Spring 4-1-2010

The Impact of Inflation Targeting Regime on the Relationship between Stock Returns and Inflation: International Evidence

Unro Lee
University of the Pacific, ulee@pacific.edu

The Impact of Inflation Targeting on the Relationship between Stock Returns and Inflation: International Evidence

Unro Lee*

Twenty six industrialized and emerging countries have adopted inflation targeting monetary policy since 1990 to combat persistently high inflation rate. This policy accords either the government and/or the central bank the authority to assign an explicit numerical target for inflation rate and implement an appropriate monetary policy to achieve its goal. This study investigates whether the adoption of inflation targeting strategy has affected the relationship between stock returns and inflation rate. Specifically, this study tests a hypothesis that, in an economy where inflation targeting has been adopted as a new monetary policy strategy, real stock returns should be sensitive to the change in inflation rate relative to its target. Both monthly and quarterly data for Australia, Canada, Chile, Israel, New Zealand, Sweden and United Kingdom are utilized in this study. The results are found to be somewhat mixed. A change in inflation rate relative to its target rate has a negative and statistically significant impact on real monthly stock returns for Chile, Israel, and Sweden and on real quarterly stock returns for only Chile and Israel.

I. Introduction

Twenty six industrialized and emerging countries (8 industrialized and 18 emerging countries) have adopted inflation targeting monetary policy since 1990 to combat persistently high inflation rate and inflation volatility. The first country to formally adopt inflation targeting policy is New Zealand (1990), which was followed by Canada (1991), Chile (1991), Israel (1992), United Kingdom (1992), Peru (1994), Australia (1994), and Sweden (1995).[1] Eighteen other countries have implemented inflation targeting policy since 1995.[2]

Inflation targeting monetary policy accords either the government and/or the central bank the authority to assign an explicit numerical target for inflation rate and implement an appropriate monetary policy to achieve its inflation target.[3] The proponents of this policy have long claimed that inflation targeting not only reduces inflation rate, inflation volatility, output volatility, and interest rates, but also enhances both the transparency and accountability of the monetary policy.[4]

The author would like to thank an anonymous reviewer and the editor of the Journal for valuable suggestions. The author is responsible for any errors which remain.

* **Unro Lee** is a Professor of Finance at the University of the Pacific in Stockton, California, USA.

[1] For an excellent and detailed account of the origin and practice of inflation targeting monetary policy, please refer to Inflation Targeting (1999) by Bernanke Laubach, Mishkin and Posen.

[2] Other countries that have adopted inflation targeting are Czech Republic (1998), Korea (1998), Poland (1998), Brazil (1999), Colombia (1999), Mexico (1999), Thailand (2000), Switzerland (2000), Iceland (2001), Norway (2001), Hungary (2001), Phillipines (2001), South Africa (2001), Slovakia (2005), Indonesia (2005), Romania (2005), Turkey (2006) and Ghana (2007). However, it is expected that Slovakia, Poland, Czech Republic, and Hungary will abandon inflation targeting once they adopt Euro as their currency.

[3] Benefits and shortcomings of targeting macroeconomic variables other than inflation rate, such as output level, exchange rate and price level, have been discussed in the literature [see, for example, Mishkin and Schmidt-Hebbel (2007)].

[4] Mishkin and Posen (1997), Bernanke, et. al (1999), and Mishkin (2001) document that inflation-targeting central banks maintain frequent communications with the government officials, regularly publish reports (e.g., Inflation Report from the Bank of England), and deliver public speeches to articulate the rationale behind their monetary policy strategies

Empirical evidence on the benefits of inflation targeting however remains somewhat inconclusive. Bernanke, Laubach, Mishkin and Posen (1999) and Mishkin and Schmidt-Hebbel (2007) find that inflation targeting reduces inflation rate, inflation volatility, interest rates, and output growth volatility for all countries that have adopted this strategy. Specifically, Mishkin and Schmidt-Hebbel (2007) show that the average inflation rate for inflation targeters has dropped from 12.6% to 4.4% after these countries have formally adopted inflation targeting. But Ball and Sheridan (2003) and Mishkin and Schmidt-Hebbel (2007) document that nontargeting industrialized countries have also experienced a significant drop in both inflation rate and its volatility since the mid 1990s, suggesting that factors other than inflation targeting policy may have triggered a decline in inflation rate and its volatility across industrialized countries. Ball and Sheridan (2003) further argue that, after adjusting for regression to the mean, inflation targeting does not reduce inflation rate and may even raise the inflation variability. However more recent studies by IMF (2005), Dotsey (2006) and Batini and Laxton (2007) dispute Ball and Sheridan's findings by pointing out that inflation rate as well as its persistence and volatility are unambiguously lower in inflation-targeting countries.[5]

