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Aspects of Macroeconomic Policy Combinations and Their Effects on Financial Markets

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ABSTRACT

This paper analyses the implications of macroeconomic policy interactions for financial stability, proxied by financial assets prices (equity and bonds). The empirical analysis applies a Vector Autoregressive (VAR) model and our findings suggest that an accommodating monetary, and disciplined fiscal, stance has been optimal for both stock and bond markets. There is also ample evidence of interdependence between policies, as an expansionary fiscal policy could persuade the monetary authorities to adopt an accommodating stance, whereas a contractionary monetary policy leads fiscal policy towards consolidation. The interrelation between monetary and fiscal policy necessitates coordination between them for the sake of financial stability.

1. INTRODUCTION AND CONTEMPORARY ISSUES

MACROECONOMIC POLICIES ARE VITAL TOOLS for the achievement of economic objectives, whether it is monetary policy to control the availability and cost of money and credit, or fiscal policy to accomplish the government's financial obligations. In this context, Nordhaus (1994) emphasised the significance of macroeconomic policies for the economy by symbolising their role as the left and right sides of the body in human anatomy. However, the effects of macroeconomic policies are not limited to the real economy in practice; the response of financial markets to monetary policy is acknowledged by the Bank of England (2011), which states that bonds and equities are inversely related to interest rates, because of the high rates on which future income is discounted. Nevertheless various studies, for example Bredin *et al* (2005), Ardagna (2009), and Arnold *et al* (2010), also report a significant impact of monetary and fiscal policies on the financial sector.

Any scope and role for macroeconomic policies in financial market performance might be questioned, given that financial stability has not been an explicit mandate of policy makers until the recent past. However, the importance of the financial sector for the real economy creates scope for active macroeconomic policy responses. The significance of the financial sector has been long accepted (see Minsky 1974) yet the behaviour of financial markets has not been incorporated into policy formulation hitherto. Perhaps financial stability[3] has been related to the prudential policies formulated by regulatory bodies, which have not been very effective in avoiding financial crises (Benigno *et al* 2011). Furthermore, Agenor *et al* (2011) and Borio (2011) argue that prudential policies are inadequate for financial stability and supported monetary policy actions. However on this issue, Mishkin (2011) criticised the monetary policy stance in the real world and argued that although central bankers were aware that the financial sector has a strong influence on the real economy, the financial sector was not a constituent part of pre-crisis (2008) monetary policy.

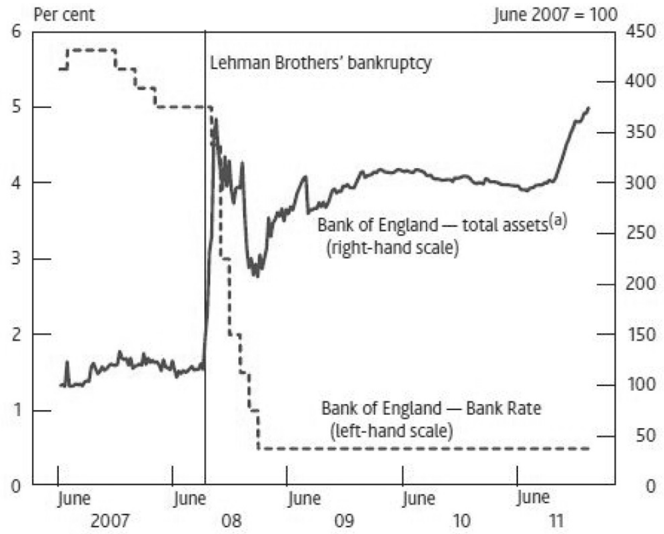
It is worth mentioning here that the Bank of England (hereafter BoE) has recently formulated a Financial Policy Committee (FPC).[4] Nevertheless, the traditional mandate of the BoE was price stability, hence it is anticipated that in future, influence on the financial sector would also be considered in policy formulation, yet the existing literature does not provide any evidence of this. Perhaps in the wake of the Global Financial Crisis the importance of the financial sector for the real economy, and thus the scope of monetary policy in this respect, has been strongly emphasised. There are some remarkable studies, for instance Malikane and Semmler (2008) and Funke *et al* (2011), which argue in favour of a role for monetary policy in financial market stabilisation. More recently, Airaudo (2011) and Albero (2011) have shown that the financial sector has a direct impact on the real economy; therefore it creates the scope for an active monetary response to financial market dynamics. However, a major limitation of these studies is their focus on monetary policy only. Fiscal policy was not part of their analysis, although some studies have emphasised joint fiscal-monetary analysis (see Porqueras and Alva 2010; Sims 2011). Furthermore the aggressive use of expansionary monetary policy for financial markets could adversely affect the real economy (Bernanke and Gertler 2001; Giorgio and Nistico 2007; Airaudo *et al* 2008). In this scenario there is a need to use an expansionary monetary stance to facilitate financial markets, but there is also a downside to the solo efforts made by the monetary authority.

In addition to the conventional instruments of monetary policy (all time low interest rates) the unprecedented events of the last few years specifically in the aftermath of the Lehman Brothers' collapse has led policy-makers to adopt unconventional and aggressive approaches as shown in Figure 1.

The BoE had launched an Asset Purchase Programme, referred to as Quantitative Easing (QE), and the British government bailed out financial institutions, for example the Royal Bank of Scotland (RBS) and Northern Rock. Additionally, money has been pumped into the financial sector to solve liquidity-shortage problems.

Despite the fact that we have limited evidence on the success of QEs in the existing literature, perhaps due to the unprecedented nature of this strat-

Figure 1: Monetary Policy and Balance Sheet



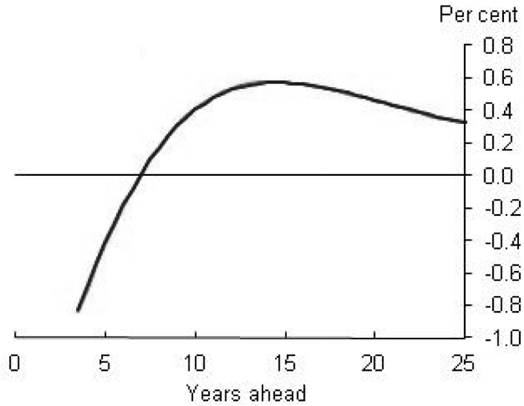
Source: - Bank of England Quarterly Bulletin (2012:1) (a) Assets in Billion GBP.

egy, Curdia and Woodford (2011) argue that the QE-depressed yield on bonds may not be very helpful. We shall not go into detail on QE, as it is beyond the limited scope of this paper, yet (a) it indicates the severity of the financial crisis and its implications for the real economy, which led to the adopting of an additional unconventional instrument by the BoE; and (b) it indicates the limitations of monetary policy, which is the zero lower-bound or liquidity trap. Although these expansionary monetary policy measures were important to support the financial sector in the immediate aftermath of the crisis, there are downsides of these policy measures, reflected in depressed yield of these assets, mainly UK Government bonds or gilts.

