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Canada: The Inflation Irrelevance Proposition

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Abstract
The underlying thesis is that inflation does not impact in a significant way stock returns. A stronger thesis is that both domestic and foreign inflation rates are neutral to stock returns. This joint hypothesis is tested for Canada, using 5 theoretical models that describe the determinants of Canadian stock returns. These models range from the most stripped one to the least constrained. All 5 models produce evidence of the strong inflation irrelevance hypothesis for the two key variables, Canadian and foreign (US) inflation rates. Naturally, the largest theoretical model is to be selected for inference purposes. This model includes 12 explanatory variables: 2 inflation rates, 2 proxies for earnings, 2 local duration effects, 2 foreign (US) duration effects, the Canadian/US dollar foreign exchange rate, the price of oil, and two categorical variables that pick up the effect of foreign (US) stock markets. The results show that the model provides sign and size effects in conformity with expectations from the theoretical macroeconomic interrelationships. Hence, the paper, besides documenting inflation neutrality, models in a meaningful manner the determinants of the stock market. All in all the empirical results are largely supportive.

Keywords: Stock returns; Inflation neutrality; Determinants of stocks; Multiple regression analysis; Calendar breakpoints; Canada and the US.

1. Introduction

Does inflation matter for stock returns? The hasty and natural answer is yes, although it is unclear whether the direction of the relation is positive or negative. Regardless of the economic transmission mechanism, inflation is a key macroeconomic variable, and the stock market should reflect and factor it in its impact (Flannery and Protopapadakis, 2002). Some commentators believe that stock prices are the present value of all future cash flows, and if cash flows are considered in nominal terms then a nominal discount rate is warranted. Else a real rate should discount real cash flows. Therefore stock prices should not be affected by inflation. The author of the present paper is among these commentators. Other authors have argued that investors have money illusion, discounting real flows by a nominal rate, or discounting nominal flows by a real rate (Campbell and Vuolteenaho, 2004; Modigliani and Cohn, 1979). There is no rational reason for such an irregularity or anomaly in the efficiency of markets. Moreover, money illusion implies that investors never learn from their own mistakes. Other authors have pointed to bracket creep to explain the relation (Feldstein, 1980). Inflation raises nominal cash flows and hence the corporate tax bracket becomes higher, and firms pay more income taxes, leading to higher operating costs which are reflected in higher product prices. Granted that this may be true, inflation also increases the value of the depreciation tax shield, leading to lower taxes.

Brusov *et al.* (2011), derive the equation of the cost of capital when the firm is modeled to have a finite lifetime, thereby relaxing an assumption in the classic analysis of Modigliani and Miller (1958;1963) who assume an infinite horizon. In Brusov *et al.* (2014) the authors apply their equation to the presence of inflation. They find analytically that inflation has adverse effects, lowering the market valuation of firms. Surprisingly in their thoughtful demonstration they assume that cash flows are the same whether there is or there is no inflation. Once such an adjustment is made, the neutrality proposition is rehabilitated.

Still others contend that inflation is seen to have a significant statistical link with stock returns because of the bias in omitting relevant explanatory variables. Once the model is expanded the statistical significance disappears (Azar, 2022). Hence the statistical link is severed. There is a claim that higher stock market prices mirror an increase in economic activity, and a higher output is negatively connected to prices, as the money demand function predicts (Fama, 1981). However, this is not operative for two reasons. First, the stock market replicates unexpected changes, which are on average zero. Second, the hypothesis has no empirical validity. Finally, there are two asset approaches. Stock returns are deemed to be inflation hedges because of their characteristic as real assets. Second, the Fisher hypothesis (Fisher, 1930), in its generalized form and application to stock returns, is frequently mentioned to explain a direct, positive, and unitary relation between expected inflation and nominal rates, given that real rates are taken to be constant. Another strand of the literature maintains that the relation is regime-specific, and that it is subject to data breaks. The episode of the stagflation in the 1970s is an obvious example. In this paper, breaks are indeed found in the sample. But, even by allowing for breaks, there is still no statistical relation for inflation and stock returns within and across breaks. All this leads to the hypothesis of inflation irrelevance that has been put forward and advocated recently and extensively in Azar (2022). This literature finds little empirical evidence for a significant relation.

