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Rules and Discretion in Monetary Policy: Is the Response of the Stock Market Rational?

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We investigate the effects of the monetary policy conduct on the domestic capital market for a sample of developed countries where the capital market plays a significant role in the economy. We break down the policy rate innovations in rules-based and discretionary components in order to determine the degree of prudentiality in the monetary policy conduct and we study their accounts with respect to capital market rationality. The rules-based component is determined using an interpolated vanilla Taylor-rule policy rate at the event date and the discretionary component is obtained by subtracting the rules-based rate from the target monetary policy rate innovation. Using an event study approach, we analyze the impact of monetary policy components on the returns of the stock market and we determine that the conduct of the monetary policy can cause irrational responses of the capital market. More than that, we show, for the analyzed countries, that if the general level of discretion in the monetary policy is high the response of the stock market becomes increasingly erratic, indicating that forward guidance may help reduce uncertainty on capital markets.

Keywords: *monetary policy, event study, capital market efficiency, discretion, rules, forward guidance*

JEL Classification*: G14, G18, E52, E43, D61*

1. Introduction

The relation between monetary policy and the stock market has been long discussed in the literature, as it is traditionally considered that prices on the stock market are an important transmission channel of the monetary policy.

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Efficient markets hypothesis as it was presented by Fama (1970), is the cornerstone of the capital market developments, stating that prices observed on the financial markets include all available information and consequently they are interpreted as offering correct signals for the future consumption and investment decisions carried out by individuals and corporations. Moreover, the efficient allocation of the capital stock in the economy can be done only in the context of efficient markets, otherwise the markets are not an optimal mechanism for the allocation of scarce resources and, in this context, researchers argue correctly that markets must be regulated in a way that will increase efficiency. In this sense, the capital market efficiency is very important for the performance of the overall economy and the cost-benefit analysis of macroeconomic policies should take into account the impact on domestic capital market efficiency. The literature on efficient markets is vast, and although initial research mostly validates the theory, in time, a strong critique coming from a number of researchers indicates that today the concept of efficiency has become only a desirable state of the financial markets. Fama (1991) writes a review of the most important papers on the topic of efficient capital markets.

On the other hand, monetary policy has always been an intriguing subject in the academic research. With the introduction of the Taylor-rule, a method that policymakers should use in order to meet the monetary policy objectives, it has become increasingly evident that an active monetary policy that follows a predetermined rule ultimately improves the performance of the overall economy, while a discretionary policy can have negative effects like inflation persistence or increased output volatility.

Therefore, the objectives of the present research is to find if unexpected policy rate events in discretionary or rules-based eras cause different effects on the capital market prices, which can or cannot be considered consistent with the idea of rational domestic capital markets. Particularly, the paper presents evidence from developed countries, on the relation between the monetary policy conduct and its effects on the domestic capital market in a way consistent with the assumption of efficient capital markets.

The paper is structured as follows: Section 2 consists of the relevant literature review on the links between the monetary policy and the capital market along with evidence and importance of rational domestic capital market for the overall economic performance; Section 3 present data and methodology, Section 4 includes the results of the analysis and Section 5 presents the final conclusions.

2. Literature review

In finance, it is unanimously accepted that the main function of efficient financial markets is to continuously discount uncertain future net cash flows, therefore the effects of monetary policy events on real financial assets prices rest on the assumption that the discount rate in the market is linked to monetary policy changes. The other side of the coin is the classic idea that the monetary policy is neutral with respect to real prices in the economy and therefore should we should not expect to see any effects on the real prices of financial assets either. Thorbecke (1997) documents this issue, and shows that monetary policy has real effects on the capital market, therefore invalidating the neutrality idea and providing a strong incentive for this present research.

If we take a more pragmatic approach and judge from the perspective of an accountant, the income statement results must be sensitive to monetary policy as firms cost of debt and the operational leverage are both influenced by the interest rate prevailing in the debt market, therefore changing the expected dividend (or net cash-flow) sequence which has ultimately impact on the value of the firm. Also, the capital structure of the firm can change as the risk-free interest rate may offer an opportunity for higher financial leverage or can determine equity capital increases instead, and studies, such as Lang, Ofek and Stulz (1996) and others, show that, in the real world, the financial leverage affects the value of the firm, somewhat invalidating the Modigliani-Miller famous rational theorem, from Modigliani and Miller (1958). If we pursue this logic, we make a compelling case for the importance of monetary policy events relative to the real financial assets prices.

