Canadian Stock Mispricing and Its Determinants

Xin Li

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By: Xin Li

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Signed by the final Examining Committee:

_____Chair

Chair's name: Dr. Mahesh Sharma

_____Examiner

Examiner's name: Dr. Abraham Brodt

_____Examiner

Examiner's name: Dr. Ravi Mateti

_____Supervisor

Supervisor's name: Dr. Lawrence Kryzanowski

Approved by _____

Chair of Department or Graduate Program Director

_____ 2016 _____

Dean of Faculty

ABSTRACT

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Xin Li

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Canada stock mispricings are estimated based on the models in Rhodes-Kropf, Robinson, and Viswanathan (2005) and Pástor and Veronesi (2003). Four sets of mispricing estimates are estimated by applying two estimation methods, Fama-MacBeth approach and Hoberg and Phillips (2010) three-step regression procedure, to each of the two models. We use both OLS and fixed-effects methods with clustered standard errors to assess potential determinant variables. We find that the industry Mining, Oil and Gas has the highest incidence of mispricing, while Information and Communication has the lowest incidence. We provide empirical evidence that stock mispricing is determined by investor sentiment, limits to arbitrage, firm characteristics and macro-level variables.

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1 INTRODUCTION

In perfect capital markets, stock prices reflect investors' rational expectations of future cash flows. The prices are irrelevant to capital structures and corporate policies in the absence of frictions, as they should always be equal to fundamental values. If such were not the case, market participants would take advantage of all possible arbitrage opportunities and cause prices to revert back to their fundamental values. Hence, there is no role for mispricing from the classical finance theory perspective in a world without frictions.

The real markets environment can, however, never satisfy the rigorous assumptions of perfect markets. There are always transaction costs, asymmetric information, agency problems, and government interventions. Additionally, economists and psychologists in the field of behavioral finance insist that investors are barely identical or fully rational. The perfect market, in reality, is an unattainable theory of utopia, because almost all arbitrages are risky and costly, which can significantly limit its effectiveness in achieving market efficiency (Shleifer & Vishny, 1997). Inevitably, the prices in real stock markets may not fully or accurately reflect fundamental values. The deviation of stock price from the fundamental value is referred to as mispricing or misvaluation.

Throughout the past few decades, there are conflicting viewpoints and evidences among scholars in regard to how much stock prices reflect their fundamental value. Fama (1970) proposes the efficient market hypothesis, where prices fully reflect available information. Subsequently, Shiller (1981) reports that stock price volatility is too high to

be attributed to new information about future dividends. Economists and psychologists in the field of behavioral finance further argue that the irrational behaviours of some investors, such as overreaction to new information or "irrational exuberance", can lead to stock mispricing (Bondt & Thaler, 1985; Shiller, 2000).

Amongst the recent greatly expanding literature on stock mispricing, we surprisingly find that there is no systematic analysis of its determinants. In contrast, most of the articles concentrate on affirming its existence or evaluating its impacts on corporate governance as well as financing and operating decisions. Since the beginning of the 2000s, mispricing is used to explain most of the stock market anomalies, corporate governance perplexities and moreover economic puzzles like merger waves. However, what causes stock mispricing? What are its determinants? In this paper, we conduct, to the best of our knowledge, the first systematic investigation of the determinants of stock mispricing.

Stock mispricing is estimated based on two recent studies, namely Rhodes-Kropf, Robinson, and Viswanathan (RKRV) (2005) and Pástor and Veronesi (PV) (2003). We generate four sets of mispricings by applying two different regression approaches to each of these two models above. The two regression methods are Fama-MacBeth (FM) approach and Hoberg and Phillips (HP) (2010) three-step regression procedure. The former approach gives bigger sample mean and median mispricings than the latter one for our mispricing sample from 1996 to 2014. Among the seven industries (Table 1) defined in this paper, we find that Mining, Oil and Gas (1) has the highest incidence of mispricing among all the industries based on the number of years an average/median firm is mispriced. Information and Communication (4) has the lowest incidence of mispricing,

and, it tends to be underpriced when it is not correctly priced. Manufacturing (2), Wholesale and Retail Trades (3) and Services (6) tend to be overpriced when they are not correctly priced.

To investigate the determinants of mispricing, we use both contemporaneous regression models and models with all independent variables lagged one year to assess the four groups of potential determinant variables, namely limits to arbitrage, firm characteristics, macro-level and market sentiment variables. We report the results of both OLS and fixed-effects estimation methods and draw inferences based on clustered standard errors (Petersen, 2009).

We find empirical evidence that stock mispricing can be affected by limits to arbitrage, firm risk, macrovariables and investor sentiment. Limits to arbitrage affects more underpricing than overpricing. Underpricing is related more to contemporaneous limits-to-arbitrage variables than to the one-year lagged values. Specifically, underpricing is negatively and significantly associated with contemporaneous bid-ask spread, percentage of zero trading days and illiquidity; but it is only impacted by one-year lagged bid-ask spread significantly. Firm risk is always negatively associated with contemporaneous stock pricing; but negatively and positively correlated with one-year lagged under- and over-pricing. Many macroeconomic and sentiment variables are significantly related to mispricing, however, the associations of mispricing (under- and over-pricing) with various macroeconomic and sentiment variables may differ for under- or overpricing, and for different mispricing estimations.

Our research contributes to the literature on the measurement of stock mispricing by further developing the methodologies that use regression analysis with accounting

multiples. To the best of our knowledge, this thesis is the first to measure mispricings in the Canadian stock market, and the first to investigate the determinants of mispricings.

2 REVIEW OF THE LITERATURE

Influenced by Fama's (1970) efficient-market hypothesis (EMH), security markets were believed to be efficient in reflecting information about individual stocks and about the stock market as a whole prior to 2000. The dramatic movements in the stock market around the turn of the millennium raised questions and concerns about the existence and impacts of stock mispricing and the overall rationality of the traditional finance framework. In response to the difficulties faced by the traditional paradigm, behavioral finance as a new approach to financial markets tries to resolve these inconsistencies by using explanations based on human behavior, both individually and in groups. In addition, the global financial crisis of 2007-08, which is considered by many economists as the worst financial crisis since the Great Depression of the 1930s, has motivated increased interest in stock mispricing research.

2.1 Critics of the EMH and Evidence of Stock Mispricing

Under the EMH, securities markets are extremely efficient in reflecting information about individual stocks and about the stock market as a whole. Nevertheless, LeRoy and Porter (1981) find that stock prices appear to be more volatile than is consistent with the efficient capital markets model. Shiller (1981) provides evidence that stock price volatility appears to be far too high (five to thirteen times) to be attributed to new information about future dividends. West (1988) also finds evidence in favour of the excess volatility hypothesis to be persuasive and states that it cannot be explained

adequately by standard models of expected returns or rational bubbles. Ackert and Smith (1993) also find apparent evidence of excess volatility when dividends are applied, although they are unable to reject the hypothesis of market efficiency. Nonetheless, the numerous findings of excess volatilities started to erode the trust in a theory which denies the existence of any systemic deviations of stock prices from their fundamental values.

Associated with the EMH is the notion that stock prices should follow a "random walk." If information is immediately reflected in stock prices, then the change in tomorrow's price will reflect only tomorrow's news and will be independent of the price changes today. Contrary to the theory, Lo and MacKinlay (1988; 2002) conclude that stock prices do not behave as true random walks based on their finding that short-run serial correlations are not zero and many successive moves occur in the same direction. Moreover, there appears to be various calendar effects in stock market returns. Gibbons and Hess (1981) document the existence of day-of-the-week effects in asset returns, and also find that the negative return for Monday is remarkably uniform across individual stocks. Haugen and Jorion (1996) confirm that the January effect stays strong even decades after its discovery, with no significant changes in the magnitude. Furthermore, many financial economists and statisticians demonstrate that stock prices are partially predictable on the basis of past stock prices[1], and certain fundamental valuation metrics, such as the initial dividend yield (Fama & French, 1988) and price-earnings multiples (Campbell & Shiller, 1998).

From the perspective of asset pricing theory, the equilibrium model is designed to examine the behavior of factors driving stock prices. With the rise of empirical asset

[1] See Pruitt and White (1988), Neftci (1991), Neely, Weller and Dittmar (1997), and Allen and Karjalainen (1999).

pricing and modern event studies, evidence consistent with stock mispricing and market anomalies has garnered greater attention. Banz (1981) finds that smaller firms have higher risk-adjusted returns, on average, than larger firms. Rosenberg *et al.* (1985) report statistically significant abnormal performance for book-to-market and specific-return-reversal strategies. Chan *et al*. (1991) and Fama-French (1992) detect unusually high average returns from stocks with high ratios of book to market value of equity in the Japanese and US markets, respectively. Positive (negative) earnings news also brings positive (negative) risk adjusted returns (Bernard & Thomas, 1989). Adding more factors to the CAPM has resulted in the Fama-French three-factor model, Carhart four-factor model and the Fama-French five-factor model (2014). This has increased the ability of the models to capture stock price behavior and to explain some anomalies. More recently, Amihud *et al.* (2015) find that the illiquidity return premium is positive after controlling for risk factors and firm characteristics across the world.

Can these anomalies and statistically significant predictable patterns be irrefutable evidence in support of stock market inefficiency or stock mispricing? Malkiel (2003) argues that many of the significant predictable patterns may simply be the result of data mining, and may not be robust in different sample periods. To some extent, statistical significance can differ from economic significance. Moreover, mispricing or asset pricing anomalies documented by equilibrium models can be still problematic due to the joint hypothesis problem. Nevertheless, Stambaugh, Yu and Yuan (2012) also conclude that mispricing due to investor sentiment is a partial explanation for many anomalies in cross-sectional stock returns. McLean and Pontiff (2016) further empirically support the notion that some or all of the original cross-sectional predictability is the result of mispricing

based on an examination of the 97 variables from previous academic studies being able to predict cross-sectional stock returns.

As opposed to the sophisticated models and complex econometric analyses, the several stock market crashes or booms and busts are believed by some as being more direct and convincing evidence that the market fails to reflect the true values of stocks. Proponents of this viewpoint see recent clear evidence of stock market mispricing or irrationality in the market crash of October 1987, the Internet bubble around 2000, and the housing bubble that triggered the 2007-08 global financial crisis. Behaviour financial economists allege that such phenomena are primarily due to psychological considerations, such as herd behaviour, bandwagon effect, noise trader effect, and so forth.[2] Conrad, Kapadia and Xing (2014) use prospect theory to explain why individual investors hold overpriced stocks. The proposed explanation is that firms with a high potential for default (death) also tend to have a relatively high probability of extremely large (jackpot) payoffs.

2.2 Determinants and Impacts of Stock Mispricing

In this section, we review the literature describing the factors that contribute to mispricing and/or evaluate the impacts of stock mispricing on corporate behaviour.

We begin by reiterating that behavioural financial economists perceive psychological considerations as being the major factor behind stock mispricing. Shleifer and Summers (1990) stress the roles of investor sentiment and limited arbitrage in determining asset prices given the existence of noise traders. Lux (1995) argues that irrational and rational herd behaviours affect stock markets by making bubbles transient phenomena and lead to repeated fluctuations around fundamental values. Shleifer and

[2] For example, Shleifer and Summers (1990), Lux (1995), Shiller (2005) and Brown and Cliff (2004).

Vishny (1997) theoretically prove that professional arbitrageurs may avoid extremely volatile arbitrage positions due to undiversifiable sentiment risk. Shiller (2000) explains the Internet bubble during the late 1990s as the result of psychological contagion leading to irrational exuberance. Brown and Cliff (2004) claim that investor sentiment may trigger market level under- and over-reactions, which result in temporary mispricing. Gilchrist *et al.* (2005) empirically find that dispersion in investor beliefs can lead to stock market bubbles. Baker and Wurgler (2007) demonstrate that investor sentiment has significant cross-sectional effects on stock prices. Although psychological considerations are associated with short-term stock mispricing, researchers cannot directly observe the degree of mispricing that depends on certain biases in investors' beliefs (Barberis, Shleifer, & Vishny, 1998; Daniel, Hirshleifer, & Subrahmanyam, 1998; Hong & Stein, 1999).

Empirical asset pricing studies provide some explanations for equity mispricing. Lee and Swaminathan (2000) find that stocks with low (high) trading volumes tend to be undervalued (overvalued) by the market. Sadka and Scherbina (2007) document a close link between mispricing and liquidity by investigating stocks with high analyst disagreement, which normally leads to overpricing. Their analysis shows that high trading costs from analyst disagreements result in the persistence of mispricing over time, and that the less liquid stocks tend to be more severely overpriced. In addition to stock liquidity, Jones and Lamont (2002) find that the presence of short-sale constraints can lead to overpriced stocks, because selling short can be costly, risky and limited by legal and institutional constraints. When heterogeneous risk-aversion agents face margin constraints, Garleanu and Pedersen (2011) show that required returns increase with

increases in both betas and margin requirements. Easton, Pinder and Uylanco (2013) rely on a specific case study to show that the imposition of short-sale constraints prevents investors from exploiting apparent mispricing. Moreover, Chu, Hirshleifer and Ma (2015) conclude that limits to arbitrage, particularly short sale constraints, play an important role in generating asset mispricing anomalies that are driven substantially by mispricing.

