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Asset Prices, Monetary Policy and Macroeconomics Stability: Empirical Evidence for Canada

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Abstract

Although the Bank of Canada admits stock market price index are considered in its policy deliberations because of their effects on inflation or output gap, the Bank of Canada denies trying to stabilize asset prices around fundamental values. However, since the start of the Bank of Canada we have seen a boom as well as a bust in the stock market. Are we to believe that the Bank of Canada did not react to these stock market fluctuations, apart from their impact consequences on economy? We investigate this issue by using a structural model based on the New Keynesian framework that is augmented by a stock market variable. We use an econometric method that allows us to distinguish the direct effect of stock prices on Bank of Canada policy rates from indirect effects via inflation or GDP. Our results suggest that stock market stabilization plays a larger role in Bank of Canada interest rate decisions than it is willing to admit. Empirically to infer the monetary policy preferences and having a best interpretation of the parameters, we follow Favero and Rovelli's (2003) approach. The results reveal practical monetary policy lessons: (i) Canadian monetary authorities should generally respond to stock market price index as long as this variable contain reliable information about inflation and output, but it should not respond to asset prices if there is considerable uncertainty about the macroeconomic role of asset prices. This finding holds even if a monetary authority cannot distinguish between fundamental and bubble asset price behavior. (ii) The monetary authorities' preferences have changed between different subperiods. In particular, the parameter associated with the financial indicator's target is highly significant at the last subperiod. Furthermore, these results give new insights into the influence of financial variables on monetary policy and should provide relevant understandings regarding the opportunities and limitations of incorporating financial indicators in monetary policy decision making. This indicates that while the Bank of Canada is targeting the information contained in this index in order to avoid inflationary pressures from imbalances in the asset and financial markets. (iii) The findings suggest that the introduction of inflation targeting in Canada was accompanied by a fundamental change in the objectives of monetary policy, not only with respect to the average target, but also in terms of precautions taken to keep inflation in check in the face of uncertainty about the economy. The economic conditions related to the aggregate demand have been favorable in comparison with those related to the aggregate supply and the stock market price fluctuations. The main contribution of this paper is to successfully not only prove that the Bank of Canada does care about output and stock market price stabilization (in addition to inflation stabilization) but reveal that targeting financial conditions might be the solution to avoid imbalances in the financial and asset markets and, consequently, to avoid sharp economic slowdowns. This provides empirically interesting extension to Rodriguez (2008) and Fiodendji (2013).

Keywords: Central Bank Preferences; Interest Rate Rule; Inflation Targeting, Output Gap, Asset prices, Generalized Method of Moments.

JEL Codes: E31; E23; E5; C21; C23; C33;

1 Introduction

The study of Central Bank behaviour has attracted considerable interest in recent years. Atten tion has focused on two rather different issues. One has to do with whether Taylor's rule (Taylor, 1993) adequately describes Central bank behaviour.

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However, empirical evidence suggests that actual interest rate policy appears more cautious than might be expected based on Taylor rule specification (e.g., see Clarida et al. 1999; Rudebusch and Svensson, 1999). On other hand, one has the establishment of the appropriate monetary policy response to asset price movements. Should the Central Bank care about the financial instability associated with large asset price fluctuations? This question whether central banks should react to asset prices has regained interest of policymakers and academics after the Japanese asset price bubble in the late 1980s, the new technology stock market boom in the late 1990s, and the recent financial and economic crisis (2007). In fact, the recent financial crisis has shown that the economic consequences of financial instability can be devastating. The precrisis consensus that asset prices should only affect monetary policy decisions insofar as they affect inflation or output gap has come under discussion.Two reasons might lead central banks to respond to asset price movements. Given the fact, the farseeing and changing reaction of monetary policy and its conduct require credible inflation forecasts. It is worth nothing that, some financial variables (stock prices, real exchange rates, composite indices of asset prices, etc...) may constitute a repelling force behind the conduct of monetary policy. It is well known that asset prices adjust more responsively to current and future economic conditions. Their integration into the reaction of a monetary policy rule would expand the information that could lead to better states of nature in future. The informational scope of the asset pricing contributed moreover to the resurgence of the arguments developed four decades ago by Alchian and Klein (1973), for whom the asset purchase constitute a deferral of consumption over time. The preservation of the purchasing power could justify that assets pricing should be considered in the measure of inflation. On the other hand, if is not clear that volatility in financial markets has increased; financial instability which in turn has worsened with the rise of institutional management. As the exposure of households, businesses and banks to capital markets has increased, frequent disconnections and persistent asset prices to their respective corevalues help make economies more vulnerable to financial cycles. For example, the experience ofJapan and the Scandinavian countries showed the impact of stock market bubbles and explosions on real estate financing systems and their consequences on the macroeconomic balance. Therefore, there is no need to mention the systemic risk that does the brutality of financial flows and even more to consider the consequences of volatile asset prices and their correlation with the real cycle. The strength linkages between financial and real sphere is a sufficient condition to consider what attitude the monetary authorities should observe visàvis the financial movements. In this vein, a number of studies have contributed in recent years to determine whether or not central banks should respond to movements in asset pricing. Specifically, following the lead of the vast literature on monetary policy rules, this work is to determine if, it is optimal for central banks to give to asset prices the same weight as that given to inflation and the output gap.

Recent analyses of central bank behaviour begin with a policy objective function and construct policy rule by optimizing the objective function subject to a system of constraints. In fact, central banks set interest rates based on inflation considerations, taking into account growth developments as well. This standard approach to monetary policy implies that stock prices only enter the deliberations of central banks insofar asset prices affect inflation or GDP. An alternative policy approach is that the central bank actively tries to stabilize asset prices around fundamental values or attempts to prick certain asset price bubbles. To contribute to this discussion, we ask whether the basic Taylor rule could instead be augmented with an alternative variable that collects and synthesises the information from the asset and financial markets, i.e. whether central banks are targeting the relevant economic information contained in a group of financial variables and not simply targeting each financial variable.The role of asset prices is an important issue considered in some studies. However, no con sensus was reached about whether the central bank should or not target this kind of variables. Cecchetti et al. (2000), Borio and Lowe (2002), Goodhart and Hofmann (2002), Chadha et al. (2004) and Rotondi and Vaciago (2005) consider important that central banks target asset prices and provide strong support and evidence in that direction. On the contrary, Bernanke and Gertler (1999, 2001) and Bullard and Schaling (2002) do not agree with an exante control over asset prices. They consider that, once the predictive content of asset prices for inflation has been accounted for, monetary authorities should not respond to movements in assets prices. Instead, central banks should act only if it is expected that they affect inflation forecast or after the burst of a financial bubble in order to avoid damages to the real economy. Moreover, Driffill et al. (2006) analyse the interactions between monetary policy and the futures market in the context of a linear reaction function.

They find evidence supporting the inclusion of futures prices in the central bank's reaction function as a proxy for financial stability. The issue of financial stability is also investigated by Montagnoli and Napolitano (2005). They build and use a financial conditional indicator that includes the exchange rate, share prices and housing prices in the estimation of a Taylor rule for some central banks. Their results show that this indicator can be helpful in modelling the conduct of monetary policy.To empirically analyze the role of asset prices, these authors used either the standard Taylor rule or augmented Taylor rule, which describes how the central bank adjusts interest rates in response to inflation, the output gap, and stock prices.

The use of this Taylor rule to draw inferences about the behaviour of the central bank is not without criticism (Judd and Rudebusch, 1998; Dennis, 2006). An important issue concerns the interpretation of the Taylor rule. A Reaction policy rule may be observed, following Sevensson (1997), as the result of an optimization of an intertemporal loss function subject to two equations describing the structure of the economy. In general, the arguments of the loss function are the gap between expected and target inflation, and the output gap. The important issue in this context is that the parameters of the reaction function rule are convolutions of the original parameters associated to the preferences of the central bank and the structure of the economy.In light of the above problem Dennis (2006) advocates modelling the Fed's behaviour by specifying its objective function and then deriving its optimal interest rate rule, conditional on a particular model for the US economy. The Fed's interest rate rule can be estimated jointly with the structural model, imposing any crossequation restrictions. This approach allows the Fed's preference parameters to be identified and to examine whether they actually change over time. Dennis uses the structural approach to examine if there has been a change in Fed preferences. He considers two subperiods (1961:1 to 1979:3) and (1982:1 to 2000:2). The central bank is assumed to have a quadratic loss function characterized by three parameters: an inflation target ( ); a weight on output gap stabilization ( ) and a weight on interest rate stabilization (μ). Favero and Rovelli (2003) also use the structural framework to examine the Fed preferences.

However, rather than solving for the optimal interest rate rule, Favero and Rovelli use the Fed's firstorder condition its Euler equation along with a structural model of the economy, to estimate Fed preferences. They argue that estimate an interest rate rule in a single equation specification is not a good advise, except if the researcher is only interested in the behaviour of the coefficient associated to the gap between expected and inflation target. Following this recommendation, Rodriguez (2008) estimated in case of Canada a three equations system, allowing for the possibility to retrieve the structural parameters associated to the preferences of the monetary authority and the structure of the economy.