It can be argued that, once a country adopts inflation targeting monetary policy, the relationship between real stock returns and inflation rate becomes negative and significant. Specifically, in such environment, real stock returns should be sensitive to a change in inflation rate relative to its target. For example, if inflation rate rises above the numerical inflation target, then forward-looking investors would predict that the central bank will quickly implement a contractionary monetary policy (i.e., an increase in the short-term interest rate) to combat escalating inflation and economic contraction will ensue as an increase in interest rates will weaken consumer spending, business investment spending, and net export. A slowdown in real economic activity will inevitably translate to plummeting corporate earnings. Anticipating such gloomy scenario, forward-looking investors would immediately reduce the demand for stocks, which in turn dampens current stock returns. The impact of inflation rate declining below the inflation target would engender opposite effects in the stock market.

The objective of this study is to investigate the relationship between real stock returns and the change in inflation rate relative to its target for those countries that formally adopted "inflation targeting" in the early 1990s, namely Australia, Canada, Chile, Israel, New Zealand, Sweden and the United Kingdom. These seven countries are chosen for this study because, as of 2006, at least 10 years have elapsed since these countries had formally adopted "inflation targeting" monetary strategy. Such selection process thereby ensures that ample data are available to conduct meaningful empirical investigation. The primary source of data for this study - monthly and quarterly data for inflation rate and stock returns – is the International Financial Statistics database published by the International Monetary Fund (IMF).

The study finds that a change in inflation rate relative to its target has had a negative and statistically significant impact on real monthly stock returns for Chile, Israel, and Sweden and on real quarterly stock returns for Chile and Israel. Section II first describes the relationship between real stock returns and inflation rate within the inflation targeting regime and then proposes a testable hypothesis. Section III discusses data and empirical findings. Section IV provides a brief summary of the paper.

[5] Mishkin and Schmidt-Hebbel (2007) assert that substantive differences in the empirical results among these studies can be attributed to the choice of the control group of nontargeting countries and the estimation techniques employed. For example, they conclude that differences in the magnitude of the decline in inflation rate are not statistically significant when the control group consists of only non-inflation targeting countries. They also show that inflation targeting countries are less vulnerable to oil and exchange rate shocks and tend to exhibit lower output and inflation volatilities than countries that do not target inflation.

II. Stock Returns, Inflation, and "Inflation Targeting" Policy

A plethora of empirical studies document a negative relationship between stock returns and inflation rate during the post-Korean War period. For example, Bodie(1976), Nelson (1976), and Fama and Schwert (1977) validate a negative relationship for the United States, while the relationship for other industrialized countries is investigated by Solnik (1983), Gultekin (1983) and Lee (1996). Kwok and Li (1993) and Lee (1998) provide empirical evidence for several Pacific Basin countries[6]. However, no empirical investigation has shed any light on the nature of the relationship between real stock returns and inflation rate for inflation-targeted countries.

In an economy where "inflation targeting" is formally adopted as a new monetary policy strategy, there should be a negative and significant relationship between real stock returns and the change in inflation rate relative to its target. If inflation rate exceeds the target inflation rate, then forward-looking investors would predict that the central bank will implement a contractionary monetary policy (i.e., an increase in short-term interest rate) to stem escalating inflation rate and stock prices will fall due to declining corporate earnings triggered by deteriorating economic condition. Anticipating such gloomy scenario, forward-looking investors would immediately reduce the demand for stocks, which in turn dampens current stock returns.

Conversely, if inflation rate falls below the target inflation rate due to weakening economy, then forward-looking investors would predict that the central bank will attempt to lower short-term interest rates to boost economic activity and the stock market will subsequently rebound. Anticipating such events, investors would immediately purchase stocks, thereby increasing current stock returns.

Therefore, real stock returns in an inflation-targeted country should be negatively and significantly affected by the change in inflation rate relative to its target. This relationship can be readily tested in the context of the following equation:

$$RSR_t = \alpha + \beta\, EXPGROWTH_t + \gamma\, INFGAP_t + \xi_t\,, \qquad (1)$$

where RSR_t is the real stock return at time t, computed as the percentage change in stock price from the end of time t-1 to the end of time t after adjusting for inflation, $EXPGROWTH_t$ is the expected economic activity at time t, and $INFGAP_t$ is the difference between the inflation rate at time t and the mean of the target range of inflation rate effective at time t.

Stock prices reflect the present value of firms' future dividends. Because dividends are determined by firms' earnings, which in turn depend on real economic activity, $EXPGROWTH_t$ is included in this equation as an exogenous variable since stock returns should be positively related to the expected economic activity.[7] It is hypothesized in this study that γ should be both negative and statistically significant for countries that has adopted "inflation targeting" policy.