Another important question that we should advance before proceeding with the research is that, do regulators of monetary policy seek capital market inefficiency, or at least, should they even be concerned that their actions can have impact on the efficiency of capital markets. Our view is that they should be concerned, as inefficiency in the financial markets has obvious effects on the risk-return relationships of financial assets and this mismatch can lead to inappropriate allocation of scarce resources. Importantly, Fischer and Merton (1984) show that the capital market is the most important predictor of future business cycles and therefore maintaining its efficiency should be a top-priority for any macroeconomic policy.

The paper also has obvious implications on the risk management policy at firm level as well, if capital markets are inefficient even on short term, there are risks that are not included in the value of the firms and this fact creates an incentive to obtain capital, through debt or equity markets, too cheap (expensive) when the public companies are overpriced (underpriced).

2.1. A short review of efficient capital markets literature and the ambiguous relation between the monetary policy and the capital market.

The related literature identifies three forms of market efficiency, as first proposed by Fama (1970): weak, semi-strong and strong. The weak form implies that information related to past prices must be included in the current price, the semi-strong implies that all relevant publicly-available information (here we can include both systematic and idiosyncratic factors) must be included in current prices and a strong form efficient market is a market were even private information is included in prices. Importantly, Fama (1991) rethinks the tests for market efficiency in tests for return predictability (weak-form tests), event studies (generally semi-strong form tests) and tests for private information (strong form tests), argues for the need of an improved economic model of asset returns and presents the event studies as the most robust approach in testing market efficiency, mainly because it drastically reduces the joint hypothesis problem that plagues all efficiency tests.

Bernanke and Kuttner (2005) carry out a similar research to the one conducted here, they investigate how the unexpected changes in Fed Funds rate influence the aggregate prices of the stock market. Unlike our study, Bernanke and Kuttner (2005) uses deviations of the spot rate from Fed Funds futures rate, which is considered to incorporate all relevant information, in order to study the effects of unanticipated policy rate changes on the aggregate financial assets prices, finding that an unanticipated rate cut of 25 basis points leads to an 1 percent increase in the stock market prices. The researchers used the event study approach, also using regular intervals for policy measurement, and they also used a VAR approach in order to find fundamental reasons for the exhibited behavior. However, Bernanke and Kuttner (2005) do not explicitly analyze the implications to the efficient markets hypothesis level in the event-study. Rigobon and Sack (2004) reinforce the results and find that an increase in the Fed Funds interest rate of 25 basis points results in a decrease of the financial market index by about 1.9%. Rigobon and Sack (2004) methodology is somehow different from the event-study carried out by Bernanke and Kuttner (2005) as they address the endogeneity problem of the monetary policy and replace the OLS estimators with a measure of heteroskedasticity of policy innovations measure. Bredin, Hyde, Nitzsche and O'Reilly (2007) carry out a similar event study to Bernanke and Kuttner (2005) applied on United Kingdom (using another futures contract that incorporates information about the expected monetary policy, i.e. the 3-month sterling futures contract), coming to similar conclusions, which indicates a timeless and universal connection between the monetary policy and the capital market.

Chulia, Martens and van Dijk (2010) use intra-day information in order to assess the impact of unexpected Fed Funds changes on the prices of financial assets and to measure an asymmetric effect of the capital market response. Using an event-study methodology, the researchers conclude that negative news for capital market prices (unexpected increases in the Fed Funds rate) induce decreases in financial asset prices regardless of the size of the unexpected event, whereas for positive news for the capital market (unexpected decreases in the Fed Funds rate) the size becomes important. The researchers conclude that the market is efficient because expected Fed Funds changes are properly anticipated and that unexpected changes affect the price of financial assets.

3. Research methodology

3.1. Selection of relevant countries and appropriate

In this section we explain the selection of the relevant countries for the analysis. The purpose of this selection method is to give more meaning to the research by selecting only the countries which rely on a significant way on domestic capital market financing of economic activities.

First, we include in the sample only developed countries, mainly because it is public knowledge by now that developed countries are relying more on capital market financing than developing countries. It would be really interesting to carry out a similar research on emerging countries. The monetary policy on emerging countries exhibits more discretionary actions causing more heterogenous effects on the capital market. It would be interesting to see if the discretionary monetary actions have different effects on capital markets of developing countries than on the developed countries capital markets.