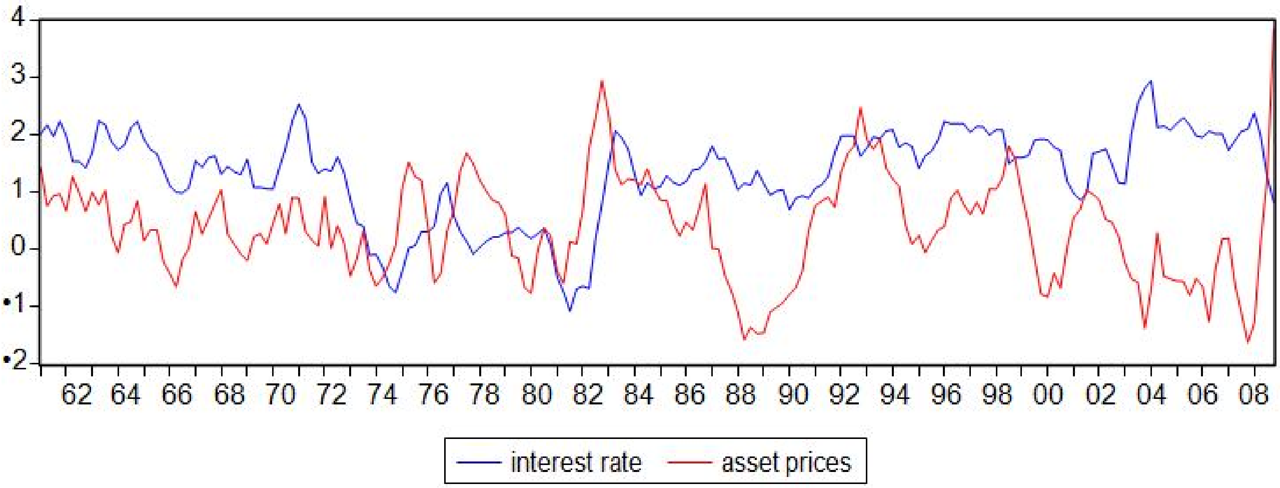
Considering these developments, our contribution is simply to estimate a reaction function rule for the Canada, where the information from some financial variables is accounted for to shed some more light on its importance. In this paper we adopt the basic approach recommended by Favero and Rovelli (2003) in modelling the behaviour of the Bank of Canada for the period 1961:1 to 2012:4. In others words, to estimate a Taylor rule augmented, this paper considers a system of equations that takes into account not only the structure of the economy and the parameters of the central bank loss function but also a stock market variable. We approximate the preferences of the Bank of Canada with a quadratic loss function. We assume that the Bank of Canada only cares not only about deviations of inflation around some target, in deviations in the output gap and smoothing the nominal interest rate but also consider a loss function which take into account the fluctuations of asset prices. The mains difference between our analysis and the previous work lies with the structure of our model for the Canadian economy. In their studies Dennis, Favero and Rovelli and Rodriguez use a purely backwardlooking model of economy (aggregate demand and supply) without effect of stock prices. In contrast our model of economy contains three equations (aggregate demand, supply and dynamic equation of asset price). In seeking to estimate the Bank of Canada's preferences (and other structural parameters) we follow Favero and Rovelli and work with the Euler equation for optimal policy, the aggregate demand curve, the Phillips curve and dynamic Euler equation of asset price.This paper proceeds as follows. Section 2 presents asset prices perspective in Canada. Section 3 extends the models. The empirical results are presented and discussed in section 4. Section 5 offers the main findings of this paper and concludes.

2 Monetary Policy and Asset Prices: A Canadian Example

The general reason to include asset price fluctuations in monetary policy rules is that an asset price bubble is socially unwanted, due to its disruptive effects on consumption and investment and in the soundness of the financial system. Policy analysts at the bank of Canada introduce movements in asset prices into their analysis in many ways. According to Selody and Wilkins (2004) there are three ways: "First, fundamental assetprice values are implicit in the calculations that determine the value of wealth in the main structural model used for policy advice and through their direct effect on the CPI. Second, indicator and monitoring models that use market determined asset prices are being developed for policy advice. Third, descriptions and analysis of the evolution of market determined asset prices are included in the regular briefings to policymakers that precede policy decisions".

These authors find that in Canada case Monetary policy should therefore aim for temporary deviations from its target only under rare and extreme circumstances. Moreover, housingprice bubbles should be a greater concern for Canadian monetary policy than equityprice bubbles, since rising housing prices are more likely to reflect excessively easy domestic credit conditions than are equity prices, which are largely determined in global markets. Choudhry (1996) investigated the relationship between stock prices and the longrun money demand function in Canada and US during 19551989. He finds that stock prices play a significant role in the determination of stationary longrun demand function in both countries. Recently Daisy et al. (2010) examined whether the sensitivity of stock returns to unexpected changes in monetary policy vary across different economies. They empirically investigate the relationship between monetary policy shocks and stock prices using VAR models for Canadian and US economies from the period 1988. They find that, in Canada, the immediate response of stock prices to a domestic contractionary monetary policy shock is small and the dynamic response is brief, whereas in the U.S., the immediate response of stock prices to a similar shock is relatively large and the dynamic response is relatively prolonged. These differences refer probably to the differences in financial market openness between the two countries. Although the Bank of Canada admits asset prices are considered in its policy deliberations because of their effects on inflation or output gap, the Bank of Canada denies trying to stabilize asset prices around fundamental values. However, since the start of the Bank of Canada we have seen a boom as well as a bust in the stock market. Are we to believe that the Bank of Canada did not react to these stock market fluctuations, apart from their impact consequences on economy? To be clear, we agree that monetary policy is not by itself a sufficient tool to contain the potentially damaging effects of booms and busts in asset prices. We examine this issue by using Favero and Rovelli (2003) framework that is augmented by a stock market variable. We use an econometric method that allows us to distinguish the direct effect of asset prices on Bank of Canada policy rates from indirect effects via inflation orGDP.

To gain insight into the relatively history of monetary policy carried out by the Bank of Canada, we take a look at stock market price index, interest rates in the Canada since 1961. The evolution of stock prices and interest rates during the period cover our study is shown in figure 1. We show the stock prices level in deviation from its average over the sample period, to get an idea of the size of peaks and troughs. The stock market peaked in 1983 with 2.9 points deviations from the sample average and reached its trough in the end of 2007 with 1.8 points deviation from average. Thus a boom as well as a bust in stock prices occurred. Volatility in stock prices was considerable during the period of this research. The question is how did the Bank of Canada respond to these stock price fluctuations? Figure 1 also shows the interest rates in the Bank of Canada that are effectively targeted by Bank of Canada. The interest rate moves closely around the refinancing rate (overnight rate), which is the policy rate of the Bank of Canada. It is apparent that the central bank raised interest rates in the beginning of 1981, while interest rates decreased from the end of 2004 until 2008. This implies that monetary policy was tightened during the stock market boom while it was eased afterwards. This behaviour of the Bank of Canada is consistent with the alternative policy approach that includes stabilizing stock prices.



3 Theoretical Framework

We use a structural backwardlooking model of a closed economy that allows for the effect of asset prices on aggregate demand. The model augments the standard Ball (1999) and Svensson (1997) specification by taking into account asset prices. Aggregate supply is the result of firms that set the prices for their products so as to maximize profits in a monopolistic competition setting.

3.1 Structure of the Economy

Svensson (1999) shows that the traditional Taylor rule is to optimal reaction function for a central bank which targets inflation in a simple backwardlooking two equations model of the economy, with the coefficients on the Taylor rule being convolution of policymaker's preferences and the parameters in the aggregate demand and aggregate supply. One key finding of Svensson model is that policymakers react to the output gap even if they are strict inflation targets. In this study, we try to extend that model including two equations for the determination of economy structure and asset prices, showing that policymakers react also to asset prices fluctuations. Therefore, we use an extension framework developed by Ball (1997) and Svensson (1997, 1999), applied recently by Kontonikas and Montagnoli (2005) and Nisticà (2006). It will be a very simple model consisting of three optimal behavioural equations:

$$\pi_{t+1} = \phi x_t + \theta \pi_t + \varepsilon_{t+1} \quad (1)$$

$$x_{t+1} = \eta_1 x_t - \eta_2 (i_t - \pi_{t+1}) + \eta_3 s_{t+1} + \mu_{t+1} \quad (2)$$

$$s_{t+1} = \gamma_1 \varepsilon_{t+1} + \gamma_2 s_t - \gamma_3 (i_t - \pi_{t+1}) + \vartheta_{t+1} \quad (3)$$

where denotes the output gap, i is the monetary policy instrument (the shortterm nominal interest rate), the inflation rate, s the stock market price index (asset prices), measured as the deviations from their trend. This last variable appears here to incorporate the asset prices effects on aggregate demand. Finally, is an aggregate demand shock, is the supply shock, may be interpreted as a shift of the degree of substitutability between inputs in the production of final goods, or an exogenous cost push shocks and represents exogenous random shocks to asset prices. It can be interpreted as a shock to the equilibrium real stock price value. All variables are in logarithms and refer to deviations from an initial steady state. The structural parameters can be interpreted as partial elasticities. Equation (1) is an inflation dynamics equation that links inflation positively to the output gap and the inflation shock. The larger is , the stronger is the adjustment of prices to deviations of output from it potential. The backwardlooking term ( ) re flects the existence of firms that employ a rule of thumb approach to set their prices. This process is also consistent with the empirical finding that inflation in the major industrialised countries is so highly persistent that it may indeed contain a unit root as some studies have shown (seee.g. Grier and Perry, 1998). The parameter is a positive constant which measures the sensitiv ity of inflation to excess demand1. Equation (2) is consistent with the specification employed by Walsh (1998), Ball (1999), and Svensson (1997) with one important difference: aggregate demand equation that allowing for a transmission lag of monetary policy relates the output gap inversely to the real interest rate and positively to the asset prices.

The parameter is assumed to be positive, and . The rationale for including a lag of the output gap is to account for habit persistence in consumption wealth effects and investment balance sheet effects. For example, a persistent decrease in the level of stock prices increases the perceived level of households' financial distress causing a reduction in consumption spending. The balance sheet channel implies a posi tive relationship between the firms' ability to borrow and their net worth, which in turn depends on asset valuations. There is a vast amount of empirical evidence indicating that asset price movements are strongly correlated with aggregate demand in most major economies2 . In our model, the central bank takes into account the effect of wealth on aggregate demand, that is, it isfully aware of the effect of st on t and its magnitude. Furthermore, parameter in the aggregate demand equation is of crucial interest since it indicates the magnitude of the effects of asset price movements on output. If there are no wealth effects/balance sheet effects then = 0 and Eq.(2) resembles a traditional dynamic IS curve. Equation (3) has their root in standard dividend model of asset pricing. Asset prices deviations are a function of next period dividends (assumed to depend on the productivity shock) and the real interest rate.