Figure 2 represents these effects on the current outlook of real yields on gilts. It is notable that in real terms the yield curve indicates a negative return in the short term, and diminishing returns in the long term (negative risk remium) between 10 to 25 years to maturity. In this situation, the Government and financial institutions might be beneficiaries of the low cost of borrowing and high prices of assets holdings. However, pensioners and savers might lose out, as the value of investments are eroded because of historic low interest rates.

Summarising the scenario presented above, financial stability is required for the economy and there is an emphasis on a role for monetary policy in this context. However, the dilemma is that this policy alone may not be able to achieve the desired outcome. This scenario fuels the intuition of combining, optimally, macroeconomic policies to positively influence the financial sector - see, for example, Porqueras and Alva (2010) and Sims (2011).

Figure 2: Real Yield Curve Gilts



Source: Bank of England (July 2012)

An important term we need to define here is 'financial stability'. In this regard, Foot (2003) argues that there is no particular definition of financial stability, however it could be defined in the context of financial asset price volatility and the generality of financial markets and institutions. Similarly in a recent study, Khorasgani (2010) gives a comprehensive description of the term. It is argued that although there is no consensus on a definition, it can be seen as relating to the oscillation of house and stock prices, exchange rates and the price of some other financial assets, or household debt growth and debt accumulation. Hence, considering these arguments, our definition of financial stability is the price behaviour of financial assets. It is true that the financial sector is wide, consisting of various markets including money, foreign exchange and capital markets, etc. However, the particular segments of the financial market on which this study is focused are stock and bond markets. There are two reasons for this choice; (a) the limited scope of this study, and (b) the importance of stock and bond markets for the real economy as a result of wealth effects (see Funke *et al* 2011; Case *et al* 2012). In this regard, the study by Airaudo (2011) argues that the wealth effect of stock markets on the real economy creates scope for active monetary responses to stock market dynamics. Nevertheless, in this study we are not only considering the interplay between the stock market and monetary policy, but also between the bond market and fiscal policy.

2. Brief review of existing literature

The significance of the financial sector for the economy was recognised long ago by Minsky (1974) in his famous theory of 'Minsky Moments' and the 'Financial Instability Hypothesis'. According to Minsky, when the economy is booming, excessive and speculative behaviour occurs within the financial sector, which creates bubbles that harm the real economy once they burst. Although Minsky was only focusing on money markets and the commercial banking aspect of the financial sector, his theory would still be categorised as pioneering in highlighting the importance of the financial sector for real economic activity. On theoretical grounds we can also see this study in the context of the Fiscal Theory of the Price Level (FTPL), which considers fiscal policy as complementary to monetary policy. In this context the very first substantiation was provided by the empirical work of Sargent and Wallace (1981) and their argument that 'Friedman's list of the things that monetary policy cannot permanently control may have to be expanded to include inflation"'(1981, p.1). Almost three decades later, Cochrane (2009) argued that the financial crisis of Autumn 2008 left less room for monetary policy, which has created scope for fiscal policy. Before moving towards the main theme of policy interaction, we acknowledge briefly the individual significance of monetary and fiscal policies in the context of the financial sector.

2.1 The significance of macroeconomic policies

We have witnessed consistent evidence of the negative impact of contractionary monetary policy on stock and bond markets, whilst monetary expansions deliver positive impacts. Supporting this view, Friedman (2006) and later Kurov (2010) argue that the money supply has determinative effects on the economy and stock markets, particularly in times of high economic and financial volatility. Studies by Hashemzadeh and Taylor (1988), Johnson *et al* (2003) and Gulley and Sultan (2003) illustrate the positive impact of an expansionary monetary policy on stock and bond marekts, while Bjørnland and Leitemo (2008), Kholodilin *et al* (2009) and Arnold *et al* (2010) report a negative impact of contractionary monetary policies on stock and bond markets. Similarly, Pennings *et al* (2011) show that there is an asymmetry in the impact of monetary policy on stock markets among various countries. This implies that the behaviour of stock markets in each country should be considered independently, giventheir idiosyncratic responses.

On the importance of monetary policy in financial stability, Albero (2011) concludes that financial market (credit market) fluctuations influence wealth and investment, and even work as a major driver of price stability. Hence, consideration of financial market behaviour in macroeconomic policy formulation has become necessary. Studies such as Giorgio and Nistico (2007) and Airaudo *et al* (2008) also express concernfor economic instability when there are aggressive monetary policy responses. Therefore whether monetary authorities should react or not react to financial asset price fluctuations is debatable, as there is an argument for financial instability in the case of no reaction, and an argument for economic instability in the event of aggressive monetary responses. In this context, Malikane and Semmler (2008) find that there is high economic volatility when the monetary authority does not respond to asset price fluctuations, and almost double the case when it does respond; this highlights the importance of an active monetary policy response. This study will take their work further by taking fiscal policy as well as monetary policy into account.

The significance of fiscal policy may not be negligible in any aspect, yet it has not been very popular regarding its potential impact on the financial sector (Ardagna 2009). However, in recent years we can evidence quite a few studies carried out in this context, the most prominent of which are by Akitoby and Stratmann (2006), Ardagna (2009) and Afonso and Sousa (2009). They have found that stock prices surged during the period of tight fiscal policy and went down during the period of fiscal expansion. The approach to which fiscal policy is conducted is also important for bond markets, as it affects the risk premium on sovereign bonds (Zigman and Cota 2011). Fiscal policy can also perform a complementary role for monetary policy, as the latter has the limitation of the liquidity trap (Cook and Devereux 2011). Nevertheless, similar to monetary policy, independent efforts by fiscal policy authorities might have limitations and externalities, as Shively (2004) and Setterfield (2009) have cautioned.

2.2 Macroeconomic policy interaction

The impact of macroeconomic policy interactions on the financial sector has not been found to be substantially evident in the literature. However, the influence of policy interactions on real economic activity is briefly acknowledged, to highlight and establish its importance. Joint analyses of macroeconomic policies and their significance has been frequently acknowledged in the literature. Comments by Leeper (1993) are very important in this context: 'Analysing one policy is like dancing a tango solo: it's a lot easier, but it is incomplete and ultimately unfulfilling' (1993, p. 3). Indeed analysing one policy is quite easy; however it does not show the complete picture nor lead to the desired outcome. Nevertheless, in the study by Isaac (2009), it was argued that macroeconomic stability does not depend on a particular fiscal or monetary policy, but on a mix of these policies. In an earlier study, Hughes Hallett and Libich (2007) also suggested that it is important to take the intentions of both the fiscal authorities and the monetary authorities into account, if we are to get a realistic picture of the effectiveness of the policies and policy institutions in any economy. Hence the stance on monetary and fiscal policy is equally important.

Policy interaction is also important as macroeconomic policies may influence the actions of each other (Neri 2003). In studies with similar outcomes, Zubairy (2010) and Davig and Leeper (2011) find that monetary policy may restrict fiscal policy effects and vice versa. Furthermore, there is also evidence of spill-over effects between macroeconomic policies. Therefore, even though the policies can be formulated independently, they are interdependent in their effects. On this aspect, Hughes Hallett *et al* (2011) argue that coordination is important even when the policies have different objectives. Work on policy interaction by Dixit and Lambertini (2001, 2003) suggests the need for the coordination and consensus of fiscal and monetary authorities to deliver a desirable level of output and inflation. They coined the term 'symbiosis' for such an arrangement. However, with regard to financial stability the question of how monetary and fiscal policies should coincide is still unanswered.