There are important repercussions to macro policy-making. Lower inflation can still be produced without affecting adversely stock prices. This can be designated as an absence of a Phillips curve, both in the short run and in the long run. Hence, and at least theoretically, the debate is open. The burden of the proof lies in the empirics.

Inflation is usually described to be the result of either a cost-push or a demand-pull mechanism (Schwarzer, 2018). Moreover, inflation is believed to have economic costs. Anticipated inflation creates menu costs. Unanticipated inflation redistributes income from lenders to borrowers, and has substantial effects on the real sector. High inflation and inflation variability distort the information content of prices, and lead to welfare and output losses (Friedman, 1977). Still inflation may be considered to be strictly a monetary phenomenon (Friedman, 1963). Despite the whole intuition behind the economic costs of inflation, inflation remains a nominal variable that should not in principle impact real variables, like stocks. Hence inflation should be irrelevant for stocks. The purpose of this paper is to study this inflation irrelevance proposition for the case of Canada. The choice of Canada is arbitrary, and should not be construed to be the result of a selection bias. In fact, in Azar (2022), Canada is one country within a global and extremely positive assessment of the proposition. See Chapters 9 and 10 for individual countries and for panel modeling respectively.

The originality of the present paper, and its addition to the literature, are as follows. First, both Canadian and USA inflation rates are part of the models. Second, the stance of oil prices is included as an explanatory variable. This variable should capture the dependency of Canada's production on energy and Canada's revenues from oil exports. Third, the Canadian price of one US dollar, i.e. the foreign exchange rate, is another explanatory variable. Fourth, duration effects are assessed. These effects come from changes in both the long term domestic and foreign interest rates. Finally, a proxy for the spillover of the US stock market is considered.

The paper's handling of the irrelevance proposition in Canada consists of five models, classified from the most constrained to the least constrained. The number of independent variables determines the scale of the constraints. All these 5 models fail to reject the irrelevance proposition without exception. This is further proof that the proposition is valid, especially because the US inflation rate, and not only the Canadian inflation rate, is also found to be contiguously irrelevant.

In the next section the five econometric models are introduced and the theory that is behind each is provided. After that section 3 tackles the empirical part. The five models are estimated, econometric diagnostics are computed, and hypothesis testing is undertaken. Most of the diagnostics are about the regression residuals. Residual serial correlation and conditional heteroscedasticity are examined. The results favor well specified functional forms. Hypothesis testing involves testing the joint nullity of the US and Canadian inflation rates in the regressions. Conventional yardsticks support strongly the thesis of the present paper. The last section summarizes and concludes.

2. The Theory and the 5 Models

The first model consists of regressing the log returns of the Canadian stock market against the Canadian and the US inflation rates, with an adjustment for serial dependence by including the first lag of the dependent variable. This model is atheoretical but serves the purpose of replicating the functional forms studied in the empirical literature. The expectation is for a statistically significant dual effect. Surprisingly no statistical significance is reported.

The second model relies on a theoretical construct implied by the well-known Gordon constant dividend growth model of stock prices, with S the stock price, E the EPS, k the cost of equity, g the constant growth rate, κ the payout ratio, and the subscript t the time period.

$$S_t = \frac{(1+g)*\kappa*E_t}{k-g} \quad (1)$$

By taking a first-order Taylor series expansion of the natural log of S with Δ the first-difference operator one has

$$\Delta logS_t \cong \frac{\partial logS}{\partial t}\Delta t + \frac{\partial logS}{\partial k}\Delta k + \frac{\partial logS}{\partial E}\Delta E \quad (2)$$

Which converts to, with μ as an intercept

$$\Delta logS_t \cong \mu - \frac{1}{(k-g)}\Delta k + \frac{\Delta E}{E} \quad (3)$$

If it is held that, with r the real rate, and π the inflation rate

$$k = r + \pi \Rightarrow \Delta k = \Delta r + \Delta\pi \quad (4)$$

And if E is decomposed into domestic E_d and foreign earnings in domestic currency E_f. If $E_f = E_f^f * \theta^{\varphi}$, where θ is the Canadian foreign exchange rate against the US dollar, E_f^f is foreign earnings in foreign currency, and φ is an elasticity parameter, then

$$\Delta logE_f = \Delta logE_f^f + \varphi\Delta log\theta$$

And the relation becomes

$$\Delta logS \cong \mu + \rho\pi + \lambda\pi_{us} - \frac{1}{(k-g)}\Delta r - \frac{1}{(k-g)}\Delta\pi + \Delta logE_d + \Delta logE_f^f + \varphi\Delta log\theta \quad (5)$$

