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Canadian stock market multiples and their predictive content

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Abstract

A substantial variation in the Canadian *E*/*P* ratio can be explained by a combination of the lagged level of the *E*/*P* along with variability in logical explanatory factors. Moreover *E*/*P* ratios have a predictable component, both in the short-term and longer-term. On the other hand, short-term stock market returns are unpredictable. But, consistent with U.S. evidence, longer-term returns are predictable, especially when one conditions on the dividend yield.

JEL classification: C22; G12
Keywords: Price–Earning ratio; Aggregate return; Predictability

1. Introduction

Is the stock market overvalued, undervalued or correctly priced? While this is a question of central importance to financial market practitioners, and almost everybody has an opinion, the reality is that this is always a very difficult question to answer. This must be so since there is a multitude of studies documenting the poor timing ability of money managers.[1] Allan Greenspan posed a question about "irrational exuberance" in 1996, and yet the market continued to march bravely forward for a few more years. While his misgivings might have been prescient in retrospect, reducing exposure to equities at the time, turned out to be a poor investment decision after the fact.

How are we to determine whether or not the stock market is correctly priced? The most obvious technique is to examine price relative to some ratio or multiple to which it is logically anchored. Such ratios or multiples can then be compared to typical values. The obvious candidates are earnings, dividends, book value and cashflows. Historically most attention is accorded the price to earnings (*P*/*E*) ratio. If such a ratio appears high compared to historical levels one might suspect that aggregate stock prices are too high and will eventually revert back down to where they should be. The problem with this approach is that there can be *valid* intertemporal variation in the *P*/*E* (and other such ratios). In fact, predictability in multiples can be consistent with market efficiency and does not necessarily imply market return

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[1] See, for example, Henriksson and Merton (1981).

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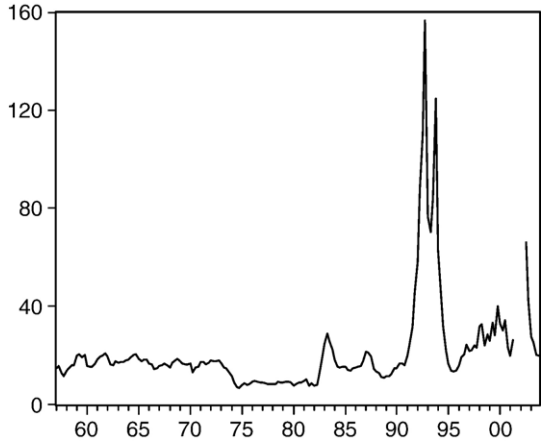

Fig. 1. Canadian quarterly *P*/*E* over time. Note: This is the path shown at quarterly frequency of the *P*/*E* ratio over time.

predictability. Still there is the feeling that sometimes markets are overly optimistic, and such episodes can be signaled by extreme multiples.[2]

The purpose of this article is to investigate theoretical and empirical determinants of Canadian aggregate stock price multiples. The *P*/*E*, its inverse, the earnings to price ratio (*E*/*P*), and dividend yield (*D*/*P*) are plotted in Figs. 1–3 for 1957–2003. For reasons discussed below, we restrict our analysis to the earnings to price (*E*/*P*) ratio. While this issue has been addressed with some care using U.S. data, little such work has been undertaken north of the 49th parallel. Additionally, we investigate whether movements in *E*/*P* are predictable, and whether *E*/*P*s can be used to predict aggregate market returns. Specifically, when an *E*/*P* level is higher or lower than its long-run level, is this because of the state of the economy and the market? Or is it because due to inefficiency, the market is allowing stocks to be mispriced? To broach these related questions we consider what theory says about how stock price levels should be influenced by such anchoring variables as earnings. We find that a substantial variation in the *E*/*P* ratio can be explained by a combination of the lagged level of the *E*/*P* along with variability in logical explanatory factors. Indeed, it is clear that while mean reversion in this ratio does occur, it occurs slowly. This mean reversion seems to be the main reason for the existence of some predictability, over both short-term and longer-term horizons, of changes in the *E*/*P* ratio. Yet in our data, *E*/*P* predictability only partly maps into aggregate return predictability, as we find that some predictability in longer-term (but not short-term) stock market returns exists, when the dividend yield is used as the conditioning variable.

In the next section we review the relevant literature and discuss theoretical considerations. Section 3 presents the empirical findings. We present our conclusion in the last section.