In contrast to the policy coordination which, in most of the earlier cited studies, had been considered fruitful, non-cooperation has been shown to hamper the economy. Lombardo and Sutherland (2004), Leitemo (2004) and Hughes Hallett and Libich (2007) argue that the Nash game between the central bank and the fiscal policy authorities may lead to strong interest-rate and exchange-rate fluctuations, which could be harmful to the economy. Similarly, Giorgio and Nistico (2008) and Hanif and Arby (2008) caution that solo efforts by the monetary authority and poor coordination could lead to interest rate and Forex volatility, high inflation and unstable growth.

Despite this evidence in support of macroeconomic policy coordination, there are also some studies, for example by Hagen and Mundschenk (2002) and recently Adam and Billi (2013), which reject the scope and aspect of policy coordination. Importantly, it is worth keeping in mind Niemann and Hagen's (2008) argument that independent monetary authorities are reluctant to coordinate with fiscal authorities. To support their point of view, they give the example of the European Central Bank's (ECB) first President Duisenberg's (2003) argument that there is clearly no scope for coordination between monetary and fiscal policy. Many recent studies on policy interaction have been focused on EMU, as documented also by Semmler and Zhang (2003). Perhaps, as shown by Viegi (2009), the role of macroeconomic policies and their interaction in EMU has its own idiosyncratic nature.

Although most of the studies on policy interactions have been focused on the real economy, and suggested policy coordination, there are differences of opinion on how to coordinate. For example, Thadden (2004), Schabert (2009), and Ferrero (2009) argue that very strict monetary policy for inflation control should be avoided, and that governments should show fiscal discipline to earn market trust. Providing less support for the above argument, Barnett (2005), Pappaa and Vassilatos (2007) and, more recently, Davig *et al* (2011) argue for a constrained fiscal policy and a strict monetary policy for the same objectives. Hence we need to be careful in generalising the impact of policy interactions.

Studies on policy interactions have been focused mostly on the real economy and the financial sector. The very first study which considered jointly fiscal and monetary policies in the financial sector was by Jansen et al (2008). This study concluded that the relationship between monetary policy and the US stock market could be influenced by fiscal policy. However, with the limited empirical framework (semi-parametric regression), policy interaction was not considered and the focus was only on analysing the impact of monetary policy on the financial market under a given fiscal stance. Last but not least, in an important study on the aspect of macroeconomic policy interaction and financial stability (sovereign debt), Hughes Hallett *et al* (2011) argued that 'let us note that there will be no additional policy instrument to achieve the financial stability goal (in the spirit of Tinbergen 1952) and it is never socially optimal for monetary policy to do the job on its own' (Hallett et al 2011, p 2). It is worth mentioning here that although they used the term 'financial stability', they consider it in the context of stabilisation of sovereign debt, whereas the present study has brought stock and bond markets together for joint analysis.

3. Theoretical framework

Consider a household with income constraint utility and preferences. The Euler equation takes the following form:

$$\text{Max } c_t,\ l_t \qquad U = E0\ \Sigma\ \beta_t \quad u\ (c_t,\ l_t) \tag{1}$$

With the objective of household utility maximisation (U) from streams of consumption (*c*) and leisure (*l*); *E*0 is the (rational) expectations operator, based on agents observing all current macroeconomic variables; β (0; 1) is the discount factor, while *u* is an instantaneous utility function and c_t and l_t are levels of consumption and leisure at time (*t*).

The portfolio of a household is constituted of two types of assets, stocks (s) and government bonds (b). The wealth of a household is generated by two sources: financial wealth (A) i.e. the income from financial assets (stocks and bonds) and non-financial wealth (H), which is labour income. Therefore total financial wealth is:

$$A = \sum_{i=1}^{\infty} s + b \tag{2}$$

On theoretical grounds, the wealth effects channel is established where the intertemporal consumption of a household depends on wealth.

$$C = mpc_w\ [A + H(Y)] \tag{3}$$

$$\approx \quad mpc_w A + mpc_Y Y$$

where *C* is consumption, *A* is financial wealth, *H* represents human wealth and Y is the value of expected labour income, net of taxes.

mpc is the proportionality coefficient, which measures the marginal propensity to consume out of financial wealth and income, respectively. We can transform Equation 1 into an elasticity form as follows:

$$\frac{\Delta C}{C} = \underbrace{\left[mpc_W \frac{A}{C} \right]}_{e_W} \frac{\Delta A}{A} \quad + \quad \underbrace{\left[mpc_Y \frac{Y}{C} \right]}_{1\text{-}e_W} \frac{\Delta Y}{Y} \qquad (4)$$

$$= \quad \underbrace{\sum mpc_W \frac{A_j}{C} \frac{\Delta A_j}{A_j}}_{e_{Wj}} \; + \left[mpc_Y \frac{Y}{C} \right] \frac{\Delta Y}{Y}$$

Equation 4 showes that the wealth elasiticity of consumption (e_w) depends on the mpc_w as well as wealth consumption ratio of each component *j*.

National income, Y, takes the form:

$$Y = C + I + G + X - M \qquad (5)$$

where *I* is investment, *G* is government spending and (*X-M*) is the balance of trade. It is obvious that *C* is a vital part of national income. Thus the wealth effects (A) of financial assets (stocks and bonds) have considerable effects on consumption.

Suppose that a household has two classes of financial assets: stocks (s) and bonds (b), which are affected by the macroeconomic policies. Therefore:

$$\text{Financial wealth } (A) = \sum_{i=0}^{n} \frac{A_t^e}{(1+r)^t} \qquad (6)$$

where A_t^e is the expected financial wealth from financial assets i.e. stock and bond markets; and *r* is the rate of interest. For fiscal policy we follow the specification by Ardagna (2009) for US stock market and fiscal policy, however we include the bond market as follows:

$$\text{Financial } (A_{(s,b)}) = f\,(Fiscal_{jt}) \qquad (7)$$

However, as we are analysing the joint impact of monetary and fiscal policy, our model has the following representation:

$$A(s,b) = f\ (M\ ,\ F) \qquad (8)$$

where *A* is the financial asset (*s, b*), *M* is monetary policy and *F* is fiscal policy.

4. Empirical framework

On the basis of the evidence in the literature on policy interaction and the real economy, we argue that insufficient attention has been paid to the empirical validation of theoretical inferences. The present study employs a VAR model to analyse the implications of macroeconomic policy interaction for financial stability, as proxied by the use of financial assets prices. The choice of a VAR model is based on the rationale that endogenous and explanatory variables interact simultaneously, hence there is an extended information set, which makes it a better presentation of the economic system (See Vorbeek 2004; Pecican 2010).