[6] Several hypotheses have been proposed in the past to explain the negative relationship between real stock returns and inflation, albeit without much success. One that received most attention is the "proxy-effect" hypothesis promulgated by Fama (1981) that claims that a negative stock return-inflation relationship exists because inflation is merely serving as a proxy for expected economic activity in a relationship between stock returns and inflation. Tax effect hypothesis proposed by Feldstein (1980) claims that inflation rate has adverse impact on stock prices due to its effect on the after-tax earnings of the firm via depreciation allowance, which is traditionally based on the historic cost of the assets, and the use of FIFO method of measuring the cost of replacing inventories

[7] The positive relationship between stock returns and expected economic activity is well documented in the literature [for example, Fama (1981)].

III. Data and Empirical Evidence

A. Data and Estimation Techniques

Both monthly and quarterly data for Consumer Price Index (CPI), industrial production, and aggregate stock market index are obtained for Canada, Chile, Israel, Sweden, and United Kingdom from the International Financial Statistics database published by the International Monetary Fund (IMF). Because monthly data are not available for Australia and New Zealand, only quarterly data are utilized for these two countries.

Industrial production, not real Gross Domestic Product (GDP), is used in this study as a proxy for real economic activity because the monthly data for GDP are not available for countries specifically chosen for this study. Furthermore, these seven countries are chosen for this study because at least 10 years have elapsed since they had formally adopted "inflation targeting" strategy. This selection process thereby ensures that ample data would be available to conduct meaningful empirical investigation.

Table 1 lists the inflation target width for countries selected for this study which is obtained from Mishkin and Schmidt-Hebbel (2001) and recent reports published by central banks. Australia formally implemented "inflation targeting" in September, 1994, with the target range of 2-3% a year set jointly by the Government and the Central Bank. Canada, which began targeting inflation rate in February 1991, have modified its target range several times since then – between 3% and 5% in 1991, between 2% and 4% in 1992, between 1.5% and 3.5% during 1993-94, and between 1% and 3% thereafter. Chile's monetary policy was ostensibly more unstable as its inflation rate was very high in the early 1990s. It set the target range of 15% - 20% in January 1991 and 13% - 16% in 1992, and it has steadily lowered the target range every year to 2% -4% in 2001 and thereafter. Israel's inflation target range has also varied significantly since it launched "inflation targeting" monetary policy in January 1992. Its initial target range was 14% - 15% in 1992, which has since declined to 1% - 3% in 2003 and thereafter. New Zealand implemented its inflation targeting policy in March 1990. Its inflation target range was 3%-5% in 1990 and it has steadily declined to 0% – 3% since 1997.

Sweden and United Kingdom, on the other hand, have implemented relatively stable inflation targeting policies in the 1990s. Sweden, which has launched its policy in January 1993, set the target range for inflation rate to be 1%-3% every year since its inception. United Kingdom, which formally adopted inflation targeting policy in October 1992, used 1% – 4% target range between 1992 and 1995, but set a specific target of 2% since 2004.

Countries that adopt inflation targeting usually go through two distinct phases of targeting. Initially, most of these countries continually adjust inflation target downward (i.e., converging target period). Subsequently, they fix the target at or within a specified constant level range for an indefinite period (i.e., stationary target period). For example, Israel initially set the inflation target as 14-15% in 1992, which has steadily declined to 1-3% in 2003. Since 2003, Israel set the target as 1-3% for an indefinite time period. As of 2004, all industrialized and emerging inflation-targeting countries, with the exception of Brazil, Colombia, Czech Republic, Hungary and Philippines, set a stationary target for inflation [see Mishkin and Schmidt-Hebbel (2007)].

RSR_t, real stock return for a given country at time t, is computed as the nominal stock return at time t minus the inflation rate at time t. Nominal stock return at time t is defined as the log SP_t – log SP_{t-1} , where SP_t is the aggregate stock market index of the country at time t. The inflation rate at time t is defined as the log CPI_t - log CPI_{t-1},, where CPI_t is the Consumer Price Index at time t. $INFGAP_t$ is defined as the gap between inflation rate and the mean of the range of inflation rate target imposed by the central bank. Economic growth rate at time t (DQ_t) is defined as the log Q_t – log Q_{t-1}, or log(Q_t/Q_{t-1}), where Q_t is the industrial production at time t.

