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LIQUIDITY EFFECTS AND EXCHANGE RATE: EMPIRICAL EVIDENCE ON THE THE EFFECTS OF MONETARY SHOCKS ON THE EXCHANGE RATE.

by

FOTIOS M. SIOKIS

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, the City University of New York.

1995

UMI Number: 9605663

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300 North Zeeb Road
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This manuscript has been read and accepted for the Graduate Faculty in Economics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

Liquidity Effects and Exchange Rate: Empirical Evidence on the Effects of Monetary Shocks on the Exchange Rate.

by

Fotios M. Siokis

Adviser: Salih Neftci.

This paper presents first, an equilibrium model allowing for liquidity effects. We then present some new empirical evidence on liquidity effects in open economies. We consider money supply as the measure of monetary shocks in the economy. Using data from the flexible exchange era, we find that expansionary shocks to the U.S. monetary policy lead (in the short-run) to a decline in the interest rate and to a depreciation of the U.S. dollar. In addition, we find that the exchange rate overshoots in the short-run and then settles to its long-run equilibrium point. Then, we consider the other non-U.S. G-7 Countries' monetary policy by identifying their monetary policy with orthogonalized shocks to their money supply. We report an "exchange rate puzzle" in some of the countries: an expansionary shock to the other non-U.S. G-7 Countries lead to an impact appreciation of their currencies. We try to solve that puzzle by using reserves as a measure of their monetary policy. In addition, we consider nonstationarity and possible cointegration relations among the variables. In all VAR systems at hand, cointegration relationship is evident and the construction of VEC system is appropriate. The deployments of impulse response functions from VEC systems show that the responses of the other non-U.S. G-7 Currencies to an innovation in their money supply are now (in most cases) consistent with the relevant economic theory.

Acknowledgments

I would like to show my appreciation to some people who helped me succeed in this later task of my life.

I particularly wish to thank Professor and Chairman of my Dissertation Committee Salih Neftci who guided me through time with extremely useful comments, thoughtful criticisms, suggestions and ideas.

I am deeply indebted to Professor Michael Grossman who gave me the opportunity to study under his supervision . To Prof. Thomas Thurston for his valuable comments and flexibility during the various steps of my dissertation . To my dear friend Dr. Hengzhong Liu for many valuable suggestions and arguments.

In addition, I would like to thank the people in AT&T, BCS Finance and in particular Dr. Sunnet Dasputre, Dr. Kang Seng, Roderick Beck, In Huh, Helen Fialkoff, Paul Schwabe, Scott Gordley, Jon Shaub, George Christodoulopoulos and Helen Goussiou for a harmonious interaction and intellectually challenged climate.

Lastly, but not least , my parents Michael and Konstantina for the guidance that they have provided me all of these years, my brothers Damianos, Peter and Bill for encouragement and love and of course my wife *Αρετή* (virtue) who was instrumental for the completion of this project.

All of you, for everything that you've done I dearly thank you.

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1. Introduction

An important issue in discussion of the monetary transmission mechanism of monetary policy is that market interest rates follow a particular time path in response to changes in the rate of monetary growth. The traditional analysis of the effects of changes in money growth in nominal interest rates runs in terms of liquidity, income, and expectations effects.

The theoretical argument of the transmission mechanism runs as follows: an unanticipated increase in the monetary growth rate results initially in an excess supply in the money markets at the existing income, interest rate and price level. Part of this excess shows up as an increase in the demand for securities where the prices of these securities are bid up, and nominal yields decline until the market clears. If the price level and real income adjust slowly then the nominal interest rate must decrease to equate money demand and money supply. This negative response of the nominal interest rate at least in the short and medium runs is known as the liquidity effect. However, two other effects can counter the liquidity effect.

First, over time, this money stock increase will have an expansionary effect on both real income and the price level. The rise in income will increase money demand which will result in higher interest rates. Finally, there is the Fisher effect as nominal interest rates increase because of a rise in inflationary expectations. Higher expected inflation resulting from money stock increases would, through a fisherian relation, increase nominal interest rates. This "price anticipation effect" could thus not only mitigate the decline in interest rates stemming from the liquidity effect, but could also overpower it. An example of this proposition is that countries experiencing rapid monetary growth experience very high rates of interest as well.

In an open economy environment, the monetary transmission mechanism is one of the central questions. It is fair to say today that there is no canonical description of how the monetary innovations are transmitted internationally.

Traditional static IS/LM models like the Mundell-Fleming 's say that a monetary expansion at home shifts the LM curve outwards reducing the rate of interest and causing an increase in output. As a consequence the home currency will depreciate. But dissatisfaction with this paradigm has lead authors either to extend the Mundell-Fleming model a la Dornbousch (1976) or to seek and explore alternative models of international transmission a la Helpman and Razin (1985) and Grilli and Roubini (1992) emphasizing the presence of liquidity constraints and the linkage from the financial markets to the money markets. In this environment, certain amount of liquidity is needed in the financial transactions to ensure smoothness in the financial markets. The fluctuation of the liquidity level will impact the level of the interest rates and it will spill over to the asset prices and to the foreign exchange market.

The purpose of this study is to identify first, and analyze later, any existing liquidity effects deriving from the monetary transmission mechanism channel.

Section 2 briefly presents a literature survey (in both theoretical and empirical studies) on liquidity effects, in which an exogenous increase in the supply of money generates persistent declines in short-term interest rates and in nominal and real exchange rate.

In section 3, we present a model of liquidity effects which draws heavily from Lucas (1990) and especially from Grilli and Roubini (1992). In this environment, the financial sector reacts instantaneously to changes in monetary policy but not the household (goods market) sector. The changes in monetary policy i.e. bond issue will raise the interest rates independently of changes in expected inflation or in marginal rates of substitution (Fisherian fundamentals of interest rate determination).

In section 4, we concentrate on isolating a measure of shocks to monetary policy and ask how the interest and exchange rates respond to these specific shocks. We use data from the flexible exchange rate era for the G-7 countries and measure shocks to their monetary policy by using the money supply as the policy instrument. In addition, section 4, presents evidence on liquidity effects and some key implications of our model which distinguish it from others.

Section 5, considers the problem of nonstationarity of the data and tests for cointegration relationships among the variables. The implementation of the cointegration relationships in to the system, as a last period's equilibrium error gives rise to a vector error correction system. Finally, section 6 contains some concluding remarks.

2. Literature Survey

2.1 Theoretical Studies on Liquidity Effects

Model of slowly adjusted prices.

One of the more influential papers (in the open economy area) to deal with exchange rate volatility is due to Dornbusch (1976) whose analysis allowed different speeds of adjustment for the goods and money markets. It introduces the idea of price stickiness(or slowly price adjustment) in the exchange rate mechanism and shows that following an unanticipated monetary disturbance the exchange rate expectations will deviate from PPP for as long as it takes goods prices to fully adjust to the new monetary conditions.

The goods prices in this environment do not adjust instantaneously, and due to the different speed of adjustment in the goods market, a short run increase in the money supply can have real effects due to the terms of trade. These real effects can have liquidity effects and can cause a reduction in interest rates in response to capital inflow resulting in an immediate depreciation of the domestic currency which can be greater than the long-run equilibrium value(overshooting).

In the medium run, however, domestic goods prices begin to rise in response to the increase in the money supply. This alleviates pressure in the money market and domestic interest rates begin to rise. As a consequence, the exchange rate then appreciates(i.e. domestic currency depreciation) until it arrives to its long-run purchasing power parity.

Equilibrium and Liquidity Models

The other group of models emphasizing liquidity effects of monetary shocks on interest rates and exchange rates and building on earlier contributions by Grossman and Weiss (1983) Rotemberg (1984) and recently by Lucas (1990) and Christiano (1991)-who have stressed the importance of liquidity effects for explaining the comovements between interest rates and monetary aggregates- are those of Grilli and Roubini (1992) and Schlagenhauf and Wrase (1992a, b).

In a general equilibrium framework, a representative agent tries to maximizes her present value utility -in a two-country world-subject to budget constraint and two cash-in-advance constraints. The agent is required to hold cash not only for the purchase of goods but also for the purchase of assets. In these economies, asset markets and goods markets are separated for one period and shocks to the stock of money have one period effect on interest rates, currency prices and relative prices of goods. Thus, the theory generates greater volatility of relative prices than would exist in an analogous model without the segmented market structure. Although, these models have a lot of similarities with the international Real Business Cycle (RBC) models they differ in a fundamental way: they allow for liquidity effects. In both models the money is introduced via cash-in advance constraints but the RBC models suffer from a generic implication. RBC models allow the change in money stock to affect the interest rates through an anticipated inflation effect. As a result, the interest rate and consequently the exchange rate exhibit persistent positive correlation to unanticipated shock to the growth rate of money.

Grilli and Roubini's (1992) "liquidity model" emphasizes the different role of the agents in an economy. The money are introduced via cash-in-advance constraints and money impact differently on different agents. As in Lucas (1990) financial intermediaries are the key subset of agents which absorbs a large share of money supply shock. This is the result for imposing a constraint on households. They make their nominal consumption-saving decision before the realization of the monetary policy. Consequently, financial intermediaries respond instantaneously to movements in assets prices induced by central bank open market operations, while households' portfolio adjustments are more sluggish. In other words, the model allows for flexibility in prices and slow adjustment in households' portfolio.

Grilli and Roubini (1992) paper was built on the work of Helpman and Razin (1985) who first introduced cash-in-advance constraints for the asset transactions. But these two paper differ in a number of aspects. Helpman and Razin analyze the case where a debtor country -which runs a current account deficit- faces a cash-in-advance constraint and has to accumulate foreign currency in order to repay its debt on time. As a consequence, the demand for foreign currency increases and the exchange rate depreciates. On the other hand, Grilli and Roubini, analyze the case where the lender country faces the cash-in-advance constraint at the time of the purchase of the assets and furthermore, they assume that the current account is not only balanced but it does not affect by any way the exchange rate.

Grilli and Roubini (1992) show that an unexpected increase in the supply of bonds of the domestic country (through stochastic open market operations) will drive the price of the bond down, the domestic real and nominal rate of interest will decline and it will lead to the appreciation of the domestic currency. In addition, liquidity effects deriving from the open market operations spill over to the foreign exchange market and leads to an excess exchange rate volatility.

2.2 Empirical Studies on liquidity effects.

Eichenbaum and Evans (1993) investigated the effects of shocks to monetary policy on nominal interest rates and on nominal and real U.S. exchange rates and they found that an expansionary monetary policy leads to an initial and persistent decline in the U.S. short-term interest rates and to a significant depreciation in the U.S. currency. By using nonborrowed reserves as the measure of money they were able to produce sharp and persistent declines in short-term interest rates and consequently identify U.S. currency depreciations. In addition, they found that a temporal pattern of the U.S. dollar following a positive innovation of the U.S. monetary policy is not consistent with the overshooting model considered by Dornbusch (1976).

Recently, Grilli and Roubini (1993) have undertaken a systematic analysis for the existence of liquidity effects in the monetary policies of the G-7 countries. They believe that the use of the short-term interest rate innovations as the indicator of the changes in the monetary policy is more appropriate than the use of the money supply. In fact, they show that changes in monetary policy -identified as positive shocks to the interest rate-are associated with reductions in output and money supply. Their analysis employs several VAR systems for the G-7 countries and find that while positive innovations to the U.S. interest rate leads to an appreciation of the U.S. dollar, positive interest rate innovations to the other G-7 countries leads to a surprising depreciation of their currencies. These currency depreciation results are completely inconsistent with the economic view that random disturbances in monetary policy (in this case contractionary monetary policy) appreciate the domestic currency.

The authors give two explanations of this "liquidity puzzle". First, policy interdependence and strategic interaction among the G-7 countries gives rise to the "leader-follower" argument. The U.S. monetary authorities in the role of the "leader" sets its monetary policy goals independently of the others. The other G-7 countries -as the "followers" - react to U.S. monetary policies accordingly. For example, an increase in the U.S. money stock would depreciate the dollar against the other G-7 currencies.The "followers" on the other hand, would react to that policy by increasing their own money supply or by decreasing their interest rates to prevent a possible appreciation of their currencies. Then, their currencies would still appreciate (but by less if they would have not done anything) because of the stronger effect of U.S. monetary policy. But this hypothesis is difficult to be supported because most of the European G-7 countries were in the stage of recession quite often in 1980's and early 1990's. This phenomenon constrained the non-U.S. monetary authorities to successfully follow and react to any U.S. monetary policy changes.

The second explanation lies on the assumption that the interest rate innovation is an endogenous reaction to any inflationary pressures that cause the non-U.S. currencies to depreciate. In favor of this argument is the positive response of the price level to the non-U.S. interest rate innovation. This interest rate policy reaction to inflationary pressures tends to dampen, but not reverse, the tendency for the non-U.S. currency to depreciate. Therefore, after controlling for expected inflation, a positive innovation to the non-U.S. interest rates is associated with a currency appreciation, in most of the non-U.S. G-7 countries.

3.0 A Model of Liquidity Effects

This section analyzes a simple model of liquidity effects in which money is required for asset transactions as well as for transactions on goods. The model emphasizes the liquidity effect which arises from the organization of markets-specifically, the timing of goods and assets markets and from the cash-in-advance constraints on the security purchases.

The model is adopted from Lucas (1990) -who deals with liquidity effects in a closed economy- and from Grilli and Roubini (1992) -who extend the model in an open economy environment. In either case, cash is required for trading in securities and for this purpose the quantity of cash available at any time will influence the prices of securities traded at that time. Therefore, the price of the security will depend not only on the stream of income but also on the liquidity in the market at the time is traded. Furthermore, the model emphasizes the effects of open market operations on interest rates and consequently on the exchange rate in which the agents hold a fraction of both economies' (home and foreign economies) money supply and have no ability to obtain more money -more liquidity - in time to affect their ability to purchase bonds. A bond issue will lower the price of bond will raise interest rates and change the exchange rate independently of changes in expected inflation -the fisherian fundamentals of interest rate determination.

In this environment, where the agents are subject to multiple sources of uncertainty and without any loss of generality, a change in monetary policy will impact the interest rate and consequently the exchange rate through the liquidity channel.

The model consists of two countries indexed i = d, f where d=domestic and f=foreign and each country is populated by competitive households. Each representative household consists of three members-each member carrying a distinct and specified task. The representative agent has the following intertemporal criterion function:

$$U = \sum_{t=0}^{\infty} \theta^t U\left(c_{it}^d, c_{it}^f\right), \quad i = 1,2 \qquad (1)$$

where c_{it}^d denotes the consumption level of the domestic country of the good produced by country i=1,2 and c_{it}^f is the consumption level of the foreign country of the food produced by country i=1,2. θ is the subjective discount rate between 0 and 1 and all the assumptions on the utility functions $U(\cdot,\cdot)$ holds i.e. U is a bounded, twice-differentiable function with $U'(c) > 0$ $U'(0) = \infty$ *and* $U''(c) < 0$. As in Lucas (1990) the good produced is non-storable and each household consists of three members: one member collects the endowment and sells it to the other households but the receipts of this transaction can be used only in the next period.

The second member takes a fraction of the initial money holdings of the household (which consists of domestic and foreign money balances) and use it to buy domestic and foreign goods from other households. Domestic goods are purchased only with domestic money and foreign goods with foreign money. The third member takes the remaining cash balances to the security markets where he engages in purchasing and selling domestic and foreign money and only one period government discount bonds B_t^d *and* B_t^f. At the end of the period the members of each household get together to pool information goods and assets. This particular division of the households emphasizes heterogeneity in the economy and shows the effects of a wide variety of monetary policies. Consequently, the money holdings of the household at time t is equal to:

$$M_{it}^j = \Xi_{it}^j + N_{it}^j \ , \qquad j = d,f \tag{2}$$

where M_{it}^j is the money stock of the country j held by the household i, Ξ_{it}^j is the portion of the money stock of country j held by the member of the household i who transacts in the assets market and N_{it}^j is the amount available for purchasing commodities in the goods market. Furthermore, the markets are separated from each other: the assets market where bonds and currency are traded and the goods market where commodities are exchanged.

The agent who transacts in the goods market faces the following cash-in-advance constraints:

$$N_{it}^d \geq P_t^d C_{it}^d \qquad \text{and} \qquad N_{it}^f \geq P_t^f C_{it}^f \ , \tag{3}$$

where N_{it}^{j} is the amount of money of country j held by the resident of country i and P^d *and* P^f are the domestic and foreign currency prices respectively. The other agent who transacts in the security market faces the following constraint

$$\Xi_{it}^{d} + e_t \Xi_{it}^{f} \geq q_t^d B_{it}^{d} + e_t q_{it}^{f} B_{it}^{f} \ , \quad i = 1, 2, \qquad (4)$$

where Ξ_{it}^{j} is the amount of money of country j held by the resident i at the beginning of period t, e is the exchange rate in period t (the price of domestic currency in terms of foreign currency), and q_t^j is the price of country j discount bond[1]. If the rate of interest is positive then the above constraint will hold as an equality and the household of the home country will begin the following period with cash balances given by

$$M_{dt+1}^{d} = P_t^d Y^d + B_{dt}^{d} \quad and \qquad (6a)$$

$$M_{dt+1}^{f} = B_{dt}^{f} \qquad (6b)$$

The above equations describe the overall constraint in period t. The home household can not spend the money that accumulates at period t but only at time t+1. These money are accumulated by selling the endowment at period t (i.e.$P_t^d Y^d$) and by

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[1] Equation 4 is the cash-in-advance constraint for the asset markets and we assume that the velocity of money is equal to one. Although, the velocity is certainly not equal to one is definitely finite which still under this environment the qualitative results of this model hold. According to Helpman and Rasin (1985) the velocity of money is quite high but not infinite.

selling home and foreign securities in the assets market $B^d_{dt}, B^f_{dt.}$

3.1 Government

The only security we consider is a one period government bond and these bonds are actioned off in the security markets at a price q^i_t.. $i = d,f.$[2]

The government in this simple model is assumed to engage in only monetary policies. It conducts open market operation activities by issuing government bonds equal to a fraction of that periods money supply. In other words, $B^d_t = \chi^d_t M^d_t$, where χ is the fraction of the money supply converted in to bonds. A bond issue of size χ_t *withdraws* $q_t\chi_t M_t$ at time t and returns χ_t at time t+1. Therefore, the growth of money supply at t+1 is equal to $\frac{M_{t+1}}{M_t} = 1 + (1-q)\chi_t$ and the open market operations is the only source of stochastic shocks in the economy.

A crucial assumption in this model economy is that open market shock χ -realization of open market operation shocks- is revealed to the households after each household allocates its money balances to the agents of the goods and assets markets respectively. Furthermore, it is assumed that only the agents in the security market observe the current shock. This means that only the prices of bonds will

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[2] These bonds are paid back at the beginning of next period before the opening of the markets. Therefore, each household can distribute the new income to the members for consumption and investment purposes for the coming period.

respond to the shock and not the prices of goods. It will enables us -as we can show later- to distinguish the liquidity effects from fisherian effects in our model economy. As in Lucas (1990) we normalize the variables in terms of their money supply. In other words,

$$M^j_{it} = \frac{M^j_{it}}{M^j_t}, \quad \xi^j_{it} = \frac{\Xi^j_{it}}{\Xi^j_t}, \quad n^j_{it} = \frac{N^j_{it}}{N^j_t}, \quad \beta^j_{it} = \frac{B^j_{it}}{B^j_t}, \quad p^j_t = \frac{P^j_{it}}{P^j_t} \quad and \quad \varepsilon_t = e_t \frac{M^f_t}{M^d_t}$$

where $j = d, f, \quad and \quad i = 1, 2.$

Then, in terms of the normalized variables equations (6a) and (6b) become

$$m^d_{1t+1} = \frac{p^d_t y^d + \beta^d_{1t}}{\left[1 + (1 - q^d_t)\chi^d_t\right]} \quad \text{and} \qquad \text{(7a)}$$

$$m^f_{1t+1} = \frac{\beta^f_{1t}}{\left[1 + (1 - q^f_t)\chi^f_t\right]}. \qquad \text{(7b)}$$

The equilibrium conditions for the goods and assets markets can be characterized as:

$$c^j_1 + c^j_2 = y^j, \qquad j = 1, 2 \qquad \text{(8)}$$

$$\xi^d_{1t} + \xi^d_{2t} = \xi^d_t = \chi^d_t q^d_t, \qquad \text{(8a) or} \quad q^d_t = \frac{\xi^d_t}{\chi^d_t}$$

$$\xi^f_{1t} + \xi^f_{2t} = \xi^f_t = \chi^f_t q^f_t. \qquad \text{(8c) and} \quad q^f_t = \frac{\xi^f_t}{\chi^f_t}$$

Eq.(8a) suggests that the total production of the good y of the country j is always consumed, in the same period (since the good is not storable) by the home and foreign agents and eq. (8b) and (8c) determine the equilibrium bond prices in the assets market.

Also, it is assumed that the only source of uncertainty comes from the sizes of χ^d and χ^f which are independent stochastic variables and distributed with a joint density function $f(\chi^d, \chi^f)$. Furthermore, the equilibrium values ξs will be constant which make q^d *and* q^f to be stochastic as well.

3.2 Maximization Solution

Grilli and Roubini (1992) value function for the home agent based on the above description of the household's decision problem and is defined as:

$$V(m_d^d, m_d^f) = \max_{n_d^d, n_d^f, \beta_d^d(\chi_d, \chi_f), \beta_d^f(\chi_d, \chi_f)} U(\tfrac{n_d^d}{p^d}, \tfrac{n_d^f}{p^f}) + \theta \int_{\chi^d} \int_{\chi^f} V(m_d^{d\,\prime}, m_d^{f\,\prime}) f(d\chi^d, d\chi^f)\, \beta_d^d(\chi_d^d, \chi_d^f),\ \beta_d^f(\chi_d, \chi_f$$

$$\text{s.t.} \quad (m_d^d - n_d^d) + \varepsilon(m_d^f - n_d^f) = q^d \beta_d^d + \varepsilon q^f \beta_d^f \tag{9}$$

where m_d^d, m_d^f, are defined by

$$m_d^d = [1 + (1 - q^d)\chi^d]^{-1}[p^d y^d + \beta_t^d] \qquad \textit{and} \qquad m_d^f = [1 + (1 - q^f)\chi^f]^{-1}[\beta_d^f]. \tag{9a}$$

The first order conditions of the maximization problem are

$$\frac{U_d\,(n^d/p^d, n^f/p^d)}{p^d} = \int_{\chi^d}\int_{\chi^f} \lambda\,(\chi^d, \chi^f) f(d\chi^d, d\chi^f), \tag{10 a}$$

$$\frac{U_f\,(n^d/p^d, n^f/p^f)}{p^f} = \int_{\chi^d}\int_{\chi^f} \varepsilon\,\lambda\,(\chi^d, \chi^f) f(d\chi^d, d\chi^f), \tag{10b}$$

$$\lambda = \theta\,\frac{V_d(m_d^{d\,\prime}, m_d^{f\,\prime})}{[1+(1-q^d)\chi^d]q^d}, \tag{10c}$$

$$\varepsilon\,\lambda = \theta\,\frac{V_f^{\prime}(m_d^{d\,\prime}, m_d^{f\,\prime})}{[1+(1-q^f)\chi^f]q^f}, \tag{10d}$$

where λ is the multiplier associated with the constraint (9).

The envelope conditions for m_d^d *and* m_d^f are

$$V_d(m_d^d, m_d^f) = \frac{U_d(n_d^d/p^d, n_d^f/p^f)}{p^d}, \tag{11a}$$

$$V_f(m_d^d, m_d^f) = \frac{U_f(n_d^d/p^d, n_d^f/p^f)}{p^f}. \tag{11b}$$

In equilibrium,

$$1 = \theta \int_{\chi^d} \int_{\chi^f} \frac{1}{[1+(1-q^d)\chi^d]q^f} f(d\chi^d, d\chi^f), \tag{12a}$$

$$1 = \theta \int_{\chi^d} \int_{\chi^f} \frac{1}{[1+(1-q^f)\chi^f]q^f} f(d\chi^d, d\chi^f). \tag{12b}$$

$$\xi^d = \theta \int_{\chi^d} \int_{\chi^f} \frac{\chi^d}{[1+(1-q^{d})\chi^d]} f(d\chi^d, d\chi^f), \tag{12c}$$

$$\xi^f = \theta \int_{\chi^d} \int_{\chi^f} \frac{\chi^f}{[1+(1-q^f)\chi^f]} f(d\chi^d, d\chi^f). \tag{12d}$$

In this model the nominal interest rate and consequently the exchange rate is influenced by a mix of liquidity effects and the fisherian fundamentals which both are driven by the realization of $\chi's$. (Lucas (1990) and Grilli and Roubini (1992) assume that the inflation expectations are formed after χ is realized). In addition, the fisherian fundamentals for the interest rate is the real rate plus the expected inflation rate. Therefore, in order to isolate the liquidity effects we impose a lump sum tax equal to $\pi(\chi_t)M_t$, payable at the beginning of period t+1 prior to the opening of the markets.

The value of $\pi(\chi_t)$ can be easily found such as to maintain zero money growth , $\frac{M_{t+1}}{M_t} = 1 \quad or \quad 1 + (1 - q(\chi_t))\chi_t - \pi(\chi_t) = 1$, for all realizations of $\chi's$. Thus, after the realization of $\chi^i s$ the authorities of each country can easily find the rate of tax which keeps the money holdings constant.

By using eq (10c), (10d) and solve for the exchange rate we can arrive at

$$\varepsilon = \frac{V_f(m_d^{d\prime}, m_d^{f}{}')}{[1 + (1 - q^d)\chi^d]q^d} \div \frac{V_d(m_d^{d\prime}, m_d^{f\prime})}{[1 + (1 - q^f)\chi^f]q^f}, \tag{13}$$

and using the envelope conditions (11a) (11b) eq.(13) becomes

$$\varepsilon = \frac{U_f p^d q^d}{U_d p^f q^f}. \tag{14a}$$

Since $\varepsilon = e\,\frac{M^f}{M^d}$ in nominal terms eq(14a) can be written as

$$e = \frac{U_f}{U_d}\frac{p^d}{p^f}\frac{M_t^f}{M_t^d}\frac{q^d}{q^f}. \tag{14b}$$

The exchange rate eq.(14b) can be decomposed into two parts. The first part reflects the fundamental s of the exchange rate and it is depicted as

$$\frac{p^d}{p^f}\frac{U_f}{U_d}, \tag{15}$$

and the second part the non-fundamental

$$\frac{q^d}{q^f} = \frac{\xi^d}{\xi^f}\frac{\chi^f}{\chi^d}, \tag{15a}$$

which is due to random bond shocks in the security market.