2. Relevant background and literature review

A number of studies have considered whether the market's *P*/*E* level is consistent with fundamentals in effect at the time. In other words, is the current level sustainable or can it be predicted to move in a certain direction? This exercise seemed particularly pressing at the turn of the millennium as many observers were questioning the sustainability of stock market gains not just in Canada, but also in the U.S. and elsewhere.

Researchers have questioned the sustainability of such *P*/*E*s. White (2000) for example examined the sustainability of this ratio for the U.S. as of 2000. Specifically, he took into account a menu of market-wide or macroeconomic variables that logically should matter. These variables included dividend yield, dividend payout ratio, interest rates, earnings growth and GDP growth. He demonstrated that a high percentage of the variability of this ratio could be explained by these factors. Still, once these factors were taken into consideration, he concluded that the market remained overvalued, an inference that subsequent events certainly validated.[3] For Canada, Booth (1999) performed a similar exercise and came to the same conclusion.

[2] See, for example, Shiller (2000).

[3] Of course it is also true that objectively perceived fundamentals changed.

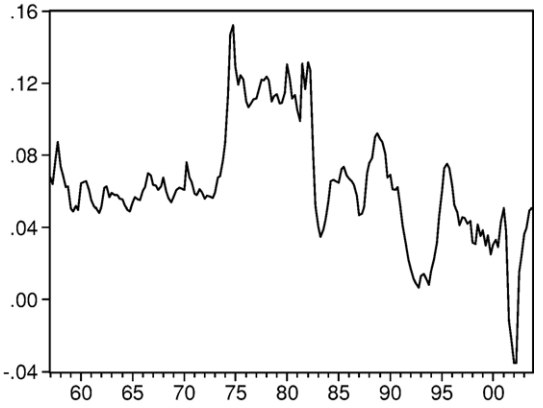

Fig. 2. Canadian quarterly E/P over time. Note: This is the path shown at quarterly frequency of the E/P ratio over time.

Both of these papers base the sustainable P/E on fundamentals. Let us step back and review this issue. Theoretically speaking, what should determine the appropriate level of these ratios? It is helpful to think in terms of the standard constant dividend growth model and to work in terms of P/E:

$$P = D(1+g)/(k-g) \tag{1}$$

where D is the current dividend, g is the dividend growth rate and k is the required return.[4]

This is easily converted to a P/E ratio:

$$P/E = (D/E)(1+g)/(k-g) \tag{2}$$

Note that the P/E ratio here projects future dividends based off trailing dividends. Certain logical determinants can easily be read off this formula. Higher anticipated dividend growth rates should lead to higher P/Es. It is reasonable to think that past earnings growth and GDP growth might be useful indicators of future earnings growth. A higher payout ratio (holding all else constant) leads to higher prices. Higher required returns, of course, should lead to lower aggregate stock prices. In this context, noisy indicators such as the current short and long interest rates, inflation and monetary growth might have explanatory power.[5] All directional impacts, of course, would be reversed for the E/P ratio. Table 1, which is in terms of the E/P ratio, lists these variables and their likely theoretical impacts on E/P.[6]

There are several salient issues. First, are inflation and its cousin, monetary growth, logical determinants of E/P? Historically high inflation has been associated with poor market performance, but some, such as Modigliani and Cohn (1979), have argued that this is due to investor irrationality. In any case, monetary growth may signal future inflation more than does past inflation, but even here the impact is contentious, as it has been shown that, if the monetary authority is credible in an inflation-fighting stance, high monetary growth should lead to higher future interest rates (temporarily in an effort to slow down monetary expansion) and lower future monetary growth — potentially leading to lower interest rates because of lower inflation (e.g., Deaves, Melino, & Pesando, 1987).

Second, it is anticipated future values that should impact the current E/P, not past magnitudes. Still, it is not easy to do much better than to use readily available current values (such as earnings growth rates) to proxy for anticipated future variables. Arguably, such "forecasts" can be improved on — by using public practitioner forecasts when available, or by using both current and lagged values (i.e., as in a distributed lag model) to better approximate true forecasts.

Third, the dependent variable (E/P) is problematic since its numerator (earnings) may not accurately reflect true economic earnings. This may be partly due to the earnings management that has become so apparent of late. In

[4] Under constant growth, the dividend growth rate, the earnings growth rate and the expected capital gain of the stock can easily be shown to be identical.

[5] There are other possible determinants as well. For example, it has been shown that market volatility impacts the equity premium (Kane, Marcus, & Noh, 1996), which in turn will impact required returns.