Although there are alternative estimation procedures that can be employed to extract expected economic growth rate (EXPGROWTH), Box-Jenkins time series model is used in this study to generate

Table 1: Inflation Rate Target Width

(Source: Mishkin, Frederic and K. Schmidt-Hebbel. (2001). One Decade of Inflation Targeting in the World: What do we know and what do we need to know? , *NBER Working Paper Series # 8397*)

	Implementation Date	Inflation Target Width	Target set by
I. Australia	September 1994	2-3%	jointly by Government and Central Bank
II. Canada:	February 1991	3-5% (1991) 2-4% (1992) 1.5 – 3.5% (1993-1994) 1-3% (1995 – present)	jointly by Government and Central Bank
III. Chile	January 1991	15-20% (1991) 13-16% (1992) 10-12% (1993) 9-11% (1994) 8 % (1995) 6.5% (1996) 5.5% (1997) 4.5% (1998) 4.3 % (1999) 3.5% (2000) 2-4% (2001- present)	Central Bank
IV. Israel:	January 1992	14-15% (1992) 10 % (1993) 8 % (1994) 8-11 % (1995) 8–10 % (1996) 7-10% (1997- 1998) 4 % (1999) 3-4% (2000) 2.5% - 3.5% (2001) 2 – 3% (2002) 1- 3% (2003 – present)	Government
V. New Zealand:	March 1990	3-5 % (1990) 2.5 – 4.5% (1991) 1.5 – 3.5% (1992) 0-2% (1993-1996) 0 – 3% (1997 – present)	jointly by Government and Central Bank
VI. Sweden	January 1993	1-3% (1993 – present)	Central Bank
VII. United Kingdom	October 1992	1-4% (1992-1995) 2.5 % (1996 – 2003) 2% (2004 – present)	Government

expected economic growth rate.[8] Based on sample autocorrelation functions of the economic growth rate, it is found that MA(2) process, or the moving average process of order 2, of the following form best fits the economic growth rate for all countries:

$$DQ_t = \mu + \varepsilon_t - \theta_1\varepsilon_{t-1} - \theta_2\varepsilon_{t-2}, \quad (2)$$

where DQ_t is the economic growth rate at time t, μ is the mean of the economic growth rate, and ε_t is a white noise process with mean 0 and variance σ_ε. This process has mean μ and variance $\sigma_\varepsilon (1 + \theta_1^2 + \theta_1^2)$. Furthermore, the reported Q-statistics indicate that the null hypothesis of white noise residuals cannot be rejected at the 5% level for all fitted MA (2) models of economic growth rate. Since autoregressive (AR) disturbance terms are detected in the ordinary least squares (OLS) estimates of equation (1) for most countries, equation (1) is re-estimated for all countries using the Beach-MacKinnon maximum-likelihood estimation procedure that adjusts for autoregressive disturbances.

B. Empirical Evidence

1. Summary Statistics

Table 2 presents both the mean and the standard deviation of real stock returns and inflation rate for all countries during two mutually exclusive periods of equal length – the period before "inflation targeting" monetary policy was formally adopted, and the period since "inflation targeting" policy was adopted. Panel A of Table 2 presents monthly statistics and Panel B provides quarterly statistics. From Panel A, it can be seen that mean stock return has increased for Canada, Israel and United Kingdom after the adoption of "inflation targeting" monetary policy, whereas stock return has declined for Chile and Sweden after the shift in monetary policy. But the standard deviation of stock return has declined for all countries after the new monetary regime was implemented. The mean inflation rate and the standard deviation of inflation rate have both declined for all countries after the shift in monetary regime.

The results obtained with quarterly data, which are presented in Panel B of Table 2, are almost identical to those obtained with monthly data. The impact of inflation targeting on stock returns has been generally favorable. The mean quarterly stock return has increased for Canada, Israel, New Zealand, Sweden, and United Kingdom after the new monetary policy regime was implemented. However, the mean stock return declined for Australia and Chile after the change in policy. The standard deviation of the quarterly stock return has declined for all countries except New Zealand. Both the mean and the standard deviation of quarterly inflation rate have diminished perceptibly for all countries after the new monetary policy was implemented.

Therefore, inflation-targeting monetary policy has undoubtedly exerted a stabilizing influence on the inflation rate for all countries, which is consistent with the findings of Mishkin and Schmidt-Hebbel (2007) and Ball and Sheridan (2003).

2. Regression Results

Estimation of equation (1) presupposes that all variables in the regression equation are stationary processes. However, if any or all of these variables are nonstationary processes, then statistical inferences that can be drawn from the *spurious* regression equation would be invalid (Granger and Newbold, 1974). Therefore it is necessary to ascertain before we estimate the equation whether the variables in equation (1) are all stationary processes.

