraint, the reality behind this shift in policy is that it has served to advance the interests of financial and industrial capital at the expense of labor.⁸ Whereas the theory of the natural rate has provided the nominal justification for the implementation of deflationary monetary policy, understanding the reality of deflationary policy requires the adoption of a political economy perspective. Traditional neo-Keynesian economics eschewed such an approach to policy questions and, instead, adopted the idealized construct of the benevolent policy maker who always acted in the public interest. Thus, in the literature on optimal monetary policy initiated by Poole (1970), the policy objective function is identified with a social welfare function that fully represents a uniquely defined national interest. New-classicals have attacked this view of a benevolent policy-maker on the grounds of bureaucratic failure; however, the public interest is still presented as a single unified interest. However, it is important to recognize the fractured nature of the public's interest. Different economic interests compete for control of the policy

⁸ For instance, the daily-turnover of foreign exchange transactions (including derivative trade in futures, options and swaps) is of the order of US \$900 billion (1992 estimate). Of this amount, less than five per cent relates to commodity trade and 10 per cent pertains to capital flows. See *Economist*, 15 August 1992, 61. The argument that deflationary monetary policy had a beneficial impact on rentier income, in developed countries, has been put recently by Palley, 1997. For the developing countries there exists an extensive literature showing the domination of finance capital at the cost of labor and sometimes even non-financial capital. For multicountry case studies, see Chossudovsky (1997).

authority, so that the preferences of the policy maker are constituted by the political environment, and primarily reflect the preferences of the group that currently has political dominance. Recently Patnaik (1997) has proposed a multi-sectoral economic model of accumulation and stability under capitalism which recognizes the conflicting nature of economic interests amongst different classes within economies and the unequal interdependence between countries within the global economy.

4.0 Discretionary Public Expenditures and Interest Rates: Estimation Results

To recapitulate the discussion in the earlier sections, government expenditure (its increase or decrease) has been explained (i) within the public choice framework, (ii) through the principle of functional finance, and (iii) through the failure of government intervention given the 'well oiled' market system. We wish to argue that nowadays the hegemony of neo-conservative thinking supported by the dominance of financial and rentier interests precludes the use of interventionist expansionary policies and, therefore, the world of cutbacks is deep rooted. To foreshadow what follows, we find, for some countries, that the discretionary component of fiscal policy is negative even when interest rates are forcing the deficits up. The abandonment of fiscal policy by governments suggests that the theory of functional finance can no longer explain the fiscal behavior of governments. Therefore, we propose to examine the discretionary fiscal behavior of governments in response to the changing interest rates. As established in chapter 2, since the fiscal side of the economies in the recent past

are temporally preceded by the monetary side, it will be advantageous also to look at the feedback mechanism between the fiscal and monetary side of the economy so as to understand further government spending behavior.

In order to capture the discretionary fiscal behavior, it is useful to look at the cyclically adjusted budget balances. It is commonplace in the literature to measure the deficit as simply the difference between aggregate federal outlays and receipts. That is, most of the literature fails to adjust the aggregate federal budget deficit for the effects of the business cycle. We need to appreciate the relationship between the deficit and the business cycle. As real GNP declines, government tax collections decline and government transfer payments increase. Thus, the total federal deficit increases and federal credit demands increase. However, concurrent with the increased credit demands of the Treasury, there will be decreased credit demands in the private sector because the downturn in real GNP will elicit diminished real private-sector spending. Thus, the cyclical rise in the federal deficit is accompanied by a cyclical decline in private-sector spending (credit demand). As a result, the increased credit demands of the Treasury to finance the "cyclical" deficit are presumably going to be offset by diminished private-sector credit demands during the same downturn. Accordingly, when examining the interest rate impact on the discretionary fiscal behavior, it is essential to distinguish between the cyclical deficit, which is the counter-cyclically endogenous component of the total deficit, and the structural deficit, which is the exogenous component of the deficit. How do we examine this relationship?

Granger causality tests between the nominal or real interest rates and cyclically adjusted budget balance (CABB) or primary cyclically adjusted budget balance (PCABB) suggest the temporal link between monetary and fiscal policy. These cyclically adjusted budget balances (also called structural deficit) reveal the discretionary behavior of the governments on the fiscal side. The Granger tests, in chapter 2, suggest that the determination of interest rates by the central bank temporally precede the fiscal side (deficit-GDP ratio). It can be argued by some that since deficits include interest payments, therefore, the causal connection between interest rates and deficits could be the result of the interest payment component of deficits. Reconfirmation of the causal connection from interest rates and primary deficits, however, suggests a much deeper relation going from interest rates to deficits.

The objective of the empirical analysis in this chapter is to capture the temporal connection between interest rate (both real and nominal) and the discretionary fiscal policy behavior of the government. Therefore, this chapter employs Granger causality tests to examine the causal connection between:

- (i) interest rates and cyclically adjusted budget balances (CABB),
- (ii) interest rates and primary cyclically adjusted budget balances (PCABB),
- (iii) interest rates and cyclically adjusted budget balances to GDP ratio (CABBGDP),
- (iv) interest rates and primary cyclically adjusted budget balances to GDP ratio (PCABBGDP), and

(v) interest rates and primary cyclically adjusted budget balances to trend GDP ratio (PCABBTGDP).

The use of different measures of cyclically adjusted budget balances (like the primary cyclically adjusted budget balance or cyclically adjusted budget balance in relation to different measure of aggregate economic activity) is based on the belief, that *a priori*, it is not possible to decide which measure amongst them will truly represent the discretionary behavior of governments.

The details of the methodology adopted to conduct Granger tests is elaborated in section 5 of chapter 2. Briefly, the algorithm is to first test the order of integration of each of the series being used. If the necessary conditions are met then we test for cointegration between them, using the Johansen test, the Augmented Dickey Fuller test and the Phillips-Perron test. If the two variables are found to be cointegrated, then the VAR equations are augmented with the appropriate 'error correction' terms prior to estimation and tested for Granger causality, otherwise Granger causality is tested without the error correction term in the VAR model.

Because of data limitations the empirical tests were done only for Canada, the United States, the United Kingdom, France, Germany and Italy. The data for European countries are taken from the European Commission (1995) publication and cover the time period from 1970 to 1990. For the United States and Canada the data used are from CitiBase database and Fiscal Reference Tables of the Federal Department of Finance, respectively. The results from the unit root tests,

lag selection procedure and cointegration tests are given in tables 3-1, 3-2 and 3-3 respectively .

Table 3-1

Test For A Unit Root: Phillips Perron Test for Cyclically Adjusted Budget Balances and Interest Rates in Levels and First Differences

Country	Phillips			Perron					Tests			(1-L) PCABB GDP
	CABB	IR	CABBGDP	(1-L) CABB	(1-L) IR	(1-L) CABBGDP	RIR	(1-L) RIR	PCABB	(1-L) PCABB	PCABB GDP	
Canada 1962-97	-0.12 [1]	-1.89 [1]	-1.39 [1]	-5.39* [1]	-5.12* [1]	-3.39* [1]	-4.15* [1]	...	-1.23 [1]	-1.16 [1]	-1.6 [1]	-3.5* [1]
United States 1955-91	-4.57* [1]	-0.415 [1]	-1.9 [1]	-7.96* [1]	-3.8* [1]	-3.8* [1]	-4.07* [1]	...	-1.39 [1]	-4.99* [1]	-1.32 [1]	-4.26* [1]
France 1970-95	-1.86 [1]	-2.22 [1]	-2.47 [1]	-1.9 [1]	-5.50* [1]	-3.31* [1]	-7.06* [1]	...	-2.4 [1]	-4.2* [1]	-2.88 [1]	-4.9* [1]
Germany 1970-95	-2.07 [1]	-3.3* [1]	-2.4 [1]	-3.9* [1]	...	-4.3* [1]	-5.3* [1]	...	-2.2 [1]	-3.7* [1]	-2.0 [1]	-4.0* [1]
Italy 1970-95	-0.55 [1]	-2.36 [1]	2.35 [1]	-3.2* [1]	-5.09* [1]	-4.1* [1]	-3.3* [1]	...	-0.6 [1]	-3.3* [1]	-0.4 [1]	-4.0* [1]
Britain 1970-95	-0.8 [1]	-2.32 [1]	2.9* [1]	-4.5* [1]	-5.2* [1]	-3.6* [1]	-2.7* [1]	...	0.54 [1]	-4.4* [1]	-2.4 [1]	-3.68* [1]

Note: The 10 percent critical value is -2.57 and -3.13 for constant with no trend and with trend respectively. The numbers in brackets show truncation lags. IR: Interest rate; RIR: Real Interest Rate; CABB: Cyclically adjusted budget balance, PCABB: Cyclically adjusted budget balance net of interest payments, PCABBGDP: Cyclically adjusted budget balance net of interest payments to GDP ratio, CABBGDP: Cyclically adjusted budget balance to GDP ratio

Table 3-2: Test for Cointegrating Relationship Between Cyclically Adjusted Budget Balances and Interest Rates: Johansen Test

Country		Johansen Test Results
Canada 1962-97	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	Rejects C.Eqn at 5% significance level
	CABBGDP-IR	1 C.Eqn at 5% significance level
	PCABBGDP-IR	Rejects C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	Rejects C.Eqn at 5% significance level
United States 1955-91	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	1 C. Eqn at 5 % significance level
	CABBGDP-IR	Rejects C.Eqn at 5% significance level
	PCABBGDP-IR	1 C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	Rejects C.Eqn at 5% significance level
United Kingdom 1970-95	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	1 C.Eqn at 5% significance level
	CABBGDP-IR	Rejects C.Eqn at 5% significance level
	PCABBGDP-IR	1 C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	Rejects C.Eqn at 5% significance level
France 1970-95	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	Rejects C.Eqn at 5% significance level
	CABBGDP-IR	Rejects C.Eqn at 5% significance level
	PCABBGDP-IR	Rejects C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	Rejects C.Eqn at 5% significance level
Italy 1970-95	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	Rejects C.Eqn at 5% significance level
	CABBGDP-IR	Rejects C.Eqn at 5% significance level
	PCABBGDP-IR	Rejects C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	Rejects C.Eqn at 5% significance level
GERMANY 1970-95	CABB-IR	Rejects C.Eqn at 5% significance level
	PCABB-IR	Rejects C.Eqn at 5% significance level
	CABBGDP-IR	Rejects C.Eqn at 5% significance level
	PCABBGDP-IR	Rejects C.Eqn at 5% significance level
	CABB-RIR	Rejects C.Eqn at 5% significance level
	PCABB-RIR	Rejects C.Eqn at 5% significance level
	CABBGDP-RIR	Rejects C.Eqn at 5% significance level
	PCABBGDP-RIR	1 C. Eqn at 5 % significance level

Note: Johansen test is based on intercept in the cointegrating equation. IR: Interest rate; RIR: Real Interest Rate; CABB: Cyclically adjusted budget balance, PCABB: Cyclically adjusted budget balance net of interest payments, PCABBGDP: Cyclically adjusted budget balance net of interest payments to GDP ratio, CABBGDP: Cyclically adjusted budget balance to GDP ratio

Table 3-3: Lag selection Results Based on Minimum Log-Schwarz Values I

Country	Lags	IR.	IR. CABB	CABB	CABB. IR.	RIR.	RIR. CABB	CABB	CABB- RIR.
Canada 1962-97	1	1.58*	1.72	17.11*	17.08	1.61*	1.84	17.11*	17.11**
	2	1.68	1.84	17.2	17.19	1.75	1.98	17.2	17.25
	3	1.78	1.96	17.22	17.17	1.9	2.01	17.22	17.28
	4	1.79	2.09	17.17	17.0**	1.96	2.2	17.17	17.32
United States 1955-91	1	0.95	1.06	7.21	7.03	1.56	1.56	7.21	7.04
	2	0.92*	1.17	6.93*	7.06	1.46*	1.65	6.93*	7.15
	3	1.01	1.19	7.07	7.01	1.6	1.78	7.07	6.84**
	4	1.09	1.23	7.14	6.90**	1.71	1.86	7.14	6.99
United Kingdom 1970-95	1	1.82	1.81	3.33*	3.35	2.75*	2.83	3.26	3.36
	2	1.72	1.88	3.39	3.45	2.87	2.86	3.26*	3.48
	3	1.74	2.05	3.57	3.59	2.89	2.92	3.44	3.56
	4	1.71*	2.22	3.76	3.62	2.76	3.01	3.61	3.58
Germany 1970-95	1	1.84	1.62	6.93*	7.02	1.75	1.25**	6.93*	7.02
	2	1.72*	1.79	6.97	7.13	1.4	1.32	6.97	7.14
	3	1.78	1.55	7.15	7.18	1.25*	1.46	7.15	7.2
	4	1.79	1.4**	7.31	7.27	1.37	1.53	7.31	7.29
France 1970-95	1	1.72*	1.92	7.23*	7.12**	1.94*	2.02	7.23*	7.02**
	2	1.78	2	7.4	7.24	2.06	2.14	7.4	7.17
	3	1.9	2.12	7.46	7.31	2.16	2.26	7.46	7.2
	4	2	2.1	7.52	7.45	2.1	2.09	7.52	7.23
Italy 1970-95	1	2.35*	2.47	18.5*	18.64	1.78*	1.86	18.5*	18.65
	2	2.54	2.66	18.68	18.8	1.96	1.96	18.68	18.82
	3	2.6	2.69	18.8	18.87	1.99	2.03	18.8	19.01
	4	2.52	2.7	18.9	19.06	2.01	2.9	18.9	19.5

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively. IR: Interest rate; RIR: Real Interest Rate; CABB: Cyclically adjusted budget balance.

Table 3-4: Regression Results I: Cyclically Adjusted Budget Balances and Interest Rates in First Differences

Country	DEP.VAR IND.VAR	CABB CABBGDP PCABB PCABBGDP	C	ECT(-1)	D(INTEREST RATE)	Adj. R-Square D.W
Canada 1962-97	D(CABB) D(IR)	(-1): -0.6 [2.2]	39.05 [0.5]	.....	(-1): -1017.3 [-2.2] (-2): -113.8 [-0.3] (-3): -790 [-2.2] (-4): -919 [-2.3] F=17.04***	0.38 2.07
Canada 1962-97	D(CABB) D(RIR)	(-1): 0.57 [2.69]	286.4 [0.34]	.....	(-1): -727.2 [-2.69] F=3.47	0.23 1.95
Canada 1962-97	D(PCABB) D(IR)	(-1): 0.3 [1.2] (-2): 0.6 [2.2] (-3): -0.5 [-7.5] (-4): -0.6 [-3.0]	809.5 [1.14]	.....	(-1): -419.36 [-0.9] (-2): -1050.6 [-2.0] F= 7.94**	0.63 2.13
Canada 1962-97	D(PCABB - GDP) D(RIR)	(-1): -0.2 [-0.15]	0.24 [0.10]	—	(-1): -2.16 [-2.03] F=4.11**	0.12 1.95
United States 1955-91	D(CABB) D(IR)	(-1): -0.035 [-0.24] (-2): -0.057 [-3.97]	2.09 [0.46]	....	(-1): 5.0 [1.57] (-2): -4.65 [-1.1] (-3): 3.5 [1.54] (-4): 6.48 [1.92] F=8.0	0.445 2.24
United States 1955-91	D(PCABB) D(RIR)	(-1): -0.07 [-0.57] (-2): -0.64 [-4.8]	4.36 [1.03]	.....	(-1): 3.7 [1.6] (-2): -3.8 [-1.7] (-3): 8.0 [3.4] F=12.4**	0.59 2.63
United States 1955-91	D(CABB) D(RIR)	(-1): -0.02 [-0.18] (-2): -0.6 [-4.5]	3.76 [0.85]	.....	(-1): 4.73 [1.98] (-2): -3.81 [-1.67] (-3): 9.04 [3.81] F=14.76***	0.58 2.63
United Kingdom 1970-95	D(PCABB- GDP) D(IR)	(-1): 0.39 [2.37]	-0.001 [-0.58]	-0.41 [-3.26] F=10.65***	(-1): 0.002 [1.86] F= 3.49	0.49 2.09
United Kingdom 1970-95	D(PCABB- TGDP) D(IR)	0.38 [2.31]	-0.001 [-0.61]	-0.43 [-3.31] F=10.98***	(-1): 0.002 [1.91] F=3.65	0.50 2.09
United Kingdom 1970-95	D(CABBGDP) D(IR)	(-1): 0.07 [0.4] (-2): -0.07 [-0.4] (-3): -0.01 [-0.06]	0.12 [05]	---	(-1): 0.24 [2.1] F= 4.42*	0.27 2.1
United Kingdom 1970-95	D(RIR) D(PCABB- GDP)	(-1): 129.7 [2.97] F=8.86***	0.63 [0.97]	—	(-1): -0.35 [-1.7]	0.29 1.91
United Kingdom 1970-95	D(RIR) D(PCABB- TGDP)	(-1): 133.42 [3.05] F=9.35***	0.64 [1.0]	.....	(-1): -0.35 [-1.74]	0.30 1.92
United Kingdom 1970-95	D(RIR) D(CABB- GDP)	(-1): 1.34 [2.78] F=7.5**	0.63 [0.96]	.....	(-1): -0.35 [-1.69]	0.26 1.92

Note: Dep. Var: Dependent variable, Ind. Var: Independent variable, D: first difference; C: Constant; ECT: Error Correction term; F is the test statistic for the error correction term and for the sum of coefficients equal to zero. It is the adjusted value of the F test statistic, where *, **, *** shows significance at 10, 5 and 1 percent respectively. Numbers in [..] show t values and in (..) show the optimal lag length based on the Schwarz criterion.

Table 3-5: Regressions Results II: Cyclically Adjusted Budget Balances and Interest Rates in First Differences

Country	DEP. VAR IND.VAR	CABB/CABB GDP PCABB PCABBGDP PCABBTGDP	C	ECT(-1)	D(INTEREST RATE)	Adj. R-Square D.W
Germany 1970-95	D(IR) D(PCABB- GDP)	(-1): -57.3 [-2.0] (-2): -2.7 [-0.1] (-3): 10.9 [0.38] F=6.21	-0.25 [-0.72]	.....	(-1): 0.29 [1.7] (-2): -0.3 [-2.1]	0.43 1.08
Germany 1970-95	D(RIR) D(PCABB- GDP)	(-1): -40.75 [1.54] F=3.08	0.02 [0.07]	.....	(-1): -0.03 [-0.14] (-2): -0.42 [-2.7] (-3): -0.006 [-0.32]	0.34 1.62
Germany 1970-95	D(RIR) D(PCABB)	(-1): -0.02 [-1.8] F = 3.22	0.04 [0.14]	.....	(-1): -0.06 [-0.3] (-2): -0.4 [-2.7] (-3): -0.05 [-0.3]	0.35 1.69
Germany 1970-95	D(IR) D(PCABB)	(-1): -0.03 [-2.37] F= 5.63**	-0.003 [-0.001]	.....	(-1): 0.15 [0.9] (-2): -0.47 [-2.9]	0.38 1.76
Germany 1970-95	D(IR) D(CABB)	(-1): -0.02 [-1.8] (-2): 0.001 [0.4] (-3): 0.003 [0.24] (-4): -0.005 [-0.46] F = 4.48	-0.15 [-0.4]	.....	(-1): 0.56 [2.9] (-2): -0.48 [-3.0]	0.55 2.81
Germany 1970-95	D(IR) D(CABB)	(-1): 0.02 [-1.6] F = 2.68	-0.49 [-0.15]	.....	(-1): -0.6 [-0.3] (-2): -0.4 [-2.7] (-3): -0.06 [-0.3]	0.33 1.60
Germany 1970-95	D(IR) D(CABB- GDP)	(-1): -0.47 [-1.9] (-2): -0.001 [- 0.005] (-3): 0.19 [0.77] (-4): -0.19 [-0.81] F=6.88	-0.10 [-0.32]	.....	(-1): 0.62 [3.4] (-2): -0.48 [-3.14]	0.59 2.17
Italy 1970-95	D(IR) D(CABBGDP)	(-1): -0.96 [-2.0] (-2): -0.63 [-1.2] (-3): 0.12 [0.25] (-4): 0.33 [0.66] F=8.0	-0.14 [-0.25]	....	-0.33 [-1.61]	0.39 1.53
Italy 1970-95	D(IR) D(PCABB- GDP)	(-1): -88.4 [-2.14] (-2): -72.8 [-1.6] (-3): 10.3 [0.22] (-4): -0.41 [0.22] F=5.12	0.42 [0.75]	.....	-0.31 [-1.6]	0.42 1.41
Italy 1970-95	D(IR) D(PCABB- TGDP)	(-1): -87.19 [-2.1] (-2): -77.3 [-1.6] (-3): 6.4 [0.14] (-4): -10.7 [-0.23] F=8.88	0.42 [0.75]	.....	-0.34 [-1.69]	0.42 1.41

Note: Dep. Var: Dependent variable, Ind. Var: Independent Variable, D: first difference; C: Constant; ECT: Error Correction term; F is the test statistics for the error correction term and for the sum of coefficients equal to zero it is the adjusted value of the F test statistic, where *, **, *** shows significance at 10, 5 and 1 percent respectively. Numbers in [..] show t values and in (..) show the optimal lag length based on the Schwarz criteria.