The next task is to propose an analysis in order to find out which economies rely the most on the stock market. The most appropriate indicator in our particular situation would be the ratio between the total financing of medium and large firms intermediated by the capital market and the total financing of medium and large firms in the economy; but unfortunately we could not find such data, so we chose to rank the countries by their capital market capitalization/GDP indicator.

We consider this approach as being satisfactory, mainly because as the market capitalization is higher, the prices of financial assets tend to become very important for the economy and consequently macroeconomic policy should monitor closely the movements of capital markets.

The initial sample consists of the G7 countries (i.e. Canada, France, Germany, Italy, Japan, United Kingdom and United States), as those countries the most developed in the world and we select the best 3 countries ranked by market cap/GDP ratio, considering 2012 as the reference year, the last entry in the World Bank Database. We chose to present a static analysis as we consider that a dynamic analysis of the historical ratios would unnecessarily complicate the results.

Table 1. *G7 countries ranked by market cap/GDP ratio*

Country	**Market Capitalization/GDP(%)**
United Kingdom	122.7
USA	114.9
Canada	110.7
France	69.8
Japan	62
Germany	43.4
Italy	23.9

Source: Author's calculations.
The data is collected from the World Bank Database

This ranking obviously does not imply that only for the first 3 countries the capital market prices are important for macroeconomic policies, we used the ranking just to somehow contain the expansion of the research and probably the conclusions of the paper would not be changed if we used a larger sample of countries.

3.2. Data selection and the Taylor rule

First, we proceed with the selection of relevant data for the measurement of the monetary policy. Then, using quarterly data, we compute the original Taylor rule (Taylor, 1993, pp.195-214) and separate all the monetary events in rules or discretion-based. The Taylor rule that we will use for all three countries in our investigation is:

$$r = \pi + i + .5(\pi - \pi^*) + .5(Y - Y^*) \quad (1)$$

where *r* is the policy rate, π is the actual inflation rate (output deflator or CPI), *i* is the real interest rate assumed to be a constant 2%, π^* is the target inflation rate, *(Y-Y*)* is the output gap, which measures deviations of actual real output from the potential, which is measured by Taylor (1993) as deviations from a linear deterministic trend. Further, another important methodological issue is that the Taylor rule is computed using quarterly data but the monetary events are not observed at regular quarterly intervals. Therefore we will intrapolate the appropriate Taylor rule at the event date from the previous quarterly Taylor-rule and the effective next period rules-based policy rate. This method is not inappropriate for our investigation, as policymakers do not use information only from past quarterly data in their decisions, their decisions are based on current information related to inflation, real output and of course other exogenous factors that might be a temporal or permanent threat for price and financial stability. For example, we have the first monetary event on 4th of February 1994 (a rate increase of 0.25%), therefore the intrapolation technique will provide an estimate for Taylor rule rate on that date based on the end of December Taylor-rule rate and the end of March Taylor rule. Because the 4th of February is 33 days away from the January Taylor-rule rate and 57 days away from the Match Taylor-rule we will obtain the rate using the following formula:

$$\Delta i_r = \frac{57}{90}\Delta i^T_{January} + \frac{33}{90}\Delta i^T_{March}$$

where

Δi_r is the Taylor-rule consistent rate at the date of the monetary event, 4th of February 1994,
$\Delta i^T_{January}$ is the rate for the first quarter of the year and
Δi^T_{March} for the second quarter.

Although the assumption that central bank has unbiased estimates of future inflation and output gap is sufficient for including only the forward Taylor-rule policy rate in the analysis, we considered better to also include the prior Taylor-rule rate in order to minimize the effects of inefficient central bank estimates.

The point of this simple technique is to use updated information about the changes in inflation and output gap. Although the forward inflation and output are not known precisely by regulators at the time of the decision, we assume that they have reliable estimates (i.e. the estimates of future changes in inflation and output gap are efficient) and consequently their actions (which are the monetary policy events) do not reflect only last quarter effective inflation and real output variables, but also consistent estimates of future changes in policy rate variables. After the formula above will be applied analogous to all monetary policy events we will break down the actual monetary policy event in two separate components: a rules-based component and a discretionary component in the following way:

$$\Delta i_t = \Delta i_r + \Delta i_d \qquad (2)$$

where

Δi_t is the target change in the Federal Funds rate from the previous period set by policymakers and
Δi_d is the discretionary component of the target policy rate.