The test of null hypothesis of first-order nonstationarity is performed using a statistical procedure proposed by Dickey and Fuller (1979) and Dickey (1981). Equation (3) is estimated for each variable:

[8] Details of the ARIMA specifications of the economic growth rate (DQ_t) used in this study are available from the author upon request.

$$\Delta Y_t = \alpha + \gamma t + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-I} + \varepsilon_t \quad (3)$$

where Y is the variable under consideration. The null hypothesis that Y is a first-order nonstationary variable is rejected if the estimated coefficient of the lagged variable, ρ, is significantly less than zero. The estimated t-statistic for ρ, t_t, is referred to as the *augmented Dickey-Fuller* (ADF) statistic.

Because the results of the Dickey-Fuller test can be sensitive to the choice of the lag length k (Thornton and Batten, 1985), the Akaike (1974) information criterion (AIC) is employed to determine the optimal lag-structure specification of equation (3). AIC searches for the lag length k that would minimize

$$AIC(k) = N \ln (SSR(k)/N) + 2p \quad (4)$$

where
N = the number of observations,
SSR(k) = the sum of squared residuals of the regression with k as the lag length, and
P = the number of regressors, which is equal to k+1.

The appropriate order of the lag length in equation (3) is obtained by computing AIC(k) over the range of values for k from 1 to 12 for monthly data and from 1 to 4 for quarterly data. The k^{th} lag that minimizes AIC, k^*, is provided for all the variables for all countries in Table 3.

Table 3 shows that the null hypothesis of a first-order nonstationarity process can be rejected for real stock returns (RSR), expected economic growth rate (EXPGROWTH), and the gap between the inflation rate and its target (INFGAP) for all countries at the 5% significance level. So we conclude that all the relevant variables in equation (1) are stationary processes for all countries, regardless of the frequency of data employed.

The relationship between real stock returns and inflation rate described in equation (1) is tested for all countries using both monthly and quarterly data, the results of which are provided in Tables 4 and 5, respectively. For each country, the equation is estimated with and without the expected economic growth (EXPGROWTH) variable. Also, for each country, the equation is estimated for the period beginning from the date inflation targeting strategy was first implemented until March 2006 (or first quarter of 2006).

From Table 4, it is apparent that INFGAP, i.e., difference between the inflation rate and the mean of the inflation target range, is negatively related to monthly real stock returns for all countries – Canada, Chile, Israel, Sweden and United Kingdom. Furthermore, the relationship remains statistically significant at the 5% level for Chile, Israel and Sweden, although this relationship is not rendered statistically significant for Canada and the United Kingdom. When EXPGROWTH is included in the regression, the relationship between stock returns and INFGAP does not change drastically. Moreover the coefficient for EXPGROWTH is positive for all but Canada and Sweden, and it is not statistically significant for all countries.

Therefore, the change in inflation rate relative to its target (INFGAP) affects monthly real stock returns negatively for Canada, Chile, Israel, Sweden and United Kingdom, although this relationship is rendered statistically significant for only Chile, Israel and Sweden. Furthermore, the inclusion of expected economic growth rate (EXPGROWTH) does not alter this relationship for all countries.

Table 2. Summary Statistics for Real Stock Returns and Inflation Rate: Monthly and Quarterly Results

	Panel A. Monthly Data			
	Real stock return		Inflation Rate	
	Mean	standard deviation	Mean	standard deviation
1. Canada:				
1975:3 – 1990:12	.0008	.0515	.0054	.0036
1991:1 – 2006:3	.0055	.0432	.0017	.0035
2. Chile				
1976:3 – 1990:12	.0181	.0793	.0225	.0243
1991:1 – 2006:3	.0054	.0507	.0051	.0057
3. Israel				
1978:5 – 1991:12	.0024	.1575	.0500	.0481
1992:1 – 2006:3	.0077	.0666	.0045	.0063
4. Sweden:				
1984:5 – 1994:12	.0047	.0688	.0045	.0060
1995:1 – 2006:3	.0042	.0682	.0009	.0038
5. United Kingdom				
1980:5 – 1992:9	.0057	.0442	.0050	.0052
1992:10 – 2006:3	.0081	.0282	.0021	.0036
	Panel B. Quarterly Data			
	Real stock return		Inflation Rate	
	Mean	standard deviation	Mean	standard deviation
1. Australia				
1984:3 – 1994:3	.0137	.1092	.0131	.0086
1994:4 – 2006:1	.0125	.0435	.0066	.0060
2. Canada				
1976:3 – 1990:4	.0024	.0793	.0163	.0073
1991:1 – 2006:1	.0167	.0675	.0050	.0054
3. Chile				
1976:4 – 1990:4	.0473	.1542	.0598	.0354
1991:1 – 2006:1	.0179	.0949	.0154	.0129
4. Israel				
1978:4 – 1991:4	.0077	.1367	.1531	.1295
1992:1 – 2006:1	.0231	.1234	.0135	.0142
5. New Zealand				
1975:1 – 1989:4	.0034	.1055	.0294	.0139
1990:1 – 2006:1	.0164	.1176	.0055	.0043
6. Sweden				
1982:1 – 1992:4	.0174	.1187	.0162	.0093
1993:1 – 2006:1	.0214	.1090	.0034	.0064
5. United Kingdom				
1980:4 – 1992:3	.0158	.0711	.0148	.0104
1992:4 – 2006:1	.0238	.0466	.0062	.0057