Table 3-6: Regressions Results III: Cyclically Adjusted Budget Balances and Interest Rates in First Differences

Country	DEP. VAR IND. VAR	CABB/CABB GDP PCABB PCABBGDP PCABBTGDP	C	ECT(-1)	D(INTEREST RATE)	Adj. R-Square D.W
France 1970-95	D(PCABB- GDP) D(IR)	(-1): -0.07 [-0.39] -0.43 [-2.6]	-0.001 [-0.91]	....	(-1): -0.001 [-3.19] (-2): 0.0001 [0.24] F= 10.26**	0.51 2.01
France 1970-95	D(PCABB- TGDP) D(IR)	(-1): -0.098 [-0.45] (-2): -0.44 [-2.48]	0.001 [-0.8]	.....	(-1): -0.002 [-3.19] (-2): 0.001 [0.01] F= 8.74*	0.56 1.86
France 1970-95	D(CABBGDP) D(IR)	(-1): -0.07 [-0.4] (-2): -0.37 [-2.2]	-0.25 [-1.82]	---	(-1): -0.21 F= 12.05***	0.52 2.06
France 1970-95	D(PCABB- TGDP) D(RIR)	(-1): 0.12 [0.58] (-2): -0.31 [-2.18]	-0.0006 [-0.46]	---	(-1): -0.001 [-2.9] (-2): 0.001 [1.7] F= 12.06***	0.61 1.99
France 1970-95	D(CABB- GDP) D(RIR)	(-1): 0.13 [0.69] (-2): -0.33 [-2.1]	-0.17 [-1.3]	---	(-1): -0.21 [-3.9] (-2): 0.11 [1.74] F= 18.82***	0.61 1.79
France 1970-95	D(CABB) D(RIR)	0.07 [0.4]	-12.49 [-1.86]	.....	(-1): -7.13 F= 8.44**	0.29 1.75
France 1970-95	D(CABB) D(IR)	0.10 [0.51]	-13.17 [-1.87]	.....	(-1): -6.78 F= 5.74**	0.22 2.01
France 1970-95	D(PCABB- GDP) D(RIR)	(-1): 0.17 [0.9] (-2): -0.4 [-2.67]	-0.0008 [-0.76]	---	(-1): -0.001 [-3.2] (-2): 0.001 [2.67] F= 17.70***	0.61 2.03
France 1970-95	D(PCABB) D(RIR)	(-1): 0.03 [0.17]	-1.66 [-0.28]	---	(-1): -5.75 [-2.35] F= 5.74**	0.21 1.7
France 1970-95	D(PCABB) D(IR)	(-1): 0.008 [0.04]	-2.7 [-0.45]	---	(-1): -6.73 [-2.29] F= 4.58*	0.20 1.96

Note: Dep. Var: dependent variable, Ind. Var: Independent Variable, D: first difference; C: Constant; ECT: Error Correction term; F is the test statistics for the error correction term and for the sum of coefficients equal to zero it is the adjusted value of the F test statistic, where *, **, *** shows significance at 10, 5 and 1 percent respectively. Numbers in [..] show t values and in (..) show the optimal lag length based on the Schwarz criteria.

The unit root tests suggest that most data series, for all countries, are $I(1)$, except the real interest rate and cyclically adjusted budget balance series for France and Germany and cyclically adjusted budget balance to GDP ratio for Britain. Johansen cointegration tests (Table 3-2) suggest that, for Canada, the cyclically adjusted budget balance to GDP ratio and nominal interest rate are cointegrated; for the United States the primary cyclically adjusted budget balance and the primary cyclically adjusted budget balance to GDP ratio are cointegrated with the nominal interest rate; for the United Kingdom, as well the cyclically adjusted budget balance, primary cyclically adjusted budget balance and primary cyclically adjusted budget balance to GDP ratio, each move in tandem with the nominal interest rate; for France, Germany and Italy no variant of the two variables is cointegrated.

The suggested causality based on lag selection procedures (Table 3-3, 3-9A, 3-10A, 3-11A) is:

- for Canada from real interest rate to CABB, from real interest rate to CABBGDP, and from nominal interest rate and real interest rate to PCABB;
- for the United States from real interest rate to both CABB and PCABB and from nominal interest rate to CABB;
- for the United Kingdom from CABBGDP to real interest rate, from nominal interest rate to CABBGDP, from PCABBGDP to real interest rate, from nominal interest rate to PCABBGDP and from nominal interest rate to PCABBTGDP;

- for Germany from CABB to nominal and real interest rate, from PCABBGDP to real and nominal interest rate, from PCABB to real and nominal interest rate and from CABBGDP to nominal interest rate;
- for Italy from CABBGDP to nominal interest rate and from PCABBGDP and PCABBTGDP to nominal interest rate; and finally
- for France from nominal and real interest rate to CABB, CABBGDP, PCABBGDP, PCABBTGDP and PCABB. Based on these results we performed the Granger-Causality tests.

Regressions to test for Granger causality are presented in Table 3-4. For Canada (1962-96), temporal causality is found from changes in nominal interest rates to changes in the cyclically adjusted budget balances or primary cyclically adjusted budget balance with a negative sign, and from real interest rates to the primary cyclically adjusted budget balance to GDP ratio with a negative sign. For the United States (1955-91) Granger causality is found from real interest rates to the cyclically adjusted budget balance with a positive sign and from real interest rates to the primary cyclically adjusted budget balance with a positive sign. Thus, it seems that the discretionary response of the United States and the Canadian government has been different during these time periods. For both countries the impetus for change in discretionary fiscal behavior seems to be coming from changes in interest rates; however, the nature of response of fiscal policy appears to be different, based on the sign of the statistically significant coefficients. This could explain the widely different economic performance of those two economies over the last decade.

For the United Kingdom, Granger causality is found from nominal interest rates to the primary cyclically adjusted budget balance to GDP ratio, from nominal interest rates to the cyclically adjusted budget balance to GDP, from nominal interest rates to the cyclically adjusted budget balance to TGDP ratio; as well as from the ratio of primary cyclically adjusted budget balance to GDP to real interest rates, from the cyclically adjusted budget balance to GDP ratio to the real interest rate, and from the cyclically adjusted budget balance to TGDP ratio to the real interest rate.⁹

For France (1970-90), 10 regressions suggest causality from nominal or real interest rates to some measure of discretionary fiscal policy with a positive sign.¹⁰ The sign of these regressions for the United States and France is positive, which is what the mainstream theory would expect. Supposedly, higher cyclically adjusted budget balance lead to higher real interest rates due to the risk premium that investors need to compensate them for the fragile state of government finances. For both Canada and the United Kingdom the regressions suggest causal connection from interest rate to some measure of discretionary expenditure with a negative sign.

⁹ As shown in Table 3-5 the suggested temporal causality from changes in primary cyclically adjusted budget balance-GDP ratio to real interest rate and from changes in primary cyclically adjusted budget balance-GDP ratio to nominal interest rate for Germany and Italy respectively are not statistically significant, for some regressions, even at 10 percent. Therefore, the discussion that follows does not include these regressions.

¹⁰ The sign of the coefficients for France are negative, but budget balance for France is defined as the difference between revenue and expenditure. Since our interpretation of the result is in terms of deficits, defined as a difference between expenditure and revenue, the discussion that follows makes the necessary adjustment. The same is true for the U.K., Germany and Italy. For

Out of 34 regressions, based on the suggested causality by the lag selection procedure, 20 regressions suggest that the causal connection goes from change in the interest rate to the change in the discretionary expenditure. Out of these 20 regressions, seven regressions suggest a negative sign for the independent variable, while the rest of the regressions suggest a positive relationship between the variables. Out of the other 14 regressions suggesting the causal connection going from a change in some measure of discretionary expenditure to a change in interest rates, only 3 are statistically significant.

Though the causality results described above give mixed results in terms of the sign of the causality, what is of greater interest to us in this chapter is the negative sign of causality going from changes in the interest rates to changes in the discretionary measure of fiscal deficit for some countries. This means that, as higher interest rates cause the deficits to increase, due to the indirect and direct effects of interest rates on aggregate deficits, the discretionary component of the government deficit declines. How can increases in interest rates lead to a fall in cyclically-adjusted deficits? It is interesting to note that most of the studies using time-series analysis of interest rates and cyclically-adjusted deficits, like (Darrat (1990), Stanford (1997), Ibrahim and Kunah (1996), Mutairi (1995), Miller and Russek (1991), Dwyer (1982), Canto and Rapp (1982) and McMillin (1986)), do not discuss the sign of the causal connection. The discussion is mostly focused on the direction of the causal connection. However, some studies doing

Canada and the United States the budget balances are defined in the data sources as the

correlation analysis also find a negative relationship between deficits and interest rates. Placone, Ulbrich and Wallace (1985), Evans (1985), and Kolluri and Giannaros (1987) find a negative relationship between deficits and interest rates. The first three studies are based on the US data, while the latter study is based on the Canadian data between 1967 and 1983. These studies suggest that larger deficits drive down short term interest rates.

The potential explanation for the negative relation is based on the possibility that debt management matters (Placone et al.). It is claimed that if the Treasury finances most of the deficit by issuing long-term securities, and long and short term securities are not good substitutes for each other, then the short-term rate could fall as deficits are incurred. Friedman (1978) also makes a similar argument and Evans (1985, 86) finds this negative relationship, between deficits and interest rates, as evidence supporting the Ricardian equivalence principle. He argues that the lower tax rates associated with larger deficits raise the after-tax real return to saving, raising saving appreciably. Therefore, private saving rises not only by enough to pay all future tax liabilities à la Barro, but also by an additional amount, thereby lowering aggregate demand and hence interest rates. Kolluri and Giannaros (1987) argue that a depressing effect of an increase in budget deficits on the short-term real rate of interest is conceivable, as it is generally believed that deficit increases are countercyclical and that real interest

rate increases are procyclical. They suggest, that at a theoretical level, the nature of the relationship is not clear.

Clearly, Evan's explanation based on the Ricardian equivalence principle involves many crucial assumptions, including the assumption that federal spending remains constant (there is plenty of empirical evidence to the contrary). Friedman's explanation based on substitutability between long and short term securities is dependent on particular conjectures about the financing of deficits.

Not only these studies but even the explanation of public expenditure, provided by the functional finance or the public choice framework cannot possibly explain the negative relation going from interest rates to the discretionary public spending. So how do we explain our results? One possible explanation for such government behavior could be that, as soaring interest rates in the 1970s and 1980s inflated government deficits in these countries, the governments' fiscal arm responded by making cutbacks. The rationale and motivation for such a behavior could come from the prevailing hegemony of the conservative economic thinking, where there exists a near moral indictment for any government intervention in economies, especially of the expansionary role of the government.

In other words, the negative relationship between deficits and interest rates could be explained in terms of mistaken and misplaced fears about government deficits that keep national governments from employing fiscal policy

when necessary¹¹. With increasing interest rates and the abandonment of fiscal policy, governments have drastically cut expenditures, and therefore the deficits have declined in spite of increases in interest rates. The cyclically-adjusted budget balances capture the discretionary impact of government fiscal policy. Therefore, it seems plausible to explain the decrease in cyclically-adjusted budget balances due to increases in interest rate as a feedback effect of government behavior. This seems to be consistent with the realities of the 1980s and the 1990s. These decades have witnessed an unprecedented decline in government support programs and public investment and a general decline in government participation in economic activities. In situations where the increasing interest rates are the most important reason for increasing deficits (this point has been argued by many scholars including Wray, 1997, Seccareccia, 1995, Pasinetti, 1997), in order to maintain the level of deficit to GDP ratio, the primary surplus (especially the primary structural surplus) should increase, i.e., either tax revenues should increase or non-interest government expenditures should decrease. With the rise to dominance in the 1980s of a "new" conventional wisdom in economic policy making, an ideological environment has been created where the old emphasis on aggregate demand policies, in tandem with the continuous growth of state interference in the economy, has been abandoned in favor of the view that private agents could be trusted by themselves to lead capitalist economies to full and efficient use of

¹¹ Pressman (1995, 212), argues a similar point to explain the relationship between large budget

resources. Within this framework, the adjustments to the primary surplus would inevitably be made by a decline in expenditures rather than an increase in taxes. In other words, it is the increasing deficits, arising out of higher interest payments, which crowd out public expenditure. As mentioned earlier it is the rentiers who crowd out public expenditures rather than public expenditures crowding-out private investment.

5.0 Conclusion

In chapter 2, we found evidence suggesting that interest rates temporally precede deficits and, in fact, changes in interest rates explain changes in deficits. Chapter 3 evaluates the fiscal reaction function of governments in the face of increasing deficits due to high interest rates. The chapter has shown that the prevalent hegemony of neo-conservative thinking, supported by the dominance of financial and rentier interests, forecloses the possibility of using interventionist expansionary policy. The chapter utilizes Granger causality tests to understand the discretionary fiscal behavior of governments.

Discretionary fiscal behavior is measured through cyclically adjusted budget balances. Granger causality tests are applied to examine the causal connection between (i) interest rates and cyclically adjusted budget balances (CABB), (ii) between interest rates and primary cyclically adjusted budget balances (PCABB), (iii) between interest rates and cyclically adjusted budget balances to GDP ratio (CABBGDP), (iv) between interest rates and primary

deficits and high unemployment.

cyclically adjusted budget balances to GDP ratio (PCABBGDP), and (v) between interest rates and primary cyclically adjusted budget balances to trend GDP ratio (PCABBTGDP).

The empirical tests give mixed results in terms of the sign of the causality. Out of 34 regressions, based on suggested causality by the lag selection procedure, 20 regressions suggest that the causal connection goes from the change in the interest rate to the change in discretionary expenditures. Out of these 20 regressions, seven regressions suggest a negative sign for the independent variable, while the rest of the regressions suggest a positive relationship between the variables. Out of the other 14 regressions suggesting the causal connection going from the change in some measure of discretionary expenditure to a change in interest rates, only 3 are statistically significant.

These results imply that, on one hand, higher interest rates cause deficits to increase and, on the other hand, the discretionary component of the government deficit falls. These results challenge the standard Keynesian idea of functional finance and the ideas of public choice framework to explain the link between deficits and public expenditure. On balance, the evidence suggests abandonment of activist fiscal policy, in the functional finance sense, as a policy tool by governments. However, there is some evidence of a activist fiscal policy which is 'anti functional finance', one which destabilizes the economy.

The negative relationship between deficits and interest rates reflects the influence of dominant economic thinking on policy decisions. The characteristic elements of this dominant discourse on macroeconomic policy, especially fiscal

policy are discussed in the chapter. The cyclically-adjusted budget balances capture the discretionary impact of government fiscal policy. Therefore, it seems reasonable to explain the decrease in cyclically-adjusted budget balances due to increases in interest rate as a feedback effect of government behavior. This seems to be consistent with the realities of the 1980s and the 1990s. These decades have witnessed an unprecedented decline in government support programs and public investment and a general decline in government participation in economic activities.

Given the monetary policy basis of fiscal policy, we also extend our analysis, in the appendix, to evaluate whether or not the destabilizing impact of discretionary fiscal policy is reinforced by the monetary policy actions of the governments. The feedback behavior of the government, between the monetary and fiscal policy, is captured using a simple model. The regressions for Canada and the UK reveal that the higher is the present rate of inflation, the higher is the nominal rate of interest set by the central bank, which in turn leads to contractionary fiscal policy (based on our earlier results on temporal precedence between interest rates and cyclically adjusted budget balances). For the United States the evidence reveals that the higher the rate of inflation, the higher is the nominal rate of interest set by the bank, which in turn leads to expansionary fiscal policy. For France, the coefficient on contemporary inflation is not significant vis-à-vis the nominal interest rate. For Italy and Germany, inflation is significant but we do not get any significant causal relationship between interest rates and discretionary expenditures.

The mixed evidence in terms of government behavior suggests that neither the functional finance framework nor the public choice framework is adequate to explain the monetary and fiscal policy links of governments. On balance the evidence suggests the prevalence of a specific kind of activist fiscal policy. Fiscal policy plays the role of slowing down the economy instead of helping the economy to stabilize.

The above reconstruction of the fiscal and monetary policy mix should be understood with caution. The Granger tests and regression results are mixed and, therefore, more countries need to be examined before any single scenario can be emphasized with greater certainty. Also, a more complex model, incorporating the monetary and fiscal policy interaction, is needed to capture the complexity of economic dynamics.

Appendix

Reconstructing the Monetary and Fiscal Policy Link

Since there is a relationship between interest rates and fiscal behavior, it is pertinent to examine the feedback behavior of the government between monetary and fiscal policy. After a brief discussion on monetary policy, we estimate two reaction functions: one involving real GDP growth and inflation as arguments and the other using output gap and inflation.¹² Assuming that the central bank sets the nominal interest rate in response to the expected real GDP growth or the output gap and expected inflation, we also estimate the two regressions using one period ahead values of each variable, as proxies for expectation of inflation, GDP growth and output gap.

Monetary Policy

Monetarists tend to think in terms of a 'target' (alternatively called 'optimal' or 'efficient') rate of inflation at which policy should aim. If the current rate of inflation exceeds this target, money growth should be slowed down until the desired rate of inflation is reached. At this point, money will be allowed to grow at a rate determined by the target of inflation, plus capacity growth, less the long-run percentage increase in velocity. There is a difference, between monetarists and new-classicals, in their attitude towards the pace at which money growth should be slowed. Assuming that full indexation is not feasible, Friedman has argued in favor of a gradualist policy to mitigate the side effects of disinflation.

Monetarism II, however, tends to favor shock treatment, understandably since the sharper reduction in money growth will not itself aggravate the unemployment costs (Minford and Peel, 1981). Clearly, there is no consensus about what the target rate of inflation is. Monetarists and supply-side economists are, however, agreed that whilst it may be positive, it will not be much above zero. There is also no consensus over the pace at which money growth should be reduced.

In the design of short-run monetary policy, two issues are important: the money aggregate to be selected as the intermediate target for policy; second, the amount of discretion in money growth that will be allowed on a year-to-year basis. The empirical approach, favored by monetarists, is to select the aggregate that explains best, by use of a single (reduced-form) equation regression, the movement of nominal income or inflation (Friedman and Meiselman, 1963). Monetarists also believe that this relationship is a relatively stable one. The analytical approach to the selection of an intermediate target derives from Poole's seminal work on the choice of a monetary instrument (Poole, 1970). For some disturbances, base money is preferred while, for others, broader money aggregate is preferred. In terms of use of discretion in the conduct of short-term monetary policy, monetarists advocate a constant money growth rule (CMGR). They favor the announcement in advance of money growth targets. The theoretical rationale underlying the advocacy of a constant money

¹² Khoury (1990, 28) summarizes 42 reaction functions and finds that most commonly used

growth rule is, however, different for the two type of monetarists. Monetarists II contend that systematic use of discretion in the short run will ultimately fail. So either the authorities act on the basis of a systematic rule, in which case their policies fail, or they behave in a random fashion, in which case they will make a real impact but this, by definition, will be destabilizing. Monetarists I accept that the monetary changes (be they anticipated or random) may have short-run real effects. So, in principle at any rate, such policy shifts could offset shocks to the economy or, at least, speed up the adjustment back to NRU. They, however, play down the importance of private sector shocks, and argue that even though, in the face of shocks, fine-tuning may, in principle, be effective, the reality is that policy makers are most unlikely to be able to achieve such stabilization. Thus, for monetarist I, it would be possible, in principle, to retain long-run control over money growth, with an eye on containing inflation, yet at the same time allow money growth within the year to respond, directly or indirectly, to emerging random shocks. A band could be allowed around the target money growth.

Three alternative strategies of monetary adjustment were proposed in the literature, all alternatives to CMGR. First, money growth could be adjusted in the course of the year in response to *ex post* unanticipated shocks. Second, the authorities could follow a feedback rule, responding to unanticipated trends in prices and/or output. A variation on this theme is to target nominal income growth (Tobin, 1980b, Meade, 1978). The authorities would adjust money growth

independent variables are the unemployment rate, the inflation rate, and economic growth.

in line with observed deviations from this target. If the proxy for income indicated that income growth was running above (below) target, money growth would be allowed in the lower (upper) ranges of the band. For each unanticipated disturbance, adjustment now occurs after the event. Third, the authorities could follow a combination policy rule (Argy, 1984), whereby they adjust the growth in the money aggregate in line with unanticipated trends in a 'price' variable. This price could be the interest rate (Poole, 1970, Benavie and Froyer, 1983) or the exchange rate (Argy, 1984, Roper and Turnovsky, 1980). Such a policy amounts to having, at the same time, a quantity and a price target. In this respect, it represents a compromise policy. The idea is to use the 'price' as an indicator for monetary policy with the objective ultimately of minimizing price/output fluctuations.

The "instrument problem" of monetary policy arises, within the monetarist framework, because of the need to specify how the central bank will conduct its open market operations. In particular, the instrument problem is the choice of a variable to be set directly by the central bank via buying and selling securities, and hence the value of which is to serve as the principal guide in carrying out that buying and selling function. Because open market operations are in essence a trading activity, the instrument variable used may be either a quantity or price. The modern literature, on the subject of whether to key open market operations to a quantity or a price, dates to the formalization by Poole (1970). The optimal choice between quantity and price in his original article depends both on familiar parameters describing economic behavior and on the relative magnitudes of

different sources of uncertainty affecting the economy (the unpredictable elements of the nonbank public's behavior in the market for goods and services and the market for financial assets, respectively).