We also add a backwardlooking term in the equation. As we see, the real interest rate affects output with1 As Clark, Goodhart, and Huang (1999) point out, there are good reasons to believe that is not constant. However, the assumption of linearity in the Phillips curve helps to obtain a closedform solution for the optimal feedback rule.
2 See among others, Kontonikas and Montagnoli (2005) for relevant empirical evidence considering the UK economy, and Goodhart and Hofmann (2000) for international evidence. A recent study by the IMF (2003) points out that equity price reductions are associated with heavy GDP losses.a oneperiod lag, and hence inflation with a two period lags. On the other hand, asset price increases widen the output gap through wealth effects on consumption and raise inflationary threats, affecting inflation with a oneperiod lag. Asset prices don't directly affect the future path of inflation. Nevertheless, they are predictors of future inflation. Inflation expectations in year t are, by equation (1) 3 :

$$\pi_{t+1} = \phi x_t + \theta \pi_t$$

Using (4) and (2), we obtain the following reduced form aggregate demand equation:

$$x_{t+1} = \sigma x_t - \eta_2 (i_t - \pi_t) + \eta_3 s_{t+1} + \mu_{t+1}$$

$$s_{t+1} = \gamma_2 s_t - \gamma_3 (i_t - \pi_t) + \tau x_t + \xi_{t+1} \quad (6) \text{ where } \tau = \phi \gamma_3 \text{ and}$$

$$\xi_{t+1} = \gamma_1 \varepsilon_{t+1} + \vartheta_{t+1}$$

In short, the structure of economy is presented as follow:

$$\begin{cases} \pi_{t+1} = \phi x_t + \theta \pi_t \\ x_{t+1} = \sigma x_t - \eta_2 (i_t - \pi_t) + \eta_3 s_{t+1} + \mu_{t+1} \\ s_{t+1} = \gamma_2 s_t - \gamma_3 (i_t - \pi_t) + \tau x_t + \xi_{t+1} \end{cases}$$

Finally, asset prices deviations depend on contemporaneous shocks to inflation, the output gap and the real interest rate, which is more appealing since asset market participants presumably look at all available and relevant information where determining the appropriate price of the assets.In empirical applications, more lags of output and asset prices (in the case of the IS curve) and output and inflation (for the Phillips curve) are often included to improve the empirical fit. Adding these lags will also induce a more persistent and therefore more realistic adjustment to shocks. In empirical studies and monetary policy analysis sometimes concepts of equilibrium and/or core inflation are added to (1), to distinguish shortrun fluctuations of inflation from longer term, equilibrium inflation. In our analysis this issue is not dealt with and inflation (as all other variables) is defined in terms of deviations from (possibly nonzero inflation) steadystate (see Vega and Wynne, 2003).3 We consider that the coefficient on pt is equal to one, which signifies that last period's inflation is very important for the formation of current inflation.

According to Peersman and Smets (1998), this coefficient is equal to 0,92 for five European countries and Rudebusch and Svensson (1999), as ourselves in last section estimations, impose the restriction that the sum of the lag coefficients of inflation equals one.Following the current monetary policy analysis framework, one possible shortcoming of equa tions (1) and (2) is their relevance in the context of open economies, where international trade is an important part of the economic activity and therefore, the exchange rate should be considered as a significant argument in policy function of open economies. However, using modified versions of equations (1) and (2), Ball (1999) does not find important changes in the interest rate move ments for open and closed economies. On the other hand, using a forwardlooking perspective, Svensson (2000) finds varied benefits of including the exchange rates in the monetary rule in comparison with the original Taylor rule. In a similar way, Taylor (2001) finds weak evidence for the exchange rate channel. Clarida et al. (1998, 2000) attempt to respecify Taylortype rules for small economies using foreign variables. For the cases of Japan and Germany, they use the US interest rate and the exchange rates in the interest rate rule and the results show that the coef ficients may be small and significant but in some cases, as for Germany, the inflation coefficient is negative. Taylor (2001) suggests that the inclusion of the exchange rate is not crucial for the monetary policy rule. As Rodriguez (2008), we consider the role of the exchange rate explicitly in the empirical part in the Phillips curve.

3.2 The Central Bank's Preferences

Following standard assumptions in the empirical literature of monetary policy, the policymaker's preferences are modeled as an intertemporal loss function in which, at each period, the loss function depends on both inflation and output in relation to their target values, as well as the smoothing interest rate and other potential variables (e.g., stock market price index). Future values are discounted at rate /3, and the weights „ μ, and 5 are nonnegative. As usual, we assume that monetary policy is conducted by a central bank that chooses the sequence of shortterm nominal interest rates in order to minimize the present discounted value of its loss function. Rather than assuming a quadratic form as is usual in the literature (see Svensson, 1997; Favero and Rovelli, 2003 and Rodriguez, 2008), we use a more general specification (nonlinear or asymmetric loss function) of the monetary authorities objectives.

$$Loss = E_t \sum_{\varsigma=0}^{\infty} \beta^{\varsigma} \left[\left(\pi_{t+\varsigma} - \pi^* \right)^2 + \lambda x_{t+\varsigma}^2 + \mu \left(i_{t+\varsigma} - i_{t+\varsigma-1} \right)^2 + \delta s_{t+\varsigma}^2 \right] \quad (8)$$

An important aspect of monetary policymaking is that the interest rate has to be chosen before the realization of economic shocks is known with certainty by monetary authorities. Thisfact is captured here by assuming that the realization of the shocks are unknown at the time policymakers pick the nominal interest rates. The policy rule can be found by minimizing the expected value from loss function, equation (8), subject to the behaviour of the economy as given by equations (7). The problem of Central bank is to choose the current interest rate and the sequence of the future interest rates. In summary, the intertemporal optimization problem is then:In summary, the intertemporal optimization problem is then to minimize (8) subject to the restrictions (7). The problem is, then

$$\underset{i_t}{Min} E_t \sum_{\varsigma=0}^{\infty} \beta^{\varsigma} \left[\left(\pi_{t+\varsigma} - \pi^* \right)^2 + \lambda x_{t+\varsigma}^2 + \mu \left(i_{t+\varsigma} - i_{t+\varsigma-1} \right)^2 + \delta s_{t+\varsigma}^2 \right] \quad (9)$$

Subject to

$$\begin{cases} \pi_{t+1} = \phi x_t + \theta \pi_t \\ x_{t+1} = \sigma x_t - \eta_2 (i_t - \pi_t) + \eta_3 s_{t+1} + \mu_{t+1} \\ s_{t+1} = \gamma_2 s_t - \gamma_3 (i_t - \pi_t) + \tau x_t + \xi_{t+1} \end{cases}$$

After finding the firstorder conditions for optimality and after some manipulations, it is possible to obtain an interest rate rule. The parameters of this monetary rule are convolutions of the coefficients associated with the restrictions under which the loss function has been intertemporally optimized; that is they are convolutions of the parameters associated with the preferences of the central bank and the structure of the economy . It represents a serious challenge in terms of estimating an interest rate rule as single equation since it implies that the structure of the economy can not be identified (see Rodriguez, 2008). In this paper, we follow Favero and Rovelli's (2003) approach which is based in a threeequation model.

This system is obtained by solving the intertemporal optimization problem (5) under the hypothesis of finite horizon and a general distributed lag specification of the aggregate demand and aggregate supply from (5). The general system may be specified as follows:4 A more detailed description of the regressions model of Favero and Rovelli (2003) is presented in Appendix A.

$$x_{t+j} = C_1(L)x_{t+j-1} - C_2(L)(i_{t+j-1} - \pi_{t+j-1}) + \mu_{t+j}$$

$$\pi_{t+j} = C_3(L)\pi_{t+j-1} + C_4(L)x_{t+j-1} + C_5(L)w_{t+j} + \varepsilon_{t+j}$$

$$s_{t+j} = C_5(L)s_{t+j-1} + C_6(L)\left(i_{t+j-1} - \pi_{t+j-1}\right) + C_7(L)x_{t+j-1} + \xi_{t+j}$$

$$f(i_{t+j+\varsigma}, \pi_{t+\varsigma+j}, x_{t+\varsigma+j}) = \sum_{\varsigma=0}^{\tau} \beta^{\varsigma} E_t(\pi_{t+\varsigma+j} - \pi^*)\frac{\partial \pi_{t+\varsigma+j}}{\partial i_{t+j}} + \sum_{\varsigma=0}^{\tau} \beta^{\varsigma} \lambda E_t(x_{t+\varsigma+j})\frac{\partial x_{t+\varsigma+j}}{\partial i_{t+j}} \quad (10)$$

$$\sum_{\varsigma=0}^{\tau} \beta^{\varsigma} \delta E_t(s_{t+\varsigma+j})\frac{\partial s_{t+\varsigma+j}}{\partial i_{t+j}} + \mu(i_{t+j} - i_{t+j-1}) - \mu\beta E_t(i_{t+j-1} - i_{t+j}) + \varepsilon^m_{t+j}$$

where w is an additional explanatory variable which is explained in the empirical section. Preliminary estimates suggest that the model estimated by Favero and Rovelli (2003) is adequate, and therefore, we follow this approach. Then, the estimated system, written for j = 1, is the following:

$$x_{t+1} = c_1 + c_2 x_t + c_3 x_{t-1} + c_4(i_{t-1} - \pi_{t-1}) + c_5(i_{t-2} - \pi_{t-2}) + c_6 s_t + \mu_{t+1} \quad (11)$$

$$\pi_{t+1} = c_7\pi_t + c_8\pi_{t-1} + c_9 x_t + c_{10}\Delta w_t + \varepsilon_{t+1}$$

$$s_{t+1} = c_{11} + c_{12}s_t + c_{13}s_{t-1} + c_{14}(i_{t-1} - \pi_{t-1}) + c_{15}(i_{t-2} - \pi_{t-2}) + c_{16}x_t + \xi_{t+1}$$

where is the exchange rate fluctuation.