An increase in the domestic supply of bonds through open market operation will affect the domestic price of bonds (since the equilibrium value of $\xi's$ is constant). In other words, an unanticipated increase in χ^d (which is translated to a contractionary monetary policy) will cause domestic bond prices to fall and therefore, an increase in the domestic interest rate. In turn, the increase in the domestic interest rate will lead to the appreciation of the exchange rate and thus, the appreciation of the domestic currency (since the exchange rate is the price of domestic currency in terms of the foreign currency). This effect represents a pure liquidity effect on the interest rate first and then on the exchange rate. The fundamental property of the model is that the foreign exchange market (which is part of the assets market) pools financial liquidity and that firms and financial intermediaries absorb a disproportionately large share of money supply shocks. Before the realization of χs (change in the supply of bonds) the agents have fixed amount of money (domestic and foreign) and can not alter the distribution of their cash holdings.

In summary, liquidity models allows for flexible prices and slow portfolio adjustment and once the decision of the agents is made about the distribution of their money, a stochastic increase in money supply -through the implementation of the open market operation- will not alter the expected inflation but it will affect the rate of interest and the exchange rate.

4.0 Evidence on the Exchange Rate of Monetary Policy

Economic theory suggests that an increase in money growth leads to a decrease in the short-term nominal and real interest rates assuming that prices, output and inflation are not immediately affected. Specifically, a positive monetary shock in one of the monetary aggregates (Monetary Base, M1 or M2) can generate a large drop in the interest rate via "liquidity effect " at least in the short run. Therefore, the "liquidity effect" is the first step of the transmission mechanism in monetary policy which along with higher real balance stimulate spending and finally increase nominal income.[3]

In the international arena, monetary models like those of Grilli and Roubini (1991,1992) and Schlagenhauf and Wrase (1992a,b) suggest that an expansionary shock to monetary policy will have an impact on economic activity by lowering domestic short-term nominal interest rates and depreciating the domestic currency in the short-run (i.e. emphasizing the existence of liquidity effects) before inflationary pressures prevail in the medium-run. These inflationary pressures (Fisherian effect) are translated into subsequent increases in the short-term interest rates and appreciation in the domestic currency. Recent empirical developments by Eichenbaum and Evans (1993) have shown that, in identifying U. S. monetary

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[3] In other words,the increase in nominal income is translated into an increase in the demand for money. But money growth can increase nominal rates through inflationary expectations. This is within the context of the IS-LM framework.

shocks, a positive innovation in the monetary aggregate (nonborrowed reserves) lead to a persistent decline in the interest rate and to an impact depreciation of the dollar exchange rate. These results are consistent with the idea of the liquidity effects. NBR (nonborrowed reserves) is chosen as the monetary aggregate because it is primarily affected by open market operations[4] and it is negatively correlated with the short-term interest rates. Christiano and Eichenbaum (1992a) report that there is a strong statistically significant, negative contemporaneous correlation between the federal fund rate and the nonborrowed reserves. In addition, the federal funds rate is negatively correlated with leads and lags of nonborrowed reserves up to one year. However, these correlations can not be taken as evidence that unanticipated expansionary monetary policy disturbances drive short term interest rates down.

While, an innovation in the other monetary measures is regarded as a shock to demand (Goodfriend 1993, Strongin 1992) or money demand (Bernanke and Blinder 1990, King and Watson 1992 and Sims 1992) an innovation in the NBR is considered as a shock to the supply of money[5]. What Eichenbaum and Evans (1993) did not consider is the identification of monetary policy shocks to the other G-7

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[4] Even that we have a plethora of U.S. monetary aggregates (M0 ,M1, M2) at hand the Open Market Committee directly controls only the nonborrowed Reserves which are governed by different regulations within the Federal Reserve System. (Goodfriend (1983) and Stigmum (1990)).

[5] Different authors have shown that innovations to one of the U. S. broad monetary aggregates (M0, M1, M2) are followed with sharp and persistent increases in the short-term nominal interest rates. Leeper and Gordon (1992) provide evidence of this "puzzle" in a closed economy context.

countries namely Germany, France, Italy, Japan, U.K. and Canada. It would be interesting to see the same liquidity effects emerged on the other G-7 countries.

Grilli and Roubini (1993) in a recent contribution attempted to detect any possible liquidity effects on the exchange rate on the other G-7 countries by using the foreign short-term interest rate as the policy instrument in identifying shocks to foreign monetary policy.[6]

They report that although, U.S. interest rate increases lead to an impact appreciation of the U.S. dollar, a contractionary monetary policy in most of the other G-7 countries leads to a surprisingly impact depreciation of their currencies relative to the U.S. dollar. This asymmetry which is defined as "exchange rate puzzle" can be explained -according to the authors- by the leader follower hypothesis. The leader, in this case the U.S., sets the monetary policy and the followers ,the other G-7 countries respond to that accordingly.

Motivated by the above results we are compelled to look at the liquidity effects issue (for all G-7 countries) from a different perspective and use as the main policy instrument the monetary aggregate in identifying U.S. and non-U.S. monetary shocks. The choice of NBR (nonborowed reserves) in the case of U.S. as the monetary aggregate can be easily justified . Firstly, as previously pointed out , NBR is negatively correlated with the short-term interest rate , it is directly controlled by

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[6] Grilli and Roubini (1993) concentrate on the interest rate as policy instrument and take any possible liquidity effects that may derived from an expansionary monetary policy on interest rates as given.

the Federal Open Market Committee (FOMC) and its innovations represents exogenous shocks to the supply of money and which according to Boschen and Mills (1995), a positive monetary shock has a transitory positive impact on nonborrowed reserves. In the later note, since open market operations have become the dominant policy tool used to influence the money supply, the purchase of government bonds and securities by the Fed is virtually equivalent to an exogenous increase in the money supply. After the purchase of government securities (mainly from the member banks) the Fed credits the banks' accounts at the Fed with the appropriate amount. As a consequence, the banking system's deposit at Fed have increased since these deposits are translated into reserves.

On the other hand, short-term interest rates are not , at best, a better proxy in identifying monetary changes. Although, Bernanke an Blinder (1992) found that transitory movements in the federal funds rate and the treasury bill rate are closely related to policy changes, Boschen and Mills (1995) found that a substantial amount of monthly variation in interest rates is not associated with policy decisions. Furthermore, the short-term interest rates can be regarded as a polluted measure of policy disturbances knowing that a portion of the innovation to interest rates represents an endogenous response of the policy makers to non policy disturbances.[7] We have no way of knowing what percentage of interest rate

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[7] Although, Sims (1992) believes that innovations to the interest rates represent changes in monetary policy, he found that positive innovations to short-term interest rate leads to a sharp and persistent increases in the price level.

innovations represent exogenous policy disturbances and what percentage represent endogenous reaction. Therefore, there is certainly no a priori reason for working with the innovations to the interest rate attributable entirely to exogenous shocks in monetary policy. Simply, if we use interest rate innovations, we'll systematically overstate the importance of policy disturbances. Therefore it seems logical, at this point, to use the monetary aggregate (NBR) as the main policy instrument and to test the existence of liquidity effects on the short-term interest rates and on the nominal exchange rate.

The variables employed in our analysis differ from the ones that Eichenbaum and Evans (1993) and Grilli and Roubini (1993) incorporate. According to Eichenbaum and Evans (1993), the exclusion of a measure of high order foreign monetary aggregate from their analysis have a minimal impact on identifying shocks to the U.S. monetary policy. Nevertheless, the inclusion of a measure of a U.S. monetary aggregate on identifying shocks to the other non-U.S. G-7 countries would have a significant impact on the foreign monetary policy. In other words, U.S. monetary variables are included since it is clear that U.S. events are a

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According to Sims (1992), this means that the policy makers have information -that is not captured by the variables included in the VAR system -regarding inflationary pressures and they increase the short term interest rates to forestall inflation (Einchenbaum (1992)). We followed Grilli and Roubini (1993) VAR structure using the interest rate (Federal Funds rate) as the monetary policy instrument and we found that an innovation to interest rate is accompanied consistently with increases in the price level. This is inconsistent with any existing theoretical models including Keynesian, Monetarist and Real Business Cycle whereas monetary contractions lead to periods of inflation.

major factor in generating foreign business cycles. Omitting U.S. monetary aggregate variables could cause important biases when analyzing the effects of foreign innovations in non-U.S. VAR systems. Therefore in our analysis we include a measure of a foreign monetary aggregate instead of a measure of foreign output.

4.1 Identifying Shocks to Monetary Policy.

In order to identify Monetary Policy shocks we incorporate the standard VAR methodology and measure orthogonalized components of the innovation to one of the monetary aggregates, namely, the money supply . The innovations to monetary policy are identified with the disturbance term in a regression function of the form:

$$\Lambda_t = \delta(\Gamma_t) + \varepsilon_{\Lambda t} \qquad (1)$$

Where Λ_t is the monetary authority's policy instrument at time t - in our case a monetary aggregate (NBR) δ is the linear function, Γ_t is the information set available to the monetary authorities at time t when Λ_t is set and $\varepsilon_{\Lambda t}$ is a serial uncorrelated policy innovation which is orthogonal to the elements of the information set and represents the exogenous shock to the monetary authority's policy instrument. The monetary authorities set the level of the money supply by taking into account the values of the variables (past and some current) that are included in the information set.

The dynamic response of a variable to a monetary policy shock can be derived by computing the impulse response function in an appropriately identified Vector Autoregression (VAR). In other words, equations were estimated for the system:

$$Z_t = A(L)Z_{t-1} + v_t \qquad (2)$$

where v is iid, $Ev_tv_t' = V$ and Z_t vector of variables

and $$A(L) = A_0 + A_1L + .. + A_nL^n$$

where L is the lag operator and n is the number of lags.

To proceed one must specify the variables involved in the VAR system the optimum number of distributed lags and the Wold ordering of the variables. Variables appearing before the policy instrument can have a contemporaneous effect on the policy instrument. In other words, the monetary authorities before setting Zt observe all the lagged variables in the system as well as the current values of the variables appearing prior to the policy instrument. The shock to monetary policy is the component of the innovation to the instrument variable and is orthogonal to the variables that are causally prior to the monetary instrument.

4.2 Empirical Results: Identifying U.S. Monetary Policy shocks.

In this section we present the dynamic responses of nominal exchange rate(along with foreign money supply, foreign interest rates U.S. money supply and U.S. interest rates) to a shock in the U.S. monetary policy in the post Bretton Woods era. We consider six nominal exchange rates for the following G-7 countries {Germany, France, Italy, Japan, U.K. and Canada) for the sample period of 1974 to 1993:11 and 1974:1 to 1992:12 for the case of France. The monthly data is taken from the International Financial Statistics tape and its detailed form can be found in the appendix. In identifying appropriately the shocks to monetary policy we are forced to examine the flexible exchange rate regime by itself -which begins on 1973 - since the fixed exchange rate regime imposed constraints on the monetary policy.[8]

We consider a seven variable VAR system including, U.S. industrial production (Y) (where industrial production is a proxy for output) U.S. consumer price index (P) (consumer price index as a proxy for prices) foreign monetary aggregate (M*) (an asterisk in this section denotes a foreign variable) foreign short term interest rate (R*) U.S nonborrowed reserves (M), U.S. short term interest rate (R) and a nominal exchange rate (E) (defined as the number of foreign currency

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[8] There is a widely accepted notion that the fixed exchange regime imposed constraints on the monetary policy and evidence can be found -among others- in Eichenbaum and Evans (1993) where they show that the U.S. monetary policy was less volatile under the fixed exchange rate than under the floating exchange regime.

units needed to buy one U.S. dollar) where E={ DM, FF, Lira, Yen, PD, Can$} respectively.

The Wold ordering of the variables { Y , P , M* , R* , M, R , E} assumes that the monetary authorities observe all lagged values of the variables as well as the current values of the variables that appear prior to the policy instrument, namely M , before setting the policy. In other words, the contemporaneous portion of the feedback rule for setting the level of M involves only the variable that appear causal-prior to M namely Y, P, M*, R*, excluding the other variables[9]. A shock to monetary policy is measured by the innovation on M that is orthogonal to innovations in Y, P, M*, and R*.

One feature of our analysis which distinguish it from Eichenbaum and Evans (1993) is that we include a measure of foreign monetary aggregate in place of the measure of foreign output. Figure 1a , exhibits all the impulse response functions that emerged from the above 7-variable VAR systems. In discussing the impulse responses we use the following convention. Suppose the system is an equilibrium and that equilibrium is placed at the origin of our coordinate system that is all variables are zero in equilibrium. Then an effect of a one time impulse on a variable is traced through time. In addition if the variable returns to its initial equilibrium the effect is called transitory.

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[9] The money supply shock is identified as the 5th element of EVt , where E is lower triangular with ones in the diagonal and EE'=V.

Figure 1a reports results for the German, French, Italian, Japanese, U.K. and Canadian case respectively. The solid lines in figure 1a represent the dynamic responses of foreign money (M*), foreign short-term interest rate (R*), U.S. money, U.S. short-term interest rate (R) and the exchange rate to one standard deviation shock to U.S. monetary policy. The dotted lines represent one standard deviation confidence intervals of the point estimates of the coefficients in the impulse response functions[10].

But before going into the discussion of the results emerging from the impulse response functions, let's look at the correlations between the innovations in table 1. Table 1 depicts the covariance matrix of the innovations in the VAR systems underlying the response functions in figure 1a. Note that the correlations among the innovations in each VAR system are low suggesting that orthogonalization has little impact on the ordering of the variables. This can be easily seen from table 1 where most of the off diagonal elements are very close to zero. Also, note the strong negative correlations of the interest rate and exchange rate to an innovation in U.S. money supply- row four and six in column five for each system. The strong negative correlations of the U.S. interest rate to an innovation in U.S. money supply (NBR) ranging from {-.038 to -.171} supports the finding by Christiano and Eichenbaum (1991) that the unconditional correlation between NBR and Federal Funds rate is

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[10] We use the method described in Doan (1990),example 10.1 to compute standard errors with 300 draws from the posterior distribution of the VAR coefficients.

Table 1

Correlation matrix of innovations in VAR : seven variable systems.

Y	P	M*	R*	M	R	E
U.S.vs Germany						
1.000						
0.067	1.000					
-0.099	0.100	1.000				
0.012	-0.063	0.030	1.000			
-0.089	-0.031	-0.278	0.029	1.000		
0.273	0.097	-0.096	-0.023	-0.091	1.000	
0.176	0.124	0.011	0.043	-0.021	0.217	1.000
U.S. vs France						
1.000						
0.126	1.000					
-0.099	-0.231	1.000				
-0.019	0.179	-0.124	1.000			
-0.159	-0.054	0.192	-0.032	1.000		
0.295	0.111	0.011	0.049	-0.100	1.000	
0.150	0.096	-0.070	-0.147	-0.011	0.217	1.000
U.S.vs Italy						
1.000						
0.068	1.000					
-0.005	-0.222	1.000				
-0.087	-0.046	0.147	1.000			
-0.095	-0.106	0.266	0.008	1.000		
0.263	0.082	0.115	0.047	-0.110	1.000	
0.148	0.087	-0.125	0.021	-0.000	0.194	1.000
U.S. vs Japan						
1.000						
0.135	1.000					
-0.052	-0.141	1.000				
-0.273	0.074	0.261	1.000			
-0.068	-0.125	0.178	0.034	1.000		
0.276	0.203	0.023	0.029	-0.171	1.000	
0.060	0.076	0.001	-0.017	-0.015	0.162	1.000
U.S. vs Britain						
1.000						
0.086	1.000					
0.020	-0.139	1.000				
0.019	0.100	0.134	1.000			
-0.095	-0.086	0.099	-0.084	1.000		
0.223	0.098	0.068	0.028	-0.087	1.000	
0.165	0.011	-0.065	0.143	0.071	0.114	1.000
U.S. vs Canada						
1.000						
0.078	1.000					
0.011	-0.093	1.000				
0.121	-0.017	0.078	1.000			
-0.071	-0.032	0.208	-0.033	1.000		
0.214	0.078	0.055	0.557	-0.038	1.000	
0.099	0.056	0.015	0.439	0.058	0.275	1.000

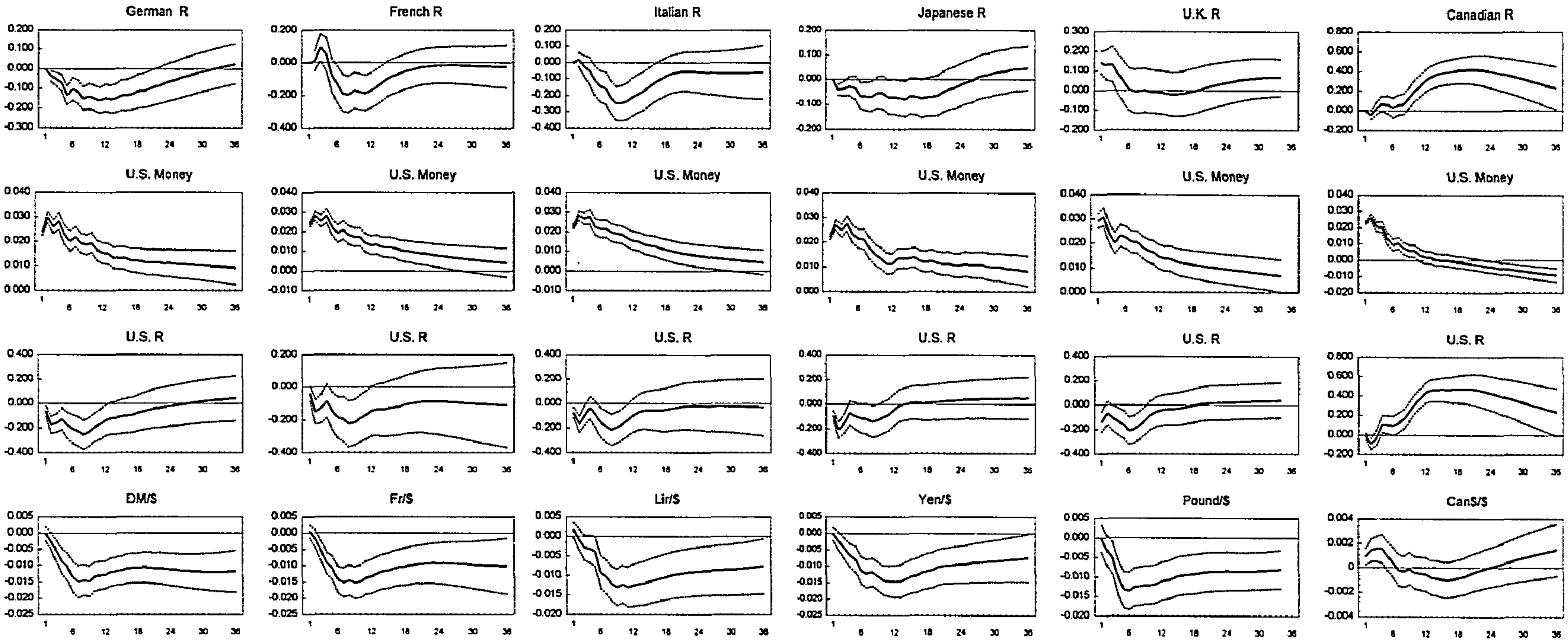
negative. In addition, the innovations of the U.S. money supply (NBR) output (Y) and prices (P) are negative-row four in column one and two in each system-suggesting that the policy makers move quickly to forestall the inflationary pressures by contracting the money supply (NBR) thereby inducing an increase in the short term interest rate.

The negative correlation of the U.S. money supply (M) and U.S. interest rate (R) can be manifested in the response of the interest rate (R) to an innovation of the U.S. money supply (M) which is depicted in figure 1a row three across. The U.S. short-term interest rate declines on impact to an innovation of the U.S. money supply ,and it stays -for over eight months- under its initial equilibrium point. Only in the case of Canada an increase in U.S. money is associated with an impact decline of the interest rate followed by sharp successive increases. Nevertheless in all cases, the impact decline is statistically significant and the liquidity effects in the short-run are evident. But interestingly enough to see is that the decline of the interest rates is followed by subsequent increases. These increases are attributed to the "Fisherian effect" where a decline in the short-term interest rate is followed by increases in nominal income and revisions of the agents' inflationary expectations. The latter is causing the nominal rates to increase.

Second, consistent with Grilli and Roubini (1992) "spill over effect" hypothesis, a positive shock to U.S. monetary policy leads to a persistent depreciation in the exchange rate (row five across) and the confidence intervals

Figure 1a

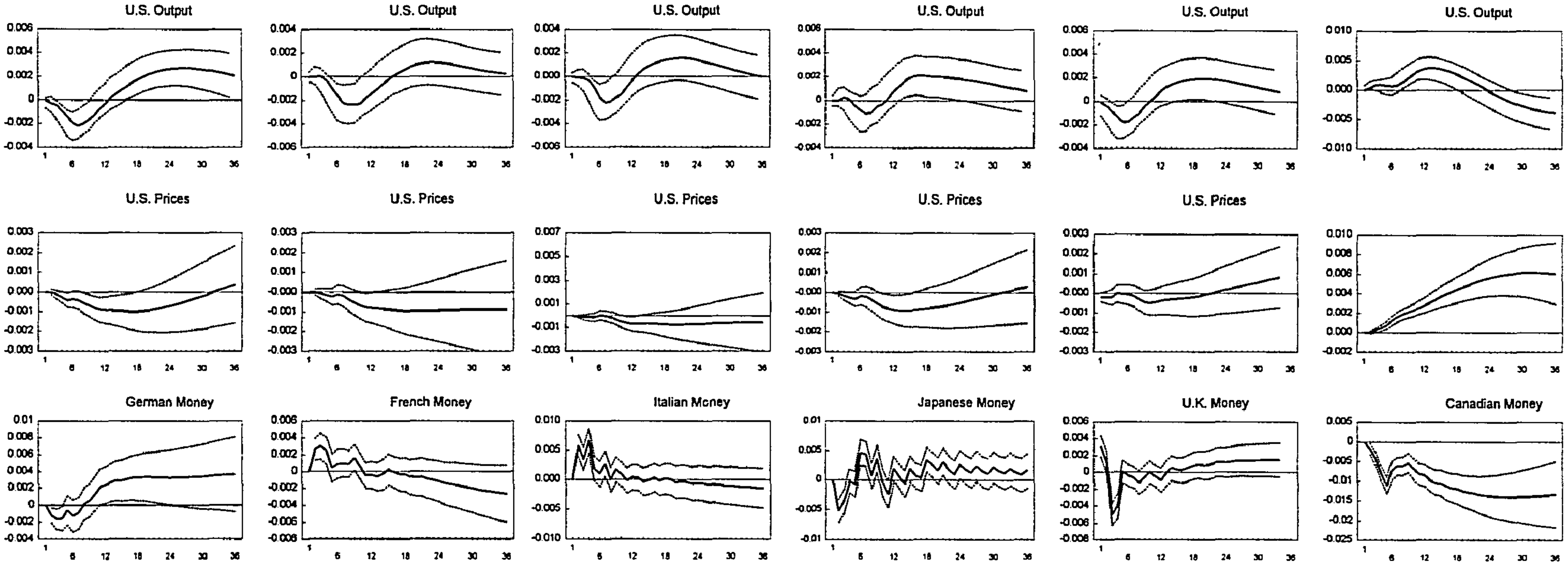
Impulse Response Functions: Orthogonalized Shocks in U.S. Money (Nonborrowed Reserves)
7 Variable System *



* Column 1 depicts the dynamic effect of an orthogonalized innovation in U.S. Money on the German interest rate, the U.S. money supply, the U.S. interest rate and the nominal exchange rate DM/$. Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada.

Figure 1b.

Impulse Response Functions: Orthogonalized Shocks in U.S. Money (Nonborrowed Reserves)
7 Variable System *



*Column 1 depicts the dynamic effect of an orthogonalized innovation in U.S. Money on the U.S. Output, the U.S. prices and the German money supply. Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada.

suggest that the dynamic coefficients are statistically significant (except in the case of Canada). But the maximal depreciation of the exchange rate which is defined as For/\$: For={ DM, FR, Lira, Yen, PD, Can\$) does not occur contemporaneously but after six to 9 months[11]. The delayed maximal depreciation of the dollar can be explained with the hypothesis that the agents might be learning about the change in monetary policy after awhile and gradually revise their expectation (Lewis (1989)).[12]

These results of the exchange rate send mixed signals on simple overshooting models like Dornbusch (1976) in which a positive shock to monetary policy generates sharp initial drop on the exchange rate. But surprisingly, the exchange rate after reaching the maximal depreciation point begins to appreciate in all cases until it reaches the long-run equilibrium point. The maximal depreciation of the exchange rate Et : E={DM, FF, Lira, Yen, PD, Can\$}/U.S. \$ occurs {6, 8, 9, 8, 7, 13} months after the shock to monetary policy. These results are in favor of Dornbusch's overshooting model in which the initial depreciation of the exchange rate is followed by subsequent appreciations.

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[11] Eichenbaum and Evans (1993) report that the maximal depreciation of the exchange rate for {Yen, DM, Lira, FF, PD} occurs after {22, 34, 37, 35, 39} months respectively and it is not followed by subsequent appreciations.Their results, are clearly at variance with the overshooting concept. Furthermore, they reject the uncovered interest parity hypothesis on the basis of higher foreign nominal returns (on foreign assets) and expected appreciation of the foreign currency.

[12] The behavior of the exchange rate is consistent with the models emphasizing delayed responses of the exchange rate (Delayed response hypothesis).

The intuition of the overshooting model is simple. At the time of the shock to monetary policy, output and prices are fixed (or adjusting slowly), so that the domestic nominal interest rate must decrease. As a result, the interest differential (between the two countries) generates capital outflow and depreciation until it is expected to appreciate to the point where the domestic and foreign bonds are equally attractive.

Column 1 of figure 1b shows the other estimated impulse responses of U.S. output (Y), U.S. prices (P) and German money supply (M*) to an innovation of U.S. money supply (M). Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada. Note that the responses of output (Y) and prices (P) across the countries are almost identical.