The recognition within the mainstream literature, that "money" in discussions of monetary policy is not a quantity set directly by the central bank¹³, brought in the issue of 'intermediate target variable' for monetary policy. This highlighted the two-stage character of the monetary policy process based on an intermediate target variable. In the first stage, the central bank supposedly determines the values of the intermediate target which would be consistent with the desired ultimate policy objective under a variety of *ex ante* assumptions and, at the second stage, the central bank proceeds, in some *ex post* fashion, to treat achieving this value of the intermediate target (set *ex ante*) as if doing so were the objective governing policy. It is expected that the key role of the intermediate target variable is to provide a rule for processing and acting on new information as time passes. Within this framework, the existence of a specified target value for the money stock, presumably determined via some prior analysis involving macroeconomic variables, is simply given. The central bank is to set its

¹³ Under the kind of fractional reserve banking system in use in almost all modern economies of the Western world, most of the money used by the public, either as a means of payment or as a liquid store of value, represents the liabilities of private depository institutions. Within this literature, the belief is that the central bank can influence the money-creating activities of these institutions. However, this influence is not the same as its being able to set the money stock exogenously, as if money were a genuine policy instrument. Instead, the quantity variable which the central bank can set directly, if it chooses, is at best some measure of its own liabilities — for example, bank reserves or the monetary base (reserves plus currency).

exogenous policy instrument so as to render the actual value of the money stock as close as possible to this target value.

Pierce and Thomson (1972) first explicitly framed the money stock control problem and examined whether non-borrowed reserves or a short-term interest rate is the superior policy instrument for minimizing the variance of the money stock around some given target value when money is determined by the interaction of the money demand and supply functions, with income taken as pre-determined but not known with certainty in advance. They found that the interest rate instrument exposes the money stock to money demand disturbances and to effects on money demand due to unexpected movements in income, both on a one-for-one basis. On the other hand, it entirely shields the money stock from money supply disturbances. The reserve instrument dampens money demand disturbances and the effects of unexpected income variation, but exposes the money stock to money supply disturbances. Which instrument is superior under these assumptions is an empirical matter. McCallum and Hoehn (1983) carried out an analogous investigation in the context of the supply-demand model. As usual, the interest rate instrument exposes the money stock to disturbances to money demand behavior on a one-for-one basis, and to disturbances to real spending and to aggregate supply weighted by the relevant elasticities. The reserve policy dampens the effect on money due to all three of these disturbances, but exposes the money stock to disturbances from money supply behavior. Which instrument is superior is again an empirical question. Another set of issues that arises when the central bank uses some measure of

money as an intermediate target, especially in the context of reserves as the exogenous policy instrument, is the prospect of excessive volatility of interest rates. The problem of instrument instability can arise whenever the effects of policy instruments on policy targets are distributed through time. Ciccolo (1974), Enzler and Johnson (1981), Freedman (1983), and others have analyzed the potential instability that can result from excessively close control of a money target.

Notwithstanding the analytical debate of monetary (or other) intermediate targets as a basis for monetary policy, beginning in the 1970s central banks in an increasing number of countries adopted some form of monetary target for monetary policy (at least according to what central banks said about their own policy). Logical questions in this case were: what aspects of the economy's condition inherited from the previous period does the central bank take into account in defining the objective which motivates its actions in each period?, what kind of feedback rules does it employ in relating the value of its instrument (and its intermediate target, if any) to those conditions?, and in what way does the central bank's objective take account of the implications of its current actions for future time periods?. An early contribution along these lines was DeRosa and Stern's (1977) effort to establish whether the Federal Reserve System had adopted (at least in part) a monetary target in 1970. Their analysis, which largely set the pattern for future efforts along these lines (Feige and McGee (1979), Lombra and Moran (1980), Hoehn (1983) and Spindt and Tarhan (1987)), involved empirically estimating a central bank reaction function of the form:

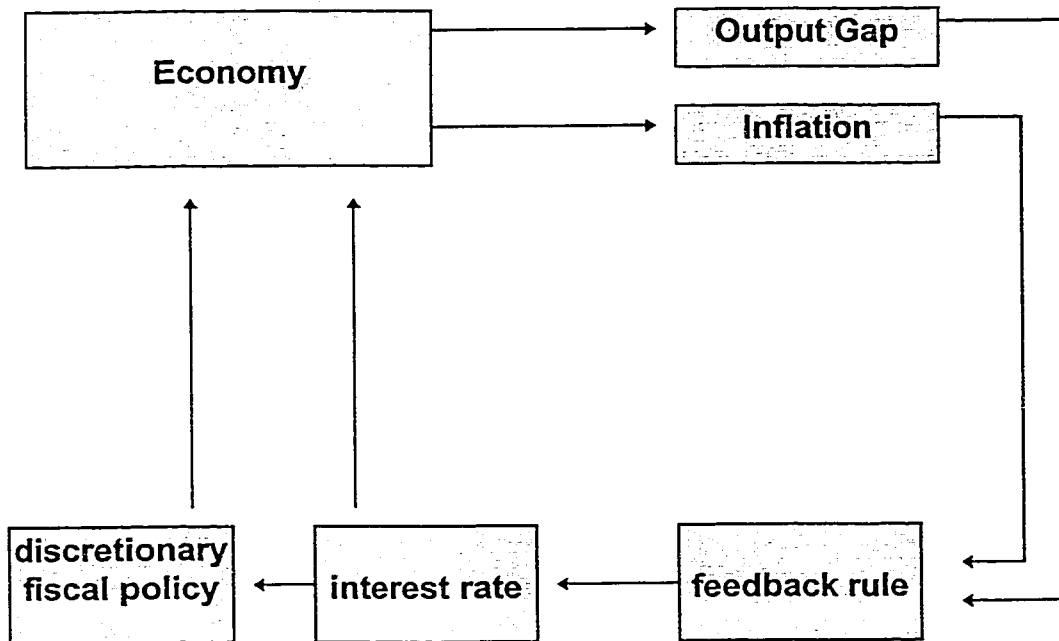
$$\Delta r_t = f(\Delta M_{t-1} - \Delta M^*_{t-1}, X_{t-1}),$$

where r is the interest rate used as the exogenous policy instrument, M is whatever monetary aggregate is used as intermediate policy target, and M^* is the corresponding announced target value, and X is a vector of other variables (like price inflation or unemployment). DeRosa and Stern (1977) found statistically significant evidence of change in US policy in 1970.

Since the 1990s most central banks claim to be targeting inflation. Evidence of this (in the context of Canada) can be found in documents of the Bank of Canada (1991a, 1991b and 1993). The Bank of Canada operating framework involves a notion of inflation, arising out of spending pressures as essentially a monetary phenomenon. An important part of the inflationary process is the formation of expectations about future inflation. Within this framework, inflation 'surprises' take place relative to the current climate of expectations. If the Bank of Canada begins to reduce the rate of inflation from recent levels, this policy constitutes such a surprise, and private agents' expectations about future inflation will not fully reflect it quickly. Thus, to reduce inflation, the Bank must reduce aggregate demand enough to force price setters, on average, to post prices lower than they had intended. Therefore, it is suggested that in order to intervene in the inflationary process, the Bank must influence the size of the output gap. Sometimes, it is suggested that if the Bank is able to reduce agents' inflationary expectations directly (pre-empting the influence of the output gap itself), it may be able to achieve its ends in a manner

less costly to output and employment (Grant, 1997). The hypothesized causal sequence of central bank's operating procedure can be described as follows. The operation of the Bank involves controlling the overnight rate and it is expected that this will translate into influence over the whole structure of real interest rates which, in turn, will influence the major components of real aggregate demand that are interest sensitive. Through the multiplier process, this spending influences the rest of consumption, shifting the path of aggregate demand to a new trajectory relative to potential output, thus affecting the output gap and inflation.

The interaction between monetary and fiscal policy can be seen through the hypothesized operating framework of the central bank and the suggested relation between the discretionary fiscal policy and interest rates based on our empirical tests. This framework implies that in response to the state of the economy (measured through output gap and inflation), the central bank adjusts the rate of interest. The changes in the rate of interest, in turn, influence the discretionary fiscal behavior of governments. This might appear as a simple and straightforward, almost embarrassingly so, framework to analyze complex economies. However, to us, as argued in this chapter, it does convey the essential operating rules of the economy. This simple idea of interaction between monetary and fiscal policy can also be described by the following flow chart.



Reaction Function: Regression Results

The above discussion on monetary policy and feedback rules suggests that most central banks now use some measure of inflation and aggregate demand in the economy as guiding variables to set the 'intermediate target', the rate of interest. As mentioned earlier, we estimate two reaction functions, one involving real GDP growth and inflation as arguments and the other using output gap and inflation. Assuming that the central bank sets the nominal interest rate in response to the expected real GDP growth or the output gap and expected inflation, we also estimate the two regressions using one period ahead values of

each variable, as proxies for expectation of inflation, GDP growth and output gap.

For the United States when nominal interest rate is regressed on contemporary real GDP growth and inflation, on an annual basis, the coefficients on both the GDP growth and inflation are statistically significant (see Table 3-7A and Table 3-8A in the appendix). If future values (one year ahead) are used as proxies for expected real GDP growth and inflation, only the coefficients on real GDP growth is significant, with a negative sign. In reality, this could mean that, if the central bank sets a high rate of interest, it impacts the economy with a 12 month lag and makes future real GDP growth to fall.

On the other hand, the causal connection between the nominal rate of interest and the primary cyclically adjusted budget balance for the United States suggests that, as the rate of interest is increased, the discretionary fiscal policy is expansionary. Thus, this simple analysis suggests that the US government has possibly followed conflicting monetary policy and fiscal policy at the same time. Is this plausible?

In a simulation analysis Macklem et al. (1995, 40) suggest the empirical premise for this diversity in the use of monetary and fiscal policy. They argue that:

... if the economy is initially in a state of excess demand and inflation is rising, the fiscal tightening helps the monetary authority offset the latent inflationary pressures that are building up. The monetary authority can therefore ease monetary conditions considerably, relative to what they otherwise would have been, and still realize a better inflation performance.

In their simulation analysis this monetary easing will reduce the impact of the fiscal tightening on real activity, but it is generally not sufficient to offset the short-run costs of debt reduction. Burdekin and Willett (1992, 93), using a dynamic framework and using the monetary base as the relevant policy instrument, also find a persistent tension between the monetary and fiscal authorities in the United States during 1963-84. As suggested in Table 3-7A, the correlation between the real GDP growth and real interest rates changes its sign from negative to positive after 1985. In terms of the reaction function this would imply that both the fiscal and monetary policy are moving in the same direction after the mid 1980s, i.e., with the expectation of a downturn in the economy the government follows an expansionary monetary and fiscal policy. Interestingly, the unemployment rate in the US also shows a steep fall from around the mid 1980s.

In the case of Canada, the regressions suggest that the coefficients on contemporary inflation has a positive sign and is significant while the coefficient on expected inflation has a negative sign and is not statistically significant. In the case of real GDP growth, coefficients on both contemporary and expected real GDP growth have a negative sign, though it is only the coefficient on the expected real GDP growth which is significant, reflecting the lagged impact of higher interest rates today on real GDP growth.

The other reaction function that was estimated for Canada uses the difference between potential GDP and actual GDP (output gap) and inflation as the explanatory variables for the central bank to determine the rate of interest

rate. These regressions reveal that the coefficient on expected output gap has a negative sign while the coefficient on the contemporary output gap has a positive sign. However, both are statistically insignificant. Coefficient on contemporary inflation is positive and on expected inflation is negative, both are statistically insignificant.

For France, the statistical significance of coefficients on reaction functions suggests that the coefficient on the expectation of real GDP growth has a negative and significant coefficient when the nominal interest rate is the dependent variable. The coefficient on contemporary inflation and the expectation of inflation has a negative sign, though statistically insignificant. In the United Kingdom, the estimates of two reaction functions suggest that the expectation of inflation is not found to be significant in either of the estimates. The coefficient on contemporary inflation in both regressions involving real GDP growth and output gap respectively is significant.

These regressions suggest that, for Canada and UK, the higher is the present rate of inflation, the higher is the nominal rate of interest set by the central bank, which in turn leads to contractionary fiscal policy (based on our earlier results on temporal precedence between interest rates and cyclically adjusted budget balances). For the United States, the evidence reveals that the higher the rate of inflation, the higher is the nominal rate of interest set by the bank, which in turn leads to expansionary fiscal policy. For France, the coefficient on contemporary inflation is not significant vis-à-vis the nominal interest rate. For Italy and Germany, inflation is significant but we do not get any

significant causal relationship between interest rates and discretionary expenditures.

This mixed evidence in terms of government behavior suggests that neither the functional finance framework nor the public choice framework is adequate to explain the monetary and fiscal policy links of governments. On balance, the evidence suggests abandonment of activist fiscal policy, in the functional finance sense, as a policy tool by governments. However, there is some evidence of an activist fiscal policy which is 'anti -functional finance', that is, one which slows down the economy rather than stabilizing it.

The Granger causality tests in the first chapter establish that the initial impetus for this deflation has come from higher interest rates. High interest rates are usually recommended by those who are afraid of the potential inflationary consequences of a boom or by those who want to relieve the economy of existing inflationary pressures. In a monetary framework where the rate of interest is set by the central bank, the dominance of high interest rate regimes suggests the dominance of speculators and rentiers, who benefit from a high interest rate policy. Restriction of credit for production forces producers to cut down on production and employment because of a lack of working capital. Investment projects become non-profitable or too risky as a result of high interest rates, and increases in interest rates discourage those projects that have been prepared by entrepreneurs for production purposes, while speculative financial acquisitions continue unabated (Lavoie and Seccareccia ,1988, 148).

Table 3-7 A: Regression Results: Reaction Function I			
Country	ir = f (Gap(=c1), inf.(=c2)) ir = f (Gr.(=c3), inf.(=c4)) AR(1), R-Sq., Durbin-Watson	ir = f (Gap+1(=c5), inf.+1(=c6)) ir = f (Gr.+1(=c7), inf.+1(=c8)) AR(1), R-Sq., Durbin-Watson	Correlation A: Gap ir rir B: Gr. ir rir C: Un inf. Gap Gr.
Canada 1962-97	c1 = 3685.6 [1.13] c2 = 0.09 [0.36] AR(1)=0.96 [4.09] RSq=0.64, DW=1.54 c3= -0.04 [-0.28] c4= 0.49 [2.11] AR(1)=0.78 [5.82] RSq=0.70, DW=1.79	c5 = -560.6 [-0.81] c6 = -0.38 [-1.73] AR(1)=0.98 [7.85] RSq=0.69, DW=1.67 c7= -0.61 [-6.5] c8 = -0.05 [-0.41] AR(1)=0.88 [10.09] RSq=0.87 DW=1.84	A: 1 -0.088 0.036* B: 1 -0.43 -0.55 C: 1 -0.13 -0.37 -0.56 *: after 1979 the sign of ir and rir is -ve and before 1979 both are +ve
US 1955-91	c1 = N.A c2 = N.A c3= 0.21 [2.84] c4= 0.60 [5.56] AR(1)=0.84 [8.58] RSq=0.87, DW=1.61	c7= -0.40 [-6.1] c8= 0.01 [0.17] AR(1)=0.89 [14.2] RSq=0.90 DW=1.32	B: 1 -0.30 -0.23* C: 1 0.30 N.A. -0.34 *: after 1985 ir and rir both have +ve sign
UK 1970-96	c1 = 0.001 [0.01] c2 = 0.26 [2.26] AR(1)=0.74 [4.6] RSq=0.61, DW=1.54 c3= -0.18 [-1.14] c4= 0.25 [2.33] AR(1)=0.73 [4.56] RSq=0.63, DW=1.80	c5 = -0.42 [-2.1] c6 = 0.0008 [0.07] AR(1)=0.77 [5.06] RSq=0.57, DW=1.35 c7= -0.55 [-4.3] c8 = -0.14 [-1.64] AR(1)=0.80 [5.4] RSq=0.72 DW=1.68	A: 1 0.07 -0.39* B: 1 -0.39 -0.06 C: 1 -0.76 -0.37 0.10 *: after 1989 sign of ir and rir is +ve
Germany 1970-96	c1 = 0.46 [1.48] c2 = 0.25 [0.69] AR(1)=0.49 [2.04] RSq=0.46, DW=1.44 c3= -0.13 [-1.02] c4= 0.68 [2.27] AR(1)=0.43 [2.02] RSq=0.45, DW=1.59	c5 = -0.63 [-2.02] c6 = 0.65 [1.64] AR(1)=0.52 [2.6] RSq=0.35, DW=1.48 c7= -0.116 [-0.77] c8 = 0.10 [0.31] AR(1)=0.47 [2.4] RSq=0.28 DW=1.38	A: 1 0.52 -0.07* B: 1 -0.14 -0.32 C: 1 -0.88 -0.62 -0.27 *: after 1980 sign of ir and rir is +ve
France 1970-96	c1 = 0.27 [0.69] c2 = 0.31 [1.15] AR(1)=0.69 [2.8] RSq=0.52, DW=1.52 c3= -0.15 [-0.54] c4= 0.39 [1.55] AR(1)=0.63 [2.5] RSq=0.52, DW=1.63	c5 = -0.65 [-1.75] c6 = 0.009 [0.04] AR(1)=0.66 [3.4] RSq=0.50, DW=1.47 c7= -0.66 [-2.94] c8 = -0.07 [-0.40] AR(1)=0.71 [4.2] RSq=0.58 DW=1.68	A: 1 0.07 -0.36* B: 1 -0.26 -0.44 C: 1 -0.74 -0.49 -0.53 *: after 1980 sign of ir and rir is +ve
Italy 1970-96	c1 = 0.35 [1.38] c2 = 0.48 [2.3] AR(1)= 0.77 [5.2] RSq=0.76 DW=2.17 c3= 0.15 [1.02] c4=0.58 [2.94] AR(1)=0.8 [5.4] RSq= 0.75 , DW=2.3	c5 = -1.31 [-5.9] c6 = 0.44 [2.4] AR(1)= 0.87 [7.7] RSq=0.83 DW=1.8 c7 = -0.82 [-7.4] c8=0.16 [1.32] AR(1)=0.8 [8.0] RSq= 0.87 DW=1.14	A: 1 0.029 -0.21 B: 1 -0.15 -0.36
Note:ir is the nominal interest rate, Gap stands for outputgap, inf stands for inflation, Gr stands for real GDP growth and +1 stands for the next period value of the variables			

Table 3-8A: Regression Results: Reaction Function II		
Country	D(ir) = f (D(Gap(=c1)), D(inf.(=c2))) D(ir) = f(D(Gr.(=c3)), D(inf.(=c4))) AR(1), R-Sq., Durbin-Watson	D(ir) = f (D(Gap+1(=c5)), D(inf.+1(=c6))) D(ir) = f(D(Gr.+1(=c7)), D(inf.+1(=c8))) AR(1), R-Sq., Durbin-Watson
Canada 1962-97	D(c1) = 3206.15 [1.08] D(c2) = 0.11 [0.31] AR(1)=0.14 [0.33] RSq= 0.11, DW= 1.75	D(c5) = - 474.29 [-0.14] D(c6) = - 0.38 [- 1.7] AR(1)=-0.07 [- 0.18] RSq = 0.18, DW=1.58
Canada 1962-97	D(c3)= - 0.019 [- 0.10] D(c4)= 0.47 [2.15] AR(1)=0.02 [0.009] RSq=0.15, DW= 1.94	D(c7)=-0.60[- 6.17] D(c8)=-0.07[- 0.54] AR(1)=0.03 [0.17] RSq=0.62, DW=1.99
US 1955-91	D(c1) = N.A D(c2) = N.A D(c3)= 0.24 [3.16] D(c4)= 0.59 [5.65] AR(1) = 0.15 [0.79] RSq= 0.54, DW= 1.87	D(c5) = N.A D(c6) = N.A D(c7) = - 0.36 [- 6.53] D(c8) = 0.05 [0.46] AR(1) = 0.35 [1.74] RSq = 0.65, DW=1.81
UK 1970-96	D(c1) = 0.02 [0.1] D(c2) = 0.23 [2.12] AR(1)=0.14 [0.56] RSq= 0.25, DW= 1.87	D(c5) = - 0.40 [- 2.06] D(c6) = - 0.06 [- 0.57] AR(1)= 0.27 [1.17] RSq = 0.28, DW=1.77
UK 1970-96	D(c3)= - 0.16 [- 0.94] D(c4)= 0.25 [2.41] AR(1)= -0.003 [- 0.01] RSq= 0.27, DW= 2.006	D(c7)= - 0.52 [- 4.11] D(c8)= - 0.16 [- 2.006] AR(1)=0.7 [0.31] RSq=0.52, DW=1.95
Germany 1970-96	D(c1) = 0.63 [2.01] D(c2) = - 0.11 [- 0.26] AR(1)=0.20 [0.8] RSq= 0.26, DW= 1.86	D(c5) = - 0.64 [- 1.92] D(c6) = 0.39 [0.79] AR(1)= -0.10 [0.46] RSq = 0.19, DW=1.64
Germany 1970-96	D(c3)= - 0.21 [- 1.72] D(c4)= 1.03 [3.01] AR(1)= -0.20 [-0.99] RSq= 0.29, DW= 1.37	D(c7)= - 0.10 [- 0.72] D(c8)= - 0.03 [- 0.08] AR(1)=0.15 [0.69] RSq=0.05, DW=1.91
France 1970-96	D(c1) = 0.41 [1.10] D(c2) = 0.24 [0.88] AR(1)=0.08 [0.30] RSq= 0.16, DW= 1.44	D(c5) = - 0.54 [- 1.56] D(c6) = - 0.26 [- 1.0] AR(1)= 0.17 [0.76] RSq = 0.22, DW=1.82
France 1970-96	D(c3)= - 0.12 [- 0.43] D(c4)= 0.43 [1.64] AR(1)= - 0.05 [- 0.20] RSq= 0.12, DW= 2.05	D(c7)= - 0.6 [- 2.83] D(c8)= - 0.28 [- 1.25] AR(1)=0.03 [0.14] RSq=0.36, DW=1.93
Italy 1970-96	D(c1)= - 0.06 [-0.27] D(c2)= 0.70 [5.01] AR(1)= -0.46 [2.04] RSq= 0.57 DW= 2.04	D(c5)= - 0.06 [-0.27] D(c6)= 0.70 [5.01] AR(1)= -0.46 [2.04] RSq= 0.57 DW= 2.04
Italy 1970-96	D(c3)=-0.10 [-0.64] D(c4)= 0.69 [5.58] AR(1)= -0.51 [-2.38] RSq= 0.57 DW= 2.06	D(c7)= - 0.81 [-9.43] D(c8)= 0.13 [1.11] AR(1)=0.44 [2.14] RSq= 0.78 DW= 1.91
Note: ir stands for nominal interest rate, Gap stands for output gap		
Gr stands for real gdp growth, D stands for first difference and +1 for next period		