This is model 2 in which stock log returns $\Delta logS$ are explained by 5 additional variables, which are the change in real interest rates Δr, the change in domestic inflation $\Delta\pi$, the rate of change of domestic Canadian earnings E_d, the rate of change of foreign US earnings E_f^f, and the rate of change of the foreign exchange rate θ. Notice that the coefficients on $\Delta logE_d$ and $\Delta logE_f^f$ are unitary. The null hypothesis is that $\rho = \lambda = 0$. This corresponds to the strong form of the inflation irrelevance proposition.

Model 3 is the same as Model 2 except that there is the addition of an oil price variable, which is denoted as Z, and which has as impact β. Canada is a major energy exporter and oil should enter positively in a stock return equation. Moreover, energy is an important input factor in the technology of production. Model 3 is thus

$$\Delta logS \cong \mu + \rho\pi + \lambda\pi_{us} - \frac{1}{(k-g)}\Delta r - \frac{1}{(k-g)}\Delta\pi + \Delta logE_d + \Delta logE_f^f + \varphi\Delta log\theta + \beta\Delta logZ \quad (6)$$

Model 4 generalizes the duration equation to foreign effects. Equation (4) becomes with α and γ as parameters, and the subscripts are for the US

$$k = r + \pi + \alpha r_{us} + \gamma\pi_{us} \Rightarrow \Delta k = \Delta r + \Delta\pi + \alpha\Delta r_{us} + \gamma\Delta\pi_{us} \quad (7)$$

Model 4 then takes the following form

$$\Delta logS \cong \mu + \rho\pi + \lambda\pi_{us} - \frac{1}{(k-g)}\Delta r - \frac{1}{(k-g)}\Delta\pi + \Delta logE_d + \Delta logE_f^f + \varphi\Delta log\theta + \beta\Delta logZ + \frac{\alpha}{(k-g)}\Delta r_{us} + \frac{\gamma}{(k-g)}\Delta\pi_{us} \quad (8)$$

To derive Model 5 a dummy variable, called $DUMMY$, is generated, and it equals 1 if the S&P 500 rises and zero if the S&P 500 declines. Hence two new variables are now defined: $DUMMY$ and $(1 - DUMMY)$. These two variables replace the regression constant for reasons of perfect collinearity. Therefore, Model 5 is

$$\Delta logS \cong \rho\pi + \lambda\pi_{us} - \frac{1}{(k-g)}\Delta r - \frac{1}{(k-g)}\Delta\pi + \Delta logE_d + \Delta logE_f^f + \varphi\Delta log\theta + \beta\Delta logZ + \frac{\alpha}{(k-g)}\Delta r_{us} + \frac{\gamma}{(k-g)}\Delta\pi_{us} + \eta DUMMY + \nu(1 - DUMMY) \quad (9)$$

Where η and ν are constant parameters. In all these 5 models, the null hypothesis is that $\rho = \lambda = 0$. This corresponds to the inflation irrelevance proposition generalized to incorporate the US inflation rate in addition to the Canadian inflation rate.

3. The Empirical Results

3.1. Source and Definition of Data

All data span the monthly period between end-December 1970 and end-June 2022, consist of 615 observations, and are retrieved from the web site of the Federal Reserve Bank of Saint Louis (FRED), except the S&P 500 stock market index which is taken from the following web site: https://www.multpl.com/s-p-500-historical-prices/table/by-month. The Canadian stock market and the DJIA are both all share prices. The inflation rates are based on the CPI index. Industrial productions proxy domestic Canadian and foreign or US earning levels. The oil price is the WTI crude oil price. The foreign exchange rate is the price of one US dollar in Canadian dollars. An increase in this rate is a depreciation of the Canadian dollar. Interest rates are for the 10-year T-securities.