4.3 Identifying Non-U.S. Monetary Policy Shocks.

In this section we try to identify shocks to the other non U.S. G-7 countries monetary policy namely to Germany, France, Italy, Japan, U.K. and Canada by employing the same procedure. We consider six 7-variable VAR systems where each VAR system includes domestic industrial production (Y), domestic consumer price index (P), U.S. monetary aggregate (M*), U.S. short-term interest rate (R*), domestic monetary aggregate (M), a domestic short-term interest rate (R) and a nominal exchange rate (E), defined as the number of domestic units required to buy one U.S. Dollar $.

The impulse response functions again are calculated based on the Wold ordering of { Y, P, M*, R*, M, R, E}. This corresponds to the assumption that the domestic monetary authorities -before setting their monetary aggregate- observe the current values of the domestic industrial production, domestic short-term interest rate , U.S. monetary aggregate and U.S. short-term interest rate and the lagged values of all the variables within the VAR system. Therefore, in this environment, domestic monetary shock is measured as the component of the innovation in domestic money supply (M) that is orthogonal to innovations in Yt, Pt, M*t, and R*t. The response functions of the six 7-variable VAR systems are presented in figure 2a and 2b. Also, table 2 presents the correlations between the innovations in the various VAR systems.

The results derived from these systems are very surprising. Other than the case of Germany[13] and Japan - where a German or Japanese expansionary monetary policy is followed by an impact depreciation of the German mark and Japanese yen - there is no clear evidence of a domestic currency depreciation. In the contrary, the U.K. pound and the Italian Lira, persistently appreciate on impact after an

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[13] If we consider innovations in the German short-term interest rate we obtain the same puzzling exchange rate effects as in Grilli and Roubini (1993). Also we notice that the German price level responds positive to a positive innovation to the interest rate.This leads us to believe that the monetary authorities increase interest rates to forestall expected inflation. As a result prices and the exchange rate (DM/$) -i.e. DM depreciation- would rise after the monetary contractions but by less than they would have without the contraction (Sims (1992)).

expansionary monetary policy of their own. The other currencies, the Canadian Dollar and the French Franc are appreciating on impact before any depreciation prevails. But these are not statistically significant according to the intervals of confidence. The intervals of confidence are the dashed lines in the figures and they represent a one standard deviation bands around the estimates of the coefficients of the impulse response functions.

Only in the cases of Germany, U.K. and Japan an expansionary monetary policy of their own leads to a sharp persistent depreciation of their currencies against the U.S. dollar[14]. Moreover, the maximal depreciation of these currencies occur not on impact but after four months. This delayed maximal depreciation response as previously pointed out can be attributed to the hypothesis that the agents might be reacting slowly to the change in monetary policy and gradually revise their expectations . And here again, consistently, the depreciation of the currency is followed by subsequent appreciations. But the question posed to us at this point is why does not the exchange rate behave consistently ? What is the mechanism behind this inconsistency?

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[14] Grilli and Roubini (1993) report the same dynamic behavior of the exchange rate to a monetary policy innovation in the countrie of Japan. Although, they use the interest rate innovations to identify changes in monetary policy, the exchange rate responses are statistically significant and consistent with the theory of liquidity effects. Moreover, the maximal appreciation of Japan's currency does not happen on impact but rather after 4 months.

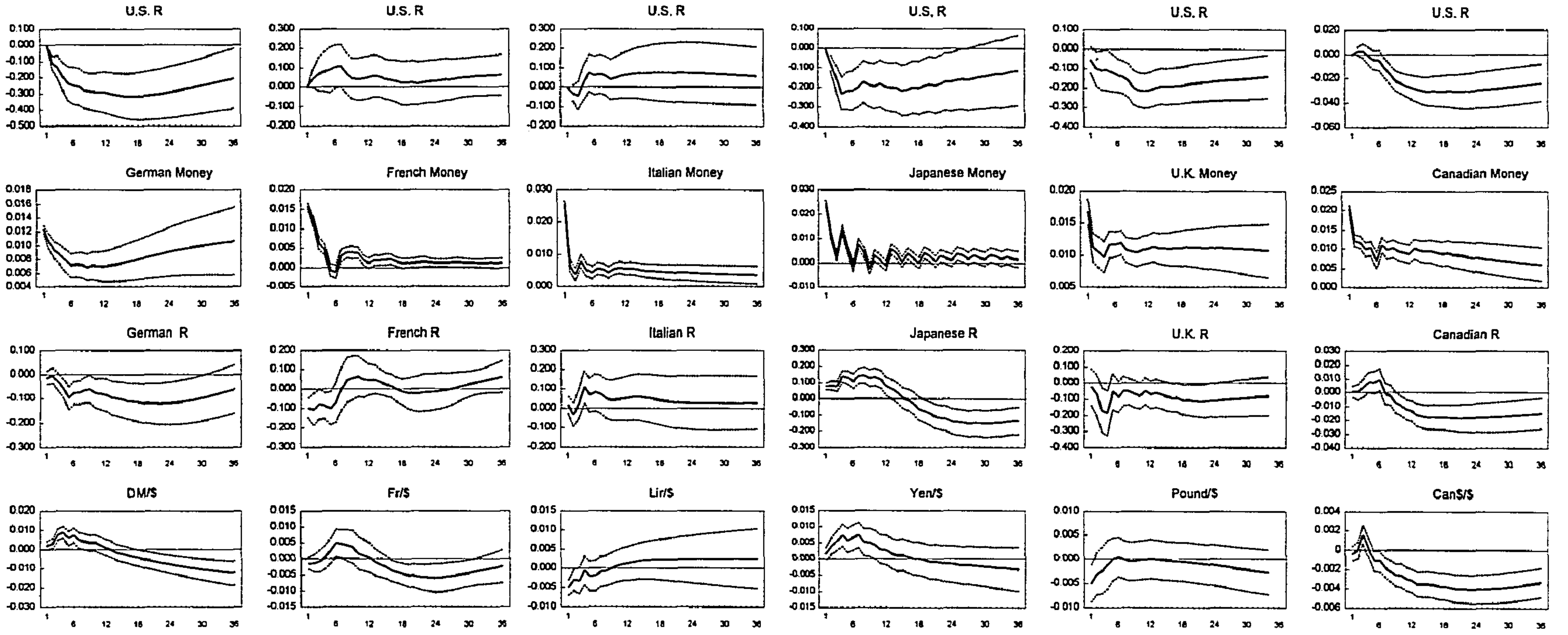
Table 2

Correlation matrix of innovations in VAR : seven variable systems.

Y	P	M^*	R^*	M	R	E
Germany						
1.000						
0.033	1.000					
-0.199	0.018	1.000				
-0.011	0.039	-0.085	1.000			
0.087	0.103	-0.289	-0.106	1.000		
0.066	-0.037	0.052	0.056	-0.056	1.000	
-0.015	0.140	0.035	0.211	0.034	0.102	1.000
France						
1.000						
0.103	1.000					
-0.190	-0.149	1.000				
0.072	0.140	-0.141	1.000			
-0.014	-0.227	0.147	-0.025	1.000		
0.093	0.023	-0.034	-0.009	-0.127	1.000	
-0.084	0.081	-0.034	0.229	-0.104	-0.094	1.000
Italy						
1.000						
0.115	1.000					
-0.004	-0.017	1.000				
0.158	0.000	-0.147	1.000			
0.146	-0.029	0.075	0.092	1.000		
-0.067	0.151	-0.020	0.012	-0.049	1.000	
0.012	0.113	-0.019	0.194	0.018	0.013	1.000
Japan						
1.000						
-0.051	1.000					
-0.060	0.009	1.000				
0.044	0.077	-0.135	1.000			
-0.059	-0.038	0.156	0.053	1.000		
0.074	-0.194	0.026	0.084	0.181	1.000	
0.029	0.038	0.027	0.169	0.073	-0.037	1.000
Britain						
1.000						
0.057	1.000					
0.054	0.102	1.000				
0.055	0.037	-0.089	1.000			
-0.137	-0.249	-0.013	-0.006	1.000		
0.007	-0.014	-0.135	0.870	0.006	1.000	
0.013	-0.092	0.005	0.135	0.017	0.133	1.000
Canada						
1.000						
-0.053	1.000					
0.097	-0.283	1.000				
0.147	0.076	-0.004	1.000			
0.038	-0.070	0.225	0.032	1.000		
0.181	0.033	-0.026	0.585	0.065	1.000	
0.116	0.116	0.058	0.316	0.026	0.489	1.000

Figure 2a

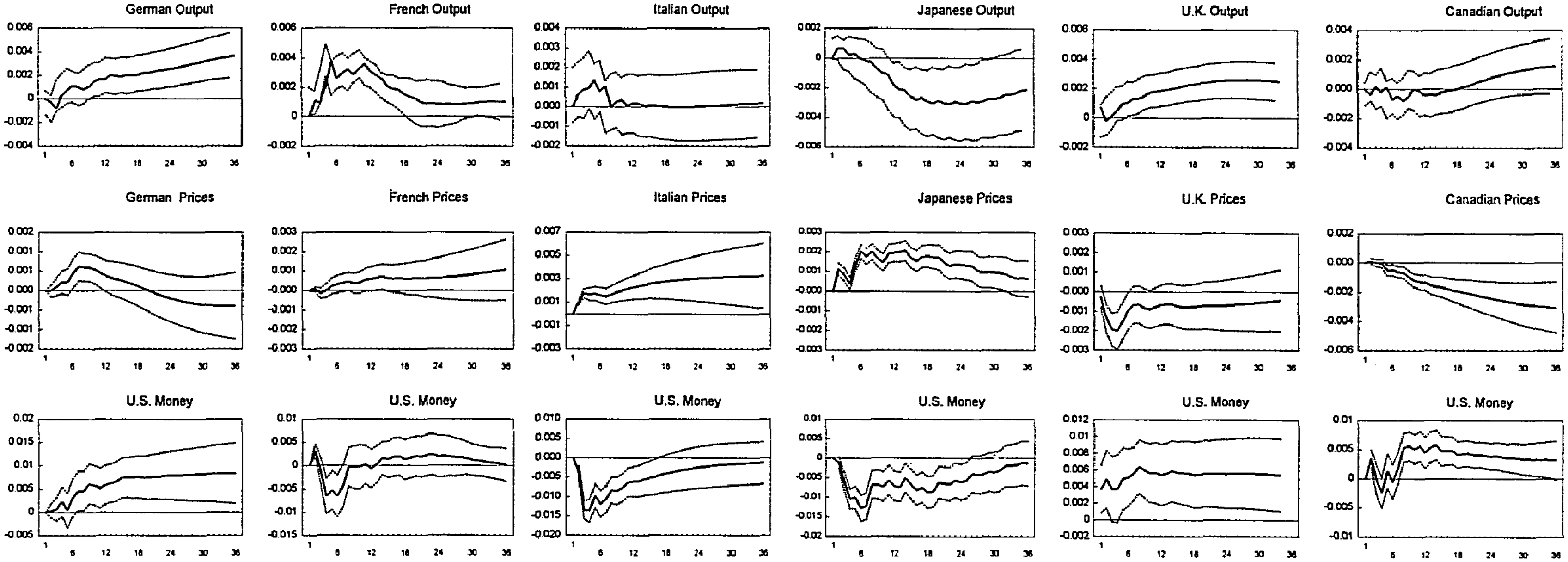
Impulse Response Functions: Orthogonalized Shocks in Money in G-7 Countries other than U.S.
7 Variable System *



* Column 1 depicts the dynamic effect of an orthogonalized innovation in German money on the U.S. interest rate, the German money supply, the German interest rate and the nominal exchange rate DM/$. Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada.

Figure 2b.

Impulse Response Functions: Orthogonalized Shocks in Money in G-7 Countries other than U.S.
7 Variable System *



* Column 1 depicts the dynamic effect of an orthogonalized innovation in German Money on the German Output, the German prices and the U.S. money supply.
Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada.

4.4 Results emerge from a Modifying non-U.S. VAR System.

In this section of the paper we would try to address and resolve the "liquidity puzzling" of the exchange rate which appears in the analysis of most non-U.S. G-7 countries. While, in identifying U.S. shocks to monetary policy we used nonborrowed reserves as the monetary tool, in identifying non-U.S. G-7 countries shocks to their monetary policy we used a broader measure of monetary aggregate (usually an M0 or M1). In a modified VAR system we now employ the reserves of the foreign Central Banks[15] as a proxy for the foreign monetary instrument which consists of deposits from the member banks plus currency outside the Central Bank. Changes in reserves in Central Bank can be considered as an exogenous shocks to the money supply which can have a noticeable impact on the nominal interest rates including the exchange rate. Therefore, we concentrate on the relationship between the monthly series for the reserves ,the interest rate and the exchange rate. The reserves are more closely associated with any foreign open market operations, and they are Central Bank's control variable.

Figure 3a exhibits the impulse responses emerged from the nonU.S. G-7 countries VAR-systems. Consider first the results for the exchange rate. Notice that, regardless of which country is viewed , innovations to monetary policy are always followed by sharp, persistent statistically significant increases in the exchange rate. In

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[15] It is hard or impossible to find data on nonborrowed reserves in the non U.S. G-7 countries. Therefore, at this point we use the total bank reserves as a proxy of money.

all but one case, Japan, the dynamic response of the exchange rate is the same: the immediate impact of the shock to monetary policy to non-U.S. G-7 countries is to raise the value of the exchange rate above of its preshock level[16]. Even in the case of Japan, the immediate depreciation of the exchange rate is followed by subsequent statistically significant appreciation of the exchange rate.

Even in this modified scheme, the maximal appreciation of the exchange rate is not achieved on impact but after a few periods: and this hump-shape dynamic responses of the exchange rate appears in almost all countries which are under consideration. But the behavior of the domestic interest rate, in general, is not consistent with the hypothesis of the liquidity effects derived from the monetary transmission mechanism. The interest rate does not decline on impact -to an innovation of the domestic supply- but rather stays unchanged or even increases on impact.

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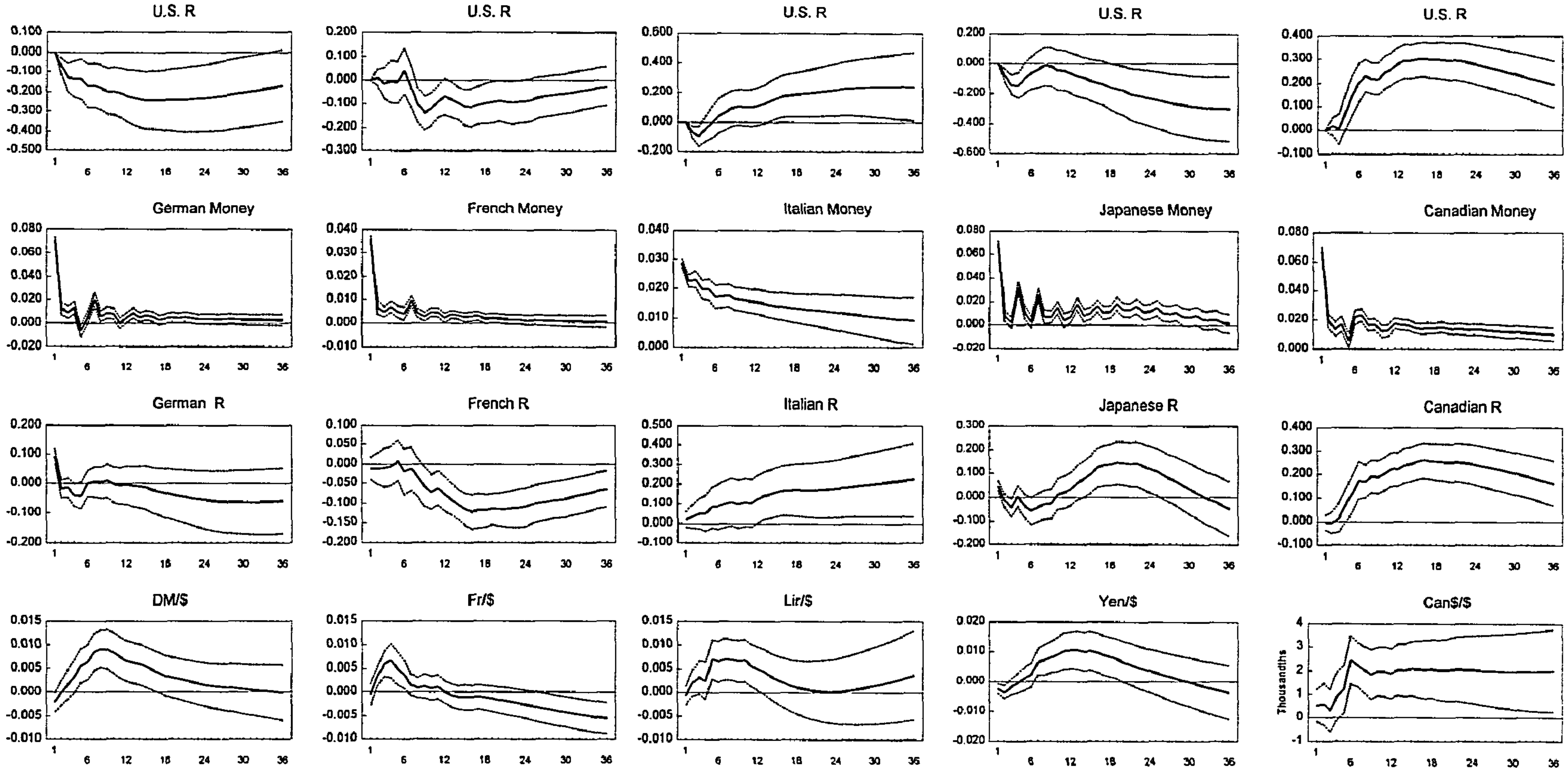
[16] U.K. is not considered in this environment because of luck of meaningful data.

Figure 3a

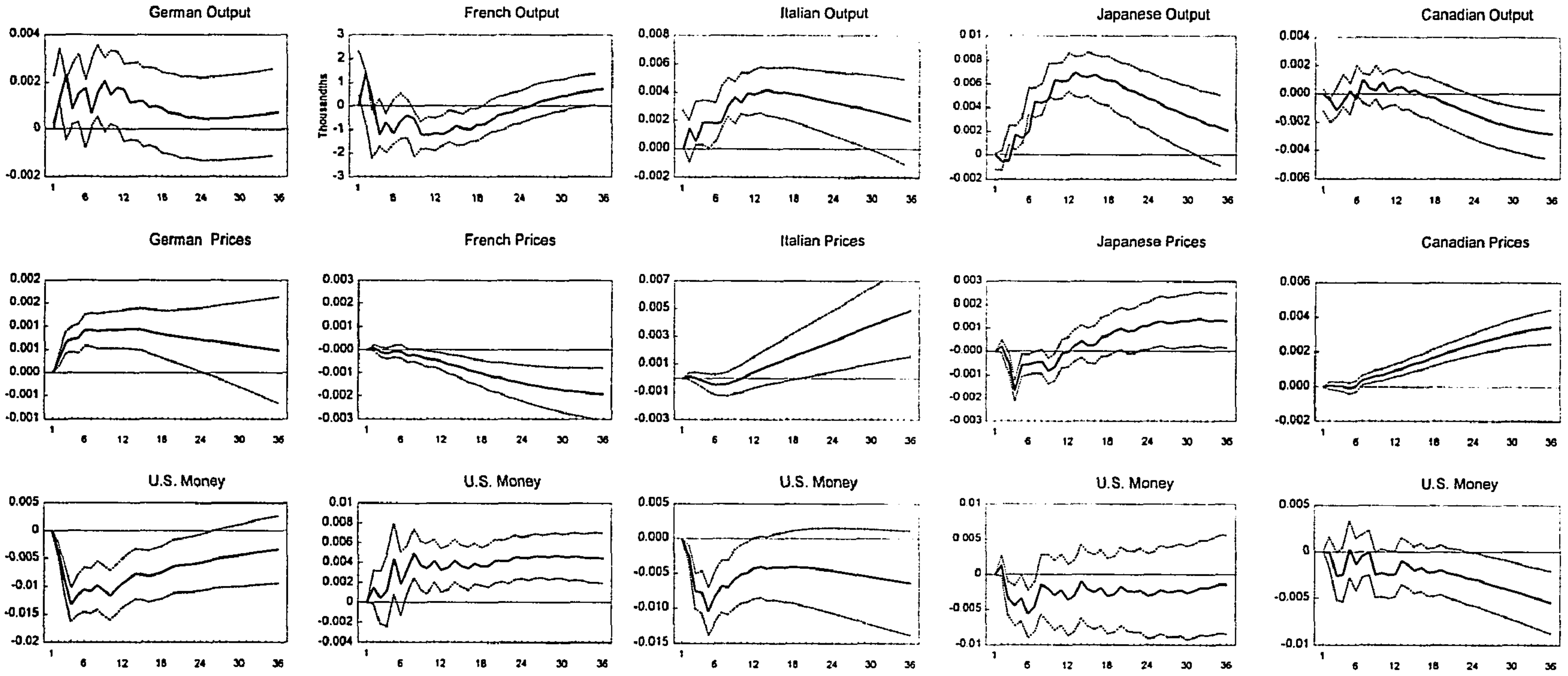
Impulse Response Functions: Orthogonalized Shocks in Reserves in G-7 Countries other than U.S.
7 Variable System *



* Column 1 depicts the dynamic effect of an orthogonalized innovation in German Reserves on the U.S. interest rate, the German money supply, the German interest rate and the nominal exchange rate DM/$. Column 2 through 6 do the same for France, Italy, Japan, U.K. and Canada.

Figure 3b.

Impulse Response Functions: Orthogonalized Shocks in Reserves in G-7 Countries other than U.S.
7 Variable System *



* Column 1 depicts the dynamic effect of an orthogonalized innovation in German Reserves on the German Output, the German prices and the U.S. money supply. Column 2 through 6 do the same for France, Italy, Japan and Canada.

5.0 Nonstationarity

The model building process outlined in the previous section has been based upon the assumption that all the time series being considered are stationary. But the assumption of stationarity is by no means an innocuous one in the important context of inference in multiple time series regressions which can produce the well known problems in econometrics of " nonsense" or "spurious regression" (Granger and Newbold (1974)).

Granger and Newbold have examined the empirical implications of such regressions warning about the presence of serially correlated errors invalidating conventional procedures of inference. They were concerned with the variables appearing in the regression in levels which often had given high R square statistics and very low DW results. Furthermore, any significance test performed on the coefficients of the regression had lead to the rejection of the null hypothesis and acceptance of a spurious relationship. They suggested that the regressions should be run in the first difference of the variables implying that all the series in the regression are integrated processes of degree one i.e. $\sim I(1)$.[17]

Therefore, it is useful to test explicitly for manifestations of nonstationarity since most of the macroeconomic time series demonstrate signs of nonstationarity and

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[17] But if the variables in the VAR system are cointegrated, a pure VAR in differences will be mispecified (Engel and Granger (1987)).

because the presence of such nonstationarity often has important econometric implications.

A variable y is said to have a unit-root in its autoregressive process if its autoregressive representation is of the form :

$$(1-L)y_t = \Phi_1(1-L)y_{t-1} + \ . \ . \ . \ + \Phi_p(1-L)y_{t-p} + e_t$$

where e_t is white noise and $\Sigma\,\Phi_i \leq 1$.
Classic statistical methods such as augmented Dickey-Fuller tests are used most often to detect the possible existence of unit roots in data series.

The Dickey-Fuller test can be computed by running the regression

$$(1-L)y_t = \beta y_{t-1} + a + \sum_{i=1}^{p} \Phi_i(1-L)y_{t-i} + e_t$$

The above equation represents a regression of an I(0) variable on a I(1) variable and therefore, test statistics are not distributed with traditional distribution (e.g. "t" test). Its distribution is negatively skewed with most of the mass below zero. Hence, critical values in the left hand tail should be smaller than those of the conventional Student-t statistics. Fuller (1976) derived appropriate limit distributions for the test statistics, Dickey (1976) computed empirical approximations for selected sample sizes and McKinnon (1991) among others, have tabulated critical values for any sample size and for any choice of independent variables in the Dickey-Fuller regression.

5.1 Unit Root Test: Empirical Results.

Tests are conducted against two alternatives, one consistent with fluctuations around a constant mean and the other with fluctuations around a deterministic linear trend. The latter is more relevant to our analysis due to the tendency of most of the variables to trend up over time.

Table 1 contains the results of the augmented Dickey-Fuller alternative tests. The first row of each sub-table reports the results of the first test (i.e. containing a mean) and the second row the results of the second alternative(i.e. including a deterministic linear trend). In both cases four lags are included to account for serial correlation in the error term. The results are found to be insensitive to other lengths. The test statistics are quite consistent with the hypothesis that unit-root nonstationarity characterizes each of the variables. The null hypothesis of a unit root in the representation can not be rejected for any of the variables at reasonable significance level (i.e. 5% level) except for Japan's CPI variable. the Japanese price level appears to be stationary.

Further analysis of the data signifies that the degree of integration is of order one. In all cases, first-difference data, test statistics imply rejection at 5 percent significance of the null hypothesis of nonstationarity for all variables which suggest that the variables are integrated of order one.

Table 3

Augmented Dickey-Fuller Unit Root Tests 1974:1-1993:10 a

a: **Exchange Rates**

USA	CAN	FRA	GER	ITA	JAP	UK	5 %
---	-1.845	-1.473	-1.405	-1.464	-0.553	-2.111	-2.874
---	-1.671	-1.467	-1.795	-1.606	-2.437	-2.211	-3.43

b: **Interest Rates**

-0.906	-1.265	-2.97**	-1.815	-2.807	-1.753	-1.831	-2.874
-1.209	-1.45	-2.941	-2.054	-2.989	-2.275	-1.934	-3.43

c: **Industrial Production**

-0.434	-0.735	-0.981	-0.847	-1.11	-1.273	-0.613	-2.874
-3.267*	-2.301	-2.89	-2.443	-2.217	-1.915	-2.752	-3.43

d: **CPI**

-0.686	-3.28**	-3.35**	-1.921	-3.91**	-7.22**	-4.86**	-2.874
-1.33	-0.148	0.681	-1.628	-0.385	-5.61**	-2.57	-3.43

e: **Money Supply**

-0.973	-1.437	-3.28**	0.159	-2.79	-1.541	-5.1**	-2.874
-1.893	-0.152	-0.304	-1.382	-0.438	-3.1	-3.09	-3.43

*(**) denotes significance at the 10 % and 5% level respectively.