$$0 = \mu E_t(i_t - i_{t-1}) - \mu\beta E_t(i_{t+1} - i_t) + \beta^2 E_t(\pi_{t+3} - \pi^*)[c_9 c_4] +$$
$$\beta^3 E_t(\pi_{t+4} - \pi^*)\left[c_9\left(c_5 + c_2 c_4\right) + c_7 c_9 c_4\right] +$$
$$+\lambda\beta E_t\left(x_{t+2}\right)[c_4] + \lambda\beta^2 E_t\left(x_{t+3}\right)[c_5 + c_4 c_2 + c_{13}c_7] +$$
$$\lambda\beta^3 E_t\left(x_{t+4}\right)[c_2(c_5 + c_4 c_2) + c_6(c_{12} + c_{13}c_{15}]$$
$$+\delta\beta E_t\left(s_{t+2}\right)[c_{12} + c_4 c_{11}] + \delta\beta^2 E_t\left(s_{t+3}\right)[c_{14} + c_{13}c_{15} + c_4 c_2 c_{12}] +$$
$$\delta\beta^3 E_t\left(s_{t+4}\right)[(c_{14} + c_{13}c_{15})c_{15} + c_5 c_{10} c_{12}]$$

Then, the IS curve equation, Phillips curve equation, stock market price dynamics equation and Euler equation can be jointly estimated as a system, generating estimates of the structural parameters cl through cl6, as well as of the policymakers structural preferences parametersFollowing Favero et Rovelli (2003), the parameters of the structural equations and the loss function are estimated jointly from a system formed by system (11) and the Euler equation (12). As we want to obtain the preferences implied by the coefficients from the threshold regression model, the dependent variable in the interest rate is the fitted interest rates from the threshold regression model including the lagged interest rates. Furthermore, to cover the different types of asymmetry in the policymaker's preferences identified in the literature, estimation is carried out sequentially allowing each of the loss function weights and to vary with the state of the corresponding target variable, and then concludes with a joint test. Statistical inference is based on individual significance tests and Wald tests.

4 Empirical Evidence

4.1 The Data Set

The structural parameters are estimated using quarterly Canadian data on inflation, the output gap, and the nominal interest rate obtained from in Statistics Canada and the Bank of Canada. The data cover the period 1961:1 to 2012:4, thus we include 52 years which means we have 208 data points. In the previous literature monthly or quarterly data are used to estimate monetary policy rules. Our analysis used quarterly data. Annual inflation is measured as 100 x (pt pt 4), where pt denotes logarithms of the Consumer Price Index (CP I). The nominal interest rate is the annual percentage yield on 3month Treasury bills.5 Several different methods (linear trend, quadratic trend methods, etc.) have been proposed to measure the output gap (see Rodriguez, 2008). Our aim is not to ascertain the way that real output evolves over the longrun. Instead, the goal is to obtain a reasonable measure of the pressure felt by the Bank of Canada to use monetary policy to affect the level of output. Output is measured by the gross domestic product. The natural output level is the HodrickPrescott (HP) trend of the current output. The output gap is then computed as the difference between the current output and its HP trend. The other two measures of the output gap construct are obtained after using a linear and a quadratic trend, respectively. The three measures are denoted by HP, LT and QT, respectively. In this paper, we consider the effects of S&P/T SX. In fact, the S&P/T SX composite index is an index of the stock market prices of the largest companies on the Toronto Stock Exchange as measured by market capitalization.

We choose this index because T SX listed companies in this index comprise about 703 of the market capitalization for all Canadian based companies listed on the T SX, thus it is the best financial index which contains the information that can help the Bank of Canada when making policy decisions.The literature on monetary rules has suggested estimation by subsamples, where the break point is considered exogenous. In a recent paper, Rodriguez (2004) has estimated interest rate rules for Canada and the US using endogenous break points selected by the approach suggested by Bai and Perron (1998, 2003). In general, his results show that the selected break dates are consistent with what previous research has used for the US. Since in our paper we have a system of three equations, while the Bai and Perron's approach is adequate for single equations, the adequacy or possible modification of the approach to the system case is beyond the scope of this empirical paper. Unlike Rodriguez (2008), we decided to use one break date selected for Canada (1991:1). Note that an explicit inflation target has been announced by the Canadian government since 1991:1. The breakdown of the sample into two subperiods is meant to capture potential differences in the reaction function between the first period, in which there was no explicit target, and the second one which was characterized by an explicitly announced inflation target. For the whole sample period, as well as for both subperiods, the implicit inflation target is estimated along with the other parameters.5 There is a choice that needs to be made between the overnight rate and the 3month Tbill rate. We chose the 3month Tbill rate because it was the implicit target of Canadian monetary policy for a longer time period. Furthermore, the overnight rate series was constructed after the fact. In any case the two series move together.

4.2 Preliminary Analysis

As is common in the literature, we estimate the monetary policy augmented rule using the Generalized Method of Moments (GMM). GMM allows us not only to disentangle the direct and indirect effects of stock market price index on policy rates, but also to incorporate forwardlooking behaviour of Central banks.Before proceeding with the estimation of the model it is important to consider some issues. First, the summary statistics are given in Table 1. In short, data vary enough so that one can apprehend relevant correlations between the dependent variable and explanatory variables. Moreover the matrix of correlations between explanatory variables (Table (B.1) of the appendixB) suggests that the inclusion of all these variables in the same model poses no problem of multicollinearity. Indeed, coefficients of correlation appear quite low on the whole.

Table 1: Descriptive Statistics

Variables	Mean	Std.Dev	Maximun	Minimum	N	
Interestrate		7.7692	3.7266	21.2500	1.0000	208
Inflationrate		5.1755	10.9157	37.4859	29.7740	208
Outputgap						
	HP	0.0281	2.9539	9.9277	8.1043	208
	LT	0.2115	7.4494	13.7801	22.2639	208
	QT	35.8652	31.2035	96.1864	0.9736	208
Exchangerate		0.0495	5.6888	23.2665	21.1944	208
Stock market price	index	3.0407	0.9677	6.3100	1.0600	208

Second, it is necessary that the variables included in the estimated model are stationary. Unit root and stationarity tests for the variables considered in this study are presented in Table2. We report the results of two different unit root tests (Augmented DickeyFuller (ADF) and ElliottRothenbergStock DFGLS test statistic) and the results of the KPSS stationarity test to see whether the power is an issue. The power of unit root tests seems not to be an issue. The KPSS test is able to provide evidence of stationarity for all variables. We estimated the ADF, DFGLS and KPSS tests using only an intercept.6 With the ADF and DFGLS tests, the unit root null can be rejected even at the 10% level for all variables. With the KPSS test, we cannot reject the null hypothesis of stationarity for all the variables even at 10% level significance. These findings are consistent with the work of other researchers (see Castro, 2008).

Table2: UnitRootandStationaritytests.

	ADF		DFGLS		KPSS	
	Test		Test		Test	
Interestrate	2.684^{t}		2.676^{ttt}		0.196*	
Inflationrate	4.370^{ttt}		4.106^{ttt}		0.111*	
Outputgap	5.383^{ttt}		2.999^{ttt}		0.024*	
Exchangerate	3.660^{ttt}		2.837^{ttt}		0.251*	
Stockmarketpriceindex	5.621^{ttt}		3.882^{ttt}		0.099*	
13criticalvalue	3.465		2.577		0.739	
53criticalvalue	2.877		1.943		0.463	
103critical value	2.575		1.616		0.347	

ADF= Augmented DickeyFuller (1979, 1981) unit root test, ElliottRothenbergStock (1996) DFGLS test statistic (DFGLS is more powerful and more recent); KPSS= Kwiatkowski, Phillips, Schmidt and Shin (1992) stationarity test. The Bandwidth selection procedure is used in the KPSS tests and, in this case, the autocovariances are weighted by the Bartlett Kernel. ttt, tt, t, unit root is rejected at a significance level of 1%, 5%, 10% stationarity. * stationarity is not rejected at a significance level of 10%. Besides, optimal lag length in these tests were selected using Modified Akaike Information Criterion (MAIC) with maximum lag order of 6. We note that, with or without trend our test decision not changes.

4.3 Estimates: Derivation of the preference parameters

Equation (12) is jointly estimated with the system (11), generating estimates of the coefficients describing the monetary policy regime and as well as of the aggregate demand, the aggregate supply and the dynamic evolution of the stock market prices coefficients. To estimate our model specifications for the Canada, we use the GMM procedure. The latter appears highly adequate for our purposes because at the time of its interest rate setting decision, the central banks cannot observe the expost realized right hand side variables. That is why the central banks have to base their decisions on lagged values only (Belke/Polleit 2007).