Afterwards, we will run the event-study methodology and identify the impact of the innovations on the domestic capital markets. The event-study consists on a battery of regressions where the explained variable is the domestic capital market index same-day log return against the explained variables which are, in turn, the raw actual policy rate, the rules-based rate (obtained from breaking down the actual rate in a rules-based and a discretionary component), the discretionary component and both the rules-based and discretionary components.
In order to achieve our objective of investigating the effects of rules-based and discretionary policy rate events on the stock market our first task would be to assess some kind of "rational" response of the stock market related to the policy rate. Therefore, we consider as rational response the negative parameter of the individual regressions against the rules-based and discretionary components.

We also present an indicator which shows to what extent the monetary policy innovations follow a rules-based approach. We calculate the indicator as the sum of absolute discretionary innovations divided by the sum of absolute raw monetary policy changes and we divide the value to the number of policy events. The indicator will provide a quantitative measure to the overall degree of discretion in the monetary policy.

In general, the data for the event study will start from 1994, mainly because before 1994 the monetary events were released together with other macroeconomic news making impossible to isolate the monetary policy event from the other relevant events and because the Taylor-rule started to gain attention from policymakers. Particularly, the dataset can be adjusted depending on the availability of data or because the policy rate for a country can change with a high frequency (as it is the case of Canada monetary policy starting from 1994 to 1996) making the event-study methodology inappropriate.

4. Analysis and Results

This section presents the research results and is divided in 3 parts, each corresponding to a selected country.

4.1. USA

For US monetary policy rate measurement we selected the target Fed Funds rate announced by the FOMC (US Federal Open Market Committee), the rate at which financial depository institutions lend excess balances at the Federal Reserve to other financial depository institutions. The rate is also suggested by Bernanke and Blinder (1992) as the best rate for measuring monetary policy effects. The data is collected from the beginning of 1994 until the end of 2013, mainly because only from 1994 FOMC began announcing changes in the policy rate, before that period, monetary news were released along with other relevant macroeconomic data, making vastly impossible to isolate the effects of the monetary events. In the analyzed period, we have 59 monetary events with the mentions that (1) on 16 December 2008, FOMC decided to make a corridor for the Fed Funds rate from 0% to 0.25% and we considered the upper interval as the policy rate event for that date and (2) we will exclude from the analysis the observation from 17th September 2001, as it is the first trading day after the 11th September 2001 terrorist attacks and consequently the monetary event could not be isolated. The rate announcements generally become public when the stock market is opened, so our investigation will focus on same day changes. The only exception is on 15th October 1998 when the policy rate announcement became public after the market closed, therefore we will use the opening return of the capital market index on 16th October 1998 for the event study. The data for computing the Taylor-rule is collected from the FRED (Federal Reserve Bank of St. Louis) database, namely the GDP implicit price deflator, as a proxy for the inflation rate, and the actual and potential real GDP growth rates with quarterly frequency. Please note that the original Taylor formula does not include growth rates of actual and potential real output, but level values. We use the S&P500 index return as a proxy for the performance of the USA capital market, data collected from the Thompson-Reuters EIKON database.

First, we calculated the discretionary indicator to be 0.2, which shows that the policymakers generally respect the Taylor policy rule and consequently, we can say that United States follows a prudential monetary policy. This indicator is important for our general conclusions and will be reported for each country included in the analysis.

Table 2 contains the regression results of the S&P500 index same-day log return against the raw actual target Fed Funds rate changes,

$$R_m = \alpha_1 + \beta \Delta i_t + e_t \quad (3)$$

where R_m is the domestic capital market return.

Table 2. *The response of S&P500 index to raw target changes of the Fed Funds rate*

Statistic	**Value**
Intercept	0.40
	(2.35)
Explanatory variable	-0.82
Coefficient	(2.12)
Multiple R	0.19
Adjusted R squared	0.02
DW test	2.05

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 59 policy rate events from 1994 to 2013.