Stock mispricings can also affect firm-level investment and capital structure strategies. Chang *et al.* (2007) find a significant positive relation between investment and proxies for mispricing, which implies that overpriced (underpriced) firms are also overinvested (underinvested). This investment-mispricing link is more pronounced in financially constrained firms (Alzahrani & Rao, 2014). Lin *et al.* (2010) report that the use of derivatives by firms is negatively associated with stock mispricing, as hedging improves transparency. Hertzel and Li (2010) find that equity-issuing firms with greater mispricings tend to decrease long-term debt and/or increase cash holdings and have lower returns. Warr *et al.* (2012) argue that equity mispricing impacts the speeds at which firms adjust to their target leverages, supporting the notion that equity mispricing can also be an important factor that alters the cost of making capital structure adjustments. Dong *et al.* (2012) document that equity issuance and total financing increase with equity overvaluation, and that equity issuance is more sensitive than debt issuance to mispricing.

Furthermore, there are many articles that evaluate the impacts of stock mispricing on corporate investments and governance. Stock overpricing drives M&A activities. Shleifer & Vishny (2003) and Rhodes-Kropf, Robinson & Viswanathan (2004) develop theoretical models for explaining why mispricings can drive M&As. The reason is that overvalued firms can increase shareholder wealth by using stock as currency to purchase

less overvalued firms. Most of the empirical evidence[3] supports the previous theories about the conjecture that stock overvaluation drives M&A activities.

Some studies cast doubt on whether shareholder wealth is truly enhanced by taking advantage of overvalued stocks through M&A activities, especially over the long term. Rau and Vermaelen (1998) argue that mispricing is the main reason for causing the widely documented long-term underperformance of bidders after M&As. Moeller *et al.* (2005) find that M&A announcements are profitable in the aggregate for acquirers until 1997. However, the losses of acquirers from 1998 through 2001 wiped out all the gains made earlier. They conclude that overvaluation drives M&A activities, which improves the wealth of acquiring-firm shareholders only in the short run and destroys it in the long run. Fu *et al.* (2013) also find that overvalued acquirers often significantly overpay for the targets they purchase, and those acquisitions do not produce the necessary synergy gains. This implies that the agency problems may be the main motive behind acquisitions by overvalued acquirers.

According to agency theory, agency problems can arise because of the presence of information asymmetry, where agents discriminately have more information than owners. Nanda and Narayanan (1999) theoretically predict that asymmetric information can cause equity mispricing.

Other studies also investigate the relation between agency problems and stock mispricings. CEO's compensation, including cash and equity-based compensation, may lead to stock mispricing, as highly incentivized CEOs may engage in higher levels of earnings manipulation (Bergstresser & Philippon, 2006). Agency conflicts may cause

[3] Ang and Cheng (2006); Dong, Hirshleifer, Richardson & Teoh (2006); Rhodes–Kropf et al. (2005); Savor & Lu (2009).

equity overpricing if the compensation packages of CEOs include substantial option grants (Aboody & Kasznik, 2000; Lie, 2005). Li *et al.* (2011) find a significant positive relation between the magnitude of equity-based compensation and the investment level, but no significant relation between investment level and stock mispricing. They argue that managers make investment decisions concerning their equity-based compensation, instead of catering to stock market mispricing. Pantzalis and Park (2014) utilize ten agency costs proxies and provide evidence that the level of agency costs is significantly and positively related to equity mispricing. They also find that the options grant component of equity-based compensation deteriorates the link between agency conflicts and equity mispricing.

Jensen (2004; 2005) theorizes that overvaluation can induce managers to engage in activities that can sustain inflated stock prices in the short run but can destroy shareholder value in the long run. Such activities can be not only overinvesting in M&As as we have discussed earlier, but also committing frauds and managing earnings. Consistent with Jensen's prediction, the empirical evidence finds that overvalued equity increases the likelihood of a misstated financial statement (Efendi, Srivastava, & Swanson, 2007) and earnings misstatements, and that price manipulation can cause sharp destructions in firm value (Marciukaityte & Varma, 2008). Chi and Gupta (2009) show that overvaluation substantially intensifies subsequent income-increasing earnings management activities. Such over-induced income-increasing earnings management is negatively related to future abnormal stock returns and operating performances, and this negative relation becomes more pronounced as overvaluation increases.

3 METHODOLOGY

Stock mispricing is measured as the deviation of a firm's stock price from its fundamental value. Firstly we estimate stock mispricing through regression analysis. Then we use OLS and fixed effects estimation methods with firm effects and year dummies, and robust standard errors to examine the relationship between the mispricing estimates and potential determinant variables.

3.1 Methods for Estimating Stock Mispricing

Prior to investigating the determinants of stock mispricing, we estimate stock mispricings based on two recent studies, namely Rhodes-Kropf, Robinson, and Viswanathan (RKRV) (2005) and Pástor and Veronesi (PV) (2003). Four sets of mispricing estimates are obtained by applying two regression methods to each of these two models.

3.1.1 RKRV model (MP1)

The first two sets of mispricing estimates are based on the model developed in Rhodes-Kropf, Robinson, and Viswanathan (RKRV) (2005). To measure the fundamental value, V_{it}, RKRV use an accounting multiples approach to decompose the market-to-book ratio into two components: a measure of price to fundamentals, ln (M/V), and a measure of fundamentals to book value, ln (V/B). The first component, which captures the mispricing part of the market-to-book ratio, is further decomposed into firm-specific and industry-specific mispricing. The design of the model is to link market equity to book value, with considerations of the impact of net income and leverage in explaining the cross-sectional variation in market values. Specifically,

$$\ln(M_{i,t}) = \alpha_{0j,t} + \alpha_{1j,t}\ln(B_{i,t}) + \alpha_{2j,t} ln|NI_{i,t}| + \alpha_{3j,t} Dln|NI_{i,t}| + \alpha_{4j,t} LEV_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where for firm i for the fiscal year t, M is market value, B is book value, and $NI_{i,t}$ is net income. D is a dummy variable that takes the value 1 if $NI_{i,t} < 0$, and takes the value 0 otherwise. $LEV_{i,t}$ is the leverage ratio. The subscript j denotes the jth industry. As the regressions are performed for each industry each year, all parameters can vary across various fiscal years (t) and industries (j).

We make some changes to the original RKRV methodology. We still run cross-sectional regressions for all firms by industry and by year. However, we do not use the industry-year coefficients directly for calculating fitted fundamental values for each firm each year. Instead, after outputting all the industry-year coefficients, we use a ten-year rolling window (year $t-10$ to $t-1$) to average the acquired coefficients (Fama & MacBeth, 1973) to be the parameters of the RKRV model for year t. Therefore, the fundamental value of firm i in the fiscal year t is predicted by the RKRV model with year t firm characteristics, and the mean coefficients from the ten-year window $t-10$ to $t-1$. Specifically, our first set of mispricing estimates, which uses the Fama-MacBeth (FM) regression approach with a 10-year rolling window, can be expressed as:

$$\begin{aligned} MP1(FM)_{i,t} &= ln(M_{i,t}) \\ &- \left[\bar{\alpha}_{0j,\tau} + \bar{\alpha}_{1j,\tau}\, ln(B_{i,t}) + \bar{\alpha}_{2j,\tau} ln|NI_{i,t}| \right. \\ &\left. + \bar{\alpha}_{3j,\tau} Dln|NI_{i,t}| + \bar{\alpha}_{4j,\tau} LEV_{i,t}\right], \end{aligned} \quad (2)$$

$$\bar{\alpha}_{k,j,\tau} = \frac{1}{10}\sum \hat{\alpha}_{j,\tau},\ k = 0,\ 1,\ \ldots,4,\ \ \tau = t-10,\ \ldots, t-1,$$

where $\bar{\alpha}_{k,j,\tau}$ (k=0,1,2,…,6) is the of set of averaged 10-year ($t-10$ to $t-1$) lagged fitted coefficients from equation (1). Following HP (2010), we winsorize the mispricings at the 1% and 99% levels within each fiscal year.

Our second set of mispricings retains the RKRV valuation model. Instead of running regressions per industry-year and averaging the coefficients, we apply HP's three-step regression procedure to the RKRV model. HP use an unbalanced panel with random fixed effects for all the firms in each industry. This is achieved through a ten-year rolling window.

The first step is to estimate the RKRV model using data of all firms in industry *j* from year $t-10$ to $t-1$, as:

$$\begin{aligned}\ln(M_{i,\tau}) = {} & \alpha_{0j,t} + \alpha_{1j,t}\ln(B_{i,\tau}) + \alpha_{2j,t} ln|NI_{i,\tau}| + \alpha_{3j,t} Dln|NI_{i,\tau}| + \alpha_{4j,t} LEV_{i,\tau} \\ & + \varepsilon_{i,t},\ \ \tau = t-10,\ \ldots, t-1.\end{aligned} \tag{3}$$

The second step is to predict the firm's market-to-book ratio in year t with the set of coefficients obtained from the previous step. We estimate the valuation regression above using rolling ten-year windows of lagged data (year $t-10$ to $t-1$) in each industry to get a set of coefficients that we apply to each year t with firm i's characteristics in year t to get a measure of predicted valuations. Specifically, the predicted valuation is:

$$\begin{aligned}Predicted\ & \left[\ln(M_{i,t})^{HP}\right] \\ & = \hat{\alpha}_{0j,t} + \hat{\alpha}_{1j,t}\, ln(B_{i,t}) + \hat{\alpha}_{2j,t} ln|NI_{i,t}| + \hat{\alpha}_{3j,t} Dln|NI_{i,t}| \\ & + \hat{\alpha}_{4j,t} LEV_{i,t},\end{aligned} \tag{4}$$

where $\hat{\alpha}_{kj,t}$ (k=0,1,2,…,6) is the set of fitted coefficients from equation (3) obtained from step one. Thus, we use characteristics in year t and fitted coefficients estimated from $t-10$ to $t-1$ from equation (3) to calculate predicted firm market-to-book ratios for fiscal year t.

The last step is to compute mispricing, which is called relative valuations in HP (2010) for each firm i in fiscal year t. Therefore, our second set of mispricing estimates, which use the RKRV model with HP's three-step regression procedure, is the difference between the actual $\ln(M_{i,t})$ and its predicted $\ln(M_{i,t})$ from equation (4):

$$MP1(HP)_{i,t} = \ln(M_{i,t}) - Predicted\left[\ln(M_{i,t})^{HP}\right]. \quad (5)$$

Following HP, we also winsorize the mispricings at the 1% and 99% levels within each fiscal year.

3.1.2 PV model (MP2)

The next two sets of mispricings are based on the valuation model of Pástor and Veronesi (PV) (2003), as specified by Hoberg and Phillips (HP) (2010). Similar to the MP1 that is based on the RKRV model, we also compute mispricings using both the HP methodology and the Fama-MacBeth approach specified previously.

Our third set of mispricing estimates is generated from the original HP (2010) methodology, where the mispricing estimates are obtained from the three steps based on the PV valuation model. The regression method is similar to that of the metric $MP1(HP)$.

The first step is to estimate the following PV valuation model using data of all firms in industry j from year $t-10$ to $t-1$,

$$ln\left(\frac{M}{B}\right)_{i,t} = \beta_{0j,t} + \beta_{1j,t}AGE_{i,\tau} + \beta_{2j,t}DD_{i,\tau} + \beta_{3j,t}LEV_{i,\tau} + \beta_{4j,t}ln(SIZE_{i,\tau}) + \beta_{5j,t}VOL_{i,\tau} + \beta_{6j,t}ROE_{i,\tau} + \epsilon_{i,t},\ \tau = t-10,\ \ldots, t-1, \quad (6)$$

where $\left(\frac{M}{B}\right)_{i,t}$ is the market-to-book ratio of firm i for the fiscal year t; AGE is minus the reciprocal of one plus firm age[4]; $DD_{i,t}$ is the dividend dummy, which is equal to one if firm i paid any dividends in the fiscal year t, zero otherwise; LEV is the leverage ratio, calculated by total debt over total assets; the natural logarithm of total assets ($SIZE$) and net income to shareholders equity (ROE) are measures of firm size and profitability; and the total return volatility (VOL) is the standard deviation of daily stock returns during the whole fiscal year. Following HP, we eliminate observations with market equity, book equity, and total assets smaller than one million, or with market-to-book ratios outside the range (0.01, 100). We also winsorize the values of VOL and ROE at the 1% and 99% levels annually as in HP.

In the second step, we use year t firm characteristics and coefficients estimated from $t-10$ to $t-1$ from equation (6) to calculate predicted firm market-to-book ratios for fiscal year t. Specifically, the predicted valuation is:

$$Predicted\left[ln\left(\frac{M}{B}\right)_{i,t}^{HP}\right] = \hat{\beta}_{0j,t} + \hat{\beta}_{1j,t}AGE_{i,t} + \hat{\beta}_{2j,t}DD_{i,t} + \hat{\beta}_{3j,t}LEV_{i,t} + \hat{\beta}_{4j,t}log(size_{i,t}) + \hat{\beta}_{5j,t}VOL_{i,t} + \hat{\beta}_{6j,t}ROE_{i,t}, \quad (7)$$

where $\hat{\beta}_{kj,t}$ (k=0,1,2,…,6) is the set of fitted coefficients from equation (6) obtained in step one.

