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Additional Evidence on Information Variables and Equity Premium Predictability

par

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Préambule

La gestion financière responsable vise la maximisation de la richesse relative au risque dans le respect du bien commun des diverses parties prenantes, actuelles et futures, tant de l'entreprise que de l'économie en général. Bien que ce concept ne soit pas en contradiction avec la définition de la théorie financière moderne, les applications qui en découlent exigent un comportement à la fois financièrement et socialement responsable. La gestion responsable des risques financiers, le cadre réglementaire et les mécanismes de saine gouvernance doivent pallier aux lacunes d'un système parfois trop permissif et naïf à l'égard des actions des intervenants de la libre entreprise.

Or, certaines pratiques de l'industrie de la finance et de dirigeants d'entreprises ont été sévèrement critiquées depuis le début des années 2000. De la bulle technologique (2000) jusqu'à la mise en lumière de crimes financiers [Enron (2001) et Worldcom (2002)], en passant par la mauvaise évaluation des titres toxiques lors de la crise des subprimes (2007), la fragilité du secteur financier américain (2008) et le lourd endettement de certains pays souverains, la dernière décennie a été marquée par plusieurs événements qui font ressortir plusieurs éléments inadéquats de la gestion financière. Une gestion de risque plus responsable, une meilleure compréhension des comportements des gestionnaires, des modèles d'évaluation plus performants et complets intégrant des critères extra-financiers, l'établissement d'un cadre réglementaire axé sur la pérennité du bien commun d'une société constituent autant de pistes de solution auxquels doivent s'intéresser tant les académiciens que les professionnels de l'industrie. C'est en mettant à contribution tant le savoir scientifique et pratique que nous pourrons faire passer la finance responsable d'un positionnement en périphérie de la finance fondamentale à une place plus centrale. Le développement des connaissances en finance responsable est au cœur de la mission et des intérêts de recherche des membres du Groupe de Recherche en Finance Appliquée (GReFA) de l'Université de Sherbrooke.

Cette étude traite de l'un des enjeux les plus fondamentaux en évaluation des prix des titres financiers, soit la prévisibilité de la prime de risque de marché. Nous proposons d'étudier un large éventail de variables de prévision dans un contexte canadien, ce qui permet de nous distinguer des nombreuses études réalisées à l'aide de données américaines. Ceci permet de vérifier si le pouvoir explicatif de certaines variables jugées performantes avec des données américaines persiste dans un contexte canadien, ou s'il s'agit plutôt de liens statistiques faussés par le recours à un échantillon spécifique. Nos résultats confirment que la prime de risque canadienne est prévisible, mais remettent néanmoins en question le succès de certaines variables jugées performantes avec des données américaines.

Additional Evidence on Information Variables and Equity Premium Predictability*

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Abstract

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JEL Classification: G11, G12, G14, C53

Keywords: Predictability; Equity Premium; Information Variables

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Additional Evidence on Information Variables and Equity Premium Predictability

Abstract

This paper presents the most comprehensive out-of-U.S.-sample examination of information variables and equity premium predictability by focusing on Canada to reassess the growing U.S.-based evidence casting doubt on predictability. Using monthly data for 36 variables from 1950 to 2013, we test their individual predictive ability and provide a new empirical assessment of the related econometric issues. We find conclusive and robust evidence of in-sample, out-of-sample and economically meaningful predictability of the Canadian equity premium, providing guidance on each variable as a market indicator. Our results nevertheless raise questions on some variables that have been successful U.S. predictors.

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1. Introduction

The predictability of the equity premium is a topic of high importance in economics and finance. A large number of empirical studies conclude that the equity premium is predictable with information variables (also called predictive/state variables or market indicators) like inflation, the Treasury bill yield, the term premium, the credit (or default) premium, the dividend yield or the dividend price ratio, etc.[1] A common impression that predictability is significant has led to the use of information variables in numerous financial applications. In particular, the role of time-varying economic conditions in conditional investigations of asset pricing and testing (e.g., Shanken, 1990; Ferson and Harvey, 1991), performance evaluation (e.g., Ferson and Schadt, 1996) and asset allocation (e.g., Kandel and Stambaugh, 1996; Campbell and Viceira, 1998) have now become prevalent. In practice, the topic has also the utmost relevance for investors using market timing strategies and economists interested in the business cycle.

More recently, a literature has developed casting doubt on the evidence and usefulness of predictability. Arguments include data mining, small sample bias, spurious regression, model instability, structural breaks, poor predictive ability, low economic value and real time availability of data and statistical methods (see, among others, Nelson and Kim, 1993; Pesaran and Timmermann, 1995; Bossaerts and Hillion, 1999; Stambaugh, 1999; Sullivan et al., 1999; Pesaran and Timmermann, 2002; Ferson et al., 2003; Goyal and Welch, 2003; Cooper et al., 2005; Paye and Timmermann, 2006; Rapach and Wohar, 2006; Ang and Bekaert, 2007; Timmermann, 2008; Welch and Goyal, 2008; Powell et al., 2009; Turner, 2015; McLean and Pontiff, 2016). For examples, Ferson et al. (2003) conclude that "many of the regressions in the literature, based on individual predictor variables, may be spurious," and Welch and Goyal (2008) add that "these models would not have helped an investor with access only to available information to profitably time the market." This literature is not without its own critics (see, among others,

[1] The literature is too voluminous to cover fully as it goes back to Dow (1920). Some classic studies include Nelson (1976), Fama and Schwert (1977), Fama (1981), Keim and Stambaugh (1986), Campbell (1987), Campbell and Shiller (1988), Fama and French (1988, 1989), and Breen et al. (1989).

Lewellen, 2004; Marquering and Verbeek, 2004; Campbell and Yogo, 2006; Campbell and Thompson, 2008; Cochrane, 2008; Rapach et al., 2010; Maio, 2013, 2016; Pettenuzzo et al., 2014; Li and Tsiakas, 2016). Given this debate and the overall importance of the topic, new evidence on the issue is needed.

This paper presents the most comprehensive examination of information variables and equity premium predictability outside the U.S. by focusing on Canada. Specifically, we identify 36 potential information variables and test their individual predictive ability for the Canadian monthly equity premium. The information variables include market characteristics, interest rate levels, changes and spreads, macroeconomic indicators and Canadian-specific variables. We provide in-sample (IS), out-of-sample (OOS) and economic value evidence using common estimation techniques and performance measures, as well as a long time series covering the period from 1950 to 2013. Our analysis has two motivations.

First and foremost, given that the current debate on predictability concentrates almost exclusively on the U.S. case, our Canadian examination provides a robustness check to shed a new light on the current doubts on predictability. As most of our 36 potential information variables have been shown as useful predictors in the U.S., our results provide out-of-U.S.-sample evidence that alleviates the data mining issue. Our sample is interesting as the Canadian and U.S. economic environments are relatively similar so that commonly-used information variables are expected to be relevant, yet the variables' measurement errors and other noise should be partly unrelated. Along with our large and unique dataset, we also carefully choose our estimation techniques and performance measures to mitigate known econometric issues and hence are able to give an out-of-U.S.-sample assessment of the importance of small sample bias, spurious regression, model instability, structural breaks, poor predictive ability, low economic value and real time data availability. Our findings provide the most in-depth look at information variables and predictability issues in any single country outside the U.S.

Second, despite the importance of predictability for Canadian academics and practitioners, there is currently little evidence of relevant information variables and equity premium predictability in Canada. Our review of the literature using Canadian data shows that existing studies are characterized by the examination of a small number of variables, the use of a short time series and a focus on IS results. For example, in contrast to the comprehensive nature of our investigation, no existing article documents IS and OOS results in Canada for more than five variables using a sample period of more than 30 years.[2] Furthermore, the Canadian evidence is often not conclusive, with contradictory results on the significance of predictability for six out of the eight variables investigated by more than one article. Overall, out of our 36 potential information variables, 19 variables are studied for the first time in Canada.

We reach the following conclusions from our empirical results. First, we find conclusive evidence of IS and OOS predictability of the Canadian equity premium. Using simulated cut-offs to account for the small sample bias and the spurious regression concern, 17 of the 36 information variables we investigate are IS significant at the 10% level and seven of these variables are OOS significant as well: the previous equity premium, the variation in the Treasury bill yields, the variation in the long-term government bond yields, the long-term government bond yield relative to its one-year moving average, the gross domestic product growth, the composite leading indicator growth and the variation in the CAD/USD exchange rate. Although the predictive power of the information variables is typically low, we establish that the predictions are economically meaningful for a mean-variance investor.

Second, we find many cases where, similar to the findings of Welch and Goyal (2008), the predictive ability of the information variables does not appear to be stable using a sub-period analysis. While the predictive ability might have disappeared for some variables, there is also evidence suggesting that the predictive ability of numerous variables differs in the inflationary context of the 1970-1989 sub-period versus the low-inflation context of the other sub-periods we investigate. If we focus more specifically on the results of the last sub-period, perhaps the most relevant for current investors and economists, we

[2] We are able to identify ten articles with some Canadian equity predictability evidence: Solnik (1993), Ferson and Harvey (1994), Carmichael and Samson (1996), Korkie and Turtle (1998), Rapach et al. (2005), Guo (2006b), Paye and Timmermann (2006), Deaves et al. (2008), Hjalmarsson (2010), and Rapach et al. (2013). Rapach et al. (2005) and Hjalmarsson (2010) are the two studies with Canadian contents the most related to ours in terms of methodology, although the country is just one of the many countries they examine. For Canada, they consider six predictive variables with data from 1975 to 2001 and four predictive variables with data from 1952 to 2004, respectively.

document eight information variables that are both IS and OOS significant, *i.e.* the previous equity premium, the Treasury bill yield, the term premium, the return-based credit premium, the gross domestic product growth, the Bank of Canada prime rate, the composite leading indicator growth and the variation in the CAD/USD exchange rate. The Canadian equity premium has thus also been predictable from 1990 to 2013. To investigate the statistical significance of the instability, we implement the tests for multiple structural breaks of Bai and Perron (1998, 2003a, 2003b). We find that the predictive relations are stable enough to accept the null hypothesis of no break for most information variables.

Overall, in contrast to Welch and Goyal (2008) and other doubters, our findings support the evidence in favor of significant and useful predictability. They also suggest that predictability might be robust to the econometric issues raised in the literature. Hence, they reinforce the use of information variables as market indicators for investors and as conditioning instruments in empirical asset pricing investigations of conditional models. However, they also raise questions on the forecasting ability of some variables that have been successful predictors for the U.S. equity premium. In particular, the widely-used dividend yield, dividend-price ratio and credit premium (or default spread) variables, as well as the cross-sectional beta price of risk variable of Polk et al. (2006), the stock variance variable of Guo (2006a) and the issuing activity variable of Boudoukh et al. (2007) show little significant predictive ability in a Canadian context.

The rest of the paper is divided as follows. The next section provides the methodology for estimating and measuring the performance of the IS and OOS predictions, and for establishing their economic value. Section 3 summarizes the data, including the sources for the variables and their descriptive statistics. Section 4 presents and interprets the empirical results. Section 5 concludes. Appendix A gives a detailed description of the construction of the information variables. Appendix B identifies and characterizes the existing Canadian evidence on the predictive ability of the information variables under investigation.

2. Methodology

We examine the monthly predictive ability of information variables for the Canadian equity premium with an in-sample (IS) and an out-of-sample (OOS) analysis covering the period from 1950 to 2013. We also assess the economic value of the predictions for a mean-variance investor.

2.1 IN-SAMPLE (IS) PREDICTABILITY

We first estimate the coefficients of a predictive regression for each information variable with the full available sample. Our goal is to document, with a common technique and time period, which variables in our list contribute significantly to explain the Canadian equity premium in sample.

Specifically, let EQP_t be the equity premium at time *t* and let $ZVAR_{it-1}$ be the information variable *i* at time *t*–1. The *t*–1 time indicator of the variable explicitly reminds that it is predetermined compare to the equity premium. Then, for each information variable, we estimate the following regression:

$$EQP_t = a + b \times ZVAR_{it-1} + \varepsilon_t \qquad (1)$$

The estimation is done using the generalized method of moments of Hansen (1982) with the independent variable as instrument. This results in a just identified system and produces OLS estimates for the parameters. Heteroskedasticity and autocorrelation consistent (HAC) Newey and West (1987) standard errors are used to form *t*-statistics on the significance of the coefficient.[3] We also compute the adjusted coefficient of determination $\overline{R}^2$ of the predictive regression and test its significance with the *F*-statistic.

In order to analyse the stability of the full-period predictive relations, we also estimate the IS regressions in three sub-periods (1950 to 1969, 1970 to 1989 and 1990 to 2013). By verifying if the information variables present a change of significance from the full period to the sub-periods, these results are useful in detecting potential structural changes in the relationship. We also implement the tests for multiple structural breaks developed by Bai and Perron (1998, 2003a, 2003b, 2006). We consider a pure structural change model that allows for *m* breaks (*m* + 1 regimes):

$$EQP_t = a_j + b_j \times ZVAR_{it-1} + \varepsilon_t , \qquad t = T_{j-1} + 1, \ldots, T_j , \text{ for } j = 1, \ldots, m+1. \qquad (2)$$

In this model, the break dates $(T_1, \ldots T_m)$ are unknown and, by convention, $T_0 = 0$ and $T_{m+1} = T$. The minimum number of observations in a regime is given by ηT, where η is the trimming. As show by Bai and Perron (1998, 2003a), the model can be estimated efficiently by least-squares principle.

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[3] The number of lags is set according to the formula Int{4(T/100)$^{1/4}$} following Granger et al. (2001).

To determine the number and date of the breaks, we follow the sequential approach recommended by Bai and Perron (2006). First, we use the double maximum tests *U DmaxF* and *W DmaxF* to test the null hypothesis of no break versus an unknown number of breaks given some upper bound.[4] When the null hypothesis is rejected, we use the test $supF(l + 1|l)$ to test for the null hypothesis of l versus $l + 1$ breaks, increasing l sequentially from 0 to the value for which $supF(l + 1|l)$ first fails to reject the null hypothesis. The number of breaks is equal to the number of rejections. See Bai and Perron (1998, 2003a, 2003b) for the detailed specifications and properties of the tests. In our implementation, the tests allow for heteroscedasticity and autocorrelation, and for heterogeneity of distribution across regimes in the residuals and the regressors. Following Bai and Perron (2006), we use the HAC estimator based on the Quadratic Spectral kernel and optimal bandwidth of Andrews (1991) to estimate the covariance matrices. We furthermore select a trimming of $\eta = 0.15$, which results in at most five breaks, following the analysis of Bai and Perron (2006) that at least 15% of the total number of observations may be needed to correctly implement the HAC estimator.[5] The critical values for the tests are available in Bai and Perron (2003b).

One concern is that some information variables are highly persistent and thus can lead to spurious IS regression results in small sample similar to the ones documented by Stambaugh (1999), Granger et al. (2001) and Ferson et al. (2003), even when using autocorrelation-consistent standard errors. To address this issue, we use a simulation to determine the appropriate significance level of the *t*-statistic of our estimates and the *F*-statistic of the regressions. The bootstrap simulation procedure is similar to the one

[4] These tests are based on the conventional *F*-statistic for testing that the coefficients are equal across regimes. For each possible number of breaks up to the upper bound, an individual *F*-statistic using the break dates that maximize its value is formed. The double maximum tests are then based on the maximum *F*-statistic across all possible choices of number of breaks, with weights on the individual tests that are either equal (for the *U DmaxF* test) or set such that the marginal *p*-values are equal across values of m (for the *W DmaxF* test, assuming a significance level of 5%).

[5] Depending on the data generating process and the number of observations, Bai and Perron (2006) find that a trimming of 0.15 or 0.20 may be needed. We thus verify that our empirical results are robust to the choice of $\eta = 0.20$ with at most three breaks. We also check the robustness to the use of the Newey and West (1987) HAC estimator.

proposed by Mark (1995) and Welch and Goyal (2008). Specifically, we use a data generating process that imposes the null of no predictability for the equity premium and assume an AR(1) process for the information variable:

$$\begin{aligned} EQP_t &= \alpha + \varepsilon_{EQPt} \\ ZVAR_t &= \mu + \rho \times ZVAR_{t-1} + \varepsilon_{ZVARt} \end{aligned} \tag{3}$$

We compute OLS parameter estimates using the full sample and store the residuals for sampling. We then generate bootstrapped time series by drawing with replacement from the residuals, hence preserving the autocorrelation structure of the information variable and the cross-correlation structure of the residuals. We finally estimate the predictive regression as described previously with the simulated variables. 10,000 simulation runs are performed for each information variable and used to establish the significance level of the *t*-statistics and the *F*-statistics.[6] The OOS analysis described below is another way to alleviate this concern as a spurious IS relation should lead to no OOS forecasting power.

2.2 OUT-OF-SAMPLE (OOS) PREDICTABILITY

Examining the OOS predictability of the information variables is a natural complement to the IS analysis. From a statistical viewpoint, as argued by Welch and Goyal (2008), it represents a useful model diagnostic for IS significant information variables. Perhaps more importantly, from an economic viewpoint, it is relevant for decision makers working in real time, like investors interested market timing, economists focusing on time-varying economic conditions, etc. The OOS exercise consists of predicting the equity premium with a lagged information variable by using a model estimated only from data available at the time of the forecast. Specifically, for each prediction month, we estimate the previously described regression using a data window that ends in the preceding month and compute the forecast from the estimated model. We follow two different methods for specifying the estimation window. The *rolling*

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[6] The initial observation of each run is selected by picking one date at random. It is then discarded before the estimation. The size of each time series corresponds either to the full-sample number of observations or to 240 observations (representative of the sub-periods).

method estimates the predictive models from data inside a fixed-size window of 240 months.[7] In other words, each OOS forecast is made from a model estimated with the previous 240 months of data. The *recursive* method, followed by Welch and Goyal (2008), involves instead using all observations available at the time of the forecast. The estimation window therefore grows over time.