Notice from Table 2 that the response of the S&P 500 index to the raw target policy rate changes is weak as the coefficient of determination is insignificant. The parameter of the regression line is negative, as expected, and the t-statistic shows that the coefficient is statistically significant different than 0 with 95% level of confidence. The Durbin-Watson test shows no important level of heteroskedasticity of the errors term.

Now, we proceed with a multiple regression which includes the rules-based and discretionary components of the policy target rate as the explanatory variables and the S&P 500 same-day returns as explained variable, as follows:

$$R_m = \alpha_2 + \beta_1 \Delta i_r + \beta_2 \Delta i_d + \varepsilon_t \quad (4)$$

Table 3. *Response of the S&P 500 index returns to the rules and discretionary-based components of the Fed Funds policy rate*

		Taylor-rule component	**Discretionary component**
Intercept	0.32		
	(1.63)		
Explanatory variable		-1.07	-0.2
coefficient		(2.39)	(0.37)
Multiple R	0.24		
Adjusted R squared	0.03		
DW test	2.07		

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 59 policy rate events from 1994 to 2013.

Notice from Table 3 that no significant improvement in the regression results are obtained after the Fed Funds target policy rate change was broken down in two components. Considering all the assumptions of our approach, a straightforward interpretation of this result is that the anticipations formed on the USA domestic capital market are not related to the conduct of monetary policy. At this point, it is important to add the fact that our results rest on the important fact that the methodology used in this paper presents rules-based monetary policy rates as a mechanical formula which must be followed by the policymakers and the degree of discretion in monetary policy is the observed deviation from that formula. As Taylor (1993) and many others researchers argue, using predetermined rules in monetary policy conduct does not imply that policymakers should not use their own judgment and provide some sort of qualitative input to the monetary policy and although our study definitely ignores this fact (and as a subjective opinion this would probably change the results in a significant manner), we think that this is the price one must pay when empirically testing the monetary policy conduct using an event study approach.

Further, we proceed with two separate regressions using explanatory variables rules and discretionary components in turn. The results are presented in Table 4:

Table 4. *The response of the S&P 500 index returns to each component of the policy rate individually*

	Taylor-rule component	**Discretionary component**
Intercept	0.32	0.4
	(1.67)	(2.28)
Explanatory	-1.01	0.41
variable Coefficient	(2.10)	(0.65)
Multiple R	0.24	0.07
Adjusted R squared	0.04	0
DW test	2.08	2.08

Source: Authors calculations. Data available from authors.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 59 policy rate events from 1994 to 2013.

The results for the individual regressions provide an ambiguous output for our domestic capital market efficiency test purposes. On one hand, the negative coefficient of the Taylor-rule component is statistically significant different than 0 at 95% level of significance performing relatively well compared to the discretionary component coefficient which is positive and statistically insignificant. Basically, we see a rational significant response of the stock market to the rules-based component of the policy rate and a much weaker and possibly

irrational (given that the coefficient is positive) response of the stock market to the discretionary component. This observation is somehow consistent with the idea that discretion in monetary policy induces market inefficiency, mainly because the information related to the degree of discretion in monetary policy is not included in the price of securities, assuming that discretionary changes should affect the stock market prices in the same manner as rules-based changes (i.e. homogenous impact of monetary policy changes).

Another explanation for this interesting observation, which would be consistent with the efficient market hypothesis but would also would not be consistent with our assumption that a policy rate innovation should have the same scaled microeconomic impact, is that discretionary monetary events are generally associated with inflation persistence or output volatility (therefore the impact on capital markets cannot be the same for rules and discretion-based innovations) and the capital market participants do not naively interpret that a discretionary expansion (contraction) will lead to increases (decreases) in capital market prices but they weigh in the macroeconomic risks of such a change. Such a view is not supported by the result of the regression against the discretionary component, as we would expect to see a higher coefficient of determination but instead we see that the discretionary decision has absolutely no impact on the capital market.

On the other hand, the results confirm that the anticipations on the US capital market are not related in a significant way to the conduct of the monetary policy, or at least to the mechanical separation of rules and discretion innovations presented here. The coefficient of determination of the first regression is 0.04 meaning that 4% of the variation of the stock market same-day return can be explained by a rules-based policy rate, similar to the result obtained by Bernanke and Kuttner (2003) after excluding outliers, where they use a measure of unexpected policy rate.