[4] Following HP, we define firm age as one plus the current year less the first year that the firm appears on the CFMRC/TSX tapes.

In the final step, we obtain our third mispricing metric as the difference between the actual $ln\left(\frac{M}{B}\right)_{i,t}$ and its predicted $ln\left(\frac{M}{B}\right)_{i,t}$ from equation (7):

$$MP2(HP)_{i,t} = ln\left(\frac{M}{B}\right)_{i,t} - Predicted\left[ln\left(\frac{M}{B}\right)_{i,t}^{HP}\right]. \quad (8)$$

Following HP, we also winsorize the mispricing estimates at the 1% and 99% levels for each fiscal year.

Our last (fourth) set of mispricing estimates retains the same model as PV (or HP), but runs a cross-sectional regression of equation (9) for all firms in each industry for each year and uses a ten-year rolling window to average the time series (Fama and MacBeth, 1973). The regression method is similar to that of our first metric $MP1(FM)$.

$$\begin{aligned} ln\left(\frac{M}{B}\right)_{i,t} = {} & \beta_{0j,t} + \beta_{1j,t}AGE_{i,t} + \beta_{2j,t}DD_{i,t} + \beta_{3j,t}LEV_{i,t} + \beta_{4j,t}ln(SIZE_{i,t}) \\ & + \beta_{5j,t}VOL_{i,t} + \beta_{6j,t}ROE_{i,t} + \epsilon_{i,t}, \end{aligned} \quad (9)$$

The predicted $ln\left(\frac{M}{B}\right)_{i,t}$ of this metric is estimated by equation (9) with year t firm characteristics and the mean fitted coefficients from the ten-year window $t-10$ to $t-1$. Hence, our last mispricing metric is the difference between the actual and predicted $ln\left(\frac{M}{B}\right)_{i,t}$ from the Fama-MacBeth approach:

$$\begin{aligned} MP2(FM)_{i,t} = {} & ln\left(\frac{M}{B}\right)_{i,t} \\ & - \left[\bar{\beta}_{0j,t} + \bar{\beta}_{1j,t}AGE_{i,t} + \bar{\beta}_{2j,t}DD_{i,t} + \bar{\beta}_{3j,t}LEV_{i,t}\right. \\ & \left. + \bar{\beta}_{4j,t}ln(SIZE_{i,t}) + \bar{\beta}_{5j,t}VOL_{i,t} + \bar{\beta}_{6j,t}ROE_{i,t}\right], \end{aligned} \quad (10)$$

$$\bar{\beta}_{k,j,\tau} = \frac{1}{10}\sum \hat{\beta}_{j,\tau},\ k = 0,\ 1,\ \ldots,4,\ \ \tau = t-10,\ \ldots, t-1,$$

where $\bar{\beta}_{k,j,\tau}$ (k=0,1,2,…,6) is the of set of averaged 10-year ($t-10$ to $t-1$) lagged fitted coefficients from equation (9). We also winsorize the mispricing estimates at the 1% and 99% levels for each fiscal year.

3.2 Regression Models for Determination of Stock Mispricing Determinants

We specify the following regression models for assessing possible determinants of stock mispricing ($Y_{i,t}$):

$$Y_{i,t} = \gamma_0 + \gamma_1 * \boldsymbol{LimitstoA_{i,t}} + \gamma_2 * \boldsymbol{FirmCharacters_{i,t}} + \gamma_3 * \boldsymbol{Macro_{i,t}} + \gamma_4 * \boldsymbol{MktSentiment_{i,t}} + \varepsilon_{i,t}. \quad (11)$$

The four groups of potential determinants in the regression model (11) are limits to arbitrage ($LimitstoA_{i,t}$), firm characteristics ($FirmCharacters_{i,t}$), macro-level variables ($Macro_t$) and market sentiment ($MktSentiment_t$).

The three firm-level limits to arbitrage ($LimitstoA_{i,t}$) determinants in (11) are: bid-ask spread ($BAspread_{i,t}$), defined as the average of the daily bid-ask spread of firm i in fiscal year t; zero return % ($Zerortnpct_{i,t}$), calculated as the ratio of the number of zero return days of firm i over the total number of trading days in the fiscal year t; and the half version of the Amihud (2002) illiquidity ratio, $ILLIQ_{i,t} = \frac{1}{D_{it}}\sum_{t=1}^{Dit}\frac{|R_{itd}|}{VOLD_{itd}}$, where R_{itd} is the return on stock i on day d of fiscal year t, $VOLD_{itd}$ is the respective daily volume in dollars and D_{it} is the number of days for which data are available for stock i for fiscal year t. Only days with positive volumes are used in calculating the half version of the Amihud (2002) illiquidity ratio.

The two firm characteristics ($FirmCharacters_{i,t}$) included in (11) are beta ($\beta_{i,t}$), the rolling average beta from the CAPM of firm i for the last month of fiscal year t; and the dividend yield ($DVDYLD_{i,t}$), which is the annual dividend yield of firm i for fiscal year t.

The five Macro-level determinants ($Macro_t$) in (11) are: risk free rate (Rf_t) as proxied by the 91-day government of Canada T-bill rate; annual GDP growth rate (GDP_t), unemployment rate ($Unemp_t$), annual inflation rate of consumer prices (Inf_t) during fiscal year t, and the Composite Leading Indicator (CLI_t), which is determined and sourced by the Organisation for Economic Co-operation and Development (OECD)[5]. It is based on various indicators like orders and inventory changes, financial market indicators, business confidence surveys, and data on key sectors and trends in key trading partners in smaller open economies.

The first of the five market sentiment ($MktSentiment_t$) determinants in (11) is the Consumer Confidence Indicator (CCI_t). This indicator is also standardised by OECD based on the plans of households for major purchases and their economic situations, both currently and their expectations for the immediate future. The second market sentiment variable is the economic policy uncertainty index (EPU_t) that Baker, Bloom and Davis (2015). The third market sentiment variable is the overall terms of Senior Loan Officer Survey (SLO_{ALL_t}) by the Bank of Canada[6], which summarizes the perspectives of respondents on price and non-price terms of business lending and on topical issues of interest to the Bank of Canada. The fourth and fifth market sentiment variables are two

[5] http://www.oecd.org/
[6] http://www.bankofcanada.ca/publications/slos/

on-balance variables from the Bank of Canada Business Outlook Survey[7]; namely: future sales growth (BOS_{FSG_t}) and investment in machinery and equipment (BOS_{IME_t}). The five variables represent the sentiments of different economic actors; namely, the confidence of consumers, economic policy uncertainty, the accessibility of loans for potential borrowers, business outlook in terms of sales growth, and business investment in important assets which provide links to future productivity.

We estimate equation (11) for each of the four sets of mispricing estimates separately for under- and for over-pricings, as the effects of the determinants are likely to differ or even be in opposite directions for underpricings versus overpricings. Hence, there are eight sets of dependent variables ($Y_{i,t}$) in total.

We use two common statistical methods, namely OLS and fixed-effects, to estimate various versions of regression model (11). In considering both firm and time effects in our panel data, we adjust our robust standard errors through clustering by fiscal year and firm (Cameron, Gelbach, & Miller, 2008; Petersen, 2009) for both estimation methods. Petersen (2009) recommends that year dummies and clustered (Roger) standard errors be used to avoid rejecting the null hypothesis too often when both potential time-series and cross-sectional correlations exist in the panel data. Thus, we use firm and year fixed effects in the fixed-effects model specifications, and draw inferences based on standard errors clustered by year and firm.

Regression model (11) investigates the contemporaneous relationship between the stock mispricing estimates and the determinant variables. Since prior firm- or market-level factors may affect current stock mispricing, we also regress mispricing estimates on

[7] http://www.bankofcanada.ca/publications/bos/

one-year lagged independent variables to address potential endogeneity concerns (Adams, Mansi, & Nishikawa, 2010). Specifically, we estimate the following model where all the terms are as previously defined:

$$Y_{i,t} = \gamma_0 + \gamma_1 * \boldsymbol{LimitstoA_{i,t-1}} + \gamma_2 * \boldsymbol{FirmCharacters_{i,t-1}} + \gamma_3 * \boldsymbol{Macro_{i,t-1}} + \gamma_4 * \boldsymbol{MktSentiment_{i,t-1}} + \varepsilon_{i,t-1}. \quad (12)$$

Since all the independent variables in regression model (12) are lagged, it can be used to assess the power of the explanatory variables to predict stock mispricing.

4 DATA AND SUMMARY STATISTICS

We begin to form our sample by extracting all available trading and return data for all the firms that are listed on the Toronto Stock Exchange (TSX) since 1960 from the Canadian Financial Markets Research Centre (CFMRC) summary information database. To ensure that these firms have the required financial data, we match these firms with the firms in five other databases in the following pecking order in decreasing importance: 1) Compustat (Canada), 2) Mergent Online, 3) Financial Post (FP) Advisor, 4) Capital IQ, and 5) StockGuide. Specifically, we first search if the required accounting and financial data based on the firm list from CFMRC is in Compustat (Canada). When no further matches are found, then we look for a match for any unmatched firms on the list using the next source, Mergent Online. We continue this matching process with each of the other three databases.

The matching process can be challenging. For example, when merging CFMRC and Compustat, the biggest challenge is to find the bridge firm identifiers to link these two databases. Besides firm names, CFMRC has only two sets of firm identifiers: ticker

+ usage (indicates the times the same ticker has been used before for other firms), and CUSIPs. Obviously, ticker is not a good bridge between the two databases, because it can be reused. Moreover, the Canadian and the U.S. markets use different tickers. When a dual-listed firm has different tickers in the two markets, Compustat often keeps the American indicators as the firm's identifier in the database. Even though CUSIP is a more reliable indicator, neither of the databases has uniform 9-digit standard CUSIPs for all firms, instead, the number of digits can range from six to nine. Compared to CFMRC, Compustat has several more precise identifiers such as GVKEY and PERMNO. Based on the criteria of uniqueness, the pair of ticker + usage is the best identifier of CFMRC, and GVKEY is best for Compustat. For linking those two sets of identifiers together, we match them through CUSIPs and firm names after retrieving each entire database since 1960. By merging the identifiers for the same firm, we successfully merge the trading and return data of CFMRC with all the available firm financial data in Compustat. We continue matching the unmatched firms in the rest of the databases mostly based on searching via ticker and verifying with firm names.

Whereas all of our four mispricing metrics require industry specifications, it is important to utilize an industry classification system that is desirable for the Canadian listed firms. RKRV (2005) use the Fama-French (1997) 12-industry classifications based on the Standard Industrial Classification (SIC), which is a widely used method in articles using American data. The SIC is a system for classifying industries by a four-digit code, established by the U.S. government in 1937 and used widely in government and private-sector. Due to various limitations of SIC in defining new and emerging industries, it is gradually being supplanted by the six-digit North American Industry Classification

System (NAICS) since 1997. But the SIC system is still widely used in both current and historical contexts in the U.S. Even certain government department and agencies, such as the Securities and Exchange Commission (SEC), still use SIC codes. Nevertheless, the Toronto Stock Exchange (TSX), the biggest stock market in Canada, only includes NAICS codes as its sole industry classification scheme for all the listed firms in its annual fact book since as early as 2000. Thus, the Fama-French 12-industry classification, which is based on the SIC system, is not directly applicable for the Canadian market.

Based on the first two digits of NAICS, we initialize a unique Canadian industry classification system particularly for TSX listed public firms and their characteristics. According to our Seven-sector Canadian industry classification, we divide firms into relatively more general sectors based on the first two digits of the NAICS codes. Table 1 explains the specifics of our classification. Based on this sector classification scheme, we also exclude firms if: a) the firm's NAICS code cannot be found in the TSX annual reports or in the five databases; b) the firm's first two digits of its NAICS code is 52 (Finance and insurance) or 53 (Real Estate and Rental and Leasing), c) the firm's ticker ends with ".UN", which indicates that it is a unit trust, and d) the firm's book value is recorded as a negative number in the database(s). After ensuring that each sector has sufficient observations annually for obtaining our mispricing measures through regression analysis, we finalize our sample period from 1986 to 2014 as consisting of 2,330 firms and 18,679 firm-year observations.

For determinants, firm-specific and market-level variables are either indirectly calculated or directly retrieved from CFMRC. Macroeconomic variables are from the

World Bank DataBank[8]. Consumer confidence index and composite leading indicator for Canada are downloaded from the website of the Organisation for Economic Co-operation and Development (OECD)[9]. Economic Policy Uncertainty index is obtained from the website of Baker, Bloom and Davis[10]. The variables of Senior Loan Officer Survey and Business Outlook Survey are from the website of Bank of Canada[11]. A brief description of all the sample variables, including variables for estimating mispricings and testing determinants and the data sources used to obtain or compute them, is described in Table 2.

Table 3 presents the industry distributions of our sample, and the mean values of each industry's characteristics used in calculating the RKRV and PV mispricing estimates. We can see that among the Canadian publicly listed firms, Mining, Oil and Gas (1) has the largest number of firms. The smallest public industry sector is Services (6). Comparing the characteristics among the industries, the biggest industry sector Mining, Oil and Gas (1) also has the biggest average M/B ratio, lowest average leverage, and the smallest average AGE (minus the reciprocal of one plus the firm's age). Information and Communication (4) has the highest average market value. Wholesale and Retail Trades (3) have the lowest volatility and biggest average AGE. Although Professional, Science and Technology (5) has much smaller average market value, book value and net income than the other industries, it has the highest average volatility and ROE (return on equity).