We decided to use the first eight lags of inflation, the output gap and the stock prices and whenever it is added to the regression equation the first eight lags of the additional variable as instruments. Moreover, we perform a Jtest to test for the validity of overidentifying restrictions to check for the appropriateness of our selected set of instruments. As the relevant weighting matrix we choose, as usual, the heteroscedasticity and autocorrelation consistent HAC matrix by Newey and West (1987). For comparison, in each estimation table, we include the estimation using the total sample. The discount factor /3 is set to 0.975 for quarterly data, as is common in the literature (see Dennis, 2001; Favero and Rovelli, 2003; Rodriguez, 2008)7. Notice that the sample size constraints the number of instruments used in these cases and the estimates obtained are the best considering these restictions.Table 3, Table 4 and Table 5 show the estimates of the preference parameters.8Table 3 indicates the estimates obtained when the HP filter approach has been used to cal culate the output gap. The results fit in terms of sign and magnitude to those obtained by Rodriguez (2008). Firstly, the value of the coefficient μ indicates an increase in the smoothing of interest rate between the preinflation targeting period (1961:11990:4) and the targeting in flation period; and the value of implies a significant decrease between the subperiods. The stock market variable is of special interest in our analysis. The stock price parameter is positive and statistically significant through the different samples, which means that the bank of Canada increases the target interest rate if the stock market price index rises, while rates are cut when this variable fall. 7 Estimating (3 together with the model parameters leads to a slightly lower value between 0.94 and 0.96 without changing the results. This accords with Favero and Rovelli (2003) who also found that qualitative results are not sensitive to variations in the discount factor. 8 All parameter estimates are in Appendix B.2, B.3 and B.4

Moreover, the value of indicates a significant increasing of the weight assigned to the financial market in the conduct of monetary policy for the second subperiod. This means that the Bank of Canada uses a direct mechanism to take into account the stock market price in its decision making. Moreover, the standard deviations of aggregate demand and supply suggest that the economic conditions related to aggregate demand have been favourable in comparison with those related to aggregate supply in preinflation targeting period. In con trast, under inflation targeting period, we observed reverse situation. The standard deviations of the monetary rules indicate that monetary policy has been more successful in the inflation targeting period. In particular, observing this parameter, it seems that the preinflation targeting period has been characterized by a bad conduct of monetary policy. The economic conditions related to the aggregate demand have been favorable in comparison with those related to the aggregate supply and the stock market price fluctuations.9 The standard deviation of the mone tary augmented rule indicates that the monetary policy has been successful in the second regime in comparison with the first regime. In particular, observing this parameter, it seems that the first regime (1961:1 1990:4) has been characterized by a bad conduction of the monetary policy.The empirical evidence suggests, without any doubt, that monetary policy has been conducted efficiently in the last subperiod. The inclusion of the financial conditions indices in the Bank of Canada monetary rule provides a remarkable outcome: results indicate that the Bank of Canada is targeting not only the inflation and the economic conditions but also the financial conditions when defining the interest rate.

The evidence provided in Table 3 shows that expansive financial conditions in Canada are stabilized by an increase in the interest rate. As this extended index contains valuable information concerning the evolution of the future economic activity and about future inflationary pressures, targeting the financial conditions is a way of the Bank of Canada also targeting inflation indirectly and avoiding financial imbalances that can be prejudicial for economic stability. 7 Estimating (3 together with the model parameters leads to a slightly lower value between 0.94 and 0.96 without changing the results. This accords with Favero and Rovelli (2003) who also found that qualitative results are not sensitive to variations in the discount factor.8 All parameter estimates are in Appendix B.2, B.3 and B.49 It is also found by Rodriguez (2008) for the case of the Canada and by Favero and Rovelli (2002) for the case of the US.The intuition and policy implications become clearer if aggregate demand is affected by the evolution of asset prices; then the monetary authorities should include asset price fluctuations in their optimal feedback rule and there should be a change in the distribution of the relevant interest rate weights. This allows for asset prices to be considered as an element of the authorities' reaction function without necessarily implying, overall tighter than before, policy since the response to inflation and output will be less aggressive. In other words, our results imply that first, asset prices should have an independent role instead of being considered as instruments to help forecast output and inflation; and second, there should be a shift in the magnitude of reaction, away from the traditional variables (inflation, output gap) and towards a direct response to financial instability. Despite the highly stylized structure of the model, the results reveal several practical monetary policy lessons.

First, a monetary authority should generally respond to asset prices as long as asset prices contain reliable information about inflation and output. Second, this finding holds even if a monetary authority cannot distinguish between fundamental and bubble asset price behavior. Third, a monetary authority's desire to respond to asset prices falls dramatically as its preference to smooth interest rates rises. Finally, a monetary authority should not respond to asset prices if there is considerable uncertainty about the macroeconomic role of asset prices. Thus, this is the first study to show that the Bank of Canada is not only trying to promote monetary stability but, in doing so; it is also trying to promote the required financial stability,specially in the last regime.As mentioned in introduction, there is a huge discussion in the literature about whether the central banks should target financial variables and, in special, asset prices. This paper provides some evidence favouring the inclusion of the information contained in those variables in the monetary rule.10 In general, papers use to deal with this issue by including each single asset price or financial variable independently in the model without taking into account the relative importance of each one at each particular moment in time. With the index used in this study, we overcome that problem and concentrate the information provided by those variables in a single indicator.10 This conclusion is in line with other works in the field, like Cecchetti et al. (2000), Borio and Lowe (2002), Goodhart and Hofmann (2002), Chadha et al. (2004), Rotondi and Vaciag (2005) and Driffill et al. (2006), that consider important that central banks target asset prices.

Table3: Estimates of the Central Bank's Preference Parameters using HP approach

	Fullsample1961:1 to2012:4	Regime1 1961:1to1990:4	Regime2 1991:2to2012:4
λ	0.038^{a}(0.002)	0.004^{a}(0.000)	0.129^{a}(0.008)
μ	0.041^{a}(0.006)	0.002^{a}(0.000)	0.042^{a}(0.013)
δ	0.137^{b}(0.057)	0.013^{b}(0.007)	0.068^{a}(0.022)
π^*	4.525^{a}(0.108)	4.962^{a}(0.071)	2.941^{a}(0.198)
$\sigma\ (\mu)$	2.395	2.264	2.266
$\sigma\ (\varepsilon)$	1.862	0.764	1.939
$\sigma\ (\xi)$	0.735	0.636	0.817
$\sigma\ (\varepsilon^{m})$	0.131	0.241	0.007
JStatistics	25.806	23.469	18.093
(pvalue)	0.128	0.206	0.208

a,b,c denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); Jstatistics is Hansen's test of the model's overidentifying restrictions, which is distributed as a x2 variate under the null hypothesis of valid overidentifying restrictions (n stands for the number of instruments minus the number of freely estimated parameters).This also avoids possible multicollinearity problems that may result from the inclusion of all those variables at a time in a single regression. Furthermore, a general conclusion from the estimates is the extreme sensitivity of the estimates to the different approaches in calculating the output gap. It is particularly the cases for the parameters and . Another conclusion is the fact that preferences of the monetary authorities have changed drastically through the regimes. Better macroeconomic conditions are also observed from the side of the aggregate demand in comparison with those from the side of the aggregate supply.

4.4 Sensitivity to the approach in calculating the output gap

We now examine how the policy regime estimates change as the approach used to calculate the output gap changed. Here we reestimate the model while using the quadratic trend approach to calculate the output gap. As before, the sample period is 1961:1 to 2012:4. Table 4 shows the estimates obtained when the LT filter approach has been used to calculate the output gap. In each case the weight on parameters stabilization are fallen between the subpériods. As in table 3, similar observations are obtained. The values of the coefficients and seem to suggest that reduced smoothing of the interest rates is assigned by the Bank of Canada and slight weight to the output gap and stock prices is also attributed. For example, the value of indicates that the implicit target has been reduced significantly in the second subperiod.

The value of indicates a significant decrease of the weight assigned to the output gap in the conduct of monetary policy between subperiods. What is more interesting is that the standard deviations of the monetary rule is close to zero in the last subperiod, indicating that monetary policy has be successful in this subperiod. Furthermore, the value of goes from small weight to a greater one indicating that, in the preinflation targeting period (regime 1), the monetary authority has not given any weight to the stock market price index fluctuations in the conduct of monetary policy, while, in the inflation targeting period (regime 2), the evidence suggests that the monetary authority does give directly an important weight to the stock market price index. This analysis demonstrates the extreme sensitivity of the estimates to the different approaches in calculating the output gap. It is particularly the cases for the parameters and . Another point is the fact that preferences of the monetary authorities have changed drastically in the inflation targeting period. It is clearly reflected in the estimates of.In general, the results of the estimation are very interesting. The estimation results give new relevant insights into the influence of stock market index prices on monetary policy in Canada. These findings about the role of stock market index prices for the Bank of Canada provide relevant insights regarding the opportunities and limitations of incorporating financial indicators in monetary policy decision making. They also give financial market participants, such as analysts, bankers and traders, a better understanding of the impact of stock market index prices on the Bank of Canada policy. We find that over time, the Bank of Canada has assigned changing weights to inflation, the output gap and the stock market price index.

Table 5, based on estimations using the QT filter approach to calculate the output gap, indicate very similar conclusions.

Table4: Estimates of the Central Bank's Preference Parameters using LT approach

	Fullsample1961:1to 2012:4	Regime1 1961:1to1990:4	Regime2 1991:2to2012:4
λ	0.032^{a}(0.002)	0.001(0.002)	0.072^{a}(0.006)
μ	0.017^{a}(0.003)	0.005^{a}(0.001)	0.050^{a}(0.008)
δ	0.018^{b}(0.008)	0.099^{a}(0.013)	0.105^{a}(0.021)
π^{*}	5.276^{a}(0.124)	5.119^{a}(0.067)	2.658^{a}(0.209)
$\sigma(\mu)$	0.588	0.945	0.323
$\sigma(\varepsilon)$	0.501	0.716	0.841
$\sigma(\xi)$	0.407	0.611	0.703
$\sigma(\varepsilon^{m})$	0.113	0.142	0.058
JStatistics	25.787	22.630	17.931
(pvalue)	0.127	0.207	0.209

a,b,c denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); Jstatistics is Hansen's test of the model's overidentifying restrictions, which is distributed as a x2 variate under the null hypothesis of valid overidentifying restrictions (n stands for the number of instruments minus the number of freely estimated parameters).

Table5: Estimates of the Central Bank's Preference Parameters using QT approach

	Fullsample1961:1to 2012:4	Regime1 1961:1to1990:4	Regime2 1991:2to2012:4
λ	0.002^{a}(0.000)	0.005^{a}(0.001)	0.022^{a}(0.001)
μ	0.002^{a}(0.000)	0.004^{a}(0.001)	0.016^{a}(0.003)
δ	0.012^{a}(0.002)	0.022^{a}(0.001)	0.040^{b}(0.018)
π^{*}	4.751^{a}(0.249)	6.282^{a}(0.258)	2.903^{a}(0.077)
$\sigma(\mu)$	0.533	0.921	0.909
$\sigma(\varepsilon)$	0.468	0.634	1.754
$\sigma(\xi)$	0.176	0.538	0.811
$\sigma(\varepsilon^{m})$	0.016	0.029	0.006
JStatistics	26.066	24.326	17.549
(pvalue)	0.128	0.204	0.209

a,b,c denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); Jstatistics is Hansen's test of the model's overidentifying restrictions, which is distributed as a x2 variate under the null hypothesis of valid overidentifying restrictions (n stands for the number of instruments minus the number of freely estimated parameters).