Once we obtain the OOS predictions, we follow Welch and Goyal (2008) to compute a number of OOS statistics to examine if the squared forecast errors of the predictive model are significantly smaller than those of a model based simply on the historical mean in the estimation window. Let ε_{Nt} be the forecast error at time *t* of the historical mean model (the *Null* model) and let ε_{At} be the forecast error at time *t* of the predictive model (the *Alternative* model). We can then compute the following OOS statistics:

Mean squared errors: $$MSE_N = \frac{1}{T}\sum_{t=1}^{T}\varepsilon_{Nt}^2 \quad MSE_A = \frac{1}{T}\sum_{t=1}^{T}\varepsilon_{At}^2 \tag{4}$$

Coefficients of determination: $$R^2 = 1 - \frac{MSE_A}{MSE_N} \quad \bar{R}^2 = 1-(1-R^2)\times\left(\frac{T-1}{T-2}\right) \tag{5}$$

F-statistic of the predictive model: $$MSE\text{-}F = T \times \frac{MSE_N - MSE_A}{MSE_A} \tag{6}$$

t-statistic of the predictive model: $$MSE\text{-}T = \sqrt{\left(\frac{T-1}{T}\right)} \times \left(\frac{MSE_N - MSE_A}{\sigma\left(\varepsilon_{Nt}^2 - \varepsilon_{At}^2\right)/\sqrt{T}}\right) \tag{7}$$

MSE-F is a *F*-statistic proposed by McCracken (2007). *MSE-T* is a *t*-statistic developed by Diebold and Mariano (1995) and modified by Harvey et al. (1997). Both statistics follow non-standard distributions as the asymptotic difference in squared forecast errors has zero variance under the Null. We assess their statistical significance from the asymptotic critical values tabulated by McCracken (2007) as well as from the simulated critical values using the bootstrapped time series described in the previous section. According to Clark and McCracken (2001), the *MSE-F* statistic has higher power than the *MSE-T* statistic.

[7] This window size is the minimum advocated statistically by McCracken (2007) and the minimum used by Welch and Goyal (2008) in their American study.

Given the 240-month estimation window before the first forecast, the full sample for the OOS analysis goes from February 1970 to December 2013.[8] In order to analyse the OOS stability of the predictive relations, we also compute the OOS statistics in two sub-periods (1970 to 1989 and 1990 to 2013) that correspond to the last two sub-periods of the IS results. To allow a diagnosis of the performance of the predictions through time, we finally provide a graphical analysis of the results based on the cumulative squared forecast errors differences $\sum_t \varepsilon_{Nt}^2 - \varepsilon_{At}^2$. Following Welch and Goyal (2008), we obtain 95% confidence intervals in the figures from the *MSE-T* critical values.

2.3 ECONOMIC VALUE OF THE PREDICTIONS

As stressed by Campbell and Thompson (2008), statistical evidence can be misleading in determining the value of information variables for investors, as predictions with low explanatory power can still produce economically meaningful results. Following Marquering and Verbeek (2004), Campbell and Thompson (2008), Welch and Goyal (2008) and Rapach et al. (2010), we examine the economic value of the predictions by calculating the realized utility gains on a real-time basis for a mean-variance investor with risk aversion parameter γ who allocates his portfolio monthly between the equity market and the risk-free asset using the predictive model.

Let EQP_{Nt} be the forecast at time t of the equity premium based on the historical mean model (the *Null* model) and let EQP_{At} be the forecast at time t of the equity premium based on the predictive model (the *Alternative* model). Let $\hat{\sigma}_t$ be a forecast at time t of the standard deviation of the equity returns. Then, for the mean-variance investor using the forecasts, the equity market allocation at time t are given by the following portfolio weights:

$$\textit{Equity allocations}: \quad X_{Nt} = \frac{1}{\gamma}\left(\frac{EQP_{Nt+1}}{\hat{\sigma}_{t+1}^2}\right) \quad X_{At} = \frac{1}{\gamma}\left(\frac{EQP_{At+1}}{\hat{\sigma}_{t+1}^2}\right) \tag{8}$$

[8] For the information variables with less than 240 months of historical observations before September 1970, we still compute their OOS forecasts as long as at least 36 observations are available.

Let μ_N and σ_N be the sample mean and standard deviation, respectively, of the returns on the portfolio with equity allocation X_{Nt} and let μ_A and σ_A be the sample mean and standard deviation, respectively, of the returns on the portfolio with equity allocation X_{At}. Over the OOS period, the realized average utility levels of the mean-variance investor are given by:

$$\textit{Utility levels}: U_N = \mu_N - \frac{1}{2}\gamma\sigma_N^2 \quad U_A = \mu_A - \frac{1}{2}\gamma\sigma_A^2 \qquad (9)$$

The utility gain (or certainty equivalent return) $U_A - U_N$ can be interpreted as the portfolio management fee that an investor would be willing to pay to have access to the additional information available in the predictive model. Following Campbell and Thompson (2008), Welch and Goyal (2008) and Rapach et al. (2010), we use a ten-year rolling window to estimate $\hat{\sigma}_t$, constrain the equity allocations between 0% and 150% to prevent extreme investments and rule out negative equity premium predictions, and select $\gamma = 3$, although other reasonable values lead to qualitatively similar results.

3. Data: Construction and Descriptive Statistics

In the predictive regressions, the dependent variable is always the Canadian equity premium (the excess return a Canadian stock market index over the risk-free rate). The independent variable is one of the 36 information variables described below. These variables are predetermined as they are lagged by one period compare to the equity premium. They are further identified by a name beginning with "Z". All variables are sampled at monthly frequency and the dataset covers the period from February 1950 to December 2013. We first provide details on the sources and construction of the variables and then present their descriptive statistics. Finally, we briefly characterize the existing Canadian evidence.

3.1 SOURCES AND CONSTRUCTION

3.1.1 *Equity Premium*

Equity Market Return: The equity market returns from February 1950 to January 1956 are the total returns (including dividends) on the value-weighted equity market index from the Canadian Financial Markets Research Centre (CFMRC). From February 1956, we use the total returns on the S&P/TSX Composite

Index (previously known as the TSE Composite Index) from the CFMRC or Datastream databases. We switch to the S&P/TSX Composite Index as soon as data are available as we have access to its dividend yield and price-earnings ratio.

Risk-Free Rate: The risk-free rate is the one-month return on the three-month Government of Canada Treasury bills, taken from the CFMRC database.

Equity Premium (EQP): The equity premium is the difference between the equity market return and the risk-free rate. Figure 1 shows the monthly EQP from February 1950 to December 2013. We can easily locate the important Canadian crisis since 1950, including the recession-linked corrections of August-October 1957 and April-May 1970, the oil shock of 1973-1974, the sharp decline associated with high interest rates and inflation concerns of the early 1980s, the October 1987 crash, the Russian debt default and associated *Long Term Capital Management* bankruptcy of August 1998, the burst of the tech bubble at the end of 2000 and the start of 2001 (lead by the decline in Nortel Networks Inc.), the September 2001 terrorism attack and the intensification of the subprime crisis in September-October 2008.

3.1.2 *Information Variables*

We identify 36 potential information variables that can be classified into four categories: market characteristic variables (based on equity valuation ratios and market-related variables), interest rate variables (based on interest rates and yield spreads), macroeconomic variables (based on aggregate economic indicators) and Canadian-specific variables (based on the Canada-U.S. exchange rate and commodity price indexes). Table I presents an overview of the variables by giving their category, name, short description, sample start date and data sources. The initial goal was to consider the information variables that have already been used or could make sense in a Canadian context, or that are common in U.S. studies. However, we encounter some difficulties regarding availability of data. We thus sometimes end up with shorter time series than desired. In a few cases, we also had to construct the information variable from the combination of up to three underlying variables to obtain longer time series. We relegate to appendix A the construction details and precise sources of the variables, as well as a correlation analysis between closely related variables. In appendix B, we discuss the existing Canadian evidence on the predictive ability of the information variables. In summary, the existing literature shows no comprehensive examination of information variables and equity premium predictability in Canada.

3.2 DESCRIPTIVE STATISTICS

Table II shows the full-sample mean, standard deviation, minimum, maximum, excess kurtosis, skewness, and autocorrelation (with significance) as well as the sub-period means of the variables in the study. The Canadian equity premium has a monthly average of 0.45% (an annualized value of 5.44%) and a standard deviation of 4.37% for the full sample, 1950 to 2013. The annualized mean EQP is 8.32% from 1950 to 1969, 3.52% from 1970 to 1989 and 4.65 % from 1990 to 2013. The minimum is -23.53% in October 1987 and the maximum is 15.84% in January 1975 as the market recovers from the oil shock recession. The excess kurtosis of 2.61 and skewness of -0.7 are similar to the ones in the American equity premium.

The information variables also have typical descriptive statistics. The most interesting element is perhaps the various economic environments provided by the three sup-periods. For example, the different means for the 1970-1989 sub-period are revealing of the inflationary context of the times as the mean inflation rate is about three times higher than the ones in the other two sub-periods. This is compatible with significantly higher means for the money supply growth, the Bank of Canada prime rate, the Treasury bill yield and the long-term yield from 1970 to 1989. Similar to U.S. variables, numerous Canadian information variables are strongly autocorrelated. In particular, ZDY, ZDYf, ZDP, ZPE, ZEP, ZCSBETA, ZTBILL, ZTBILLr, ZLTGOV, ZLTGOVr, ZTERM, ZCREDIT, ZCREDITs, ZUNEMP, ZPRIME, ZPRIMEr, ZFX and ZFXr have an autocorrelation coefficient greater than 0.80. Similar to the U.S., the Canadian market needs attention on the spurious regression concern.

4. Empirical Results

Tables 3 to 9 present the empirical results for the 36 information variables. Tables 3 and 4 show respectively the IS and OOS results for the full sample. Tables 5 and 6 give respectively the IS and OOS results by sub-periods. In the tables with IS results, for each information variable, we report the estimate of the regression coefficient *b* and its Newey-West adjusted *t*-statistic, as well as the $\overline{R}^2$ and the *F*-statistic of the predictive regression. The significance level of the *t*-statistic and *F*-statistic is determined using simulated critical cut-offs. In the tables with OOS results, for each information variable, we report the *MSE-T* statistic, the *MSE-F* statistics and the OOS $\overline{R}^2$ for the rolling and recursive methods. For comparison, we also provide the corresponding IS $\overline{R}^2$. The significance of the *MSE-T* and *MSE-F* statistics is determined from simulated critical values. Table VII presents the findings for the multiple structural break tests. Table VIII examines the results of predictive regressions that consider the publication delays of macroeconomic variables. Table IX assesses the economic value of the predictions.

Our analysis of the empirical results proceeds as follows. First, we present our general findings on the predictability of the equity premium in Canada. Second, we provide a detailed variable-by-variable analysis of the predictive ability of the information variables under consideration. Third, we study the impact of publication delays. Fourth, we give some evidence on the economic value of the predictions.

4.1 GENERAL FINDINGS

4.1.1 *In-Sample Significance of the Information Variables*

Table III shows evidence that numerous information variables are individually able to predict the Canadian equity premium in sample. Based on the *F*-statistic, 6, 14 and 17 variables are significant at the 1%, 5% and 10% levels, respectively. Based on the *t*-statistic, 4, 8 and 13 variables are significant at the 1%, 5% and 10% levels, respectively. While many significant variables are interest rate variables (ZTBILL, ZTBILLv, ZTBILLr, ZLTGOV, ZLTGOVv, ZLTGOVr, ZTERM), we also find some predictive ability in market characteristic variables (ZEQP, ZSVAR, ZJAN), macroeconomic variables (ZGDPG, ZPRIME, ZPRIMEv, ZPRIMEr, ZLEAD) and a Canadian-specific variable (ZFXv).

Given the large number of variables investigated, it may not be surprising to find some significant relations just by chance, and there is the possibility that our results may be attributed to data mining. However, the large proportion of significant variables suggests true IS predictability. For example, assuming that the 36 predictive regressions are independent, we would expect to incorrectly find (or making a type I error) at most 1 ($0.01\times36 < 1$), 2 ($0.05\times36 < 2$) and 4 ($0.1\times36 < 4$) significant variables at the 1%, 5% and 10% levels, respectively. Furthermore, the high significance levels of the results provide some evidence against the concern of data mining. A conservative way to demonstrate this is by considering modified cut-off statistics that use Bonferroni correction intervals. Given the 36 variables investigated, this modification is equivalent in an operational sense to requiring 0.028% (1%/36), 0.139% (5%/36) and 0.278% (10%/36) levels of significance rather than 1%, 5% and 10% levels. Using these modified (and conservative) levels, three variables are still significant based on both the *t*-statistic and the *F*-statistic (ZEQP, ZLTGOVr, ZLEAD). Overall, the results in Table III suggest that the Canadian equity premium is IS predictable and thus provide an out-of-U.S.-sample validation of the U.S. evidence.

4.1.2 *Out-of-Sample Significance of the Information Variables*

Table IV reports conclusive evidence of OOS predictability of the Canadian equity premium. Based on the *MSE-F* statistic and the recursive window schemes, the case with the highest statistical power according to Clark and McCracken (2001), 3, 6 and 7 variables are significant at the 1%, 5% and 10% levels, respectively. The significant variables include a market characteristic variable (ZEQP), interest rate variables (ZTBILLv, ZLTGOVv, ZLTGOVr), macroeconomic variables (ZGDPG, ZLEAD), and a Canadian-specific variable (ZFXv). Six of these variables (ZEQP, ZTBILLv, ZLTGOVv, ZLTGOVr, ZGDPG, ZLEAD) are significant whether we consider the results from the *MSE-T* or *MSE-F* statistics, or from the rolling or recursive window schemes. Given the difficulty reported by Welch and Goyal (2008) in their comprehensive study of finding significant OOS predictability, our results suggest that the evidence on the predictability of the equity premium in Canada might be stronger than in the U.S.

4.1.3 *Predictive Power*

While we find evidence of IS and OOS predictability, it should be emphasized that the predictive power of the information variables is very low. In the IS results reported in Table III, only three variables present $\overline{R}^2$ greater than 1%: ZEQP ($\overline{R}^2$ = 1.41%), ZLTGOVr ($\overline{R}^2$ = 1.88%) and ZLEAD ($\overline{R}^2$ = 1.61%). In the OOS results reported in Table IV, they are the only variables with $\overline{R}^2$ greater than 0.5% and most variables obtain negative $\overline{R}^2$. These low values are not surprising as they are similar to those in U.S. studies. They nevertheless demonstrate that the monthly equity premium is difficult to predict accurately.

4.1.4 *Stability*

Tables 5 and 6 provide sub-period results to assess the stability of the predictive relationships. Similar to the findings of Welch and Goyal (2008), the predictive ability of the information variables does not appear to be stable. For example, in Table V, while many variables are significant in at least one sub-period, no variable presents a significant predictive ability in all three sub-periods. Three hypotheses can be raised to explain these results.

A first hypothesis is that the predictability documented by older studies is spurious or irrational, in which case it should not appear in the more recent sub-period as it might have been the result of chance or arbitraged away. Some variables (like ZDP, ZJAN, ZTBILLr and ZLTGOVr) seem to have in fact lost their predictive ability over time. However, there are almost as many significant variables in the 1990-2013 sub-period than in the 1950-1969 sub-period, and many variables (like ZEQP, ZTBILL, ZTERM, ZPRIME and ZLEAD) have remarkably similar predictive ability in the two sub-periods.

Another hypothesis is that the predictive ability is time-varying and depends on the economic conditions. We can provide some indicative evidence on this hypothesis by looking at the results in the 1970-1989 sub-period versus the other two sub-periods. As discussed previously, the 1970-1989 sub-period is particular for its inflationary context. The results in Table V show that the predictive ability of many interest rate and macroeconomic variables is different in this sub-period than in the other two sub-periods. First, there are a smaller number of information variables with predictive ability in the inflationary sub-period than in the other two sub-periods. Second, variables that are significant predictors in the inflationary sub-period tend to lose their significance in the other two sub-periods, and vice versa.[9] Similar conclusions can be reached from the OOS results in Table VI.

[9] While beyond the scope of this paper, this finding suggests that a multivariate approach that combines variables with complementary predictive ability in different contexts should be more successful in predicting the Canadian equity premium. Rapach et al. (2010) argue that such an approach works well in the U.S.

A last hypothesis is that instability appears in the predictive relationships due to the reduced power of the statistics in smaller samples. If predictive ability is truly stable, then more observations should lead to higher statistical power. While this hypothesis cannot be rule out, and the usual advice that sub-period statistics should be interpreted with caution applies, Tables 5 and 6 find numerous cases of significant predictive regressions, suggesting that the statistics are powerful enough in the sub-periods.

Overall, Tables 5 and 6 show that the results are relatively unstable. While the predictive ability might have disappeared for some variables, there is also evidence suggesting that the predictive ability of numerous variables differs in the inflationary context of the 1970-1989 sub-period versus the low-inflation context of the other sub-periods. If we focus more specifically on the results of the last sub-period, perhaps the most relevant for current investors and economists, Tables 5 and 6 document seven information variables (ZEQP, ZTBILL, ZTERM, ZGDPG, ZPRIME, ZLEAD, ZFXv) that are both IS and OOS significant. The Canadian equity premium has thus been predictable from 1990 to 2013.