Table 3-9A

Lag Selection Results Based on Minimum Log-Schwarz Values II

Country	Lags	IR.	IR. CABB GDP	CABB GDP	CABB GDP- IR.	RIR.	RIR.- CABB GDP	CABB GDP	CABB GDP- RIR.
Canada 1962-97	1	1.72*	1.84	5.23*	5.32	1.61*	1.82	5.34*	5.31**
	2	1.79	1.89	5.3	5.43	1.79	1.96	5.45	5.38
	3	1.89	1.96	5.45	5.51	1.94	1.99	5.51	5.42
	4	1.89	2.01	5.57	5.48	2.02	2.04	5.59	5.51
United States 1955-91	1	1.06	1.09	-9.04	-9.09	1.56*	1.66	-9.04	-9.07
	2	1.04*	1.19	-9.18	-9	1.65	1.78	-9.18	-8.98
	3	1.14	1.21	-9.18*	-9	1.78	1.92	-9.18*	-9.12
	4	1.22	1.23	-9.04	-9.11	1.86	1.95	-9.04	-9.13
United Kingdom 1970-95	1	1.66	1.76	1.05	0.67**	2.75*	2.58**	1.05	0.86
	2	1.6*	1.96	0.96	0.79	2.87	2.72	0.96	0.99
	3	1.67	2.02	0.75*	0.92	2.89	2.92	0.75*	0.86
	4	1.72	2.18	0.89	0.91	2.76	2.86	0.89	1.03
Germany 1970-95	1	1.84	1.55	0.80*	0.89	1.75	1.26	0.80*	0.89
	2	1.72*	1.72	0.88	0.95	1.4	1.3	0.88	0.95
	3	1.78	1.49	1.04	0.89	1.25*	1.42	1.04	0.89
	4	1.79	1.28**	1.19	0.99	1.37	1.46	1.19	0.99
France 1970-95	1	1.77*	1.92	-0.18	-0.59**	1.94*	2.02	-0.18	-0.65
	2	2.12	2.01	-0.24*	-0.48	2.06	2.14	-0.24*	-0.67**
	3	2.1	2.12	0.07	-0.36	2.16	2.16	-0.07	-0.51
	4	2	2.1	0.12	-0.28	2.1	2.1	-0.12	-0.50
Italy 1970-95	1	2.35*	2.28	0.48*	0.53	1.78*	1.91	0.48*	0.6
	2	2.54	2.26	0.51	0.62	1.96	2.09	0.51	0.64
	3	2.72	2.46	0.69	0.58	1.84	1.84	0.69	0.8
	4	2.45	2.22**	0.73	0.69	1.89	1.89	0.73	0.93

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively. IR: Interest rate; RIR: Real Interest Rate; CABB GDP: Cyclically adjusted budget balance -GDP ratio

Table 3-10A

Lag selection based on minimum Log-Schwarz values III

Country	Lags	IR.	IR. PCABB	PCABB	PCABB- IR.	RIR.	RIR. PCABB	PCABB	PCABB- RIR.
Canada 1962-97	1	1.58*	1.74	17.14	17.09	1.61*	1.77	17.14	17.09**
	2	1.68	1.88	17.26	17.03**	1.79	1.81	17.26	17.19
	3	1.78	2.03	17.23	17.13	1.94	2.05	17.23	17.18
	4	1.79	2	17.10*	17.1	2.04	2.03	17.10*	17.31
U S 1955-91	1	1.06	1.11	6.92	6.93	1.56*	1.66	7.17	6.91
	2	1.04*	1.24	6.85*	6.99	1.65	1.78	6.81*	7.9
	3	1.14	1.33	6.94	6.91	1.78	1.91	6.84	6.78**
	4	1.22	1.39	6.9	6.71	1.86	1.98	6.87	6.91
U K 1970-95	1	1.82	1.92	3.32*	3.42	2.75*	2.81	3.41*	3.54
	2	1.76*	1.99	3.52	3.55	2.87	2.93	3.5	3.72
	3	1.83	2.01	3.69	3.64	2.89	3.07	3.68	3.8
	4	1.92	2.1	3.74	3.63	2.78	3.08	3.87	4.01
Germany 1970-95	1	1.84	1.01**	6.98*	7.08	1.75	1.22**	6.98*	7.08
	2	1.72*	1.79	7.07	7.19	1.4	1.3	7.07	7.24
	3	1.78	1.81	7.26	7.24	1.25*	1.43	7.26	7.33
	4	1.79	1.92	7.29	7.33	1.31	1.48	7.29	7.39
France 1970-95	1	1.77*	1.92	7.09*	7**	1.79*	1.87	7.09*	6.98**
	2	1.78	2.1	7.23	7.13	1.96	2	7.23	7.09
	3	1.9	2.32	7.65	7.32	2.01	2.2	7.54	7.11
	4	2	2.43	7.89	7.67	2.2	2.3	7.89	7.21
Italy 1970-95	1	2.35*	2.37	19.24*	19.38	1.78*	1.87	19.24*	19.35
	2	2.54	2.54	19.42	19.56	1.96	2	19.42	19.34
	3	2.65	2.7	19.78	19.76	2.32	2.4	19.56	19.43
	4	2.78	2.42	19.87	20.01	2.44	2.32	19.87	19.54

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively. IR: Interest rate; RIR: Real Interest Rate; PCABB: Cyclically adjusted budget balance net of interest payments.

Table 3-11A

Lag Selection Results Based on Minimum Log-Schwarz Values IV

Country	Lags	IR.	IR. PCABB GDP	PCABB GDP	PCABB- GDP IR.	RIR.	RIR. PCABB GDP	PCABB GDP	PCABB- GDP RIR.
Canada 1962-97	1	1.58*	1.71	0.55*	0.64	1.61*	1.7	0.55*	0.64
	2	1.68	1.78	0.59	0.75	1.75	1.79	0.59	0.78
	3	1.78	1.93	0.72	0.8	1.94	1.94	0.72	0.88
	4	1.79	2.04	0.87	0.72	1.96	2.04	0.87	0.87
U S 1955-91	1	1.06	1.08	-9.74*	-9.64	1.56*	1.66	-9.09	-9.26
	2	1.04*	1.14	-9.64	-9.59	1.65	1.78	-9.3	-9.17
	3	1.14	1.28	-9.50	-9.5	1.78	1.91	-9.37*	-9.36
	4	1.22	1.15	-9.37	-9.56	1.86	1.98	-9.27	-9.27
U K 1970-95	1	1.77*	1.92	-8.34*	-8.36**	2.75*	2.54**	-8.0*	-8.07
	2	1.78	2.1	-8.18	-8.23	2.87	2.69	-8.07	-7.94**
	3	1.9	2.2	-8.21	-8.1	2.89	2.88	-8.21*	-8.03
	4	2	2.24	-8.07	-8.02	2.78	2.84	-8.08	-7.94
Germany 1970-95	1	1.84	1.54	-8.3*	-8.2	1.75	1.22**	-8.3*	-8.2
	2	1.72*	1.73	-8.21	-8.13	1.4	1.3	-8.2	-8.07
	3	1.78	1.51**	-8.04	-8.21	1.25*	1.43	-8.03	-8.03
	4	1.79	1.31	-7.9	-8.10	1.31	1.48	-7.94	-8.04
France 1970-95	1	1.77*	1.92	-9.48	-9.88	1.94*	2.01	-9.48	-9.78
	2	1.78	2.1	-9.56*	-9.99**	2.06	2.16	-9.56*	9.98**
	3	1.9	2.32	-9.41	-9.64	2.16	2.22	-9.41	-9.85
	4	2	2.43	-9.28	-9.59	2.1	2.3	-9.28	-9.65
Italy 1970-95	1	2.35*	2.23	-8.47*	-8.34	1.78*	1.91	-8.47*	-8.38
	2	2.54	2.17	-8.41	-8.25	1.96	2.09	-8.41	-8.29
	3	2.72	2.36	-8.55	-8.18	1.84	1.89	-8.25	-8.21
	4	2.45	2.16**	-8.08	-7.98	2.02	1.9	-8.08	-8.02

Note: The numbers with * and ** stand for lag length that has minimized the Schwarz criterion in the univariate and the bi-variate case respectively. IR: Interest rate; RIR: Real Interest Rate; PCABBGDP: Cyclically adjusted budget balance net of interest payments -GDP ratio.

CHAPTER 4

The Monetization of Deficits and Inflationary Fears: Theoretical Debates and Empirical Evidence

1.0 Introduction

The nature of the money supply process is of central importance to macroeconomic theory and policy. Whether or not it is exogenously or endogenously determined is an issue which has been hotly disputed, as, too, is the role of the public sector in its determination. Elementary textbooks have set down a well-established relationship between the monetary base and general monetary aggregates (i.e. mainly bank deposits). This translation is made through the money multiplier and the determination of the money base and the factors influencing the size of the multiplier provide interesting empirical questions. A mechanical approach to the determination of the money stock ignores the complexity of the money supply 'process'. For example, it washes out the analysis of the role played by financial institutions. This omission is of importance, especially if financial institutions are modeled as profit maximizers whose portfolio decisions (balancing risks and returns) will themselves impinge at various points of the money supply process. Monetarists assume a stable demand for money and regard the government as having direct control over the monetary base of the system so that the money stock is exogenously determined by the monetary authorities. If, on the other hand, the bank deposit multiplier is variable or if the monetary base is changed in response to aggregate real demand and if money,

rather than being a stock, is a flow variable, then the money supply is clearly endogenous.¹

In recent years, old fears that monetized public sector deficits will eventually cause inflation have been rekindled. Monetization refers to the process through which an increase in government debt results in an increase in the money stock. This has brought the issue of financing of budget deficits to the fore. The belief is that various methods of financing impact the money supply differently and, therefore, have different consequences for price stability. For example, printing money to finance budget deficits raises the money supply proportionately. Foreign borrowing could impact on the money supply by increasing the international reserves component of the monetary base (in the absence of an offsetting change in domestic credit). However, borrowing domestically from the non-bank public does not raise the money supply, since the public trades currency for bonds and receives the currency back when government spends the proceeds of borrowing.

¹ This is part of a long-running debate between the Keynesians and monetarists (see Kaldor, 1970, Tobin, 1970). The essence of the Keynesian argument is that in order to finance their real expenditure plans (demand) individuals will demand more credit, and so profit-maximizing financial institutions, especially banks, will respond to this incentive and expand bank lending to the private sector, thereby increasing the money supply. If rising interest rates do not discourage borrowing, then the lender of the last resort facility allows bank reserves to increase in direct response to the increased demand for credit. Rochon (1999, forthcoming), distinguishes between the theory of endogenous money developed by early post-Keynesians like Kaldor and Minsky and the latter day post-Keynesians, like Lavoie, Moore and others who defined "revolutionary" endogeneity. The early contributions emphasize the importance of financial innovations, the creation of money substitutes, and the importance of bank credit. The latter authors suggest that, while changes in velocity lead to the "introduction" of money, it is not the same thing as saying that this is an endogenous creation of money. This *new* money is neither the result of credit demand, nor is it consistent with a flow analysis. "If money can be created by portfolio adjustments, these effects are secondary since they are not the result of economic activity" (Lavoie, 1990, 110).

Whether the financing from the commercial banks causes the money supply to increase is something which has prompted varied responses.

The question addressed in this chapter is, what logical or empirical basis is there to the fears and beliefs that the nature of financing of public sector deficits can result in an expansion of the money supply and, hence in financial instability and inflation?

This chapter seeks to demonstrate the endogeneity of the money supply and of deficits. The empirical results for the G-7 countries in this chapter suggest that, to understand the macroeconomic consequences of deficits, it is not the financing of deficits which is of primary importance. The fear of inflation through monetization seems unfounded. When the literature is reviewed it is found that no simple unambiguous set of relationships exists. A number of theories exist. The relationship between deficits and the money supply is found to be much more complex. Treating money as a flow variable rather than a stock variable is found to be the relevant starting point.

The dynamics among deficits, economic growth and money supply (seen as demand for credit) is quite crucial to understand appropriately the macroeconomic impact of deficits. This chapter is divided into three sections.

1. In section 2 we provide empirical evidence against the inflationary fears of deficits. This section examines the hypothesis according to which the way budget deficits are financed can explain why budget deficits might not be necessarily strongly linked with inflation and, even when they may be strongly linked, why this

linkage might not be a contemporaneous one. To capture the inter-temporal linkage between deficits and inflation, Granger causality tests are performed between deficits and inflation using annual data for the G-7 countries except Japan.²

2. In section 3 we review different theoretical viewpoints which suggest that central banks have to monetize deficits at some point in time and that the extent of monetization depends upon the nature of the financing of deficits. To capture the contemporaneous relation between deficits and high-powered money, we did the cointegration tests between deficits and the monetary base. Moreover, the inter-temporal link between deficits and monetary base is examined by estimating Granger causality regressions between deficits and a measure of the monetary base. To understand further the inflation argument arising from the monetization of deficits, we also performed Granger causality tests among deficits, monetary base and inflation, using annual data for the G-7 countries except Japan.

3. In the final section we explore the endogenous nature of money and deficits. The evidence based on multivariate causality tests among deficits, Gross Domestic Product and M1 supports this hypothesis. It is worthwhile to note that the use of M1 was necessitated, instead of some other broader monetary aggregate, due to data limitations.

² Estimation for Japan is not done in this chapter since we could not get an adequate number of consistent observations.

Empirical results for every Granger causality test involve providing results from the unit root tests, cointegration tests, lag selection procedure and the test of significance for the relevant coefficients in the causality regressions.

2.0 Inflationary Fears

Public sector deficits have a bad reputation because, among other things it is believed that sooner or later the government will resort to money creation, and hence inflation, to finance the deficit.³ The government budget constraint and equilibrium models of inflation suggest that the inflationary aftermath of government deficits depends on the government's strategy for servicing the debt. The reason, it is said, is that fiscal deficits and money are not related in a unique way: the government can cover its deficits by issuing interest-bearing government debt, at least to some extent, instead of money.

In other words, it is argued that, if government expenditures exceed revenues, the resulting deficits have to be financed either through borrowing or issuing money. However, borrowing is limited by the public's capacity or willingness to hold additional government debt, and monetary expansion leads to inflation.⁴ Thus the positive association between budget deficits and inflation is

³ The relation between deficits and inflation is commonly seen through the following two relationships. The difference equation $\Delta P_t = (1/\alpha) \sum (\beta/\alpha)^j E(\Delta M_{t+j})$, where Δ is the difference operator and ΔP_t refers to $P_t - P_{t-1}$ states that the changes in the current price level are positively related to the expected changes in the money supply in the current and all future periods. Additionally, the link between changes in money supply and budget deficits is made through the inter-temporal budget constraint $\sum (1/(1+r))^{t+j} (G_{t+j} - T_{t+j}) + B_{t-1} = \sum (1/(1+r))^{t+j} (\Delta M_{t+j})$ which implies that the present value of budget deficits and an initial level of debt has to be equal to the present value of money issues.

⁴ Inflation is considered to be a bad because it is believed that inflation generates uncertainty in economic decisions, may lower investment and output in the long-run and may, therefore, reduce the tax base and thus increase deficits. Inflation may also lead to higher budget deficits by

widely recognized. However, this association is not statistically significant in many countries, as shown in the following table, including those countries with high inflation rates.

Table 4-1: Contemporaneous Correlation between Budget Deficits and Inflation for Selected Countries

Country	Correlation between inflation and deficits	Time Period
Australia	0.22	1970-89
Germany	-0.01	1970-89
Denmark	0.18	1970-89
France	0.01	1970-89
India	-0.01	1970-89
Japan	-0.12	1970-89
Netherlands	-0.19	1970-89
Pakistan	-0.03	1970-89
Singapore	0.03	1970-89
United Kingdom	0.41	1970-89
United States	0.25	1970-89
Canada	0.00	1970-88
Brazil	0.76	1970-87
Greece	0.07	1970-89
Turkey	0.19	1970-81

Source: Neyapti, Bilin (1998, 34)

However, the observed lack of contemporaneous relationship between budget deficits and inflation has not been interpreted to mean the absence of a close association between deficits and inflation. Indeed, theoretical studies (Sargent and Wallace, 1981, Drazen and Helpman, 1990), who analyze the relationship between budget deficits and inflation, point out that, if an increase in budget

increasing the debt service, by encouraging tax evasion or by means of delays in tax collection, the Tanzi effect (Tanzi, 1977). Moreover, inflation lowers the value of money balances, in response to which people hold lower real balances. Hence real revenues from money creation start to fall above some rate of inflation as inflation continues to rise. The decline in revenues from money creation associated with higher levels of inflation is generally referred to as the Olivera-Tanzi effect.

deficits is not financed and is not expected to be financed in the future through additional money issue, prices do not rise. Nevertheless, these studies also point out that, if the government's debt becomes unsustainable, budget deficits may eventually lead to inflation, even though they are not currently financed through monetary expansion.

Sargent and Wallace (1981) and Sargent (1987) discuss deficit financing regimes that are intermediate to the models of only money or only bonds. In these intermediate regimes, an increase in interest-bearing debt leads eventually to higher inflation because increased debt signals future increases in money. Sargent and Wallace (1981) show that, in a situation where a real rate of return on government securities is in excess of the economy's growth rate, then simply to "roll over" a fixed amount of interest-bearing government debt in private hands requires raising revenue from other sources to pay the interest on debt. In particular, the government must either levy taxes or reduce purchases or print currency to pay the interest. The other alternative is to issue additional interest-bearing debt to pay the interest on existing debt. However, there is a limit to the growth of stock of real government interest-bearing debt per capita. Thus, eventually either taxes must be levied or currency must be issued to service the debt. Moreover, the larger is the value at which the real interest-bearing debt per capita is ultimately stabilized, the larger the amount of revenue that eventually has to be raised either via tighter fiscal policy or via greater monetary expansion.

... the Fed can make the base money component grow more slowly than the growth of total debt implied by the deficit only by making the growth rate of the interest-bearing component exceed the growth of the total

government debt. However, once the limit on the federal debt per capita that can be marketed with the public has been reached, the Fed has no choice: It must increase base money. That is, it must "monetize" all of the additional government borrowing by purchasing all real additions to the stock of interest bearing debt that the treasury issues. More generally, given the time path of fiscal policy and given that government interest-bearing debt can be sold only at a real interest rate exceeding the growth rate (of the economy), the tighter is current monetary policy, the higher must the inflation rate be eventually. (Sargent and Wallace, 1981, 160)

McCallum (1984) also suggests that persistent deficits are inflationary. He argues that the 'monetarist hypothesis' is problematic, which says that, for given time paths of the money stock and government spending, it does not matter for aggregate demand (therefore inflation) whether the necessary revenue is raised by taxation or by bond sales. Bond-financed deficits could indeed be inflationary. In a situation of a permanent deficit, financed by indefinitely continuing issuance of bonds, outstanding bond stock continues to grow. So, accordingly, does the interest that must be paid each period on the outstanding stock. If, for example, the magnitude of the real deficit (net of interest payments) is kept at d , the real bond stock b_t will be required to grow according to $b_t = (1+r)b_{t-1} + d(1+r)$, as long as the real interest is constant at the value r . Thus the bond stock will in this case grow without bound, if $d > 0$, $b_t \rightarrow \infty$ as $t \rightarrow \infty$. In McCallum's model, the stock of willingly held government bonds can grow indefinitely at a rate in excess of the rate of output growth, provided that the difference between the growth rate of bond and output is smaller than the rate of time preference.

Barro (1976) suggests that persistent bond-financed deficits are inflationary if the rate of growth of bonds exceeds the rate of output growth. The reason is that

the value of outstanding stock of debt at any point in time is bounded by the government's present value of future taxing capacity. If the rate of growth of bonds exceeds the rate of output growth, then the Ricardian equivalence argument breaks down.

Thus in this literature, how budget deficits are financed can explain why they might not be necessarily strongly linked with inflation and, even though they are strongly linked, why this linkage might not be a contemporaneous one.⁵ The arguments by Sargent and Wallace, McCallum, Barro and others imply that the dominant belief still is that deficits are inflationary, regardless of whether they are monetized or financed by bonds. In the latter case, it is the fear of future monetization (and therefore inflationary expectations) which makes deficits inflationary over the long-run. Persistent deficits determine future inflation.