5 Conclusion

What have we learned from this paper? There is strong evidence that Bank of Canada should take into account asset price fluctuations when setting interest rates.In other words, Bank of Canada should care about the financial instability associated with large asset price fluctuations when setting interest rate. This remark gives new relevant insights into the influence of stock market index prices on monetary policy in Canada. These findings about the role of stock market index prices on Canadian monetary policy provide relevant insights regarding the opportunities and limitations of incorporating financial indicators in monetary policy decision making. They also give financial market participants, such as analysts, bankers and traders, a better understanding of the impact of stock market index prices on Bank of Canada policy. This is not the case in the U.S. (see Castro, 2008). Indeed, it would seem that the Fed leaves those markets free from any direct control. This difference in the behaviour of the two central banks might be one of the causes for the credit crunch that arose recently in the US housing market and that affected the real economy, with important repercussions in the world economy, but to which Canada remained less exposed. Thus, the first main contribution of this paper is that targeting financial conditions might be a solution to avoid the financial and asset market instabilities and, consequently, to help to avoid sharp economic slowdowns. However, we acknowledge that it may be difficult to interpret asset price movements and distinguish between fundamental and nonfundamental components, but the same type of uncertainty exists when policymakers are faced with stochastic trend output. Hence, there is scope for the monetary authorities to take into account asset price fluctuations in the conduct of monetary policy despite the measurement errors that they might face.

There is strong evidence of change in the central bank's target rate of inflation towards the end of the 1970s. In the preinflation targeting period, we estimate the target rate of inflation to be greater than 4 percent per annum. Since the inflation targeting period, the target rate of inflation seems to be less than 3 percent per annum. This implies, without any doubt, that monetary policy has been conducted efficiently in the last subperiod. We find strong statistical support for this decline and the result is consistent with previous findings by Rodriguez (2008). Whether the relative weight that the Bank of Canada gives to output stabilization has fallen since the inflation targeting period becomes certain. Unlike Rodriguez we do find sizeable (and significant) estimate for and leading us to conclude that the Bank of Canada does care about output and stock market price stabilization (in addition to inflation stabilization). Better macroeconomic conditions are also observed from the side of aggregate demand in comparison with those from aggregate supply only in the preinflation targeting period (1961:1 to 1990:4), while, the reverse situation is observed in the targeting period (1991:2 to 2012:4). The main contribution of this paper is to successfully not only prove that the Bank of Canada does care about output and stock market price stabilization (in addition to inflation stabilization) but reveal that targeting financial conditions might be the solution to avoid imbalances in the financial and asset markets and, consequently, to avoid sharp economic slowdowns.Besides extending this study to other central banks, another important extension would be to understand whether and how the financial sector regulation and commercial banks offbalance sheet entities are taken into account in the central banks' reaction function. We believe that such analysis could contribute a little more to the understanding of the reasons for the recent credit crunch. Our intention is to proceed with that analysis in a future work, as soon as more data are available.

References

Alchian, A., and B. Klein. 1973. On a Correct Measure of Inflation. Journal of Money, Credit and Banking. 5,173191.

Assenmacherwesche, K. 2006. Estimating Central Banks' preferences from a time varying em pirical reaction function. European Economic Review, 50, 19511974.

Bai, J. and P. Perron.1998. Estimating and Testing Linear Models with Multiple Structural Changes. Econometrica, 66(1), 47 78.

2003. Computation and analysis of multiple structural change models. Journal of Applied Econometrics, 18(1), 122.
Ball, L. M. 1999. Efficient Rules for Monetary Policy. International Finance. 2, 6383Belke, A. and Polleit, T. 2007. How the ECB and the US Fed Set Interest Rates, Applied Economics, 39(17), 2197 2209.
Bernanke, B. and M. Gertler. 1999. Monetary policy and asset prices volatility. Federal Reserve Bank of Kansas City Economic Review, 84(4), 1751.
2001. Should Central Banks respond to movements in asset prices? American Economic Review, 91(2), 253257.
Bernanke, B. and I. Mihov. 1998. Measuring Monetary Policy Shocks. Quarterly Journal of Economics, 113, 869902.
Boivin, J. and M., Giannoni. 2003. Has Monetary Policy Become More Effective? National Bureau of Economic Research Working Paper #9.
Bordo, M. and J., Olivier. 2002a. Asset prices, financial and monetary stability: Exploring the nexus. Bank for International Settlements Working Papers, no 114.
2002b. Monetary policy and asset prices: Does 'benign neglect' make sense? International Finance, 5(2), 139164.
Campbell, J. and G., Mankiw.1989. Consumption, income and interest rates: reinterpreting the time series evidence. NBER Working Paper no 2924.
Campbell, J.Y. and Perron, P. 1991. Pitfalls and Opportunities: What Macroeconomics should know about unit roots. Papers 360, Princeton, Department of Economics Econometric Research Program.
Castelnuovo, E. and P., Surico. 2003. What does monetary policy reveal about a Central Bank's Preferences? Economic Notes, 32, 3..2004. Model uncertainty, optimal monetary policy and the preferences of the Fed. Scottish Journal of Political Economy, 51, 1.
Castro, V. 2008. Are Central Banks following a linear or nonlinear (augmented) Taylor rule?. The Warwick Economics Research Paper Series (TWERPS) 872, University of Warwick, Department of Economics.
Cecchetti, S., H. Genberg, J. Lipsky and S. Wadhwani. 2000. Asset Prices and Central Bank Policy. CEPR, London.
Chadha, J., L. Sarno and G. Valente. 2004. Monetary policy rules, asset prices, and Exchange rates. IMF Staff Papers, 51(3), 529552.
Chiang, A. C. 1992. Elements of Dynamic Optimization , Waveland Press, Illinois Christiano, L. J., M. Eichenbaum and C. L. Evans. 1999. Monetary policy shocks: What have we learned and to what end? In John B. Taylor and Michael Woodford (eds.) Handbook of Macroeconomics Volume 1A. Amsterdam.
Christiano, L., R. Motto and M. Rostagno.2006. Monetary Policy and Stock Market BoomBust Cycles. Presented at the 4th ECB Central Banking Conference on The role of money: Money and monetary policy in the twentyfirst century.
Clarida, R, Gali, J. and M., Gertler. 1997. Monetary policy rules in practice: some in ternational evidence. Cambridge: National Bureau of Economic Research. Working Paper, no 6254.1998. Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. NBER Working Papers no 6442.
1999. The science of monetary policy: a NewKeynesian perspective. Journal of Economic Literature, 37, 16611707.
2000. Monetary policy rules and macroeconomic stability: evidence and some theory. Quarterly Journal of Economics 115, 147180.
Clark, P. B., C. A. E, Goodhart and H., Huang. 1999. Optimal monetary policy rules in a rational expectations model of the Phillips curve. Journal of Monetary Economics, Elsevier, 43(2), 497520.
Collins, S. and P. L., Siklos. 2004. Optimal monetary policy rules and inflation targets: are Australia, Canada, and New Zealand different from the U.S.? Open Economies Review, 15, 4.
Cukierman, A. 2000. Establishing a reputation for dependability by means of inflation targets. Economics of Governance, Springer, 1(1), 5376, 03.2002. Are contemporary central banks transparent about economic models and objectives and what difference does it make? Review, Federal Reserve Bank of St. Louis, issue July, 1536.
Dennis, R. 2000. Steps toward identifying central bank preferences. Federal Reserve Bank of San Francisco Working Paper..2001. The policy preferences of the U.S. Federal Reserve. Working Papers in Applied Economic Theory 200108, Federal Reserve Bank of San Francisco..2006. The policy preferences of the US Federal Reserve. Journal of Applied Econometrics.21, 5577. 1981. Distribution of the estimators for autoregressive time series with a unit root.
Econometrica 49, 105772.2004. Inferring policy objectives from economic outcomes. Oxford Bulletin of Economics and Statistic, 66, 1.
Dickey, D. and W. Fuller. 1979. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74, 427431.

Driffill, J., Z. Rotondi, P. Savona and C. Zazzara. 2006. Monetary policy and financial stability: What role for futures market? Journal of Financial Stability, 2, 95112.

Elliott, G., T.J., Rothenberg, and J. H., Stock. 1996. Efficient Tests for an Autoregressive Unit Root. Econometrica, Econometric Society, 64(4), 81336.

Estrella, A. and J. C. Fuhrer. 2003. Monetary policy shifts and the stability of monetary policy models. Review of Economics and Statistics, 85 (1), 94104.

Favero, C. and R., Rovelli. 2003. Macroeconomic Stability and the Preferences of the Fed: A Formal Analysis, 196198. Journal of Money, Credit, and Banking, 35(4), 54556.

Fendel, R. and M. Frenkel. 2006. Five years of single European monetary policy in practice: Is the ECB rulebased? Contemporary Economic Policy, 24(1), 106115.

Fiodendji, K. 2013. The Asymmetric Reaction of Monetary Policy to Inflation and the Output gap: Evidence from Canada. Economic Modelling 30 (C), 911923.

Gali, J. and M., Gertler. 1999. Inflation dynamics: a structural econometric approach. Journal of Monetary Economics, 44 (2), 195222.

Gali, J., M., Gertler and J. D., LopezSalido. 2005. Robustness of the estimates of the hybrid New Keynesian Phillips curve. Journal of Monetary Economics, 52, 11071118.

Goodhart, C. 1999. Central bankers and uncertainty. Bank of England quarterly bulletin, 39 (1), 102121.