4.1.5 *Structural Breaks*

While the previous subsection uncovers some instability, Table VII finds conclusive evidence of the IS presence of a structural break for only two variables, i.e., the dividend-price ratio (ZDP) and the long-term Government bond yield (ZLTGOV). For ZDP, the break date is December 1964 and the predictive coefficient is significantly positive before the break (b = 2.841) and insignificant after the break (b = 0.033). For ZLTGOV, the break date is April 1960 and the predictive coefficient is significantly negative in the first regime (b = -1.670) and insignificant in the second regime (b = -0.104). These findings are robust to the use of the Newey and West (1987) HAC estimator instead of the Quadratic Spectral kernel HAC estimator of Andrews (1991). When the trimming is set at η = 0.20 (with at most three breaks), instead of η = 0.15 (with at most five breaks), ZLTGOV does not present a significant break anymore, but the results for the other variables are similar. Overall, the tests for multiple structural breaks of Bai and

Perron (1998, 2003a, 2003b, 2006) indicate that the predictive relations appear stable enough to accept the null hypothesis of no break for most information variables.[10]

4.1.6 *Spurious Regression Concern*

Given the high autocorrelation of the information variables and the associated spurious regression concern, we assess the significance levels of the statistics in Tables 3 to 6 from simulated critical values using the procedure described in section 2. To understand the importance of the spurious regression concern in our Canadian context, in unreported results, we examine if the significance levels of the statistics change when we use the asymptotic critical values rather than the simulated ones.[11] In the full-sample results of Tables 3 and 4, we find that spurious regression results are not an important concern, in accordance with the relatively large number of observations.[12] Not surprisingly, the issue is a bigger concern in the smaller samples of the sub-periods. For the results in Table V, we count eight cases where a statistic goes from significant at the 10% level with the asymptotic critical values to insignificant with the simulated ones. However, in Table VI, we obtain only one change of significance, suggesting that the *MSE-T* and *MSE-F* statistics are less concerned by spurious results.

4.1.7 *Out-of-Sample Methodology and Statistics*

In Tables 4 and 6, we provide OOS results for two estimation window schemes (rolling and recursive) and two OOS statistics (*MSE-T* and *MSE-F*). A comparison of the results for these different possibilities

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[10] It is possible to account for structural breaks in OOS predictability results. For example, Pesaran and Timmermann (2002) propose a strategy based on structural break tests with data available at the time of the forecast. When at least one break is detected, they make the OOS forecast using data from the last break date up to the forecast date, instead of using a rolling or recursive estimation window scheme. Since we find little IS significant evidence of structural breaks, we do not empirically examine OOS predictability in the presence of structural breaks.

[11] McCracken (2007) provides asymptotic critical values for the *MSE-T* and *MSE-F* statistics.

[12] Specifically, there is only one change of decision in Table III when we use the simulated critical values rather than the asymptotic ones: the *t*-statistic for ZSVAR changes from significant at the 10% level to insignificant. In Table IV, there is no change of decision.

suggests that the choice does not matter in most cases. In Table IV, for example, there is no case where the *MSE-T* and *MSE-F* statistics does not agree on whether the predictive relation is significant at least at the 10% level. Similarly, there are only three cases where insignificant evidence is found with one window scheme while significant evidence, albeit at the 10% level, is obtained with the other.[13]

4.2 VARIABLE-BY-VARIABLE RESULTS

In this section, we present a detailed variable-by-variable analysis of our results. Such analysis is insightful for two main reasons. First, it provides a comprehensive robustness check as many of the variables studied are believed to be successful predictors in the U.S. and sometimes in Canada. Second, it provides guidance on the value of each variable as conditioning information in financial applications or as market timing signal for investors. As mentioned previously, a good OOS performance is a useful statistical and economic complement to a statistically significant IS relationship when establishing the quality of a predictive model. For this reason, in our variable-by-variable analysis, we split the variables into two groups based on their full-sample IS significance and discuss their results separately.

For the IS significant variables, our analysis focuses on the following criteria that a good predictive model should meet: 1- Significant OOS performance for the full sample; 2- Generally significant IS and OOS performances in sub-periods; 3- Relatively stable IS regression coefficient estimates in sub-periods. Using the same criteria, the goal for IS insignificant variables is to establish if instability or structural changes occur in the relationship and hence detect environments in which the information variables could be significant predictors. Throughout the analysis, we examine particularly the most recent sub-period (1990-2013). Its results represent not only a useful data snooping check given that most information variables were uncovered in earlier years, but they might also be the most relevant for current investors and economists.

[13] We also consider a rolling window scheme with a five-year estimation period rather than the 20-year period advocated by McCracken (2007). In unreported results, we find no significant OOS statistics with this alternative.

Figures 2 and 3 provide illustrations of the results for the IS significant variables and the IS insignificant variables, respectively. As discussed in section 2, the figures allow a diagnosis of the performance of the predictions through time by showing the evolution of the cumulative squared forecast errors differences between the historical mean model and the predictive model.[14] In the figures, when the slope is positive (negative), the predictive model performs better (worse) than the historical mean model as its squared errors are smaller (larger). We can interpret the figures with respect to the first two previously mentioned criteria in the following way: 1- The OOS lower confidence interval should be above zero in December 2013; 2- The IS and OOS slopes should be positive in general, not for only short specific periods. Without loss of generality, the illustrated OOS results use the recursive method.

4.2.1 *In-Sample Significant Variables*

Table III shows that 17 of the 36 information variables demonstrate significant IS relationship at the 10% level on the full sample based on the *F*-statistic. The IS significant variables are ZEQP, ZSVAR, ZJAN, ZTBILL, ZTBILLv, ZTBILLr, ZLTGOV, ZLTGOVv, ZLTGOVr, ZTERM, ZCREDITr, ZGDPG, ZPRIME, ZPRIMEv, ZPRIMEr, ZLEAD and ZFXv. We discuss the IS and OOS results of Tables 3 to 6 for each variable separately below. Figure 2 illustrates the performance of their predictive regressions.

Previous Equity Premium (ZEQP): ZEQP is one of the best performing information variables. It has a reliably positive predictive coefficient and presents highly significant OOS performance. It still has a strong performance in the most recent sub-period, with the best IS and OOS $\bar{R}^2$ from 1990 to 2013. In fact, Figure 2 shows that the variable performs relatively well throughout the sample period, except for a few years following the oil shock of 1973-1974.

Stock Variance (ZSVAR): ZSVAR is significant at the 5% level with the IS *F*-statistic, but is not significant according to the other IS or OOS statistics. Guo (2006b) also finds that ZSVAR is insignificant

[14] The historical mean model is the historical mean in the estimation window for the OOS performance and the full-sample historical mean for the IS performance.

in Canada. Figure 2 shows that, apart from performing very well in predicting the equity premium during the 2008 subprime crisis, ZSVAR has not been a reliable predictor.

January Dummy (ZJAN): As in the U.S., ZJAN is positively related to the equity premium in Canada, a finding that confirms the results from multivariate regressions in the literature (Solnik, 1993; Carmichael and Samson, 1996; Korkie and Turtle, 1998). But as in the U.S., the January effect has mostly disappeared since it was first documented by Rozeff and Kinney (1976), as shown by the IS and OOS results in the 1990-2013 sub-period and the graph in Figure 2.

Treasury Bill Yields (ZTBILL, ZTBILLv, ZTBILLr): The Treasury bill yields variables obtain a negative predictive coefficient in the full sample and in the sub-periods, a sign that corresponds to the one found in the existing Canadian literature and in most U.S. studies. Future excess equity returns are higher when the T-bill yield is low and has decreased compare to the previous month and to the previous year average. Of the three variables, ZTBILL has the best IS and OOS performances in the most recent sub-period, but the worst in the second sub-period. On the contrary, the significant performance of ZTBILLv comes mainly from the second sub-period. Figure 2 illustrates how the performance of the two variables differ greatly in the inflationary context of the late 1970s and the 1980s, where the T-bill yields were at their highest historical levels, but constantly declining, which translates into opposite predictions for ZTBILL and ZTBILLv. Based on U.S. predictability results, the T-bill yields variables are some of the most commonly used information variables. Our significant performance thus provides an important robustness check to the U.S. results.

Long-Term Government Bond Yields (ZLTGOV, ZLTGOVv, ZLTGOVr): The IS and OOS results for ZLTGOV, ZLTGOVv and ZLTGOVr are qualitatively similar to their respective short term equivalent ZTBILL, ZTBILLv and ZTBILLr, as can be observed from Figure 2. The main noteworthy difference is that the relative variable (ZLTGOVr) now presents the most significant IS and OOS performances. For long-term bond yields, this version thus works generally better than the level variable (ZLTGOV) or the variation variable (ZLTGOVv).

Term Premium (ZTERM): Similar to the findings reported in the existing literature, ZTERM has a reliably positive predictive coefficient. It has also performed well recently, as the IS and OOS results are significant at least at the 5% level in the last sub-period. Its insignificant full-sample OOS performance can be explained by its poor ability during the inflationary context of the late 1970s and the 1980s. Otherwise, as seen in Figure 2, the variable predicts consistently well. Overall, ZTERM is thus a relatively good predictor in Canada, confirming the predictive ability of the term premium in U.S. data.

Return-Based Credit Premium (ZCREDITr): The return-based credit premium variable is significant at the 10% level with the IS *F*-statistic, but is not significant according to the other IS or OOS statistics. It has a positive, but insignificant, predictive coefficient in all sub-periods. Figure 2 shows that, apart from performing very well in predicting the equity premium during the 2008 subprime crisis, ZCREDITr has not been a reliable predictor.

Gross Domestic Product Growth (ZGDPG): ZGDPG is positively associated with the equity premium. Its IS and OOS performances are particularly good in the most recent sub-period and are sufficiently good overall to obtain significant full-sample IS and OOS results. Figure 2 reveals that the performance has been especially good since the end of the 1990s, making ZGDPG a potentially interesting information variable going forward.

Bank of Canada Prime Rates (ZPRIME, ZPRIMEv, ZPRIMEr): Not surprisingly, the IS and OOS performance results for ZPRIME, ZPRIMEv and ZPRIMEr are similar to their respective T-bill equivalents ZTBILL, ZTBILLv and ZTBILLr, as can be seen in Figure 2. However, the variables do not predict as well as their T-bill counterparts, perhaps because the T-bill yields reflect market conditions more rapidly and more completely than the prime rates, which indicate mainly the monetary conditions.

Composite Leading Indicator Growth (ZLEAD): According to the full-sample IS or OOS $\overline{R}^2$, ZLEAD is one of the best performing information variables. It has a reliably positive predictive coefficient and its IS and OOS results are significant at the 1% level. It has also the second best performance in the most recent sub-period, with an IS $\overline{R}^2$ equal to 1.46% and a recursive OOS $\overline{R}^2$ equal to

1.28% in the period from 1990 to 2013. Similar to ZEQP, Figure 2 shows that ZLEAD performs relatively well throughout the sample period, except for a few years following the oil shock of 1973-1974. This similarity is not unexpected as the TSX Composite Index is one of the components of the Composite Leading Indicator.

CAD/USD Exchange Rate Variation (ZFXv): ZFXv is negatively related to the equity premium, so that an appreciation of the Canadian dollar leads to an increase in the excess return of equity. This predictive relation is IS significant at the 5% level and is OOS significant at the 10% level with a recursive estimation window scheme. Figure 2 shows that, apart from performing very well in predicting the equity premium during the 2008 subprime crisis, ZFXv has not been a reliable predictor.

4.2.2 *In-Sample Insignificant Variables*

Table III shows that 19 of the 36 information variables demonstrate insignificant IS relationship on the full sample based on the *F*-statistic. The IS insignificant variables are ZDY, ZDYf, ZDP, ZPE, ZEP, ZVOLG, ZVOLGd, ZISSUE, ZCSBETA, ZCREDIT, ZCREDITs, ZINF, ZPRODG, ZUNEMP, ZMONEYG, ZFX, ZFXr, ZENERG and ZMMG. We discuss the IS and OOS results of Tables 3 to 6 for each variable separately below. If a model has no IS performance, its OOS performance is not interesting. However, because some of these variables are so prominent, it is useful to examine their results. The analysis could further identify sub-periods of success, which could help identify variables that have lost their predictive power over the years or that have just recently become valuable predictor. Figure 3 illustrates the performance of their predictive regressions.

Dividend Yields (ZDY, ZDYf), Dividend-Price Ratio (ZDP), Price-Earnings Ratio (ZPE) and Earnings-Price Ratio (ZEP): As expected from the literature, these market valuation ratios have generally positive predictive coefficients (except for ZPE). However, they show little evidence of ability in predicting the equity premium. In fact, their upper confidence intervals in Figure 3 indicate that their OOS predictions are significantly worse than the historical mean model, with prediction errors especially large around the oil shock of 1973-1974. These results are of particular importance for ZDP, which is one of the most commonly used information variable in U.S. studies. The results in Table V show that ZDP loses its predictive power in the last two sub-periods after being a significant IS predictor in first sub-period. The structural break tests in Table VII confirm that it is significant only in the first regime that ends in December 1964. These findings are consistent with the U.S. evidence of Boudoukh et al. (2007), who argue that dividends do not capture well anymore the payouts of firms due to the explosion of share repurchase transactions.

Volume Growths (ZVOLG, ZVOLGd): The volume of shares growth ZVOLG and the dollar volume growth ZVOLGd are not helpful in predicting the equity premium. While volume indicators are regularly part of technical analysis predictive system, their usefulness might be greater in forecasting the volatility of the equity premium.

Issuing Activity (ZISSUE): The net equity expansion variable ZISSUE should better reflect the payout yield of firms (Boudoukh et al., 2007). However, contrary to the U.S. findings of Welch and Goyal (2008), ZISSUE presents no evidence of predictive ability in full sample or in sub-periods in Canada. Figure 3 shows that it has an especially large OOS prediction errors around the oil shock of 1973-1974.

Cross-Sectional Beta Price of Risk (ZCSBETA): ZCSBETA should have a positive predictive coefficient according to Polk et al. (2006), which is what we find, although we obtain no significant performance statistics in our (relatively short) Canadian sample. In fact, Figure 3 demonstrates that ZCSBETA is one of the worst OOS performers in our information variables.

Yield Spread Credit Premium (ZCREDIT, ZCREDITs): The credit premium variables based on yield spreads are not useful in predicting the equity premium in Canada. The long-term default yield spread ZCREDIT obtains a negative and insignificant predictive coefficient. This finding is in contrast to the U.S. results, where ZCREDIT has typically a significantly positive coefficient and is one of the most commonly used information variables. While this difference suggests an issue with robustness, it could more likely reflect problems in constructing ZCREDIT for Canada. The credit premium in the U.S. is defined as the difference between BAA and AAA-rated corporate bond yields. We are unfortunately unable to construct such a variable with the available Canadian data. In fact, to construct ZCREDIT, we compare long-term government yields to the long-term corporate yields obtained from a combination of three different series. The resulting yield spread is thus influenced by differences in important factors such as duration, liquidity, etc. between the government and corporate sectors. It is further affected by the changing average ratings of the corporate sector through time, as the rating is not held fixed at BAA for the corporate bonds. Our attempt to obtain a cleaner variable by forming a short-term credit premium variable ZCREDITs proves unsuccessful, as ZCREDITs also obtains a negative and insignificant predictive coefficient.

Inflation Rate (ZINF): ZINF does not forecast the equity premium in any significant way, although the sign of its predictive relation is constantly negative in the sub-periods. No lasting favorable predictability pattern emerges from Figure 3 either.

Industrial Production Growth (ZPRODG): ZPRODG presents no significant forecasting power and obtains predictive coefficients that change sign across the sub-periods. Figure 3 shows that it briefly works very well in the oil shock period of 1973-1974, but has a sharp decline in its performance around the market correction of the early 1980s.

Unemployment Rate (ZUNEMP): ZUNEMP is positively associated with the equity premium, but is never a significant predictor. The scale of its graph in Figure 3 indicates that its squared forecast errors are highly similar to the ones of the historical mean model.

Money Supply Growth (ZMONEYG): ZMONEYG presents significant IS performance from 1950 to 1969, with a positive predictive coefficient. However, it loses its predictive ability in the second and especially the third sub-periods, where it also sees its coefficient changes sign. Its graph in Figure 3 illustrates well its relatively favorable performance until the end of the 1980s and its bad performance since then, consistent with money supply becoming a less useful indicator of monetary policy.

CAD/USD Exchange Rates (ZFX, ZFXr): While the variation in the CAD/USD exchange rates presents some predictability evidence due to its performance during the 2008 subprime crisis, the level of the exchange rate (ZFX) and its relative value (ZFXr) have no significant forecasting ability. As Figure 3 illustrates, ZFX even underperforms significantly the historical mean model since the first half of the 1980s with its OOS predictions.

Commodity Price Growths (ZENERG, ZMMG): ZENERG and ZMMG are positively associated with the equity premium in the 1990-2013 sub-period, although the relations are insignificant. Figure 3 illustrates that their OOS performances are particularly poor around the market correction of the early 1980s. While the energy and metals and minerals sectors weight heavily in the Canadian economy, the growths in their associated commodity price indexes do not represent useful information variables.

4.3 PUBLICATION DELAYS FOR MACROECONOMIC VARIABLES

One concern with some macroeconomic variables is that they are published with a delay. Obviously, any variable not yet known publicly is not useful in real time, even though evidence of its predictive ability is still indicative of its informational content. Furthermore, it is possible that a variable with insignificant results in our regressions could still have predictive ability if we consider its publication delay adequately, as its impact on the equity premium might be related to its announcement. Complicating matters more, the publication delays are not the same across variables and have likely been reduced through time from 1950 to 2013. To consider this issue, we examine the results of predictive regressions that use the value of a macroeconomic variable two, three or four months before the equity premium as a predictor. These results thus assume implicitly that a delay of two, three or four months between the value of the predictive variable and the equity premium is sufficient to account for the publication delays.[15]

Table VIII examines the IS and OOS results of predictive regressions that consider the publication delays of six macroeconomic variables in our sample, i.e., ZINF, ZPRODG, ZUNEMP, ZMONEYG, ZGDPG and ZLEAD. The three macroeconomic variables related to the Bank of Canada prime rates are not relevant for this exercise as they are available in real time. The significant forecasting power documented in Tables 3 and 4 for ZGDPG and ZLEAD is diminished once we consider publication delays. The significantly positive relation for ZGDPG at the one-month delay becomes insignificant at the

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[15] A related concern for real time predictability is the availability of statistical methods and computer technology. Pesaran and Timmermann (1995) consider this concern in their choice of model selection criteria through time and find that their results are generally similar across techniques. In this paper, we do not examine this issue.

two- and three-month delays and significantly negative at the four-month delay. ZLEAD still predicts positively and significantly the equity premium with a three-month delay, although the predictive coefficient is reduced by approximately 50%. Oppositely, while Tables 3 and 4 document little forecasting power for ZINF, ZPRODG, ZUNEMP and ZMONEYG, Table VIII finds evidence of predictive ability at the three- and four-month delays for ZINF, at the four-month delay for ZPRODG and at the two-month delay for ZMONEYG. The strongest findings are for ZINF using a four-month delay, where the IS and OOS results are significant at the 1% level with $\bar{R}^2$ approximately equal to 0.8%. Inflation has thus a significantly negative relation to the equity premium once a reasonable publication delay is considered.