These observations indicate that an appropriate analysis of the relationship between budget deficits and inflation requires an inter-temporal analysis. We now seek to answer this important question. Can future movements of prices be predicted by changes in budget deficits? The Granger causality technique is used

⁵ In the literature mentioned above, various factors are identified which are likely to conceal or eliminate the contemporaneous relation between inflation and budget deficits. First, if inflation is high and thus creates an incentive for the government to delay its interest payments, for instance, there may appear to be no contemporaneous correlation between budget deficits and inflation. Secondly, to create an impression of good economic performance, governments with a short horizon may therefore lower budgetary spending and increase extra-budgetary spending. Moreover, a downward adjustment in budget deficits to eliminate inflationary pressures, especially following the periods of very high inflation rates, may also conceal the positive linkage between inflation and budget deficits over a time series. Thirdly, an 'unsustainable path of budget deficits' may not be reflected in the inflationary expectations for some period of time. Thus, in the short run, budget deficits can be financed through increasing government debt issue, without necessarily generating much inflation. Hence, increases in budget deficits may not be necessarily accompanied by contemporaneous increases in the inflation rates, although they may be linked intertemporally.

to answer this question.⁶ To do so, first, we check whether stationary long-run relationships between deficits and the consumer price index exist for the 1955-1997 period, by using the Johansen (1988) technique (for details of the methodology, see section 5, chapter 2, 40-48).⁷

The Granger causality tests were done for the G-7 countries, except Japan, using annual data from the mid 1950s to 1995/97, after choosing the appropriate model based on the unit root tests (Table 4-2). We do not find any evidence of cointegrating relationship between deficits and change in CPI or deficit-to-GDP ratio and inflation (except for Italy), which implies the absence of a contemporaneous relationship between deficits and inflation. There is no evidence of inter-temporal causal relation between the deficit-to-GDP ratio and inflation for all six countries. The null hypothesis of "no causality from changes in deficits to changes in the consumer price index" is not rejected for five countries, except Germany. The null hypothesis of "no causality from changes in consumer price index to the changes in deficits" is also not rejected for five out of six countries. The only exception being Italy. The overwhelming evidence confirms the absence of causal connection between deficits and inflation (See Tables 4-3, 4-4, and 4-5).

⁶ The Granger causality tests performed in this chapter consider at most four lags.

⁷ To reiterate, the essentials of this methodology are: We first test the order of integration of each of the series. The common practice is to test the order of integration of the natural logarithm of the variables. However, since government deficits or surplus will most likely include positive and negative numbers we have tested the order of integration without taking the natural logarithm (to maintain consistency and clarity in the interpretation of results we have tested the order of integration without taking the natural logarithm of all variables). If all variables are $I(1)$, then we test for cointegration between them, using the Johansen test. Otherwise, both variables are used in first difference form in the equations of the VAR model, as is also the case if they are found not to be cointegrated (differencing an $I(1)$ series renders it stationary and differencing an $I(0)$ series does not alter its stationarity). If the variables are found to be cointegrated then the VAR

The above results suggest that the fear of orthodoxy that the deficits tend to be inflationary seems to be ill founded.⁸ However, orthodoxy argues that monetized deficits are surely even more inflationary because of the widespread belief that money causes inflation; this is used as an admonition against central bank monetization of deficits through accommodative policy. This is what the next section examines. It specifically examines the hypothesis regarding whether the central bank will be obliged to monetize the deficit in the current period and if such monetary accommodation will lead to increases in the money supply and, *ceteris paribus*, in the rate of inflation in the future periods.

equations above are augmented with the appropriate 'error correction' terms prior to estimation and testing for Granger causality.

⁸ The absence of deficits-inflation link has been explained from an alternative point of view in terms of the absence of demand (full employment of resources) and supply side (bottleneck of inputs or crowding out of private investment) conditions that are required for continuous inflationary pressure arising from fiscal deficits in the United States and Canada (See Smithin, 1994, Arestis and Bain, 1994, Wray, 1989 and Seccareccia and Sharpe, 1994). At a theoretical level Shaikh (1997) explains the rising inflation associated with rising unemployment in the 1970-1980's in terms of the limit to the growth of the system in normal-capacity rate of profit. He argues that there is a separate intrinsic limit to Growth. Even when labor is freely available at the going real wage, the maximum sustainable rate of capital accumulation within an economy is given by the normal capacity rate of profit. "If for any reason the gap between the actual growth rate and the through put limit [the maximum sustainable growth] narrows, there will be less and less room for output growth and consequently more and more pressure on prices (Shaikh, 1997, 9).

Table 4-2

Tests for A Unit Root: Phillips-Perron Test in Levels and First Differences

Country	def	(1-L) Def	mbase	(1-L) mbase	m1	(1-L) M1	gdp	(1-L) gdp
Canada 1955-96	-2.3	-6.0*	-1.8	-3.7*	-2.6	-4.5*	-1.7	-3.2*
Germany 1952-90	-2.0	-8.2*	-1.1	-3.5*	-1.4	-5.0*	-2.4	-4.7*
France 1952-95	-2.1	-6.7*	-0.8	-4.4*	-1.4	-3.8*	-1.6	-3.5*
US 1957-95	-2.4	-4.7*	1.8	-5.3*	-1.1	-3.3*	-0.6	-5.3*
Italy 1955-95	-1.9	-7.4*	-1.9	-3.5*	-2.1	-6.2*	-2.5	-3.6*
U K 1952-94	-3.5	-3.9*	-2.3	-5.4*	-2.2	-5.1*	-2.0	-3.2*

Country	infl	(1-L) infl	def- gdp	(1-L) def- gdp	cpi	(1-L) cpi	rmbase	(1-L) rmbase
Canada 1955-96	-1.7	-5.4*	-2.9	-6.8*	-1.3	-2.1	-2.3	-8.5*
Germany 1952-90	-2.3	-4.3*	-4.2*	-8.9*	-1.2	-2.3	-4.3*	-8.22*
France 1952-95	-2.9	-10.3*	-2.9	-7.8*	-1.3	-1.8	-5.3*	-11.4*
US 1957-95	-2.1	-4.8*	-2.5	-6.6*	-2.2	-2.4	-4.2*	-9.3*
Italy 1955-95	-2.0	-5.4*	-1.6	-6.1*	-2.0	-2.3	-6.3*	-9.8*
U K 1952-94	-2.2	-6.5*	-2.8	-5.5*	-1.7	-2.6	-5.5*	-9.1*

Note: The 10 percent critical value is -1.62 for no constant, no trend; -2.60 for the regression with intercept only and -3.18 for the regression with constant and respectively.
def: deficit; mbase: monetary base; rmbase: rate of growth of monetary base; infl: Inflation; cpi: consumer price index.

Table: 4-3
Results from Johansen and Juselius Cointegration Test* between Deficit-to-GDP Ratio and Inflation

Country	Null Trace test A. $r=0$ B. $r \leq 1$	Alternative $r > 0$ $r > 1$	Critical Values 95% A. B.	Critical Values 99% A. B.
Canada 1955-96	A. 18.271 B. 3.868**		A. 15.41 B. 3.76	A. 20.04 B. 6.65
United States 1957-95	A. 14.168 B. 2.424		A. 15.41 B. 3.76	A. 20.04 B. 6.65
Italy 1955-95	A. 18.814* B. 1.901		A. 15.41 B. 3.76	A. 20.04 B. 6.65
France 1952-95	A. 9.259 B. 2.728		A. 15.41 B. 3.76	A. 20.04 B. 6.65
United Kingdom 1952-94	A. 22.198 B. 4.43**		A. 15.41 B. 3.76	A. 20.04 B. 6.65

Notes

1. * Johansen framework considers five combinations of intercept-trend cases. They differ according to various possible specifications of the VAR equations and the cointegrating equations. The default option in Eviews is the third, namely, there is an intercept in both the cointegrating equations and the differenced form of the VAR. The presence of both intercepts implies a linear trend in the levels of the series. The above results are based on the default of Eviews. The number of lags in the VAR are also chosen by the default of Eviews.

2.** This is interpreted as follows: If there are N endogenous variables, each of which is first-order integrated there can be from zero to N-1 linearly independent cointegrating vectors. If there are N cointegrating equations, it means that none of the series is actually integrated. If the unit root tests show some series are integrated but the Johansen test show that the cointegrated rank is N, there is contradiction. In such situations we conclude absence of cointegration. (Eviews User's Guide, 193).

3. Test for cointegration are not done for Germany since the two series are not of the same order of integration

Table 4-4
Results from Lag Selection Procedure Based on Minimum Log-Schwarz
Values

Country	Lags	Deficit-GDP	Deficit-GDP and Inflation	Inflation	Inflation and Deficit-GDP
Canada	1	-8.71*	-8.66	1.13*	1.18
	2	-8.63	-8.58	1.20	1.25
	3	-8.58	-8.54	1.21	1.31
	4	-8.55	-8.53	1.29	1.40
United States	1	-8.75	-8.68	1.40	1.47
	2	-8.78*	-8.66	1.26*	1.57
	3	-8.71	-8.57	1.38	1.64
	4	-8.66	-8.44	1.46	1.67
United Kingdom	1	-7.83	-7.79	2.60*	2.68
	2	-7.87*	-7.71	2.61	2.74
	3	-7.76	-7.79	2.66	2.83
	4	-7.75	-7.55	2.78	2.83
France	1	-8.76*	-8.71	2.66	2.57
	2	-8.68	-8.67	2.46*	2.68
	3	-8.58	-8.58	2.53	2.68
	4	-8.54	-8.47	2.64	2.70
Germany	1	-8.64	-8.82**	0.56	0.47
	2	-8.793*	-8.81	0.48	0.58
	3	-8.794	-8.80	0.421*	0.70
	4	-8.67	-8.81	0.53	0.83
Italy*	1	-10.44*	-10.36	2.22*	2.24
	2	-10.39	-10.27	2.27	2.33
	3	-10.37	-10.18	2.39	2.39
	4	-10.33	-10.09	2.50	2.50

Table 4-5
Lag Selection Results Based on Minimum Log-Schwarz Values⁺

Country	lags	Deficit	Deficit and Change in CPI	Change in CPI	Change in CPI and Deficit
Canada	1	16.65	16.63	0.16	0.25
	2	16.68	16.85	0.25	0.35
	3	16.62	16.94	0.27	0.42
	4	16.54*	17.05	0.15*	0.51
United States	1	7.34	6.88	-0.02	0.01
	2	7.46	6.95	-0.05*	0.10
	3	7.51	7.05	0.03	0.16
	4	7.17*	7.14**	0.11	0.09
United Kingdom	1	16.95	16.82	0.61*	0.69
	2	16.90	16.78	0.73	0.78
	3	16.94	16.80	0.71	0.73
	4	16.73*	16.93	0.79	0.83
France	1	7.82*	7.83	-0.41*	-0.32
	2	7.93	7.824	-0.34	-0.20
	3	8.03	7.94	-0.26	-0.10
	4	8.00	8.06	-0.16	-0.09
Germany	1	4.85*	4.92	-0.52*	-0.56**
	2	4.90	4.96	-0.44	-0.46
	3	5.01	5.06	-0.39	-0.33
	4	5.22	5.06	-0.26	-0.20
Italy	1	4.73	4.64**	-0.42*	-0.37
	2	4.69*	4.70	-0.33	-0.29
	3	4.81	4.75	-0.25	-0.19
	4	4.93	4.83	-0.20	-0.07

+ The two series are not of the same order of integration, therefore, tests for cointegration were not performed.

3.0 Financing of Budget Deficits

The issue that interests us in this section is the relationship between sources of financing deficits and the money supply. Economic writing has often emphasized the bond-versus-money creation distinction and some writings on developing countries have paid attention to foreign borrowing. A growing literature on fiscal deficits deals with the relation between fiscal deficits and economic growth, the sensitivity of macroeconomic variables to changes in the public sector budget, and the channels through which fiscal deficits impinge on the economy. This literature emphasizes the implications of an increased reliance on domestic financing of public deficits as a result of the sharp reduction in external financing in most highly indebted developing countries (Buiter, 1990, Dornbush, 1985, Wijnbergen, 1989). Exploring how various methods of deficit financing affect money supply differently is often motivated by the belief that the stabilization effects of budget deficits depend to a great extent on their impact on money supply.

3.1 The 'One-Sided' Views on Monetization

Mostly, the future stream of money supply is related to the future stream of budget deficits via the budget constraint of the government. The government budget constraint in the following equation expresses the relationship between deficits and money supply at a given period:

$$G_t - T_t + rB_{t-1} = Def_t = \Delta M_t + \Delta B_t \quad (1)$$

where G stands for nominal government expenditures, T includes tax revenue and non tax revenue, B is the stock of interest-bearing government debt, r is the nominal interest rate that the government pays on the outstanding debt, and ΔM and ΔB are the changes in money supply and government debt respectively. Def stands for the government financing requirement: current expenditures plus interest payments on the outstanding debt minus tax revenues. The above equation states that in each period the government has to finance its deficits either by issuing money or new debt. In this representation, there is no difference in whether the bonds are owned by households or commercial banks. The idea that borrowing from the chartered banks does not involve any kind of monetization is based on the belief that borrowing from the banks produces a non-legal tender and, therefore, within the quantity theory framework, without much inflationary effects. It is believed that the Bank of Canada creates new money only when its Governor decides to do so, usually by buying some federal government bonds. When the government finances its deficit by borrowing from the private sector, it is engaged in debt financing. It sells securities or debt to the private sector and, in return, receives cheques from individuals and firms (including banks) in exchange for securities it sells to them. The cheques are deposited in government accounts at the Chartered banks or at the Bank of Canada and can then be spent in the same way as tax receipts. Alternatively, the government can borrow from the Bank of Canada by selling securities to the Bank (money financing). When the Bank of Canada lends to the government by buying

securities, it pays for them by giving the government a cheque on the Bank of Canada, that is, by creating high powered money. When the government spends the deposit it has received at the Bank of Canada in exchange for its debt, it leaves the private sector with larger holdings of high-powered money.

3.2 The Monetary Base Approach: The Flow-Of-Funds Approach

There also exist some very eclectic points of view on the monetizing impact of deficit financing. The relationship that lies behind the monetization of public sector deficits is established through the following two flow-of-funds accounting identities:

Public sector deficit (PSD) $\equiv$ OMO (operations in marketable debt, i.e. sale of bonds, T-Bills etc. to the non-bank private sector) + NMD (non-marketable debt, i.e. post office deposits, national savings, etc.) - MAT (use of funds to pay off maturing debt) + ECF (finance obtained or acquired to accommodate external flows) + ΔB (the increase in public sectors' monetary liabilities, i.e. an increase in high powered money). This can be rearranged as:

$$\Delta B \equiv PSD - OMO - NMD + MAT - ECF \quad (2)$$

The change in the money supply is a now multiple of the change in the monetary base originating with public sector deficits. To the extent that the deficit is not covered by the sale of debt (OMO) or non-debt items (NMD) or externally, in each case for the non-bank private sector, then it will be financed through an expansion of the money supply. All of this is true by definition, as the accounting identity shows. This accounting identity also implies that, the more sophisticated

and developed is a country's financial system, the less likely it is that public sector deficits will be monetized. With a well-developed financial system, OMO and NMD will be high (provided the non-bank private sector demands government debt), thereby taking pressure off the money supply. Furthermore, the institutional structure of the financial system, the rules and regulations surrounding financial transactions and the relationship between the central bank and the commercial banks together circumscribe the extent to which monetization of government debt will occur.⁹ The institutional structure impacts the extent to which debt sales can be secured by financial innovation or by changes in interest rates.¹⁰

The flow-of-funds accounting identity, together with the idea that the money supply is equal to the multiplier times the monetary base, also implies that, if the public sector's financial deficit is financed through the central banks acquisition of public debt, then the high-powered money base (B) is expanded and the broad based money supply (M) also expands by a multiple thereof. This idea ignores the question of how the commercial banks manage their portfolios. Within this framework the question of the extent to which commercial banks are

⁹ A recent paper summarizes this argument quite clearly. "In order to get the public to hold additional debt, the government typically has to pay higher interest rates, since an increase in the outstanding stock of debt increases the risk of default either through inflation or through debt repudiation. We argue that, for a given stream of government spending and revenues, the higher the degree of financial market development, the lower this risk premium and the higher the level of debt stock that is sustainable (or the longer the time period to reach an upper level of bond financing) (Neyapti, 1997).

¹⁰ For example, Jackson (1990), suggests that in the United Kingdom there is a strong demand for government debt from the insurance and pension funds which use gilts for matching portfolios, i.e. ensuring that the term structure of assets matches the term structure of liabilities. This means that the government can often sell its debt without increasing interest rates (Bain, 1982a, 1982b).

able to create credit has been discussed by Tobin (1963) and Gurley and Shaw (1960). The identities considered above simply give a description of balance sheet equalities which must, by definition, hold true. Money is a stock variable here and the high-powered money base is, in this approach, taken as exogenously given. Tobin (1963) and Gurley and Shaw (1960), however, suggest that the money base is endogenous since it responds to changes within the model, in particular, via interest rate differentials. This portfolio adjustment approach takes into account the asset preferences of the general public and the liability management of the financial system.

One of the major groups of actors in the credit expansion process is, of course, the commercial banks. Following Baltensperger (1972), a bank is thought of as a profit-maximizing entity operating within a specific market setting (oligopoly) which has a particular risk-preference schedule (e.g. risk aversion). Different specifications of the model over these dimensions will generate different asset demand and supply functions. Bank expansion of credit will only take place if, at the margin, it is profitable. The relevant question then is under what conditions the commercial banks will be prepared to take public sector debt into their portfolios. The behavior of portfolio decision-makers with respect to liability management of the commercial banks becomes important in this context.¹¹ Commercial banks purchase government debt and convert it into the

¹¹ Note that the causality of money, in this framework, is still from liabilities to assets and also the causality of money multiplier model running from an exogenous supply of high-powered money to the stock of money is accepted. This is the difference from the other post-Keynesians, as mentioned in footnote 1. (We will elaborate more on this in later sections).

output of the banking system — that is, deposits. A profit-maximizing bank will purchase government debt if it holds expectations that interest rates will fall. In that case, it anticipates a rise in the price of bonds and the prospects of making capital gains. Furthermore, the management of portfolio is not just driven by the objective of profit (short or long-run). There is also the question of how much risk is acceptable within the portfolio. Banks might purchase government debt when they wish to reduce their overall exposure to risk. This means that, while there is a simple accounting relationship between the public sector borrowing and the money stock, in practice, the exact nature of the relationship is likely to be more complex, depending upon the portfolio decisions of the different agents within the financial system. Thus, the monetization of public sector debt is not inevitable in the short run. There is no necessary one-to-one relationship between private sector deficits and the money stock, contrary to what is suggested by those (discussed earlier) who believe that deficits get monetized or just its opposite.

3.3 'New Classical School' on Monetization

Sargent and Wallace (1981) demonstrated that a permanently higher government deficit must eventually be accommodated by an increase in the monetary base. In other words, monetary policy cannot be manipulated independently (exogenously) when the growth path of government expenditures and the tax structure are both fixed. The choice which faces the central bank is not whether to monetize a public sector deficit but when — now or later. The result

follows from the government budget constraint plus an upper bound on the *real* per capita stock of interest-bearing public debt held by the private sector.

First, there is a limit to the growth of interest-bearing nominal government debt, relative to nominal income. This is referred to as the *transversality* condition on debt growth. Suppose that, for political or any other reasons, the current-period government is not prepared to increase taxes in order to finance the additional public spending. Issuing interest-bearing debt implies that the future-period governments will face higher debt charges which will result in higher tax rates or larger future deficits. This does not produce a stable long-run equilibrium, especially if individuals fully anticipate this (i.e. the Barro-Ricardo equivalence theorem) and respond by increasing current-period savings. The response of future governments to this state of affairs will be to monetize the debt. In order to prevent the government debt-to-income ratio rising faster than its limit, to secure a long-run equilibrium path for the economy, the government must monetize some of its debt. Clearly then, debt policy will affect monetary policy.

Second, there is the 'time inconsistency problem'. This problem refers to the set of incentives which policy makers face when solving a dynamic game. Nominal fixed-interest government debt gives the authorities an incentive to produce unanticipated inflation and, thereby, to reduce the real value of the debt and the real value of future tax liabilities. To do this, there is a strong attraction either to monetize the debt directly or to expand the money supply through some other route. The problem is to generate the optimal amount of 'surprise' inflation and this, in turn, raises the question of how much debt should get monetized. Again,

however, a link between deficit financing and an expansion of the money supply in the long-run is established. The Sargent and Wallace approach has much in common with the Barro-Ricardo equivalence theorem. Both are elements of the new classical macroeconomics and arrive at the same results, albeit via different routes. Current debt must be paid off by future taxes. Sargent and Wallace limit the increase in future 'fiscal' taxes and concentrate upon monetary (inflation) taxes. The Barro-Ricardo view ignores monetary taxes and concentrates on fiscal taxes, since in a strict Ricardian regime government deficits have no effect upon the price path because government deficits are assumed to be temporary and are expected to be offset against future taxation (or government surpluses).