[8] http://databank.worldbank.org/data/home.aspx
[9] https://data.oecd.org
[10] www.policyuncertainty.com
[11] http://www.bankofcanada.ca/stats/bos/quarter/winter_2016

Table 4 describes the summary statistics for all firm-level variables, including variables for the RKRV and HP models, and possible determinants. Information is presented on number of observations, mean, median and standard deviation. Panel A and B report the summary statistics of the mispricing estimating variables for the RKRV and HP model from 1986 to 2014, respectively. Because our mispricing metrics require ten years of lagged data, stock mispricing estimates are reported from 1996 to 2014 and tests of the possible determinants are over the same time period. Panel C presents the characteristics of the firm-level possible determinants, where beta has relatively less observations because the CFMRC database requires a minimum of 24 months of returns over the past 60 months before computing a beta. Table 5 reports the summary statistics for market and macro-level determinant variables, including the market sentiment variables.

In the contemporaneous models (11), the contemporaneous independent variables are those that match their corresponding annual mispricing estimates using the method we used to merge the monthly market trading data with the annual accounting data. For a firm's mispricing estimate for a fiscal year, we match with the monthly independent variables whose month matches the fiscal-year-end month of that firm in the specific fiscal year. For quarterly independent variables, we take yearly averages.

5 STOCK MISPRICING ESTIMATES

Summary statistics for the two mispricing metrics (MP1 from the RKRV model and MP2 from the PV model) estimated herein using the Fama-MacBeth approach and HP's three-step procedure for the full sample and the sample differentiated by industry are presented

in Panel A and B, respectively, of Table 6. Although the inferences using $MP1$ and $MP2$ are similar, $MP1$ is the natural logarithm of the ratio of a firm's actual market value over its predicted market value based on the RKRV model, while $MP2$ is the natural logarithm of the ratio of a firm's actual market-to-book ratio over its predicted market-to-book ratio based on the PV model.[12] If we compare the results of the two regression estimation methods for each model, we observe that the Fama-MacBeth approach always gives bigger mean and median mispricing estimates for our sample from 1996 to 2014. The mean and median mispricing estimates are negative and positive for the four sets of estimates for the full sample.

Panel B1 and B2 of Table 6 present the mispricing estimates by industry for MP1 and MP2, respectively. We observe that the levels of mispricing vary greatly from industry to industry, and that the mean, median and standard deviation estimated by the two estimation specifications are almost identical. Among our seven industrial sectors, Manufacturing (2) and All Others (7) have the smallest mispricing estimates based on the absolute means, and Wholesale & Retail Trades (3) and Services (6) have relatively higher levels of mispricing.

The similarity in the time-series patterns for the four sets of mispricing estimates for the full sample are further illustrated in Figure 1, which plots the cross-sectional annual mean and median estimates from 1996 to 2014. Since $MP1$ and $MP2$ are different measures of mispricing, we use a different y-axis for MP1 and MP2. The mispricings associated with the Internet and housing bubbles, and the early 2000s recession are

[12] MP1 is essentially the natural log of the ratio of a firm's actual market value to its predicted fundamental value, while MP2 is essentially the natural log of the ratio of a firm's actual market-to-book ratio to its predicted market-to-book ratio.

evident in the figure. Similarly, the market overvaluation during 2003-07 and the deflation in valuations during the global financial crisis of 2007-8 are also evident in the graph. There are some visual differences between the MP1 and MP2 estimates. For example, the mean and median values of $MP1$ are negative in 1999 while those for $MP2$ are positive. Based on the mean and median mispricing estimates for each industry in 1999 reported in Table 7, we observe large differences in the $MP1$ and $MP2$ mispricing estimates for three industrial sectors; namely, Mining, Oil and Gas (1), Manufacturing (2) and Services (6).

To draw robust inferences, we conduct t-tests of the mean mispricing estimates and Wilcoxon sign-ranked tests of the median mispricing estimates for each year from 1996 to 2014 for each of the four sets of mispricing estimates. These test results are reported in Panels A and B of Table 7, respectively. We observe that these summary statistics are significant at the 0.05 level for most of the tests. Thus, the evidence indicates that both an average and a typical firm are mispriced in most years based on the four sets of mispricing estimates.

In Panel C of Table 7, we summarize our inferences for the number of years that an average and a typical firm of the sample is over-, under- or correctly valued. We infer market over- (under-) valuation for an average firm in a fiscal year if all four of the respective means are positive (negative) and significant at the 0.05 level from the t-tests. Otherwise, we infer that the average firm was correctly valued during that fiscal year. We use a similar inference method for a typical firm by examining if all four medians in a fiscal year have the same sign and are significant at the 0.05 level from the Wilcoxon sign-ranked tests. We also report the inferences based on each of our four mispricing

metrics solely. Based on Panel C, the four metrics generally give similar results. For the 19 fiscal years, the overall market is correctly priced for two or three years, and almost evenly under- or over-priced in the remaining years.

Similar to the method to generate Table 7, we also conduct t-tests and Wilcoxon sign-ranked tests per fiscal year at the industry-level. Instead of presenting the detailed test statistics, we just summarize our inferences for the number of fiscal years that an average and a typical firm of each industry is under-, over-, or correctly valued in Table 8. We can see that the pricing condition varies from industry to industry. Information and Communication (4) and All Others (7) score the most numbers of correctly-priced fiscal years. Information and Communication (4) is always underpriced in the years where it is not correctly priced. Manufacturing (2), Wholesale and Retail Trades (3) and Services (6) tend to be overpriced when they are not correctly priced. Mining, Oil and Gas (1) has the greatest incidence of mispricing among all the industries.

We also test the robustness per fiscal year at the industry-level between the two regression methods, namely Fama-Macbeth approach and HP three-step process, that we apply to RKRV model (MP1) and HP model (MP2). Table 9 reports the number of fiscal years that the mean (T-test) or median (Wilcoxon sign-ranked test) is the same at the 0.05 level. We can see that the two regression methods tend to give different mispricing estimates for Mining, Oil & Gas (1) and Manufacturing (2), but analogous estimates for Wholesale & Retail Trades (3) and Services (6). Generally speaking, the two regression methods obtain more similar mispricings for MP2 than MP1, where the difference is greater for Professional, Science & Technology (5) and All Others (7).

6 DETERMINANTS OF STOCK MISPRICING

As specified in Section 3.2, we investigate the determinants of mispricing estimates separately for under- and for over-pricings. For each of the four sets of stock under- and over-pricing estimates, we report the results of two specifications for the independent variables (i.e., contemporaneous and lagged). Both specifications include the three limits-to-arbitrage proxies and the two firm characteristics. Specification (1) also includes the five macro-level variables. Specification (2) also comprises the five sentiment variables that represent the sentiments of different economic actors, but excludes the five macrovariables due to the multicollinearity effects with the five sentiment variables.

Results are reported using both OLS and fixed effects with year dummies. We use heteroscedastic robust standard errors adjusted for the correlations (clustering) within firm and year groups (Petersen, 2009). We report the results using both contemporaneous (equation 11) and one-year lagged (equation 12) independent variables. The results from the fixed-effects panel regressions should be more robust because they control for missing or unobserved time-invariant variables.

6.1 OLS Results

Panels A and B of Table 10 report the results of OLS panel regressions with robust standard errors clustered by both firm and fiscal year, when the dependent variables are under- and over-pricing estimates respectively. The results are based on model (11), which examines the contemporaneous relationship between mispricing estimates and potential determinants.

Based on Panel A of Table 10, we find that the estimated coefficients of all limits-to-arbitrage proxies are always significant. This indicates that the stock underpricing

estimate is more negative (stock is more underpriced) when the bid-ask spread ($BAspread$), number of trading days of zero return ($Zerortnpct$), or stock illiquidity ($ILLIQ$) are higher. This result is consistent with the notion that illiquidity causes prices to fall and that costly arbitrage allows mispricing. Beta (β) is significantly and negatively related to the underpricing estimates, which implies that riskier firms are associated with stocks being more underpriced. The estimated coefficient of the dividend yield ($DVDYLD$) is always positive and significant, which infers that a higher dividend yield is associated with stocks being less underpriced. The estimated coefficients of some of the macrovariables (Rf, GDP and Inf) are insignificant. The estimated coefficients of the unemployment rate ($Unemp$) and CLI are positive and significant for 3 and 4, respectively, of the 4 estimations. With regard to the sentiment variables, the coefficient estimates of SLO_{ALL} are always negative and significant, which implies that firms tend to be more underpriced when overall business lending conditions are tighter. The coefficient estimates for CCI are significantly and positively associated with underpricing for three of the four estimations (except for MP2 based on the Fama-MacBeth approach). This result is consistent with the notion that a rising trend in consumer confidence is generally beneficial for economic activities. Better economic conditions are associated with lower stock underpricing.

Panel B of Table 10 presents the OLS coefficient estimates and robust t-statistics for each of the four sets of overpricing estimates as the dependent variable. The coefficient estimates for $ILLIQ$ are always insignificant and those for $BAspread$ are generally insignificant. Only the coefficient estimates for $Zerortnpct$ are always negative and significant. This result is consistent with the notion that more frequent

trading aids arbitrage activities that have an important role in reducing stock overpricing. The coefficient estimates of the macrovariables are generally insignificant except for the coefficient estimates for CLI which are always significant and positive. Among the sentiment variables, only BOS_{IME} has significant (positive) coefficient estimates (in all the runs), which infers that the balance of opinion on investment in machinery and equipment has a positive sentiment association with stock overpricing.

Table 11 reports similar results to those reported in Table 10 but using independent variables lagged one year. The most obvious difference from the previous results using contemporaneous independent variables is that all of the lagged sentiment variables are now insignificant in Panel A of Table 11. This suggests that sentiment variables reflect more what the mood is at that point in time and have little power to predict stock underpricing. CLI is no longer a significant determinant of underpricing. Inf joins $Unemp$ as a significant determinant of underpricing with positive coefficient estimates, which indicates that a higher current unemployment rate and inflation are associated with subsequent less negative underpricing (stock being less underpriced). All the one-year-lagged firm-level variables, including the limits-to-arbitrage and firm characteristics, have similar coefficient estimates as in Panel A of Table 10, but with fewer insignificant coefficient estimates for $ILLIQ$ and $Zerortnpct$. This result indicates that prior firm-level variables have some power in predicting current firm underpricing, but have less explanatory power in explaining current firm underpricing than current firm-level variables.

Panel B of Table 11 shows somewhat similar results for the limits-to-arbitrage variables and $DVDYLD$ as Panel B of Table 10. However, the negative coefficient

estimates for $Zerortnpct$ for the MP2 overpricing estimates are now significant. The negative coefficient estimates for Inf are now significant. The positive coefficient estimates for CLI remain significant only for the MP2(FM) mispricing estimates. The coefficient estimates for BOS_{FSG} are now significant and positive for all the estimations. The coefficient estimates for the other four sentiment variables remain negative but become significant for the MP2 mispricing estimates.

6.2 Fixed-effects Panel Regression Results

To address the effect of heterogeneity caused by missing or unobserved regressors, we examine the determinants of stock mispricing using a fixed-effects panel regression with a firm effect and fiscal year dummies. Tables 12 and 13 report the results for stock mispricing (under- and overpricing) with contemporaneous and lagged regressors, respectively.

Comparing the contemporaneous results reported in Panel A of Table 12 for underpricing based on fixed-effects estimations with their counterparts in Table 10 based on OLS estimations, we observe similar inferences for the three limits-to-arbitrage proxies for MP1 mispricing estimates and only for $Zerortnpct$ for the MP2 underpricing estimates. The coefficient estimates are now insignificant for $ILLIQ$ for the MP2 underpricing estimates. While firm risk is still a significant determinant of stock underpricing, the dividend yield is no longer a significant determinant of underpricing. Stock underpricing is now positively and significantly associated with $Unemp$ for all four MP underpricing estimates and with Inf for the two MP1 underpricing estimates. This implies that an increase in the unemployment rate and inflation are associated with an increase in firms become less underpriced. The results for CLI, CCI and SLO_{ALL} are

similar to previous results reported in Panel A of Table 10. The negative and positive coefficient estimates for EPU and BOS_{IME}, respectively, are now always significant. The negative coefficient estimates for EPU are consistent with the notion that stocks are more underpriced when economic policy uncertainty is higher. The positive coefficient estimates for BOS_{IME} infer that stocks are underpriced less when the balance of opinion on investment in machinery and equipment is higher.

We now compare the results using lagged regressors reported in Panel B of Table 12 for overpricing with their counterparts reported in Panel B of Table 10. While the coefficient estimates for $Zerortnpct$ and $BAspread$ are similar to those reported in Table 10, the coefficient estimates for $ILLIQ$ are now significantly positive for the MP2 estimates of overpricing. The coefficient estimates for β are now significant (and negative). The coefficient estimates for $Unemp$ are now significant (positive). While the coefficient estimates for CLI are no longer significant, the coefficient estimates for SLO_{ALL} are now significant (and negative), and the coefficient estimates for BOS_{IME} remain significant but now with negative signs.