3.2. Model 1

Model 1 is a regression of the Canadian stock market log returns on the two respective inflation rates, Canadian and US, with the inclusion of the first lag of the dependent variable in order to remedy for serial dependence. See Table 1. The object of Model 1 is to test the stripped effect of inflation rates, and the model does not rely on any theoretical fundamentals. The reader is reminded that originally in the 1970s the regression equation had only inflation as an explanatory variable (Fama and Schwert, 1977). International but also restrictive evidence came later like in Solnik (1983). Hence the specification of Model 1 is intended to allow comparing with the results of the previous literature. Three hypotheses are tested. One, the coefficient on the Canadian inflation rate is statistically insignificant. The corresponding t-statistic is 0.6617 and has a p-value of 0.5084. Two, the coefficient on the US inflation rate is statistically insignificant. The corresponding t-statistic is 0.3233 and has a p-value of 0.7466. Three, the two coefficients are jointly equal to zero, and the actual p-value for the test is 0.6071, failing to reject the joint nullity of the effects of the two inflation rates. Inflation is therefore neutral.

3.3. Model 2

Model 2 comprises in addition to Model 1 five variables: the Canadian dollar, the Canadian and US industrial productions, the change in real *ex post* Canadian interest rates, and the change in the Canadian inflation rate. The first 3 variables are inserted in terms of the first-difference of their natural logs. The last two variables should measure duration effects. A depreciation of the Canadian dollar is expected to impact positively Canadian stock returns. This follows from the empirical evidence for the US (Azar, 2022), and is based on the argument that a depreciation of the foreign exchange rate encourages exports which has a positive effect on foreign earnings and on stock returns of multinational firms. The Canadian industrial production is expected to enter positively. Higher domestic output is associated with higher earnings. Earnings are a percent or a fraction of production or sales. Similarly, the US industrial production is expected to have also a positive coefficient, as increases in foreign output generate more foreign earnings for international and multinational stocks. Again foreign earnings are a percent of sales, or a fraction of output. These output fractions, which measure profitability ratios, and specifically profit margins on sales, will appear appended on the coefficient of the underlying output variable in the regression. Duration is expected to enter negatively. Moreover, the implied duration from a change in real interest rates is expected to be equal to the implied duration from a change in Canadian inflation rates.

Actual results are as follows. The Canadian foreign exchange rate is statistically significant, but is negatively related to Canadian stocks, against all expectations. Maybe a depreciation of the Canadian dollar hurts the tradable and import sector and this sector dominates the whole stock market. Or, a strong Canadian dollar is a mirror to a strong economy. The foreign exchange rate elasticity φ is statistically insignificantly different from -1. The two coefficients on Canadian and US industrial production are positive but statistically insignificant. They imply profitability ratios, or profit on output or sales, of 9.38% for domestic business and 24.9% for foreign commerce. It seems as if the latter is more risky to justify such a high profitability rate. As expected the durations are estimated to be negative and to have a very high statistical significance. The durations are in years, and the estimates are 38.86 years and 39.25 years, relative to the change in the real interest rate and in the inflation rate respectively, figures that are very reasonable for securities like stocks which have theoretically an indefinite maturity or infinite life. They also measure the absolute inverse of the dividend yield, which is estimated to be 2.57% and 2.55% relative to the change in the real interest rate and in the inflation rate respectively. Such estimates are not unreasonable. Finally, the null that the two durations are equal fails to be rejected with a p-value of 0.3199, which indicates that the variables are correctly measured with little error.

Turning towards the main topic of interest, the Canadian and US inflation betas, which are expected to be separately and jointly statistically insignificant, the results are as follows. The two betas are indeed statistically insignificant with t-statistics of 0.977 and 0.547, and p-values of 0.3288 and 0.5847 respectively. Moreover, the two betas are jointly statistically insignificant with a joint p-value of 0.2380. Therefore the inflation irrelevance proposition is safely, fairly and strongly supported.

3.4. Model 3

In Model 3 the additional explanatory variable is the difference in the log of the price of the WTI crude oil. The expected statistical outcomes for the other variables are the same as in the previous subsection. The impact of oil prices is positive (0.07857) on Canadian stock markets, and is statistically significant (t-stat.: 3.719, p-value: 0.0002). This implies that a 1% increase in oil prices increases stocks by 0.07857%, which seems to be a very low figure. But another interpretation is possible. Oil or energy is a factor input in the production process. So, at the optimum, the marginal product of energy is equal to the price of oil. A higher marginal product is a higher output or sales level originating from oil as a factor input. It must be multiplied by the profitability ratio to convert the product into earnings. Therefore the estimate of 0.07857 is an estimate of the profitability ratio. The reader is reminded that the analysis is similar to that carried out for the effect of industrial production. In both cases the parameter slopes are measures of profitability ratios, and particularly profit margins on sales.