4.1 Data

All observations are of monthly frequency, as stock and bond markets exhibit quite volatile behaviour, thus important information could be lost with the use of low frequency: higher frequency data give better estimates (Hautsch, 2011). We consider the Bank Rate as the most suitable proxy for monetary policy. Bernanke and Blinder (1992) argue that federal funds rates are good measures of monetary policy: the UK equivalent is the Bank Rate. Fiscal policy is proxied by Public Sector Net Cash Requirements, formally known as Public Sector Borrowing Requirements (PSBR), expressed as a percentage of GDP.

The monthly averages of real yield on UK government bonds (gilts) are used as a proxy for the bond market response. The stock market is proxied by monthly average prices of the FTSE-100 index. Stock market data is dividend-adjusted, so it incorporates earning effects. All data are collected from the Office of National Statistics, FTSE Group and the Bank of England.

4.2 Descriptive statistics

The period of analysis is January 1985 to August 2008 (N = 284). There are three reasons for this choice. Firstly, abnormal events led to highly volatile financial markets and non-linearity in data series after September 2008. Secondly, the observations of bond yield showed negative values, which cannot be transformed to overcome the issue of non-normality. Thirdly and most importantly, the Bank Rate has been constant and very low since March 2009. This is the situation where monetary policy is in the Liqudity Trap and can not manoeuvre substantially. To gauge the effects of structural breaks such as the Global Financial Crisis and Liquidity Trap, we would need to use a separate theoretical and empirical framework, which is beyond the scope of the present study.

The descriptive statistics are represented in Table 1. All empirical results are attached in appendices. The positive values of measures of central tendency show that the overall stance of fiscal policy has been expansionary (positive deficit value) while the monetary stance has been contractionary.

Bank Rates have, on average, been almost 7.5 per cent, which is very high. It reflects a conflicting stance between the two policies in the UK and is consistent with the argument of Fragetta and Kirsanova (2010), that fiscal and monetary policies act in a non-cooperative manner.

Furthermore, an important assumption of our model is the stationarity of data series. We perform Augmented Dickey Fuller (ADF) tests as shown in Table 2. The results show that in all cases, the test statistics taking the first difference were greater than the critical values at 5 per cent as well as 1 per cent significance level, which implies that all the data series were non-stationary in levels but stationary in first difference: they are I(1) variables and have same level of integration.

4.3 Macroeconomic policy interactions and bond markets

The Vector Autoregressive (VAR) model is presented in the following equation (8).

$$Y_t(\text{LnBond}) = C + \beta Y_{(t-1)}(\text{LnBond}) + \beta Y_{(t-2)}(\text{LnBond})\ldots + \beta X_{(t-1)}(\text{fiscal}) + \beta X_{(t-2)}(\text{fiscal})\ldots\ \beta X_{(t-1)}(\text{LnMonetary}) + \beta X_{(t-2)}(\text{LnMonetary})\ldots\ et \qquad (8)$$

Where Y_t and X_t are (n x 1) vectors of time series endogenous variables, β_i are the (n x n) coefficient matrixes and *et* is the (n x 1) white noise or unobservable vector process, with assumptions of no autocorrelation and independent distribution i.e. *et* ~N (0, σ^2).

To choose the most appropriate number of lags, we perform an optimal lag selection test using several criteria, as shown in Table 3. Our results of the lag selection test indicate that all criteria of lag selection unanimously suggest 12 as an optimal lag order.

Cointegration analysis techniques are then employed to determine whether the variables are cointegrated and if there is a long-run association among the variables. When there is a cointegration relationship, a Vector Error Correction (VEC) model is employed. The employed VEC is a restricted form of a Vector Autoregression (VAR) model. The basic feature of a VEC model is that it includes an error correction term ($U_{(t-1)}$), which is a one period lag residual term that guides/restores the system to equilibrium. The results of our cointegration tests using Johansen Cointegration techniques are shown in Table 4. The results suggest that no cointegrating relationship exists considering 12 lag periods. Both of the Unrestricted Cointegration Rank tests (Trace and Max Eigen statistics) show that the null of no cointegration could not be rejected at the 5 per cent level of significance, on the basis of MacKinnon-Haug-Michelis (1999) p-values.

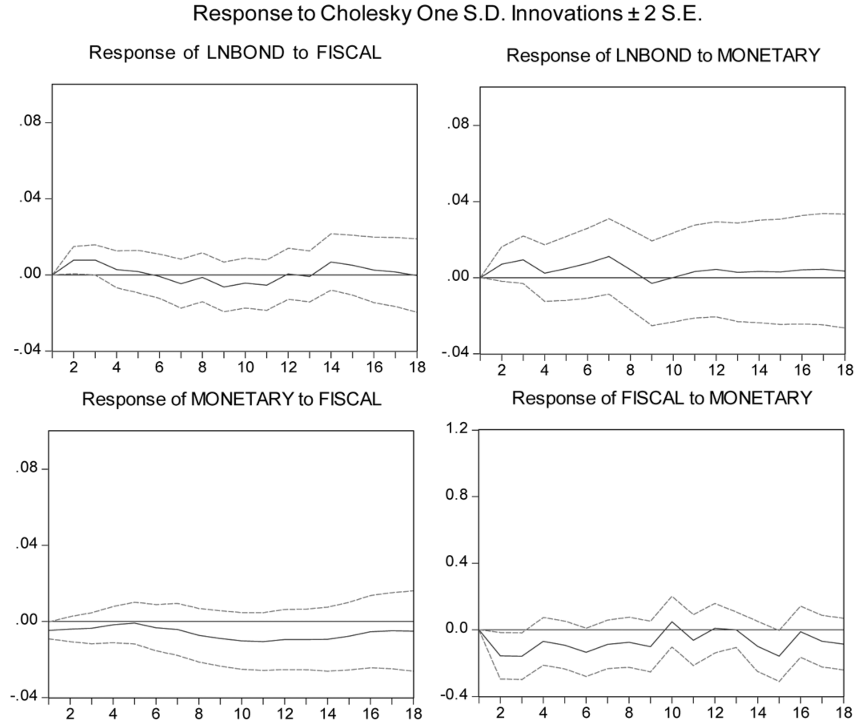
The results are intuitive, as relations among macroeconomic policy and financial sector variables are expected to fall short of significance levels in 12 periods. Hence we employ an unrestricted VAR model as in equation 1, and results are shown in Table 4.1. In addition to checking the robustness of our model for heteroskedasticity, autocorrelation and exogeneity, diagnostic tests are performed. As presented in Table 5, our diagnostic test results show that the null of homoskedasticity (White test) and null of no serial correlation (BG test) cannot be rejected at the 5 per cent level of significance, implying that the model and results are non-spurious. In addition, fiscal policy shows an exogenous association with the bond market, yet monetary policy did not have any significant exogenous impact. Interestingly a combination of monetary and fiscal policies was significantly exogenous to the bond market.