The values of the first row of each table are t-statistics on β_0 in the regression $\Delta y_t = \alpha + \beta_0 y_{t-1} + \Sigma_{i=1}^{4} \beta_i \Delta y_{t-i}$ and the values of the second row are t-statistics on β_0 in the regression $\Delta y_t = \alpha_0 + \alpha_1 t + \beta_0 y_{t-1} + \Sigma_{i=1}^{4} \beta_i \Delta Y_{t-i}$. . McKinnon critical values for rejection of the hypothesis of a unit root at 5% level are -2.87 for the first equation and -3.43 for the second one. At 10% level the critical values are -2.5734 and -3.1709 respectively.

a The data sample for France is from 1974:1 to 1992:12.

Therefore, the levels of all variables (except in the case of Japan) must be first differenced to achieve stationarity. In the next section, tests for cointegration will determine whether a linear combination of the series results in stationary disturbances around zero.

5.2 Cointegration Analysis.

The cointegation analysis-in our case- has two purposes. First, if we wish to specify an easily interpreted form for an exchange rate equation or money supply equation, like an error correction model, we must first determined the existence and number of the cointegrating relationship in the data. Secondly, this acts as a check on the adequacy of our model. If the long-run exchange rate is determined by factors other than these associated with the variables in the system, then their omission should prevent us from finding evidence of cointegration. In addition, evidence of cointegration implies that the variable in the system can adequately capture all the permanent innovations in the money supply and exchange rate over our sample period.

The methodology used in this study is based on the work of Johansen (1990) who derived the statistical properties of cointegrating vectors by relating these vectors to the canonical correlations between the levels and first-differences of the process(corrected for any short-run dynamics). By specifying an explicit AR/Gaussian process for the data, Johansen was able to develop likelihood ratio tests for the number of cointegrating vectors. The maximum likelihood framework has the additional virtues of facilitating inferences concerning the structure and relative importance of the cointegrating vectors as well as providing relatively powerful tests when the model is correctly specified.

This section provides an informal discussion of Johansen's maximum likelihood approach to testify for cointegration.The starting point of the analysis ia the following VAR(p) specification for the $n \times 1$ vector of $I(1)$ variables $Y_{t.}$:

$$Y_t = \mu + A_1 Y_{t-1} + \ . \ . \ . \ + A_p Y_{t-p} + e_t \qquad (1)$$

where e_t is assumed to be a Gaussian process, with nonsingular covariance matrix $\Sigma_{e.}$

Defining $\Delta \equiv 1 - L$ where $1 - L$ is the lag operator , (1) is rewritten as follows:

$$\Delta Y_t = \mu + \theta_1 \Delta Y_{t-1} + \ . \ . \ . \ + \theta_{p-1} \Delta Y_{t-p+1} + \Pi Y_{t-p} + e_t \qquad (2)$$

where $\theta_i = -(I - A_1 - \ . \ . \ . \ - A_i) \qquad i = 1, .., p-1$

and

$$\Pi = -(I - A_1 - .. A_p)$$

Now all the long-run information in the Y process is summarized by the "long-run impact matrix", Π and it is the rank of this matrix that determines the number of cointegrating vectors.

There are three distinct cases to consider. If r=0, where r is the rank of cointegration, then $\Pi = 0$ (null matrix) and equation (2) reduces to a standard

VAR in first-differences where there are no stationary long-run relations among the elements of Y_t. In other words, ΔY_t has a stable $VAR(p-1)$ representation.

Second, if Π is full rank matrix and assumed stationarity of the error term in eq. (1) requires that the levels of the Y_t process themselves are stationary, implying the absence of any stochastic trends whatsoever in the data contrary to our original I(1) specification.

The third case when Π is of rank r(0 < r <n) in which case Π can be factored as $\Pi = \alpha\beta'$ where α *and* β' are $n \times r$ matrices. Notice that because e_t and ΔY_t are assumed to be stationary, for eq. (2) to make sense ΠY_{t-p} must also be stationary. Furthermore, $\beta' Y_t$ must comprise p cointegrating I(0) relations inducing the restricted I(0) representation

$$\Delta Y_t = \mu + \sum_{i=1}^{p-1} \theta_i \Delta Y_{t-1} + \alpha\beta' Y_{t-p} + e_t \tag{3}$$

To ensure that Y_t is not I(2) a further requirement is that $r(\alpha \perp \Upsilon \beta' \perp) = n - p$ where

$$Y = -\sum_{i=1}^{p} i\pi_i \tag{4}$$

where Υ is the mean lag matrix $\alpha \perp$ *and* $\beta \perp$ are orthogonal complements of α *and* βrespectively.

Next we can simplify the estimation of α *and* β by concentrating out the short-run dynamics. This can be done by regressing ΔY_t *and* Y_{t-p} *on* $\{\Delta Y_{t-i}\}$ giving the residual vectors $\Re_{0t}$ *and* $\Re_{pt}$. The concentrated likelihood functionthen has the form of

$$\Re_{ot} = \alpha\beta'\Re_{pt} + V_t \ . \tag{5}$$

By using equation (5) for a fixed β we can estimate α by linear regression.

$$\hat{\alpha}(\beta) = (S_{0p}\beta\beta' S_{pp}\beta)^{-1} \tag{6}$$

where $S_{i\,j}$ are product moment matrices defined by the residual vectors i.e.

$$S_{ij} = T^{-1}\sum_{t=1}^{T} \Re_{ij}\Re'_{jt} \quad i,j = 0,$$

Substituting (5) into (6) gives the following sum-of squares function:

$$\Sigma(\beta) = S_{0\,0} - \hat{\alpha}(\beta)(\beta' S_{pp}\ \beta)\hat{\alpha}(\beta)' . \tag{7}$$

By solving the eigenvalue problem we minimize the determinant of (7)

$$|\lambda S_{pp} - S_{p0}S_{00}^{-1}S_{0p}| = 0 \tag{8}$$

To find the eigenvalues of $\hat{\lambda}_1 > \ldots > \hat{\lambda}_n$ and corresponding eigenvectors $\hat{v} = (\hat{v}_1 \ldots \hat{v}_n)$ where $\hat{v}$ is normalized by $\hat{V}' S_{pp}\hat{V} = 1$.

Estimates of the cointegrating vectors $\hat{\beta}$, are then given by the r eigenvectors corresponding to the layout r eigenvalues. In other words, the eigenvalues given by eq. (8) are the squared canonical correlation between $\Re_{0t}$ *and* $\Re_{pt}$. Thus, $\hat{\lambda}_t$ measures how strongly the linear combination $\hat{V}' Y_{t-p}$ is correlated with the stationary point of the process. If $\hat{V}' Y_{t-p}$ is nonstationary, his correlation tends to zero. Asymptotically then, the null hypothesis $\hat{\lambda}_i = 0$.

As a result, the maximum likelihood function takes the form (under the null hypothesis of r cointegrating vectors):

$$\Im^{-2/T} = |S_{00}|\left(1-\hat{\lambda}_i\right) \ldots \left(1-\hat{\lambda}_r\right) \qquad (9)$$

In practice we wouldn't know r. But eq.(9) permits the formation of likelihood ratio tests for the value of r. Johansen recommends two specific tests. The first, tests the restriction $r \leq q(q \leq n)$ against the unrestricted model $r \leq n$.

The second one , tests the null hypothesis that at most q cointegrating vectors exist.But the alternative is that only one additional cointegrating vector exists (i.e. $r \leq q+1$). The likelihood ratio statistic associated with the first test is called the "Trace Stat" while the second test is termed the "λmax Stat". From eq. (9)

$$\text{Trace Stat} = -T \sum_{i=q+1}^{n} (1-\hat{\lambda}_i)$$

and

$$\lambda \max Stat = -T\left(1-\hat{\lambda}_{q+1}\right)$$

The choice of the maximum lag length used in the specification of the VAR system can affect the determination of the dimension of the cointegration space i.e. the rank of Π as pointed out in Park and Ogaki (1991) and Reimers (1991). In particular, Reimers (1991) finds that overfitting implies a loss of power while underfitting leads to potential spurious cointegration.

Although, the lag order selection criteria such as AIC or Schwarz perform relatively well in determining the size and power of cointegration tests, they lead to selecting small low order VAR models usually of order two or three. But our problem is however here different for we are trying to develop a first stage model that has to be general enough to capture the long run relations, but also the short run dynamics. Consequently, we use VAR's of relatively high order to be certain that the short run dynamic is well captured.

The following tables summarize the cointegration properties of the data. Table 4.1 reports the results derived from the Germany vs U.S. VAR system . It lists the eigenvalues related to the long-run impact matrix from largest to smallest the estimated likelihood ratio (LR)-test for the number of cointegration vectors and the estimated cointegration rank, along with critical values at 5 and the 1 percent level when a linear deterministic trend is present and its coefficients are not restricted.

For the Germany vs U.S. VAR system, the sequential testing procedure provides us with 3 cointegration vectors at 5 percent critical valueand 2 cointegration vectors at 1 percent critical value. In other words, the cointegration tests strongly reject the null of no cointegration but not the null of at most three cointegrating vectors. For the other systems the cointegrating vectors at the 5 percent critical level are {3, 2, 3, 4, 4) for { France, Italy, Japan, U.K., Canada } and at the 1 percent critical level {2, 1, 1, 3, 4} respectively[18]. Therefore, a VEC (vector error correction) model should be deployed to correct for any spurious results in the regressions.

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[18] We are not going to continue examining the case of Japan because one of the

Table 4.1: Cointegration analysis of 7 dimensional VAR system.

Germany vs U.S

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.221	172.409	124.24	133.57	p==0**
0.16	114.156	94.15	103.18	p<=1**
0.133	73.548	68.52	76.07	p<=2*
0.077	40.268	47.21	54.46	p<=3
0.071	21.538	29.68	35.65	p<=4
0.018	4.312	15.41	20.04	p<=5
0.001	0.002	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 3 cointegrating equations at 5% and 2 at 1% significance level.

---

variables invlolved namely, the Japanese CPI seems to be stationary (table 3).

Table 4.2: Cointegration analysis of 7 dimensional VAR system.

France vs U.S.

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.275	187.21	124.24	133.57	p==0**
0.173	115.55	94.15	103.18	p<=1**
0.125	73.128	68.52	76.07	p<=2*
0.085	43.307	47.21	54.46	p<=3
0.058	23.559	29.68	35.65	p<=4
0.035	10.234	15.41	20.04	p<=5
0.01	2.353	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 3 cointegrating equations at 5% and 2 at 1% significance level.

Table 4.3: Cointegration analysis of 7 dimensional VAR system.

Italy vs U.S.

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.268	173.548	124.24	133.57	p==0**
0.144	100.594	94.15	103.18	p<=1*
0.101	64.106	68.52	76.07	p<=2
0.068	39.194	47.21	54.46	p<=3
0.047	22.673	29.68	35.65	p<=4
0.036	11.467	15.41	20.04	p<=5
0.017	2.981	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 2 cointegrating equations at 5% and 1 at 1% significance level.

Table 4.4: Cointegration analysis of 7 dimensional VAR system.

Japan vs U.S.

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.187	153.457	124.24	133.57	p==0**
0.144	105.139	94.15	103.18	p<=1*
0.107	68.694	68.52	76.07	p<=2*
0.091	42.193	47.21	54.46	p<=3
0.049	19.847	29.68	35.65	p<=4
0.027	8.186	15.41	20.04	p<=5
0.007	1.754	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 3 cointegrating equations at 5% and 1 at 1% significance level.

Table 4.5: Cointegration analysis of 7 dimensional VAR system.

U.K. vs U.S.

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.177	169.974	124.24	133.57	p= =0**
0.15	124.273	94.15	103.18	p<=1**
0.145	86.195	68.52	76.07	p<=2**
0.108	49.504	47.21	54.46	p<=3*
0.062	22.672	29.68	35.65	p<=4
0.025	7.672	15.41	20.04	p<=5
0.008	1.806	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 4 cointegrating equations at 5% and 3 at 1% significance level.

Table 4.6: Cointegration analysis of 7 dimensional VAR system.

Canada vs U.S.

Test assumptions: Linear deterministic trend in the data.

Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Number of Coint. Equations
0.241	202.448	124.24	133.57	p==0**
0.167	137.817	94.15	103.18	p<=1**
0.156	95.191	68.52	76.07	p<=2**
0.116	55.578	47.21	54.46	p<=3**
0.068	26.756	29.68	35.65	p<=4
0.033	10.319	15.41	20.04	p<=5
0.01	2.442	3.76	6.65	p<=6

*(**) denotes rejection of the hypothesis at 5% (1%) significance level

The likelihood ratio test indicates 4 cointegrating equations at 5% and 1% significance level.

5.3 Vector Error Correction Estimates.

The long-run equilibrium VAR model (cointegration regression) was first fit to the variables and the calculated cointegration vectors from that model could be used in a vector error-correction model to specify the systems'short-run dynamics. The vector error correction (VEC) is a restricted VAR designed for use with non-stationary series that are known to be cointegrated.

The VEC specification restricts the long run behavior of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short run dynamics.According to Engle and Granger(1987) the main purpose of the error-correction model is to determine if a part of the disequilibrium from one estimation period is corrected in the following period. This can be written as:

$$A(L)\Delta Y_t = \alpha\beta' Y_{t-1} + d(L)e_t.$$

where Y is the n-vector of variables in the model, Δ is the first difference operator, β is the n x r matrix of co-integrating vectors, α is an n x r matrix of coefficients, A(L) and d(L) are matrix polynomials in the lag operator L with A(L)=I, and e is a zero-mean n-vector of white noise disturbances.

The error correction representation is not the only possible parameterization of a dynamic model with co-integrated variables, but it has the advantage that all of the variables in the representation are I(0). This means that the standard asymptotic theory can be used to conduct statistical inference.

Another issue that has to be addressed is the technique employed in estimating the EC terms. An estimation of a fully specified EC system is more desirable than single estimation of an EC. Single equation estimation of an ECM is generally not sufficient unless the variables in the regressor set are strongly exogenous for the cointegrating coefficients.[19]

Summary statistics from the various VECM systems are reported in the following tables. In all equations at least one error correction terms is significant at the 5 percent level.[20] In addition, all of the error correction terms are significant in at least one equation. Furthermore, most of the error correction terms(Johansen's lag cointegrating terms) have significant influence in all of the domestic money supply (M) equations. For example, in the case of Germany, (table 5.1) all of the error correction terms entered in the foreign money equation appear to be statistically significant at the 5 percent level. The t-statistics for the three error terms are 3.4 , 2.7 and -3.2 respectively.

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[19] According to Phillips (1991) in cointegrated systems the use of single equation techniques imports bias, nuisance parameter dependencies and loses optimality.

[20] Since all variables in the regression are I(0), conventional distribution theory applies.

Table 5.1 Vector Error Correction System

Summary Statistics: Four Lag Model.

Germany vs. U.S.

Equation:	Y	P	M*	R*	M	R	E
Rsquare	0.3	0.35	0.34	0.34	0.17	0.35	0.18
Ssr	0.058	0.001	0.144	102	0.041	41	0.227
LL	636	1,090	529	-235	675	-128	477
EC(1)	-.0425	-.0027	-0.121	0.629	.124	6.218	-.147
	(.043)	(.0062)	(.068)	(1.82)	(.036)	(1.149)	(.086)
	(-.983)	(-.449)	(-1.777)	(.346)	(3.408)	(5.409)	(-1.72)
EC(2)	-.0623	-.0179	-0.314	3.64	0.123	-2.23	.0868
	(.054)	(.0076)	(.0845)	(2.25)	(.045)	(1.43)	(.106)
	(-1.16)	(-2.346)	(-3.7.14)	(1.614)	(2.72)	(-1.57)	(.818)
EC(3)	.0037	-.0006	.0025	-.0346	-0.0076	-.359	0.013
	(.003)	(.0004)	(.0045)	(.119)	(.0024)	(.075)	(.006)
	(1.30)	(-1.55)	(.559)	(-.291)	(-3.21)	(-4.778)	(2.32)

This table reports various statistics for the VEC model estimated using a maximum lag length of four. Ssr gives the sum of squared residuals , LL gives the log likelihood and EC(i) gives the normalized estimated coefficient of the (i)th error correction equation along with their estimated standard errors and t-statistics in parentheses. Only the coefficients of the error correction terms are reported in this table. For information about cointegration tests and vector error correction systems please see the appendix.

Note: In this text asterisks are used to denote U.S. variables.

Table 5.2 Vector Error Correction System

Summary Statistics: Four Lag Model.

France vs. U.S.

Equation:	Y	P	M*	R*	M	R	E
Rsquare	0.3	0.75	0.353	0.32	0.345	0.267	0.16
Ssr	0.04	0.001	0.138	105.2	0.066	166.8	0.21
LL	641	1,081	507	-232	588	-284	460
EC(1)	-.135	-.00037	.095	0.273	0.0596	6.386	-.297
	(.0425)	(.0059)	(.0777)	(2.147)	(.054)	(2.704)	(.0961)
	(-3.1817)	(-.0637)	(1.223)	(.0127)	(1.104)	(2.36)	(-3.086)
EC(2)	-.0422	0.0015	0.185	2.432	0.184	8.667	-.118
	(.039)	(.0055)	(.072)	(1.99)	(.05)	(2.502)	(.089)
	(-1.072)	(.995)	(2.563)	(1.224)	(3.69)	(3.46)	(-1.33)
EC(3)	-0.020	-.0027	-0.0076	.012	-0.012	1.005	-0.0595
	(.007)	(.001)	(.0137)	(.379)	(.0095)	(.477)	(.017)
	(-2.69)	(-2.598)	(-.552)	(.031)	(-1.235)	(2.108)	(-3.514)

This table reports various statistics for the VEC model estimated using a maximum lag length of four. Ssr gives the sum of squared residuals , LL gives the log likelihood and EC(i) gives the normalized estimated coefficient of the (i)th error correction equation along with their estimated standard errors and t-statistics in parentheses. Only the coefficients of the error correction terms are reported in this table. For information about cointegration tests and vector error correction systems please see the appendix.

Note: In this text asterisks are used to denote U.S. variables.

Table 5.3 Vector Error Correction System

Summary Statistics: Four Lag Model.

Italy vs. U.S.

Equation:	Y	P	M*	R*	M	R	E
Rsquare	0.33	0.66	0.33	0.32	0.15	0.38	0.15
Ssr	0.117	0.003	0.147	105	0.023	94	0.21
LL	554	994	528	-238	745	-225	487
EC(1)	.0202	.0037	0.065	0.512	.0163	0.525	-.071
	(.017)	(.0026)	(.019)	(.51)	(.0075)	(.485)	(.023)
	(1.181)	(1.42)	(3.403)	(.997)	(2.169)	(1.08)	(-3.12)
EC(2)	0.048	-.042	-0.22	-.482	-.015	4.57	.132
	(.055)	(.008)	(.062)	(1.66)	(.024)	(1.57)	(.074)
	(.87)	(-5.08)	(-3.48)	(-.290)	(-.604)	(2.917)	(1.79)

This table reports various statistics for the VEC model estimated using a maximum lag length of four. Ssr gives the sum of squared residuals , LL gives the log likelihood and EC(i) gives the normalized estimated coefficient of the (i)th error correction equation along with their estimated standard errors and t-statistics in parentheses. Only the coefficients of the error correction terms are reported in this table. For information about cointegration tests and vector error correction systems please see the appendix.

Note: In this text asterisks are used to denote U.S. variables.

Table 5.4 Vector Error Correction System

Summary Statistics: Four Lag Model.

U.K. vs. U.S.

Equation:	Y	P	M*	R*	M	R	E
Rsquare	0.28	0.5	0.24	0.37	0.23	0.32	0.17
Ssr	0.038	0.006	0.167	98	0.099	119	0.23
LL	687	896	516	-229	576	-254	476
EC(1)	-.100	.0156	-0.053	5.24	.0125	5.722	-.16
	(.034)	(.014)	(.071)	(1.72)	(.053)	(1.90)	(.084)
	(-2.94)	(1.123)	(-.75)	(3.05)	(.228)	(3.009)	(-1.9)
EC(2)	-.0232	-.018	-.0413	2.18	.027	2.27	-.0627
	(.014	(.0055)	(.028)	(.68)	(.022)	(.754)	(.033)
	(-1.72)	(-3.23)	(-1.47)	(3.21)	(1.26)	(3.02)	(-1.89)
EC(3)	.024	-.0004	-.0079	.264	.055	-.421	-.067
	(.0098)	(.004)	(.020)	(.496)	(.016)	(.55)	(.024)
	(2.47)	(-.0907)	(-.385)	(.533)	(3.45)	(-.766)	(-2.778)
EC(4)	-.0008	-0.002	.00015	-.021	.017	.472	.015
	(.004)	(.0015)	(.0078)	(.19)	(.006)	(.210)	(.0093)
	(-.206)	(-1.43)	(.019)	(-.109)	(2.81)	(2.24)	(1.62)

This table reports various statistics for the VEC model estimated using a maximum lag length of four. Ssr gives the sum of squared residuals , LL gives the log likelihood and EC(i) gives the normalized estimated coefficient of the (i)th error correction equation along with their estimated standard errors and t-statistics in parentheses. Only the coefficients of the error correction terms are reported in this table. For information about cointegration tests and vector error correction systems please see the appendix

Note: In this text asterisks are used to denote U.S. variables.

Table 5.5 Vector Error Correction System

Summary Statistics: Four Lag Model.

Canada vs. U.S.

Equation:	Y	P	M*	R*	M	R	E
Rsquare	0.189	0.443	0.381	0.407	0.343	0.278	0.252
Ssr	0.036	0.002	0.134	91.82	0.107	85.48	0.03
LL	689	1,023	537	-222	567	-213	713
EC(1)	0.073	0.002	-0.117	5.23	0.1506	2.837	0.0586
	(.0272)	(.0064)	(.0520)	(1.358)	(.0464)	(1.310)	(.0243)
	(2.679)	(.0343)	(-2.248)	(3.853)	(3.241)	(2.164)	(2.387)
EC(2)	0.050	-.0067	-0.156	3.828	0.046	2.236	.0556
	(.0216)	(.00515)	(.0414)	(1.08)	(.0307)	(1.042)	(.0195)
	(2.354)	(-1.318)	(-3.778)	(3.544)	(1.247)	(2.145)	(2.848)
EC(3)	-0.007	0.0109	-0.13	1.689	-0.0247	0.714	-0.0252
	(.0151)	(.0036)	(.0290)	(.754)	(.0257)	(.727)	(.0136)
	(-.483)	(3.055)	(-4.52)	(2.239)	(-0.96)	(.981)	(-1.848)
EC(4)	-0.001	0.0004	0.0029	-0.131	-0.0042	-.0428	0.0003
	(.0007)	(.00017)	(.001)	(.035)	(.0012)	(.034)	(.0006)
	(-2.409)	(2.877)	(2.186)	(-3.734	(-3.506)	(-1.259)	(.490)

This table reports various statistics for the VEC model estimated using a maximum lag length of four. Ssr gives the sum of squared residuals , LL gives the log likelihood and EC(i) gives the normalized estimated coefficient of the (i)th error correction equation along with their estimated standard errors and t-statistics in parentheses. Only the coefficients of the error correction terms are reported in this table. For information about cointegration tests and vector error correction systems please see the appendix.

Note: In this text asterisks are used to denote U.S. variables.

5.4 Impulse Responses to Non-U.S. G-7 VEC System.

The following figures show the estimated impulse responses for the seven-variable VEC estimates for the five countries {Germany, France , Italy, U.K. and Canada}. Responses are shown over an expanse of 36 months. These figures depict the responses of U.S. money supply (M*), U.S. short-term interest rate (R*), domestic money supply (M), domestic short-term interest rate (R) and exchange rate (E) to orthogonalized innovations in domestic money supply (M) for the Wold ordering given by { Y, P, M*, R*, M, R, E}.

Consider first, the response of the Germany VEC system to an innovation in German money supply (M) in figure 4.1. Notice that the German short-term interest rate falls on impact and continues to fall -roughly for five months- until it reaches its maximal decline. Furthermore, we find that the contemporaneous response to an unexpected increase in the German money supply is an appreciation of the exchange rate (E) i.e. a depreciation of the German mark. The exchange rate overshoots first, before it returns to its steady state value. This outcome -for the case of Germany- supports the various business models like Lucas (1990), Grilli and Roubini (1993) which embodies strong liquidity effects on the short-term interest rate and the exchange rate.

Figure 4.2 depicts the responses of the French VAR system to an innovation in the French money supply. the negative response of the French short-term interest rate exhibits strong liquidity effects. It declines on impact equal to 12 percentage points and it reaches its maximal decline after six months. Thereafter, subsequent increases bring the short-term interest rate to its long run equilibrium point. But contrary to the French interest rate the exchange rate depreciates on impact.[21] This is hard to reconcile with the economic theory. But after the initial impact the exchange rate increases and overshoots before it settles to its steady state which is above the initial equilibrium point.

The delayed response of the exchange rate can be attributable to peoples' expectations. They might be learning slowly about the change in the monetary regime and slowly adjust their expectations. Note however, that the behavior of the exchange rate -derived by implementing the error correction terms in to the system (figure 4.2)- relative to the exchange rate -derived by simply using the variables in levels (figure 2a)- is totally different. While, in figure 2a the exchange rate Fr/$ depreciates on impact and stays under its initial equilibrium point thereafter, in figure 4.2, the exchange rate -after the initial depreciation- appreciates subsequently overpasses the initial equilibrium point and settles to its steady state.