In what concerns the essential feature of the analysis which is inflation irrelevance, there is one peculiar outcome. The Canadian inflation beta is still estimated to be positive and statistically insignificant. However, the US inflation beta is estimated to be negative, while still being statistically insignificant. This indicates that the measure of the inflation beta is not necessarily positive as some would argue in support of non-neutrality of inflation. The two betas are indeed statistically insignificant with t-statistics of 1.267 and -0.437, and p-values of 0.2057 and 0.5158 respectively. Moreover, the two betas are jointly statistically insignificant with a joint p-value of 0.4297. Therefore the inflation irrelevance proposition is again safely, fairly and strongly supported.

3.5. Model 4

Model 4 includes two additional variables on Model 3: the duration effect of changes in foreign or US real interest rates and foreign or US inflation rates. As expected the two durations are positive and are highly significant statistically, with p-values lower than 0.0022. The estimates for duration are 38.98 years and 39.57 years for changes in the US real rate and in the US inflation rate respectively. And the two are equal with a p-value of 0.4011. The implied dividend yields are respectively 2.57% and 2.53%. However, including the US counterparts has changed the estimates of the durations from home rates. They become 73.007 years and 73.63 years. These durations are relatively high and they imply too low and unreasonable dividend yields. The energy price variable produces a figure of 6.57% as a measure of the margin on sales, or as a profitability ratio. The domestic profitability ratio is 2.95% while the foreign one is 13.10%. These also indicate more risk for foreign transactions, but the domestic profitability is nevertheless too low. The foreign exchange rate elasticity is -0.844.

In what concerns the essential analysis which is inflation irrelevance, there is one important and solid outcome. The Canadian inflation beta is still estimated to be positive and statistically insignificant. However, the US inflation beta is estimated to be negative, while still being statistically insignificant. This indicates that the measure of the inflation beta is not necessarily positive as some would argue in support of non-neutrality of inflation. The two betas are indeed statistically insignificant with t-statistics of 1.297 and -0.636, and p-values of 0.1950 and 0.3853 respectively. Moreover, the two betas are jointly statistically insignificant with a joint p-value of 0.3304. Therefore the inflation irrelevance proposition is once again safely, fairly and strongly supported.

3.6. Model 5

Model 5 is the fully unconstrained model, and should provide the final estimates to the working problem at hand. It is estimated with robust HAC standard errors, based on the Newey-West procedure. Model 5 is differentiated from Model 4 by its inclusion of two dummy or categorical variables that stand for the US stock market developments. When the US equity index is an explanatory variable econometric diagnostics deteriorate visibly. It does not matter which variable is taken, the returns on the S&P 500 or on the DJIA, the diagnostics are and remain unfavorable. There is no valid economic reason for such an anomaly or occurrence. In order to circumvent the statistical problem a dummy or binary variable is generated. It takes the value 1 if the log returns of the S&P 500 index are positive, and the value zero otherwise. It is named $DUMMY$. Its complement is $1 - DUMMY$. Both variables replace the regression constant to avoid perfect collinearity. With such a transformation the effect of the US equity market is part of the analysis, although indirectly, and statistical deterioration is avoided.

The foreign exchange rate elasticity is -0.549 and is the lowest among all five models in absolute values. Hence, contrary to previous matters, the elasticity is inelastic, although it remains negative. A one percent depreciation of the Canadian dollar reduces Canada’s stock market by -0.549%. The fact that this elasticity is negative is troublesome because the evidence on the US stock market points to an opposite outcome: a depreciation of the US dollar raises US stock prices. Another interpretation is that a strong Canadian dollar may reflect a strong economy.

The profitability ratios of the Canadian and US industrial production are 5.22% and 5.60% respectively. These estimates are more reasonable than those found above, with the other 4 models. They represent profit margins on sales and their magnitudes are in conformity to traditional ratio analysis. Moreover they indicate equality of product market risk between domestic and foreign activities. There is no reason to expect that foreign business is riskier than domestic business.

The durations relative to Canadian rate data are negative and are 58.81 years and 59.31 years, depending on whether they are the result of changes in real interest rates or of changes in the inflation rate. The two values are immaterially different (p-value: 0.5238). The implied dividend yields are 1.70% and 1.69%. The durations relative to US rate data are positive and are 33.59 years and 34.00 years, implying dividend yields of 2.98% and 2.94%. The two duration values are immaterially different (p-value: 0.1933). Nevertheless, the four duration values are different from each other (p-value: 0.0074).