The results presented in this section for USA present a rather ambiguous relation between the conduct of monetary policy and the domestic capital market. First, our approach does not suggest a high connection between the conduct of the monetary policy and the performance of the capital market, as the coefficient of determination of the regressions presented in this section is low and indicates that only a small fraction of the variation of the domestic capital market index is explained by the rules component. This observation can be explained by our strict methodology for separating the rules-based and discretionary components.

Secondly, the individual regressions show us a rational response of the domestic stock market to the rules-based component and a response to the discretionary component which can be accounted only as irrational, as the rational response to increased systematic risk is invalidated by the regression results. Strictly speaking from the capital market performance perspective, our research should provide incentive for the policymakers to adopt rules-based decisions.

4.2. CANADA

We considered the Canada policy rate target rate the rate for overnight rate at which financial institutions borrow/lend from/to each other in order to cover their exposures during the day, through the Large Value Transfer System (LVTS). Generally, the Central Bank of Canada (BOC) operates the overnight market in a band of 50 basis points wide, making the overnight target rate the center of the operating band. BOC will always lend money to financial institutions at the top rate of the assumed operating band and borrow at the lower rate of the band, therefore the financial institutions will not trade balances at rates outside the operating band. It is important to mention that from March 1980 to February 1996 the policy rate was set at 25 basis points above the average yield on a 3-month treasury bill at the federal government's weekly auction (for more details about the history of the policy rate in Canada, please visit the official Bank of Canada site), which imply frequent changes to the policy rate. We consider that period inappropriate for the event-study methodology as the high frequency of policy events make vastly impossible the isolation of the event from other relevant news for the stock market. Therefore, we choose to consider for our analysis only monetary events from 22 February 1996, meaning 72 policy rate events. From the 72 events, we chose to proceed with the elimination of the outliers using the simple technique of interquartile range. The option to use an econometric method is because the narrative evidence about every event that we consider suspicious is scarce. As a proxy for the Canada capital market performance we use the S&P/TSX composite index log return. The data for the capital market index return and the policy rate events was collected from the Thompson-Reuters EIKON database. In order to compute the quarterly Taylor-rule we use the output gap series available on the Bank of Canada website, as we consider that measure to be better as the original deviation from a linear trend, proposed by Taylor (1993). As a proxy for inflation we use GDP deflator quarterly data collected from the FRED database.

First, the discretionary indicator for Canada has the value of 1, much larger than USA, which indicates that Canada monetary policy relies more on discretion or that they follow other policy rule.

We present the results of the interquartile range incipient analysis. Below you can find the interquartile table:

Table 5. *Interquartile table of the S&P/TSX index return*

	Values	**Outliers Range**	
Minimum value	-6.23%	Minimum	Maximum
1st Quartile	-0.52%	-1.74%	1.53%
Median	-0.03%		
3rd Quartile	0.30%		
Maximum Value	4.11%		
Interquartile Range (IQR)	0.82%		

Source: Author's calculations.

The lower bound of the outliers range is $Q1 - 1.5 * IQR$ and the upper bound is $Q3 + 1.5 * IQR$. Using the method described above we eliminated 10 policy rate events: 27 August 1998, 29 September 1998, 22 March 2000, 23 January 2001, 18 October 2005, 22 January 2008, 8 October 2008, 21 October 2008, 9 December 2008, 20 January 2009.

We follow the structure of the USA section and present the regression results for the capital market index same-day return, as explained variable, against the raw change in the policy rate, as explanatory variable:

Table 6. *The response of S&P/TSX index to raw target changes of the Canadian policy rate*

Intercept	-0.07
	(0.9)
Explanatory variable	-0.30
Coefficient	(1.3)
Multiple R	0.18
Adjusted R squared	0
DW test	2.40

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 62 policy rate events from 1996 to 2013.

Observe that the regression results indicate that there is no significant relation between the domestic capital market index and the policy rate change as the coefficient of determination is low and although the parameter of the explanatory variable is negative as expected, it is not statistically significant different than 0, as shown by the t-statistic. The general response of the domestic capital market index in the case of Canada is even weaker than in the case of USA.