In the VAR model with long lags, the results indicated several values of coefficients which were insignificant. Therefore, the Wald tests were performed to analyse if the various explanatory variables and their coefficients jointly influence response variables. Table 6 shows the Wald test results. The bond market does show significant evidence of volatility, which implies that innovation in bond markets are to a considerable extent endogenous and can be attributed to internal factors e.g. the level of debt. On the policy side, fiscal policy shows a significant association with the bond market, implying that the fiscal stance is an important factor in the volatility of the bond market. However, monetary policy on its own does not exhibit a strong association with the bond market in the long term. On the other hand, combining monetary policy with fiscal policy shows a significant (at the 5 per cent significance level) association with the bond market. This is an important finding in the context of policy coordination: in the long run, coordination between macroeconomic policies could significantly influence the bond market.

Although we have presented the empirical results obtained from the VAR Model in detail, this does not reveal the whole analysis. That said, scrutinising each coefficient is not very helpful, as they become insignificant after a few lags. Therefore, the findings are presented in the form of an Impulse Response Function (IRF) in Figure 3. It represents the dynamics of the response variable as a result of one standard deviation innovation in the explanatory variable (the red lines show the 95 per cent confidence interval). Figure 3 shows that a one standard deviation shock to fiscal policy leads to a surge in bond yields, which takes about seven periods (months) to dissipate. This implies that the price of bonds falls in response to an expansionary fiscal stance. The same fiscal stance leads to an initial drop in Bank rates, or monetary expansion, which indicates cooperation from the monetary side. On the other hand, a one standard deviation innovation in monetary policy leads to a surge in bond yields, which implies that the prices of bonds are negatively affected by monetary contraction. The same innovation to monetary policy also negatively affects fiscal policy. This implies that contractionary monetary policy leads to fiscal consolidation, which could be attributed to the high borrowing cost for the government, as the yield on bonds rises in response to the monetary contraction.

An important point to acknowledge here is the loss of significance over longer lags in the VAR model, prominent in IRF analysis. Our expectations to

Figure 3: Impulse Response Function



capture fully the dynamics of the system being modelled deal with a risk as the greater the number of lags, the greater the number of parameters that must be estimated and the fewer the degrees of freedom. Moreover, the presence of several lags of the same variable leads to parameter estimates not being statistically significant (See Pindyck and Rubinfeld 1997; Pecican 2010). Hence, although the impact of the explanatory variable does not meet the statistical level of significance, it is still important as we seek to look at this phenomenon in a broader context and make the best judgment based on the central view of tendency. The wealth effects are instantaneously created with the increase in the value of financial assets, then transmitted into the real economy in subsequent periods and persist for several quarters before being completely defused (Carroll *et al* 2011). Moreover, we need to relate the IRF analysis with the Wald test results, which indicate that macroeconomic policies, and particularly their combination, have a significant influence on the financial sector. Putting all four together, an accommodating (expansionary) monetary policy with fiscal discipline would lead to a better outcome for bond markets. Hence, coordination between monetary and fiscal policy brings the best outcome as monetary policy on its own could not achieve significant results and a policy conflict could adversely affect bond markets.

4.4 Macroeconomic policy interactions and stock markets

The stock market is now incorporated into our analysis. The empirical framework is similar to the previous model. The VAR model is:

$$Y_t(\text{LnBond}) = C + \beta Y_{(t-1)}(\text{LnStock}) + \beta Y_{(t-2)}(\text{LnStock}) \ldots. + \beta X_{(t-1)}(\text{fiscal}) + \beta X_{(t-2)}(\text{fiscal}) \ldots.. \ \beta X_{(t-1)}(\text{LnMonetary}) + \beta X_{(t-2)}(\text{LnMonetary}) \ldots \ et$$

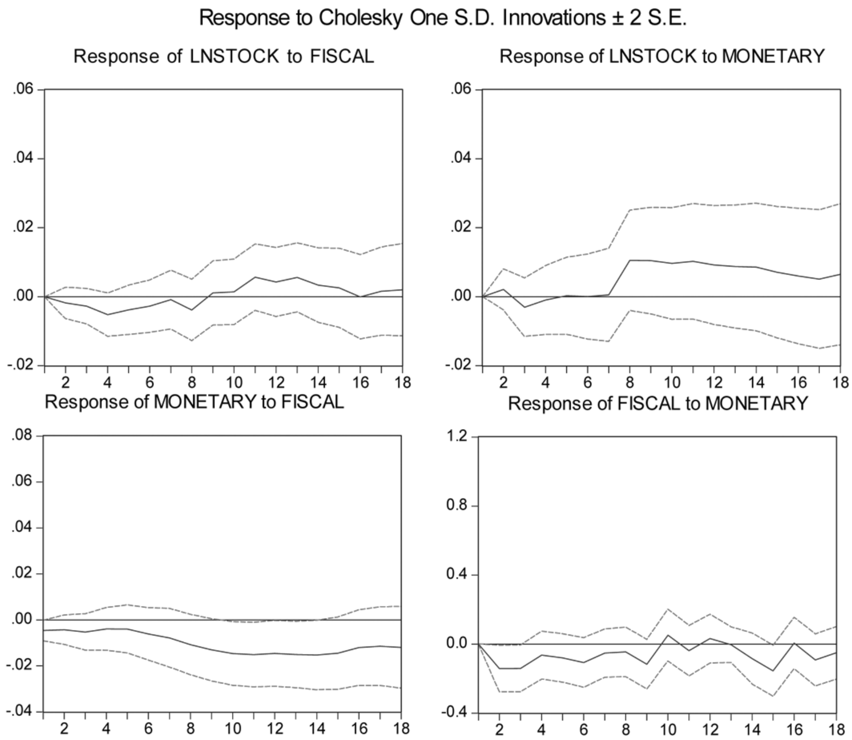
$$et \ \tilde{} N(0, \sigma^2) \quad (9)$$

The selection of optimal lag order is performed on the basis of various criteria, shown in Table 7. The lag selection test results show very similar results to before. We then perform cointegration tests by employing the same Johansen Cointegration methods, with the results presented in Table 8. Our results of the Johansen Cointegration tests, with an assumption of linear deterministic trend, lead to the acceptance of the null hypothesis of no cointegration. The results also show that no cointegrating relationship exists, as both unrestricted Cointegration Rank tests (Trace and Max Eigen statistics) could not satisfy the criteria at the 5 per cent significance level, on the basis of MacKinnon-Haug-Michelis (1999) p-values.

Diagnostic tests are also performed for the validity of our model and are presented in Table 9. The results show that the null of homoskedasticity and absence of serial-correlation cannot be rejected. The exogeneity tests show interesting results, as fiscal policy and monetary policy on their own fail to show any significant exogenous association. Joint exogenous impact of both policies is more significant at 5 per cent level, further demonstrating the significance of policy combination. Wald tests are performed to analyse the long run association among the variable and the joint impact of explanatory variables on response variables, as shown in Table 10. The results show that, similar to bonds, the stock market shows substantial innovation of its own, implying the presence of endogenous volatility in the stock market. Unlike with the bond market, fiscal policy does not show a strong and significant association with the stock market; however monetary policy is effective, at least at the 10 per cent level of significance. Most importantly, the joint impact of monetary and fiscal policy on the stock market is much stronger and significant (p value < 0.05) than the individual policy impacts, which again strongly supports the notion of policy coordination in the stock market.