The energy marginal product, stemming from the price of energy, provides an estimate of 6.15% for the profit margin on sales, and is fairly constant across models although that it tends to fall as one moves to less constraining models. A hypothesis test is applied to check whether the 3 profitability ratios are equal to each other. The first ratio is obtained from the coefficient on the Canadian industrial production. The second is from that on the US industrial production. The last one is the one predicted by oil prices. The test produces an actual p-value of 0.9962, failing to reject coefficient equality.

The dummies are characterized by a high significance level. A rise in the US stock market leads to a rise in the Canadian stock market. A fall in the US stock market leads to a fall in the Canadian stock market. On average the monthly gain in the Canadian stock market in case of a strong US equity is 1.60%, and the monthly loss is -1.88% in case of a bearish US equity market. The p-value for testing that these two coefficients are equal in absolute terms is high, at 0.5170, failing to reject equality.

In what concerns the analysis of inflation irrelevance, there is one important and recurring outcome. The Canadian inflation beta is still estimated to be positive and statistically insignificant. However, the US inflation beta is estimated to be negative, while still being statistically insignificant. This indicates that the measure of the inflation beta is not necessarily positive as some would argue in support of non-neutrality of inflation, and this means that estimates of the inflation betas are truly random, taking random signs. The two betas are indeed statistically insignificant with t-statistics of 1.248 and -0.2294, and p-values of 0.2126 and 0.8186 respectively. Moreover, the two betas are jointly statistically insignificant with a joint p-value of 0.5170. Therefore the inflation irrelevance proposition is one more time safely, fairly and strongly supported.

Table 1 includes 3 econometric diagnostics: the adjusted R-Square, the Ljung-Box Q-statistics on the residuals squared, for up to 6 and up to 12 lags, and a serial correlation test for 12 residual lags. The adjusted R-square are modest for Models 1 and 2. They reach around 18% in Models 3 and 4, and they culminate at 32% for Model 5. These are highly unexpected results, especially for the last model. An R-Square of 32% for monthly stock data is relatively rare. The Q-statistics reject the presence of conditional heteroscedasticity, except for one case out of 10. And the serial correlation tests reject the presence of serial correlation. Hence, the residuals are independently and identically distributed for all models. The econometric diagnostics are extremely favorable, and the model is well-specified.

Some authors have commented that the inflation irrelevance relation depends on the periodicity. This means that during certain pre-specified periods the inflation beta will turn out to be either positive, or negative, or nil. This is especially critical if the sample is long in size, as it is in the present paper. One crying example is usually provided in the literature: the stagflation turnout of the 1970s. During that period inflation and recession cohabited. Hence, checking for calendar breakpoints becomes essential. Fortunately there is an econometric procedure that tests for such instability, and it is Least Squares with Breaks. Table 2 shows the statistical results. The estimation is with robust HAC standard errors, based on the Newey-West procedure. The statistical package identifies two breakpoints: 1995M10, and 2009M04. Therefore there are three different subsamples. It is possible to test for parameter stability by two methods: the Wald coefficient test, and the variable redundancy test. The first test carries a p-value of 0.6309, and the second 0.8618. Both fail to reject the null that the coefficients are stable across subsamples.

As an additional support, the Quandt-Andrews unknown breakpoint test is applied with 15% trimmed data. It identifies only one breakpoint: 1995M07. The Chow breakpoint test is also applied for the two breakpoints: 1995M10, and 2009M04. Only the first period has a valid breakpoint, providing support to the Quandt-Andrews unknown breakpoint test. Therefore there is at least one breakpoint in the whole sample, and this breakpoint does not materially affect the stability or the constancy of the inflation betas. These remain statistically insignificant. The argument that the irrelevance thesis depends critically on the policy regime, and that there are periods of contrasting results does not hold. Indeed there are breakpoints but these do not change the ultimate and fundamental hypothesis of inflation irrelevance.