In the case of Italy, (figure 4.3) the initial response of the Italian short-term interest rate to an innovation in Italian money supply is clearly a decline equal to 8 percentage points. After 6 months, the interest rate subsequently increases and settles to its long run value: this behavior can be regarded as the emerging of the "fisherian

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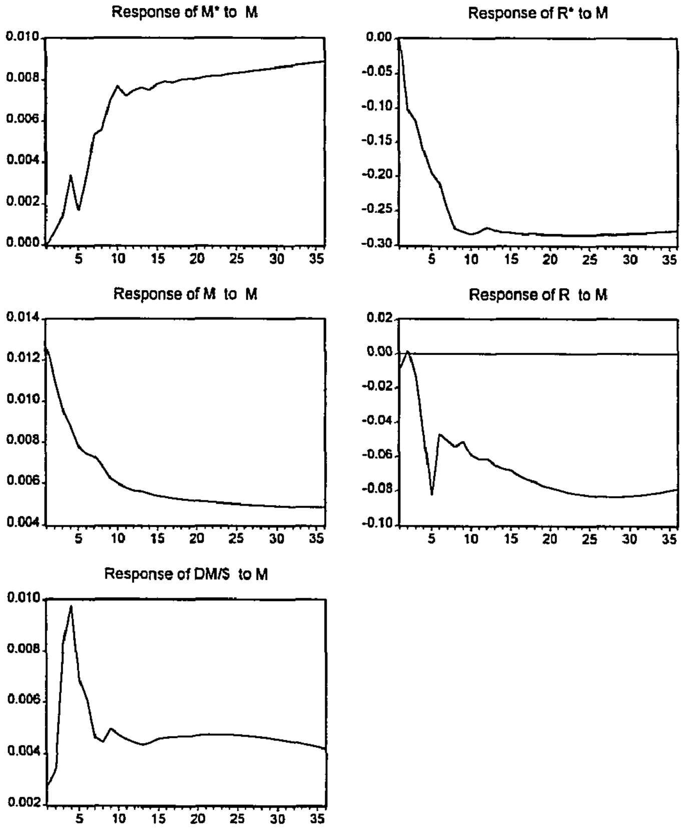
[21] An exchange rate depreciation is translated to an appreciation of the French franc since a decrease in Fr/$ exchange rate requires now less francs to buy one dollar.

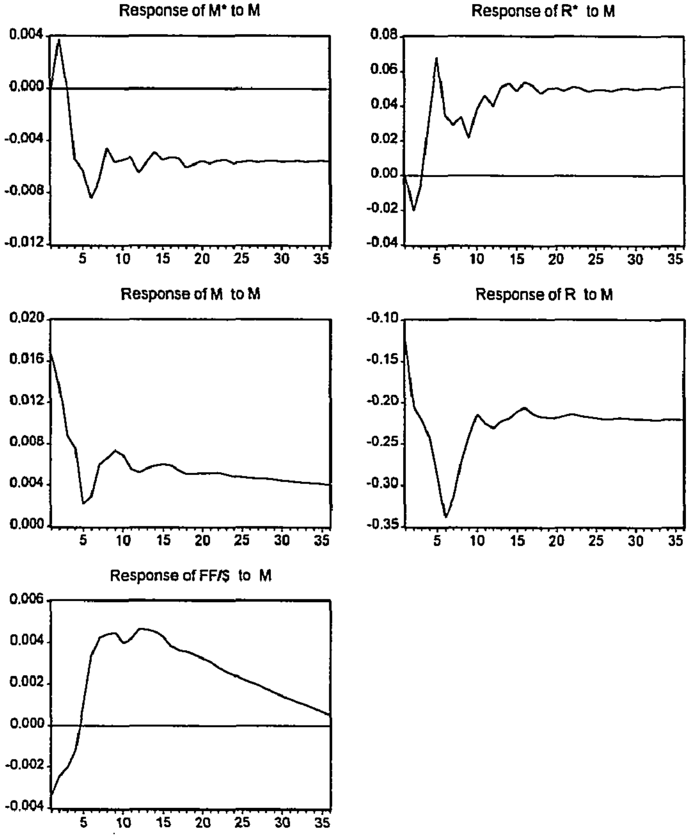
effect". On the other hand, the exchange rate i.e. Lira/$ appreciates on impact and it stays over the initial equilibrium point for approximately 5 months. It is interesting enough to observe the time pattern responses of the Italian interest rate and the exchange rate. Initially, both rates responded according to the theory: a decline in the interest rate following a positive shock to the money supply and an appreciation of the exchange rate (i.e. a depreciation of the Italian Lira). But over time, (approximately 6 months) we observe subsequent increases of the interest rate and at the same time interval, decreases in the exchange rate.

Figure 4.1
Germany: Seven-Variable System
Responses to One S.D. Innovation in German Money supply



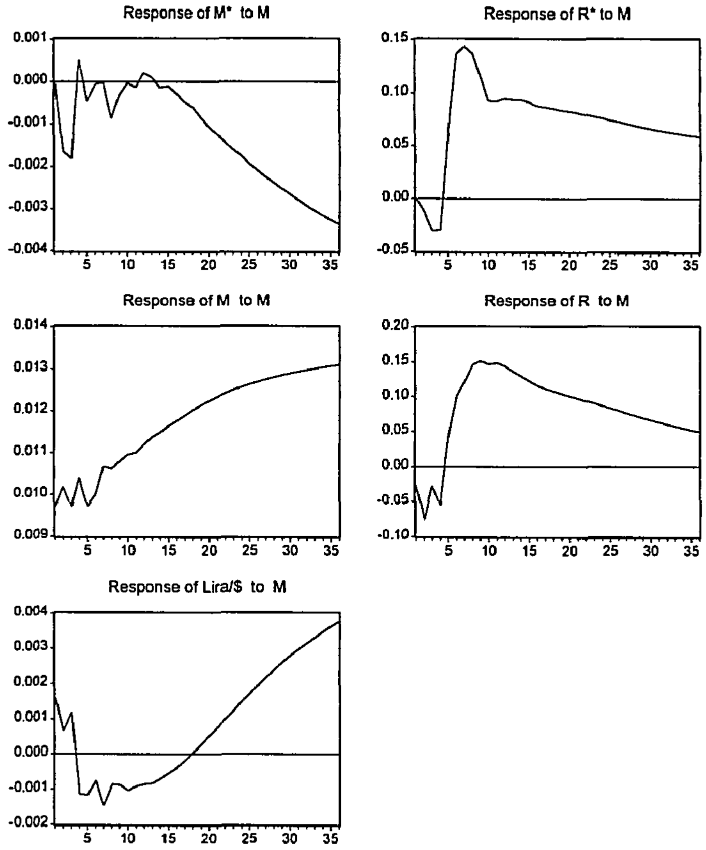
The above graphs show the effect of an innovation in the German money supply (M) on the U.S. money (M*), the U.S. interest rate (R*). the German money (M), the German interest rate (R) and the DM/$ exchange rate.

Figure 4.2
France: Seven-Variable System
Responses to One S.D. Innovation in French Money supply



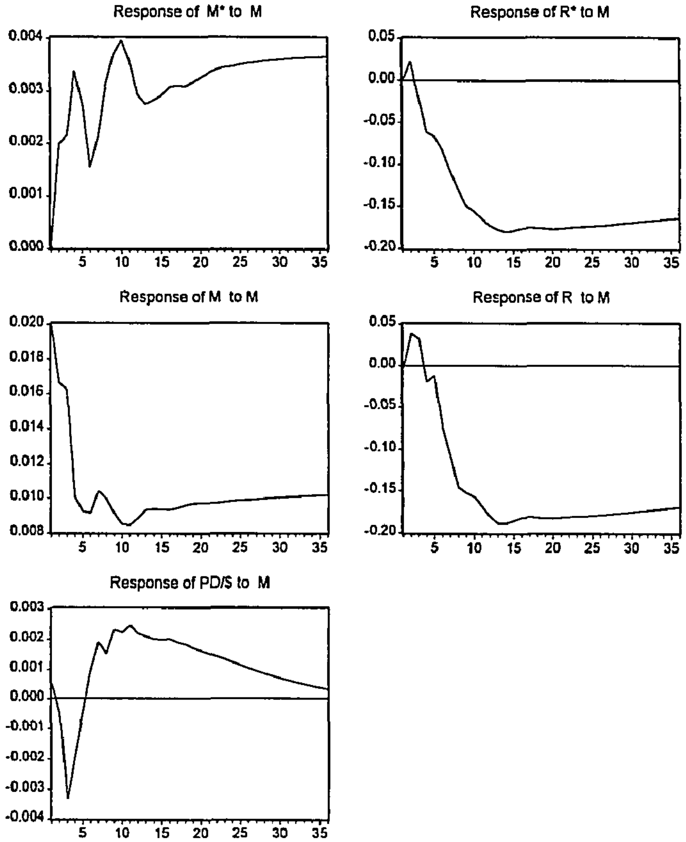
The above graphs show the effect of an innovation in the French money supply (M) on the U.S. money (M*), the U.S. interest rate (R*), the French money (M), the French interest rate (R) and the FF/$ exchange rate.

Figure 4.3
Italy: Seven-Variable System
Responses to One S.D. Innovation in Italian Money supply



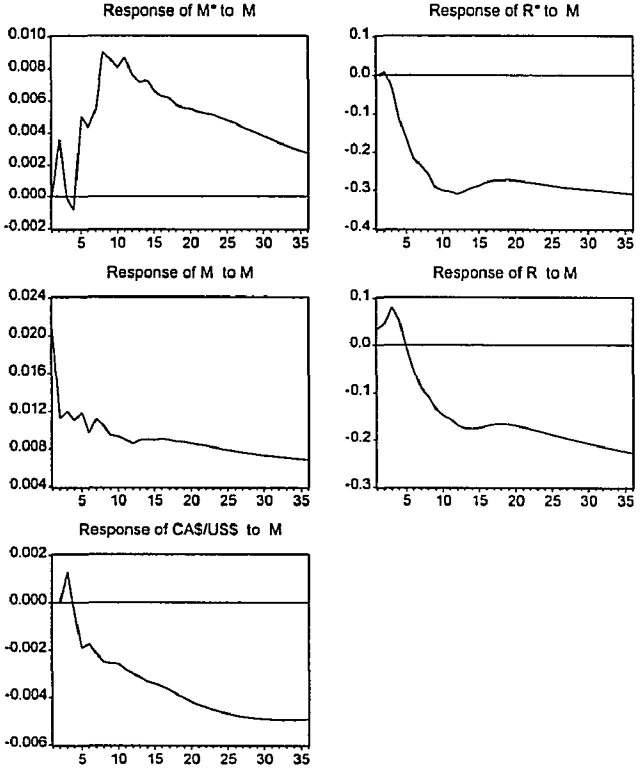
The above graphs show the effect of an innovation in the Italian mmoney supply (M) on the U.S. money (M*), the U.S. interest rate (R*), the Italian money (M), the Italian interest rate (R) and the Lira/$ exchange rate.

Figure 4.4
U.K.: Seven Variable System
Responses to One S.D. Innovation in U.K. Money supply



The above graphs show the effect of an innovation in the U.K. money supply (M)
on the U.S. money (M*), the U.S. interest rate (R*), the U.K. money (M), the U.K. interest rate (R) and the PD/$ exchange rate (E).

Figure 4.5
Canada: Seven- Variable System
Responses to One S.D. Innovation in Canadian Money Supply



The above graphs show the effect of an innovation in the Canadian money supply (M) on the U.S. money (M*) the U.S. interest rate (R*), the Canadian money (M), the Canadian interest rate (R) and the CA$/US$ exchange rate.

Concluding Remarks

In this study, we tried to identify the international transmission mechanism of monetary disturbances in open economies and generate a number of new results.

First, we investigated the effects of unanticipated shocks to U.S. monetary policy on U.S. interest and exchange rates. When the shock to U.S. monetary policy (i.e. U.S. unanticipated expansionary open market operations) was measured as the orthogonalized component of the innovation to U.S. nonborrowed reserves, the U.S. short-term interest rate and the U.S.dollar displayed sharp persistent decline -at least in the short-run- in response to expansionary policy. The intuition is that the Federal Reserve Board lowers the short term interest rate by withdrawing nonborrowed reserves from the system. In the medium and long-run , the U.S. interest rates exhibit strong subsequent increases across countries -consistent with the "Fisherian effect" hypothesis.

These findings, constitute strong evidence in favor of the view that expansionary U.S. open market operations drive the interest-rate down and depreciate the U.S. currency and can be reconciled with models like Grilli and Roubini (1992) and Schlagenhauf and Wrase (1992) that incorporate liquidity effects. In addition, a major finding of this study is that in response to a U.S. expansionary policy the exchange rate overshoots its value, (or undershoots) although with some time delay, before it settles to its long-run equilibrium point.

This finding (which is evident across the G-7 Countries) consistent with the "delayed response hypothesis" supports the models like Dornbusch (1976) emphasizing exchange rate overshooting.

Second, we investigated the effects of unanticipated changes in the other non-U.S. G-7 countries monetary policies. Contrary to the U.S. results (U.S. open market policies), we found that in some G-7 countries an unanticipated change in monetary policy lead to the so-called "liquidity puzzle" as Grilli and Roubini (1993) found, but not for the same countries. In other words, when examining changes in the monetary policy of the other G-7 countries, there is no clear evidence of liquidity effects on interest rates and much less in the exchange rate. In some cases, the exchange rate exhibits strong persistent and opposite behavior that it is hard to reconcile with any existing theoretical model. This finding can be arising from what it perceives to be shocks to the demand for money and not shocks to the supply of money. As suggested by Christiano and Eichenbaum (1992) for the case of U.S.. "Shocks that stimulate money demand tend to create a positive association between money and interest rates in an environment where the Fed seeks to smooth nominal interest rates." Therefore, the interest rate first and then the exchange rate of the other non-U.S. G-7 countries increase in response to an expansionary monetary shock.

In response to this challenge , we substituted the reserves of the Central Banks for the broader measures of money such as M1 or M2. The reserves (a narrow measure of money) were employed as the policy instrument to identify changes in monetary policy. In most countries, expansionary open market operations constituted sharp and persistent depreciation of their currencies supporting the models which exhibit liquidity effects. Furthermore, the values of the currencies arrived at their maximal depreciation not on impact but rather after few periods (but certainly in the short-run) before settling on their long run equilibrium values.

Finally, tests of non-stationarity and evidence of cointegration relationships in all non-U.S. G-7 countries VAR systems compelled us to construct vector error correction systems by imposing restriction on the long-run relationship of the variables. We showed that imposing the model as a long-run equilibrium condition on a dynamic error correction model leads to the determination of the form of the short-run dynamics and to an improved and persistent behavior of the exchange rate.

On the basis of the existing evidence, it is not easy to draw any inference about the relative performance of models that allow for liquidity effects (Grilli and Roubini (1992)) versus overshooting models (Dornbusch (1976)) which allow for slow adjustment of prices. Both types of models imply that a monetary shock would have similar empirical implications on the interest rate and on the nominal and real exchange rate but with a different propagation channel.

7.0 Appendix.

The data (monthly) for tests of the model were extracted from the *International Financial Statistics* (IFS) tapes. The money stocks are alternative M1 and M2 and for the U.S. is nonborrowed reserves derived from federal Reserve Board. Output is proxied by industrial production and prices by consumer price indices (CPI). Exchange rates are end -of-period units of foreign currency per U.S. dollar. Short-term nominal rates are call rates and for the United States is the federal funds rate. Following is a detailed description of the data by country. Cointegration's tests and Vector Error Correction Systems' estimates.

Industrial production
U.S. Industrial Production, S.A. IFS 11166...C
U.K. Industrial Production, S.A. IFS 11266...C
Japan Industrial Production, S.A. IFS 15866...C
Germany Industrial Production,S.A. IFS 13466...C
France Industrial Production, S.A. IFS 13266...C
Canada Industrial Production, S.A. IFS 15666...C
Italy Industrial Production, S.A. IFS 13666...C

Price index
U.S. CPI. IFS 11164...ZF
U.K. CPI. IFS 11264...ZF
Japan CPI. IFS 15864...ZF
Germany CPI. IFS 13464...ZF
France CPI.IFS 13264...ZF
Canada CPI. IFS 15664..ZF
Italy CPI. IFS 13664...ZF

Money Supply

U.S. Nonborrowed Reserves. Federal Reserve Board of Governons.
U.K. M1. IFS 11234...
Japan M1. IFS 15834...
Germany M1. IFS 13434...
France M1. IFS 13234...
Italy M1. IFS 13634..

Interest rate

U.S. Federal Funds Rate. IFS 11160B...
U.K. Treasury Bill Rate.IFS 11260C...
Japan Call Rate.IFS 15860B...
Germany Call Rate. IFS 13460B...
France Call Rate.IFS 13260B...
Canada Money Market Rate. IFS 15660B...
Italy Call Rate. IFS 13660B...

Exchange Rate

PD/$ U.K. Market Rate. IFS 112...AC..
Yen/$ Japan Market Rate. IFS 158..AC...
DM/$ Germany Market Rate. IFS 134..AC...
Fr/$ France Market Rate. IFS 132...AC...
Can$/$ Canada Market Rate. IFS 156...AC...
Lira/$ Italy MArket Rate. IFS 136...AC

Reserves

Japan Reserves. IFS 15814...ZF
Germany Reserves. IFS 13414...ZF
France Reserves. IFS 13214...ZF
Italy Reserves. IFS 13614...ZF

Germany-Johansen Cointegration Test.
Sample: 1974:01 1993:10
Included observations: 233
Test assumption: Linear deterministic trend in the data
Series: Y P USM USR M R E
Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.221207	172.4088	124.240	133.570	None **
0.159942	114.1564	94.15	103.180	At most 1 **
0.133099	73.54805	68.52	76.07	At most 2 *
0.077242	40.26845	47.21	54.46	At most 3
0.071266	21.53806	29.68	35.65	At most 4
0.018326	4.311766	15.41	20.04	At most 5
9.45E-06	0.002202	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

Y	P	USM	USR	M	R	E
-2.4204	0.068648	0.148508	-0.0101	0.344553	0.039659	0.047246
-0.0364	1.157724	0.067691	-0.0014	-0.3948	-0.0284	-0.0181
0.779102	2.933072	-0.0324	-0.0435	-1.7813	0.022739	-0.7648
0.792300	0.087630	0.372592	-0.0005	-0.2363	0.018872	0.465084
0.180903	-0.8951	0.369773	-0.0147	0.248947	0.004913	0.571067
0.800620	0.650551	-0.5763	-0.0101	-0.2140	-0.0012	-0.0809
0.880220	0.999766	-0.2668	0.002640	-0.6806	-0.0142	-0.2204

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	-0.0284	-0.061358	0.004185	-0.14236	-0.01639	-0.01952	-0.17446
	(0.17868)	(0.04095)	(0.00260)	(0.09308)	(0.00293)	(0.05491)	

Log likelihood 909.2353

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	-0.0598	0.004154	-0.15216	-0.0171	-0.01998	-0.29536
		(0.04484)	(0.00247)	(0.03556)	(0.00623)	(0.05287)	
0.000000	1.000000	0.056593	-0.0011	-0.3458	-0.0251	-0.0163	-4.2625
		(0.11421)	(0.00629)	(0.09058)	(0.01586)	(0.13466)	

Log likelihood 929.5395

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.021314	0.103088	-0.0602	0.256118	7.154312
			(0.04561)	(0.68776)	(0.11074)	(0.62284)	
0.000000	1.000000	0.000000	-0.0173	-0.5876	0.015788	-0.2778	-11.3182
			(0.01645)	(0.24807)	(0.03994)	(0.22465)	
0.000000	0.000000	1.000000	0.287175	4.271807	-0.7221	4.620707	124.6750
			(0.69687)	(10.5081)	(1.69199)	(9.51608)	
Log likelihood	946.1793						

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	-0.2192	-0.0023	0.007201	-1.3468
				(0.02841)	(0.00640)	(0.05531)	
0.000000	1.000000	0.000000	0.000000	-0.3256	-0.0313	-0.0754	-4.4077
				(0.06144)	(0.01384)	(0.11961)	
0.000000	0.000000	1.000000	0.000000	-0.0705	0.059062	1.266906	10.13427
				(0.23548)	(0.05304)	(0.45846)	
0.000000	0.000000	0.000000	1.000000	15.12061	-2.7203	11.67861	398.8539
				(4.23212)	(0.95327)	(8.23945)	
Log likelihood	955.5445						

Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	-0.0777	0.190591	4.095402
					(0.04567)	(0.23308)	
0.000000	1.000000	0.000000	0.000000	0.000000	-0.1434	0.196952	3.675833
					(0.08776)	(0.44792)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.034820	1.325850	11.88348
					(0.06272)	(0.32012)	
0.000000	0.000000	0.000000	1.000000	0.000000	2.482644	-0.9723	23.42906
					(2.76356)	(14.1049)	
0.000000	0.000000	0.000000	0.000000	1.000000	-0.3441	0.836668	24.82867
					(0.22781)	(1.16274)	
Log likelihood	964.1576						

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.543376	4.848683
						(0.17093)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.848002	5.065981
						(0.32297)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	1.167734	11.54586
						(0.19773)	
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-12.2460	-0.6428
						(6.69686)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	2.399196	28.16505
						(0.73860)	
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	4.540977	9.696069
						(3.30852)	
Log likelihood	966.3124						

France-Johansen Cointegration Test.
Sample: 1974:01 1992:12
Included observations: 223
Test assumption: Linear deterministic trend in the data
Series: Y P USM USR M R E
Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.274830	187.2107	124.240	133.570	None **
0.173232	115.5498	94.15	103.180	At most 1 **
0.125172	73.12812	68.52	76.07	At most 2 *
0.084749	43.30680	47.21	54.46	At most 3
0.058002	23.55858	29.68	35.65	At most 4
0.034723	10.23388	15.41	20.04	At most 5
0.010497	2.353096	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 3 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

Y	P	USM	USR	M	R	E
-0.1171	-0.9333	0.233460	-0.0275	1.042764	-0.0031	0.193337
-1.5651	-2.4462	-0.1535	-0.0147	2.490197	0.054920	-0.1615
2.430311	0.558441	0.426914	0.003904	-1.1783	0.002991	0.442927
-0.0685	-2.7895	-0.5273	0.012001	2.683048	-0.0012	-0.0376
0.238470	0.819239	-0.1211	0.006368	-0.5263	-0.0008	-0.4113
0.259854	-0.2931	-0.5438	0.003246	0.507718	-0.0013	0.040575
-0.5739	-0.0513	0.445660	0.021158	-0.0761	-0.0034	0.204773

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	7.967333	-1.993002	0.235134	-8.90185	0.026088	-1.65048	-22.64
	(20.4782)	(5.83943)	(0.64196)	(22.5760)	(0.10614)	(4.92837)	

Log likelihood 753.9356

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.608353	-0.0457	0.193087	-0.05002	0.531157	11.84089
		(0.50602)	(0.03723)	(0.30199)	(0.03214)	(0.30606)	
0.000000	1.000000	-0.3265	0.035249	-1.1415	0.009552	-0.2738	-4.3274
		(0.28951)	(0.02130)	(0.17278)	(0.01839)	(0.17511)	

Log likelihood 775.1465

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.020992	-0.5138	0.033418	0.044724	2.845444
			(0.02010)	(0.32652)	(0.03698)	(0.11916)	
0.000000	1.000000	0.000000	-0.0005	-0.7621	-0.0352	-0.0128	0.500469
			(0.01303)	(0.21159)	(0.02396)	(0.07722)	
0.000000	0.000000	1.000000	-0.1096	1.162030	-0.1372	0.799590	14.78657
			(0.07450)	(1.21027)	(0.13707)	(0.44166)	

Log likelihood 790.0571

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.005064	-0.0441	0.205488	4.416352
				(0.19667)	(0.04383)	(0.10512)	
0.000000	1.000000	0.000000	0.000000	-0.7757	-0.0332	-0.0170	0.459409
				(0.13027)	(0.02903)	(0.06963)	
0.000000	0.000000	1.000000	0.000000	-1.5481	0.267657	-0.0401	6.581859
				(1.23225)	(0.27465)	(0.65868)	
0.000000	0.000000	0.000000	1.000000	-24.7188	3.692172	-7.6582	-74.8329
				(17.1886)	(3.83103)	(9.18785)	

Log likelihood 799.9312

Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	-0.0471	0.231632	4.409910
					(0.16724)	(1.15136)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.422530	-4.0214	1.446015
					(2.93475)	(20.2042)	
0.000000	0.000000	1.000000	0.000000	0.000000	1.177227	-8.0324	8.550968
					(6.47621)	(44.5853)	
0.000000	0.000000	0.000000	1.000000	0.000000	18.21499	-135.2687	-43.3927
					(101.903)	(701.548)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.587522	-5.1625	1.271914
					(3.84195)	(26.4498)	

Log likelihood 806.5936

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.0508	4.392051
						(0.17902)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-1.4855	1.606356
						(0.99531)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.9669	8.997700
						(1.12461)	
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-25.9462	-36.4806
						(19.4578)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-1.6363	1.494866
						(1.15640)	
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-6.0018	-0.3795
						(5.00503)	

Log likelihood 810.5340

Italy-Johansen Cointegration Test
Sample: 1974:01 1993:10
Included observations: 233
Test assumption: Linear deterministic trend in the data
Series: Y P USM USR M R E
Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.267105	175.0434	124.240	133.570	None **
0.147205	102.6380	94.15	103.180	At most 1 *
0.108053	65.53595	68.52	76.07	At most 2
0.068906	38.89264	47.21	54.46	At most 3
0.047317	22.25769	29.68	35.65	At most 4
0.033503	10.96341	15.41	20.04	At most 5
0.012893	3.023529	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 2 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

Y	P	USM	USR	M	R	E
0.091620	-1.9696	0.204603	-0.0033	1.443171	0.044751	0.258038
-0.7050	1.178042	0.105205	-0.0035	-0.6879	0.026969	-0.7056
-0.8329	-1.8325	0.813940	-0.0110	1.424918	0.026575	0.565317
1.956017	0.560602	-0.1968	0.000788	-0.6808	-0.0073	-0.0549
-1.1534	-0.6670	0.319340	0.023965	0.689779	-0.0016	-0.0262
0.471939	1.114544	0.505041	-0.0006	-1.2338	-0.0033	-0.0108
-0.4750	-0.9622	0.057830	-0.0102	0.914320	0.004126	-0.0740

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	-21.4972	2.233181	-0.036248	15.75176	0.488443	2.816407	488.0096
	(68.0450)	(7.56033)	(0.11255)	(50.4327)	(1.53452)	(8.77165)	

Log likelihood 718.8895

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	-0.3500	0.008470	-0.26969	-0.08265	0.847857	-3.313
		(0.27801)	(0.01045)	(0.11499)	(0.06317)	(0.58217)	
0.000000	1.000000	-0.1202	0.002080	-0.7453	-0.0266	-0.0916	-22.8552
		(0.06445)	(0.00242)	(0.02665)	(0.01464)	(0.13495)	