[6] Of course the impact on P/E would be the reciprocal of the impact on E/P.

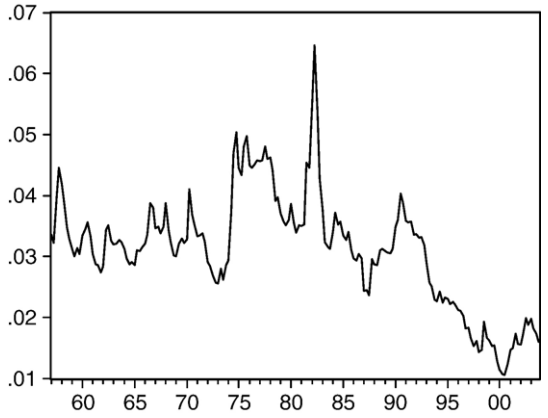

Fig. 3. Canadian quarterly *D*/*P* over time. Note: This is the path shown at quarterly frequency of the *D*/*P* ratio over time.

addition to *E*/*P*, other market multiples need to be interpreted with care. Take the dividend yield (*D*/*P*). While there is less noise with dividends than with earnings, the problem with dividends is that dividends as a percentage of earnings and relative to prices have been in secular decline over the last decade or so, as many companies have begun to substitute share repurchases for dividends as a tax-saving device. This is quite apparent from Fig. 3. While there are ways to ameliorate these problems, there are no clear-cut solutions.[7]

Fourth, certain variables, such as market returns, the dividend yield (*D*/*P*), the payout ratio (*D*/*E*) and earnings growth, are problematic as they embody a tautological element when they are used to explain *E*/*P*. The problem is that E or P appears on both sides of the equation so an impact on *E*/*P* is arguably redundant. For example, rising stock prices in a given period will lead to a low *E*/*P*, a low dividend yield (*D*/*P*), and a high return ((*D*+*P*−*P*(lagged))/*P*(lagged)); and rising earnings in a given period will lead to high *E*/*P*, low earnings growth ((*E*−*E*(lagged)/*E*(lagged)) and a low payout ratio (*D*/*E*).

Fifth, a small open economy such as Canada's is likely to be heavily influenced by international events, especially those that matter south of the border. Focusing on the U.S., such external events are likely to have an impact on the U.S. market *E*/*P*, so we should not be surprised to see U.S. and Canadian *E*/*P*s correlated. This suggests the appropriateness of including U.S. *E*/*P* as an explanatory variable in Canadian *E*/*P* regressions.

The first empirical exercise conducted below is to endeavor to identify an empirical model of the fundamental determinants of Canadian *E*/*P* which best takes into account all these issues. Suppose we arrive at a reasonable model. When we observe that actual *E*/*P* exceeded its corresponding fitted value at some point in time, can we say that it was predictable that *E*/*P* would decline? The second empirical task that we set for ourselves is to investigate this issue.

To illustrate with a heuristic example, suppose that earnings which grow at a steady pace are suddenly expected to grow more rapidly for several periods. In the long run though, there is the expectation that earnings growth will revert back to its long-run level. For simplicity, let us assume that a constant fraction of earnings is paid out in dividends, and that the market discount rate is constant. Logically what should happen in response to the anticipated earnings growth spurt is that aggregate stock prices should increase in response. This price increase leads to the return in that particular period being above normal — plus the *E*/*P* is pushed down. Over time though, *E*/*P* will gradually revert to its long-run level. This implies a predictable change in *E*/*P*. Predictable variation in *E*/*P* is not the same as predictable variation in aggregate returns though. After the initial price reaction (leading to a high return), *expected* returns are unchanged going forward. While anticipated capital gains are higher than normal, these are exactly offset by the lower than normal anticipated dividend yields. So *returns* are not forecastable. And predictability in *P*/*E* does not imply predictability in stock returns (Fig. 4).[8]

And yet there is a literature that has sought to establish that market multiples can be used to predict aggregate stock market returns. Indeed, there seems to be evidence of some predictability in stock prices based on *P*/*E*s. Good (1991), for example, using U.S. data from 1955, notes that whenever *P*/*E*s were extremely high (above 20), stock prices fell

[7] One approach might be to smooth earnings (e.g., by taking a five-year moving average, or by using the trend level of earnings).

[8] See Fig. 4 for a possible graph of *E*/*P* and returns in this "rational" case. The underlying assumptions are a steady sate with 3% dividend growth, a required return of 10% and a payout of 80%. Starting from this steady state the market changes its expectation to 6% in the coming year, followed by 5.5%, 5% and so on until the 3% steady state is reached again. At $t=1$ these new expectations take hold. By $t=7$ the steady state is reached again.