Goodhart, C. and B. Hofmann 2000. Financial Variables and the Conduct of monetary Policy. Sveriges Riksbank Working Paper no. 112.

Grier, K. B. and M. J., Perry. 1998. On inflation and inflation uncertainty in the G7 countries. Journal of International Money and Finance, 17(4), 671689.

Hamilton, J. 1989. A new approach to the economic analysis of nonstationary time series and the business cycle. Econometrica, 57, 357384.

Hodrick R.J. and E.C., Prescott. 1980. Post War U.S. Business Cycles: an Empirical Investigation, CarnegieMellon University Discussion Paper, no 451.

Ilbas, P.2008. Estimation of monetary policy preferences in a forwardlooking model: a Bayesian approach. National Bank of Belgium Working Paper.

International Monetary Fund. 2003. World Economic Outlook.

Kharel, R. S. 2006. Does the Bank of England target inflation precisely?, Technical report, Brunel University.

Kontonikas, A. and C., Ioannidis. 2005. Should monetary policy respond to asset price misalignments? Economic Modelling, 22, 11051121.

Kontonikas, A. and A., Montagnoli. 2005. Optimal Monetary Policy and Asset Price Mis alignments. Working Papers 2005 9, Department of Economics, University of Glasgow.

Kwiatkowski, D., P. Phillips, P., Schmidt, and Y., Shin. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? Journal of Econometrics 54, 159178.

Lange, R. H. 2010. Regimeswitching monetary policy in Canada. Journal of Macroeconomics, www.elsevier.com/locate/jmacro.

Lubik, T. and F., Schorfheide. 2007. Do central banks respond to exchange rate movements? A structural investigation. Journal of Monetary Economics, 54, 10691087.

Martin, C. and C. Milas. 2004. Modelling Monetary Policy: Inflation Targeting in Practice. Economica, 71, 209221.

McCallum, B. T. and E., Nelson. 1999. An Optimizing ISLM Specification for Monetary Policy and Business Cycle Analysis. Journal of Money, Credit and Banking, Blackwell Pub lishing, 31(3), 296316.

Moons, C. et al.2007. Monetary policy in the NewKeynesian model: An application to the Euro Area. Journal of Policy Modeling

Muscatelli, V. A., P., Tirelli and C., Trecroci. 2002. Does institutional change really matter? Inflation targets, central bank reform and interest rate policy in the OECD countries. The Manchester School, 70 (4).

2004. Fiscal and Monetary Policy Interactions in a New Keynesian Model with Liquid ity Constraints. CDMA Conference Paper Series 0402, Centre for Dynamic Macroeconomic Analysis.

Newey, W. and West, K. 1987. A Simple, Positive Definite, Heteroscedasticity and Autocor relation Consistent Covariance Matrix, Econometrica, 55(3), 703708.

Ng, S. and P., Perron. 1995. Estimation and Inference in Nearly Unbalanced, Nearly Cointe grated Systems. Cahiers de recherche 9534, Centre interuniversitaire de recherche en économie quantitative, CIREQ.
Nisticô, S. 2006. Monetary Policy and StockPrice Dynamics in a DSGE Framework. LLEE Working Paper no 28.
Nobay, R. and D., Peel. 2003. Optimal discretionary monetary policy in a model of asym metric central bank preferences. Economic Journal, 113, 657665.
Orphanides, A. 2001. Monetary policy rules, macroeconomic stability and inflation: a view from the trenches. Finance and Economics Discussion Series 200162, Board of Governors of the Federal Reserve System (U.S.).
Ozlale, U. 2003. Price stability vs. output stability: tales of Federal Reserve administrations. Journal of Economic Dynamics and Control, 17, 9.
Perron, P. 1989.The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis. Econometrica, Econometric Society, 57(6), 13611401.
Phillips, P. and P., Perron. 1988. Testing for a unit root in time series regression. Biometrika, 75 (2): 335346.
Rodrfguez, G. 2008. Stability of central bank preferences, macroeconomic shocks, and efficiency of the monetary policy: empirical evidence for Canada. Applied Economics Letters 15 (6), 437 441.
Rudebusch, G. and L., Svensson. 1999. Policy rules for inflation targeting. In J. B. Taylor Eds. Monetary Policy Rules. University of Chicago Press for NBER.. 2004. The Inflation Bias when the Central Bank Targets the Natural Rate of Unem ployment. European Economic Review, 48, 91107.
Smets, F. 1997. Financialasset Prices and Monetary Policy: Theory and Evidence. RBA Annual Conference Volume, in: Philip Lowe (ed.), Monetary Policy and Inflation Targeting Reserve Bank of Australia.
Smets, F., and R. Wouters. 2002. An Estimated dynamic stochastic general equilibrium model of the euro area. European Central Bank Working Paper no171.
. 2007b. The monetary policy of the European Central Bank. Scandinavian Journal of Economics, 109(1), 115135.
Svensson, L. E. 1997. Inflation forecast targeting: Implementing and monitoring inflation targets. European Economic Review, 41, 11111146.. 2009. Transparency under flexible inflation targeting: Experiences and challenges. Sveriges Riksbank Economic Review 1, 544.
Taylor, J. 1993. Discretion versus policy rules in practice. CarnegieRochester Conference Series on Public Policy, 39, 195214.
Vega, J.L. and M. A., Wynne. 2003. A First Assessment of Some Measures of Core Inflation for the Euro Area. German Economic Review, Blackwell Publishing, 4, 269306
Walsh, Carl E.1999. Monetary policy tradeoffs in the open economy. Manuscript, University of California, Santa Cruz.
.2003. Monetary Theory and Policy, The MIT Press, second edition.
Wouter Botzen, W. J. and P.S. Marey. 2010. Did the ECB respond to the stock market before the crisis? Journal of Policy Modelling 32 (2010) 303322.
Woodford, M. 2003a. Interest and Prices: Foundations of a Theory of Monetary Policy. Princeton, NJ.: Princeton University Press..2003b. Optimal InterestRate Smoothing. Review of Economic Studies 70 (4), 861886.

Appendix A: An Approach to Detect Central Bank Augmented Preferences

The monetary authority minimizes the expected loss from the inflation gap and the output gap facing the economy, which can be characterized by the aggregate demand and supply relations. Therefore, the problem of the central bank is to choose the current interest rate and the sequence of future interest rates such as to minimize its loss function subject to the behaviour of the economy. Adopting the method of Optimal Control to solve this problem (see Chiang, 1992), we calculate the firstorder conditions for the minimization of the loss function, which leads to the following Euler equation:

$$0=\begin{bmatrix} \sum_{\varsigma=0}^{\infty}\beta^{\varsigma}E_t(\pi_{t+\varsigma}-\pi^*)\frac{\partial\pi_{t+\varsigma}}{\partial i_t}+\sum_{\varsigma=0}^{\infty}\beta^{\varsigma}\lambda E_t(x_{t+\varsigma})\frac{\partial x_{t+\varsigma}}{\partial i_t} \\ \sum_{\varsigma=0}^{\infty}\beta^{\varsigma}\delta E_t(s_{t+\varsigma})\frac{\partial s_{t+\varsigma}}{\partial i_{t+j}}+\mu(i_t-i_{t-1})-\mu\beta E_t(i_{t+1}-i_t) \end{bmatrix}$$

Because of the persistence in the structural equations of the economy, the Euler equation has an infinite horizon, and thus cannot be used directly in empirical work.

To estimate this equation it is necessary to truncate its lead polynomials at some reasonable temporal horizon. As Favero and Rovelli (2003), we use a 4 quarters lead horizon. Two reasons stand in favour of the lead truncation of the Euler equation. First, as Favero and Rovelli (2001) have argued, a natural cutting point for the future horizon of the Euler equation emerges anyway, even if we consider a theoretical infinite horizon loss function. In fact, the weight attached to expectations of future gaps and inflation decreases as the timelead increases, meaning that expectations of the state of the economy carry less relevant information for the present conduct of policy as they relate to periods further away in the future. Second, expanding the horizon in the Euler equation would complicate it and bring collinearities to the system, causing great difficulties in making estimations. It is worth noting that our option is consistent with the standard practice in the estimation of forwardlooking policy reaction functions.

Boivin and Giannoni (2003) truncate the forecast horizon at 1 quarter for output and 2 quarters for inflation, while Muscatelli et al. (2002), and Orphanides (2001 b) truncate the inflation forecast horizon at 4 quarters. Rodriguez (2008) shows that estimated backwardlooking policy reaction functions for the US and Canada strongly indicate that actual policy decisions involve forecast horizons of inflation not beyond 4 quarters ahead.Once the Euler equation is truncated at 4 quarters ahead, its partial derivatives components can be expressed as functions of the aggregate demand and aggregate supply parameters, thus building into the Euler equation the crossequation restrictions. This ensures that the loss function is being properly minimized subject to the constraints given by the economy's structure.

$$0=\left[\begin{array}{l}\sum_{\varsigma=0}^{4}\beta^{\varsigma}E_t(\pi_{t+\varsigma}-\pi^{*})\frac{\partial\pi_{t+\varsigma}}{\partial i_t}+\sum_{\varsigma=0}^{4}\beta^{\varsigma}\lambda E_t(x_{t+\varsigma})\frac{\partial x_{t+\varsigma}}{\partial i_t}\\ \sum_{\varsigma=0}^{4}\beta^{\varsigma}\delta E_t(s_{t+\varsigma})\frac{\partial s_{t+\varsigma}}{\partial i_{t+j}}+\mu(i_t-i_{t-1})-\mu\beta E_t(i_{t+1}-i_t)\end{array}\right] \quad \text{(A.2)}$$