We also perform an Impulse Response Function (IRF), analysis of which is shown in Figure 4. A one standard deviation shock to fiscal policy leads to a consistent drop in the stock market for a few periods, then a gradual recovery afterwards. It implies that stock prices fall in response to an expansionary fiscal stance. However a similar fiscal policy shock leads to an initial drop in interest rates, or monetary expansionn, indicating cooperation from the monetary side in response to fiscal discipline. On the other hand, innovation in monetary policy leads to a mixed response from the stock market. The results show that monetary contraction negatively affects stock prices. However, we need to see this phenomenon in the context of policy coordination, as the Wald test also shows the individual impact of policies is not highly significant compared to their combinations. Furthermore, a similar innovation to monetary policy also negatively affects fiscal policy, as we have shown previously, given the high yield on government debt.

Figure (4): Impulse Response Function (IRF)



5. Conclusions

Our empirical results show that the best response of the bond market can be achieved by macroeconomic policy coordination. Monetary policy on its own does not significantly influence the bond market in the long run. A contractionary stance from monetary policy leads to an increase in the bond yield (fall in bond prices) and also compels the fiscal authority to consolidate. On the other hand, coordinating (expansionary) monetary policy can bring the best outcome for the bond market. A similar empirical framework used to analyse the stock market effects shows that monetary and fiscal interaction also influences the stock market. Coordination between policies also brings the best results for the stock market, as compared with the solo efforts of macroeconomic policies; in particular, fiscal policy does not influence the stock market significantly. This is contrary to the bond market case, where fiscal policy was more influential than monetary policy. Nevertheless, the most important outcome of the analysis is that the joint impact of monetary and fiscal policy is highly significant. Specifically in the stock market, an accommodating monetary policy with fiscal discipline (contraction) is found to be optimal.

In the context of macroeconomic policy interrelations, we find that an expansionary fiscal policy can induce an accommodating (expansionary) stance for monetary policy, whereas a contractionary monetary policy leads fiscal policy towards consolidation. Another important result, in the context of financial markets, is that a non-cooperative interaction of macroeconomic policies is not optimal for bond and stock markets, as we clearly see their negative response to fiscal expansion and monetary contraction. The implications of our findings for policy formulation are profound, since we establish that policy-makers can affect stock and bond markets through the coordination of macroeconomic policies.

There are some limitations to this study, which provide the foundations and potential for future research. We suggest that considering structural breaks, in the form of changes in institutional design of policy making bodies, for instance independence of the Bank of England or macro-financial events, might be an interesting extension. Moreover considering a different framework or estimation, for instance Bayesian estimation, may also give us further insight. However, considering the limited scope of the present paper, we leave this for future research.

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APPENDIX

Table 1: Descriptive Statistics (Jan 1985 - Aug 2008)

	Bond	*Fiscal*	*Monetary*	*Stock*
Mean	2.95	0.54	7.49	3913.20
Median	3.21	0.82	6.00	3788.60
Std. Dev.	0.95	2.51	3.29	1672.01
Jarque-Bera test	21.173	17.694	41.150	22.546
Prob. (P- Value)	0.000	0.000	0.000	0.000
Observations (N)	284	284	284	284

Source: Authors' calculation using aforementioned data.

Table 2 : Augmented Dickey-Fuller Unit Root Test

Variable	*ADF Test Stat**	*1 % level***	*5% level*	*P-value*
At level I(0)				
LnBond	- 0.402	- 3.453	- 2.871	0.905
LnStock	- 1.876	- 3.990	- 3.425	0.664
Fiscal	- 1.995	- 3.992	- 3.426	0.600
LnMonetary	- 2.238	- 3.991	- 3.425	0.466
1st Difference I(1)				
LnBond	- 16.775	- 3.991	- 3.426	0.000
LnStock	- 16.455	- 3.991	- 3.426	0.000
Fiscal	- 4.252	- 3.993	- 3.427	0.004
LnMonetary	- 8.424	- 3.991	- 3.425	0.000
Residual	- 16.723	- 3.991	- 3.426	0.000

*ADF test statistics of LnBond, Fiscal and Monetary Policy. **Critical value at 1% level of significance. ***Critical value at 5% level of significance.

Table 3: Optimal Lag Selection

Lag	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	NA	0.062	5.736	5.776	5.752
1	1941.694	0.000	-1.470	-1.310	-1.406
2	63.555	0.000	-1.644	-1.365	-1.532
3	95.549	0.000	-1.944	-1.545	-1.783
4	31.660	0.000	-2.000	-1.482	-1.792
5	19.604	0.000	-2.010	-1.372	-1.754
6	62.674	0.000	-2.193	-1.435	-1.888
7	27.252	0.000	-2.236	-1.358	-1.883
8	39.505	0.000	-2.330	-1.333	-1.930
9	9.217	0.000	-2.301	-1.185	-1.853
10	23.972	0.000	-2.335	-1.099	-1.838
11	79.924	0.000	-2.606	-1.250	-2.061
12	118.089*	9.61e-06*	-3.043*	-1.568*	-2.451*
13	7.194	0.000	-3.009	-1.414	-2.368

*significance level (5%), LR: sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table 4 : Johansen Co-integration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	*Eigen value*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***
None	0.025	9.288	29.797	0.9889
At most 1	0.008	2.409	15.495	0.987
At most 2	0.000	0.017	3.841	0.893

Unrestricted Co-integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	*Eigen value*	*Max. Eigen value statistic*	*0.05 Critical Value*	*Prob.***
None	0.025	6.878	21.131	0.958
At most 1	0.008	2.391	14.264	0.978
At most 2	0.000	0.017	3.841	0.893

*Hypothesis of no co-integration was rejected by Trace & Max Eigen value test. ** MacKinnon-Haug-Michelis (1999) p-values.

Table 4.1: Vector Auto Regression (VAR) Model

Variables	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LnBond t-12	-0.062	0.079	-0.783	0.434
Fiscal t-12	-0.003	0.003	-0.947	0.345
LnMonetary t-12	0.019	0.118	0.157	0.875
Constant	-0.018	0.026	-0.713	0.477

Estimation Using Ordinary Least Square (OLS) method.

Table 5: Diagnostic Test (Heteroskedasticity, Autocorrelation & Exogeneity)

Heteroskedasticity : White Test	*Test Stat*		*P value*
Obs. R-Squared	42.097	Prob. Chi-Square (36)	0.160
Breusch-Godfrey Serial Correlation LM test			
Obs. R-squared	12.746	Prob. Chi-Square(12)	0.387
Block Exogeneity Wald test			
Fiscal	28.183	df-12	0.004*
Monetary	12.001	df-12	0.404
All	38.954	df-12	0.023**

*Significant at 1% level, ** Significant at 5% level

Table 6: Wald Test: Error Correction Model

Variable/Test Statistic	*Value*	*df*	*Probability*
LnBond			
F-statistic	205.938	(12, 235)	0.000*
Chi-square	2471.798	12	0.000*
Fiscal Policy			
F-statistic	2.392	(12, 235)	0.006*
Chi-square	28.715	12	0.004*
Monetary Policy			
F-statistic	1.043	(12,235)	0.409
Chi-square	12.524	12	0.404
Fiscal + Monetary (coordination)			
F-statistic	1.647	(24, 235)	0.033**
Chi-square	39.534	24	0.024**

*Significant at 1% level, ** Significant at 5% level

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3. According to Foot (2003) there is No particular definition of financial stability, however it could be defined in context of financial assets price volatility.