Table 1
Expected relationships

Independent variables	Expected link	Comments
Earnings growth	Direct	Investors in general will pay more for a given *current* level of earnings if higher *future* growth is expected.
Economic growth	Indeterminate	Higher growth in GDP and industrial production should raise earnings, resulting in higher *E*/*P*. The market sometimes is willing to pay a higher *P*/*E* (lower *E*/*P*) for higher expected growth.
Dividend to earnings ratio	Inverse	Earnings appear in the denominator of *D*/*E*, so it should move inversely with *E*/*P* where it appears in the numerator.
T-bill yield	Direct	Higher interest rates mean *discounted* cashflows are reduced, resulting in lower expected stock prices.
Bond yields	Direct	Same as above. Bond yields sometimes viewed as a proxy for *E*/*P*.
Monetary growth	Indeterminate	Ambiguous (see Section 2)
Inflation	Direct	High inflation increases discount rate reducing discounted cashflows. Results in lower stock prices.
Dividend yield	Direct	*D*/*P* moves in same direction as *E*/*P* normally, since *P* appears in denominator in both cases.
Stock returns	Inverse	Higher stock prices equate to higher trailing returns and lower *E*/*P*s.
U.S. *E*/*P*	Direct	Closely related, and should be subject to many of same intangible factors.

over the next four quarters and, whenever *P*/*E*s were extremely low (below 8), stock prices rose over the next four quarters. Bleiberg (1989) sorts historical market *P*/*E*s into quintiles and examines subsequent returns of these quintiles, finding that the lower is the *P*/*E* quintile, the higher is the subsequent market return over the next one or two years.

Fama and French (1988) show that the dividend yield is a useful predictor of multiyear market returns in the U.S. There are, however, some criticisms of this latter work based on certain statistical issues raised by Hodrick (1992) and Goetzmann and Jorion (1993). Campbell and Shiller (1998) consider whether the *D*/*P* ratio predicts prices or dividends. The answer appears to be both: it depends on one's horizon. Over the short-run it predicts dividends: a low *D*/*P* leads to higher future dividends. In the long-run it predicts prices: a low *D*/*P* leads to lower future prices (lower market returns).[9]

Following up on this literature, the third empirical exercise conducted here is to investigate whether aggregate Canadian market returns are predictable using multiples. Specifically, *E*/*P* and *D*/*P* are considered as possible predictors of aggregate returns.

It is natural to consider how potential return predictability tallies with our previous heuristic example (where there was a positive earnings growth surprise). Suppose now markets *overreact* to the positive earnings news. Again prices will rise but now they will rise too high. How can we tell the difference between these two situations? In both cases, after all, an earnings growth spurt logically leads to an increase in stock prices. There is a difference however. Since in the second situation prices have moved too high, eventually the market should realize this and future price increases (during the transition to the steady state) should be lower than in the previous case. This leads to lower future returns, first, because of lower future capital gains, and, second, because of lower dividend yields than in the previous case. Note that, in the second case, where the market has overreacted, we have return predictability.[10]

3. Empirical results

3.1. Data

Data were collected of both Canadian market multiples and those variables with the potential to explain these multiples. While most of the series are at a monthly frequency, the empirical results presented in this paper are at a quarterly frequency.[11] The data go back to 1956 (continuing to the end of 2003) when reasonably reliable Canadian aggregate stock prices first became available.

[9] Aside from academic interest, potential predictability of course can be quite useful in tactical asset allocation. MacBeth and Emanuel (1993) however find little evidence of this.

[10] Once again refer to Fig. 4 for a graph of *E*/*P* and returns in this "irrational" case. The difference compared to the base case is a capital gain in response to the changing expectations which is twice as high as it should be. The price is assumed to eventually converge (using linear interpolation) to the correct level by $t=7$.

[11] We also conduct regressions using the monthly time series. The results (not reported) are not materially different from those obtained by using the quarterly time series. The *t*-statistics of the significant coefficients are in general larger than those of their counterparts obtained from the quarterly regressions. In the monthly regression model, we need to include four lags of *E*/*P* and the explanatory variables before we can remove the autocorrelation in the residuals, as suggested by both the Ljung–Box and Breusch–Godfrey LM test statistics.