Log likelihood 737.4405

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.008278	-0.4613	-0.1880	2.126291	1.615057
			(0.02509)	(0.39935)	(0.31774)	(3.32599)	
0.000000	1.000000	0.000000	0.002015	-0.8111	-0.0627	0.347298	-21.1636
			(0.00731)	(0.11636)	(0.09258)	(0.96911)	
0.000000	0.000000	1.000000	-0.0005	-0.5473	-0.3009	3.652216	14.07706
			(0.04575)	(0.72808)	(0.57929)	(6.06380)	
Log likelihood	750.7621						

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	-0.1785	-0.0207	0.290650	0.324032
				(0.14605)	(0.08836)	(0.98847)	
0.000000	1.000000	0.000000	0.000000	-0.7422	-0.0220	-0.0994	-21.4778
				(0.08037)	(0.04863)	(0.54396)	
0.000000	0.000000	1.000000	0.000000	-0.5660	-0.3120	3.773268	14.16220
				(1.20390)	(0.72839)	(8.14822)	
0.000000	0.000000	0.000000	1.000000	-34.1585	-20.2130	221.7365	155.9496
				(69.4562)	(42.0227)	(470.092)	
Log likelihood	759.0796						

Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.077592	-0.8430	-0.3764
					(0.07883)	(0.77720)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.386544	-4.8134	-24.3904
					(0.33490)	(3.30160)	
0.000000	0.000000	1.000000	0.000000	0.000000	-0.0004	0.178684	11.94118
					(0.10409)	(1.02623)	
0.000000	0.000000	0.000000	1.000000	0.000000	-1.4109	4.792460	21.90461
					(2.58999)	(25.5336)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.550435	-6.3511	-3.9242
					(0.45990)	(4.53392)	
Log likelihood	764.7267						

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.0321	4.226562
						(0.10296)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.7734	-1.4593
						(0.34514)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.174021	11.91472
						(0.15876)	
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-9.9543	-61.7976
						(4.10211)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.5981	28.72945
						(0.46511)	
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-10.4517	-59.3234
						(1.43822)	
Log likelihood	768.6967						

United Kingdom-Johansen Cointegration Test
Sample: 1974:01 1993:10
Included observations: 233
Test assumption: Linear deterministic trend in the data
Series: Y P USM USR M R E
Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.177413	169.9736	124.240	133.570	None **
0.150177	124.2732	94.15	103.180	At most 1 **
0.145125	86.19510	68.52	76.07	At most 2 **
0.108336	49.50385	47.21	54.46	At most 3 *
0.062093	22.67205	29.68	35.65	At most 4
0.024754	7.671590	15.41	20.04	At most 5
0.007689	1.806248	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 4 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

Y	P	USM	USR	M	R	E
-0.2311	0.575741	0.304788	0.004526	-0.3489	-0.0219	0.141424
0.376388	0.236131	-0.4293	0.215997	-0.0914	-0.2212	-0.4856
0.712952	0.153464	0.475362	0.118650	-0.4339	-0.1246	0.260218
2.315636	0.735769	-0.0443	-0.1163	-0.6377	0.098857	-0.3683
1.083637	-0.3424	-0.2646	0.027163	0.187163	-0.0078	0.327111
-0.7895	-0.1044	0.670113	0.016351	0.014310	-0.0069	-0.0002
-0.1045	-0.3399	0.010792	-0.0004	0.225289	-0.0085	0.003271

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	-2.49168	-1.319055	-0.019586	1.509816	0.094732	-0.61205	-12.142
	(4.62489)	(2.16075)	(0.16669)	(2.95360)	(0.22321)	(1.03183)	

Log likelihood 661.5662

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	-1.1766	0.454501	0.109732	-0.45053	-1.15373	-7.1443
		(1.10199)	(0.50979)	(0.23074)	(0.50788)	(1.13977)	
0.000000	1.000000	0.057183	0.190268	-0.5619	-0.2188	-0.2174	2.005638
		(0.73868)	(0.34172)	(0.15467)	(0.34044)	(0.76401)	

Log likelihood 680.6053

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.243070	-0.2741	-0.2431	-0.1478	3.211881
			(0.17591)	(0.08262)	(0.17663)	(0.18412)	
0.000000	1.000000	0.000000	0.200544	-0.5433	-0.2289	-0.2663	1.502318
			(0.22492)	(0.10563)	(0.22583)	(0.23541)	
0.000000	0.000000	1.000000	-0.1797	-0.3262	0.176320	0.854994	8.801987
			(0.21940)	(0.10304)	(0.22029)	(0.22963)	

Log likelihood 698.9509

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	-0.1628	0.000943	-0.0873	3.798166
				(0.01710)	(0.00216)	(0.08329)	
0.000000	1.000000	0.000000	0.000000	-0.4514	-0.0276	-0.2164	1.986031
				(0.04005)	(0.00507)	(0.19508)	
0.000000	0.000000	1.000000	0.000000	-0.4085	-0.0041	0.810286	8.368547
				(0.04081)	(0.00516)	(0.19880)	
0.000000	0.000000	0.000000	1.000000	-0.4579	-1.0039	-0.2488	-2.4120
				(0.10659)	(0.01349)	(0.51920)	

Log likelihood 712.3668

Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.012305	0.729280	4.167152
					(0.00882)	(0.51076)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.003918	2.047874	3.009190
					(0.02933)	(1.69823)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.024431	2.859358	9.294466
					(0.02495)	(1.44469)	
0.000000	0.000000	0.000000	1.000000	0.000000	-0.9719	2.048041	-1.3741
					(0.02911)	(1.68513)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.069796	5.015889	2.266541
					(0.05935)	(3.43592)	

Log likelihood 719.8670

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	9.638909	-0.9581
						(71.1426)	
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	4.884777	1.377260
						(38.5085)	
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	20.54868	-0.8813
						(145.964)	
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-701.6771	403.4441
						(5281.24)	
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	55.55148	-26.8041
						(408.902)	
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-724.0437	416.5066
						(5446.65)	

Log likelihood 722.7997

Canada-Johansen Cointegration Test
Sample: 1974:01 1993:10
Included observations: 233
Test assumption: Linear deterministic trend in the data
Series: Y P USM USR M R E
Lags interval: 1 to 4

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.2378	206.934	124.240	133.570	None **
0.1716	143.668	94.15	103.180	At most 1 **
0.1559	99.8085	68.52	76.07	At most 2 **
0.1299	60.3053	47.21	54.46	At most 3 **
0.0677	27.8864	29.68	35.65	At most 4
0.0364	11.5626	15.41	20.04	At most 5
0.0125	2.9336	3.76	6.65	At most 6

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 4 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

Y	P	USM	USR	M	R	E
1.1497	1.1559	-0.1331	-0.0421	-0.9182	-0.0164	0.0357
-0.2486	0.6290	0.0845	0.0043	-0.1806	-0.0112	-1.1989
-0.5105	-0.5061	-1.0234	0.0274	0.8316	-0.0103	-0.1413
-1.2333	-0.8223	-0.3558	-0.0025	1.0106	0.0253	0.6166
1.7082	0.0249	-0.2523	-0.0004	-0.1941	-0.0032	-0.3991
0.3369	0.0926	-0.2636	-0.0426	-0.1246	0.0505	0.0028
0.1458	0.4755	0.0511	0.0186	-0.2865	-0.0146	-0.0802

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	1.005432	-0.115728	-0.036609	-0.79863	-0.0143	0.03109	-12.619
	(0.20355)	(0.124174)	(0.008962)	(0.13469)	(0.00665)	(0.147)	

Log likelihood 1013.599

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	0.0000	-0.1795	-0.0311	-0.36494	0.002583	1.39356	-6.4252
		(0.22037)	(0.014626)	(0.1168)	(0.01025)	(0.549)	
0.0000	1.0000	0.0634	-0.0055	-0.4313	-0.0168	-1.3551	-6.1601
		(0.203452)	(0.013503)	(0.10783)	(0.00946)	(0.5068)	

Log likelihood 1035.528

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	0.0000	0.0000	-0.0326	-0.4357	0.0055	1.4127	-6.2287
			(0.015029)	(0.0826)	(0.01075)	(0.5479)	
0.0000	1.0000	0.0000	-0.0049	-0.4064	-0.0178	-1.3619	-6.2295
			(0.014068)	(0.07732)	(0.01007)	(0.5128)	
0.0000	0.0000	1.0000	-0.0081	-0.3943	0.0161	0.1068	1.0947
			(0.012523)	(0.06883)	(0.00896)	(0.4565)	

Log likelihood 1055.28

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	0.0000	0.0000	0.0000	-0.4350	-0.0097	0.5742	-6.2345
				(0.07636)	(0.00706)	(0.3448)	
0.0000	1.0000	0.0000	0.0000	-0.4062	-0.0201	-1.4890	-6.2303
				(0.08015)	(0.00741)	(0.3619)	
0.0000	0.0000	1.0000	0.0000	-0.3941	0.0123	-0.1013	1.0932
				(0.06748)	(0.00624)	(0.3047)	
0.0000	0.0000	0.0000	1.0000	0.0228	-0.4673	-25.7384	-0.1780
				(2.01024)	(0.18575)	(9.0778)	

Log likelihood 1071.489

Normalized Cointegrating Coefficients: 5 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	0.0000	0.0000	0.0000	0.0000	0.0062	-0.7317	4.4078
					(0.01037)	(0.4176)	
0.0000	1.0000	0.0000	0.0000	0.0000	-0.0052	-2.7088	3.7093
					(0.01791)	(0.7213)	
0.0000	0.0000	1.0000	0.0000	0.0000	0.0268	-1.2845	10.7355
					(0.01521)	(0.6125)	
0.0000	0.0000	0.0000	1.0000	0.0000	-0.4681	-25.6699	-0.7364
					(0.17791)	(7.1669)	
0.0000	0.0000	0.0000	0.0000	1.0000	0.0366	-3.0025	24.4676
					(0.03323)	(1.3386)	

Log likelihood 1079.651

Normalized Cointegrating Coefficients: 6 Cointegrating Equation(s)

Y	P	USM	USR	M	R	E	C
1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.5324	4.3802
						(0.2952)	
0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	-2.8777	3.7327
						(0.5193)	
0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	-0.4218	10.6160
						(0.4875)	
0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	-40.7620	1.3541
						(8.478)	
0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	-1.8217	24.3040
						(0.9918)	
0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	-32.2408	4.4659
						(10.85)	

Log likelihood (1083.97)

Germany-Vector Error Correction Estimates

Sample: 1974:06 1993:10

Included observations: 233

Excluded observations: 0 after adjusting endpoints

Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
Y(-1)	1.0000	0.0000	0.0000
P(-1)	0.0000	1.0000	0.0000
USM(-1)	0.0000	0.0000	1.0000
USR(-1)	0.0213	(0.0173)	0.2872
	0.0456	0.0165	0.6969
	0.4673	(1.0532)	0.4121
M(-1)	0.103088	-0.58755	4.271807
	(0.68776)	(0.24807)	(10.5081)
	(0.14989)	(-2.3685)	(0.40653)
R(-1)	-0.06025	0.015788	-0.72214
	(0.11074)	(0.03994)	(1.69199)
	(-0.544)	(0.39525)	(-0.4268)
E(-1)	0.256118	-0.27779	4.620707
	(0.62284)	(0.22465)	(9.51608)
	(0.41121)	(-1.2365)	(0.48557)
C	7.154312	-11.3182	124.675

Error Correction:	D(Y)	D(P)	D(USM)	D(USR)	D(M)	D(R)	D(E)
CointEq1	-0.04251	-0.00277	-0.12114	0.629584	0.124101	6.218419	-0.14689
	(0.04321)	(0.00615)	(0.06817)	(1.8173)	(0.03641)	(1.14951)	(0.08561)
	(-0.9839)	(-0.4498)	(-1.777)	(0.34644)	(3.4082)	(5.40961)	(-1.7159)
CointEq2	-0.06223	-0.0179	-0.31403	3.6382	0.122778	-2.23092	0.086842
	(0.05359)	(0.00763)	(0.08455)	(2.25403)	(0.04516)	(1.42577)	(0.10618)
	(-1.1611)	(-2.346)	(-3.7139)	(1.61408)	(2.71854)	(-1.5647)	(0.81788)
CointEq3	0.003677	-0.00062	0.002496	-0.03461	-0.00764	-0.35941	0.01298
	(0.00283)	(0.0004)	(0.00446)	(0.11891)	(0.00238)	(0.07521)	(0.0056)
	(1.30049)	(-1.5467)	(0.55959)	(-0.291)	(-3.2088)	(-4.7785)	(2.31726)
D(Y(-1))	-0.4764	0.010211	0.326916	4.950421	-0.10202	-3.83061	0.043468
	(0.0801)	(0.0114)	(0.12636)	(3.36864)	(0.0675)	(2.1308)	(0.15868)
	(-5.9478)	(0.8955)	(2.58708)	(1.46956)	(-1.5115)	(-1.7977)	(0.27393)
D(Y(-2))	-0.15028	0.016238	0.165332	1.356252	-0.01684	-1.91144	0.138084
	(0.08577)	(0.01221)	(0.13531)	(3.60719)	(0.07228)	(2.28169)	(0.16992)
	(-1.7521)	(1.32989)	(1.22185)	(0.37599)	(-0.2331)	(-0.8377)	(0.81263)
D(Y(-3))	0.01577	0.014686	-0.02337	1.938025	-0.01143	-0.41367	-0.04681
	(0.08435)	(0.01201)	(0.13307)	(3.54747)	(0.07108)	(2.24392)	(0.16711)
	(0.18696)	(1.223)	(-0.1756)	(0.54631)	(-0.1608)	(-0.1844)	(-0.2801)

D(Y(-4))	0.08894	0.004569	0.121248	3.090577	-0.02404	-1.39738	-0.01929
	(0.07215)	(0.01027)	(0.11382)	(3.0343)	(0.0608)	(1.91932)	(0.14294)
	(1.23276)	(0.44482)	(1.06523)	(1.01855)	(-0.3955)	(-0.7281)	(-0.135)
D(P(-1))	-1.08764	0.234746	-2.64185	17.89149	-0.30632	7.882419	3.035469
	(0.48656)	(0.06927)	(0.76762)	(20.4633)	(0.41002)	(12.9439)	(0.96395)
	(-2.2354)	(3.38896)	(-3.4416)	(0.87432)	(-0.7471)	(0.60897)	(3.14898)
D(P(-2))	-0.39464	-0.06217	0.488596	-52.6029	-0.78494	10.11311	0.121604
	(0.53188)	(0.07572)	(0.83912)	(22.3693)	(0.44821)	(14.1495)	(1.05374)
	(-0.742)	(-0.8211)	(0.58227)	(-2.3516)	(-1.7513)	(0.71473)	(0.1154)
D(P(-3))	-0.03666	0.109545	-0.36647	-15.0973	0.706825	26.71666	1.564491
	(0.53731)	(0.07649)	(0.84768)	(22.5975)	(0.45278)	(14.2938)	(1.06449)
	(-0.0682)	(1.43211)	(-0.4323)	(-0.6681)	(1.56109)	(1.86911)	(1.46972)
D(P(-4))	0.146731	-0.03634	-2.15628	13.63601	-0.13019	6.512287	0.791806
	(0.52845)	(0.07523)	(0.83371)	(22.2251)	(0.44532)	(14.0582)	(1.04694)
	(0.27766)	(-0.483)	(-2.5864)	(0.61354)	(-0.2924)	(0.46324)	(0.7563)
D(USM(-1))	-0.04305	0.008791	0.233377	-4.96985	-0.02413	-1.37466	-0.05625
	(0.04453)	(0.00634)	(0.07025)	(1.87283)	(0.03753)	(1.18464)	(0.08822)
	(-0.9668)	(1.38664)	(3.32191)	(-2.6537)	(-0.6432)	(-1.1604)	(-0.6375)
D(USM(-2))	-0.04299	0.00797	-0.238	2.525083	0.023789	0.75725	-0.07245
	(0.0444)	(0.00632)	(0.07004)	(1.86715)	(0.03741)	(1.18104)	(0.08795)
	(-0.9683)	(1.26097)	(-3.3981)	(1.35237)	(0.63588)	(0.64117)	(-0.8237)
D(USM(-3))	-0.02981	0.004993	0.164437	0.56229	0.00198	-0.51096	-0.11691
	(0.04454)	(0.00634)	(0.07026)	(1.87309)	(0.03753)	(1.1848)	(0.08823)
	(-0.6693)	(0.78751)	(2.34028)	(0.30019)	(0.05275)	(-0.4313)	(-1.325)
D(USM(-4))	0.048646	-0.00283	-0.25659	-0.77409	0.018774	-1.40234	-0.11452
	(0.04264)	(0.00607)	(0.06728)	(1.79348)	(0.03594)	(1.13445)	(0.08448)
	(1.14074)	(-0.4658)	(-3.8139)	(-0.4316)	(0.52245)	(-1.2361)	(-1.3555)
D(USR(-1))	-0.00059	-7.1E-05	-0.00258	0.471758	0.00167	-0.05322	0.006168
	(0.00178)	(0.00025)	(0.00281)	(0.07503)	(0.0015)	(0.04746)	(0.00353)
	(-0.3311)	(-0.2785)	(-0.9151)	(6.28748)	(1.11112)	(-1.1214)	(1.74517)
D(USR(-2))	-0.00032	0.000291	-0.00475	-0.14771	-0.00013	0.026973	-5.9E-05
	(0.0019)	(0.00027)	(0.003)	(0.07986)	(0.0016)	(0.05052)	(0.00376)
	(-0.166)	(1.07758)	(-1.5853)	(-1.8495)	(-0.0785)	(0.53396)	(-0.0157)
D(USR(-3))	-0.00025	-0.00019	0.003936	-0.02649	-0.00029	0.064477	-0.00036
	(0.00184)	(0.00026)	(0.0029)	(0.07726)	(0.00155)	(0.04887)	(0.00364)
	(-0.1354)	(-0.7328)	(1.35806)	(-0.3428)	(-0.1864)	(1.31927)	(-0.099)
D(USR(-4))	0.002177	0.000442	-0.00625	-0.05992	0.001549	0.013989	0.001444
	(0.00172)	(0.00025)	(0.00272)	(0.07244)	(0.00145)	(0.04582)	(0.00341)
	(1.26375)	(1.80263)	(-2.2998)	(-0.8271)	(1.06743)	(0.30527)	(0.42299)
D(M(-1))	-0.09666	-0.00699	-0.12077	-6.25423	-0.04223	-0.39146	0.089405
	(0.08683)	(0.01236)	(0.13698)	(3.6517)	(0.07317)	(2.30984)	(0.17202)
	(-1.1132)	(-0.5658)	(-0.8817)	(-1.7127)	(-0.5772)	(-0.1695)	(0.51974)
D(M(-2))	-0.0982	-0.00201	-0.10365	3.807416	-0.03195	-1.93832	0.456857
	(0.0857)	(0.0122)	(0.1352)	(3.60426)	(0.07222)	(2.27984)	(0.16978)
	(-1.1459)	(-0.1652)	(-0.7666)	(1.05637)	(-0.4424)	(-0.8502)	(2.69082)

D(M(-3))	0.004107	0.00334	0.032259	-3.32985	-0.00918	-3.75929	0.229199
	(0.08474)	(0.01206)	(0.13368)	(3.56372)	(0.0714)	(2.25419)	(0.16787)
	(0.04847)	(0.27684)	(0.24131)	(-0.9344)	(-0.1286)	(-1.6677)	(1.36531)
D(M(-4))	0.053367	-0.00877	-0.23341	0.797945	-0.03654	-5.12026	-0.12316
	(0.08338)	(0.01187)	(0.13154)	(3.5066)	(0.07026)	(2.21807)	(0.16518)
	(0.64007)	(-0.7391)	(-1.7745)	(0.22755)	(-0.5201)	(-2.3084)	(-0.7456)
D(R(-1))	0.001677	-0.00027	-0.00063	0.029066	-0.0039	-0.24994	-0.00349
	(0.0024)	(0.00034)	(0.00378)	(0.10084)	(0.00202)	(0.06379)	(0.00475)
	(0.69925)	(-0.7796)	(-0.1666)	(0.28824)	(-1.9289)	(-3.9185)	(-0.7348)
D(R(-2))	0.002367	-0.00059	-0.0023	0.093892	-0.00426	-0.12738	0.005646
	(0.0021)	(0.0003)	(0.00331)	(0.08832)	(0.00177)	(0.05587)	(0.00416)
	(1.12707)	(-1.9785)	(-0.6927)	(1.06303)	(-2.4063)	(-2.28)	(1.35706)
D(R(-3))	0.00001	-0.00057	-0.00236	0.02877	-0.00402	-0.05882	0.00752
	(0.00209)	(0.0003)	(0.00329)	(0.0878)	(0.00176)	(0.05554)	(0.00414)
	(0.00297)	(-1.9113)	(-0.7167)	(0.32772)	(-2.2869)	(-1.0592)	(1.81821)
D(R(-4))	0.00050	0.00000	0.00297	0.10915	-0.00223	-0.04935	0.00307
	(0.0019)	(0.00027)	(0.00299)	(0.07971)	(0.0016)	(0.05042)	(0.00375)
	(0.26448)	(0.00259)	(0.9923)	(1.36939)	(-1.3971)	(-0.9787)	(0.81667)
D(E(-1))	0.02349	0.00498	-0.12056	3.08247	0.04831	1.86181	-0.11675
	(0.03928)	(0.00559)	(0.06198)	(1.65214)	(0.0331)	(1.04504)	(0.07783)
	(0.59808)	(0.89102)	(-1.9454)	(1.86575)	(1.45952)	(1.78157)	(-1.5001)
D(E(-2))	-0.06192	-0.00378	-0.06504	-0.94876	0.03319	2.23171	0.00442
	(0.03936)	(0.0056)	(0.06209)	(1.65516)	(0.03316)	(1.04695)	(0.07797)
	(-1.5735)	(-0.6749)	(-1.0476)	(-0.5732)	(1.00092)	(2.13162)	(0.05663)
D(E(-3))	0.00360	0.00083	-0.08377	1.42460	0.00285	-0.16432	-0.04937
	(0.03904)	(0.00556)	(0.0616)	(1.64203)	(0.0329)	(1.03865)	(0.07735)
	(0.09209)	(0.14913)	(-1.3599)	(0.86758)	(0.08651)	(-0.1582)	(-0.6383)
D(E(-4))	-0.00160	0.00434	-0.04038	-1.94545	0.04950	-0.16874	-0.08595
	(0.03786)	(0.00539)	(0.05974)	(1.59245)	(0.03191)	(1.00729)	(0.07501)
	(-0.0421)	(0.80498)	(-0.6759)	(-1.2217)	(1.55126)	(-0.1675)	(-1.1457)
C	-1.71101	-0.20827	-5.98048	82.08560	2.91905	-49.91566	0.81039
	(1.08852)	(0.15496)	(1.71731)	(45.7801)	(0.91728)	(28.9578)	(2.15654)
	(-1.5719)	(-1.344)	(-3.4825)	(1.79304)	(3.18229)	(-1.7237)	(0.37578)
R-squared	0.30086	0.34689	0.33686	0.33735	0.17028	0.35336	0.17944
Adj. R-squared	0.19303	0.24616	0.23458	0.23515	0.04232	0.25363	0.05288
Sum sq. resids	0.05804	0.00118	0.14445	102.656	0.04121	41.07322	0.22779
S.E. equation	0.01699	0.00242	0.02681	0.71465	0.01432	0.45204	0.03366
Log likelihood	636.072	1090.278	529.838	-235.122	675.953	-128.405	476.774
Akaike AIC	-8.0230	-11.9218	-7.1112	-0.5450	-8.3654	-1.4610	-6.6557
Schwartz SC	-7.5491	-11.4478	-6.6372	-0.0710	-7.8914	-0.9870	-6.1817
Mean dependent	0.00081	0.00273	0.00243	-0.03571	0.00671	-0.00695	-0.00177
S.D. dependent	0.01892	0.00279	0.03064	0.81716	0.01463	0.52324	0.03459

France-Vector Error Correction Estimates
Sample: 1974:06 1992:12
Included observations: 223
Excluded observations: 0 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2	CointEq3
Y(-1)	1.0000	0.0000	0.0000
P(-1)	0.0000	1.0000	0.0000
USM(-1)	0.0000	0.0000	1.0000
USR(-1)	0.0210	(0.0005)	(0.1096)
	0.0201	0.0130	0.0745
	1.0444	(0.0421)	(1.4717)
M(-1)	-0.51384	-0.76212	1.16203
	(0.32652)	(0.21159)	(1.21027)
	(-1.5737)	(-3.6018)	(0.96014)
R(-1)	0.033418	-0.03523	-0.13715
	(0.03698)	(0.02396)	(0.13707)
	(0.90372)	(-1.4701)	(-1.0006)
E(-1)	0.044724	-0.01275	0.79959
	(0.11916)	(0.07722)	(0.44166)
	(0.37534)	(-0.1652)	(1.81041)
C	2.845444	0.500469	14.78657

Error Correction:	D(Y)	D(P)	D(USM)	D(USR)	D(M)	D(R)	D(E)
CointEq1	-0.13547	-0.00037	0.095121	0.273491	0.059656	6.386314	-0.29653
	(0.04258)	(0.00592)	(0.07779)	(2.14734)	(0.054)	(2.70436)	(0.09609)
	(-3.1818)	(-0.0629)	(1.22286)	(0.12736)	(1.1047)	(2.36149)	(-3.0859)
CointEq2	-0.04223	0.00545	0.18451	2.43163	0.184413	8.667517	-0.11854
	(0.0394)	(0.00548)	(0.07198)	(1.98703)	(0.04997)	(2.50247)	(0.08892)
	(-1.0718)	(0.995)	(2.56341)	(1.22375)	(3.69044)	(3.46358)	(-1.3331)
CointEq3	-0.02019	-0.00271	-0.00757	0.011532	-0.01176	1.005386	-0.05955
	(0.00751)	(0.00104)	(0.01372)	(0.3787)	(0.00952)	(0.47693)	(0.01695)
	(-2.6884)	(-2.5979)	(-0.552)	(0.03045)	(-1.2352)	(2.10804)	(-3.5141)
D(Y(-1))	-0.34045	0.016716	0.098239	-0.92235	-0.06345	-7.54033	0.355798
	(0.07424)	(0.01032)	(0.13563)	(3.74421)	(0.09416)	(4.71546)	(0.16755)
	(-4.5858)	(1.61968)	(0.72431)	(-0.2463)	(-0.6738)	(-1.5991)	(2.12356)
D(Y(-2))	0.021245	0.020505	0.132791	3.362304	-0.16625	-2.00057	0.337944
	(0.08031)	(0.01116)	(0.14672)	(4.05033)	(0.10186)	(5.101)	(0.18125)
	(0.26454)	(1.83667)	(0.90507)	(0.83013)	(-1.6322)	(-0.3922)	(1.86456)
D(Y(-3))	0.072763	0.019527	-0.01933	4.675936	0.052175	1.487545	0.042374
	(0.08072)	(0.01122)	(0.14748)	(4.0712)	(0.10238)	(5.12728)	(0.18218)
	(0.9014)	(1.74003)	(-0.1311)	(1.14854)	(0.5096)	(0.29012)	(0.2326)