4.4 ECONOMIC VALUE

To go beyond the statistical significance of the results, Table IX presents results on the economic value of the predictions by using the methodology outlined in section 2.3. For each information variable and its associated OOS predictive model, the table first reports results on the portfolio of a mean-variance investor using the forecasts from the predictive model, namely the average equity allocation, the proportions of allocation equal to 0% or 150% (the limits allowed), the annualized values of the mean return, standard deviation of returns and average utility level of the portfolio and the end-of-sample value of a 1$ beginning-of-sample investment in the portfolio.[16] It then gives differences with the portfolio using forecasts from the historical mean model in terms of average utility level, mean return, standard deviation of returns and value of a 1$ investment. Without loss of generality, we report the results using the recursive OOS predictions.

Despite the statistical evidence of low explanatory power and only 7 full-sample IS and OOS significant predictions, the results in Table IX indicate that the information variables provide individual forecasts that are generally economically meaningful, supporting the argument of Campbell and Thompson (2008). Focusing on the average utility gain (or certainty equivalent return) $U_A - U_N$, a mean-

[16] The annualized values are obtained by multiplying the monthly results by 12 for the mean return and average utility level, and by $\sqrt{12}$ for the standard deviation of returns.

variance investor would be willing to pay an average annualized portfolio management fee of 0.49% to have access to the additional information available in the predictive model. The fees are positive for 19 out of 36 information variables, greater than 0.5% for 16 variables, greater than 1% for 10 variables and greater than 2% for 4 variables (ZEQP, ZTBILL, ZLTGOVv, ZLEAD).[17] Compare to a portfolio based on the historical mean forecast, the portfolios based on the predictive model produce higher mean return in 16 cases and lower standard deviation of returns in 22 cases. This latter result is consistent with the findings of Breen et al. (1989) that an important factor in the contribution of a predictive model to an investment strategy is the reduction of volatility.

The most economically meaningful variable is by far the composite leading indicator growth ZLEAD with an average utility gain of 4.77%. ZLEAD obtains the highest annualized mean return increase ($\mu_A - \mu_N$ = 4.20%), even though it produces a portfolio with an average equity allocation (Mean X_A = 73.0%) similar to the average across information variables of 68.2%, and lower than the one of 81.4% for the portfolio based on the historical mean model. For comparison, ZLTGOVv ($\mu_A - \mu_N$ = 3.10%) and ZLTGOVr ($\mu_A - \mu_N$ = 3.01%) obtains the second and third highest mean return increases by allocating respectively 84.0% and 91.4% of their portfolio to equities. The best information variables in terms of annualized volatility reduction are ZDY ($\sigma_A - \sigma_N$ = -5.28%) and ZGDPG ($\sigma_A - \sigma_N$ = -4.43%). While their portfolio allocates less than 50% to equities, ZGDPG further generates a positive utility gain for the mean-variance investor, even producing a positive mean return difference over the 81.4%-equity-weighted historical mean portfolio.

5. Conclusion

There is currently an important debate on the evidence and usefulness of equity premium predictability results, a debate with far reaching implications for both researchers and practitioners. Despite the international relevancy of the issue, this debate is mainly based on evidence from U.S. data. For example,

[17] Similar to Campbell and Thompson (2008), our results do not take into account transaction costs, but we note that utility gains of more than 50 basis points per year should be sufficient to cover substantial costs.

in Canada, where this topic is as important as elsewhere, there is currently no comprehensive evidence of relevant information variables and equity premium predictability. The main objective of this paper is to document such Canadian evidence, which is not only useful on its own, but also serves as an out-of-U.S.-sample assessment of the predictability debate.

Specifically, we construct 36 potential information variables and test their individual predictive ability for the Canadian monthly equity premium from 1950 to 2013. The information variables include market characteristics, interest rate levels, changes and spreads, macroeconomic indicators and Canadian-specific variables. We provide IS, OOS and economic value evidence using common estimation techniques and performance measures, which are carefully chosen to mitigate known econometric issues.

The four principal findings from our results are as follows. First, we find conclusive evidence of IS and OOS predictability of the Canadian monthly equity premium, providing an out-of-U.S.-sample robustness check of the U.S. evidence. Second, we provide a new empirical assessment of the issues of small sample bias, spurious regression, model instability, structural breaks, poor predictive ability, low economic value and real time data availability. We show that our results are generally robust to these econometric issues that have been raised in the literature. While we uncover some instability in the results related to the 1973-1974 oil shock and the inflationary concern of the 1980s, we implement multiple structural break tests and do not obtain any significant break for most information variables. We also document strong evidence that the equity premium is still predictable from 1990 to 2013. Third, we show that forecasts from the information variables are economically meaningful for a mean-variance investor.

Fourth, we provide guidance on the usefulness of each information variable as a market indicator, raising questions on the forecasting ability of some variables that have been successful predictors for the U.S. equity premium. Table X provides a summary of the significance of the complete set of IS and OOS results documented in the paper. The table makes it easy to identify the information variables with the best predictive ability, namely the previous equity premium, the Treasury bill yield and long-term government bond yield variables, the gross domestic product growth and the composite leading indicator growth. The table also shows that the dividend yield, the dividend-price ratio, the credit premium, the cross-sectional beta price of risk of Polk et al. (2006), the stock variance of Guo (2006a) and the issuing activity of Boudoukh et al. (2007) show little significant predictive ability in a Canadian context.

While our results show significant predictability of the Canadian equity premium, there are numerous possible ways to improve the forecasting ability of the information variables. A straightforward extension, examined by Campbell and Thompson (2008) in U.S. data, is to impose economic restrictions on the sign of the predictions so that the equity premium is predicted to be non-negative. Another interesting extension is to combine the individual forecasts from information variables to improve the predictive performance. Rapach et al. (2010) show that such a combination approach improves the OOS performance of U.S. predictions. Finally, we can extend our predictive approach from individual models to multivariate models. For example, the general-to-specific approach of Hendry (1995) provides a way to identify a set of significant variables that can be useful in a multivariate forecasting model. Champagne et al. (2017) examine these extensions and find stronger predictability evidence for the Canadian equity premium.

Appendix A. Construction Details and Sources of the Information Variables

This appendix gives a detailed description of the construction and sources of the information variables, regrouped by their category, as well as a correlation analysis between the closely related variables.

A.1 MARKET CHARACTERISTIC VARIABLES

Twelve information variables are related to equity valuation ratios and market-related variables (ZDY, ZDYf, ZDP, ZPE, ZEP, ZEQP, ZVOLG, ZVOLGd, ZSVAR, ZISSUE, ZCSBETA and ZJAN):

Dividend Yields (ZDY, ZDYf): We consider two annual dividend yield variables for the S&P/TSX Composite Index. The realized dividend yield (ZDY) is computed from the difference between the one-year total return of the index and its one-year price return. The data come from the CFMRC database and start in February 1957. We also obtain a forward-looking dividend yield variable (ZDYf) available as series V122628 in the CANSIM database from Statistics Canada. This series is described as "taking the indicated dividend to be paid per share of stock over the next 12 months and dividing it by the current price of the stock."[18] The data begin in February 1956. The correlation between ZDY and ZDYf is 0.62.

Dividend-Price Ratio (ZDP): We calculate the dividend-price ratio as the realized dividend yield multiplied by the value of the index one year ago and divided by the current value of the index. The data go back to February 1957. The correlation between ZDP and ZDY is 0.87.

Price-Earnings Ratio (ZPE): The price-earnings ratio of the S&P/TSX Composite Index is obtained from the CANSIM database as series V122629. It is available starting in February 1956. It corresponds to the current market price divided by the earnings in the latest fiscal year.[19]

Earnings-Price Ratio (ZEP): The earnings-price ratio is one over the price-earnings ratio. The correlation between ZEP and ZPE is -0.54.

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[18] See the Notes to the Tables for Table F3 in the *Bank of Canada Banking and Financial Statistics*, May 2010.

[19] From August 2001 to July 2002, the ratio was not listed due to negative earnings. We replace the missing value with the maximum value of the price-earnings ratio prior to August 2001.

Previous Equity Premium (ZEQP): Canadian equity market returns are slightly positively autocorrelated, perhaps due to non synchronous or thin trading (see Fowler et al., 1979). ZEQP is simply the lagged EQP and attempts to capture the predictive information in the premium of the previous month.

Volume Growths (ZVOLG, ZVOLGd): We consider two volume growth variables for the TSX exchange. The volume of shares growth variable (ZVOLG) is the growth in the monthly number of shares transacted while the dollar volume growth is the growth in the monthly value of shares traded. The data come from the CANSIM database as series V37413 and V37412, respectively, and start in March 1953. The correlation between ZVOLG and ZVOLGd is 0.75.

Stock Variance (ZSVAR): We compute the realized stock variance as the sum of squared daily returns on the Canadian stock market. The data are from the CFMRC or Datastream databases. ZSVAR is computed from the daily returns of the value-weighted CFMRC equity market index from February 1975 to January 1977 and the S&P/TSX Composite Index thereafter. Guo (2006a) documents a positive relation between ZSVAR and future market returns in the U.S.

Issuing Activity (ZISSUE): To compute the corporate issuing activity, we first compute the dollar amount of net equity issuing activity, following Welch and Goyal (2008) as: Net Issue at month *t* = Market Capitalisation at month *t* – Market Capitalisation at month *t-1* × (1 + Market Capital Gain Return at month *t*). The issuing activity variable (ZISSUE) is the net equity expansion defined as the ratio of the twelve-month moving sums of net issues divided by the current market capitalisation. The data come from the CFMRC database. From February 1951 to September 2000, the price and number of shares for each individual stock is used to obtain the total market capitalisation. From October 2000, we take the total market capitalisation of the S&P/TSX Composite Index from Datastream. ZISSUE is related to a variable proposed by Boudoukh et al. (2007) in the U.S. They show that since the adoption of SEC rule 10b-18 in 1982, there has been an explosion of share repurchase transactions. They argue that this newly important distribution channel has caused the dividend yield to lose its predictive power, but a more largely defined payout yield that includes share repurchases still provides significant predictions. This analysis could be relevant for Canada as well as Kooli and L'Her (2010) similarly find a decline in dividend paying firms and a significant increase in share repurchase programs.

Cross-Sectional Beta Price of Risk (ZCSBETA): The cross-sectional beta premium is the difference in betas between value and growth portfolios. Polk et al. (2006) show that it predicts the equity premium for the U.S. and a group of international countries (excluding Canada). From January 1980, we follow Polk et al. (2006) to construct ZCSBETA from the Canadian value and growth portfolios available on Kenneth R. French's Web page (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).[20] Specifically, ZCSBETA is equal to the 36-month average rolling beta of the four value portfolios minus the 36-month average rolling beta of the four growth portfolios.

January Dummy (ZJAN): This dummy variable (not lagged) is set to 1 in January and 0 for the other months and captures the so-called January effect predicting higher returns in January.

A.2 INTEREST RATE VARIABLES

Ten information variables are related to interest rates (ZTBILL, ZTBILLv, ZTBILLr, ZLTGOV, ZLTGOVv, ZLTGOVr, ZTERM, ZCREDIT, ZCREDITs, ZCREDITr).

Treasury Bill Yields (ZTBILL, ZTBILLv, ZTBILLr): The Treasury bill yield is the annualized yield-to-maturity of the three-month Government of Canada Treasury bill. It is taken from the CFMRC database and is also available as series V122541 in the CANSIM database. We use the lagged value directly as an information variable (ZTBILL). But as ZTBILL is highly persistent, we also consider its lagged monthly variation (ZTBILLv) and its lagged value relative to its twelve-month moving average (ZTBILLr).

Long-Term Government Bond Yields (ZLTGOV, ZLTGOVv, ZLTGOVr): The long-term government yield is the average yield-to-maturity of the Government of Canada Treasury bonds with a maturity of ten years or more. It is available in the CFMRC database and in the CANSIM database as series V122487. As for ZTBILL, we use its lagged value (ZLTGOV), its lagged variation (ZLTGOVv) and its lagged value

[20] These portfolios are the top 30% and bottom 30% portfolios of stocks sorted on four Morgan Stanley Capital International value measures: Dividend yield, book-to-market ratio, Earnings-price ratio and cash flows-price ratio.

relative to its twelve-month moving average (ZLTGOVr). The correlations with their corresponding Treasury bill variable are 0.94 for ZLTGOV, 0.45 for ZLTGOVv, and 0.64 for ZLTGOVr.

Term Premium (ZTERM): The term premium is the difference between ZLTGOV and ZTBILL.

Credit Premium (ZCREDIT, ZCREDITs, ZCREDITr): We consider three credit premium (or default spread) variables. The first credit premium is the difference between the yield on long-term corporate bonds and ZLTGOV. To construct a long history of the corporate yields, we combine three different series. From February 1950 to October 1977, we use the series V35752 from the CANSIM database, the Scotia-McLeod Canada Long-Term All-Corporate Yield Index. From November 1977 to June 2007, we take the Scotia Capital Canada All-Corporations Long-Term bond yield series from CFMRC, also available as series V122518 in the CANSIM database. From July 2007, we take the yield from the Bank of America Merrill Lynch Canada Corporate Bond 10Y+ Index (series MLCCTPL) from Datastream. In an effort to avoid mixing three different series, a second yield spread variable is computed as the difference between the yield on the three-month prime corporate paper (series V122491) and ZTBILL. This short-term credit premium variable (ZCREDITs) goes back to February 1956 and has a correlation of 0.05 with ZCREDIT. Finally, we form a return-based credit premium variable (ZCREDITr) as the difference between long-term corporate bond and long-term government bond returns. For the corporate bond returns, we use series V35754 (the Scotia-McLeod Canada Long-Term All-Corporate Total Return Index) from December 1950 to October 2002. From November 2002, we take the total returns from the Bank of America Merrill Lynch Canada Corporate Bond 10Y+ Index (series MLCCTPL). We obtain the government bond returns from the CFMRC database. ZCREDITr has correlations of -0.06 with ZCREDIT and -0.07 with ZCREDITs.

A.3 MACROECONOMIC VARIABLES

Nine information variables are based on macroeconomic indicators (ZINF, ZPRODG, ZUNEMP, ZMONEY, ZGDPG, ZPRIME, ZPRIMEv, ZPRIMEr, ZLEAD).

Inflation Rate (ZINF): The inflation rate is the monthly growth in the Consumer Price Index (CPI) obtained from the CANSIM database as series V41690973.

Industrial Production Growth (ZPRODG): The monthly industrial production growth is the monthly growth in the Industrial Production Index (IPI) extracted from the CANSIM database as series V53384745 or Datastream. It is available from March 1956.

Unemployment Rate (ZUNEMP): The unemployment rate data are collected from Datastream (code CNOUN014R) and go back to February 1960. It is also available as series V2064894 from the CANSIM database from January 1975.

Money Supply Growth (ZMONEYG): The money supply growth is the monthly growth of the Money Supply Index obtained as series V37173 from the CANSIM database. The money supply variable represents the unadjusted currency outside banks.

Gross Domestic Product Growth (ZGDPG): The gross domestic product (GDP) growth is the monthly growth in the seasonally adjusted GDP for all industries. We construct the ZGDPG variable with two series (V329529 and V65201483) from the CANSIM database. The first one, the GDP at factor cost in 1992 constant prices, allows going back to March 1961, but is now discontinued. The second one, the GDP at basic prices in 2007 constant prices, is used as soon as possible so that it is behind the ZGDPG variable from March 1997. Although they differ slightly in their methodology, the series produce growths correlated at 0.90 in their common time span.

Bank of Canada Prime Rates (ZPRIME, ZPRIMEv, ZPRIMEr): Series V122530 from the CANSIM database is the source for the Bank of Canada prime or discount rate. As it is highly persistent (like ZTBILL), we use its lagged value (ZPRIME), its lagged variation (ZPRIMEv) and its lagged value relative to its twelve-month moving average (ZPRIMEr). The correlations with their corresponding Treasury bill variable are 0.995 for ZPRIME, 0.84 for ZPRIMEv, and 0.97 for ZPRIMEr.

Composite Leading Indicator Growth (ZLEAD): The composite leading indicator (CLI) growth is mainly the monthly growth of the unsmoothed CLI available as series V7687 from the CANSIM database. According to Statistics Canada, the CLI is “comprised of ten components which lead cyclical activity and together represent all major categories of GDP. It thus reflects a variety of mechanisms that can cause business cycles."[21] The components are an housing index, the business and personal services employment, the TSE 300 Index, the money supply M1, the U.S. Composite Leading Indicator, the average work week hours, the new orders in durable goods, the shipments/inventories of finished goods, the furniture and appliance sales and other durable goods sales. The series starts in May 1952, but is discontinued since April 2012. Thereafter, we use a CLI from the OECD Main Economic Indicators, available in Datastream as series CNCYLEADT. The CLIs have a correlation of 0.97 in their common time span.

A.4 CANADIAN-SPECIFIC VARIABLES

The last five information variables are particularly relevant for the Canadian economy (ZFX, ZFXv, ZFXr, ZENERG, ZMMG).