We now compare the results using contemporaneous regressors reported in Panel A of Table 13 for fixed-effects estimations of underpricing with their counterpart results reported in Table 11 for OLS estimations. The coefficient estimates remain significant for only one limits-to-arbitrage proxy. Specifically, the coefficient estimates for $BAspread$ are negative but primarily significant for only the MP1 underpricing estimates. The coefficient estimates for β become positive in all the estimations and remain significant in seven of the eight estimations. The negative coefficient estimates for GDP are now always significant and the positive coefficient estimates for $Uemp$ are no longer

significant for the MP1 underpricing estimates. The negative coefficient estimates for CLI are now significant for the MP2 underpricing estimates. With the exception of BOS_{IME}, all of the coefficient estimates for the other four sentiment variables are now positive and significant.

We now compare the results using lagged regressors reported in Panel B of Table 13 for fixed-effects estimations of overpricing with their counterpart results reported in Table 11 for OLS estimations. The coefficient estimates for $Zerortnpct$ are no longer significant, while those for $ILLIQ$ for the MP2 estimates of overpricing remain significantly positive. The coefficient estimates for the five macrovariables are now significant. GDP and $Unemp$ are positively associated with the overpricing estimates, while the risk free rate, inflation and CLI are negatively associated with the overpricing estimates. The coefficient estimates for the five sentiment variables retain their signs but are now always significant. Specifically, only the coefficient estimates for BOS_{FSG} are positive.

In our last set of comparisons, we highlight differences in the associations between the mispricing estimates and the independent variables when the latter are contemporaneous in Table 12 and lagged in Table 13. We begin with the associations between the independent variables with the underpricing estimates reported in Panel A of each table. With regard to the limits-to-arbitrage regressors, the coefficient estimates are negative and always significant for contemporaneous $Zerortnpct$ and always insignificant for lagged $Zerortnpct$. The coefficient estimates that are negative and significant for contemporaneous $ILLIQ$ when the dependent variable is the MP1 underpricing estimates become insignificant when $ILLIQ$ is lagged. With regard to the

two firm-specific regressors, the coefficient estimates are always significantly negative for contemporaneous β but significantly positive for lagged β. The coefficient estimates are insignificant for contemporaneous and lagged $DVDYLD$. With regard to the five macrovariables, the insignificant positive and negative coefficient estimates for contemporaneous Rf and GDP become significant when these two independent variables are lagged. The positive coefficient estimates for $Unemp$ become insignificant for the MP1 underpricing estimates while those for Inf become significant for the MP2 underpricing estimates. The positive and significant coefficient estimates for CLI become insignificant for the MP1 underpricing estimates and remain significant but change sign for the MP2 underpricing estimates. With regard to the five sentiment variables, the coefficient estimates are always significant and positive for contemporaneous and lagged CCI. They are always significant but negative for contemporaneous EPU and SLO_{ALL} and positive for lagged EPU and SLO_{ALL}. The positive coefficient estimates that are only significant for the MP2 underpricing estimates for contemporaneous BOS_{FSG} are significant for the MP1 and MP2 underpricing estimates for lagged BOS_{FSG}. The positive coefficient estimates that are significant for all underpricing estimates for contemporaneous BOS_{IME} become insignificant for lagged BOS_{IME}.

We now examine the associations between the independent variables with the overpricing estimates reported in Panel B of Tables 12 and 13. With regard to the limits-to-arbitrage regressors, the coefficient estimates are negative and always significant for contemporaneous $Zerortnpct$ and always insignificant for lagged $Zerortnpct$. With regard to the two firm-specific regressors, the coefficient estimates are always significantly negative for contemporaneous β but significantly positive for lagged β. The

coefficient estimates are negative and sometimes significant for contemporaneous $DVDYLD$ but always insignificant for lagged $DVDYLD$. With regard to the five macrovariables, the insignificant coefficient estimates for contemporaneous Rf and GDP become significant (negative and positive, respectively) when these two independent variables are lagged. The positive coefficient estimates for $Unemp$ remain significantly positive. While the coefficient estimates for contemporaneous Inf and CLI are insignificant, they are negative and significant for their lagged counterparts. With regard to the five sentiment variables, the coefficient estimates for contemporaneous CCI and EPU are always insignificant but become significantly negative when these independent variables are lagged. The coefficient estimates are negative and significant for both contemporaneous and lagged SLO_{ALL} and BOS_{IME}. The positive but insignificant coefficient estimates for contemporaneous BOS_{FSG} become significant for lagged BOS_{FSG}.

7 CONCLUSION

We estimate Canadian stock mispricing through regression analysis based on two recent studies, namely Rhodes-Kropf, Robinson, and Viswanathan (RKRV) (2005) and Pástor and Veronesi (PV) (2003). For each of the two models above, we obtain four sets of mispricing estimates by applying two regression methods, namely Fama-MacBeth (FM) approach and Hoberg and Phillips (HP) (2010) three-step regression procedure. The Fama-MacBeth approach always gives bigger sample mean and median mispricing estimates than the HP procedure for our mispricing sample from 1996 to 2014. Among the seven industries defined in this paper, we find that Mining, Oil and Gas (1) has the

highest incidence of mispricing based on the number of year an average/median firm is mispriced. Information and Communication (4) has the lowest incidence of mispricing, although it tends to be underpriced when it is not correctly priced. In contrast, Manufacturing (2), Wholesale and Retail Trades (3) and Services (6) tend to be overpriced when they are not correctly priced.

As the effects of the determinants are likely to differ for underpricings versus overpricings, we analyze each of the four sets of mispricing estimates separately for under- and for over-pricings. Both OLS and fixed-effects methods with clustered standard errors are used to assess the four groups of potential determinant variables, namely limits to arbitrage, firm characteristics, macro-level and market sentiment variables. We report the estimations using both contemporaneous and one-year lagged regressors. The estimates from the OLS and fixed-effects estimates often lead to different inferences, especially for the sentiment and macro-level variables. The results from the fixed-effects panel regressions should be more robust because they control for missing or unobserved time-invariant variables.

We find empirical evidence that stock mispricing can be affected by limits to arbitrage, firm risk, macrovariables and investor sentiment. Limits to arbitrage affects more underpricing than overpricing. Underpricing is also related more to contemporaneous limits-to-arbitrage variables than to the one-year lagged values. Specifically, underpricing is negatively and significantly associated with contemporaneous bid-ask spread, percentage of zero trading days and illiquidity; but it is only impacted by one-year lagged bid-ask spread significantly. Firm risk is always

negatively associated with contemporaneous stock mispricing; but negatively and positively correlated with one-year lagged under- and over-pricing.

Many macroeconomic and sentiment variables are significantly related to mispricing, however, the associations of mispricing (under- and over-pricing) with various macroeconomic and sentiment variables may differ for under- or overpricing, and for different mispricing estimations. According to regression models with contemporaneous independent variables, mispricing (under-/overpricing) is positively and negatively related to unemployment rate and the perspective of overall business lending condition. Additionally, underpricing is positively associated with inflation, composite leading index, consumer confidence index and the balance of opinion on investment in machinery and equipment; and negatively associated with economic policy uncertainty index. While overpricing is still significantly affected by the balance of opinion on investment in machinery and equipment, however, the relationship becomes negative.

On the basis of regression models with one-year lagged independent variables, overpricing is significantly associated with every single lagged macro-level or sentiment variable. The majority of their coefficients are negative, but positive for GDP growth rate, unemployment rate and the balance opinion on future sales growth. For underpricing, the coefficients remain positive for inflation and the perspective of overall business lending condition, but change to the opposite signs for the other sentiment and macro variables. The balance of opinion on investment in machinery and equipment no longer significant affects underpricing.

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9 APPENDIX: Tables and Figures

Table 1. Canadian Industry Classification

This table reports our division of Canadian firms into seven industrial sectors based on the first two digits of the NAICS (North American Industry Classification System) codes. It excludes NAICS codes 52 (Finance and insurance) and 53 (Real Estate and Rental and Leasing).

Industry Sectors	First two digits of the NAICS code	Description
(1)	21	Mining, Oil and Gas
(2)	31-33	Manufacturing
(3)	42, 44 & 45	Wholesale and Retail Trades
(4)	51	Information and Communication
(5)	54	Professional, Science and Technology
(6)	55-81	Services
(7)	11, 22, 23, 48, 49	All Others, including Agriculture, Utilities, Construction, transportation and Warehousing

Table 2. Variable Definitions and Primary Data Source

Variable	Explanation	Data source
Estimation of mispricing		
Market value	Market value of common shares	CFMRC/TSX
Book value	Book value of common shares	Compustat/Mergent Online/FP Advisor/Capital IQ/Stock Guide
Net income	Net income from Income Statement	Compustat/Mergent Online/FP Advisor/Capital IQ/Stock Guide
Leverage ratio	Total debt over total assets	Compustat/Mergent Online/FP Advisor/Capital IQ/Stock Guide
Firm age	One plus the current year less the first year that the firm appears on CFMRC/TSX database	CFMRC/TSX
Total return volatility	Standard deviation of daily stock returns during the fiscal year	CFMRC/TSX
Return on equity	Net income over book value of common equity	Compustat/Mergent Online/FP Advisor/Capital IQ/Stock Guide
Determination of mispricing determinants		
Bid-ask spread	Average of the daily bid-ask spread in the fiscal year	CFMRC/TSX
Zero return %	Ratio of the number of zero return days over the total number of trading days in the fiscal year	CFMRC/TSX
The half version of Amihud (2002) ratio	Average ratio of the daily absolute return over the daily dollar trading volume in the fiscal year; only days with positive volumes are used.	CFMRC/TSX
Beta	Firm's CAPM beta	CFMRC/TSX
Dividend yield	Annual dividend yield	CFMRC/TSX
Risk free rate	The 91-day government of Canada T-bill rate	CFMRC/TSX
GDP growth rate	Annual GDP growth rate	World Bank
Unemployment rate	Annual unemployment rate	World Bank
Inflation rate	Annual inflation rate of consumer prices	World Bank
Composite leading indicator	Standardised by OECD	OECD
Consumer confidence indicator	Standardised by OECD	OECD
Economic policy uncertainty index	Baker, Bloom and Davis (2015)	Webside of Baker, Bloom and Davis
Senior Loan Officer survey: overall terms	Standardised by Bank of Canada	Bank of Canada
Business Outlook Survey: future sales growth	Standardised by Bank of Canada	Bank of Canada
Business Outlook Survey: investment in machinery and equipment	Standardised by Bank of Canada	Bank of Canada

Table 3. Industry Characteristics Used in Mispricing Valuation Models

Industry definitions are described in Table 1. Observations describe the minimum, maximum, and mean number of observations per year in each industry. All the characteristic variables are the equal-weighted average values for the industry. Leverage is total debt over total assets. AGE is minus the reciprocal of one plus the firm's age. ROE is net income divided by common equity. Our sample is from 1986 to 2014 for the mispricing estimates.

Industry	Observations per year			Market	Book	Net	Leverage	M/B	AGE	Dividend	SIZE*	ROE	Volatility
Sectors	Min.	Max.	Mean	value*	value*	income*				dummy			
(1)	106	465	264	932.180	557.399	24.835	0.300	9.965	-0.181	0.198	4.891	0.311	0.0034
(2)	110	238	175	1120.110	825.981	42.676	0.462	3.597	-0.131	0.455	5.458	0.305	0.0021
(3)	20	50	40	1582.320	737.194	94.359	0.523	2.159	-0.115	0.688	5.934	0.221	0.0015
(4)	22	68	44	1859.720	700.417	21.209	0.485	6.036	-0.145	0.474	5.576	0.378	0.0025
(5)	9	84	46	465.810	181.788	6.344	0.390	4.672	-0.181	0.208	4.335	0.636	0.0036
(6)	15	60	36	1117.110	660.989	52.261	0.508	2.376	-0.139	0.559	5.719	0.287	0.0024
(7)	19	61	39	1802.460	880.676	92.486	0.524	1.626	-0.132	0.575	6.123	0.203	0.0019
Sample	339	896	632	1116.310	650.270	38.148	0.402	6.168	-0.156	0.361	5.239	0.323	0.0028

*Market value, book value, net income, and SIZE are reported in millions.

Table 4. Summary Statistics for Firm-Level Variables

This table reports summary statistics for all firm-level variables including variables for the RKRV and HP mispricing estimation models and possible determinants of the mispricing estimates. The number of observations, means, medians and standard deviations are reported. All firm-level trading and return data are from the Canadian Financial Markets Research Centre (CFMRC) summary information database. The accounting data is from five databases in the following pecking order in decreasing importance: 1) Compustat (Canada), 2) Mergent Online, 3) Financial Post (FP) Advisor, 4) Capital IQ, and 5) StockGuide. Our final sample from 1986 to 2014 consists of 2,330 firms and 18,679 firm-year observations. Stock mispricing estimates are reported from 1996 to 2014 due to the use of a ten-year lagged rolling window. Bid-ask spread is the average of the daily bid-ask spread for the fiscal year. Zero return % is the ratio of the number of zero return days divided by the total number of trading days during the fiscal year. Amihud (2002) illiquity ratio is the average ratio of the absolute daily return over the daily dollar volume for the fiscal year. Beta (monthly) is obtained directly from CFMRC database, which is the rolling average beta from the CAPM. A minimum of 24 months of the returns over the past 60 months are required before a beta is calculated. Dividend yield is the annual dividend yield.