From the discussion so far, we can see that all three approaches agree on the fear of deficits due to the monetization of deficits. They differ on the possibilities of monetization. The 'One Sided View' believes that there is no fear of monetization, if there is no money financing of deficits. The more eclectic approach discusses various possibilities and circumstances under which bond financing of deficits can lead to monetization. The New Classical school raises the inevitability of monetization of deficits, based on the limits of bond financing. The above discussion shows that, within the diversity of mainstream literature, there is nothing inevitable about the expansion of the money supply because of the link between changes in the public sector's borrowing to changes in interest rates. In the flow of funds analysis, there is a possibility that the total demand for finance may not rise and, consequently, that interest rates need not rise. In terms of portfolio adjustment also, it is not necessary to use interest rates to make government debt

sufficiently attractive to the non-bank private sector. The commercial banks through financial innovations can vary the nature of their debt instruments to match investors' asset preferences. However, within the Sargent and Wallace framework, there is a possibility that public sector deficits increase interest rates and, therefore, positively impact on the money supply. Here a large government deficit can induce financial instability. If agents believe that the government will eventually monetize the debt, then they will expect falling prices of securities. The debt holders will fear that they will end up in a collapsing bond market. This will make it difficult for the government to sell sufficient debt to the non-bank private sector. To do so, they would have to raise interest rates to make the debt attractive. This makes the situation worse and increases the likelihood of monetization because an explosive cycle is set up. Fear of future monetization raises the expectation of higher rates of inflation and, through the Fisher effect, this will raise expectations of increases in nominal interest rates which feed back into the monetization decision, thereby reinforcing the original fears and amplifying the cycle. Because of these fears of an explosive cycle, agents in the bond market will demand a higher nominal rate on long term bonds — higher than is justified by the current inflation. This rise in nominal interest rates increases the money supply further by increasing the cost of working capital (and therefore promotes bankruptcies and crisis borrowing from the banking sector) and by appreciation of the exchange rate (the rise in nominal interest rates relative to those in the rest of the world will cause an appreciation in the exchange rate). Thus, within the Sargent-Wallace framework a

large public deficit is generally associated with a rapid growth in the money supply. In this case, however, the effect is indirect through changes in interest rates.

3.4 Empirical Studies on Deficits and Money Supply

By the late 1960s deficit finance, after being a dormant issue in the early postwar years, attracted attention of economists who began developing theoretical and empirically-tested models on the subject. Oliviera (1967), Dutton (1971), and Gordon (1976) among others, questioned the exogeneity of the money supply and argued, instead, that money growth is a dependent variable of a policy reaction function. Moreover, the extensive empirical literature on government deficits that has developed dealt primarily with industrial countries, including many studies which estimated the central bank's reaction function within a single equation as with Mcmillen and Beard (1982), Hamburger and Zwick (1981), Allen and Smith (1983), King and Plosser (1985), Jones (1985), or Grier and Neiman (1987). In other studies, the central bank's reaction function was embedded in a system of equations describing the entire economy, as with Levy (1981), or Turnovsky and Wohar (1987). In still other studies, causality tests were performed on the linkage between money growth and other macro variables as in Dwyer (1982) or Mcmillen (1986). Further, Ahking and Miller (1985) employed a tri-variate autoregressive process with government deficit, money growth, and inflation, and found that, for the 1950s and 1970s, government deficits and inflation were causally related, but not for the 1960s. Also, Hoffman *et al.* (1983) argued that there had been a significant and positive relationship between monetary growth and deficit spending, since the central

bank had responded to capital market pressure which had appeared in advance of impending debt issues. Conversely, in other studies a non-accommodation by central banks was implied, such as in Wood (1967), Friedlander (1973), Gordon (1977), Mcmillen and Beard (1982), Dwyer (1982), and Jones (1985).

Moreover, the Ricardian equivalence Theorem (Barro, 1974) depicted government deficits as having no influence on inflation, since rational agents save to pay for the future tax obligations, which would be produced by government deficits. Evans (1985) found supporting empirical evidence for the presence of a Ricardian regime. Conversely, Sargent and Wallace (1981), under the assumption that the time paths of government expenditures and revenues are exogenously determined, have argued that bond-financed government deficits are non-sustainable, and are therefore bound to exert pressure on the central bank to monetize the government debt. Langdana (1990) in a model further extended the Sargent-Wallace thesis by including foreign capital flows. Miller (1983) and Cox (1985) argued that even the growth of the non-monetized government deficit can be inflationary, as long as such a deficit is perceived as permanent, and interest payments on government bonds are deficit-financed, as opposed to tax-backed. Further, some of the studies suggested some monetization of public debt, as for instance in Anderson and Jordon (1968), Levy (1981), Froyen (1974), Barro (1977; 1978), Niskanen (1978), Mcmillen and Beard (1982), Mcmillen (1986), Hamburger and Zwick (1981), Dewald (1982), Barth *et al.* (1982), Blinder (1982). In another study, a positive close association had been established between central banks' lending to governments and

printing of base money (Leone, 1991). Further, Leone found that countries with relatively low ratios of government deficits to GDP were able to maintain relatively low holdings of government securities by their central banks.

In addition, Gordon (1976), Aghevli and Khan (1978), Dornbusch and Fisher (1981), Protopapadakis and Siegel (1987), Barro (1977), Niskanen (1978), Giffen *et al.* (1983), and Hafer and Hein (1988) found little evidence of a close relationship between deficits and inflation. Further, Blinder (1982) found that, unless accompanied by faster adjusted bank reserve growth, government deficits had no long-run effect on inflation. Haulk (1981), and Dwyer (1982) also, found no connection between government budget deficits and inflation. Conversely, Akhar and Wilford (1979), Mcmillen and Beard (1982), Levy (1981), Hamburger and Zwick (1981), and Dewald (1982) found a positive relationship between government deficits and money growth.

As can be seen from the above discussion, the relationship between deficits and money supply is mostly studied in the context of inflation. Embedded in the explorations of the relationship between deficits and money supply is the theory of inflation. This can be evidenced, for example, (i) in McMillin (1986) where multivariate Granger causality tests are done based on a regression which involves the inflation rate, or (ii) in Landon and Reid (1990), who incorporate within their system of equations the relationship that "a change in the rate of monetary expansion may alter the current level of output or the rate of money price change which may, in turn, impact the government's budget position, causing the monetary authority to alter the money growth rate" (p.382), or (iii) in

Karatzas (1993), who analyzes the linkage between inflation and deficit finance through the monetization of government debt. Our contention is that, if the relationship is true for the 'whole', then it must be true for the part. In other words, if deficits lead to greater monetization, in conjunction with income and inflation, then it must be fundamentally true between the two variables themselves. Therefore, in order to establish the one-to-one correspondence between deficits and money supply, it is pertinent to establish the relationship on its own.

Also, the measure of monetary policy variable in most of these empirical studies is almost exclusively the monetary base, though the choice of deficit measure is quite varied. The choice of the monetary base is based on the idea that actions of the central bank dominate movements in the money supply more than the private sector response to the deficits. The choice of the monetary base is also sometimes linked to the Barro linkage, where government finances expenditures by a mixture of taxes and money creation. Both these notions, i.e. the link between deficits and inflation and the use of the monetary base as the relevant monetary aggregate, are problematic. In section two, we have already shown the absence of any inter-temporal relationship between budget deficits and inflation. The use of the monetary base as the relevant monetary aggregate misses out the role of financial institutions in the economy and denies the role of credit in the present day economies (the theoretical discussion and the empirical

evidence in the later sections of this chapter establish the endogenous nature of both money and deficits).¹²

In order to test the hypothesis that the central bank will be obliged to monetize the deficit in the current period and that such monetary accommodation will lead to increases the in money supply and, *ceteris paribus*, in the rate of inflation in the future periods, we examine whether deficits and the monetary base are cointegrated. Moreover, we analyze whether there was any inter-temporal relationship or predictability, first, between fiscal deficits and changes in monetary base or between Deficit-to-GDP ratio and the rate of change in monetary base and, later among the three variables: the rate of change in the monetary base and inflation or the change in the monetary base and the change in the price index.

3.5 Granger Causality Results among Deficits, Monetary Base and Inflation

To understand the process of monetization, unit root tests and cointegration tests were done between fiscal deficits and the monetary base for six of the G-7 countries. The unit root tests results reveal that deficits and the monetary base are integrated of order one for all countries (see for detailed results, Table 4-2). Based on the unit root tests, the cointegration test results suggest the absence of a cointegrating relationship between deficits and the monetary base (see for detailed results, Table 4-6). This implies that, empirically, we do not find any long-term equilibrium relationship between deficits and the

¹² Some studies which use multi-equation models or the studies which distinguish between the supply-side and demand-side explanations of the debt-money relationship are an exception which use broader measures of money than the monetary base.

monetary base. We also found an absence of a cointegrating relationship between deficits and the monetary base for quarterly data. Though we do not report these results in this chapter, these tests were done for two time periods: mid 1950s to 1979 and 1980 to the mid nineties. These tests were performed to confirm whether there was a shift in the relationship between the variables after the 1970s.

The absence of a cointegrating relationship between deficits and the monetary base implies that there is no contemporaneous correspondence between budget deficits and money creation. This means that the strict government budget constraint, discussed in equation 1 or 2, does not find support empirically. It is important to distinguish here between the government budget constraint as an accounting identity and as one describing a economic relationship. The absence of cointegration suggests the lack of support for the economic relationship. The economic relationship implied in the standard budget constraint is that the extent of monetization of budget deficits depends on the contemporaneous nature of financing of budget deficits. However, the results in this section imply that the fear of contemporaneous monetization based on the nature of financing of deficits is not supported empirically.

Table: 4-6
Johansen and Juselius Cointegration Test* between Fiscal Deficit and Monetary Base

Country	Null Trace test A. $r=0$ B. $r \leq 1$	Alternative $r > 0$ $r > 1$	Critical Values 95% A. B.	Critical Values 99% A. B.
Canada 1955-96	A. 5.687 B. 0.179		A. 15.41 B. 3.76	A. 20.04 B. 6.65
United States 1957-95	A. 41.28 B. 8.69**		A. 15.41 B. 3.76	A. 20.04 B. 6.65
France 1952-95	A. 9.484 B. 2.788		A. 15.41 B. 3.76	A. 20.04 B. 6.65
United Kingdom 1952-94	A. 34.85 B. 4.19**		A. 15.41 B. 3.76	A. 20.04 B. 6.65
Italy 1955-95	A. 13.44 B. 1.10		A. 15.41 B. 3.76	A. 20.04 B. 6.65
Germany 1952-90	A. 13.59 B. 3.00		A. 15.41 B. 3.76	A. 20.04 B. 6.65

Notes

* Johansen framework considers five combinations of intercept-trend cases. They differ according to various possible specifications of the VAR equations and the cointegrating equations. The default option in Eviews is the third, namely, that there is intercept in both the cointegrating equations and the differenced form of the VAR. The presence of both intercepts implies a linear trend in the levels of the series. The above results are based on the default of Eviews. The number of lags in the VAR are also chosen by the default of Eviews.

3.** This is interpreted as follows: If there are N endogenous variables, each of which is first-order integrated there can be from zero to N-1 linearly independent cointegrating vectors. If there are N cointegrating equations, it means that none of the series is actually integrated. If the unit root tests show some series are integrated but the Johansen test shows that the cointegrated rank is N, there is contradiction. In such situations we conclude absence of cointegration. (Eviews User's Guide, 193).

Furthermore, as discussed earlier, the other common belief amongst economists seems to be that the central bank will be ultimately obliged to monetize, either in the current or in future periods. To understand the inter-temporal link between deficits and the monetary base, we also performed Granger causality tests between fiscal deficits and changes in the monetary base or between the deficit-to-GDP ratio and the rate of change in the monetary base (Table 4-7, 4-8).

The results from the lag selection procedure and causality regressions are summarized in Table 4-7, 4-8 and 4-9. The lag selection procedure suggests only four possible causal relationships: from the rate of change of the monetary base to deficit-to-GDP ratio for the United States, France, Germany and Italy and, from the monetary base to deficit for Italy (Table 4-7). Granger causality regressions confirm this causal connection as statistically significant for the United States, France, and Germany. The suggested causality for Italy is not statistically significant (Table 4-9). No causality is found from the deficit-to-GDP ratio to rate of change in the monetary base for all six countries (Table 4-7, 4-9). This means that, for all six countries, we do not find any evidence that suggests that changes in deficits today lead to future monetization. This evidence is not in support of the argument made by Sargent and Wallace, Barro, McCallum and others who believe that monetary accommodation is inevitable over the course of time.

Table 4-7

Results from Lag Selection Procedure Based on Minimum Log-Schwarz Values

Country	Lags	Deficit-GDP	Deficit-GDP and Rate of Change in Monetary Base	Rate of Change in Monetary Base	Rate of Change in Monetary Base and Deficit-GDP
Canada**	1	-8.71*	-8.55	2.43*	2.53
	2	-8.63	-8.66	2.54	2.56
	3	-8.58	-8.54	2.68	2.64
	4	-8.55	-8.47	2.76	2.70
United States	1	-8.75	-8.74	2.32*	2.43
	2	-8.78*	-8.64	2.40	2.53
	3	-8.71	-8.64	2.36	2.45
	4	-8.66	-8.84**	2.48	2.58
United Kingdom	1	-7.83	-7.74	4.80	4.58
	2	-7.87*	-7.62	4.56*	4.67
	3	-7.76	-7.55	4.68	4.74
	4	-7.75	-7.45	4.77	4.80
France	1	-8.76*	-8.79**	4.58*	4.63
	2	-8.68	-8.68	4.69	4.73
	3	-8.58	-8.59	4.68	4.80
	4	-8.54	-8.47	4.68	4.92
Germany	1	-8.64	-8.58	4.04*	4.11
	2	-8.793*	-8.96	4.17	4.19
	3	-8.794	-8.84	4.14	4.29
	4	-8.67	-9.09**	4.20	4.38
Italy	1	-10.44*	-10.54**	5.35	4.70
	2	-10.39	-10.40	4.75	4.79
	3	-10.37	-10.28	4.60*	4.90
	4	-10.33	-10.16	4.63	4.99

** The order of integration of the 2 series is the same only for Canada, the trace statistics are 11.13 and 3.78 and they reject any cointegration in the series.

Table 4-8
Lag Selection Results Based on Minimum Log-Schwarz Values⁺

Country	lags	Deficit	Deficit and Change in Mbase	Change in Mbase	Change in Mbase and Deficit
Canada	1	16.65	16.73	11.66*	11.69
	2	16.68	16.85	11.77	11.77
	3	16.62	16.94	11.87	11.72
	4	16.54*	17.05	11.98	11.79
United States	1	7.34	6.89	3.42*	3.85
	2	7.46	6.99	3.48	3.93
	3	7.51	6.89	3.55	3.72
	4	7.17*	6.64**	3.47	3.79**
United Kingdom	1	16.95	16.82	14.00	13.90
	2	16.90	16.78	13.82*	13.96
	3	16.94	16.80	13.95	14.00
	4	16.73*	16.93	14.03	14.04
France	1	7.82*	7.86	5.71*	5.64
	2	7.93	7.98	5.82	5.62**
	3	8.03	8.08	5.93	5.65
	4	8.00	8.14	6.04	5.77
Germany	1	4.85*	4.73**	3.84*	3.93
	2	4.90	4.76	3.94	4.03
	3	5.01	4.89	3.94	4.13
	4	5.22	5.02	4.08	4.27
Italy	1	4.73	4.31**	17.48*	17.46**
	2	4.69*	4.41	17.55	17.55
	3	4.81	4.52	17.62	17.63
	4	4.93	4.62	17.73	17.68

+ The two series are not of the same order of integration, therefore, tests for cointegration were not performed.

Table 4-9: Regression Results

Deficit-GDP and Rate of Change in the Monetary Base	No Cointegration No Causality from Rate of Change in Monetary Base to Deficit-GDP for 3 countries for United States, $F=17.36^*[4]$ for France, $F=4.64^*[1]$ for Germany, $F=17.52^*[4]$ for Italy, $F=0.12[1]$ No Causality from Deficit-GDP to Change in Monetary Base for all 6 countries
Rate of Change in the Monetary Base and Inflation	No Cointegration No Causality from Rate of Change in Monetary Base to Inflation for all 6 countries No Causality from Inflation to Change in Monetary Base for all 6 countries
Deficit and Change in the Monetary Base	No Cointegration Deficit to Change in Monetary Base United States, $F=45.72^*[1]$ France, $F=10.3^*[1]$ Italy, $F=4.004^*[1]$ Change in Monetary Base to Deficit Germany, $F=8.70^*[1]$ United States, $F=21.88^*[4]$ Italy, $F=0.42[1]$
Change in the Monetary Base and Change in CPI	No Cointegration No Causality from change in monetary base to change in CPI for 5 countries, for UK, $F=31.12[4]$ No Causality from change in CPI to change in monetary base for 4 countries for UK, $F=5.72[1]$, for Germany, $F=5.71[1]$

As mentioned earlier, we also did Granger causality tests between deficits and the change in the monetary base. We get bi-directional causality for the United States, and Italy (Table 4-8 and 4-9) and from deficits to change in monetary base for France and the other way around for Germany. Thus, in these regressions, we do get evidence of "central bank monetization" for countries where the pressure of debt has forced governments to finance its purchases through the central bank. However, as discussed in the earlier section, we did not find any evidence of such 'monetization' being inflationary.

In order to further capture the inflationary effects of deficits through monetization, we conducted Granger causality tests between rate of change in the monetary base and inflation or between changes in the monetary base and changes in the price index. We do not find any temporal relationship between the rate of change in the monetary base and inflation for all six countries and between changes in monetary base and change in the price index for five countries (except the UK).

The overwhelming evidence from regression results estimating Granger causality suggests the absence of any causal connection among different measures of deficits, monetary base and inflation for all countries. It needs to be remembered that the suggested relation between deficits and the monetary base, through the financing story, is mostly not an inter-temporal relationship, and this is what the Granger causality test implies. The absence of a contemporaneous relation between deficits and the monetary base has already been established. The inter-temporal relationship from deficits to monetary base

found in the case of some countries supports the argument of Sargent and Wallace and others. However, the monetization argument, as suggested by the New Classical school or the one based on the portfolio behavior of commercial banks is concerned with the inflationary effects of such monetization. The absence of an inflationary impact of the Sargent-Wallace variety of monetization necessitates that we explore some alternative links between deficits and the money supply.

4.0 Money as a 'Flow' Variable: Alternative Links between Deficits and the Money Supply

Are there alternative ways of looking at the relationship between deficits and the money supply? In this section, we discuss some of the contributions which link deficits and the money supply, not on the basis of the type of financing of public deficits, but at a more fundamental and theoretical level. The heterodox monetary theorists do not focus on money primarily as a *stock* variable under the control of the monetary authorities; rather, money is treated as a *flow* variable arising as an outcome of the endogenous interaction of economic agents within the banking sector. They question the very ability of the central bank to control the extent of monetization of deficits as well as the mechanism of financing such deficits. These contributions are based on the endogenous view of money¹³ and

¹³ As already mentioned in footnote 1, the endogeneity of money here is motivated differently from the endogeneity discussed earlier, based on the writings of Gurley and Shaw and Tobin. The standard post-Keynesian view of endogenous money (though not fully accepted by all post-Keynesians) can be summarized by the following four facts: Loans make deposits, broader aggregate of money makes base money, the money supply curve is horizontal and the rate of interest is exogenous. This endogeneity is more fundamental than the endogeneity discussed above in the flow-of-funds framework where it is base money which makes broader money aggregates.

often discuss the links between deficits and money supply on distributive considerations.¹⁴

Post-Keynesians agree that the supply of credit money is endogenously determined by market forces characterizing the demand for bank credit, and not exogenously controlled by the monetary authorities, as asserted in the mainstream literature. In a simplified model of the monetary circuit, Lavoie (1992) argues that the impact of the public sector running a deficit is that 'commercial banks create a deposit account in favor of the government .. and loans are now called Treasury bills or bonds'. He argues that money is created in both instances, i.e. when the commercial banks grant loans to the private sector and to the public sector. This implies that the process of money creation (monetization) for deficits is endogenous to macroeconomic processes, and that the central bank has no direct control over the quantity of base money. Banks make loans independently of their reserve positions and then borrow any needed reserves. The Fed lends to the banks whatever they need. The inelastic nature of the demand for bank reserves leaves no control over the quantity of money. The Fed controls only the price. When required reserves are not forthcoming on the open market, the Fed ends up providing them at the discount window.

¹⁴ Seccareccia (1995) and Robinson (1995) bring out this quite clearly. They recognize that the effect on the money supply is similar whether the deficit is "monetized" through an increase in central bank money or whether it is "monetized" through the private financial system. The difference has to do solely with whether or not it is the financial or *rentier* sector that profits from the monetization through a reflux of interest payments to the private banking and financial system. The often repeated proposal that the Bank should decide to buy Treasury bills and government bonds to pay less interest to other holders is useful only in so far as it helps to show the difference between what seems logical and in the general interest on the one hand and how the system actually works and in whose interest on the other.

If banks were left on their own to obtain more reserves, no amount of inter-bank lending would be able to create the necessary reserves. Inter-bank lending changes the location of the reserves but the amount of reserves in the entire banking system remains the same. On the other hand, reserve requirements are a means by which the Federal Reserve controls the price of funds which banks lend. Therefore, when the monetary authorities decide to tighten up the conditions under which the discount window can be used, this decision will affect the cost to the banks of obtaining their needed reserves (Moore, 1988, Ch. 6). But because central banks are obligated to accommodate the demand for reserves at the discount window, no effective quantity constraint exists on banks reserve needs.

The argument here is that government deficits get monetized anyway (financed either by chartered banks or the central bank) but the central bank does not have control over the actual process of monetization that occurs in the economy. The central bank controls the price of reserves but, by deciding the price of reserves, it does not control the structure of reserves.