CAD/USD Exchange Rates (ZFX, ZFXv, ZFXr): Canada's largest trading partner is by far the U.S. The spot exchange rate in Canadian dollars per U.S. dollar is collected from the CFMRC database and is also available as series V37426 from the CANSIM database. As it is highly persistent, we use its lagged value (ZFX), its lagged variation (ZFXv) and its lagged value relative to its twelve-month moving average (ZFXr).[22] ZFX, ZFXv and ZFXr start in November 1950, December 1950 and October 1951, respectively.

Commodity Price Growths (ZENERG, ZMMG): We consider two commodity price index growth variables that are associated with two important sectors of the Canadian economy. The energy index growth is the monthly growth in the Fisher Commodity Energy Price Index. The metals and minerals index growth is the monthly growth in the Fisher Commodity Metals and Minerals Price Index. The data come from the CANSIM database as series V52673498 and V52673499, respectively, and start in March 1972. The correlation between ZENERG and ZMMG is 0.23.

[21] For this explanation and more details on the CLI series, see the Statistics Canada website at the following address: www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=1601&lang=fr&db=imdb&adm=8&dis=2.

[22] We also considered the three-month forward CAD/USD exchange rate (series V37437) used by Korkie and Turtle (1998). However, given its correlation of 0.9997 with the spot exchange rate, we discard it from further analysis.

Appendix B. Existing Canadian Evidence

This appendix identifies and characterizes the existing Canadian evidence on the predictive ability of the 36 information variables under investigation. Table B1 provides a summary of this evidence. Specifically, for each variable covered in the literature, it gives the article reference, the IS data period, the sign of the predictive coefficient estimate, the IS $\bar{R}^2$ (or R^2 if $\bar{R}^2$ is unavailable), as well as whether or not the IS and OOS results are significant if available. The table includes articles that look at the individual predictive performance of the information variables, as we do in this paper. As a complement, the table also includes articles that present variable-specific predictive coefficient estimates taken from a multivariate predictive model. This last set of articles, for which we only report the sign and significance of the predictive coefficient estimates, provides indirect evidence on the predictive relation of the information variables.

A number of conclusions can be drawn from the Canadian evidence we uncover. First, while American evidence exists on most of the information variables considered in this study, the predictive ability of 19 of our 36 variables is not examined in a Canadian context. Furthermore, the *individual* predictive performance of some of the variables covered in the literature is undocumented as only multivariate results are available. Second, the results for most variables are not confirmed by an extensive body of works. Out of the 17 variables covered in the Canadian literature, nine variables are examined by one article and two variables are studied by two articles, hardly definitive evidence. Only three variables (ZDP, ZTBILL, ZTERM) are investigated by more than three papers. Third, the sample sizes of many existing Canadian studies are relatively small. Out of the ten articles found with Canadian evidence, only one recent article (Hjalmarsson, 2010) use more than 40 years of monthly data. Seven of the ten articles have a sample size less than half the one we have.

Fourth, the Canadian evidence is often not conclusive. There are contradictory results on the significance of IS predictability for six (ZDP, ZJAN, ZTBILL, ZTBILLv, ZLTGOV, ZTERM) of the variables with evidence from more than one article. Only two variables have similar IS evidence from multiple sources: ZDY (significant performance) and ZEP (insignificant performance). There is also little OOS Canadian evidence as only two articles (Rapach et al., 2005; Hjalmarsson, 2010) have reported results on OOS performance. Thus, in contrast to the comprehensive nature of our investigation, no existing article documents IS and OOS results in Canada for more than five information variables using a sample period of more than 30 years.

Rapach et al. (2005) and Hjalmarsson (2010) are perhaps the two studies included in Table B1 that are the most related to ours in terms of methodology. Both studies look at international equity premium IS and OOS predictability from individual country-specific information variables. While they do not focus specifically on Canada, the country is included as part of the large number of countries they examine. For Canada, Rapach et al. (2005) consider six variables with data from 1975 to 2001 while Hjalmarsson (2010) studies four variables with data from 1952 to 2004. Rapach et al. (2005) find significant IS relations for ZLTGOVr (negative) and ZPRODG (positive), and insignificant relations for ZTBILLr (negative), ZTERM (positive), INF (positive) and ZMONEYG (positive). Hjalmarsson (2010) find significant IS relations for ZTBILL (negative) and ZTERM (positive), and insignificant relations for ZDP (positive) and ZEP (positive). ZLTGOVr and ZTERM present significant OOS performance as well.

Other than the articles included in Table B1, we can also mention some additional evidence from related literature on the Canadian market. For example, in a multivariate conditional APT context, Koutoulas and Kryzanowski (1994, 1996) show that market returns are negatively related to innovations on the variation of the exchange rate (a variable similar to ZFXv) and on the term premium (a variable similar to ZTERM), and positively related to innovations on the leading indicator growth (a variable similar to ZLEAD) and on the industrial production growth (a variable similar to ZPRODG). In a similar context, Carmichael and Samson (2003) estimate that market returns are positively related to the lagged term premium (a variable similar to ZTERM), the lagged equity premium (a variable similar to ZEQP) and the January dummy ZJAN, while the relation with the lagged GDP growth (a variable similar to ZGDPG), the lagged inflation (a variable similar to ZINF) and the lagged real short-term interest rate (a variable similar to ZTBILL) depends on their specification.

Using a cointegration technique, Cheung and Ng (1998) show that quarterly market returns are related positively to the lagged equity premium (a variable similar to ZEQP) and negatively to the lagged real oil price index growth (a variable related to ZENERG), while not significantly related to the lagged growth in money supply (a variable similar to ZMONEYG) and the lagged gross national product growth (a variable related to ZGDPG). More recently, in a study on the exposures of returns in the G7 economies, Bredin and Hyde (2011) obtain that Canadian returns are positively exposed to the lagged appreciation of the Canadian dollar (a variable inversely related to ZFXv) and the lagged variation in the Treasury bill yield (a variable similar to ZTBILLv). While the evidence presented in these articles is suggestive of the relevancy of some information variables, it comes from different contexts and does not provide an assessment of their individual predictive ability.

Finally, there exists a literature on the predictability of the Canadian equity premium from *international* information variables. For example, Ferson and Harvey (1993, 1994) show that Canadian excess returns in U.S. dollars can be predicted by world information variables. Interestingly, they also reject the hypothesis that country information variables have no explanatory power when global variables are included. Harvey (1991) and Carmichael and Samson (1996) find that some commonly used U.S. information variables are IS significant in predicting the Canadian equity premium. More recently, Rapach et al. (2013) look at the role of the U.S. in international stock return predictability and show that the lagged U.S. equity premium produces significant IS and OOS predictions for the Canadian equity premium. In this paper, similar to the comprehensive studies of U.S. predictability, we focus exclusively on local information variables.

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Table B1. Canadian Evidence on the Predictability of the Equity Premium

This table presents a summary of the Canadian evidence on the predictive ability of the 36 information variables. For each variable covered, the table gives the article reference, the IS data period (labelled Sample), the sign of the predictive coefficient estimate (labelled *sign*(*b*)), the IS $\bar{R}^2$ (or R^2 if $\bar{R}^2$ is unavailable), and whether or not the IS and OOS results are significant (labelled IS Sig and OOS Sig). NA indicates that the evidence is not available.

Variable	Reference	Sample	*sign(b)*	IS $\bar{R}^2$	IS Sig	OOS Sig	Notes
ZDY	Solnik (1993, Table 1)	1971-1990	+	NA	Yes	NA	From a multivariate regression
	Ferson and Harvey (1994, Table 2.3)	1976-1993	+	NA	Yes	NA	Data in USD; From a multivariate regression
	Deaves, Miu, and White (2008, Table 3)	1956-2003	+	1.60%	Yes	NA	Quarterly data
ZDP	Carmichael and Samson (1996, Table 2)	1969-1992	+	NA	Yes	NA	From a multivariate regression
	Paye and Timmermann (2006, Table 4)	1970-2003	+	0.05%	No	NA	
	Hjalmarsson (2010, Table 5)	1934-2004	+	0.30%	No	No	
	Rapach, Strauss, and Zhou (2013, Table 2)	1980-2010	+	NA	No	NA	From a multivariate regression
ZEP	Deaves, Miu, and White (2008, Table 3)	1956-2003	+	0.40%	No	NA	Quarterly data
	Hjalmarsson (2010, Table 5)	1956-2004	+	0.00%	No	No	
ZSVAR	Guo (2006b, Table 2)	1974-2002	+	0.30%	No	NA	Quarterly data in USD
ZJAN	Solnik (1993, Table 1)	1971-1990	+	NA	No	NA	From a multivariate regression
	Carmichael and Samson (1996, Table 2)	1969-1992	+	NA	Yes	NA	From a multivariate regression
	Korkie and Turtle (1998, Table 2)	1967-1993	+	NA	Yes	NA	From a multivariate regression
ZTBILL	Solnik (1993, Table 1)	1971-1990	-	NA	No	NA	From a multivariate regression
	Korkie and Turtle (1998, Table 2)	1967-1993	+	NA	No	NA	From a multivariate regression
	Paye and Timmermann (2006, Table 4)	1970-2003	-	0.97%	Yes	NA	
	Hjalmarsson (2010, Table 5)	1952-2004	-	1.02%	Yes	No	
	Rapach, Strauss, and Zhou (2013, Table 2)	1980-2010	-	NA	Yes	NA	From a multivariate regression
ZTBILLv	Carmichael and Samson (1996)	1969-1992	-	NA	No	NA	Results discussed but not reported
	Korkie and Turtle (1998, Table 2)	1967-1993	-	NA	Yes	NA	From a multivariate regression
ZTBILLr	Rapach, Wohar, and Rangvid (2005, Table 3)	1975-2001	-	0.00%	No	No	
ZLTGOV	Solnik (1993, Table 1)	1971-1990	-	NA	No	NA	From a multivariate regression
	Ferson and Harvey (1994, Table 2.3)	1976-1993	-	NA	Yes	NA	Data in USD; From a multivariate regression
	Korkie and Turtle (1998, Table 2)	1967-1993	-	NA	Yes	NA	From a multivariate regression
ZLTGOVv	Carmichael and Samson (1996, Table 2)	1969-1992	-	NA	Yes	NA	From a multivariate regression
ZLTGOVr	Rapach, Wohar, and Rangvid (2005, Table 3)	1975-2001	-	5.00%	Yes	Yes	
ZTERM	Carmichael and Samson (1996, Table 2)	1969-1992	+	NA	Yes	NA	From a multivariate regression
	Rapach, Wohar, and Rangvid (2005, Table 3)	1975-2001	+	0.00%	No	No	
	Paye and Timmermann (2006, Table 4)	1970-2003	+	0.54%	No	NA	
	Hjalmarsson (2010, Table 5)	1952-2004	+	0.96%	Yes	Yes	
ZCREDIT	Paye and Timmermann (2006, Table 4)	1970-2003	+	0.15%	No	NA	Based on the U.S. credit premium
ZINF	Rapach, Wohar, and Rangvid (2005, Table 3)	1975-2001	+	0.00%	No	No	
ZPRODG	Rapach, Wohar, and Rangvid (2005, Table 3)	1975-2001	+	1.00%	Yes	No	
ZMONEYG	Rapach, Wohar and Rangvid (2005, Table 3)	1975-2001	+	0.00%	No	No	
ZFX	Korkie and Turtle (1998, Table 2)	1967-1993	+	NA	Yes	NA	Based on 3-month forward FX; From a multivariate regression

Table I. Overview of the Information Variables

This table presents an overview of the 36 information variables used in the predictive regressions. The column labelled Sample Start gives the start date of the monthly observations of the variables. The end date is December 2013 for all variables. The column labelled Data Sources gives information on the sources of the series used to construct the information variables. CFMRC represents the Canadian Financial Markets Research Centre database. CANSIM represents the Canadian Socioeconomic database from Statistic Canada. Datastream represents Thomson Reuters Datastream database. Kenneth R. French's Data Library is available on the Web page http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Category	Variable	Description	Sample Start	Data Sources
Market Characteristic Variables	ZDY	Dividend Yield	1957:02	CFMRC
	ZDYf	Dividend Yield Forward	1956:02	CANSIM V122628
	ZDP	Dividend-Price Ratio	1957:02	CFMRC
	ZPE	Price-Earnings Ratio	1956:02	CANSIM V122629
	ZEP	Earnings-Price Ratio	1956:02	Inverse of ZPE
	ZEQP	Previous Equity Premium	1950:03	Lagged value of EQP
	ZVOLG	Volume Growth	1953:03	CANSIM V37413
	ZVOLGd	Volume Growth Dollar	1953:03	CANSIM V37412
	ZSVAR	Stock Variance	1975:02	CFMRC or Datastream
	ZISSUE	Issuing Activity	1951:02	CFMRC or Datastream
	ZCSBETA	Cross-Sectional Beta Premium	1980:01	Kenneth R. French's Data Library
	ZJAN	January Dummy	1950:02	
Interest Rate Variables	ZTBILL	T-Bill Yield	1950:02	CFMRC or CANSIM V122541
	ZTBILLv	T-Bill Yield Variation	1950:02	Computed from ZTBILL
	ZTBILLr	T-Bill Yield Relative	1950:02	Computed from ZTBILL
	ZLTGOV	Long Gov Bond Yield	1950:02	CFMRC or CANSIM V122487
	ZLTGOVv	Long Gov Bond Yield Variation	1950:02	Computed from ZLTGOV
	ZLTGOVr	Long Gov Bond Yield Relative	1950:02	Computed from ZLTGOV
	ZTERM	Term Premium	1950:02	Computed from ZLTGOV and ZTBILL
	ZCREDIT	Credit Premium	1950:02	CANSIM V35752, V122518, Datastream MLCCTPL and ZLTGOV
	ZCREDITs	Credit Premium Short	1956:02	CANSIM V122491 and ZTBILL
	ZCREDITr	Credit Premium Return	1950:12	CANSIM V35754, Datastream MLCCTPL, CFMRC
Macro-economic Variables	ZINF	Inflation Rate	1950:02	CANSIM V41690973
	ZPRODG	Industrial Production Growth	1956:03	CANSIM V53384745 or Datastream
	ZUNEMP	Unemployment Rate	1960:02	CANSIM V2064894 or Datastream CNOUN014R
	ZMONEYG	Money Supply Growth	1950:02	CANSIM V37173
	ZGDPG	GDP Growth	1961:03	CANSIM V329529 and V65201483
	ZPRIME	Prime Rate	1950:02	CANSIM V122530
	ZPRIMEv	Prime Rate Variation	1950:02	Computed from ZPRIME
	ZPRIMEr	Prime Rate Relative	1950:02	Computed from ZPRIME
	ZLEAD	Leading Indicator Growth	1952:05	CANSIM V7687, Datastream CNCYLEADT
Canadian-Specific Variables	ZFX	CAD/USD Rate	1950:11	CFMRC or CANSIM V37426
	ZFXv	CAD/USD Rate Variation	1950:12	Computed from ZFX
	ZFXr	CAD/USD Rate Relative	1951:10	Computed from ZFX
	ZENERG	Energy Price Growth	1972:03	CANSIM V52673498
	ZMMG	Metals-Minerals Price Growth	1972:03	CANSIM V52673499