Variable	Symbol	N	Mean	Median	Standard Deviation
Panel A: *Mispricing estimating variables for RKRV model (1986-2014)*					
Market value	M	18,375	1126.290	128.456	4742.510
Book value	B	18,542	655.194	86.906	2595.990
Net income	NI	18,426	38.738	1.837	875.876
Leverage	LEV	18,536	0.402	0.410	0.228
Panel B: *Mispricing estimating variables for HP model (1986-2014)*					
Market-to-book ratio	M/B	18,220	2.254	1.478	3.447
AGE	AGE	18,220	-0.156	-0.111	0.144
Leverage	LEV	18,215	0.399	0.407	0.225
Total asset	$SIZE$	18,220	5.285	5.076	1.914
Return on equity	ROE	18,220	0.280	0.117	0.724
Total return volatility	VOL	18,220	0.003	0.001	0.005
Panel C: *Firm-level possible determinants (1996-2014)*					
Bid-ask spread	$BAspread$	14,316	0.050	0.023	0.457
Zero return %	$Zerortnpct$	14,317	0.115	0.108	0.083
Amihud (2002) illiquidity ratio	$ILLIQ$	14,302	0.073	1.148	0.001
Beta (CAPM)	β	11,458	1.182	1.009	0.917
Dividend yield	$DVDYLD$	14,321	0.010	0.000	0.031

*Amihud (2002) illiquidity ratios are divided by 1000.

Table 5. Summary Statistics for Market and Macroeconomic Variables

This table presents summary statistics for all market and macroeconomic variables, including market sentiment variables.

Variable	Symbol	Data Frequency	Availability		Minimum	Maximum	Average
			From	To			
Risk free rate	Rf	Monthly	1996	2014	0.460	1.560	1.004
GDP growth rate	GDP	Annually	1996	2014	-2.711	5.123	2.572
Unemployment rate	$Unemp$	Annually	1996	2014	6.000	9.600	7.550
Inflation rate	Inf	Annually	1996	2014	0.299	2.912	1.914
Composite leading indicator	CLI	Monthly	1996	2014	95.996	101.386	99.864
Consumer confidence index	CCI	Monthly	1996	2014	96.837	101.695	100.101
Economic policy uncertainty index	EPU	Monthly	1996	2014	30.097	399.846	119.849
Senior loan officer survey: overall terms	SLO_{ALL}	Quarterly	1999	2014	-25.013	48.270	5.401
Business outlook survey: future sales growth	BOS_{FSG}	Quarterly	1998	2014	-9.500	30.000	13.847
Business outlook survey: investment in machinery and equipment	BOS_{IME}	Quarterly	1998	2014	-2.750	24.750	12.583

Table 6. Summary Statistics for the Mispricing Estimates for the Whole Sample and for Each Industrial Sector

This table reports summary statistics for the mispricing estimates of the entire sample (Panel A) and for each industry (Panel B). The sample contains 2,330 firms (18,679 firm-year observations) from 1986 to 2014. The mispricing estimates are reported from 1996 due to 10-year lagged rolling window required for the estimation of mispricing. We employ four mispricing metrics based on two models, Rhodes-Kropf, Robinson, and Viswanathan (2005) and Pástor and Veronesi (2003). We apply two regression procedures to each model. One regression method is based on Fama-MacBeth approach. We run regressions by industry-year and average the coefficients using a ten-year rolling window ($t-10\ to\ t-1$). Then we predict the valuation for firm i using the fiscal year t characteristics with the set of estimated coefficients from the previous step. Lastly, we calculate the mispricing estimate for fiscal year t for firm i as the difference between the actual and predicted valuations. The other regression method uses the three-step procedure specified in Hoberg and Phillips (2010).

Panel A: *Summary Statistics of Mispricing Estimates for the Whole Sample*

Mispricing Estimates	N	Mean	Median	Standard Deviation	10th %	90th %
MP1(FM)	14212	-0.016227	0.029761	0.8839	-1.1424	1.0365
MP1(HP)	14212	-0.025553	0.015357	0.8797	-1.1402	1.0233
MP2(FM)	14305	-0.013666	0.028792	0.91625	-1.1068	1.0381
MP2(HP)	14305	-0.027497	0.002206	0.87201	-1.1181	1.0142

Panel B1: *Summary Statistics for MP1 for Each Industry*

Industry	N		Mean		Median		Standard Deviation	
	FM	HP	FM	HP	FM	HP	FM	HP
(1)	6098	6098	-0.060	-0.068	0.005	-0.013	0.937	0.928
(2)	3615	3615	0.004	0.000	0.038	0.032	0.853	0.855
(3)	736	736	0.095	0.092	0.108	0.117	0.661	0.662
(4)	919	919	-0.018	-0.017	0.053	0.027	0.961	0.953
(5)	1145	1145	-0.008	-0.029	-0.017	-0.060	0.892	0.888
(6)	819	819	0.082	0.044	0.072	0.034	0.833	0.841
(7)	880	880	0.011	-0.004	0.046	0.037	0.708	0.713
Sample	14212	14212	-0.016	-0.026	0.030	0.015	0.884	0.880

Panel B2: *Summary Statistics for MP2 for Each Industry*

Industry	N		Mean		Median		Standard Deviation	
	FM	HP	FM	HP	FM	HP	FM	HP
(1)	6137	6137	-0.046	-0.066	0.009	-0.017	0.896	0.892
(2)	3632	3632	0.051	0.009	0.074	0.019	0.894	0.876
(3)	742	742	0.023	0.109	0.118	0.123	0.822	0.717
(4)	926	926	-0.152	-0.053	-0.057	-0.010	1.036	0.958
(5)	1150	1150	-0.113	-0.036	-0.082	-0.038	1.049	0.892
(6)	830	830	0.211	-0.006	0.169	-0.033	1.016	0.864
(7)	888	888	-0.018	-0.009	0.019	0.022	0.733	0.689
Sample	14305	14305	-0.014	-0.027	0.029	0.002	0.916	0.872

Table 7. T-Test and Wilcoxon Sign-Ranked Test at the Market-Level

This table reports the results of t-tests and Wilcoxon sign-ranked tests on the mean and median mispricing estimates for the four metrics for the whole sample annually from 1996 to 2014 (19 years in total). Panel A shows the annual mean mispricing estimates, and t-statistics and p-values for the test that the mean value equals zero. Panel B presents the median mispricing estimates and Wilcoxon sign-ranked test statistics and p-values for the test that the median values equal zero. Panel C summaries both Panel A and B, and reports the number of years that the whole market is underpriced, fairly priced or overpriced (see the descriptor for Panel C for greater details). .

Panel A: *T-test on the mean mispricing estimates*

Fiscal	MP1(FM)			MP1(HP)			MP2(FM)			MP2(HP)		
Year	mean	t	p-value	mean	t	p-value	mean	t	p-value	mean	t	p-value
1996	0.244	8.542	0.000	0.213	7.549	0.000	0.205	6.591	0.000	0.200	6.939	0.000
1997	0.130	4.686	0.000	0.097	3.502	0.000	0.088	2.930	0.004	0.095	3.419	0.001
1998	-0.181	-5.800	0.000	-0.221	-7.140	0.000	-0.085	-2.531	0.012	-0.137	-4.502	0.000
1999	-0.062	-1.829	0.068	-0.074	-2.196	0.028	0.161	3.817	0.000	0.105	2.786	0.005
2000	-0.237	-7.249	0.000	-0.255	-7.862	0.000	-0.062	-1.625	0.105	-0.198	-5.994	0.000
2001	-0.216	-6.292	0.000	-0.207	-6.052	0.000	-0.238	-5.387	0.000	-0.193	-5.470	0.000
2002	-0.165	-4.974	0.000	-0.149	-4.494	0.000	-0.174	-4.948	0.000	-0.117	-3.600	0.000
2003	0.210	7.327	0.000	0.227	7.818	0.000	0.168	5.464	0.000	0.215	7.257	0.000
2004	0.302	11.254	0.000	0.305	11.360	0.000	0.229	8.515	0.000	0.259	9.642	0.000
2005	0.361	13.338	0.000	0.357	13.267	0.000	0.275	10.328	0.000	0.301	11.612	0.000
2006	0.327	12.833	0.000	0.300	11.816	0.000	0.245	9.661	0.000	0.219	8.831	0.000
2007	0.213	7.679	0.000	0.167	6.088	0.000	0.129	4.658	0.000	0.077	2.810	0.005
2008	-0.693	-20.924	0.000	-0.753	-22.494	0.000	-0.558	-16.840	0.000	-0.647	-19.689	0.000
2009	0.007	0.253	0.800	-0.017	-0.592	0.554	0.058	1.958	0.051	0.014	0.470	0.638
2010	0.242	8.605	0.000	0.223	7.913	0.000	0.175	6.258	0.000	0.151	5.414	0.000
2011	-0.099	-3.602	0.000	-0.102	-3.681	0.000	-0.138	-4.971	0.000	-0.141	-5.114	0.000
2012	-0.224	-7.084	0.000	-0.198	-6.309	0.000	-0.237	-7.793	0.000	-0.231	-7.588	0.000
2013	-0.268	-7.305	0.000	-0.217	-6.130	0.000	-0.269	-7.805	0.000	-0.243	-7.220	0.000
2014	-0.208	-5.356	0.000	-0.168	-4.411	0.000	-0.254	-6.760	0.000	-0.237	-6.281	0.000

Panel B of Table 7: *Wilcoxon sign-ranked test on the median mispricing estimates*

Fiscal Year	MP1(FM)			MP1(HP)			MP2(FM)			MP2(HP)		
	median	w	p-value	median	w	p-value	median	w	p-value	median	w	p-value
1996	0.246	37668.0	0.000	0.206	32668.0	0.000	0.223	35091.0	0.000	0.174	30236.0	0.000
1997	0.187	25295.5	0.000	0.151	19879.5	0.000	0.148	19235.0	0.000	0.133	18437.0	0.000
1998	-0.143	-28686.5	0.000	-0.197	-35629.5	0.000	-0.087	-15767.5	0.002	-0.130	-24391.5	0.000
1999	-0.057	-14083.0	0.017	-0.087	-16936.0	0.004	0.052	15481.5	0.009	-0.006	7637.5	0.198
2000	-0.244	-43142.5	0.000	-0.278	-47033.5	0.000	-0.095	-12339.5	0.042	-0.224	-34740.5	0.000
2001	-0.147	-29848.5	0.000	-0.132	-28677.5	0.000	-0.117	-21816.5	0.000	-0.110	-25395.5	0.000
2002	-0.080	-20792.0	0.000	-0.077	-18858.0	0.000	-0.082	-19349.5	0.000	-0.065	-15355.5	0.004
2003	0.197	41329.5	0.000	0.206	43298.5	0.000	0.198	37078.0	0.000	0.226	40983.0	0.000
2004	0.306	62683.0	0.000	0.291	62897.0	0.000	0.256	53033.5	0.000	0.279	56232.5	0.000
2005	0.385	82307.5	0.000	0.362	81688.5	0.000	0.305	71444.0	0.000	0.310	74624.0	0.000
2006	0.271	84703.5	0.000	0.243	77541.5	0.000	0.242	70068.5	0.000	0.205	61330.5	0.000
2007	0.194	60686.5	0.000	0.149	47859.5	0.000	0.130	39898.0	0.000	0.091	24468.0	0.002
2008	-0.632	-124096.0	0.000	-0.715	-130657.0	0.000	-0.540	-104797.0	0.000	-0.654	-118012.0	0.000
2009	0.028	5394.0	0.405	0.021	-556.0	0.932	0.082	14039.0	0.030	0.030	4926.0	0.448
2010	0.265	61722.0	0.000	0.241	56425.0	0.000	0.199	45933.5	0.000	0.191	40956.5	0.000
2011	-0.092	-24505.0	0.000	-0.103	-26394.0	0.000	-0.123	-32867.5	0.000	-0.139	-35282.5	0.000
2012	-0.180	-41813.5	0.000	-0.180	-37429.5	0.000	-0.218	-46873.0	0.000	-0.208	-44525.0	0.000
2013	-0.168	-36413.0	0.000	-0.128	-29315.0	0.000	-0.258	-42123.5	0.000	-0.250	-39520.5	0.000
2014	-0.223	-21518.5	0.000	-0.179	-17471.5	0.000	-0.288	-27925.5	0.000	-0.266	-25776.5	0.000

Panel C of Table 7: *Summary of the market pricing conditions 1996-2014*

We infer market over-/ under- valuation for an average (median) firm in a fiscal year if all four of the respective means (medians) are positive/negative and significant at the 0.05 level from the t-tests (Wilcoxon sign-ranked tests).

Test	Number of Fiscal Years		
	Undervalued	Correctly Valued	Overvalued
T-test	8	3	8
Wilcoxon sign-ranked test	9	2	8

Table 8. T-Test and Wilcoxon Sign-Ranked Test at the Industry-Level

This table reports t-test and Wilcoxon sign-ranked test results per fiscal year at the industry-level. Instead of presenting the detailed test statistics, we just summarize our inferences for the number of fiscal years that an average and a typical firm of one industry is under-, over, or correctly valued (see descriptors to Panel C of Table 7 for greater details on the determination method).