4. Headed by the Governor of the Bank of England, this committee will monitor the UK's financial sector and its effects on the economy:
http://www.bankofengland.co.uk/financialstability/Pages/fpc/default.aspx

5. The authors thank the anonymous reviewers for the insightful comments and helpful suggestions. The usual disclaimer applies.

REFERENCES

Adam K and Billi R M (2013) 'Distortionary Fiscal Policy and Monetary Policy Goals', Sveriges Riksbank, Working Paper no. 278.

Afonso A and Sousa R M (2009) 'The Macroeconomic Effects of Fiscal Policy', European Central Bank, Working Paper no. 99.

Agenor P R and Silva L A P D (2011) 'Macroeconomic Stability, Financial Stability, and Monetary Policy Rules', Foundation for Education and Research on International Development, Working paper no. 29.

Airaudo M, Nistico S and Zanna L F (2008) 'Learning Monetary Policy and Asset Prices', LLEE, Working Paper no. 48.

Airaudo M, Cardani R and Lansing K J (2011) 'Monetary Policy and Asset Prices with Belief-Driven Fluctuations and News Shocks', LeBow College of Business, Drexel University, Philadelphia.

Albero C F (2011) 'Financial Frictions, the Financial Immoderation, and the Great Moderation', Department of Economics, Rutgers University.

Ardagna S (2009) 'Financial markets behaviour around episodes of large changes in the fiscal stance', *European Economic Review*, 53, 37–55.

Arnold I J M and Vrugt E B (2010) 'Treasury Bond Volatility and Uncertainty about Monetary Policy', *The Financial Review*, 45, 707–728.

Asghar Z and Abid, I (2007) 'Performance of Lag Length Selection Criteria in Three Different Situations', Munich Personal RePEc Archive, University Library of Munich.

Akitoby B and Stratmann T (2006) 'Fiscal Policy and Financial Markets', IMF Working Paper, Fiscal Affairs Department, Working Paper, no. P/06/16.

Bank of England (2011) 'The transmission mechanism of monetary policy [internet], The Monetary Policy Committee Bank of England',< www.bankofengland.co.uk> [Accessed 3rd December 2011].

Barnett R C (2005) 'Coordinating macroeconomic policy in a simple AK growth model', *Journal of Macroeconomics*, 27, 621–647.

Benigno G, Chen H, Otrok C, Rebucci A and Young E R (2011) 'Financial Crises and Macro-Prudential Policies', Centre for Economic Performance, Discussion Paper no. 1032.

Bernanke B S and Gertler M (2001) 'Should Central Banks Respond to Movements in Asset Prices?', *The American Economic Review*, 91, 253-257.

Bernanke B S and Blinder A S (1992) 'The Federal Funds Rate and the Channels of Monetary Transmission', *The American Economic Review*, 82, 901-921.

Bjørnland H C and Leitemo K (2008) 'Identifying the interdependence between US monetary policy and the stock market', *Journal of Monetary Economics*, 56, 275-282.

Blake A P and Kirsanova T (2011) 'Inflation Conservatism and Monetary-Fiscal Policy Interactions', *International Journal of Central Banking*, 7, 41-83.

Borio C (2011) 'Rediscovering the macroeconomic roots of financial stability policy: journey, challenges and a way forward', BIS Working Papers no. 354.

Bredin D, Hyde S and Reilly G O (2005) 'UK Stock Returns & the Impact of Domestic Monetary Policy Shocks', Department of Banking & Finance, Graduate School of Business, University College Dublin.

Campbell J Y (1995) 'Some Lessons from Yield Curve', *Journal of Economic Perspectives*, 9, 129-152.

Carroll C D, Otsuka M Slacalek J (2011) 'How Large Are Housing and Financial Wealth Effects? A New Approach', *Journal of Money, Credit, and Banking*, 43, 55–79.

Chadha J S and Nolan C (2007) 'Optimal simple rules for the conduct of monetary and fiscal policy', *Journal of Macroeconomics*, 29, 665–689.

Cochrane J H (2009) 'Fiscal theory, and fiscal and monetary policy in the financial crisis', Booth School of Business, University of Chicago and The National Bureau of Economic Research.

Cook D and Devereux M B (2011) 'Optimal fiscal policy in a world liquidity trap', *European Economic Review*, 55, 443–462.

Curdia V and Woodford M (2011) 'The central-bank balance sheet as an instrument of monetary policy', *Journal of Monetary Economics*, 58, 54–79.

Davig T and Leeper E M (2011) 'Monetary–fiscal policy interactions and fiscal stimulus', *European Economic Review*, 55, 211–227.

Dixit A and Lambertini L (2001) 'Monetary- fiscal policy interactions and commitment versus discretion in a monetary union', *European Economic Review*, 45, 977-987.

Dixit A and Lambertini L (2003) 'Symbiosis of monetary and fiscal policies in a monetary Union', *Journal of International Economics*, 60, 235–247.

Duisenberg W (2003) 'Monetary and fiscal policy in the euro area, Introduction by Dr. Willem F. Duisenberg', President of the European Central Bank, at the International Monetary Conference, Berlin.

Ferrero A (2009) 'Fiscal and monetary rules for a currency union', *Journal of International Economics* ,77, 1–10.

Foot M (2003) 'What is financial stability and how do we get it? ACI (UK)', The Roy Bridge Memorial Lecture. Available from:< http://www.fsa.gov.uk/library/communication/speeche s/2003/sp122.shtml> [Accessed 7th March 2012]

Fragetta M and Kirsanova T (2010) 'Strategic monetary and fiscal policy interactions: An empirical investigation', *European Economic Review*, 54, 855–879.

Friedman M (2006) 'A Natural Experiment in Monetary Policy Covering Three Episodes of Growth and Decline in the Economy and the Stock Market', *Journal of Economic Perspectives*, 19, 145-150.

Funke M, Paetz M and Pytlarczyk E (2011) 'Stock market wealth effects in an estimated DSGE model for Hong Kong', *Economic Modelling*, 28, 316-334.

Giorgio D G and Nistico S (2007) 'Monetary Policy and Stock Prices in an Open

Economy', *Journal of Money, Credit and Banking*, 39, 1947-1985.

Giorgio D G and Nistico S (2008) 'Fiscal Deficits, Current Account Dynamics and Monetary Policy', Department of the Treasury, Ministry of the Economy and of Finance Italy, Working Paper no. 8.

Gulley O D and Sultan J (2003) 'The link between monetary policy and stock and bond markets: evidence from the federal funds futures contract', *Applied Financial Economics*, 13, 199–209.