Table II. Descriptive Statistics of the Equity Premium and Information Variables

This table presents the full-sample mean, standard deviation, minimum, maximum, excess kurtosis, skewness, and autocorrelation (with significance), as well as the mean in three sub-periods of the variables in the study. The data are at monthly frequency and cover the period from February 1950 to December 2013. The variable EQP is the Canadian equity premium. The variables beginning by Z are the information variables and have been lagged by one month. The information variables are described in Table I. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Full Sample							1950-1969	1970-1989	1990-2013
Variable	Mean	Std Dev	Min	Max	Excess Kurt	Skew-ness	Autocor-relation	Mean	Mean	Mean
EQP	0.0045	0.044	-0.235	0.158	2.607	-0.697	0.124 ***	0.0069	0.0029	0.0039
ZDY	0.0345	0.013	0.009	0.085	0.933	0.740	0.882 ***	0.0369	0.0435	0.0259
ZDYf	0.0308	0.009	0.010	0.063	0.028	0.128	0.985 ***	0.0335	0.0375	0.0235
ZDP	0.0324	0.011	0.009	0.086	0.517	0.275	0.862 ***	0.0350	0.0401	0.0246
ZPE	24.652	35.437	6.580	254.98	31.450	5.434	0.911 ***	17.024	12.978	38.802
ZEP	0.0626	0.028	0.004	0.152	0.539	0.664	0.986 ***	0.0596	0.0870	0.0441
ZEQP	0.0045	0.044	-0.235	0.158	2.600	-0.695	0.124 ***	0.0070	0.0029	0.0038
ZVOLG	0.0297	0.236	-0.577	1.885	7.107	1.513	-0.237 ***	0.0370	0.0345	0.0206
ZVOLGd	0.0323	0.233	-0.606	1.791	6.199	1.485	-0.187 ***	0.0276	0.0420	0.0274
ZSVAR	0.0019	0.004	0.000	0.055	91.074	8.335	0.577 ***		0.0014	0.0022
ZISSUE	0.0276	0.083	-0.223	0.543	14.126	2.517	0.780 ***	0.0259	0.0401	0.0184
ZCSBETA	-0.2789	0.308	-1.463	0.249	3.752	-1.588	0.987 ***		-0.288	-0.275
ZJAN	0.0821	0.275	0.000	1.000	7.320	3.050	-0.090 **	0.0795	0.0833	0.0833
ZTBILL	0.0539	0.038	0.002	0.208	0.988	1.041	0.992 ***	0.0325	0.0913	0.0405
ZTBILLv	0.0000	0.005	-0.036	0.033	13.285	0.099	0.248 ***	0.0003	0.0002	-0.0004
ZTBILLr	0.0000	0.011	-0.039	0.045	2.114	0.098	0.913 ***	0.0016	0.0011	-0.0021
ZLTGOV	0.0681	0.030	0.021	0.177	0.116	0.762	0.995 ***	0.0466	0.1010	0.0585
ZLTGOVv	0.0000	0.003	-0.023	0.020	12.249	-0.176	0.065 *	0.0002	0.0001	-0.0002
ZLTGOVr	0.0000	0.006	-0.026	0.032	5.903	0.596	0.874 ***	0.0011	0.0005	-0.0013
ZTERM	0.0141	0.014	-0.043	0.044	1.590	-0.892	0.955 ***	0.0141	0.0097	0.0179
ZCREDIT	0.0103	0.005	0.002	0.037	4.608	1.606	0.975 ***	0.0070	0.0104	0.0128
ZCREDITs	0.0050	0.006	-0.002	0.039	5.688	2.154	0.878 ***	0.0077	0.0064	0.0023
ZCREDITr	0.0005	0.013	-0.067	0.092	5.949	0.038	-0.043	0.0006	0.0005	0.0004
ZINF	0.0030	0.005	-0.013	0.026	1.785	0.639	0.244 ***	0.0021	0.0056	0.0017
ZPRODG	0.0028	0.006	-0.029	0.038	4.102	0.359	0.370 ***	0.0012	0.0055	0.0014
ZUNEMP	0.0753	0.022	0.024	0.141	-0.181	0.197	0.962 ***	0.0506	0.0803	0.0814
ZMONEYG	0.0054	0.016	-0.051	0.053	1.749	-0.668	-0.049	0.0043	0.0076	0.0045
ZGDPG	0.0027	0.005	-0.015	0.022	1.099	-0.019	-0.079 **	0.0045	0.0028	0.0019
ZPRIME	0.0580	0.037	0.005	0.210	0.952	1.022	0.992 ***	0.0368	0.0964	0.0437
ZPRIMEv	0.0000	0.005	-0.038	0.042	18.563	0.121	0.270 ***	0.0003	0.0002	-0.0004
ZPRIMEr	0.0000	0.011	-0.037	0.048	2.479	0.175	0.914 ***	0.0014	0.0011	-0.0021
ZLEAD	0.0032	0.010	-0.028	0.035	0.611	-0.196	0.134 ***	0.0027	0.0033	0.0036
ZFX	1.1540	0.169	0.948	1.600	-0.400	0.802	0.996 ***	1.0235	1.1510	1.2608
ZFXv	0.0000	0.014	-0.074	0.126	10.271	0.477	0.255 ***	0.0001	0.0004	-0.0004
ZFXr	-0.0002	0.034	-0.158	0.170	4.540	-0.073	0.922 ***	0.0005	0.0024	-0.0028
ZENERG	0.0074	0.063	-0.241	0.282	2.469	-0.027	0.264 ***		0.0078	0.0071
ZMMG	0.0042	0.036	-0.134	0.172	2.504	0.283	0.326 ***		0.0060	0.0028

Table III. Full-Sample IS Results

This table presents the IS predictive regression results for the 36 information variables using the full available samples. The information variables are described in Table I. The column labelled *N* gives the number of observations. The columns labelled *b* and *t*-stat give the predictive regression coefficient and its Newey-West adjusted *t*-statistic. The columns labelled $\overline{R}^2$ and *F*-stat give the adjusted R^2 and *F*-statistic of the predictive regression. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs.

Variable	N	b	t-stat	$\overline{R}^2$	F-stat
ZDY	683	0.079	0.52	-0.10%	0.34
ZDYf	695	0.125	0.52	-0.08%	0.47
ZDP	683	0.126	0.63	-0.06%	0.61
ZPE	695	0.000	-1.04	0.00%	1.04
ZEP	695	0.027	0.37	-0.11%	0.21
ZEQP	766	0.124	**3.24** ***	1.41%	**11.99** ***
ZVOLG	730	0.004	0.66	-0.08%	0.38
ZVOLGd	730	0.002	0.26	-0.13%	0.07
ZSVAR	467	-1.030	-1.81	0.58%	**3.73** **
ZISSUE	755	0.003	0.19	-0.13%	0.03
ZCSBETA	408	0.011	1.47	0.29%	2.18
ZJAN	767	0.012	**1.98** *	0.46%	**4.56** **
ZTBILL	767	-0.115	**-2.09** **	0.88%	**7.79** ***
ZTBILLv	767	-0.756	**-2.41** **	0.53%	**5.09** **
ZTBILLr	767	-0.314	-1.60	0.47%	**4.62** **
ZLTGOV	767	-0.117	**-1.66** *	0.54%	**5.14** **
ZLTGOVv	767	-1.541	**-3.30** ***	0.93%	**8.25** ***
ZLTGOVr	767	-1.120	**-3.64** ***	1.88%	**15.71** ***
ZTERM	767	0.286	**2.17** **	0.74%	**6.74** **
ZCREDIT	767	-0.307	-0.62	-0.01%	0.95
ZCREDITs	695	-0.394	-1.03	0.12%	1.84
ZCREDITr	757	0.223	1.28	0.31%	**3.38** *
ZINF	767	-0.321	-0.82	-0.01%	0.89
ZPRODG	694	-0.181	-0.56	-0.07%	0.49
ZUNEMP	647	0.111	1.36	0.15%	1.96
ZMONEYG	767	0.097	1.09	-0.01%	0.96
ZGDPG	634	0.736	**2.00** *	0.57%	**4.67** **
ZPRIME	767	-0.113	**-2.01** **	0.80%	**7.20** ***
ZPRIMEv	767	-0.565	**-1.93** *	0.23%	**2.78** *
ZPRIMEr	767	-0.265	-1.35	0.29%	**3.25** *
ZLEAD	740	0.602	**3.43** ***	1.61%	**13.09** ***
ZFX	758	0.002	0.21	-0.12%	0.06
ZFXv	757	-0.226	**-2.05** *	0.41%	**4.13** **
ZFXr	747	-0.030	-0.57	-0.08%	0.41
ZENERG	502	0.043	1.03	0.14%	1.69
ZMMG	502	0.013	0.21	-0.19%	0.05

Table IV. Full-Sample OOS Results

This table presents the OOS predictive regression results for the 36 information variables using the full available samples and the rolling or recursive estimation window schemes. The information variables are described in Table I. The columns labelled $\bar{R}^2$ and IS $\bar{R}^2$ give the OOS and IS adjusted R^2. The columns labelled *MSE-T* and *MSE-F* give the *t*-statistic developed by Diebold and Mariano (1995) and modified by Harvey et al. (1997) and the *F*-statistic proposed by McCracken (2007). ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs.

		OOS (Rolling)			OOS (Recursive)		
Variable	IS $\bar{R}^2$	*MSE-T*	*MSE-F*	$\bar{R}^2$	*MSE-T*	*MSE-F*	$\bar{R}^2$
ZDY	-0.10%	-1.65	-5.72	-1.29%	-1.04	-4.02	-0.96%
ZDYf	-0.08%	-1.38	-7.14	-1.57%	-1.28	-6.34	-1.41%
ZDP	-0.06%	-1.86	-12.86	-2.70%	-1.45	-10.17	-2.16%
ZPE	0.00%	-1.97	-6.00	-1.34%	-1.74	-5.87	-1.32%
ZEP	-0.11%	-1.41	-9.04	-1.94%	-1.17	-7.80	-1.70%
ZEQP	1.41%	**0.74** **	**4.41** ***	0.64%	**0.67** **	**4.55** ***	0.67%
ZVOLG	-0.08%	-1.11	-1.97	-0.57%	-0.25	-0.39	-0.26%
ZVOLGd	-0.13%	-0.89	-2.96	-0.76%	-1.00	-1.53	-0.48%
ZSVAR	0.58%	-1.42	-10.09	-2.64%	-1.03	-6.26	-1.71%
ZISSUE	-0.13%	-1.81	-6.00	-1.34%	-1.32	-4.60	-1.07%
ZCSBETA	0.29%	-2.30	-23.87	-7.15%	-2.41	-24.74	-7.42%
ZJAN	0.46%	-0.13	-0.79	-0.34%	0.08	0.51	-0.09%
ZTBILL	0.88%	-0.46	-3.91	-0.94%	-0.14	-1.25	-0.43%
ZTBILLv	0.53%	**0.61** **	**2.52** **	0.29%	**0.78** **	**2.61** **	0.30%
ZTBILLr	0.47%	**0.09** *	**0.43** *	-0.11%	0.01	0.03	-0.19%
ZLTGOV	0.54%	-0.82	-6.60	-1.46%	-0.31	-2.50	-0.67%
ZLTGOVv	0.93%	**0.48** **	**2.62** **	0.30%	**0.49** *	**2.76** **	0.33%
ZLTGOVr	1.88%	**0.66** **	**6.39** ***	1.01%	**0.39** *	**4.47** ***	0.65%
ZTERM	0.74%	-0.09	-0.32	-0.25%	-0.04	-0.19	-0.23%
ZCREDIT	-0.01%	-1.04	-8.04	-1.74%	-0.64	-3.59	-0.88%
ZCREDITs	0.12%	-1.52	-5.65	-1.28%	-0.28	-0.97	-0.38%
ZCREDITr	0.31%	-1.96	-7.33	-1.60%	-0.15	-0.31	-0.25%
ZINF	-0.01%	-1.70	-4.64	-1.08%	-0.27	-0.55	-0.30%
ZPRODG	-0.07%	-1.53	-6.01	-1.35%	-0.48	-1.78	-0.53%
ZUNEMP	0.15%	-0.56	-2.16	-0.60%	-0.06	-0.14	-0.22%
ZMONEYG	-0.01%	-0.47	-1.32	-0.44%	-0.64	-1.82	-0.54%
ZGDPG	0.57%	**0.20** *	**0.85** *	-0.03%	**0.42** **	**1.80** **	0.15%
ZPRIME	0.80%	-0.49	-3.89	-0.93%	-0.18	-1.50	-0.48%
ZPRIMEv	0.23%	**0.20** *	**0.67** *	-0.06%	0.21	0.50	-0.10%
ZPRIMEr	0.29%	-0.09	-0.38	-0.26%	-0.12	-0.54	-0.29%
ZLEAD	1.61%	**0.43** **	**3.38** **	0.45%	**1.02** **	**6.25** ***	0.98%
ZFX	-0.12%	-1.56	-8.46	-1.82%	-1.33	-4.09	-0.97%
ZFXv	0.41%	-0.12	-0.37	-0.26%	**0.44** *	**1.00** *	0.00%
ZFXr	-0.08%	-0.66	-2.13	-0.60%	-0.84	-1.96	-0.57%
ZENERG	0.14%	-1.27	-3.67	-1.01%	-1.39	-5.06	-1.32%
ZMMG	-0.19%	-2.16	-12.08	-2.88%	-2.12	-12.74	-3.03%

Table V. Sub-Period IS Results

This table presents the IS predictive regression results for the 36 information variables in three sub-periods. The information variables are described in Table I. The column labelled *N* gives the number of observations. The columns labelled *b* and *t*-stat give the predictive regression coefficient and its Newey-West adjusted *t*-statistic. The columns labelled $\overline{R}^2$ and *F*-stat give the adjusted R^2 and *F*-statistic of the predictive regression. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs.

	1950-1969					1970-1989					1990-2013				
Variable	*N*	*b*	*t*-stat	$\overline{R}^2$	*F*-stat	*N*	*b*	*t*-stat	$\overline{R}^2$	*F*-stat	*N*	*b*	*t*-stat	$\overline{R}^2$	*F*-stat
ZDY	155	0.551	0.90	-0.10%	0.86	240	0.197	0.84	-0.13%	0.69	288	-0.019	-0.05	-0.35%	0.00
ZDYf	167	1.527	1.49	1.28%	3.19	240	0.621	1.24	0.52%	2.26	288	-0.216	-0.42	-0.22%	0.38
ZDP	155	3.729	**4.18 *****	6.02%	**11.01 *****	240	0.331	0.94	0.03%	1.08	288	-0.026	-0.06	-0.35%	0.01
ZPE	167	-0.002	-0.91	0.19%	1.33	240	0.000	-0.09	-0.42%	0.01	288	0.000	-1.11	0.11%	1.32
ZEP	167	0.378	0.75	-0.01%	1.00	240	0.058	0.45	-0.31%	0.26	288	0.055	0.33	-0.29%	0.18
ZEQP	238	0.160	**2.71 ****	2.16%	**6.28 ****	240	0.078	1.35	0.19%	1.47	288	0.153	**2.23 ****	1.98%	**6.86 *****
ZVOLG	202	0.005	0.60	-0.30%	0.41	240	0.003	0.30	-0.39%	0.06	288	0.003	0.18	-0.34%	0.04
ZVOLGd	202	-0.008	-0.65	-0.26%	0.49	240	0.000	0.04	-0.42%	0.00	288	0.011	0.85	-0.05%	0.88
ZSVAR						179	-0.167	-0.37	-0.55%	0.02	288	-1.294	**-2.20 ***	1.41%	**5.15 ****
ZISSUE	227	-0.119	-1.01	0.15%	1.36	240	-0.003	-0.15	-0.41%	0.01	288	0.042	1.10	0.02%	1.06
ZCSBETA						120	0.045	0.74	-0.01%	1.01	288	0.010	1.31	0.30%	1.89
ZJAN	239	0.018	**2.07 ***	1.43%	**4.49 ****	240	0.021	1.49	0.91%	**3.22 ***	288	0.000	0.02	-0.35%	0.00
ZTBILL	239	-0.303	**-2.30 ****	1.82%	**5.46 ****	240	-0.133	-1.19	0.43%	2.05	288	-0.172	**-2.12 ****	0.99%	**3.89 ****
ZTBILLv	239	0.007	0.01	-0.42%	0.00	240	-1.006	**-2.46 ****	1.25%	**4.06 ****	288	-0.639	-1.06	-0.01%	0.97
ZTBILLr	239	-0.517	**-1.85 ***	0.56%	2.36	240	-0.368	-1.28	0.80%	**2.94 ***	288	-0.128	-0.45	-0.29%	0.18
ZLTGOV	239	-0.358	**-1.90 ****	1.06%	**3.59 ***	240	-0.233	-1.26	0.68%	2.66	288	-0.120	-1.15	0.05%	1.16
ZLTGOVv	239	-0.855	-0.33	-0.35%	0.17	240	-1.702	**-2.92 ****	1.74%	**5.27 ****	288	-1.341	-1.67	0.21%	1.62
ZLTGOVr	239	-2.480	**-2.52 ****	1.98%	**5.86 ****	240	-1.290	**-3.39 *****	3.98%	**10.99 *****	288	-0.582	-1.15	-0.02%	0.94
ZTERM	239	0.668	**2.17 ***	1.76%	**5.30 ****	240	0.134	0.62	-0.20%	0.52	288	0.409	**2.50 ****	1.46%	**5.29 ****
ZCREDIT	239	-0.801	-0.79	-0.02%	0.96	240	0.057	0.05	-0.42%	0.00	288	-0.206	-0.27	-0.27%	0.23
ZCREDITs	167	-0.470	-0.68	-0.24%	0.61	240	-0.360	-0.70	-0.12%	0.72	288	-1.425	-0.65	0.23%	1.68
ZCREDITr	229	0.245	1.08	-0.01%	1.00	240	0.044	0.13	-0.41%	0.03	288	0.330	1.32	1.00%	**3.94 ****
ZINF	239	-0.118	-0.27	-0.40%	0.06	240	-0.757	-0.93	-0.03%	0.94	288	-0.021	-0.03	-0.35%	0.00
ZPRODG	166	0.162	0.25	-0.58%	0.04	240	-0.322	-0.49	-0.25%	0.40	288	-0.124	-0.35	-0.31%	0.12
ZUNEMP	119	0.124	0.66	-0.35%	0.60	240	0.260	1.53	0.74%	**2.81 ***	288	0.101	0.57	-0.20%	0.43
ZMONEYG	239	0.254	**2.34 ****	0.84%	**3.05 ***	240	0.179	1.32	0.03%	1.08	288	-0.253	-1.20	0.18%	1.52
ZGDPG	106	0.604	1.10	0.43%	1.48	240	0.648	1.06	0.14%	1.34	288	1.145	1.55	0.60%	**2.74 ***
ZPRIME	239	-0.304	**-2.08 ****	1.53%	**4.73 ****	240	-0.138	-1.10	0.35%	1.84	288	-0.179	**-2.29 ****	1.08%	**4.18 ****
ZPRIMEv	239	0.343	0.58	-0.32%	0.24	240	-0.865	**-2.22 ****	0.82%	**3.01 ***	288	-0.440	-0.79	-0.22%	0.38
ZPRIMEr	239	-0.391	-1.51	0.20%	1.49	240	-0.336	-1.12	0.54%	2.31	288	-0.081	-0.31	-0.32%	0.08
ZLEAD	212	0.571	**2.47 ****	2.74%	**7.00 *****	240	0.560	1.61	0.74%	2.80	288	0.710	**1.98 ***	1.46%	**5.29 ****
ZFX	230	0.012	0.20	-0.41%	0.06	240	0.016	0.66	-0.26%	0.39	288	0.005	0.31	-0.30%	0.14
ZFXv	229	-0.249	-0.64	-0.28%	0.36	240	-0.075	-0.31	-0.39%	0.07	288	-0.264	**-2.08** *	1.18%	**4.46 ****
ZFXr	219	0.093	0.60	-0.31%	0.33	240	0.085	0.82	-0.23%	0.46	288	-0.067	-1.07	0.21%	1.62
ZENERG						214	-0.008	-0.11	-0.47%	0.01	288	0.052	1.12	0.53%	2.55
ZMMG						214	-0.044	-0.49	-0.37%	0.23	288	0.066	0.75	-0.07%	0.79

Table VI. Sub-Period OOS Results

This table presents the OOS predictive regression results for the 36 information variables in two sub-periods and using the rolling or recursive estimation window schemes. The information variables are described in Table I. The columns labelled $\overline{R}^2$ and IS $\overline{R}^2$ give the OOS and IS adjusted R^2. The columns labelled *MSE-T* and *MSE-F* give the *t*-statistic developed by Diebold and Mariano (1995) and modified by Harvey et al. (1997) and the *F*-statistic proposed by McCracken (2007). ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs.