The results obtained with quarterly data, as can be seen in Table 5, are not as robust as those obtained with monthly data for most countries, presumably because the effect of changes in inflation rate is most likely to be captured by stock returns within three months. INFGAP is negatively related with quarterly real stock returns for all countries except Canada, and this relationship is statistically significant only for Chile and Israel. Again, the inclusion of expected economic growth rate (EXPGROWTH) does not alter the relationship for all countries, although the coefficient for INFGAP

Table 3. Augmented Dickey-Fuller (ADF) Test Results for Stock Returns(RSR), Expected Economic Growth (EXPGROWTH), and Inflation Gap (INFGAP): Monthly and Quarterly Results

$$\Delta Y_t = \alpha + \gamma t + \rho Y_{t-1} + \sum_{i=1}^{k^*} \beta_i \Delta Y_{t-I} + \varepsilon_t$$

	Y	k*	t(k*)
Panel A: Monthly Results			
1. Canada:	RSR	10	-6.0254***
	EXPGROWTH	1	-13.2677***
	INFGAP	8	-6.5848***
2. Chile	RSR	5	-9.6642***
	EXPGROWTH	10	-14.8870***
	INFGAP	2	-10.9160***
3. Israel	RSR	1	-16.1412***
	EXPGROWTH	9	-5.8678***
	INFGAP	12	-3.6240**
4. Sweden	RSR	1	-11.3976***
	EXPGROWTH	4	-11.1933***
	INFGAP	12	-4.7761***
5. United Kingdom	RSR	1	-12.0342***
	EXPGROWTH	4	-7.4854***
	INFGAP	6	-6.3621***
Panel B: Quarterly Results			
	Y	k*	t(k*)
1. Australia	RSR	1	-7.5440***
	EXPGROWTH	3	-6.3394***
	INFGAP	1	-5.3091***
2. Canada	RSR	3	-6.0012***
	EXPGROWTH	3	-6.6766***
	INFGAP	1	-7.8474***
3. Chile	RSR	1	-9.1451***
	EXPGROWTH	3	-4.0056**
	INFGAP	1	-7.8446***
4. Israel	RSR	1	-6.6311***
	EXPGROWTH	1	-7.2240***
	INFGAP	4	-5.3045***
5. New Zealand	RSR	1	-8.3158***
	EXPGROWTH	1	-7.2498***
	INFGAP	1	-7.0116***
6. Sweden	RSR	1	-5.8089***
	EXPGROWTH	1	-8.2213***
	INFGAP	4	-4.2556***
5. United Kingdom	RSR	1	-7.7233***
	EXPGROWTH	1	-6.1746***
	INFGAP	2	-6.9816***

Note: The null hypothesis of first-order nonstationarity for the variables in the equation (1) is tested with the ADF statistic, i.e. the estimated t-statistic for ρ in the regression equation:

$$\Delta Y_t = \alpha + \gamma t + \rho Y_{t-1} + \sum_{i=1}^{k^*} \beta_i \Delta Y_{t-I} + \varepsilon_t \ ,$$

where Y is the variable under investigation. ***,**, and * denote statistical significance at the 1%, 5% and 10%, respectively. k*, the optimal lag-length of the equation, is determined by the Akaike information criterion.

Table 4. Relationship between Stock Returns and Inflation: Monthly Results

$RSR_t = \alpha + \beta\ EXPGROWTH_t + \gamma\ INFGAP_t + \xi_t$, where RSR_t = real stock return at time t,
$EXPGROWTH_t$ =expected real economic activity at time t, and
$INFGAP_t$ = diff. between the inflation rate at time t and the mean of the range of inflation target imposed at time t