D(Y(-4))	-0.04589	-0.00971	0.027282	2.305855	0.044073	-5.51999	0.079395
	(0.07249)	(0.01008)	(0.13244)	(3.65618)	(0.09195)	(4.6046)	(0.16361)
	(-0.633)	(-0.9639)	(0.20599)	(0.63067)	(0.47934)	(-1.1988)	(0.48527)
D(P(-1))	-0.41364	0.323956	-1.99643	22.59691	-0.22852	62.02345	-0.78116
	(0.53261)	(0.07404)	(0.97305)	(26.862)	(0.67553)	(33.83)	(1.20203)
	(-0.7766)	(4.37522)	(-2.0517)	(0.84122)	(-0.3383)	(1.83338)	(-0.6499)
D(P(-2))	0.345824	-0.16748	0.373279	7.251055	0.279105	33.28748	0.409414
	(0.52836)	(0.07345)	(0.96528)	(26.6474)	(0.67014)	(33.5598)	(1.19243)
	(0.65453)	(-2.2801)	(0.38671)	(0.27211)	(0.41649)	(0.99189)	(0.34334)
D(P(-3))	-0.25058	0.218675	0.971429	54.36747	0.603869	15.70539	-1.49925
	(0.51909)	(0.07216)	(0.94834)	(26.1799)	(0.65838)	(32.971)	(1.17151)
	(-0.4827)	(3.03029)	(1.02434)	(2.07669)	(0.9172)	(0.47634)	(-1.2798)
D(P(-4))	0.933418	-0.16152	-3.39281	-38.4186	-2.31607	-5.33687	0.375602
	(0.51838)	(0.07206)	(0.94704)	(26.144)	(0.65748)	(32.9258)	(1.1699)
	(1.80065)	(-2.2414)	(-3.5825)	(-1.4695)	(-3.5227)	(-0.1621)	(0.32105)
D(USM(-1))	-0.00554	-0.003	0.238598	-4.77903	0.111211	-0.02826	-0.00799
	(0.03921)	(0.00545)	(0.07164)	(1.97773)	(0.04974)	(2.49076)	(0.0885)
	(-0.1413)	(-0.5501)	(3.33044)	(-2.4164)	(2.23599)	(-0.0113)	(-0.0903)
D(USM(-2))	0.030086	-0.00394	-0.12442	3.111577	0.033401	3.169578	-0.09656
	(0.03958)	(0.0055)	(0.0723)	(1.99603)	(0.0502)	(2.5138)	(0.08932)
	(0.7602)	(-0.7164)	(-1.7207)	(1.55888)	(0.6654)	(1.26087)	(-1.081)
D(USM(-3))	-0.02267	0.015686	0.148415	-1.07121	-0.01053	-0.58902	-0.15342
	(0.03962)	(0.00551)	(0.07238)	(1.99814)	(0.05025)	(2.51646)	(0.08941)
	(-0.5722)	(2.84798)	(2.05048)	(-0.5361)	(-0.2095)	(-0.2341)	(-1.7159)
D(USM(-4))	0.016101	0.006645	-0.19446	-1.74484	-0.10176	-3.84559	-0.02604
	(0.0381)	(0.0053)	(0.0696)	(1.92151)	(0.04832)	(2.41995)	(0.08598)
	(0.42261)	(1.25469)	(-2.7938)	(-0.9081)	(-2.1059)	(-1.5891)	(-0.3029)
D(USR(-1))	0.002763	0.000188	-0.00079	0.41457	-0.00016	0.081762	0.004166
	(0.00148)	(0.00021)	(0.00269)	(0.07439)	(0.00187)	(0.09369)	(0.00333)
	(1.87322)	(0.91844)	(-0.294)	(5.57269)	(-0.0851)	(0.87268)	(1.25138)
D(USR(-2))	-0.00036	-0.00046	-0.00348	-0.2246	-0.00062	-0.02299	-0.00427
	(0.00159)	(0.00022)	(0.00291)	(0.08024)	(0.00202)	(0.10105)	(0.00359)
	(-0.228)	(-2.0806)	(-1.1958)	(-2.7991)	(-0.3055)	(-0.2275)	(-1.188)
D(USR(-3))	-0.00039	0.000216	0.002628	-0.0666	-0.00331	-0.12403	-0.00134
	(0.00154)	(0.00021)	(0.00282)	(0.07791)	(0.00196)	(0.09811)	(0.00349)
	(-0.2511)	(1.00635)	(0.9311)	(-0.8548)	(-1.6875)	(-1.2641)	(-0.3832)
D(USR(-4))	0.001899	-7.2E-05	-0.00438	-0.11126	-0.00145	-0.0568	0.002446
	(0.00143)	(0.0002)	(0.00262)	(0.07235)	(0.00182)	(0.09111)	(0.00324)
	(1.3236)	(-0.3629)	(-1.6711)	(-1.5379)	(-0.7972)	(-0.6234)	(0.75561)
D(M(-1))	-0.01591	0.003851	0.397226	1.003902	-0.02734	4.507937	-0.1298
	(0.06072)	(0.00844)	(0.11093)	(3.06239)	(0.07701)	(3.85677)	(0.13704)
	(-0.262)	(0.45623)	(3.5808)	(0.32782)	(-0.355)	(1.16884)	(-0.9472)
D(M(-2))	-0.05085	-0.00693	-0.05821	3.584385	-0.18576	6.456756	-0.09752
	(0.05924)	(0.00824)	(0.10823)	(2.98774)	(0.07514)	(3.76276)	(0.1337)
	(-0.8584)	(-0.8412)	(-0.5378)	(1.1997)	(-2.4723)	(1.71596)	(-0.7294)

D(M(-3))	-0.00111	0.00975	-0.10199	1.789056	-0.00203	2.734411	-0.05208
	(0.05535)	(0.00769)	(0.10112)	(2.7916)	(0.0702)	(3.51574)	(0.12492)
	(-0.02)	(1.26713)	(-1.0085)	(0.64087)	(-0.0289)	(0.77776)	(-0.4169)
D(M(-4))	0.102423	0.001776	0.052175	2.124204	-0.27212	3.023551	0.034675
	(0.05428)	(0.00755)	(0.09917)	(2.73764)	(0.06885)	(3.44778)	(0.1225)
	(1.88691)	(0.23529)	(0.52612)	(0.77593)	(-3.9526)	(0.87696)	(0.28305)
D(R(-1))	0.001422	0.000059	0.000747	0.100675	0.000954	0.205502	-0.00092
	(0.00118)	(0.00016)	(0.00216)	(0.05976)	(0.0015)	(0.07526)	(0.00267)
	(1.20014)	(0.35879)	(0.34523)	(1.68472)	(0.63478)	(2.73061)	(-0.3452)
D(R(-2))	0.000816	-4.1E-05	0.003081	0.013908	0.002128	0.086692	-0.00125
	(0.00113)	(0.00016)	(0.00207)	(0.05712)	(0.00144)	(0.07193)	(0.00256)
	(0.72089)	(-0.2581)	(1.48918)	(0.2435)	(1.48139)	(1.20516)	(-0.4899)
D(R(-3))	-0.00004	-0.00011	0.00194	0.04606	0.00120	-0.15268	0.00224
	(0.00114)	(0.00016)	(0.00208)	(0.05731)	(0.00144)	(0.07218)	(0.00256)
	(-0.0365)	(-0.6946)	(0.9365)	(0.80375)	(0.83385)	(-2.1153)	(0.87273)
D(R(-4))	0.00040	0.00015	0.00082	0.01034	0.00185	0.16191	-0.00008
	(0.00115)	(0.00016)	(0.0021)	(0.05786)	(0.00146)	(0.07287)	(0.00259)
	(0.3484)	(0.92423)	(0.39324)	(0.17861)	(1.27386)	(2.2217)	(-0.0299)
D(E(-1))	0.00290	0.00129	-0.08718	0.35818	-0.06081	2.67556	-0.05698
	(0.03223)	(0.00448)	(0.05888)	(1.62547)	(0.04088)	(2.04712)	(0.07274)
	(0.09003)	(0.28892)	(-1.4806)	(0.22035)	(-1.4876)	(1.30699)	(-0.7833)
D(E(-2))	-0.01489	0.00543	-0.01050	-2.68039	-0.06685	1.64424	0.09685
	(0.03207)	(0.00446)	(0.05859)	(1.61741)	(0.04068)	(2.03697)	(0.07238)
	(-0.4643)	(1.21713)	(-0.1792)	(-1.6572)	(-1.6435)	(0.8072)	(1.33808)
D(E(-3))	0.06725	0.00031	-0.08017	0.34772	0.03520	0.93438	0.09804
	(0.03305)	(0.00459)	(0.06038)	(1.66676)	(0.04192)	(2.09912)	(0.07458)
	(2.0349)	(0.06801)	(-1.3279)	(0.20862)	(0.83984)	(0.44513)	(1.31446)
D(E(-4))	0.04732	-0.00167	-0.02270	-2.03602	0.00982	2.33121	-0.01084
	(0.03327)	(0.00462)	(0.06078)	(1.67775)	(0.04219)	(2.11296)	(0.07508)
	(1.4224)	(-0.361)	(-0.3735)	(-1.2135)	(0.23278)	(1.10329)	(-0.1443)
C	1.40710	0.08130	-0.47797	-4.68756	-0.15678	-75.47857	3.57799
	(0.46848)	(0.06513)	(0.85589)	(23.6275)	(0.59419)	(29.7565)	(1.05729)
	(3.00354)	(1.24837)	(-0.5585)	(-0.1984)	(-0.2639)	(-2.5365)	(3.3841)
R-squared	0.30017	0.75076	0.35352	0.32050	0.34546	0.26746	0.16130
Adj. R-squared	0.18659	0.71031	0.24859	0.21022	0.23923	0.14856	0.02517
Sum sq. resids	0.04137	0.00080	0.13808	105.22525	0.06655	166.89685	0.21071
S.E. equation	0.01472	0.00205	0.02689	0.74224	0.01867	0.93478	0.03321
Log likelihood	641.632	1081.643	507.242	-232.678	588.623	-284.110	460.116
Akaike AIC	-8.3054	-12.2517	-7.1001	-0.4641	-7.8300	-0.0028	-6.6775
Schwartz SC	-7.8165	-11.7628	-6.6112	0.0248	-7.3411	0.4861	-6.1885
Mean dependent	0.00058	0.00580	0.00228	-0.03762	0.00639	-0.01283	0.00051
S.D. dependent	0.01632	0.00380	0.03102	0.83520	0.02140	1.01305	0.03364

Italy-Vector Error Correction Estimates

Sample: 1974:06 1993:10
Included observations: 233
Excluded observations: 0 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2
Y(-1)	1.0000	0.0000
P(-1)	0.0000	1.0000
USM(-1)	-0.35004	-0.12017
	(0.27801)	(0.06445)
	(-1.2591)	(-1.8646)
USR(-1)	0.00847	0.00208
	(0.01045)	(0.00242)
	(0.81077)	(0.85903)
M(-1)	-0.26969	-0.74528
	(0.11499)	(0.02665)
	(-2.3454)	(-27.96)
R(-1)	-0.08265	-0.02657
	(0.06317)	(0.01464)
	(-1.3084)	(-1.8142)
E(-1)	0.847857	-0.09157
	(0.58217)	(0.13495)
	(1.45638)	(-0.6786)
C	(-3.3125)	(-22.855)

Error Correction:	D(Y)	D(P)	D(USM)	D(USR)	D(M)	D(R)	D(E)
CointEq1	0.020246	0.003685	0.065201	0.512252	0.016341	0.524957	-0.07133
	(0.01713)	(0.00259)	(0.01916)	(0.51385)	(0.00753)	(0.48534)	(0.02286)
	(1.1817)	(1.42443)	(3.40284)	(0.99688)	(2.1687)	(1.08163)	(-3.1198)
CointEq2	0.048157	-0.04239	-0.21507	-0.48239	-0.01469	4.569938	0.131997
	(0.05531)	(0.00835)	(0.06186)	(1.6589)	(0.02433)	(1.56684)	(0.07381)
	(0.87064)	(-5.0756)	(-3.4768)	(-0.2908)	(-0.6038)	(2.91665)	(1.78837)
D(Y(-1))	-0.60779	0.004981	-0.01089	-0.05207	-0.03038	0.372204	0.082458
	(0.07513)	(0.01134)	(0.08402)	(2.25329)	(0.03304)	(2.12824)	(0.10025)
	(-8.0897)	(0.43911)	(-0.1296)	(-0.0231)	(-0.9193)	(0.17489)	(0.8225)
D(Y(-2))	-0.34839	-0.01286	-0.06003	-1.37608	0.016684	1.045335	0.143728
	(0.08559)	(0.01292)	(0.09572)	(2.56692)	(0.03764)	(2.42447)	(0.11421)
	(-4.0705)	(-0.9955)	(-0.6271)	(-0.5361)	(0.44324)	(0.43116)	(1.25848)
D(Y(-3))	-0.11183	-0.00127	-0.04966	0.515728	0.021812	3.671449	0.133721
	(0.08533)	(0.01288)	(0.09542)	(2.55902)	(0.03752)	(2.41701)	(0.11386)
	(-1.3106)	(-0.0989)	(-0.5205)	(0.20153)	(0.58127)	(1.519)	(1.17447)

D(Y(-4))	0.04331	0.011603	0.073897	0.935954	0.028693	3.184971	0.114287
	(0.07095)	(0.01071)	(0.07935)	(2.12795)	(0.0312)	(2.00986)	(0.09468)
	(0.61041)	(1.08307)	(0.93131)	(0.43984)	(0.91956)	(1.58467)	(1.20713)
D(P(-1))	0.299129	0.36798	-1.13313	-2.04783	0.393786	68.04274	0.582925
	(0.4576)	(0.0691)	(0.51175)	(13.7241)	(0.20125)	(12.9625)	(0.61062)
	(0.65369)	(5.32569)	(-2.2142)	(-0.1492)	(1.95675)	(5.2492)	(0.95465)
D(P(-2))	0.706747	-0.02471	1.751652	30.43934	-0.03231	-6.04978	0.528528
	(0.49923)	(0.07538)	(0.5583)	(14.9727)	(0.21955)	(14.1418)	(0.66617)
	(1.41567)	(-0.3277)	(3.13745)	(2.03299)	(-0.1472)	(-0.4278)	(0.79338)
D(P(-3))	-0.13629	-0.13767	-0.07817	-3.3682	0.400774	10.4758	-0.94858
	(0.50172)	(0.07576)	(0.56109)	(15.0473)	(0.22065)	(14.2123)	(0.66949)
	(-0.2716)	(-1.8172)	(-0.1393)	(-0.2238)	(1.81635)	(0.73709)	(-1.4169)
D(P(-4))	-0.37534	0.045172	-2.17702	-20.5367	0.016168	23.70872	0.452155
	(0.47869)	(0.07228)	(0.53533)	(14.3566)	(0.21052)	(13.5599)	(0.63875)
	(-0.7841)	(0.62497)	(-4.0667)	(-1.4305)	(0.0768)	(1.74845)	(0.70787)
D(USM(-1))	-0.07271	-0.00019	0.226963	-3.81258	-0.00698	-0.85246	-0.00415
	(0.05751)	(0.00868)	(0.06432)	(1.72486)	(0.02529)	(1.62914)	(0.07674)
	(-1.2643)	(-0.0221)	(3.52884)	(-2.2104)	(-0.2761)	(-0.5233)	(-0.0541)
D(USM(-2))	0.090185	0.001756	-0.21317	2.355598	0.006496	-0.76377	-0.0713
	(0.05793)	(0.00875)	(0.06479)	(1.73746)	(0.02548)	(1.64104)	(0.0773)
	(1.55674)	(0.20077)	(-3.2904)	(1.35577)	(0.25496)	(-0.4654)	(-0.9223)
D(USM(-3))	-0.05305	-0.0004	0.146533	-0.11504	0.0124	0.816851	0.043918
	(0.05711)	(0.00862)	(0.06387)	(1.71281)	(0.02512)	(1.61775)	(0.07621)
	(-0.9289)	(-0.0464)	(2.29433)	(-0.0672)	(0.4937)	(0.50493)	(0.57631)
D(USM(-4))	0.015811	0.005034	-0.29012	-2.33572	-0.02236	-2.57562	-0.0596
	(0.05558)	(0.00839)	(0.06215)	(1.66683)	(0.02444)	(1.57433)	(0.07416)
	(0.28449)	(0.59984)	(-4.6678)	(-1.4013)	(-0.9149)	(-1.636)	(-0.8037)
D(USR(-1))	0.001293	0.00015	-0.00078	0.41668	-0.0004	-0.04375	0.003251
	(0.00237)	(0.00036)	(0.00265)	(0.07105)	(0.00104)	(0.0671)	(0.00316)
	(0.54603)	(0.41803)	(-0.2928)	(5.86484)	(-0.3798)	(-0.6519)	(1.02844)
D(USR(-2))	0.002048	-0.00042	-6.9E-05	-0.1767	0.000495	-0.02168	-0.00271
	(0.00257)	(0.00039)	(0.00287)	(0.07697)	(0.00113)	(0.07269)	(0.00342)
	(0.79788)	(-1.074)	(-0.0241)	(-2.2959)	(0.43827)	(-0.2982)	(-0.7926)
D(USR(-3))	-0.0044	0.00059	0.002709	-0.05167	-0.00087	0.012682	0.000341
	(0.0025)	(0.00038)	(0.0028)	(0.07513)	(0.0011)	(0.07096)	(0.00334)
	(-1.7582)	(1.55948)	(0.96689)	(-0.6878)	(-0.7861)	(0.17872)	(0.10216)
D(USR(-4))	0.002047	0.000082	-0.00372	-0.10368	0.000644	-0.00978	0.002166
	(0.00227)	(0.00034)	(0.00254)	(0.06814)	(0.001)	(0.06436)	(0.00303)
	(0.90106)	(0.23881)	(-1.4646)	(-1.5216)	(0.64465)	(-0.152)	(0.7145)
D(M(-1))	0.060378	0.013119	-0.30734	-1.77347	0.034546	-0.54952	-0.01588
	(0.16567)	(0.02502)	(0.18527)	(4.96865)	(0.07286)	(4.69291)	(0.22107)
	(0.36445)	(0.52444)	(-1.6589)	(-0.3569)	(0.47415)	(-0.1171)	(-0.0718)
D(M(-2))	0.077907	0.03615	-0.07917	-1.5417	-0.08201	5.169135	0.112378
	(0.16394)	(0.02475)	(0.18334)	(4.91689)	(0.0721)	(4.64402)	(0.21876)
	(0.4752)	(1.46033)	(-0.4318)	(-0.3136)	(-1.1374)	(1.11307)	(0.5137)

D(M(-3))	0.168561	-0.00495	0.061758	-0.68283	0.04045	-6.97891	-0.22648
	(0.16349)	(0.02469)	(0.18283)	(4.90321)	(0.0719)	(4.63111)	(0.21815)
	(1.03103)	(-0.2005)	(0.33779)	(-0.1393)	(0.5626)	(-1.507)	(-1.0382)
D(M(-4))	0.158795	0.009278	-0.27458	8.33433	-0.12665	10.37397	0.086626
	(0.16302)	(0.02462)	(0.18231)	(4.88923)	(0.07169)	(4.6179)	(0.21753)
	(0.97408)	(0.37691)	(-1.5061)	(1.70463)	(-1.7665)	(2.24647)	(0.39822)
D(R(-1))	0.002482	0.000598	0.000884	0.038526	-3.7E-05	0.377506	-0.002
	(0.00229)	(0.00035)	(0.00256)	(0.06878)	(0.00101)	(0.06496)	(0.00306)
	(1.08243)	(1.72686)	(0.34466)	(0.56017)	(-0.0364)	(5.81143)	(-0.653)
D(R(-2))	0.003163	-9.2E-06	-0.00579	0.066341	0.000578	0.032139	-0.00127
	(0.00245)	(0.00037)	(0.00274)	(0.07337)	(0.00108)	(0.0693)	(0.00326)
	(1.29293)	(-0.0249)	(-2.118)	(0.90414)	(0.53677)	(0.46375)	(-0.3896)
D(R(-3))	0.001155	-0.00084	0.002613	0.012621	-0.0015	0.026339	0.005478
	(0.00239)	(0.00036)	(0.00268)	(0.07176)	(0.00105)	(0.06778)	(0.00319)
	(0.48251)	(-2.3142)	(0.97644)	(0.17586)	(-1.4298)	(0.38859)	(1.71562)
D(R(-4))	0.00093	-0.00035	0.00090	-0.08069	-0.00079	0.02387	-0.00534
	(0.00234)	(0.00035)	(0.00262)	(0.07027)	(0.00103)	(0.06637)	(0.00313)
	(0.39769)	(-0.9905)	(0.34414)	(-1.1483)	(-0.7682)	(0.35973)	(-1.7065)
D(E(-1))	0.04019	0.01515	-0.09010	1.40896	0.02065	-2.40129	0.08796
	(0.05237)	(0.00791)	(0.05857)	(1.57074)	(0.02303)	(1.48357)	(0.06989)
	(0.76742)	(1.91583)	(-1.5383)	(0.897)	(0.89635)	(-1.6186)	(1.25867)
D(E(-2))	-0.09870	0.00457	0.00681	-1.94529	-0.00290	3.27346	0.10775
	(0.05245)	(0.00792)	(0.05865)	(1.57294)	(0.02306)	(1.48565)	(0.06998)
	(-1.882)	(0.57691)	(0.11609)	(-1.2367)	(-0.1257)	(2.20339)	(1.53967)
D(E(-3))	0.03114	-0.00823	-0.04691	0.31981	-0.01457	-0.27817	0.04129
	(0.05284)	(0.00798)	(0.05909)	(1.58478)	(0.02324)	(1.49683)	(0.07051)
	(0.5894)	(-1.0316)	(-0.7938)	(0.2018)	(-0.6271)	(-0.1858)	(0.58553)
D(E(-4))	0.04392	-0.00600	-0.01562	-1.54084	0.00568	-1.73993	-0.01175
	(0.05273)	(0.00796)	(0.05897)	(1.58143)	(0.02319)	(1.49367)	(0.07036)
	(0.83299)	(-0.7539)	(-0.2649)	(-0.9743)	(0.24511)	(-1.1649)	(-0.167)
C	2.32846	-1.90720	-9.37468	-18.75084	-0.55889	211.41668	5.55896
	(2.45376)	(0.3705)	(2.74409)	(73.5917)	(1.07912)	(69.5077)	(3.27425)
	(0.94893)	(-5.1476)	(-3.4163)	(-0.2548)	(-0.5179)	(3.04163)	(1.69778)
R-squared	0.3285	0.6590	0.3263	0.3187	0.1477	0.3761	0.1525
Adj. R-squared	0.2288	0.6084	0.2263	0.2175	0.0211	0.2834	0.0266
Sum sq. resids	0.1173	0.0027	0.1467	105.5439	0.0227	94.1547	0.2089
S.E. equation	0.0241	0.0036	0.0270	0.7228	0.0106	0.6827	0.0322
Log likelihood	554.058	994.548	528.002	-238.354	745.462	-225.051	486.845
Akaike AIC	-7.328	-11.109	-7.104	-0.526	-8.971	-0.640	-6.751
Schwartz SC	-6.868	-10.650	-6.645	-0.067	-8.511	-0.181	-6.292
Mean dependent	0.0009	0.0088	0.0024	-0.0357	0.0099	-0.0207	0.0040
S.D. dependent	0.0274	0.0058	0.0306	0.8172	0.0107	0.8065	0.0326

United Kingdom -Vector Error Correction Estimates

Sample: 1974:06 1993:10
Included observations: 233
Excluded observations: 0 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4
Y(-1)	1.0000	0.0000	0.0000	0.0000
P(-1)	0.0000	1.0000	0.0000	0.0000
USM(-1)	0.0000	0.0000	1.0000	0.0000
USR(-1)	0.0000	0.0000	0.0000	1.0000
M(-1)	-0.1628	-0.45142	-0.40852	-0.45791
	(0.0171)	(0.04005)	(0.04081)	(0.10659)
	(-9.5205)	(-11.272)	(-10.009)	(-4.296)
R(-1)	0.000943	-0.02759	-0.00408	-1.0039
	(0.00216)	(0.00507)	(0.00516)	(0.01349)
	(0.43573)	(-5.4443)	(-0.7904)	(-74.433)
E(-1)	-0.08729	-0.21639	0.810286	-0.24879
	(0.08329)	(0.19508)	(0.1988)	(0.5192)
	(-1.048)	(-1.1093)	(4.07591)	(-0.4792)
C	3.798166	1.986031	8.368547	-2.41201