Next, we proceed with the multiple regression, where we add as explanatory variables the rules and discretion components:

Table 7. *Response of the S&P/TSX index returns to the rules and discretionary-based components of the Canada policy rate*

		Taylor-rule component	**Discretionary component**
	-0.07		
Intercept	(0.83)		
Explanatory variable		-0.32	-0.32
Coefficient		(1.34)	(1.29)
Multiple R	0.24		
Adjusted R squared	0.01		

DW test	2.39

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 72 policy rate events from 1996 to 2013.

In the case of the multiple regression model, we do not see any improvement from the previous model where the raw change of policy rate was included as explanatory variable, which indicates that the Canadian stock market performance is not at all related to the conduct of the monetary policy. The parameters of the multiple regression, although negative, they are not statistically significant.

Further, we proceed with regressions of the capital market index return against each component of the policy rate:

Table 8. *The response of the S&P/TSX index returns to each component of the policy rate*

	Taylor-rule component	Discretionary component
Intercept	-0.06 (0.7)	-0.05 (0.67)
Explanatory variable Coefficient	-0.01 (0.18)	0 (0.03)
Multiple R	-0.02	0
Adjusted R squared	0	0
DW test	2.40	2.40

Source: Authors calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 72 policy rate events from 1996 to 2013.

The result of the individuals regressions only reinforce our observation that in Canada, the stock market performance is not related to the conduct of the monetary policy.

Further, in the examination of the monetary policy conduct influence on the stock market we also include the monetary policy components of US, in order to determine if the stock market responds to changes in target US policy rate, as the two economies are highly integrated. Secondly, Canadian stock market should respond in a significant manner to external shocks, as the economy is smaller and consequently its interest rate should adjust to the world interest rate, as indicated by the Mundell-Fleming model. In this case, we can say that the openness of the Canadian market is a determinant of the response of the stock market to the domestic monetary policy, as argued by Li, Iscan and Xu (2010). In order to see if our assumption is true we run a regression of the S&P/TSX index against the USA policy rates:

Table 9. *Response of the S&P/TSX index returns to the rules and discretionary-based components of the Fed Funds policy rate*

		Taylor-rule component	Discretionary component
Intercept	-0.5 (2.77)		
Explanatory variable Coefficient		-1.06 (2.1)	-1.28 (2.71)
Multiple R	0.28		
Adjusted R squared	0.05		
DW test	2.14		

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 60 policy rate events from 1992 to 2013.

Notice that the response of the Canadian stock market to the USA monetary policy components can be considered as rational and statistically significant for both rules-based and discretionary components. We can

consider this result as a confirmation of the well-known Mundell-Fleming logic for a small open economy with full capital mobility (i.e. Canada).

The conclusion is that, in the relevant sample, our event-study approach was unable to find any evidence of an even weak relation between the conduct of monetary policy and the Canadian stock market performance. We consider that this may be caused by the fact that USA and Canada economies are integrated and therefore the monetary policy of Canada becomes irrelevant for domestic prices as the interest rate adjusts to the world (USA) interest rate, as indicated by the Mundell-Fleming model.

4.3. United Kingdom

In United Kingdom the monetary policy decisions are taken by a Monetary Policy Committee, which is reunited on a monthly basis in order to change or maintain the official bank rate. The bank rate affects the real economy through the traditional channels therefore, can be considered equivalent to the Fed Funds rate and the Bank of Canada rate. The initial sample consists of 55 policy rate events through the period 1994-2013, the data is collected from the Thompson-Reuters EIKON database. For the quarterly Taylor-rule we use the standard GDP deflator data collected from the FRED database and the output gap data is collected from the Bloomberg database. As a proxy of the domestic capital market performance we will use the return of the FTSE100 index collected from the Thompson-Reuters EIKON database. We used the outlier removal technique and removed 3 events: 8 October 2008, 6 November 2008 and 5 March 2009. For more details regarding the data please consult the authors. The discretionary indicator for United Kingdom monetary policy is 0.61, indicating that the monetary policy degree of prudentiality is between USA and Canada.

We follow the regression equation sequence and proceed with the regression result of the same-day log return of the FTSE100 index against the raw changes in the policy rate:

Table 10. *The response of the FTSE100 same-day return to the raw target changes in the UK policy rate*

Intercept	-0.13
	(0.97)
Explanatory variable	0.90
Coefficient	(1.77)
Multiple R	0.28
Adjusted R squared	0.06
DW test	1.88

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 52 policy rate events from 1994 to 2013.