4. Conclusion

The present paper has a dual purpose. The major intent is to test for inflation irrelevance in Canada. The inflation irrelevance proposition states that the stock market does not react to domestic inflation, and, more strongly, to foreign (US) inflation. This follows from the equilibrium relation that stock markets are Net Present Values, discounting nominal net cash flows at a nominal rate or, equivalently, discounting real net cash flows at a real rate. The basic, and constrained model studies the lone effect of inflation rates on Canadian stock index returns. This assumes that no other explanatory variables are of importance. Four other expanded models of stock returns are envisaged, and they all depend on a simple characterization of stock prices, which is the Gordon constant dividend growth model. The 4 models try to identify all the variables that impact theoretically stock prices, by considering the theoretical determinants of stock prices. This is the other intent of the paper. On this issue, the comments in the literature are contrasting. Some believe that inflation matters if other variables are included in an encompassing model, while others suggest that additional variables are needed to prevent inflation from being a significant factor. In the present paper both alternatives are discussed. What is empirically found is surprising but comforting: inflation enters statistically insignificantly in both cases, i.e. in case the model is stripped or totally unconstrained. This result is surprising because of its unexpected and strong support to inflation irrelevance, whatever the model specification. It is comforting because a simple principle of neutrality is enough to describe the reaction and the determinants of stocks. It is true that the sample is characterized by calendar breakpoints. But these breakpoints leave the irrelevance hypothesis intact.

Thus, while inflation irrelevance stands forcefully, the estimated models give a synopsis of the effect of other fundamental variables on stock returns. The interrelationships between domestic and foreign stock prices, domestic and foreign interest rates, domestic and foreign earnings, and foreign exchange rates show up solidly and soundly as expected. There is one caveat. While inflation is neutral and irrelevant the *changes* in local and foreign inflation rates are not. However, this is not due to changes in purchasing power but to duration effects and rate risks. And these effects and risks appear only in the enlarged models.

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Table-1. Multiple regression analysis. The dependent variable is the log relative of the Canadian market stock index

variable		Model 1	Model 2	Model 3	Model 4	Model 5
constant	Coefficient	0.002771	0.001784	0.003614	0.004239	
	t-Statistic	1.100659	0.733186	1.470378	1.69566	
	Prob.	0.2715	0.4637	0.142	0.0905	
Canadian inflation rate	Coefficient	0.284953	0.536979	0.690707	0.725253	0.761026
	t-Statistic	0.661676	0.977353	1.266759	1.297432	1.247829
	Prob.	0.5084	0.3288	0.2057	0.195	0.2126
US inflation rate	Coefficient	0.20298	0.352364	-0.43701	-0.63588	-0.18931
	t-Statistic	0.323305	0.546783	-0.65021	-0.86877	-0.22941
	Prob.	0.7466	0.5847	0.5158	0.3853	0.8186
The log relative of the Canadian/US dollar rate	Coefficient		-0.98275	-0.84141	-0.84387	-0.54944
	t-Statistic		-8.49978	-6.9792	-7.04198	-3.23262
	Prob.		0	0	0	0.0013
Log relative of the Canadian industrial production	Coefficient		0.093767	0.046335	0.029545	0.052203
	t-Statistic		0.580052	0.288739	0.185248	0.310925
	Prob.		0.5621	0.7729	0.8531	0.756
Log relative of the US industrial production	Coefficient		0.248975	0.130639	0.130986	0.05597
	t-Statistic		1.181982	0.619561	0.624616	0.236857
	Prob.		0.2377	0.5358	0.5325	0.8128
Change in the Canadian real ex post interest rate	Coefficient		-38.8564	-40.6668	-73.007	-58.8117
	t-Statistic		-5.41237	-5.71091	-5.706	-3.64102
	Prob.		0	0	0	0.0003
Change in the Canadian inflation rate	Coefficient		-39.2425	-41.2037	-73.6291	-59.3052
	t-Statistic		-5.4545	-5.77171	-5.75401	-3.68055
	Prob.		0	0	0	0.0003
Log relative of the price of oil	Coefficient			0.07857	0.065717	0.061526
	t-Statistic			3.719148	3.044124	2.506622
	Prob.			0.0002	0.0024	0.0125
Change in the US real ex post interest rate	Coefficient				38.98379	33.59619
	t-Statistic				3.079546	2.272623
	Prob.				0.0022	0.0234
Change in the US inflation rate	Coefficient				39.57099	33.99978
	t-Statistic				3.122811	2.288567
	Prob.				0.0019	0.0225
DUMMY	Coefficient					0.015976
	t-Statistic					7.13582
	Prob.					0
1-DUMMY	Coefficient					-0.01881
	t-Statistic					-5.99962
	Prob.					0
Lagged Canadian stock market log return	Coefficient	0.121263				
	t-Statistic	2.966763				
	Prob.	0.0031				
Adjusted R-Square		0.012785	0.017572	0.177655	0.191408	0.321093
Ljung-Box Q^2-statistic 6 lags		0.366	0.405	0.240	0.167	0.025
12 lags		0.653	0.743	0.651	0.583	0.230
Serial correlation test		0.3449	0.5633	0.5443	0.6696	0.5554
Hypothesis test		0.6071	0.2380	0.4297	0.3304	0.5170