In relation to the monetization of budget deficits, the endogenous money argument implies that the money supply is not based on the financing decision of the central bank. Rather the association between deficits and the money supply reflects the common association of the two variables to aggregate economic activity. All budget deficits get financed, and the process of financing is implicit in the process of expenditures associated with deficits. In an economy in which bank credit is the primary mode of financing productive activity, the process of

expenditures by the government (meaning deficits) involves the creation of a loan (deposit account) in favor of the government (in this sense the deficits are always financed) and there is always creation of credit money. In a modern credit-money system, in which all money is created independently through the actions of the banking system, the supply of finance adjusts automatically to meet the volume of credit demanded by borrowers (including the government) at any given interest rate. Money is integrated into the production economy.

The essentiality of money is also central to the circulation approach.¹⁵ Money is the *sine qua non* of a capitalist economy, its existence condition. *Circuitistes* view money primarily as a means of circulation, not as a good that people wish to hold. The monetary circuit model elaborates the process of money creation and its destruction. The financing of government deficits is merely one element in the process of monetary creation. Savings are not, therefore, a 'source' of financing deficits. In fact, increases in bank deposits (savings) could be conceived as an obstacle to the closure of the monetary circuit and, presumably, positively correlated with the evolution of debt in the economy. The initial finance (credit) at the beginning of the production cycle, advanced by the banking system, is extinguished from the sale proceeds of output at the end of the circuit. In this situation, the household patterns of expenditures will determine the volume and composition of the monetary reflux to the banking system, i.e. the reimbursement of the existing loans by firms is the

¹⁵ For a useful discussion of the post-Keynesian and Circulation approaches, see Deleplace and Nell (1996) and in particular Seccareccia (1996) and Parguez (1996).

result of spending by the households. Credit and money are destroyed in the reimbursement process. At the end of the production cycle, what remains as money is just a residual.

At this stage, the banking sector becomes a financial intermediary. The banks consolidate previously made loans to the firms, the amount of which is equal to the savings that the households do not wish to hold in non-liquid form. (Lavoie, 1992, 155).

The implication of the circuit view of credit money for government deficits is that governments with large budget deficits are seen as providing stability to the fragile credit system because of their spending powers and their impact on aggregate demand.

Through their links with the central bank financing, governments simply do not face the same sort of constraints as, say, private firms do in dealing with problem of monetary reflux. It is only when policy-makers seek to subject the state sector to the same fiscal constraints, which are imposed by the financial system on the private sector, that systemic instabilities arise.... (Seccareccia, 1996, 414).

Thus bank credit not only finances initial production but it also bridges the gap between the initial act of commencing production and the ultimate reflux originating from the expenditures of households, governments and firms in the consumption and capital goods sector (Seccareccia, 1997, 7). Therefore, the association between deficits and the money supply is a reflection of the intensity of aggregate economic activity, as well as the expenditure pattern of households. The additional income of households associated with the increased economic activity will lead to an increment in consumption expenditures and also an additional increment in household savings. The latter two elements of reflux would be used to reduce the overall outstanding debt with the banking sector.

Any change in the household portfolio preference would directly impact on the net indebtedness in the economy.

Given this framework of credit (money) creation and destruction, where the amount of money in the economy is the outcome of the level of economic activity and expenditure patterns of the economic agents, there ought to be a positive empirical association between the money supply process and economic activity. Since *ceteris paribus* higher government deficits are associated with increased economic activity, it is expected that deficits and the money supply would also be empirically related. However, since here the notion of money is in terms of credit (the deposits made by loans), it is appropriate to expect this relationship between deficits and money supply through various broader measures of either credit or monetary aggregates such as M2, M2+ and M3.

In the following section, we wish to capture the empirical 'reality' of deficits and the money supply and try to reconstruct the endogenous link between deficits and the money supply process.

4.1 Granger Causality Results among Deficits, Gross Domestic Product and M1

In this section, we report the results of Granger causality tests among deficits, Gross Domestic Product and M1. The idea is to capture the relationship between aggregate economic activity, proxied by GDP and fiscal deficits, and some broad measure of money, endogenously linked to aggregate economic activity.

Lacking sufficient annual series for M2, M2+ or M3 for the previously mentioned group of countries, data for M1 were used to conduct the various tests. Since M1 includes demand deposits, it is likely that growth in M1 is associated with the increment in economic activity due to increased transaction balances (cash and/or bank deposits) associated with the increment in income. Existence of such a relationship would suggest the link between the money supply process and economic activity.

The Johansen cointegration tests suggest that there exist cointegrating relationships among deficits, GDP and M1 for Canada, France, Germany and Italy (Table 4-10). For the United States and the United Kingdom we did not find any cointegration between these three variables. Cointegration reflects the presence of a long-run relationship between these variables and, therefore, some endogenous association between deficits, GDP and the money supply. In the earlier section (Table 4-3), we did not find any contemporaneous link between deficits and the monetary base. The presence of such a relationship between deficits and M1 shows that what lies at the heart of this cointegration relationship are the demand deposits (and therefore changes in money balances associated with changes in economic activity and income).

Regression results (Table 4-12) reveal the temporal precedence of both GDP and deficits to M1 for Canada, France, Italy and Germany. In other words, for all countries where we found cointegrating relationships between deficits, GDP and M1, the causal link is from changes in GDP this period, which precedes changes in M1 next period. Thus M1 seems to be endogenous to

changes in the aggregate level of economic activity. Similarly, changes in deficits this period precede changes in M1 next period. Thus changes in both deficits and GDP impact upon M1 in the next period. This could be interpreted to mean that a greater intensity of economic activity (and higher deficits) today leads to higher growth in the stock of money in the next period.

We do not get any causal connection between Deficits and GDP (Table 4-12). In some sense, this was to be expected. This is because, earlier in chapter 2 and 3, we found that interest rate changes are behind the increase in deficits for the G-7 countries. Such characteristics of deficits can also alter the expansionary economic impact of deficits.

For the United States, we find that changes in deficits precede M1 only in a situation where the relationship is not mediated through GDP. We also find similar causation from GDP to deficits for the United States (Table 4-12). Both these causal connections point towards the endogenous nature of deficits and the money supply. The United Kingdom is the only country where we find the causal link from M1 to deficits and from GDP to deficits. This implies that, though changes in GDP this period impact deficits next period, it is the changes in M1 which impact upon changes in deficits next period. It may be mentioned here that it is conceivable to observe a link between M1 and deficits in a situation where changes in M1 (arising out of changes in economic activity) have an impact on the deficits next period through the automatic stabilizers. However, the Granger causality results among deficits, M1 and GDP for the United Kingdom do not provide us an answer as to where the change in M1 are coming from. This

makes the results for the United Kingdom susceptible to being interpreted as evidence in support of exogenous money.¹⁶ Such regression results are an exception rather than the rule. Out of a possible 54 causal connections, only five do not support the idea of the endogenous nature of the money supply process as established theoretically above.

Most of the evidence from Canada, the United States, France, Germany and Italy is found to be consistent with the idea of a growing economy associated with an increase in the money supply in the following period. What is important, however, is that such "monetization" has little to do with inflation (the results in section 2 and 3 confirm this).

Within the given constraints of data and a smaller number of observations, we did Granger causality tests among M2, GDP and Deficits for the United States and Canada for the time period 1968 to 1996. The results are mixed: for Canada the results are similar to those we have reported with M1, but for the United States it is not so. Summary of these results is provided in the appendix.

¹⁶ Some additional causal links from M1 to GDP for Italy and Germany and M1 to deficits for Italy (Table 4-11) can also be interpreted as likely support for the exogenous money point of view.

Table: 4-10
Johansen and Juselius Cointegration Tests* among Fiscal Deficits, GDP
and M1

Country	Null Trace test	Alternative	Critical Values 95%	Critical Values 99%
	1. $r=0$ 2. $r \leq 1$ 3. $r \leq 2$	$r > 0$ $r > 1$ $r > 2$	1. 2. 3.	1. 2. 3.
Canada 1955-96	1. 62.719 2. 11.389 3. 0.563		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65
United States 1957-95	1. 73.46 2. 25.13 3. 4.655**		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65
France 1952-95	1. 51.405 2. 22.701 3. 2.878		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65
United Kingdom 1952-94	1. 64.398 2. 16.410 3. 4.067**		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65
Italy 1955-95	1. 32.433 2. 8.091 3. 0.226		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65
Germany 1952-90	1. 35.50 2. 10.808 3. 0.0008		1. 29.68 2. 15.41 3. 3.76	1. 35.65 2. 20.64 3. 6.65

Notes:

1. * Johansen framework considers five combinations of intercept-trend cases. They differ according to various possible specifications of the VAR equations and the cointegrating equations. The default option in Eviews is the third, namely, that there is intercept in both the cointegrating equations and the differenced form of the VAR. The presence of both intercepts implies a linear trend in the levels of the series. The above results are based on the default of Eviews. The number of lags in the VAR are also chosen by the default of Eviews.

2.** This is interpreted as follows: If there are N endogenous variables each of which is first-order integrated, there can be from zero to N-1 linearly independent cointegrating vectors. If there are N cointegrating equations, it means that none of the series is actually integrated. If the unit root tests shows some series are integrated but the Johansen test show that the cointegrated rank is N, there is contradiction. In such situations, we conclude absence of cointegration. (Eviews User's Guide, 193).

Table 4-11
Lag Selection Results Based on Minimum Log-Schwarz Values

Country	lags	Deficit	Deficit and M1	Deficit, M1 and GDP	Deficit and GDP	Deficit GDP and M1
Canada*	1	16.49	16.24		16.20	
	2	16.16*	16.33		16.19	
	3	16.23	16.34		16.26	
	4	16.33	16.46		16.34	
United States	1	6.92	6.97		6.83	6.96
	2	7.04	7.06		6.73	7.05
	3	7.12	7.10		6.66**	7.22
	4	6.88*	7.02		6.75	7.40
United Kingdom	1	16.95	16.64	16.67	16.82	16.60***
	2	16.90	16.64**	16.60	16.71**	16.62
	3	16.94	16.74	16.44**	16.72	16.74
	4	16.73*	16.87	16.52	16.80	16.87
France*	1	7.38	7.21		7.20	
	2	7.35	7.20		7.28	
	3	7.35	7.14		7.37	
	4	7.13*	7.23		7.36	
Germany*	1	4.70*	4.81		4.80	4.68
	2	4.71	4.92		4.64**	4.80
	3	4.90	5.02		4.75	4.93
	4	4.95	5.02		4.75	5.02
Italy*	1	4.85	4.81	4.36	4.86	
	2	4.78*	4.88	4.44	4.93	
	3	4.86	4.84	4.13	4.90	
	4	4.95	4.42**	4.02**	4.82	

cont....

Table 4-11 (cont.)
Lag Selection Results Based on Minimum Log-Schwarz Values

Country	lags	M1	M1 and Deficit	M1 Deficit and GDP	M1 and GDP	M1 GDP and Deficit
Canada*	1	14.53	14.55	14.31	14.49	14.24
	2	14.51*	14.63	14.25	14.32	14.27
	3	14.63	14.45**	14.16***	14.31	14.25
	4	14.68	14.52	14.24	14.21**	14.16***
United States	1	6.87*	6.711**	6.59***	6.88	
	2	6.96	6.77	6.64	6.89	
	3	7.04	6.713	6.73	6.99	
	4	7.08	6.714	6.74	7.00	
United Kingdom	1	19.141*	19.23		19.06**	19.16
	2	19.179	19.32		19.11	19.25
	3	19.29	19.36		19.08	19.30
	4	19.42	19.40		19.07	19.33
France*	1	7.49*	7.58	7.58	7.50	7.54
	2	7.60	7.66	7.66	7.45**	7.59
	3	7.70	7.74	7.74	7.54	7.71
	4	7.81	7.48**	7.28***	7.53	7.44***
Germany*	1	5.97	5.55**	5.71	5.77	5.44***
	2	5.74*	5.62	5.49***	5.70	5.51
	3	5.80	5.70	5.59	5.75	5.61
	4	5.87	5.81	5.51	5.57**	5.69
Italy*	1	18.62	18.31	17.76	18.10	18.12
	2	18.26*	19.38	17.85	18.20	18.22
	3	18.34	18.25**	17.91	18.29	17.74***
	4	18.42	18.36	17.75***	18.10**	17.83

cont....

Table 4-11 (cont.)
Lag Selection Results Based on Minimum Log-Schwarz Values

Country	lags	GDP	GDP and M1	GDP M1 and Deficit	GDP and Deficit	GDP Deficit and M1
Canada*	1	18.123*	18.06	18.10	18.20	
	2	18.29	18.03**	18.12	18.78	
	3	18.19	18.10	18.17	18.36	
	4	18.12	18.13	18.21	18.31	
United States	1	8.49	8.49		8.61	
	2	8.46	8.50		8.66	
	3	8.45	8.54		8.71	
	4	8.42*	8.65		8.70	
United Kingdom	1	17.13*	17.18		17.18	
	2	17.23	17.27		17.16	
	3	17.34	17.30		17.28	
	4	17.40	17.37		17.16	
France*	1	8.34*	8.44		8.45	
	2	8.35	8.48		8.46	
	3	8.44	8.54		8.48	
	4	8.55	8.48		8.70	
Germany*	1	6.52	6.39	6.28	6.48	
	2	6.454*	6.36**	6.20***	6.455	
	3	6.55	6.50	6.30	6.459	
	4	6.56	6.63	6.40	6.68	
Italy*	1	8.22*	8.23	8.27	8.221**	8.16***
	2	8.31	8.18**	8.34	8.29	8.23
	3	8.28	8.27	8.38	8.37	8.32
	4	8.30	8.38	8.43	8.46	8.42

Table 4-12
Granger Causality Tests based on OLS Equations A, B and C
(Deficits, M1 and GDP)

Country	F- Statistic	Causal
Canada* 1955-96 Equation A Equation B Equation C	No suggested causality $F_{ect} = 0.62$, $F = 14.26^{***}$ [3] $F_{ect} = 0.005$, $F = 14.88^{***}$ [4] $F_{ect} = 0.55$, $F = 27.00^{***}$ [4] $F_{ect} = 0.616$, $F = 26.19^{***}$ [3] $F_{ect} = 0.24$, $F = 15.26^{***}$ [2]	Deficit to M1 Deficit to M1 GDP to M1 GDP to M1 M1 to GDP
United States 1954-95 Equation A Equation B Equation C	$F = 17.55^{***}$ [3] $F = 41.56^{***}$ [4] No suggested causality	GDP to Deficit Deficit to M1
France* 1952-95 Equation A Equation B Equation C	No suggested causality $F_{ect} = 20.62^{***}$, $F = 8.72^{**}$ [2] $F_{ect} = 0.0001$, $F = 17.8^{***}$ [4] $F_{ect} = 0.33$, $F = 16.8^{***}$ [4] $F_{ect} = 0.012$, $F = 15.9^{***}$ [4] No suggested causality	GDP to M1 GDP to M1 Deficit to M1 Deficit to M1
Italy 1955-95 Equation A Equation B Equation C	$F_{ect} = 0.55$, $F = 34.72^{***}$ [4] $F_{ect} = 0.67$, $F = 34.68^{***}$ [4] $F_{ect} = 3.73$, $F = 22.64^{***}$ [4] $F_{ect} = 5.54$, $F = 40.44^{***}$ [4] $F_{ect} = 3.24$, $F = 11.25^{**}$ [3] $F_{ect} = 5.53$, $F = 25.5^{***}$ [3] $F_{ect} = 1.61$, $F = 7.90^{***}$ [1] $F_{ect} = 2.67$, $F = 5.59^{**}$ [2]	M1 to Deficit GDP to Deficit GDP to M1 GDP to M1 Deficit to M1 Deficit to M1 M1 to GDP M1 to GDP

cont....

Table 4-12 (cont.)
Granger Causality Tests based on OLS Equations A, B and C
(Deficits, M1 and GDP)

Germany 1952-90 Equation A Equation B Equation C	$F_{ect} = 6.97^{**}$, $F = 9.54^{**}$ [2] $F_{ect} = 9.19^{***}$, $F = 21.44^{***}$ [4] $F_{ect} = 3.08$, $F = 8.02^{**}$ [2] $F_{ect} = 0.63$, $F = 10.32^{***}$ [1] $F_{ect} = 6.72^{**}$, $F = 6.94^{**}$ [1] $F_{ect} = 1.61$, $F = 7.90^{***}$ [2]	GDP to Deficit GDP to M1 GDP to M1 Deficit to M1 Deficit to M1 M1 to GDP
United Kingdom 1952-94 Equation A Equation B Equation C	$F = 7.08^{**}$ [1] $F = 7.68^{**}$ [2] $F = 18.78^{**}$ [3] $F = 7.13^{**}$ [1] No suggested causality No suggested causality	M1 to Deficit M1 to Deficit GDP to Deficit GDP to Deficit

Notes

1. Equation A: M1, GDP and deficit (with their lags) are regressed on deficit as an independent variable along with a constant.
2. Equation B: M1, GDP and deficit (with their lags) are regressed on M1 as an independent variable along with a constant.
3. Equation C: M1, GDP and deficit (with their lags) are regressed on GDP as an independent variable along with a constant.
4. Numbers in parenthesis show the number of lags
5. * significant at 10%, ** significant at 5%, *** significant at 1%

5.0 Conclusion

This chapter examines whether higher public sector deficits result in the expansion of the money supply and, hence, financial instability and inflation. The chapter establishes that the money supply and deficits are endogenous to economic activity. The dynamics between deficits, economic growth and the money supply (seen as a consequence of the demand for credit) is elaborated in this chapter at three levels.

In section 2, we examine the proposition that when budget deficits are bond-financed, they are still necessarily linked with inflation, even though this linkage might not be a contemporaneous one. To capture the inter-temporal linkage between deficits and inflation, Granger causality tests were performed between deficit-to-GDP ratio and inflation or between deficit and changes in the CPI using annual data for the G-7 countries, except Japan. We did not find any cointegrating relationship between these variables. This means that there is no evidence of any contemporaneous relationship between deficits and inflation. There was no evidence of an inter-temporal causal relation from fiscal deficits to a change in the CPI (except for Germany) and between the deficit-to-GDP ratio and inflation for all six countries.

In the next section, we test the proposition according to which the central bank will always be obliged to monetize the deficit in the current or future period. Moreover, we evaluate whether such monetary accommodation will lead to increases in the money supply and, *ceteris paribus*, in the rate of inflation in future

periods. There is no cointegrating relationship between deficits and the monetary base. This implies that the strict government budget constraint, does not find support empirically. The absence of cointegration suggests the lack of support for the economic relationship. The economic relationship implied in the standard budget constraint is that the extent of monetization of budget deficits depends on the contemporaneous nature of financing of budget deficits.

The other common belief amongst economists is that the central banks are ultimately obliged to monetize, either in the current or in future periods. To understand the inter-temporal link between deficits and the monetary base, we also performed Granger causality tests between fiscal deficits and changes in the monetary base or between the deficit-to-GDP ratio and the rate of change in the monetary base. No causality is found from the deficit-to-GDP ratio to the rate of change in the monetary base for all six countries. This means that, for all six countries, we do not find any evidence that suggests that changes in deficits today lead to future monetization. This evidence is not in support of the argument made by Sargent and Wallace, Barro, McCallum and others who believe that monetary accommodation is inevitable over the course of time.

Granger causality tests between deficits and changes in the monetary base suggest bi-directional causality for the United States, and Italy. The causality goes from deficits to the change in the monetary base for France and the other way around for Germany. Thus in these regressions, we do get evidence of "central bank monetization" whereby the pressure of debt has forced

governments to finance their purchases through the central bank. However, we did not find any evidence of such 'monetization' being inflationary.

Furthermore, Granger causality tests do not suggest any temporal relationship between the rate of change in the monetary base and inflation for all six countries and between the change in the monetary base to changes in the price index for five countries (except the UK).

The overwhelming evidence from the regression results estimating Granger causality suggests the absence of any causal connection among different measures of deficits, monetary base and inflation for all countries. The inter-temporal relationship from deficits to the monetary base, found in the case of a few countries supports the argument of Sargent and Wallace and others. However, the monetization argument, as suggested by the New Classical school or the one based on the portfolio behavior of commercial banks, is always linked to the inflationary effects of such monetization. The absence of an inflationary impact of a Sargent-Wallace type of monetization necessitated that we explore some alternative links between deficits and the money supply.

The Johansen cointegration tests suggest that there exist cointegrating relationships among deficits, GDP and M1 for Canada, France, Germany and Italy. For the United States and United Kingdom, we did not find any cointegration between these three variables. Cointegration reflects the presence of a long-term relationship among these variables and, therefore, some endogenous association among deficits, GDP and the money supply.

Regression results reveal the temporal precedence of both GDP and deficit-to-GDP to M1 for Canada, France, Italy and Germany. In other words, for all countries where we found a cointegrating relationship between deficits, GDP and M1, the causal link is from changes in GDP this period, which precedes changes in M1 next period. Thus M1 seems to be endogenous to changes in the aggregate level of economic activity. Similarly, changes in deficits this period precede changes in M1 next period. Thus changes in both deficits and GDP impact upon M1 in the next period. This can be interpreted to mean that the greater intensity of economic activity (and higher deficits) today leads (lead) to a higher growth in the residual stock of money in the next period. The increase in M1 is probably a reflection of the portfolio decision of households to increase their savings in money form with the increased economic activity and not the result of the financing decisions of the central bank.

Most of the evidence from Canada, the United States, France, Germany and Italy is found to be consistent with the idea of the money supply process whereby a growing economy is accompanied by an endogenous increase in the money supply. What we have argued here is that such "monetization" has little to do with inflation.