Expanding the partial derivatives, (8) turns into

$$0=\left[\begin{array}{l}\beta E_t(\pi_{t+2}-\pi^{*})\left[\frac{\partial\pi_{t+2}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right]+\beta^{2}E_t(\pi_{t+3}-\pi^{*})\left[\frac{\partial\pi_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right]\\ +\beta^{3}E_t(\pi_{t+4}-\pi^{*})\left[\frac{\partial\pi_{t+4}}{\partial x_{t+3}}+\left(\frac{\partial x_{t+3}}{\partial i_t}+\frac{\partial\pi_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right)+\frac{\partial\pi_{t+4}}{\partial\pi_{t+3}}\left(\frac{\partial\pi_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right)\right]\\ +\lambda\beta\ E_t(x_{t+2})\left[\left(\frac{\partial x_{t+2}}{\partial i_t}+\frac{\partial x_{t+2}}{\partial s_{t+2}}\times\frac{\partial s_{t+2}}{\partial i_t}\right)\right]+\lambda\beta^{2}E_t(x_{t+3})\\ \left[\frac{\partial x_{t+3}}{\partial i_t}+\frac{\partial\pi_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}+\frac{\partial x_{t+3}}{\partial s_{t+2}}\times\frac{\partial s_{t+2}}{\partial i_t}\right]+\lambda\beta^{3}E_t(x_{t+4})\\ \left[\frac{\partial x_{t+4}}{\partial x_{t+3}}\left(\frac{\partial x_{t+3}}{\partial i_t}+\frac{\partial x_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right)+\frac{\partial x_{t+4}}{\partial s_{t+3}}\left(\frac{\partial s_{t+3}}{\partial i_t}+\frac{\partial s_{t+3}}{\partial s_{t+2}}\times\frac{\partial s_{t+2}}{\partial i_t}\right)\right]\\ +\delta\beta\ E_t(s_{t+2})\left[\frac{\partial s_{t+2}}{\partial i_t}+\frac{\partial s_{t+2}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right]+\delta\beta^{2}E_t(s_{t+3})\\ \left[\frac{\partial s_{t+3}}{\partial i_t}+\frac{\partial s_{t+3}}{\partial s_{t+2}}\times\frac{\partial s_{t+2}}{\partial i_t}+\frac{\partial s_{t+3}}{\partial x_{t+3}}\times\frac{\partial x_{t+3}}{\partial x_{t+2}}\times\frac{\partial x_{t+2}}{\partial i_t}\right]+\delta\beta^{3}E_t(s_{t+4})\\ \left[\frac{\partial s_{t+4}}{\partial s_{t+3}}\left(\frac{\partial s_{t+3}}{\partial i_t}+\frac{\partial s_{t+3}}{\partial s_{t+2}}\times\frac{\partial s_{t+2}}{\partial i_t}\right)+\frac{\partial s_{t+4}}{\partial x_{t+4}}\left(\frac{\partial s_{t+4}}{\partial i_t}+\frac{\partial x_{t+4}}{\partial x_{t+3}}\times\frac{\partial x_{t+3}}{\partial i_t}\right)\right]\\ +\left[\mu(i_t-i_{t-1})-\mu\beta\ E_t(i_{t+1}-i_t)\right]\end{array}\right] \quad \text{(A.3)}$$

Appendix B: Tables

AppendixB.1:Correlation	Matrix				
	Output	Inflation	Exchange	StockMarket	Interest
	gap	rate	rate	Index price	rate
Outputgap	1.0000				
Inflationrate	0.0004	1.0000			
Exchangerate	0.2360	0.2968	1.0000		
StockMarketIndexPrice	0.0218	0.0734	0.1437	1.0000	
Interestrate	0.3643	0.3548	0.1276	0.0899	1.0000

Appendix B.2: Estimates of the preferences of monetary policy using HP approach.

	Fullsample	Regime1	Regime2
	1961:1to2012:4	1961:1to1990:4	1991:2to2012:4
	Coefficient	Coefficient	Coefficient
c1	0.169[a](0.022)	0.158[a](0.033)	0.176[a](0.018)
c2	1.461[a](0.017)	1.558[a](0.015)	1.285[a](0.052)
c3	0.509[a](0.006)	0.348[a](0.008)	0.659[a](0.008)
c4	0.030[a](0.002)	0.002[b](0.001)	0.664[a](0.002)
c5	0.026[a](0.002)	0.005[b](0.002)	0.054[a](0.002)
c6	0.011[a](0.001)	0.008[a](0.002)	0.028[a](0.001)
c7	0.732[a](0.009)	1.231[a](0.006)	0.510[a](0.007)
c8	0.023[a](0.007)	0.353[a](0.006)	0.105[a](0.006)
c9	0.192[a](0.013)	0.040[b](0.017)	0.178[a](0.011)
c10	0.076[a](0.012)	0.031[a](0.007)	0.396[a](0.010)
c11	0.429[a](0.052)	0.775[a](0.038)	0.363[a](0.064)
c12	0.007[a](0.002)	0.069[b](0.033)	0.054[a](0.013)
c13	0.142[a](0.020)	0.529[a](0.029)	0.023[b](0.011)
c14	0.642[a](0.011)	0.593[a](0.012)	0.716[a](0.016)
β	0.975[e]	0.975[e]	0.975[e]
π^*	4.525[a](0.108)	4.962[a](0.071)	2.941[a](0.198)
λ	0.038[a](0.002)	0.004[a](0.000)	0.129[a](0.008)
μ	0.041[a](0.006)	0.002[a](0.000)	0.042[a](0.013)
δ	0.137[b](0.057)	0.013[b](0.000)	0.068[a](0.022)
$\sigma(\mu)$	2.395	2.264	2.266
$\sigma(\varepsilon)$	1.862	0.764	1.939
$\sigma(\xi)$	0.735	0.636	0.817
$\sigma(\varepsilon^m)$	0.131	0.241	0.007
Jstat.	25.806	23.469	18.093

Appendix B.3: Estimates of the preferences of monetary policy using LT approach.

	Fullsample	Regime1	Regime2
	1961:1to2012:4	1961:1to1990:4	1991:2to2012:4
	Coefficient	Coefficient	Coefficient
cl	0.169[a](0.022)	0.158[a](0.033)	0.176[a](0.018)
c2	1.461[a](0.017)	1.558[a](0.015)	1.285[a](0.052)
c3	0.509[a](0.006)	0.348[a](0.008)	0.659[a](0.008)
c4	0.030[a](0.002)	0.002[b](0.001)	0.664[a](0.002)
c5	0.026[a](0.002)	0.005[b](0.002)	0.054[a](0.002)
c6	0.011[a](0.001)	0.008[a](0.002)	0.028[a](0.001)
c7	0.732[a](0.009)	1.231[a](0.006)	0.510[a](0.007)
c8	0.023[a](0.007)	0.353[a](0.006)	0.105[a](0.006)
c9	0.192[a](0.013)	0.040[b](0.017)	0.178[a](0.011)
cl0	0.076[a](0.012)	0.031[a](0.007)	0.396[a](0.010)
cll	0.429[a](0.052)	0.775[a](0.038)	0.363[a](0.064)
cl2	0.007[a](0.002)	0.069[b](0.033)	0.054[a](0.013)
cl3	0.142[a](0.020)	0.529[a](0.029)	0.023[b](0.011)
cl4	0.642[a](0.011)	0.593[a](0.012)	0.716[a](0.016)
β	0.975[e]	0.975[e]	0.975[e]
π^*	4.525[a](0.108)	4.962[a](0.071)	2.941[a](0.198)
λ	0.038[a](0.002)	0.004[a](0.000)	0.129[a](0.008)
μ	0.041[a](0.006)	0.002[a](0.000)	0.042[a](0.013)
δ	0.137[b](0.057)	0.013[b](0.000)	0.068[a](0.022)
$\sigma(\mu)$	2.395	2.264	2.266
$\sigma(\varepsilon)$	1.862	0.764	1.939
$\sigma(\xi)$	0.735	0.636	0.817
$\sigma(\varepsilon^m)$	0.131	0.241	0.007
Jstat.	25.806	23.469	18.093

Appendix B.4: Estimates of the preferences of monetary policy using QT approach.

	Fullsample	Regime1	Regime2
	1961:1to2012:4	1961:1to1990:4	1991:2to2012:4
	Coefficient	Coefficient	Coefficient
c1	0.119[a](0.030)	0.378[a](0.030)	0.475[a](0.032)
c2	0.946[a](0.005)	0.954[a](0.007)	0.635[a](0.012)
c3	0.062[a](0.003)	0.032[a](0.008)	0.336[a](0.011)
c4	0.014[a](0.001)	0.012[a](0.001)	0.081[a](0.003)
c5	0.026[a](0.003)	0.031[a](0.003)	0.007[a](0.002)
c6	0.007[a](0.001)	0.003[a](0.001)	0.039[a](0.001)
c7	0.704[a](0.009)	1.225[a](0.008)	0.495[a](0.005)
c8	0.055[a](0.007)	0.399[a](0.020)	0.117[a](0.007)
c9	0.233[a](0.011)	0.142[a](0.006)	0.065[a](0.005)
c10	0.189[a](0.014)	0.142[a](0.007)	0.380[a](0.016)
c11	0.359[a](0.022)	0.282[a](0.010)	1.011[a](0.027)
c12	0.006(0.018)	0.001[c](0.001)	0.092[a](0.007)
c13	0.159[a](0.024)	0.550[a](0.014)	0.059[a](0.010)
c14	0.637[a](0.011)	0.584[a](0.013)	0.721[a](0.011)
β	0.975[e]	0.975[e]	0.975[e]
π^*	5.276[a](0.124)	5.119[a](0.067)	2.658[a](0.209)
λ	0.032[a](0.002)	0.001(0.003)	0.072[a](0.006)
μ	0.017[a](0.003)	0.005[a](0.001)	0.050[a](0.008)
δ	0.018[b](0.008)	0.099[a](0.013)	0.105[a](0.031)
$\sigma(\mu)$	0.588	0.954	0.323
$\sigma(\varepsilon)$	0.501	0.716	0.841
$\sigma(\xi)$	0.141	0.611	0.703
$\sigma(\varepsilon^m)$	0.123	0.142	0.058
Jstat.	25.787	22.630	17.931