Industry Sector	Number of Fiscal Years (t-test)			Number of Fiscal Years (Wilcoxon sign-ranked test)		
	Underpriced	Correctly Priced	Overpriced	Underpriced	Correctly Priced	Overpriced
(1)	7	4	8	8	3	8
(2)	2	11	6	2	11	6
(3)	1	14	4	1	14	4
(4)	4	14	1	3	15	1
(5)	4	12	3	3	13	3
(6)	1	14	3	1	13	3
(7)	1	16	2	1	14	4

Table 9. T-Test and Wilcoxon Sign-Ranked Test between the Two Regression Methods

This table reports the number of fiscal years that the mean (T-test) or median (Wilcoxon sign-ranked test) is the same at the 0.05 level. We test the robustness per fiscal year at the industry-level between the two regression methods, namely Fama-MacBeth approach and HP three-step process, that we apply to the RKRV model (MP1) and HP model (MP2) to obtain the mispricing estimates.

Industry Sector	Number of Fiscal Years (t-test)		Number of Fiscal Years (Wilcoxon sign-ranked test)	
	MP1	MP2	MP1	MP2
(1)	3	5	4	4
(2)	5	9	3	5
(3)	11	13	10	14
(4)	9	8	9	7
(5)	7	13	8	16
(6)	12	12	8	9
(7)	10	14	9	13

Table 10. OLS Regression Models with Contemporaneous Independent Variables

This table reports summary OLS regression results for the various underpricing estimates in Panel A and for the various overpricing estimates in Panel B when the independent variables are contemporaneous. The t-statistics reported in the parentheses are based on standard errors clustered by both year and firm (Petersen, 2009).

Panel A of Table 10: *Dependent variable is the estimated underpricings*

	Dependent Variable							
	MP1(FM) Underpricings		MP1(HP) Underpricings		MP2(FM) Underpricings		MP2(HP) Underpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.3019**(-2.31)	-0.2734**(-2.52)	-0.3066**(-2.31)	-0.2761**(-2.51)	-0.2640***(-2.98)	-0.2416***(-3.35)	-0.2461***(-3.02)	-0.2300***(-3.35)
$Zerortnpct$	-1.3108***(-3.61)	-1.4326***(-3.89)	-1.2467***(-3.67)	-1.3695***(-3.96)	-1.0677***(-3.06)	-1.1754***(-3.45)	-1.0918***(-3.44)	-1.1899***(-3.75)
$ILLIQ$	-0.0528***(-5.30)	-0.0524***(-5.46)	-0.0526***(-5.42)	-0.0522***(-5.64)	-0.0343**(-1.97)	-0.0341**(-2.00)	-0.0261*(-1.88)	-0.0262*(-1.91)
β	-0.0876***(-4.38)	-0.0941***(-4.71)	-0.0807***(-3.49)	-0.0853***(-3.64)	-0.1141***(-4.38)	-0.1272***(-4.74)	-0.0895***(-3.81)	-0.0983***(-4.27)
$DVDYLD$	1.8559***(4.71)	1.7180***(4.46)	1.8616***(4.99)	1.7290***(4.71)	1.2224***(2.68)	1.0824**(2.49)	1.1010**(2.47)	0.9975**(2.24)
Rf	0.0217(1.23)		0.0196(1.19)		0.0143(0.83)		0.0228(1.46)	
GDP	-0.0173(-1.21)		-0.0159(-1.13)		-0.0057(-0.39)		-0.0098(-0.86)	
$Unemp$	0.0602**(2.09)		0.0469*(1.72)		0.0348(1.29)		0.0490**(2.12)	
Inf	0.0481(1.51)		0.0435(1.53)		-0.0028(-0.07)		0.0162(0.60)	
CLI	0.0931***(7.86)		0.1092***(10.15)		0.0715***(6.21)		0.0810***(8.73)	
CCI		0.0810***(3.24)		0.0822***(3.86)		0.0431(1.31)		0.0698***(3.48)
EPU		0.0002(0.68)		0.0001(0.31)		0.0001(0.26)		0.0001(0.34)
SLO_{ALL}		-0.0029***(-3.42)		-0.0035***(-4.58)		-0.0029***(-2.95)		-0.0026***(-3.72)
BOS_{FSG}		0.0006(0.24)		0.0008(0.39)		0.0020(0.70)		0.0013(0.60)
BOS_{IME}		0.0004(0.18)		0.0001(0.04)		0.0003(0.15)		0.0002(0.11)
N	5580	4926	5666	4982	5528	4898	5621	4963
Adj R-sq	0.137	0.145	0.141	0.150	0.093	0.103	0.105	0.111

Panel B of Table 10: *Dependent variable is the estimated overpricings*

	Dependent Variable							
	MP1(FM) Overpricings		MP1(HP) Overpricings		MP2(FM) Overpricings		MP2(HP) Overpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	0.1692(1.08)	0.1394(0.88)	0.1756(1.05)	0.1342(0.81)	0.7215**(2.42)	0.6297**(2.22)	0.4437*(1.65)	0.4098(1.53)
$Zerortnpct$	-0.6947***(-4.69)	-0.7224***(-4.95)	-0.6241***(-4.12)	-0.6226***(-4.22)	-0.8074***(-4.16)	-0.8173***(-4.14)	-0.8057***(-4.33)	-0.8003***(-4.16)
$ILLIQ$	0.0007(0.06)	0.0014(0.12)	-0.0036(-0.32)	-0.0020(-0.17)	0.0146(0.81)	0.0138(0.75)	0.0050(0.56)	0.0041(0.46)
β	0.0214(1.18)	0.0123(0.75)	0.0210(1.14)	0.0110(0.65)	0.0207(1.24)	0.0074(0.50)	0.0110(0.67)	-0.0001(-0.01)
$DVDYLD$	-1.1056(-1.31)	-2.4719***(-5.00)	-1.0609(-1.29)	-2.4401***(-4.70)	-1.0890(-1.35)	-2.4586***(-4.87)	-1.0069(-1.25)	-2.3636***(-4.64)
Rf	0.0041(0.44)		0.0009(0.09)		0.0207*(1.86)		0.0161(1.63)	
GDP	0.0048(0.85)		0.0049(0.87)		0.0125*(1.71)		0.0068(0.98)	
$Unemp$	-0.0086(-0.56)		-0.0105(-0.69)		0.0020(0.12)		0.0062(0.38)	
Inf	-0.0006(-0.05)		0.0084(0.58)		-0.0216(-1.16)		-0.0071(-0.37)	
CLI	0.0431***(6.27)		0.0464***(7.14)		0.0313***(3.29)		0.0384***(3.82)	
CCI		0.0178(1.02)		0.0169(1.04)		0.0228(0.89)		0.0283(1.59)
EPU		-0.0003(-1.35)		-0.0003(-1.50)		-0.0004(-1.46)		-0.0003(-1.32)
SLO_{ALL}		-0.0003(-0.43)		-0.0004(-0.67)		0.0015(1.19)		0.0008(0.83)
BOS_{FSG}		0.0005(1.12)		0.0007(1.50)		0.0010(0.76)		0.0018*(1.88)
BOS_{IME}		0.0019**(2.47)		0.0018**(2.25)		0.0031**(2.07)		0.0017*(1.68)
N	5838	5046	5752	4990	5913	5090	5820	5025
Adj R-sq	0.019	0.028	0.018	0.025	0.029	0.038	0.022	0.032

Table 11. OLS Regression Models with Lagged Independent Variables

This table reports summary OLS regression results for the various underpricing estimates in Panel A and for the various overpricing estimates in Panel B when the independent variables are lagged one year. The t-statistics reported in the parentheses are based on standard errors clustered by both year and firm (Petersen, 2009).

Panel A of Table 11: *Dependent variable is the estimated underpricings*

	Dependent Variable							
	MP1(FM) Underpricings		MP1(HP) Underpricings		MP2(FM) Underpricings		MP2(HP) Underpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.3101**(-2.50)	-0.2883***(-2.81)	-0.3252**(-2.50)	-0.3012***(-2.82)	-0.2393***(-4.00)	-0.2259***(-4.88)	-0.2296***(-3.56)	-0.2167***(-4.25)
$Zerortnpct$	-0.9294***(-2.59)	-1.1112***(-3.21)	-0.8818***(-2.58)	-1.0661***(-3.24)	-0.5520(-1.45)	-0.6510*(-1.71)	-0.5983*(-1.79)	-0.7266**(-2.22)
$ILLIQ$	-0.0408***(-2.61)	-0.0423***(-2.76)	-0.0398**(-2.53)	-0.0414***(-2.66)	-0.0213(-1.22)	-0.0221(-1.28)	-0.0179(-1.23)	-0.0201(-1.38)
β	-0.0929***(-4.75)	-0.0973***(-4.39)	-0.0898***(-4.17)	-0.0937***(-3.71)	-0.1009***(-4.43)	-0.1098***(-4.60)	-0.0791***(-4.41)	-0.0826***(-4.01)
$DVDYLD$	1.6551***(4.41)	1.3334***(3.88)	1.5909***(4.38)	1.2659***(3.85)	1.1778***(3.29)	0.9390**(2.41)	1.0331***(2.65)	0.7965*(1.92)
Rf	-0.0055(-0.26)		-0.0123(-0.53)		-0.0114(-0.58)		-0.0032(-0.17)	
GDP	-0.0239(-1.31)		-0.0182(-0.94)		-0.0140(-0.97)		-0.0177(-1.14)	
$Unemp$	0.1120***(2.76)		0.1054**(2.36)		0.0869**(2.56)		0.1017***(2.79)	
Inf	0.0668**(2.20)		0.0569*(1.85)		0.0473*(1.71)		0.0556**(1.98)	
CLI	-0.0234(-0.98)		-0.0236(-0.94)		-0.0254(-1.12)		-0.0329(-1.59)	
CCI		-0.1220(-1.38)		-0.1421(-1.50)		-0.1005(-1.44)		-0.1302(-1.63)
EPU		-0.0014(-1.32)		-0.0016(-1.47)		-0.0009(-1.04)		-0.0015(-1.62)
SLO_{ALL}		-0.0027(-0.92)		-0.0035(-1.14)		-0.0027(-1.24)		-0.0035(-1.34)
BOS_{FSG}		0.0041(1.05)		0.0046(1.21)		0.0027(0.78)		0.0022(0.69)
BOS_{IME}		-0.0020(-0.61)		-0.0031(-0.93)		-0.0024(-0.81)		-0.0033(-1.17)
N	4792	4122	4852	4164	4742	4137	4804	4161
Adj R-sq	0.081	0.083	0.080	0.085	0.050	0.049	0.051	0.050

Panel B of Table 11: *Dependent variable is the estimated overpricings*

	Dependent Variable							
	MP1(FM) Overpricings		MP1(HP) Overpricings		MP2(FM) Overpricings		MP2(HP) Overpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	0.2142(1.34)	0.1194(1.03)	0.2491(1.48)	0.1513(1.18)	0.7704**(2.07)	0.4776**(2.27)	0.4687(1.54)	0.2288(1.37)
$Zerortnpct$	-0.3036*(-1.94)	-0.2802*(-1.84)	-0.2583(-1.63)	-0.2147(-1.38)	-0.4324***(-2.59)	-0.3769**(-2.34)	-0.4736***(-2.76)	-0.4174**(-2.55)
$ILLIQ$	0.0225(0.98)	0.0204(0.97)	0.0194(0.88)	0.0158(0.81)	0.0451*(1.91)	0.0453**(2.38)	0.0396**(2.02)	0.0360***(2.63)
β	0.0060(0.41)	0.0058(0.37)	0.0053(0.35)	0.0052(0.32)	-0.0069(-0.51)	-0.0142(-1.13)	-0.0102(-0.76)	-0.0132(-0.93)
$DVDYLD$	-0.9515(-1.56)	-1.7794***(-3.88)	-0.9255(-1.54)	-1.7568***(-3.59)	-1.0459(-1.50)	-2.1229***(-4.44)	-1.0551(-1.55)	-2.0811***(-4.36)
Rf	0.0033(0.43)		0.0019(0.23)		0.0149(1.33)		0.0143(1.38)	
GDP	-0.0077(-1.26)		-0.0083(-1.22)		0.0106(1.13)		-0.0001(-0.01)	
$Unemp$	-0.0206(-1.39)		-0.0235(-1.48)		0.0090(0.61)		0.0105(0.66)	
Inf	-0.0241**(-2.54)		-0.0214**(-2.00)		-0.0615***(-3.28)		-0.0386*(-1.94)	
CLI	0.0075(1.24)		0.0095(1.32)		-0.0238**(-2.53)		-0.0191(-1.63)	
CCI		-0.0336**(-2.23)		-0.0283*(-1.67)		-0.0215(-1.14)		-0.0188(-0.91)
EPU		-0.0004***(-2.60)		-0.0003**(-1.96)		-0.0003(-1.21)		-0.0002(-1.18)
SLO_{ALL}		-0.0009**(-2.11)		-0.0007(-1.29)		-0.0001(-0.12)		-0.0004(-0.58)
BOS_{FSG}		0.0020**(2.15)		0.0024***(2.87)		0.0015*(1.72)		0.0016***(2.62)
BOS_{IME}		-0.0019**(-2.03)		-0.0019**(-1.97)		-0.0011(-0.98)		-0.0019**(-2.11)
N	4985	4335	4925	4293	5049	4328	4987	4304
Adj R-sq	0.009	0.013	0.008	0.013	0.024	0.022	0.015	0.019

Table 12. Fixed Effects Regression Models with Contemporaneous Independent Variables

This table reports summary fixed-effects panel regression results for the various underpricing estimates in Panel A and for the various overpricing estimates in Panel B when the independent variables are contemporaneous. The t-statistics reported in the parentheses are based on standard errors clustered by both year and firm (Petersen, 2009).