Notes: The Ljung-Box Q2-statistic is on the squared residuals. The actual p-value is reported for 6 and 12 lags.

The serial correlation test is the Breusch-Godfrey Serial Correlation LM Test for 12 lags. The actual p-value is reported. The hypothesis test is for the null that the two inflation betas are zero. The actual p-value is reported.

Table-2. Multiple regression. Dependent Variable: log relative of the Canadian market stock index Sample (adjusted): 1971M02 2022M02. Included observations: 613 Breaks: 1995M10, 2009M04HAC standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1971M02 - 1995M09 -- 296 observations				
Canadian inflation	0.478303	0.853560	0.560362	0.5754
US inflation	0.222405	1.306748	0.170197	0.8649
Canadian price of one US dollar	-0.045650	0.272865	-0.167298	0.8672
Canadian industrial production	-0.189209	0.255044	-0.741868	0.4585
US industrial production	0.610649	0.394398	1.548304	0.1221
Canadian real interest rate	-50.19728	18.58682	-2.700692	0.0071
Change in Canadian inflation	-50.95174	18.51901	-2.751321	0.0061
Price of oil	0.019308	0.026549	0.727261	0.4674
US real interest rate	14.30258	16.26128	0.879548	0.3795
Change in US inflation	12.62195	16.08252	0.784824	0.4329
DUMMY	0.014769	0.004506	3.277499	0.0011
1-DUMMY	-0.019679	0.005904	-3.332849	0.0009
1995M10 - 2009M03 -- 162 observations				
Canadian inflation	0.749199	1.106969	0.676802	0.4988
US inflation	-1.652860	1.026056	-1.610886	0.1078
Canadian price of one US dollar	-0.837578	0.238590	-3.510529	0.0005
Canadian industrial production	0.535186	0.234470	2.282536	0.0228
US industrial production	-0.523543	0.451360	-1.159925	0.2466
Canadian real interest rate	-147.9495	48.38159	-3.057971	0.0023
Change in Canadian inflation	-148.3761	48.50773	-3.058814	0.0023
Price of oil	0.092896	0.026754	3.472166	0.0006
US real interest rate	132.8114	34.45296	3.854861	0.0001
Change in US inflation	135.3128	34.34155	3.940206	0.0001
DUMMY	0.020864	0.003428	6.086210	0.0000
1-DUMMY	-0.018487	0.004467	-4.138321	0.0000
2009M04 - 2022M02 -- 155 observations				
Canadian inflation	0.471104	0.661095	0.712611	0.4764
US inflation	-0.086637	1.040349	-0.083276	0.9337
Canadian price of one US dollar	-0.402296	0.192411	-2.090824	0.0370
Canadian industrial production	0.163707	0.244206	0.670365	0.5029
US industrial production	-0.413571	0.309624	-1.335717	0.1822
Canadian real interest rate	-91.27675	31.93505	-2.858200	0.0044
Change in Canadian inflation	-90.71427	31.71748	-2.860071	0.0044
Price of oil	0.127123	0.027099	4.691045	0.0000
US real interest rate	82.38459	30.07689	2.739133	0.0064
Change in US inflation	81.16923	29.38706	2.762074	0.0059
DUMMY	0.011341	0.002834	4.001716	0.0001
1-DUMMY	-0.011362	0.002984	-3.807853	0.0002
R-squared	0.393074	Mean dependent variable		0.005057
Adjusted R-squared	0.356259	S.D. dependent variable		0.044533
S.E. of regression	0.035730	Akaike information criterion		-3.768692
Sum squared residuals	0.736638	Schwarz criterion		-3.509212
Log likelihood	1191.104	Hannan-Quinn criterion		-3.667779
Durbin-Watson statistic	2.117999			