APPENDIX

Table 4-12A: Lag Selection Based on Minimum Log-Schwarz Values and Regression Results

Country	lags	Deficit	Deficit and M2	Deficit, M2 and GDP	Deficit and GDP	Deficit GDP and M2
Canada	1	17.06	17.20		17.06	
	2	17.12	17.34		17.17	
	3	17.09	17.53		17.27	
	4	17.01*	17.70		17.33	
United States	1	7.34	7.26		7.25	7.24
	2	7.46	7.43		7.18	7.35
	3	7.51	7.61		7.11**	7.48
	4	7.17*	7.81		7.23	7.69

United States: Δ GDP $\rightarrow$ Δ Deficit, F=10.20*

Country	lags	M2	M2 and Deficit	M2 Deficit and GDP	M2 and GDP	M2 GDP and Deficit
Canada	1	17.28*	17.27**	16.97	16.89**	16.97
	2	17.41	17.38	16.94***	16.96	17.08
	3	17.54	17.50	17.06	17.07	17.20
	4	17.67	17.62	17.06	17.17	17.32
United States	1	8.26*	8.38		8.37	
	2	8.34	8.39		8.47	
	3	8.51	8.48		8.70	
	4	8.68	8.55		8.66	

Canada : Δ GDP $\rightarrow$ Δ M2, F=15.96* and F= 11.95*; Δ Deficit $\rightarrow$ Δ M2, F=3.46

Country	lags	GDP	GDP and M2	GDP M2 and Deficit	GDP and Deficit	GDP Deficit and M2
Canada	1	18.54*	18.69		18.65	
	2	18.63	18.79		18.76	
	3	18.74	18.94		18.81	
	4	18.78	19.10		18.68	
United States	1	8.87*	8.94		8.96	
	2	8.92	9.06		9.08	
	3	8.92	9.10		9.14	
	4	8.90	9.16		9.20	

CHAPTER 5

Conclusion

1.0 Methodology

Although economists generally avoid methodological debates, their substantive views are heavily influenced by their methodological preferences. In a field, such as economics, in which conclusive evidence is so hard to obtain, practitioners can afford the luxury of accepting hypotheses that fit their methodological preferences better than they seem to fit the elusive and disputable 'facts'. Furthermore, the idea that scientific proof ever settles issues in economics is problematic. We decide what is reasonable in our subjects in a whole variety of ways — theoretical plausibility (based on introspection, or on the common observation of people's behavior/motives), consistency with 'stylized facts', ability to explain striking events (the stock market crashes, the Great Depression, the 1960s boom), especially cumulative ability to explain such things (international, historical repeat-episodes), and last of all formal econometric evidence. Why last of all? Because our econometric methods are highly sophisticated and only recently developed: this has meant that we are constantly discovering pitfalls in methods about which we were enthusiastic only yesterday.

The 1970s and 1980s have seen a methodological shift in preferences of economists. Skill at deriving subtle implications of rational utility maximization became the measure of an economist's proficiency. The new methodology

insists not only that all statements about the behavior of agents be consistent with utility or profit maximization but, also, requires that this consistency be spelled out explicitly in mathematized models. Formalism is praised, and intuitive reasoning is a term of derogation. At the same time, the mathematical and econometric sophistication of economists improved greatly, and the emphasis that is placed on using the most recent techniques has increased substantially. The typical paper estimates the model and evaluates the restrictions it imposes on coefficients, but empirical testing is no longer central in papers that are typical of this new methodology. The empirical evidence that is considered persuasive also changed in two other ways. It seems that there is now more tendency to rely on a single test, usually consisting of time series regressions, rather than on a wide array of less formal evidence covering many periods and many countries. Second, theorizing had previously been constrained, at least informally, by having to be more or less consistent with common sense and casual observation; for example the occurrence of involuntary unemployment was not to be denied. Now that the economists have acquired advanced mathematical tools, they have felt sufficient confidence to do as 'real scientists', like physicists, do, that is to develop theories that appear irreconcilable with what we observe around us.

Where does this thesis stand in such a methodological value system? The thesis's slogan is neither "Just look at these facts" nor "Look at my sophisticated techniques". The thesis uses "new" econometric techniques to evaluate the reasoning of models based on "new" methodology (the "new" here does not

mean in the sense of never existed before but is used in the sense that what had previously been the methodological preferences of a few economists has now become the methodology that dominates economics). It is useful to classify economic paradigms on the basis of their policy conclusions to highlight the ideological underpinnings of the paradigms, but to classify theories on the basis of their reasoning and evidence is useful to highlight their limitations and also build alternatives to the dominant paradigms. It is their reasoning and evidence, and also policy recommendations that is the focus of our critical attention. The critical attention in this thesis is based on a conceptual framework which is built on the class and institutional basis of economies. The exogeneity / endogeneity of macroeconomic variables discussed in chapter 2, 3 and 4 is explained in terms of the nature of existing institutions, the role of dominant thinking, and social and economic forces which sustain different economic policies. For instance, in chapter 2, the exogeneity of interest rates is explained in terms of the ability of the central bank to determine interest rates, and chapter 3 then links this to social and economic interests which sustain the high interest rate, anti inflationary regimes of present-day central banks. The evidence of decline in public expenditures in a situation of increasing deficits, in chapter 3, can be interpreted as support of the idea that highlights the importance of dominant economic thinking to explain the reaction function of fiscal authorities. In chapter 4 the absence of link between inflation and deficits and evidence of causality from GDP to M1 and Deficits is contextualised as an instance of endogenous

nature of money and deficits. It is another instance of the limitations of the commodity view of money.

2.0 Economic policy

New classicals often recommend the same policy as monetarists, but for very different reasons. Monetarists want a stable growth rate of a monetary aggregate because they believe that unstable monetary growth generates the inflation and unemployment that cause much misery and lower productivity. New classicals also advocate stable monetary growth, but not because they think, as do monetarists, that the growth rate of money is of paramount importance. Just the opposite, they believe that the monetary growth rate has little effect on welfare. With agents having rational expectations, and prices adjusting flexibly, it does not matter much at what rate money is growing. Chapter 4 examines both these viewpoints and shows that money matters, in the sense of being a reflection of aggregate economic activity, but it does not matter because it generates inflation and unemployment. This chapter discusses the two crucial components of the discourse on budget deficits, the first that arises from the argument that continued budget deficits are unsustainable (because of limits to bond financing, etc.), and the second component that arises from the reaction of the financial markets (the inflationary fears based on hypothesized future monetization, etc.). We view financial markets as a source of instability which can be transmitted to other sectors of the economy and the participants in those markets as able to impose their objectives on economic policy-making. The

evidence in this chapter showing the 'actual' workings of the economy vis-à-vis deficits and inflation makes a indirect case to restrain the power and influence of financial markets.

The New classicals and Monetarists also recommend the same policy relating to government deficits (fiscal policy) but for different reasons. For the New classicals, fiscal policy is ineffective because of Ricardian equivalence, while for the monetarists, bond-financed deficits crowd out private investment. Both imply that fiscal policy is not desirable, either because it is a 'bad' or because it is ineffective. In chapter 2 and 3, we show the monetary policy basis of fiscal policy and show how the effectiveness of fiscal policy has been marred by the domination of restrictive monetary policy, based on inflationary fears. These chapters put forward an approach to economic policy which could be described as post-Keynesian.

The term "Keynesian policies" tends to be associated with demand management, especially those seeking to fine tune the economy using fiscal policy. Our concept of macroeconomic policies is rather different, and would not generally include attempts to fine tune. It would, however, include some 'coarse tuning' (Arestis and Sawyer, 1997), namely the idea that the government use budget deficits (or rather less likely) surpluses in order to underpin a level of aggregate demand sufficient for the generation of the highest sustainable levels of employment (and to use monetary policy to achieve the lowest possible level of interest rates). Whilst full employment is a prime objective of economic policy, a more equal distribution of market power, income and wealth is another

desirable goal in its own right and as a vehicle for increasing general prosperity. The thesis lacks detailed discussion on this front. The distributional impact of budget deficits needs to be examined carefully.

Furthermore, the link between a more equal distribution of market power, income and wealth and pursuit of full-employment policy also need further examination. This link holds the key to the relationship between the industrialized countries and other developing countries. Analysing this question will help understand whether the 'tolerable' unemployment levels and the increase in real wages (more or less in tandem with productivity increases) in the metropolis has something to do with misery in the outlying regions. Alternatively, often this misery is attributed to their specific national traits or 'outlandish' institutions or the social turmoil that this misery itself inevitably breeds.

The thesis also discusses the significant impact of monetary policy on the level of economic activity. We have argued that the stock of money is no longer (if it ever was) readily controllable by the authorities, and that monetary policy is effectively an interest rate policy. Any policy on interest rates is inevitably circumscribed by global financial markets, and interest rate changes are politically sensitive. Interest rate variations may be more potent than hitherto with the spread of consumer credit and variable interest rate borrowing. A monetary policy is required which pegs interest rates as low as possible (bearing in mind international constraints) for this may give some stimulus to demand but also relieves the constraint on the use of fiscal policy.

3.0 Future Research

The second chapter is quite definitive. The evidence mostly suggests absence of a temporal relationship from deficits to interest rates. It often provides supporting evidence of a causal relationship from interest rates to deficits (net of interest payments). What needs to be further explored is the transmission mechanism from interest rates to deficits and, in particular, what are the channels through which interest rates impact on deficits. In chapter 2, these channels are hypothesized. We need to concretize the social and economic processes which provide control to the global financial markets. At an empirical level this would involve multivariate analysis. In the third chapter, this issue is partly explored when we examine the relationship between discretionary public expenditure and interest rates. However, much more needs to be done. How exactly do deficits get endogenised and how exactly do interest rates impact on aggregate economic activity need further exploration. This also gets connected to the issue of the reaction function — the interaction between monetary and fiscal policy. We have examined a very simple representation of the reaction function. How exactly is the pursuit of contractionary monetary and fiscal policy sustained? What are the economic processes involved in this interaction? These questions require further study. On the monetization and inflation issue (chapter 5) many aspects are left dangling. What explains inflation, if fiscal policy is not the real culprit? Also, what is the meaning of 'monetization'? If money is

endogenous, in the sense of being integral to the process of production and credit creation, we need to capture this relationship through some measure of credit and aggregate economic activity. Unfortunately, the use of M1 as a substitute in chapter 5 is very limiting. This thesis provides a useful starting point to these and other related questions.

4.0 Vector-Autoregressions and Granger tests

Historically, the use of the "new" econometric methodology, meaning the Granger-Sims causality analysis, has been at the background of the debate among the New classicals, Keynesians and the Monetarists.

The use of the Granger and Sims approach to causality has been integral to the attack on Keynesian macroeconometric models by Lucas, Sargent and others. Also, the development of equilibrium business cycle models, new classical economics, rational expectations and other radical adjustments in economic theory was associated with the reappraisal of the simultaneous-equations model which had been the statistical framework of large scale Keynesian macroeconometric structures.¹

Monetarists have long argued that shocks to the money supply precede cyclical turning points, and this provides at least a presumption that money causes income rather than the reverse. Their techniques have consisted of a

¹ Lucas and Sargent (1979) provide three criticisms of such structures, one of which is the partitioning of measured variables into exogenous and endogenous types. The Sims test enters this debate as a means of testing this partition rather than depending on prior restrictions.

simple comparison of cyclical turning points with turning points in the growth rate of a monetary aggregate (Friedman and Schwartz, 1963) or with deviations of the growth rate of money from its trend (Poole, 1975). Allan Meltzer (1986) introduced a more modern and superior technique by using a Kalman filter to separate unusual fluctuations in the growth rate of the monetary base from more normal ones. He found that shocks to the monetary base led the shocks to output at seven of the nine turning points, but two of the leads were relatively weak. The importance of this finding is, however, reduced by Tobin's (1970) demonstration that, in at least one Keynesian model in which money is just accommodative, turning points in the monetary growth rate also precede turning points in income.

Does it mean that Granger tests are not applicable to the question at hand? We have interpreted such a critique as a caution against generalizations based on the use of 'pure' time series techniques. The specification of the model to be examined should be rooted in prior theoretical and methodological reasoning. It should thus be rooted in economic theory, before these techniques are applied to examine economic relationships: take for example, relationships between money and income, between deficits and interest rates, between deficits and inflation, or between deficits and the money supply. Economic reality is historically constructed with significant economic, social and political forces which influence the relation among individuals, among regions or countries, and therefore, reconstruction or deconstruction of this reality using statistical

techniques should involve a skillful and detailed relation with compelling theoretical generalizations.

Following this, we have successfully used the Granger-Sims methodology to discuss issues relating to the debate among the New classicals, Keynesians and the Monetarists. Contrary to the historical record, our results, using this methodology, do not support the New classical propositions (such as the idea that there is no relationship between deficits or interest rates or that the link between the monetary base and inflation is inevitable). This is one of the main contributions of this thesis.

As much as the Granger-Sims methodology is useful to answer specific questions (like the ones discussed above), the results from the Granger-Sims causality tests should also be interpreted with suitable qualifying remarks. These qualification arise because the Granger-Sims causality are sensitive to the choice of the number of current and past values of X in estimates of a regression of Y . We have tried to overcome this limitation of the Granger-Sims method by adopting a consistent criteria to choose the number of lags for all regressions. The choice of criterion is based on the Monte-Carlo simulation results. Another issue that arises with respect to the fluidity of results based on Granger-Sims causality tests is the criterion of deciding whether the fitted coefficients are sufficiently close to zero. Here again, we have chosen a conventional criterion from the literature and, the chosen criterion has been consistently followed for all the estimated coefficients.

Therefore, as a caveat to this thesis, it can be said that the use of the time series technique is certainly empowering, but it is also important to recognize the sensitivity of conclusions to specification of the Granger causality tests. We have erred on the side of caution by basing our conclusions on substantive evidence in a particular direction. However, it can be tentatively concluded, based on our analysis of the evidence, that current fiscal policies of austerity have played a major destabilizing role in contemporary economies.

Appendix 1

Data Sources And Construction of Variables

The data used in the model estimation are derived from several major sources. What follows is an outline of the sources and transformation of data elements that was necessary to construct variables.

A1.1 Interest Rates

The three month, or six month Treasury bill and note rates were acquired from the *International Financial Statistics* CD ROM of the International Monetary Fund. The interest rates are expressed in percentage terms. The **real interest rates** are derived from nominal interest rate using the price indices (line 64 of the *International Financial Statistics Yearbook*) as follows:

$\text{inflation} = ((\text{cpi}(+1) - \text{cpi}) / \text{cpi}) * 100$; $\text{real interest rate} = \text{nominal interest rate} - \text{inflation}$.

A1.2 Gross Domestic Product

The Gross Domestic Product is reported in *International Financial Statistics* database on CD ROM (line 99b. c and line 99b. r) as the sum of final expenditures. They are compiled according to the *System of National Accounts* (SNA). The data is in billions or millions of national currency units. GDP growth was calculated as follows: $((\text{GDP} - \text{GDP}(-1)) / \text{GDP}(-1)) * 100$

A1.3 Deficits

The Deficit variable is acquired from *International Financial Statistics* database on CD ROM. Unless otherwise stated for individual country, the data cover operations of the consolidated central government (that is, operations of budgetary central government, extra budgetary units, and social security funds). The coverage of consolidated central government may not necessarily include all existing extra budgetary units and/or social security funds. The concept of deficit used by the International Monetary Fund is gross fiscal deficit, which represents the overall borrowing requirement of the government. The Deficit or Surplus on a cash-flow basis (line 80) is calculated as the difference between revenue and, if applicable, grants received on the one hand and expenditure and lending minus repayments on the other hand. The deficit/surplus is also equal, with opposite sign, to the sum of the net borrowing by the government plus the net decrease in government cash, deposits, and securities held for liquidity purposes. Thus, revenues-expenditures. The data are in billions or millions of national currency units. The **Primary Deficit** is derived from deficits by adjusting for interest payments.

A1.4 Cyclically Adjusted Budget Balance

The Cyclically Adjusted Budget Balance series were acquired from the *European Economy No. 60*, published by the Directorate General for Economic and Financial Affairs, European Commission. Fluctuations in economic activity significantly affect government budget receipts and expenditure: tax receipts weaken and social transfers increase during recessions. By calculating the

effects of these cyclical fluctuations in economic activity on the budget balance, and by filtering these effects out of the actual budget balance, it is possible to identify an underlying budget balance which is indicative of the structural budgetary situation, independently of the cyclical effects. The Directorate-General for Economic and Financial Affairs of the European Commission (DG II) uses its own cyclical adjustment method for the analysis of the budgetary policy situation in the European Union.

The DG II method for the cyclical adjustment of government budget balances involves two main steps:

- (i) Trend output is estimated via the Hodrick-Prescott method. Estimates of the cyclical fluctuations are obtained by subtracting these trend output estimates from actual output.
- (ii) The effects of these output gaps on government budget receipts and expenditure are calculated via the use of revenue and expenditure elasticities. These cyclical effects are then deducted from the actual government budget balance to obtain the Cyclically Adjusted Budget Balance. The **Output Gap** is defined as the difference, between the actual level of GDP and that of trend GDP, expressed as a percentage of trend GDP.

The Cyclically Adjusted Budget Balance estimates for Canada were acquired from the Department of Finance and for the United States from the CitiBase Database. The method of estimation used by the Department of Finance is very similar to DG II described above.

A1.5 Money Supply

The money supply variables are the seasonally adjusted M1, M2 and monetary base as published by the International Monetary Fund in their *International Financial Statistics Yearbook*, various years. The data are in millions or billions of national currency units. The data in line 34 (*Money*), equals sum of currency outside banks and private sector demand deposits, are frequently referred to as M1. The sum of line 34 and line 35 (*Quasi-Money*) comprising the time, saving, and foreign currency deposits of residents, gives a broader measure of money similar to that which is frequently called M2. The information on monetary base is provided in line 14 (*Reserve Money*) of the *International Financial Statistics* as the liability of the monetary authority.

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Chapter 2

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Chapter 4

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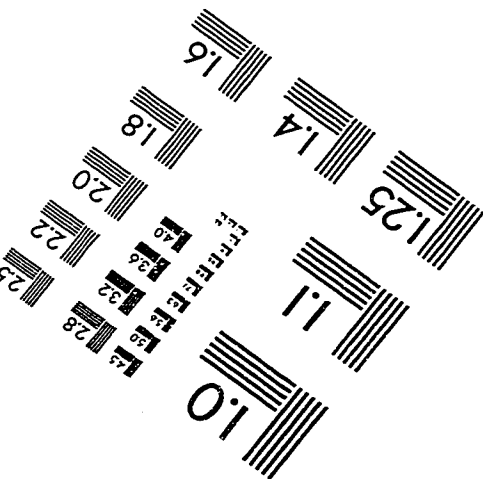
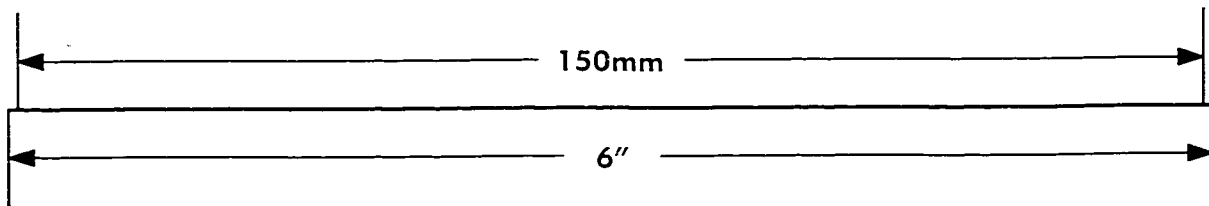
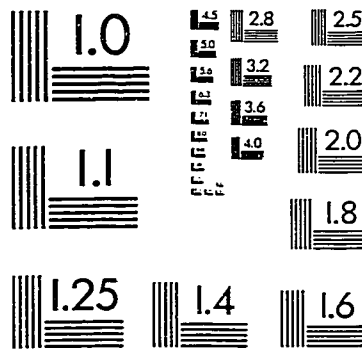
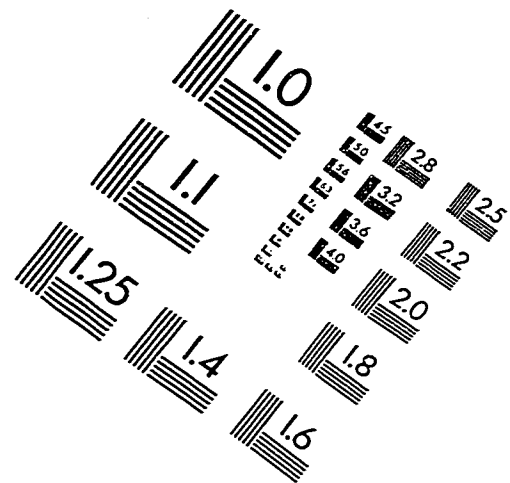
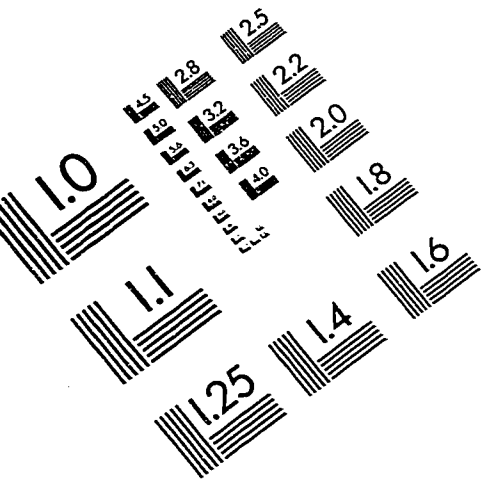
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IMAGE EVALUATION TEST TARGET (QA-3)



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