Hagen J V and Mundschenk S (2002) 'Fiscal and Monetary Policy Coordination in EMU', Central Bank of Chile, Working Papers no. 194.

Hanif M N and Arby M F (2009) 'Monetary and Fiscal Policy Coordination', MPRA Paper no. 10307.

Hashemzadeh N and Taylor P (1988) 'Stock prices, money supply, and interest rates, the question of causality', *Applied Economics*, 20, 1603-1611.

Hautsch N, Kyj L M and Malec P (2011) 'The Merit of High Frequency Data in Portfolio Allocation', SFB 649, Discussion Paper no. 2011-059.

Hughes Hallett A and Libich J (2007) 'Fiscal-Monetary Interactions: The Effect of Fiscal Restraint and Public Monitoring on Central Bank Credibility, *Open Economies Review*, 18, 559–576.

Hughes Hallett A, Libich J and Stehlik P (2011) 'Macro-prudential Policies and Financial Stability', *The Economic Record*, 87, 318–334.

Hughes Hallett A, Libich J and Stehlik P (2011) 'Welfare Improving Coordination of Fiscal and Monetary Policy', *AUCO Czech Economic Review*, 5, 7–26.

Isaac A G (2009) 'Monetary and Fiscal Interactions: Short-run and Long-run Implications', Journal compilation, Blackwell Publishing Ltd, 9600 Garsington Road, Oxford: UK.

Jansen D W, Li Q, Wang Z and Yang J (2008) 'Fiscal policy and asset markets: A semi-parametric analysis', *Journal of Econometrics* ,147, 141 -150.

Johnson R R, Buetow G W, Jensen G R and Reilly F K (2003) 'Monetary policy and fixed income returns', *The Quarterly Review of Economics and Finance*, 43, 133–146.

Kholodilin K, Montagnoli A, Napolitano O and Siliverstovs B (2009) 'Assessing the impact of the ECB's monetary policy on the stock markets: A sectoral view', *Economics Letters*, 105, 211–213.

Kirsanova T, Stehn S J and Vines D (2005) 'The Interactions between Fiscal Policy and Monetary Policy, *Oxford Review of Economic Policy*, 21, no. 4.

Kurov A (2010) 'Investor sentiment and the stock market's reaction to monetary policy', *Journal of Banking and Finance*, 34, 139–149.

Leeper E (1993) 'The Policy Tango; towards a holistic view of monetary and fiscal effects', *Federal Reserve Bank of Atlanta Economic Review*, 78, 1- 27.

Leitemo K (2004) 'A game between the fiscal and the monetary authorities under inflation targeting', *European Journal of Political Economy*, 20, 709–724.

Lombardo G and Sutherland A (2004) 'Monetary and fiscal interactions in open economies', *Journal of Macroeconomics*, 26, 319–347.

Malikane C and Semmler W (2008) 'Asset Prices, Output and monetary policy in a small open economy', *Metroeconomica*, 59, 4.

Minsky H P (1974) 'The Modeling of Financial Instability: An introduction', Modeling and Simulation', Proceedings of the Fifth Annual Pittsburgh Conference.

Mishkin F S (2011) 'Monetary Policy Strategy: Lessons From the Crisis', National Bureau of Economic Research, Working Paper no. 16755.

Muscatelli A, Tirelli P and Trecroci C (2004) 'Fiscal and monetary policy interactions: Empirical evidence and optimal policy using a structural New-Keynesian model', *Journal of Macroeconomics*, 26, 257–280.

Nevill A M and Holder R L (1995) 'Scaling, normalizing and per ratio standards: Scaling an Allometric modelling approach', The American Physiological Society. Available at: http://wlv.openrepository.com/wlv/bitstream/2436/66082/1/JAP%20Scaling,%20Normalizing.pdf [Accessed at: 28 April 2012]

Neri S (2003) 'Structural VARs and DSGE Models: Applications to Macroeconomics, Dissertation, University Pompeu Fabra.

Niemann S and Hagen J V (2008) 'Coordination of monetary and fiscal policies: A fresh look at the issue', *Swedish Economic Policy Review*, 15, 89-124.

Nordhaus W D (1994) 'Policy Games: Coordination and independence in monetary and fiscal policies', *Brookings Paper on Economic Activity*, 2, 139 -216.

Pappaa E P and Vassilatos V (2007) 'The unbearable tightness of being in a monetary union: Fiscal restrictions and regional stability', *European Economic Review*, 51, 1492–1513.

Pecican E S (2004) 'Forecasting Based on Open VAR Model', *Romanian Journal of Economic Forecasting*, Institute of Economic Forecasting.

Pennings S, Ramayandi A and Tang H C (2011) 'The Impact of Monetary Policy on Financial Markets in Small Open Economies: More or Less Effective during the Global Financial Crisis?', ADB Working Paper Series on Regional Economic Integration no. 72.

Pindyck R S and Rubinfeld D (1997) *Econometric Models and Econometric Forecasts*, Irwin McGraw Hill Publishing Co.

Porqueras P G and Alva A P (2010) 'Optimal monetary and fiscal policies in a search theoretic model of monetary exchange', *European Economic Review*, 54, 331–344.

Sargent T J and Wallace N (1981) 'Some Unpleasant Monetarist Arithmetic', Research Department, Federal Reserve Bank of Minneapolis.

Schabert A (2009) 'Central bank instruments, fiscal policy regimes, and the requirements for equilibrium determinacy', *Review of Economic Dynamics*, 9, 742–762.

Semmler W and Zhang W (2003) 'Monetary and Fiscal Policy Interactions: Some Empirical Evidence in the Euro-Area', Centre for Empirical Macroeconomics, Bielefeld University.

Setterfield M (2009) 'Fiscal and monetary policy interactions: lessons for revising the

EU Stability and Growth Pact', *Journal of Post Keynesian Economics*, 31, 623- 643.

Shively P A (2004) 'The size and dynamic effect of aggregate-demand and Aggregate-supply disturbances in expansionary and contractionary regimes', *Journal of Macroeconomics*, 26, 83–99.

Sims C A (2011) 'Stepping on a rake: The role of fiscal policy in the inflation of the 1970s', *European Economic Review*, 55, 48–56.

Thadden L V (2004) 'Active monetary policy, passive fiscal policy and the value of public debt: Some further monetarist arithmetic', *Journal of Macroeconomics*, 26, 223–251.

Verbeek M (2004) *A Guide to Modern Econometrics* 2e, John Wiley & Sons.

Viegi N (1999) 'Fiscal Interdependence, Fiscal and Monetary Policy Interaction and the Optimal Design of EMU', Department of Economics, University of Strathclyde.

Yang J, Zhou Y and Wang Z (2009) 'The stock–bond correlation and macroeconomic conditions: One and a half centuries of evidence', *Journal of Banking and Finance*, 33, 670–680.

Zigman A and Cota B (2011) 'The Impact of Fiscal Policy on Government Bond Spreads in Emerging Markets', *Financial Theory and Practice*, 35, 386-412.

Zubairy S (2010) 'On Fiscal Multipliers: Estimates from a Medium Scale DSGE Model', Bank of Canada, Working Paper no. 2010-30.