	1970-1989							1990-2013					
		OOS (Rolling)			OOS (Recursive)				OOS (Rolling)			OOS (Recursive)		
Variable	IS $\overline{R}^2$	*MSE-T*	*MSE-F*	$\overline{R}^2$	*MSE-T*	*MSE-F*	$\overline{R}^2$	IS $\overline{R}^2$	*MSE-T*	*MSE-F*	$\overline{R}^2$	*MSE-T*	*MSE-F*	$\overline{R}^2$
ZDY	-0.13%	-1.06	-2.62	-1.53%	-0.76	-2.17	-1.34%	-0.35%	-1.40	-3.09	-1.44%	-0.75	-1.71	-0.95%
ZDYf	0.52%	-0.72	-2.64	-1.54%	-0.58	-1.92	-1.24%	-0.22%	-1.43	-4.73	-2.03%	-1.36	-4.79	-2.05%
ZDP	0.03%	-1.31	-7.06	-3.48%	-1.16	-6.37	-3.17%	-0.35%	-1.76	-5.29	-2.23%	-1.07	-3.05	-1.42%
ZPE	-0.42%	-1.68	-3.44	-1.89%	-1.54	-3.39	-1.87%	0.11%	-1.04	-2.28	-1.15%	-0.86	-2.18	-1.11%
ZEP	-0.31%	-1.21	-6.30	-3.14%	-1.12	-6.08	-3.04%	-0.29%	-0.98	-1.81	-0.99%	-0.36	-0.60	-0.56%
ZEQP	0.19%	0.01	0.05	-0.40%	-0.05	-0.22	-0.51%	1.98%	1.18 **	5.19 ***	1.43%	1.22 **	5.76 ***	1.62%
ZVOLG	-0.39%	-0.94	-0.40	-0.59%	-0.14	-0.15	-0.49%	-0.34%	-0.88	-1.76	-0.97%	-0.22	-0.24	-0.44%
ZVOLGd	-0.42%	-0.82	-1.40	-1.02%	-0.70	-0.80	-0.76%	-0.05%	-0.49	-1.53	-0.89%	-0.83	-0.68	-0.59%
ZSVAR	-0.55%	-1.13	-5.04	-4.39%	-1.23	-5.26	-4.55%	1.41%	-0.86	-4.20	-1.83%	0.25	0.71	-0.10%
ZISSUE	-0.41%	-1.69	-4.47	-2.34%	-1.26	-3.67	-1.99%	0.02%	-0.65	-0.79	-0.63%	-0.62	-0.27	-0.44%
ZCSBETA	-0.01%	-2.29	-18.00	-28.8%	-2.43	-18.15	-29.1%	0.30%	-0.51	-1.77	-0.97%	-0.56	-2.50	-1.23%
ZJAN	0.91%	0.23	1.13 *	0.05%	0.60 *	2.77 **	0.73%	-0.35%	-1.11	-2.49	-1.22%	-1.05	-3.21	-1.48%
ZTBILL	0.43%	-0.51	-3.09	-1.74%	-0.34	-2.44	-1.46%	0.99%	-0.05	-0.28	-0.45%	0.60 *	1.99 **	0.34%
ZTBILLv	1.25%	0.64 *	2.00 **	0.41%	0.73 *	1.79 **	0.33%	-0.01%	0.09	0.19	-0.28%	0.29	0.58	-0.15%
ZTBILLr	0.80%	0.25	0.94 *	-0.03%	0.17	0.73	-0.12%	-0.29%	-0.46	-0.80	-0.63%	-0.45	-0.98	-0.69%
ZLTGOV	0.68%	-0.60	-3.13	-1.76%	-0.34	-2.17	-1.34%	0.05%	-0.55	-3.41	-1.55%	0.04	0.10	-0.32%
ZLTGOVv	1.74%	0.34	1.42 *	0.17%	0.35	1.50 *	0.21%	0.21%	0.38 *	1.10 *	0.03%	0.41	1.15 *	0.05%
ZLTGOVr	3.98%	0.76 **	5.93 ***	2.01%	0.54 *	5.06 ***	1.66%	-0.02%	-0.18	-0.64	-0.57%	-0.41	-1.70	-0.95%
ZTERM	-0.20%	-0.97	-2.33	-1.41%	-0.74	-2.62	-1.54%	1.46%	1.07 **	2.94 **	0.66%	1.06 **	3.54 ***	0.87%
ZCREDIT	-0.42%	-1.32	-2.32	-1.41%	-0.62	-1.49	-1.05%	-0.27%	-0.71	-6.23	-2.57%	-0.38	-2.15	-1.11%
ZCREDITs	-0.12%	-0.49	-1.26	-0.95%	-0.38	-1.07	-0.87%	0.23%	-1.93	-4.89	-2.08%	0.39	0.36	-0.23%
ZCREDITr	-0.41%	-1.84	-3.48	-1.90%	-1.14	-1.65	-1.12%	1.00%	-1.07	-3.80	-1.69%	1.40 **	1.97 **	0.33%
ZINF	-0.03%	-0.22	-0.45	-0.61%	0.14	0.20	-0.34%	-0.35%	-3.18	-4.81	-2.05%	-0.79	-0.94	-0.68%
ZPRODG	-0.25%	-0.82	-2.32	-1.41%	-0.37	-1.09	-0.88%	-0.31%	-1.57	-3.84	-1.71%	-0.35	-0.58	-0.55%
ZUNEMP	0.74%	0.08	0.17	-0.35%	-0.10	-0.16	-0.49%	-0.20%	-0.80	-2.77	-1.32%	0.06	0.07	-0.33%
ZMONEYG	0.03%	-0.03	-0.07	-0.45%	0.09	0.19	-0.34%	0.18%	-1.28	-1.46	-0.86%	-1.79	-2.40	-1.19%
ZGDPG	0.14%	-0.09	-0.25	-0.53%	0.07	0.20	-0.34%	0.60%	0.47 *	1.36 *	0.12%	0.72 *	1.85 **	0.29%
ZPRIME	0.35%	-0.61	-3.39	-1.87%	-0.40	-2.67	-1.56%	1.08%	0.04	0.18	-0.29%	0.63 *	2.02 **	0.35%
ZPRIMEv	0.82%	0.25	0.65	-0.15%	0.21	0.37	-0.27%	-0.22%	-0.06	-0.11	-0.39%	0.05	0.08	-0.32%
ZPRIMEr	0.54%	0.13	0.42	-0.25%	0.09	0.30	-0.30%	-0.32%	-0.66	-1.02	-0.71%	-0.55	-1.05	-0.72%
ZLEAD	0.74%	0.01	0.06	-0.40%	0.47 *	1.89 **	0.36%	1.46%	0.55 *	3.93 ***	1.00%	1.05 **	4.76 ***	1.28%
ZFX	-0.26%	-1.06	-3.62	-1.97%	-0.98	-2.44	-1.46%	-0.30%	-1.14	-4.93	-2.10%	-1.35	-1.41	-0.84%
ZFXv	-0.39%	-1.60	-1.96	-1.25%	-0.97	-0.95	-0.82%	1.18%	0.76 **	2.34 **	0.46%	1.08 **	2.54 **	0.53%
ZFXr	-0.23%	-0.82	-0.84	-0.78%	-0.25	-0.31	-0.55%	0.21%	-0.38	-1.34	-0.82%	-0.87	-1.88	-1.01%
ZENERG	-0.47%	-1.90	-3.92	-2.83%	-1.44	-3.75	-2.73%	0.53%	0.72 **	1.21 *	0.07%	-0.29	-0.62	-0.57%
ZMMG	-0.37%	-2.17	-9.67	-6.35%	-2.01	-9.51	-6.25%	-0.07%	-0.20	-0.25	-0.44%	-0.72	-1.25	-0.79%

Table VII. Results of Multiple Structural Break Tests

This table presents the results for the multiple structural break tests developed by Bai and Perron (1998, 2003a, 2003b, 2006) for the 36 information variables using the full sample. The information variables are described in Table I. The columns labelled *U DmaxF* and *W DmaxF* give the double maximum tests of the null hypothesis of no break versus an unknown number of breaks given some upper bound. The columns labelled *N* and Break Dates give the number and date of the breaks identified using the sequential approach described in section 2.1. The columns labelled *b* give the predictive regression coefficient in each regime when a break is identified. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using the critical values of Bai and Perron (2003a) for the double maximum tests and asymptotic critical values for the *t*-statistic associated with the predictive regression coefficient.

	Test of No Break vs Unknown Number of Breaks		Number of Breaks and Break Dates		Coefficient *b* per Regime		
					Regime 1	Regime 2	Regime 3
Variable	*U DmaxF*	*W DmaxF*	N	Break Dates	*b*	*b*	*b*
ZDY	4.50	6.08	0				
ZDYf	5.34	8.64	0				
ZDP	15.44 **	18.23 ***	1	196412	2.841 ***	0.033	
ZPE	8.64	9.63	0				
ZEP	6.00	9.69	0				
ZEQP	3.60	4.86	0				
ZVOLG	2.96	4.98	0				
ZVOLGd	5.42	9.18	0				
ZSVAR	6.71	9.06	0				
ZISSUE	3.82	5.19	0				
ZCSBETA	7.13	8.80	0				
ZJAN	5.87	7.01	0				
ZTBILL	8.43	10.20	0				
ZTBILLv	6.84	9.49	0				
ZTBILLr	6.90	6.90	0				
ZLTGOV	13.08 **	13.52 **	0	196004	-1.67 ***	-0.1	
ZLTGOVv	2.64	3.49	0				
ZLTGOVr	5.88	8.34	0				
ZTERM	4.30	5.10	0				
ZCREDIT	4.31	5.85	0				
ZCREDITs	6.42	10.38	0				
ZCREDITr	5.96	8.49	0				
ZINF	6.90	8.23	0				
ZPRODG	3.83	5.69	0				
ZUNEMP	5.45	7.12	0				
ZMONEYG	4.53	5.81	0				
ZGDPG	4.88	6.11	0				
ZPRIME	7.56	10.19	0				
ZPRIMEv	5.34	5.34	0				
ZPRIMEr	4.80	4.80	0				
ZLEAD	2.03	3.60	0				
ZFX	7.96	15.91 **	0				
ZFXv	9.04	12.59 *	0				
ZFXr	5.57	7.82	0				
ZENERG	5.67	7.13	0				
ZMMG	6.61	9.42	0				

Table VIII. IS and OOS Results for Delayed Information Variables

This table presents the IS and OOS predictive regression results for the six macroeconomic variables with publication delays, using the full available samples. The variables are described in Table I. The column labelled Delay gives the number of months by which an information variable is lagged to account for the publication delay. For the IS results, the columns labelled *b* and *t*-stat give the predictive regression coefficient and its Newey-West adjusted *t*-statistic. The columns labelled $\bar{R}^2$ and *F*-stat give the adjusted R^2 and *F*-statistic of the predictive regression. For the OOS results, the columns labelled *MSE-T* and *MSE-F* give the *t*-statistic developed by Diebold and Mariano (1995) and modified by Harvey et al. (1997) and the *F*-statistic proposed by McCracken (2007). The column labelled $\bar{R}^2$ gives the OOS adjusted R^2. The OOS results use the recursive estimation window scheme. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs.

		IS				OOS (Recursive)		
Variable	Delay	*b*	*t*-stat	$\bar{R}^2$	*F*-stat	*MSE-T*	*MSE-F*	$\bar{R}^2$
ZINF	2 Months	-0.122	-0.34	-0.11%	0.13	-1.05	-0.75	-0.33%
	3 Months	-0.785	**-1.91 ***	0.56%	**5.31 ****	**0.75 ****	**3.09 ****	0.39%
	4 Months	-0.919	**-2.49 ****	0.82%	**7.30 *****	**1.96 *****	**5.22 *****	0.79%
ZPRODG	2 Months	-0.160	-0.46	-0.09%	0.38	-1.36	-4.44	-1.04%
	3 Months	-0.372	-1.27	0.15%	2.05	-0.25	-2.59	-0.69%
	4 Months	-0.547	-1.58	0.50%	**4.45 ****	0.22	**1.10 ***	0.02%
ZUNEMP	2 Months	0.079	1.01	0.00%	1.01	-0.46	-0.73	-0.33%
	3 Months	0.065	0.84	-0.05%	0.66	-0.54	-0.98	-0.38%
	4 Months	0.069	0.91	-0.04%	0.76	-0.59	-1.09	-0.40%
ZMONEYG	2 Months	-0.174	**-1.70 ***	0.27%	**3.06 ***	-1.24	-4.46	-1.05%
	3 Months	-0.134	-1.36	0.11%	1.82	-0.47	-1.04	-0.39%
	4 Months	-0.038	-0.42	-0.11%	0.14	-1.27	-2.42	-0.65%
ZGDPG	2 Months	0.069	0.18	-0.15%	0.04	-0.81	-1.66	-0.51%
	3 Months	0.183	0.50	-0.11%	0.28	-0.60	-1.21	-0.42%
	4 Months	-0.594	-1.59	0.32%	**3.02 ***	**0.32 ***	**0.78 ***	-0.04%
ZLEAD	2 Months	0.019	0.10	-0.13%	0.01	-0.80	-1.53	-0.48%
	3 Months	0.316	**1.83 ***	0.34%	**3.55 ****	**0.53 ***	**1.73 ****	0.14%
	4 Months	0.147	0.79	-0.03%	0.77	-0.40	-1.03	-0.39%

Table IX. Economic Value of the Predictions

This table examines the economic value of the predictions for a mean-variance investor who forms his portfolio based on the forecasts from the OOS predictive regressions using the recursive estimation window scheme. The information variables are described in Table I. The methodology is described in section 2.3. The columns labelled Portfolio Based on Predictive Model give statistics on the portfolios constructed with the forecasts from the information variables, namely their average equity allocation (Mean X_A), their proportions of allocation equal to the limits allowed of 0% (%X_A = 0) or 150% (%X_A = 1.5), their annualized values of the mean return (μ_A), standard deviation of returns (σ_A) and average utility level (U_A), and their end-of-sample value of a 1$ beginning-of-sample investment ($$V_A$). The columns labelled Differences with Portfolio Based on Historical Mean give statistics on the differences with a portfolio constructed with the forecasts from the historical mean model, namely their differences in utility level (U_A-U_N), mean return (μ_A-μ_N), standard deviation of returns (σ_A-σ_N) and value of a 1$ investment ($$V_A$-$$V_N$).

	Portfolio Based on Predictive Model							Differences with Portfolio Based on Historical Mean			
Variable	Mean X_A	% X_A = 0	% X_A =1.5	μ_A	σ_A	U_A	$$V_A$	U_A-U_N	μ_A-μ_N	σ_A-σ_N	$$V_A$-$$V_N$
ZDY	37.4%	12.7%	1.9%	6.65%	9.02%	5.43%	15.27 $	-0.48%	-2.32%	-5.28%	-16.83 $
ZDYf	44.2%	32.3%	8.9%	7.65%	12.27%	5.39%	20.54 $	-0.52%	-1.33%	-2.02%	-11.56 $
ZDP	37.5%	21.8%	5.3%	6.93%	9.19%	5.66%	17.28 $	-0.24%	-2.04%	-5.11%	-14.81 $
ZPE	60.1%	6.1%	4.4%	7.45%	12.19%	5.22%	18.64 $	-0.69%	-1.53%	-2.11%	-13.45 $
ZEP	54.4%	4.9%	3.8%	7.50%	11.68%	5.45%	19.62 $	-0.46%	-1.48%	-2.61%	-12.48 $
ZEQP	77.0%	16.9%	18.4%	11.84%	14.32%	8.76%	112.10 $	2.85%	2.87%	0.03%	80.01 $
ZVOLG	68.0%	0.2%	2.1%	8.20%	12.45%	5.87%	25.56 $	-0.04%	-0.78%	-1.84%	-6.53 $
ZVOLGd	68.3%	0.9%	3.4%	7.95%	12.75%	5.51%	22.51 $	-0.40%	-1.03%	-1.55%	-9.59 $
ZSVAR	62.2%	3.9%	3.5%	8.53%	12.92%	6.03%	15.55 $	-1.35%	-1.24%	0.30%	-9.01 $
ZISSUE	68.1%	3.6%	3.4%	8.39%	13.14%	5.80%	26.63 $	-0.11%	-0.58%	-1.15%	-5.46 $
ZCSBETA	62.3%	17.2%	9.7%	7.57%	11.88%	5.45%	8.22 $	-0.74%	-0.79%	-0.13%	-2.27 $
ZJAN	66.0%	0.0%	8.7%	8.90%	12.79%	6.45%	34.44 $	0.54%	-0.07%	-1.50%	2.35 $
ZTBILL	72.4%	31.3%	18.4%	11.18%	14.73%	7.92%	80.97 $	2.01%	2.20%	0.43%	48.87 $
ZTBILLv	83.7%	4.7%	11.2%	11.17%	15.54%	7.55%	77.24 $	1.64%	2.20%	1.25%	45.15 $
ZTBILLr	83.0%	11.8%	19.5%	10.69%	14.84%	7.38%	66.08 $	1.47%	1.71%	0.55%	33.98 $
ZLTGOV	60.0%	33.4%	11.0%	9.59%	13.65%	6.80%	43.33 $	0.89%	0.62%	-0.65%	11.24 $
ZLTGOVv	84.0%	12.1%	17.5%	12.07%	15.86%	8.30%	113.26 $	2.39%	3.10%	1.57%	81.17 $
ZLTGOVr	91.4%	17.6%	32.3%	11.99%	16.61%	7.85%	102.31 $	1.94%	3.01%	2.32%	70.22 $
ZTERM	82.2%	14.4%	20.9%	10.85%	14.44%	7.72%	72.61 $	1.82%	1.88%	0.14%	40.51 $
ZCREDIT	59.0%	9.9%	2.8%	8.42%	11.98%	6.26%	28.60 $	0.36%	-0.56%	-2.32%	-3.49 $
ZCREDITs	71.1%	2.7%	0.4%	8.75%	12.00%	6.59%	33.21 $	0.68%	-0.23%	-2.30%	1.12 $
ZCREDITr	74.4%	2.5%	5.9%	8.79%	13.47%	6.07%	31.03 $	0.16%	-0.18%	-0.83%	-1.07 $
ZINF	79.9%	2.1%	6.6%	9.00%	14.64%	5.78%	31.41 $	-0.13%	0.02%	0.34%	-0.68 $
ZPRODG	54.6%	8.7%	1.3%	7.70%	10.95%	5.91%	22.22 $	0.00%	-1.27%	-3.35%	-9.87 $
ZUNEMP	83.8%	0.0%	5.1%	9.55%	14.20%	6.53%	41.47 $	0.62%	0.58%	-0.10%	9.37 $
ZMONEYG	80.5%	4.6%	11.8%	8.85%	15.51%	5.24%	28.15 $	-0.67%	-0.12%	1.22%	-3.94 $
ZGDPG	49.8%	14.0%	3.4%	9.13%	9.87%	7.67%	43.91 $	1.76%	0.16%	-4.43%	11.82 $
ZPRIME	70.4%	30.2%	16.7%	10.71%	14.32%	7.63%	67.75 $	1.72%	1.73%	0.02%	35.66 $
ZPRIMEv	83.2%	3.0%	9.1%	9.73%	14.76%	6.47%	43.49 $	0.56%	0.76%	0.46%	11.40 $
ZPRIMEr	83.5%	8.2%	17.3%	9.98%	14.33%	6.90%	50.11 $	0.99%	1.01%	0.04%	18.01 $
ZLEAD	73.0%	15.7%	17.5%	13.17%	12.90%	10.68%	220.50 $	4.77%	4.20%	-1.39%	188.41 $
ZFX	87.7%	0.4%	14.0%	8.79%	16.84%	4.53%	24.48 $	-1.38%	-0.19%	2.54%	-7.61 $
ZFXv	77.2%	2.1%	8.0%	9.40%	14.19%	6.38%	39.14 $	0.48%	0.43%	-0.11%	7.05 $
ZFXr	72.4%	3.2%	3.2%	8.25%	13.16%	5.66%	25.07 $	-0.25%	-0.72%	-1.14%	-7.02 $
ZENERG	43.6%	15.0%	1.1%	7.08%	8.33%	6.04%	13.51 $	-1.07%	-2.37%	-4.15%	-14.84 $
ZMMG	47.1%	13.1%	3.4%	6.99%	9.99%	5.50%	12.32 $	-1.61%	-2.45%	-2.49%	-16.03 $