Error Correction:	D(Y)	D(P)	D(USM)	D(USR)	D(M)	D(R)	D(E)
CointEq1	-0.10036	0.015659	-0.05339	5.24095	0.012508	5.722096	-0.1595
	(0.03409)	(0.01395)	(0.07097)	(1.71698)	(0.05482)	(1.90195)	(0.08398)
	(-2.9441)	(1.12239)	(-0.7524)	(3.05242)	(0.22816)	(3.00855)	(-1.8994)
CointEq2	-0.02323	-0.01785	-0.04131	2.184412	0.027451	2.274312	-0.06273
	(0.01351)	(0.00553)	(0.02812)	(0.68027)	(0.02172)	(0.75355)	(0.03327)
	(-1.7199)	(-3.2284)	(-1.4694)	(3.21108)	(1.26386)	(3.01811)	(-1.8852)
CointEq3	0.024266	-0.00037	-0.00789	0.263926	0.054587	-0.42063	-0.06732
	(0.00984)	(0.00403)	(0.02048)	(0.49551)	(0.01582)	(0.54889)	(0.02424)
	(2.46656)	(-0.0907)	(-0.3853)	(0.53264)	(3.45038)	(-0.7663)	(-2.7778)
CointEq4	-0.00078	-0.00221	0.000148	-0.02074	0.017052	0.47204	0.015044
	(0.00377)	(0.00154)	(0.00785)	(0.19002)	(0.00607)	(0.21049)	(0.00929)
	(-0.2055)	(-1.4291)	(0.01882)	(-0.1091)	(2.8107)	(2.24263)	(1.61874)
D(Y(-1))	-0.28444	0.001363	0.069993	2.125451	-0.13862	-0.32996	0.003098
	(0.0706)	(0.02889)	(0.14696)	(3.55565)	(0.11352)	(3.93868)	(0.17391)
	(-4.0292)	(0.04717)	(0.47627)	(0.59777)	(-1.2211)	(-0.0838)	(0.01781)
D(Y(-2))	-0.0637	0.001548	0.227601	-2.43612	-0.12326	-3.10348	-0.1769
	(0.06829)	(0.02795)	(0.14216)	(3.43939)	(0.10981)	(3.80989)	(0.16822)
	(-0.9329)	(0.05541)	(1.60105)	(-0.7083)	(-1.1224)	(-0.8146)	(-1.0516)
D(Y(-3))	0.137174	-0.03515	0.040535	2.244208	-0.02356	3.522647	-0.08189
	(0.06647)	(0.0272)	(0.13837)	(3.34775)	(0.10689)	(3.70838)	(0.16374)
	(2.06374)	(-1.2921)	(0.29295)	(0.67036)	(-0.2205)	(0.94992)	(-0.5001)

D(Y(-4))	0.060476	-0.01825	0.181989	-2.45979	-0.07608	-0.31338	0.072106
	(0.06368)	(0.02606)	(0.13257)	(3.20752)	(0.10241)	(3.55305)	(0.15688)
	(0.94963)	(-0.7)	(1.37274)	(-0.7669)	(-0.7429)	(-0.0882)	(0.45963)
D(P(-1))	-0.07254	0.292036	-0.33311	1.70966	0.217423	-1.77932	0.382621
	(0.1752)	(0.0717)	(0.36471)	(8.82396)	(0.28173)	(9.77452)	(0.43158)
	(-0.4141)	(4.07293)	(-0.9133)	(0.19375)	(0.77174)	(-0.182)	(0.88656)
D(P(-2))	0.065941	0.022845	0.383588	-0.71815	0.133635	-0.24652	-0.14227
	(0.17692)	(0.07241)	(0.36829)	(8.91056)	(0.2845)	(9.87044)	(0.43581)
	(0.37272)	(0.31552)	(1.04153)	(-0.0806)	(0.46972)	(-0.025)	(-0.3265)
D(P(-3))	-0.26946	-0.05155	-0.29147	5.847502	-0.54853	-3.17919	-0.06214
	(0.17316)	(0.07087)	(0.36048)	(8.72159)	(0.27846)	(9.66112)	(0.42657)
	(-1.5561)	(-0.7274)	(-0.8086)	(0.67046)	(-1.9698)	(-0.3291)	(-0.1457)
D(P(-4))	0.172082	-0.02387	-0.56653	-11.9957	0.233156	-6.53061	-0.0021
	(0.16081)	(0.06581)	(0.33476)	(8.09928)	(0.25859)	(8.97177)	(0.39613)
	(1.07011)	(-0.3627)	(-1.6923)	(-1.4811)	(0.90163)	(-0.7279)	(-0.0053)
D(USM(-1))	-0.01293	-0.02417	0.283158	-3.47675	-0.16999	-2.4424	0.030601
	(0.0333)	(0.01363)	(0.06933)	(1.67743)	(0.05356)	(1.85813)	(0.08204)
	(-0.3883)	(-1.7736)	(4.0841)	(-2.0727)	(-3.174)	(-1.3144)	(0.37299)
D(USM(-2))	-0.01714	-0.03246	-0.24733	2.398014	0.001249	3.344411	0.055391
	(0.03603)	(0.01474)	(0.075)	(1.8145)	(0.05793)	(2.00997)	(0.08875)
	(-0.4758)	(-2.2014)	(-3.2978)	(1.32158)	(0.02155)	(1.66391)	(0.62415)
D(USM(-3))	0.057687	0.008932	0.208732	-1.01644	0.030131	-1.26889	-0.10997
	(0.03569)	(0.01461)	(0.0743)	(1.79774)	(0.0574)	(1.9914)	(0.08793)
	(1.61618)	(0.61145)	(2.80915)	(-0.5654)	(0.52494)	(-0.6372)	(-1.2507)
D(USM(-4))	-0.02939	0.022405	-0.25139	-1.3197	-0.13626	0.249088	0.034403
	(0.03551)	(0.01453)	(0.07393)	(1.78874)	(0.05711)	(1.98143)	(0.08749)
	(-0.8274)	(1.54148)	(-3.4003)	(-0.7378)	(-2.386)	(0.12571)	(0.39324)
D(USR(-1))	0.00074	0.001426	-0.00352	0.145664	-0.01714	0.203966	-0.00303
	(0.00376)	(0.00154)	(0.00783)	(0.18942)	(0.00605)	(0.20982)	(0.00926)
	(0.19688)	(0.92674)	(-0.4491)	(0.76901)	(-2.8344)	(0.97208)	(-0.3276)
D(USR(-2))	0.002356	-2.1E-06	-0.00128	-0.13682	-0.01042	-0.00097	-0.00042
	(0.0034)	(0.00139)	(0.00708)	(0.17123)	(0.00547)	(0.18968)	(0.00838)
	(0.69287)	(-0.0015)	(-0.1804)	(-0.799)	(-1.906)	(-0.0051)	(-0.0501)
D(USR(-3))	0.002757	0.002698	0.006321	-0.13659	-0.01419	0.00292	0.006463
	(0.00301)	(0.00123)	(0.00627)	(0.15174)	(0.00484)	(0.16809)	(0.00742)
	(0.91509)	(2.18788)	(1.00785)	(-0.9001)	(-2.929)	(0.01737)	(0.87076)
D(USR(-4))	0.002228	0.001065	-0.00373	-0.1769	-0.00686	-0.03163	-0.01126
	(0.00261)	(0.00107)	(0.00544)	(0.13167)	(0.0042)	(0.14585)	(0.00644)
	(0.85243)	(0.99501)	(-0.6846)	(-1.3435)	(-1.631)	(-0.2168)	(-1.748)
D(M(-1))	-0.01858	0.034609	0.071209	3.087871	-0.1221	4.038662	-0.12592
	(0.04478)	(0.01833)	(0.09322)	(2.25545)	(0.07201)	(2.49842)	(0.11031)
	(-0.4148)	(1.88839)	(0.76386)	(1.36907)	(-1.6955)	(1.61649)	(-1.1415)
D(M(-2))	0.035493	-0.04096	-0.0273	-0.71246	0.002024	2.115759	-0.22929
	(0.04326)	(0.0177)	(0.09005)	(2.17867)	(0.06956)	(2.41337)	(0.10656)
	(0.82053)	(-2.3135)	(-0.3032)	(-0.327)	(0.02909)	(0.87668)	(-2.1518)

D(M(-3))	-0.03634	-0.04773	0.016596	-0.15133	-0.26675	1.238142	0.039201
	(0.0445)	(0.01821)	(0.09263)	(2.24121)	(0.07156)	(2.48265)	(0.10962)
	(-0.8166)	(-2.6209)	(0.17916)	(-0.0675)	(-3.7277)	(0.49872)	(0.35762)
D(M(-4))	-0.02146	-0.01576	-0.04746	2.447473	-0.04823	5.119655	0.080651
	(0.04544)	(0.0186)	(0.0946)	(2.28888)	(0.07308)	(2.53545)	(0.11195)
	(-0.4722)	(-0.8471)	(-0.5017)	(1.06929)	(-0.6599)	(2.01923)	(0.72043)
D(R(-1))	-0.00166	-0.00207	0.003337	0.363714	0.015805	0.252363	0.003322
	(0.00363)	(0.00148)	(0.00755)	(0.18259)	(0.00583)	(0.20226)	(0.00893)
	(-0.4571)	(-1.3978)	(0.44217)	(1.99197)	(2.71105)	(1.24772)	(0.37197)
D(R(-2))	-0.00092	-0.00080	-0.00040	-0.06022	0.01348	-0.21260	-0.00067
	(0.00324)	(0.00133)	(0.00675)	(0.16343)	(0.00522)	(0.18104)	(0.00799)
	(-0.2823)	(-0.6014)	(-0.0596)	(-0.3685)	(2.58316)	(-1.1743)	(-0.0843)
D(R(-3))	0.00001	-0.00244	-0.00244	0.10672	0.01347	-0.07115	-0.01021
	(0.00282)	(0.00115)	(0.00587)	(0.14203)	(0.00453)	(0.15733)	(0.00695)
	(0.00266)	(-2.115)	(-0.4158)	(0.75137)	(2.96948)	(-0.4522)	(-1.4696)
D(R(-4))	-0.00246	-0.00136	-0.00055	0.09439	0.00603	-0.00875	0.01080
	(0.00259)	(0.00106)	(0.00539)	(0.13039)	(0.00416)	(0.14444)	(0.00638)
	(-0.9488)	(-1.2789)	(-0.1023)	(0.7239)	(1.44925)	(-0.0606)	(1.69358)
D(E(-1))	0.03584	-0.00162	-0.07937	1.64145	0.00916	2.63521	0.06967
	(0.0299)	(0.01224)	(0.06225)	(1.5061)	(0.04809)	(1.66835)	(0.07366)
	(1.19842)	(-0.132)	(-1.275)	(1.08986)	(0.1904)	(1.57953)	(0.94578)
D(E(-2))	-0.04910	-0.00662	0.04534	-1.44762	0.00399	-1.60476	0.00671
	(0.02912)	(0.01192)	(0.06062)	(1.4667)	(0.04683)	(1.6247)	(0.07174)
	(-1.6861)	(-0.5554)	(0.74798)	(-0.987)	(0.0851)	(-0.9877)	(0.09349)
D(E(-3))	0.01064	0.00198	-0.04471	2.02780	-0.00559	2.63776	-0.03196
	(0.02853)	(0.01168)	(0.05939)	(1.43689)	(0.04588)	(1.59168)	(0.07028)
	(0.37299)	(0.16947)	(-0.7528)	(1.41124)	(-0.1219)	(1.65722)	(-0.4547)
D(E(-4))	0.00266	-0.00145	-0.00539	-1.61522	0.02767	-2.18462	-0.01408
	(0.02833)	(0.01159)	(0.05897)	(1.42671)	(0.04555)	(1.5804)	(0.06978)
	(0.09375)	(-0.1251)	(-0.0914)	(-1.1321)	(0.60749)	(-1.3823)	(-0.2018)
C	0.44694	-0.04642	0.71022	-53.03673	-1.02013	-43.25912	2.66329
	(0.35118)	(0.14373)	(0.73106)	(17.6876)	(0.56473)	(19.5929)	(0.86509)
	(1.27267)	(-0.323)	(0.97149)	(-2.9985)	(-1.8064)	(-2.2079)	(3.07861)
R-squared	0.27506	0.49993	0.23549	0.36941	0.23381	0.31905	0.17242
Adj. R-squared	0.15964	0.42031	0.11377	0.26902	0.11183	0.21064	0.04066
Sum sq. resids	0.03851	0.00645	0.16689	97.69222	0.09959	119.87360	0.23370
S.E. equation	0.01384	0.00566	0.02882	0.69716	0.02226	0.77226	0.03410
Log likelihood	687.289	896.343	515.720	-229.831	576.128	-253.771	476.329
Akaike AIC	-8.4301	-10.2169	-6.9637	-0.5914	-7.4800	-0.3868	-6.6270
Schwartz SC	-7.9428	-9.7296	-6.4764	-0.1042	-6.9927	0.1005	-6.1397
Mean dependent	0.00084	0.00703	0.00253	-0.03543	0.01020	-0.03521	0.00204
S.D. dependent	0.01510	0.00744	0.03061	0.81541	0.02362	0.86921	0.03481

Canada-Vector Error Correction Estimates

Sample: 1974:06 1993:10
Included observations: 233
Excluded observations: 0 after adjusting endpoints
Standard errors & t-statistics in parentheses

Cointegrating Eq:	CointEq1	CointEq2	CointEq3	CointEq4
Y(-1)	1.0000	0.0000	0.0000	0.0000
P(-1)	0.0000	1.0000	0.0000	0.0000
USM(-1)	0.0000	0.0000	1.0000	0.0000
USR(-1)	0.0000	0.0000	0.0000	1.0000
M(-1)	-0.43496	-0.40624	-0.39408	0.022819
	(0.07636)	(0.08015)	(0.06748)	(2.01024)
	(-5.6959)	(-5.0686)	(-5.8401)	(0.01135)
R(-1)	-0.00975	-0.02012	0.012325	-0.46727
	(0.00706)	(0.00741)	(0.00624)	(0.18575)
	(-1.3817)	(-2.7165)	(1.97674)	(-2.5156)
E(-1)	0.57424	-1.48903	-0.10126	-25.7384
	(0.34484)	(0.36193)	(0.30472)	(9.07775)
	(1.66525)	(-4.1142)	(-0.3323)	(-2.8353)
C	-6.23455	-6.23034	1.093222	-0.17805

Error Correction:	D(Y)	D(P)	D(USM)	D(USR)	D(M)	D(R)	D(E)
CointEq1	0.07563	0.004914	-0.07492	4.846355	0.124502	2.469882	0.058005
	(0.02404)	(0.00576)	(0.0465)	(1.20153)	(0.04108)	(1.16201)	(0.02174)
	(3.14652)	(0.85394)	(-1.611)	(4.03347)	(3.03036)	(2.12553)	(2.66854)
CointEq2	0.062984	-0.00463	-0.14325	4.227916	0.032339	2.34276	0.061167
	(0.02205)	(0.00528)	(0.04266)	(1.10235)	(0.03769)	(1.06608)	(0.01994)
	(2.85616)	(-0.8762)	(-3.3576)	(3.83538)	(0.85796)	(2.19754)	(3.06721)
CointEq3	-0.00497	0.011894	-0.12273	1.849057	-0.03706	0.714682	-0.0232
	(0.01479)	(0.00354)	(0.02862)	(0.73946)	(0.02528)	(0.71513)	(0.01338)
	(-0.3362)	(3.35818)	(-4.2883)	(2.50055)	(-1.4659)	(0.99937)	(-1.7342)
CointEq4	-0.00191	0.000421	0.002438	-0.13066	-0.00381	-0.04006	0.00026
	(0.00068)	(0.00016)	(0.00132)	(0.03409)	(0.00117)	(0.03296)	(0.00062)
	(-2.7998)	(2.57658)	(1.84799)	(-3.8333)	(-3.2699)	(-1.2154)	(0.42226)
D(Y(-1))	-0.26038	0.015868	-0.08722	4.287991	-0.1276	7.605855	-0.10505
	(0.07847)	(0.01879)	(0.15181)	(3.92245)	(0.13412)	(3.79341)	(0.07096)
	(-3.3184)	(0.8446)	(-0.5745)	(1.09319)	(-0.9513)	(2.00502)	(-1.4804)
D(Y(-2))	-0.01847	0.007544	-0.32094	2.189946	-0.24947	0.627398	-0.16136
	(0.08211)	(0.01966)	(0.15885)	(4.10443)	(0.14035)	(3.96941)	(0.07425)
	(-0.2249)	(0.38373)	(-2.0204)	(0.53356)	(-1.7776)	(0.15806)	(-2.1732)
D(Y(-3))	0.000827	-0.00551	-0.01984	-0.45833	-0.17449	-0.22867	-0.10468
	(0.08266)	(0.01979)	(0.15993)	(4.13222)	(0.1413)	(3.99629)	(0.07475)
	(0.01001)	(-0.2782)	(-0.1241)	(-0.1109)	(-1.2349)	(-0.0572)	(-1.4003)

D(Y(-4))	-0.11649	-0.01106	0.088389	-5.48863	-0.01178	-3.9893	-0.14858
	(0.07634)	(0.01828)	(0.14769)	(3.8159)	(0.13048)	(3.69037)	(0.06903)
	(-1.526)	(-0.6054)	(0.5985)	(-1.4384)	(-0.0902)	(-1.081)	(-2.1523)
D(P(-1))	-0.50712	-0.12597	0.376686	6.857084	1.170289	19.66681	0.153258
	(0.30397)	(0.07278)	(0.58808)	(15.1949)	(0.51957)	(14.695)	(0.27489)
	(-1.6683)	(-1.7308)	(0.64053)	(0.45128)	(2.25242)	(1.33833)	(0.55753)
D(P(-2))	0.401616	-0.07106	0.291225	9.570257	0.418735	3.676532	-0.11795
	(0.31169)	(0.07463)	(0.60303)	(15.5811)	(0.53278)	(15.0686)	(0.28187)
	(1.2885)	(-0.9522)	(0.48293)	(0.61422)	(0.78595)	(0.24399)	(-0.4185)
D(P(-3))	0.227745	0.005742	-0.97445	4.770595	-0.23572	-2.86347	0.033656
	(0.30737)	(0.07359)	(0.59466)	(15.3649)	(0.52538)	(14.8594)	(0.27796)
	(0.74095)	(0.07803)	(-1.6387)	(0.31049)	(-0.4487)	(-0.1927)	(0.12108)
D(P(-4))	0.282717	0.081953	-0.91657	16.28724	-0.1662	5.048612	-0.09367
	(0.30392)	(0.07277)	(0.58798)	(15.1923)	(0.51948)	(14.6926)	(0.27484)
	(0.93025)	(1.12624)	(-1.5588)	(1.07207)	(-0.3199)	(0.34362)	(-0.3408)
D(USM(-1))	0.010633	-0.01483	0.245607	-4.29686	-0.01694	-1.50049	0.05142
	(0.03798)	(0.00909)	(0.07347)	(1.89833)	(0.06491)	(1.83588)	(0.03434)
	(0.27999)	(-1.6306)	(3.34294)	(-2.2635)	(-0.261)	(-0.8173)	(1.49728)
D(USM(-2))	0.067048	-0.00724	-0.05022	1.94989	-0.06748	1.113236	0.040147
	(0.03878)	(0.00929)	(0.07503)	(1.93862)	(0.06629)	(1.87485)	(0.03507)
	(1.72887)	(-0.7792)	(-0.6694)	(1.00581)	(-1.0179)	(0.59377)	(1.14473)
D(USM(-3))	0.020345	-0.006	0.134549	0.690941	-0.15511	0.890271	0.059034
	(0.03822)	(0.00915)	(0.07395)	(1.91076)	(0.06534)	(1.8479)	(0.03457)
	(0.53225)	(-0.6556)	(1.81942)	(0.36161)	(-2.3741)	(0.48177)	(1.70782)
D(USM(-4))	-0.02029	0.000748	-0.28471	-2.08538	-0.21389	-0.33368	0.027319
	(0.03665)	(0.00878)	(0.07091)	(1.8323)	(0.06265)	(1.77202)	(0.03315)
	(-0.5535)	(0.08526)	(-4.0149)	(-1.1381)	(-3.4139)	(-0.1883)	(0.82418)
D(USR(-1))	0.001087	0.000032	0.000582	0.365318	0.001039	0.270393	0.002149
	(0.00171)	(0.00041)	(0.0033)	(0.08526)	(0.00292)	(0.08245)	(0.00154)
	(0.63743)	(0.07829)	(0.1764)	(4.28479)	(0.35625)	(3.2793)	(1.3932)
D(USR(-2))	-0.00093	0.000165	-0.00208	-0.10564	0.002427	-0.05079	-2.0E-07
	(0.00172)	(0.00041)	(0.00332)	(0.08587)	(0.00294)	(0.08305)	(0.00155)
	(-0.5423)	(0.40231)	(-0.6245)	(-1.2302)	(0.82644)	(-0.6116)	(-0.0001)
D(USR(-3))	0.001046	-0.00028	0.003121	-0.0234	-0.00178	0.121058	0.001436
	(0.00162)	(0.00039)	(0.00313)	(0.08087)	(0.00277)	(0.07821)	(0.00146)
	(0.64669)	(-0.7145)	(0.99724)	(-0.2894)	(-0.6455)	(1.54791)	(0.98149)
D(USR(-4))	-0.00043	-6.1E-05	-0.0054	-0.10842	-0.00371	0.039323	0.000096
	(0.00156)	(0.00037)	(0.00301)	(0.07778)	(0.00266)	(0.07522)	(0.00141)
	(-0.2751)	(-0.1647)	(-1.794)	(-1.394)	(-1.3955)	(0.52279)	(0.06793)
D(M(-1))	0.017102	0.017455	0.023901	4.817956	-0.37872	3.189526	0.042628
	(0.04442)	(0.01064)	(0.08594)	(2.22063)	(0.07593)	(2.14758)	(0.04017)
	(0.38499)	(1.64105)	(0.2781)	(2.16963)	(-4.9877)	(1.48517)	(1.06112)
D(M(-2))	0.042218	0.013725	-0.28271	3.962955	-0.15975	4.493663	0.096707
	(0.04596)	(0.011)	(0.08892)	(2.29739)	(0.07856)	(2.22182)	(0.04156)
	(0.91861)	(1.24733)	(-3.1795)	(1.72498)	(-2.0336)	(2.02252)	(2.32685)

D(M(-3))	0.021298	0.008106	-0.23061	0.644546	-0.11235	2.377689	0.020181
	(0.04528)	(0.01084)	(0.0876)	(2.26329)	(0.07739)	(2.18883)	(0.04094)
	(0.47041)	(0.74779)	(-2.6326)	(0.28478)	(-1.4517)	(1.08628)	(0.49289)
D(M(-4))	0.040331	-0.01343	0.087991	0.997555	0.039474	0.703725	-0.03598
	(0.04163)	(0.00997)	(0.08054)	(2.08104)	(0.07116)	(2.01258)	(0.03765)
	(0.96879)	(-1.347)	(1.09248)	(0.47935)	(0.55474)	(0.34966)	(-0.9557)
D(R(-1))	0.003006	-0.00047	0.000962	0.28342	-0.00157	0.058448	0.001004
	(0.00205)	(0.00049)	(0.00397)	(0.10263)	(0.00351)	(0.09925)	(0.00186)
	(1.46427)	(-0.9535)	(0.24225)	(2.76165)	(-0.4468)	(0.5889)	(0.54099)
D(R(-2))	0.00241	-0.00014	-0.00333	0.04895	-0.00515	0.20420	0.00308
	(0.00204)	(0.00049)	(0.00394)	(0.10192)	(0.00349)	(0.09857)	(0.00184)
	(1.17971)	(-0.2794)	(-0.8444)	(0.48023)	(-1.4789)	(2.0717)	(1.67087)
D(R(-3))	0.00172	0.00021	0.00010	0.01175	0.00102	-0.08212	-0.00140
	(0.00203)	(0.00049)	(0.00393)	(0.10157)	(0.00347)	(0.09823)	(0.00184)
	(0.84558)	(0.42884)	(0.0255)	(0.11573)	(0.29465)	(-0.836)	(-0.7644)
D(R(-4))	0.00047	-0.00024	-0.00000	0.13913	0.00192	0.00925	-0.00129
	(0.00197)	(0.00047)	(0.00381)	(0.09845)	(0.00337)	(0.09522)	(0.00178)
	(0.23818)	(-0.5068)	(-0.0001)	(1.41315)	(0.56937)	(0.09711)	(-0.7219)
D(E(-1))	-0.21442	0.01148	-0.14754	-8.98318	-0.03842	-3.37166	-0.17818
	(0.08554)	(0.02048)	(0.16549)	(4.27591)	(0.14621)	(4.13525)	(0.07735)
	(-2.5067)	(0.56062)	(-0.8915)	(-2.1009)	(-0.2628)	(-0.8153)	(-2.3034)
D(E(-2))	-0.09269	0.04918	-0.00038	-10.81736	-0.06821	-7.95203	-0.19567
	(0.08654)	(0.02072)	(0.16743)	(4.32601)	(0.14792)	(4.1837)	(0.07826)
	(-1.0711)	(2.37371)	(-0.0023)	(-2.5005)	(-0.4611)	(-1.9007)	(-2.5002)
D(E(-3))	-0.01557	0.02543	-0.22474	5.09344	-0.10071	-1.22698	-0.00978
	(0.0881)	(0.02109)	(0.17045)	(4.4042)	(0.1506)	(4.25932)	(0.07967)
	(-0.1768)	(1.20543)	(-1.3185)	(1.1565)	(-0.6687)	(-0.2881)	(-0.1227)
D(E(-4))	-0.06498	0.03634	-0.13053	-5.08544	-0.16439	-7.15457	0.08041
	(0.08368)	(0.02004)	(0.16189)	(4.18295)	(0.14303)	(4.04535)	(0.07567)
	(-0.7765)	(1.81395)	(-0.8063)	(-1.2158)	(-1.1493)	(-1.7686)	(1.06264)
C	1.73725	-0.01679	-2.43732	108.75953	2.04232	58.21619	1.53771
	(0.53806)	(0.12883)	(1.04098)	(26.8968)	(0.9197)	(26.012)	(0.48658)
	(3.22874)	(-0.1303)	(-2.3414)	(4.04359)	(2.22064)	(2.23805)	(3.16023)
R-squared	0.19656	0.44063	0.37271	0.41115	0.34206	0.27948	0.25607
Adj. R-squared	0.06801	0.35113	0.27234	0.31693	0.23679	0.16420	0.13704
Sum sq. resids	0.03651	0.00209	0.13664	91.22341	0.10666	85.32031	0.02985
S.E. equation	0.01351	0.00323	0.02614	0.67536	0.02309	0.65315	0.01222
Log likelihood	690.081	1023.152	536.313	-221.367	565.175	-213.573	713.513
Akaike AIC	-8.4781	-11.3370	-7.1582	-0.6545	-7.4059	-0.7214	-8.6792
Schwartz SC	-7.9893	-10.8483	-6.6694	-0.1657	-6.9171	-0.2326	-8.1904
Mean dependent	0.00127	0.00516	0.00243	-0.03571	0.00707	-0.01824	0.00136
S.D. dependent	0.01399	0.00402	0.03064	0.81716	0.02643	0.71443	0.01315

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