	α	β	γ	R^2
I. Canada				
1991:1 – 2006:3				
(i)	.005		-1.040	.02
	(1.878)		(-1.121)	
(ii)	.006	-.2645	-.9789	.02
	(1.597)	(-.723)	(-1.049)	
II. Chile				
1991:1 – 2006:3				
(i)	.0049		-1.435	.16
	(.9140)		(-1.8369)*	
(ii)	.0042	.0317	-2.5676	.19
	(1.143)	(.649)	(-3.034)*	
III. Israel				
1992:1 – 2006:3				
(i)	.0139		-2.2837	.05
	(2.391)*		(-2.725)*	
(ii)	.0136	.2773	-2.2972	.07
	(2.344)	(1.637)	(-2.762)*	
IV.Sweden				
1995:1 – 2006:3				
(i)	.0021		-3.508	.04
	(.269)		(-1.960)*	
(ii)	.0018	-.0068	-3.5115	.04
	(.268)	(-.024)	(-1.945)*	
V. United Kingdom				
1992:10 – 2006:3				
(i)	.0082		-1.1957	.09
	(2.083)*		(-1.5278)*	
(ii)	.008	.1280	-1.2191	.09
	(1.985)*	(.2807)	(-1.540)	

Note: Beach-MacKinnon maximum-likelihood estimation procedure was utilized to estimate equation (1) for all countries as autoregressive disturbances in the regression equation are detected on the basis of Durbin-Watson statistic. * significant at the 5% level

becomes negative with EXPGROWTH in the regression equation for Canada. Furthermore, the coefficient for EXPGROWTH is positive for all countries except Chile. However this coefficient is not statistically significant for all countries, with the exception of Israel.[9]

[9] Since the stock market collapsed for most countries during the spring of 2000, triggered by the dot.com bubble burst, structural stability of the regression equation (1) is also tested by invoking Chow test procedure, although the results are not reported in this study. The sample period for all countries is divided into two sub-periods – a period ending in March 2000 (or first quarter, 2000) and a period beginning in April 2000 (or second quarter, 2000). It is found that only Sweden experienced a structural break in the relationship between real stock returns and INFGAP. Canada experienced a structural break on the basis of quarterly data, but not on the basis of monthly data. These results are available from the author upon request.

Table 5. Relationship between Stock Returns and Inflation: Quarterly Results

$RSR_t = \alpha + \beta\ EXPGROWTH_t + \gamma\ INFGAP_t + \xi_t$, where RSR_t = real stock return at time t, $EXPGROWTH_t$ = expected real economic activity at t, and $INFGAP_t$ = difference between the inflation rate at time t and the mean of the range of inflation target imposed at time t.

	α	β	γ	R^2
I. Australia				
1994:4 – 2006:1				
(i)	.013		-1.2046	.03
	(1.939)		(-1.110)	
(ii)	.013	.0904	-1.2275	.04
	(1.779)	(.188)	(-1.110)	
II. Canada				
1991:1- 2006:1				
(i)	.017		.1267	.03
	(1.658)		(.077)	
(ii)	.009	1.0983	-.1092	.06
	(.841)	(1.490)	(-.067)	
III. Chile				
1991:1 – 2006:1				
(i)	.0122		-5.118	.20
	(.838)		(-3.406)*	
(ii)	.0133	-.0894	-4.9351	.20
	(.872)	(-.322)	(-3.055)*	
IV. Israel				
1992:1 – 2006:1				
(i)	.011		-3.995	.13
	(.736)		(-2.935)*	
(ii)	.004	1.024	-4.797	.25
	(.317)	(3.111)*	(-3.880)*	
V. New Zealand				
1990:1 – 2006:1				
(i)	.020		-2.704	.03
	(1.454)		(-.897)	
(ii)	.0196	.0483	-2.7924	.03
	(1.411)	(0.931)	(-8.72)	
VI . Sweden				
1993:1 – 2006:1				
(i)	.0247		-1.318	.17
	(.938)		(-.593)	
(ii)	.0232	.2344	-1.2908	.18
	(.876)	(.548)	(-.574)	
VII. United Kingdom				
1992:4-2006:1				
(i)	.024		-.025	.12
	(2.513)*		(-1.811)	
(ii)	.022	.4490	-.0247	.13
	(1.833)	(.326)	(-1.780)	

Note: Beach-MacKinnon maximum-likelihood estimation procedure was utilized to estimate equation (1) for all countries as autoregressive disturbances in the regression equation are detected on the basis of Durbin-Watson statistic.
* significant at the 5% level.

Therefore, implementation of "inflation targeting" monetary policy seems to affect the strength of the relationship between real stock returns and inflation rate for only a selected number of countries. Although a change in inflation rate relative to the target inflation rate has a negative impact on stock returns for all countries, this relationship remains statistically significant for Chile, Israel, and Sweden based on monthly results and for Chile and Israel based on quarterly results.