Panel A of Table 12: *Dependent variable is the estimated underpricings*

	Dependent Variable							
	MP1(FM) Underpricings		MP1(HP) Underpricings		MP2(FM) Underpricings		MP2(HP) Underpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.0859***(-2.92)	-0.0758**(-2.56)	-0.0866***(-2.98)	-0.0765***(-2.62)	-0.0504(-1.56)	-0.0386(-1.20)	-0.0718**(-2.56)	-0.0638**(-2.25)
$Zerortnpct$	-1.2796***(-9.98)	-1.4154***(-10.19)	-1.1799***(-9.35)	-1.2975***(-9.48)	-1.2760***(-8.86)	-1.5237***(-9.92)	-1.2581***(-9.87)	-1.4344***(-10.39)
$ILLIQ$	-0.0281***(-4.27)	-0.0279***(-4.21)	-0.0275***(-4.24)	-0.0280***(-4.30)	-0.0043(-0.48)	-0.0033(-0.37)	0.0003(0.03)	0.0003(0.04)
β	-0.0232*(-1.72)	-0.0321**(-2.21)	-0.0317**(-2.41)	-0.0381***(-2.68)	-0.0657***(-4.41)	-0.0753***(-4.74)	-0.0430***(-3.31)	-0.0506***(-3.61)
$DVDYLD$	0.4229(1.08)	0.1760(0.42)	0.4346(1.13)	0.1921(0.48)	-0.3068(-0.71)	-0.7019(-1.58)	-0.4755(-1.26)	-0.7548*(-1.94)
Rf	0.0183(0.77)		0.0173(0.74)		0.0274(1.04)		0.0059(0.26)	
GDP	-0.0096(-0.50)		-0.0098(-0.52)		-0.0127(-0.59)		0.0041(0.22)	
$Unemp$	0.1579***(5.45)		0.1407***(5.02)		0.1228***(3.82)		0.1436***(5.07)	
Inf	0.1013***(2.89)		0.1004***(2.98)		0.0333(0.86)		0.0319(0.95)	
CLI	0.0794***(3.87)		0.0991***(4.93)		0.0560**(2.44)		0.0606***(2.96)	
CCI		0.1044***(3.93)		0.1076***(4.16)		0.0648**(2.27)		0.0903***(3.53)
EPU		-0.0006*(-1.94)		-0.0008***(-2.63)		-0.0008**(-2.41)		-0.0006**(-1.99)
SLO_{ALL}		-0.0023*(-1.76)		-0.0032**(-2.46)		-0.0020(-1.41)		-0.0023*(-1.83)
BOS_{FSG}		0.0015(1.02)		0.0011(0.82)		0.0035**(2.34)		0.0024*(1.84)
BOS_{IME}		0.0039**(2.21)		0.0062**(2.39)		0.0066**(2.28)		0.0047*(1.82)
N	5580	4926	5666	4982	5528	4898	5621	4963
Adj R-sq	0.492	0.507	0.491	0.508	0.463	0.492	0.483	0.502

Panel B of Table 12: *Dependent variable is the estimated overpricings*

	Dependent Variable							
	MP1(FM) Overpricings		MP1(HP) Overpricings		MP2(FM) Overpricings		MP2(HP) Overpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.2290(-1.13)	-0.1899(-0.89)	-0.2626(-1.31)	-0.2164(-1.02)	0.4686***(3.35)	0.3613**(2.53)	0.1703(1.22)	0.0972(0.68)
$Zerortnpct$	-1.0867***(-7.87)	-1.2537***(-7.99)	-1.0787***(-7.77)	-1.2084***(-7.67)	-1.3893***(-10.34)	-1.6335***(-10.94)	-1.2741***(-9.74)	-1.4689***(-10.13)
$ILLIQ$	-0.0047(-0.24)	-0.0185(-0.92)	-0.0121(-0.61)	-0.0138(-0.69)	0.0320***(3.11)	0.0265**(2.56)	0.0430***(2.69)	0.0337**(2.03)
β	-0.0540***(-4.53)	-0.0627***(-4.79)	-0.0509***(-4.24)	-0.0602***(-4.56)	-0.0346***(-2.82)	-0.0445***(-3.37)	-0.0379***(-3.14)	-0.0469***(-3.58)
$DVDYLD$	-0.0428(-0.20)	-0.8669*(-1.76)	-0.0536(-0.25)	-1.1680**(-2.32)	-0.1807(-0.84)	-1.0811**(-2.51)	-0.1265(-0.61)	-1.1530***(-2.68)
Rf	-0.0097(-0.46)		-0.0186(-0.87)		0.0209(0.95)		0.0287(1.34)	
GDP	0.0287(1.63)		0.0337*(1.90)		0.0068(0.38)		-0.0000(-0.00)	
$Unemp$	0.1450***(5.71)		0.1399***(5.44)		0.1254***(4.90)		0.1295***(5.23)	
Inf	0.0196(0.62)		0.0170(0.53)		0.0368(1.16)		0.0532*(1.71)	
CLI	0.0116(0.57)		0.0177(0.86)		0.0174(0.85)		0.0212(1.07)	
CCI		0.0093(0.39)		-0.0001(-0.00)		0.0143(0.59)		0.0296(1.26)
EPU		-0.0001(-0.41)		-0.0001(-0.41)		-0.0002(-0.77)		0.0000(0.05)
SLO_{ALL}		-0.0036***(-2.74)		-0.0043***(-3.20)		-0.0030**(-2.32)		-0.0030**(-2.33)
BOS_{FSG}		0.0012(0.90)		0.0013(0.95)		0.0011(0.84)		0.0011(0.85)
BOS_{IME}		-0.0058**(-2.16)		-0.0070**(-2.55)		-0.0058**(-2.22)		-0.0065**(-2.55)
N	5838	5046	5752	4990	5913	5090	5820	5025
Adj R-sq	0.357	0.365	0.364	0.372	0.399	0.421	0.385	0.407

Table 13. Fixed Effects Regression Models with Lagged Independent Variables

This table reports summary fixed-effects panel regression results for the various underpricing estimates in Panel A and for the various overpricing estimates in Panel B when the independent variables are lagged one year. The t-statistics reported in the parentheses are based on standard errors clustered by both year and firm (Petersen, 2009).

Panel A of Table 13: *Dependent variable is the estimated underpricings*

	Dependent Variable							
	MP1(FM) Underpricings		MP1(HP) Underpricings		MP2(FM) Underpricings		MP2(HP) Underpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.0827***(-2.60)	-0.0853***(-2.64)	-0.0933***(-2.98)	-0.0957***(-3.01)	-0.0411(-1.23)	-0.0449(-1.34)	-0.0477(-1.56)	-0.0527*(-1.70)
$Zerortnpct$	-0.0218(-0.15)	-0.1681(-1.06)	0.0859(0.61)	-0.0305(-0.20)	0.2420(1.55)	0.1966(1.16)	0.0869(0.62)	0.0587(0.38)
$ILLIQ$	-0.0037(-0.40)	-0.0058(-0.60)	-0.0001(-0.02)	-0.0028(-0.30)	0.0044(0.42)	0.0015(0.15)	0.0121(1.30)	0.0075(0.79)
β	0.0616***(4.24)	0.0498***(3.10)	0.0518***(3.66)	0.0452***(2.88)	0.0378**(2.41)	0.0178(1.04)	0.0485***(3.44)	0.0406***(2.64)
$DVDYLD$	-0.0465(-0.14)	-0.2512(-0.70)	-0.0175(-0.05)	-0.1939(-0.57)	-0.3912(-1.11)	-0.5839(-1.63)	-0.5073(-1.58)	-0.6286*(-1.90)
Rf	0.0970***(8.14)		0.0811***(7.01)		0.0085(0.75)		0.0046(0.45)	
GDP	-0.1111***(-10.26)		-0.1018***(-9.69)		-0.0588***(-5.63)		-0.0500***(-5.27)	
$Unemp$	0.0250(1.30)		0.0100(0.53)		0.1722***(9.41)		0.1757***(10.52)	
Inf	0.1405***(6.72)		0.1265***(6.11)		0.0911***(4.37)		0.0685***(3.54)	
CLI	0.0087(0.87)		0.0136(1.41)		-0.0827***(-8.57)		-0.0876***(-10.06)	
CCI		0.1530***(4.68)		0.1613***(5.04)		0.1050***(3.12)		0.1239***(3.94)
EPU		0.0024***(5.99)		0.0026***(6.43)		0.0022***(5.20)		0.0021***(5.28)
SLO_{ALL}		0.0083***(6.91)		0.0085***(7.16)		0.0071***(5.74)		0.0072***(6.19)
BOS_{FSG}		0.0101***(6.67)		0.0099***(6.80)		0.0094***(5.97)		0.0074***(5.15)
BOS_{IME}		-0.0003(-0.25)		-0.0001(-0.12)		-0.0010(-0.77)		-0.0008(-0.69)
N	4792	4122	4852	4164	4742	4137	4804	4161
Adj R-sq	0.516	0.525	0.518	0.527	0.507	0.525	0.512	0.525

Panel B of Table 13: *Dependent variable is the estimated overpricings*

	Dependent Variable							
	MP1(FM) Overpricings		MP1(HP) Overpricings		MP2(FM) Overpricings		MP2(HP) Overpricings	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$BAspread$	-0.1208(-0.80)	-0.1719(-1.11)	-0.1101(-0.73)	-0.1657(-1.09)	0.5558***(3.88)	0.3469**(2.52)	0.3510**(2.54)	0.1894(1.39)
$Zerortnpct$	-0.1585(-1.08)	-0.0323(-0.20)	-0.1174(-0.79)	0.0017(0.01)	-0.0691(-0.48)	-0.0141(-0.09)	-0.1630(-1.17)	-0.0927(-0.61)
$ILLIQ$	0.0397(1.51)	0.0394(1.49)	0.0329(1.22)	0.0302(1.12)	0.0458**(2.15)	0.0443**(2.18)	0.0642***(2.75)	0.0591***(2.59)
β	-0.0617***(-4.51)	-0.0521***(-3.49)	-0.0558***(-4.04)	-0.0429***(-2.86)	-0.0721***(-5.22)	-0.0551***(-3.87)	-0.0604***(-4.45)	-0.0426***(-2.95)
$DVDYLD$	-0.0336(-0.16)	-0.0867(-0.21)	-0.0551(-0.26)	-0.2379(-0.55)	-0.1742(-0.82)	-0.5032(-1.26)	-0.1992(-0.98)	-0.4393(-1.11)
Rf	-0.0300**(-2.56)		-0.0310***(-2.61)		-0.0149(-1.26)		-0.0202*(-1.77)	
GDP	0.0212**(2.18)		0.0208**(2.13)		0.0357***(3.52)		0.0368***(3.78)	
$Unemp$	0.0776***(4.09)		0.0840***(4.39)		0.0920***(4.82)		0.0873***(4.72)	
Inf	-0.0700***(-3.26)		-0.0688***(-3.24)		-0.0925***(-4.11)		-0.1055***(-4.93)	
CLI	-0.0348***(-3.64)		-0.0344***(-3.53)		-0.0491***(-5.14)		-0.0508***(-5.43)	
CCI		-0.1639***(-6.35)		-0.1718***(-6.45)		-0.1606***(-6.93)		-0.1889***(-7.98)
EPU		-0.0016***(-4.78)		-0.0017***(-4.93)		-0.0017***(-5.50)		-0.0021***(-6.99)
SLO_{ALL}		-0.0045***(-5.34)		-0.0048***(-5.56)		-0.0045***(-5.69)		-0.0055***(-6.99)
BOS_{FSG}		0.0046***(3.75)		0.0050***(4.01)		0.0027**(2.32)		0.0023**(1.98)
BOS_{IME}		-0.0030*(-1.84)		-0.0031*(-1.87)		-0.0026*(-1.71)		-0.0033**(-2.18)
N	4985	4335	4925	4293	5049	4328	4987	4304
Adj R-sq	0.355	0.357	0.362	0.367	0.399	0.407	0.395	0.405

Figure 1. Annual Mean and Median Mispricings Plot

MP1 indicates the two mispricing metrics based on RKRV model, using Fama-MacBeth approach, MP1(FM), and HP three-step regression procedure, MP1(HP). Similarly, MP2(FM) and MP2(HP) are the two metrics based on HP model with the two above regression procedures. As MP1 and MP2 have different concepts and measurements, we plot the annual means and medians of the four mispricing metrics using the same x-axis (fiscal year) but two distinct y-axes with different dimensions.