The results of the regression show that the market response to the changes in the policy rate is not statistically significant, as the t-statistic is low. The positive value of the coefficient is not necessarily relevant for our purposes, it only shows that raw changes of the policy rate are inappropriate when evaluating the impact on capital market efficiency. Therefore, we pursue with our regressions against the rules and discretionary components of the policy rate:

Table 11. *The response of the FTSE100 same-day return to both the rules and discretionary components of the policy rate*

		Taylor-rule component	**Discretionary component**
	-0.13		
Intercept	(0.97)		
Explanatory variable		0.87	1.13
Coefficient		(2.12)	(1.90)
Multiple R	0.38		
Adjusted R squared	0.11		
DW test	1.88		

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 52 policy rate events from 1994 to 2013.

Notice that the result of the second regression is puzzling. First, the coefficient of determination is high, compared to the regression against raw changes, which suggest that the break-down of the policy rate in discretionary and rules-based explains a significant part of the same-day variation of the capital market. Secondly, the coefficients of the regression are positive which can indicate that the market response to the monetary policy conduct is irrational.

Now, we proceed with individual regressions against rules and discretionary components of the policy rate:

Table 12. *The response of the FTSE100 index to each component of the policy rate*

	Taylor-rule component	**Discretionary component**
Intercept	-0.18 (1.06)	-0.17 (1.07)
Explanatory variable Coefficient	-0.17 (0.95)	0.27 (1.15)
Multiple R	-0.18	0.27
Adjusted R squared	0.01	0.06
DW test	1.76	1.77

Source: Author's calculations.

Note: The numbers in the parentheses are the t-statistics of the model parameters, computed using Newey-West heteroskedastic and autocorrelation robust estimates. The full sample consists of 52 policy rate events from 1994 to 2013.

The individual regressions provide interesting and puzzling information. The regression against the rules component shows a negative but statistically insignificant coefficient and a low explanatory power of the model, indicating that 1% of the same day stock market variation is explained by a rules-based monetary policy innovation. On the other hand, the regressions against the discretionary we see a positive and statistically insignificant coefficient but a relative better explanatory power of the model may indicate that the capital market prices increased macroeconomic risks associated with monetary decisions.

5. Concluding remarks

The purpose of our paper was to see if there is any relation between the conduct of the monetary policy and the short-term efficiency of domestic capital markets. Our paper has implications on the cost-benefit analysis of any monetary policy change, the policymakers must with respect to the importance of ignoring short-term capital market effects. It is our opinion that the monetary policy objectives should not include explicit reference to the capital market performance because inserting a factor in the policy rule related to the performance of the capital market and committing to respect the rule can (and probably will) lead to large deviations from fundamental values as the average response of the capital market to the policy components is weak and indicates that there are many other factors that influence the variation of stock market prices. Although, the traditional objectives of the monetary policy do not include any explicit reference to the capital market prices, it can obviously have undesirable effects on the expected return-risk relationship on the domestic capital market, which can be further transmitted to the real economy if the capital market is an important mechanism for resource allocation in the overall economy. In this sense, we think that the capital market efficiency should be considered as a secondary objective in the monetary policy design. In order to close the circle, it would be of high interest to see to what extent the short-term inefficiency of the stock market propagates to the real economy and any researcher should be encouraged by our findings to pursue this objective in another paper.

Also, our results interestingly show that there is no universal relation between the conduct of monetary policy and the performance of the capital market. In USA for example, we have a strong response of the capital market to the rules monetary policy component but we do not see the same behavior for other countries. This interesting fact can only be explained by the discretionary indicator, showing that if monetary policy decisions rely more on discretion, the stock market response becomes increasingly erratic and can cause irrational responses. If we judge strictly from the perspective of capital markets effects, the observation can also indicate that forward guidance, meaning a commitment to follow a predetermined rule, helps monetary policy to reduce microeconomic

uncertainty. Therefore, the result definitely provides motivation for policymakers to use forward guidance in the policy conduct in order to increase the efficiency of capital markets and reduce volatility caused by noise trading. In general, if discretionary policy rate events are considered the response of the monetary authority to issues of financial stability, then we can think that the results of the paper provide evidence of the trade-off between macroeconomic stability and short-term capital market efficiency, with the mention that the policy rate decision must also be conditional on identifying if the short-term capital market inefficiency is indeed transmitted to the real economy.

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