Obviously these findings have useful implications for those investors interested in trading stocks in these countries. If investors in an inflation-targeting country (especially Chile, Israel or Sweden) expect the inflation rate at time t, which will be announced at the end of time t, will be higher than its announced target, then they should either sell short or postpone purchasing stocks at the beginning of time t. On the other hand, if they expect the inflation rate at time t will be lower than its target, then they should purchase stocks, preferably on margin, at the beginning of time t. Of course, these strategies would be profitable only if (i) investors correctly predict the magnitude of the inflation rate relative to its target and (ii) transaction costs of executing these strategies do not outweigh the gross profit generated from these strategies.

IV. Conclusion

This study has investigated whether implementation of inflation targeting monetary policy by the central bank will affect the strength of the relationship between real stock returns and inflation rate. It is hypothesized in this paper that, in a country where inflation targeting is formally adopted, a change in inflation rate relative to its target should have significant and negative impact on real stock returns. This hypothesis is predicated on the assumption that forward-looking investors execute investment strategies anticipating the effect of a change in inflation rate relative to its target on future economic activity and corporate profits. However the findings of this study support this assertion only for a selected number of countries. A change in inflation rate relative to its target has negative and significant impact on the real monthly stock returns for Chile, Israel and Sweden and on real quarterly stock returns for Chile and Israel.

References

Akaike, H. (1974). A New Look at Statistical Model Identification. *IEEE Tran. Automatic Control AC-19* : 716-722.

Ball, L., and N. Sheridan. (2003). Does Inflation Targeting Matter? *NBER Working Paper Series #9577* .

Batini, N., and D. Laxton. (2007). Under What Conditions Can Inflation Targeting Be Adopted? *Monetary Policy under Inflation Targeting*, (F. Mishkin and K. Schmidt-Hebbel, ed.), Central Bank of Chile.

Bernanke, B.S., T. Laubach, F. S. Mishkin, and A.S. Posen. (1999). Inflation Targeting: Lessons from the International Experience, Princeton University Press ,Princeton, New Jersey.

Bodie, Z. (1976). Common Stocks as a Hedge against Inflation. *Journal of Finance* 31: 459-470.

Dickey, D.A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica* 49: 1057-1072.

Dickey, D.A., and W.A. Fuller. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association* 74: 427-431.

Dotsey, M. (2006). A Review of Inflation Targeting in Developed Countries. *Business Review*, Federal Reserve Bank of Philadelphia: 10-20.

Fama, E.F. (1981). Stock Returns, Real Activity, Inflation and Money. *American Economic Review* 71: 545-565.

Fama, E.F., and G.W. Schwert.(1977). Asset Returns and Inflation. *Journal of Financial Economics* 5: 115-146.

Feldstein, M. (1980). Inflation, Tax Rules and the Stock Market. *Journal of Monetary Economics* 6: 309-331.

Granger, C., and P. Newbold.(1974). Spurious Regressions in Econometrics. *Journal of Econometrics* 2: 1045-1066.

Gultekin, N.B. (1983). Stock Market Returns and Inflation: Evidence from Other Countries. *Journal of Finance* 38: 49-65.

IMF (International Monetary Fund). (2005). World Economic Outlook, Washington,D.C.

Kwok, R., and K. Li.(1993). The Interrelationship between Macroeconomic Variables and Stock Prices in the Newly Industrialized Economies of Asia. *Research in International Business and Finance*10: 221-228.

Lee, U.(1996). Further Empirical Test of the Proxy-Effect Hypothesis: Some International Evidence. *Journal of International Financial Markets, Institutions and Money* 6: 35-46.

Lee, U. (1998). A Test of the Proxy-Effect Hypothesis: Evidence from Pacific Basin Countries. *Quarterly Journal of Business and Economics* 37: 40-52.

Mishkin, F.S. (2001). Issues in Inflation Targeting. *Price Stability and the Long-Run Target for Monetary Policy*. Bank of Canada (Ottawa, Canada).

Mishkin, F.S., and A. Posen. (1997). Inflation Targeting: Lessons from Four Countries. *Federal Reserve Bank of New York Economic Policy Review.* (August Issue): 9-110.

Mishkin, F.S., and K. Schmidt-Hebbel. (2001). One Decade of Inflation Targeting in the World: What do We Know and What do We Need to Know? *NBER Working Paper Series #8397.*

Mishkin, F.S., and K. Schmidt-Hebbel. (2007). Does Inflation Targeting Make a Difference? *NBER Working Paper Series #12876.*

Nelson, C.R. (1976). Inflation and Rates of Return on Common Stocks. *Journal of Finance* 31: 471-483.

Solnik, B. (1983). The Relation between Stock Prices and Inflationary Expectations: The International Evidence. *Journal of Finance* 38: 35-48.

Thornton, D.L., and D.S. Batten. (1985). Lag-Length Selection and Tests of Granger Causality between Money and Income. *Journal of Money, Credit, and Banking* 17: 164-178.