Table X. Summary of the *F*-Statistic and *MSE-F* Statistic Significance Level

This table presents a summary of the significance levels obtained IS or OOS with the *F*-statistics in Tables 3 to 6, in full sample or in three sub-periods and with the rolling or recursive estimation window schemes. The information variables are described in Table I. The IS *F*-statistic is the *F*-statistic of the predictive regression. The OOS *F*-statistic is the *MSE-F* statistic proposed by McCracken (2007). ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively, using simulated critical cut-offs. NA indicates that the evidence is not available.

		Full Sample			1950-1969	1970-1989			1990-2013		
Variable	Name	IS	OOS (Roll)	OOS (Recu)	IS	IS	OOS (Roll)	OOS (Recu)	IS	OOS (Roll)	OOS (Recu)
ZDY	Dividend Yield										
ZDYf	Dividend Yield Forward										
ZDP	Dividend-Price Ratio				***						
ZPE	Price-Earnings Ratio										
ZEP	Earnings-Price Ratio										
ZEQP	Previous Equity Premium	***	***	***	**				***	***	***
ZVOLG	Volume Growth										
ZVOLGd	Volume Growth Dollar										
ZSVAR	Stock Variance	**			NA				**		
ZISSUE	Issuing Activity										
ZCSBETA	Cross-Sectional Beta Premium				NA						
ZJAN	January Dummy	**			**	*	*	**			
ZTBILL	T-Bill Yield	***			**				**		**
ZTBILLv	T-Bill Yield Variation	**	**	**		**	**	**			
ZTBILLr	T-Bill Yield Relative	**	*			*	*				
ZLTGOV	Long Gov Bond Yield	**			*						
ZLTGOVv	Long Gov Bond Yield Variation	***	**	**		**	*	*		*	*
ZLTGOVr	Long Gov Bond Yield Relative	***	***	***	**	***	***	***			
ZTERM	Term Premium	**			**				**	**	***
ZCREDIT	Credit Premium										
ZCREDITs	Credit Premium Short										
ZCREDITr	Credit Premium Return	*							**		**
ZINF	Inflation Rate										
ZPRODG	Industrial Production Growth										
ZUNEMP	Unemployment Rate					*					
ZMONEYG	Money Supply Growth				*						
ZGDPG	GDP Growth	**	*	**					*	*	**
ZPRIME	Prime Rate	***			**				**		**
ZPRIMEv	Prime Rate Variation	*	*			*					
ZPRIMEr	Prime Rate Relative	*									
ZLEAD	Leading Indicator Growth	***	**	***	***			**	**	***	***
ZFX	CAD/USD Rate										
ZFXv	CAD/USD Rate Variation	**		*					**	**	**
ZFXr	CAD/USD Rate Relative										
ZENERG	Energy Price Growth				NA					*	
ZMMG	Metals-Minerals Price Growth				NA						

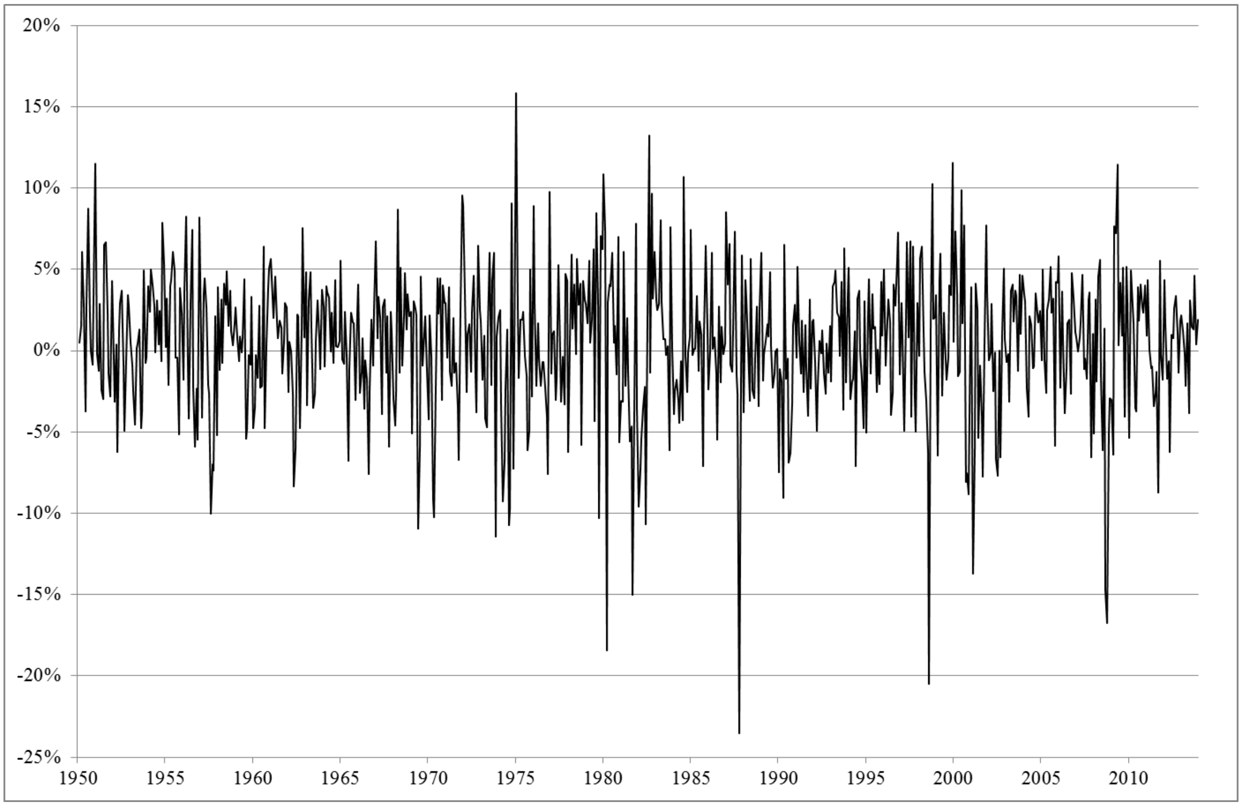

Figure 1: Canadian Equity Premium from February 1950 to December 2013. This figure shows the evolution of the monthly realized equity premium in Canada from February 1950 to December 2013.

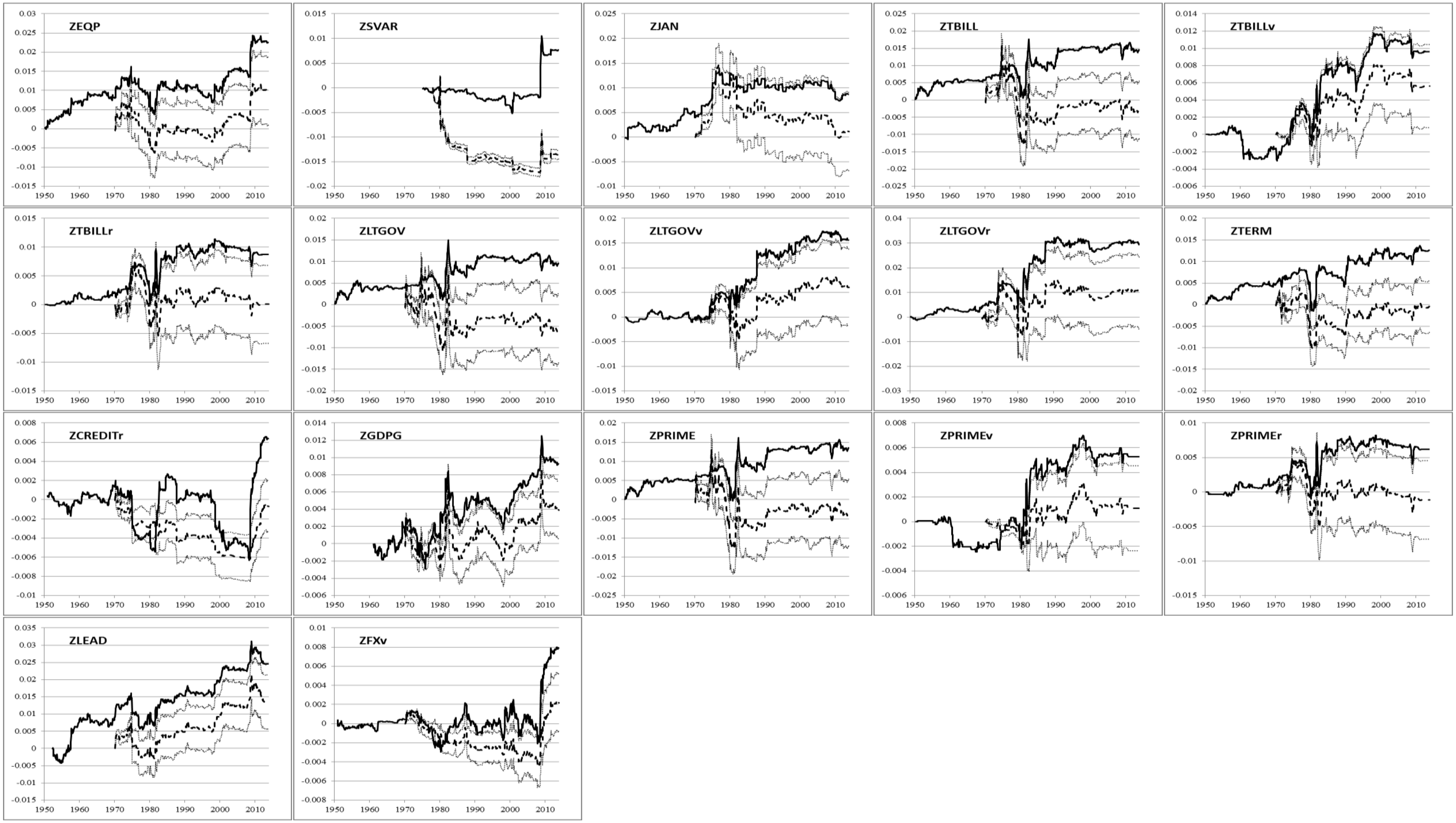

Figure 2: Performance of the IS Significant Information Variables. This figure shows the IS and OOS performances through time of the monthly predictive regression for the IS significant information variables. The information variables are described in Table I. The performances are illustrated by the cumulative squared forecast error differences between the historical mean model (the Null model) and predictive model (the Alternative model) relying on the information variable noted in each panel. An increase (a decrease) in a line indicates better performance by the predictive (historical mean) model. The continuous line represents the IS performance. The dashed line represents the OOS performance using the recursive estimation window scheme. Its lower and upper confidence intervals (the dotted lines) are the equivalent of 95% two-sided levels, based on *MSE-T* simulated critical values.

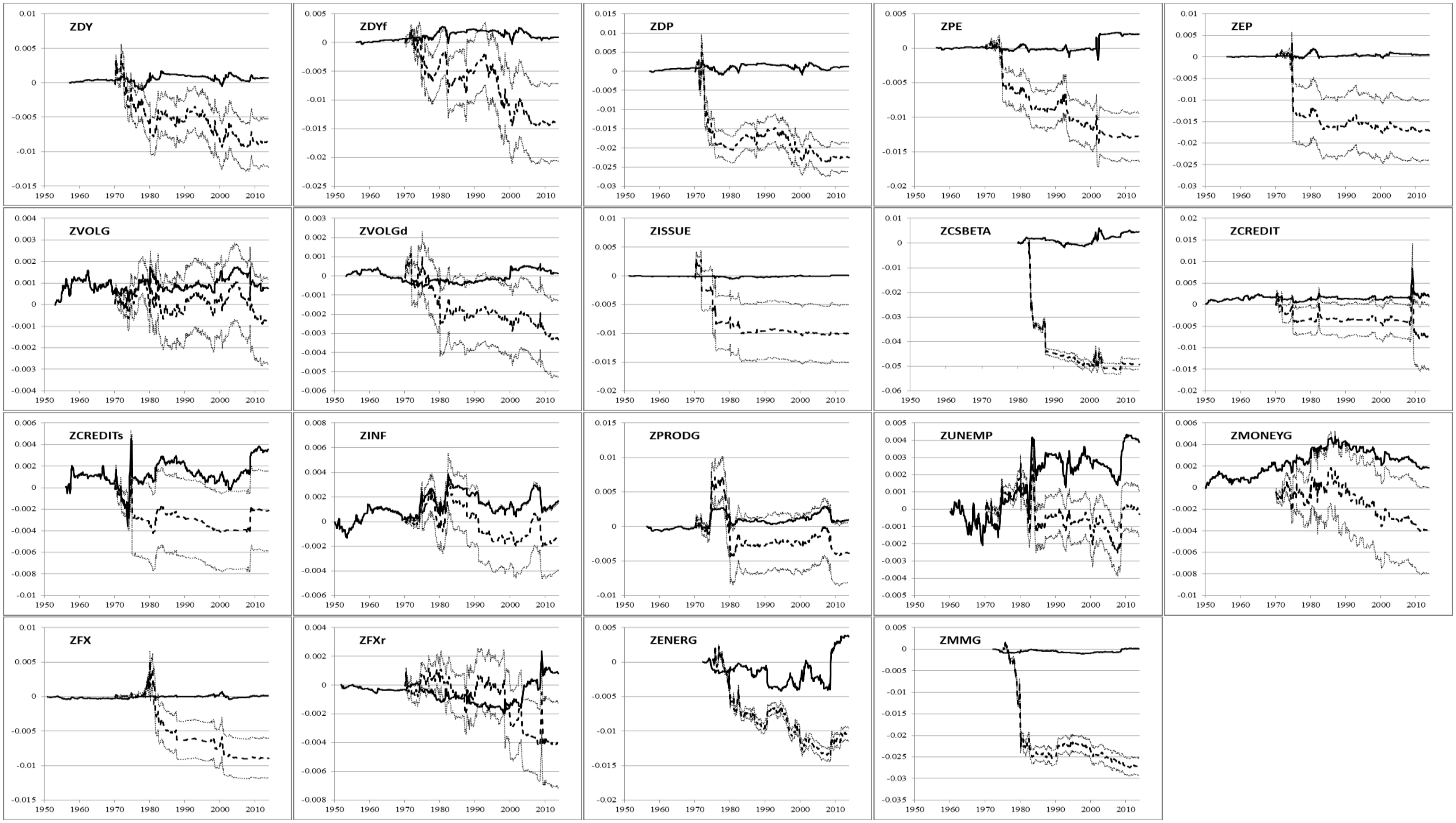

Figure 3: Performance of the IS Insignificant Information Variables. This figure shows the IS and OOS performances through time of the monthly predictive regression for the IS insignificant information variables. The information variables are described in Table I. The performances are illustrated by the cumulative squared forecast error differences between the historical mean model (the Null model) and predictive model (the Alternative model) relying on the information variable noted in each panel. An increase (a decrease) in a line indicates better performance by the predictive (historical mean) model. The continuous line represents the IS performance. The dashed line represents the OOS performance using the recursive estimation window scheme. Its lower and upper confidence intervals (the dotted lines) are the equivalent of 95% two-sided levels, based on *MSE-T* simulated critical values.