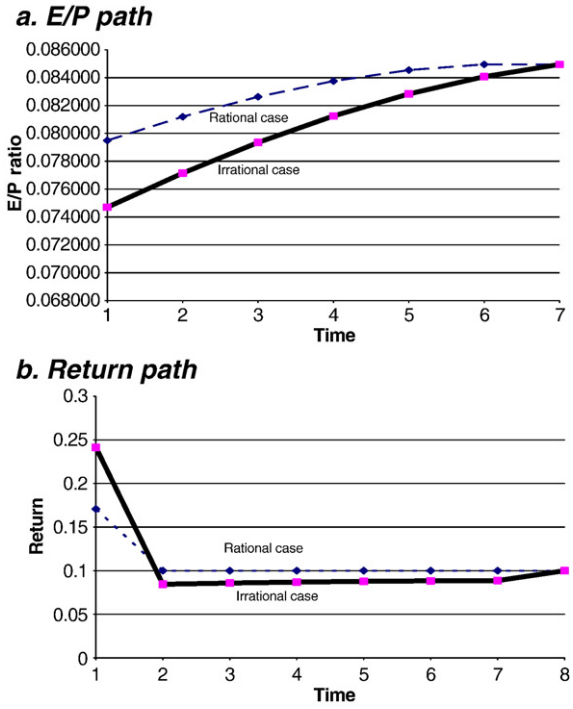

Fig. 4. Possible *E*/*P* and return paths after an anticipated earnings growth increase.

Again refer to Figs. 1 and 2 where Canadian quarterly *P*/*E* and *E*/*P* during 1957–2003 are shown. The same sort of *P*/*E* run-up (or *E*/*P* decline) which occurred in the U.S. (and elsewhere) as the end of the millennium approached is also apparent in Canada. The Canadian *P*/*E* plot does, however, reveal a couple of anomalous episodes and these relate to the relative narrowness of the Canadian market. These are the extremely high *P*/*E* levels in the early 1990s and the discontinuity beginning in 2001. Note that the earnings variable itself, from which derivative variables must be calculated, is a 12-month trailing value. It is generated by taking the *P*/*E* (where the *E* is a 12-month trailing number) and multiplying by the level of the *S&P/TSX Composite Index.* Unfortunately an extremely high loss for *Nortel*, the Canadian company that dominated Canada's market capitalization by the beginning of this century, occurring in August 2001, led to the aggregate market earnings figure going negative in August of 2001 and remaining there until July 2002. Additionally, in the recession of the early 1990s, aggregate earnings went very low (relative to price), in large part causing *P*/*E*s to become extremely high. *E*/*P* is not similarly affected by very low or even negative aggregate earnings, so for this reason it was deemed preferable to utilize *E*/*P*s rather than *P*/*E*s in all estimations. Fig. 2, in fact, shows that *E*/*P* is not nearly so unmanageable a variable.

Because earnings are noisy, those series derived from earnings are also to be interpreted with care. The series in question are the payout ratio and earnings growth. Note that an adjustment in the formula for earnings growth during the episode of negative earnings was necessary to avoid the impact of falling negative earnings appearing as earnings growth.[12] Since we have less faith in the validity of earnings growth numbers after 2000, we always perform two sets of regressions. In addition to regressions for the full sample, we also run regressions ending at the close of 2000.

As for other variables used in this study, as stated above, they are listed in Table 1 along with likely directional impacts on *E*/*P*.[13] Each series was reviewed for normality, stationarity, and potential multicollinearity. As a result of

[12] For example, in October 2001 earnings fell to −135.60 from −80.82 in September. Calculating growth the conventional way, [(−135.60−(−80.82))/−80.82] would lead to a (meaningless) 67.8% earnings gain. To account for this, we use the absolute value of earnings in the denominator.
[13] These data come from Statistics Canada's *CANSIM* database. Full details are available from the authors on request.

the latter, T-bills were eliminated from the regressions, as they were highly correlated with bond yields.[14] All series were reasonably close to normality in their distributions.[15] As for stationarity, the formal method is to perform unit root tests using augmented Dickey–Fuller and Phillips–Perron tests.[16] While for *E*/*P*, U.S. *E*/*P*, *D*/*P* and the long-term bond yield, we could not reject the null at the 5% level, suggesting the possibility of a unit root (that is, a non-stationary process), we are not reporting regressions with differenced variables. First, all of the estimated AR(1) coefficients were less than one and, second, on intuitive grounds, it seemed likely that all these variables had to be anchored to some long-run value.[17] Moreover, results were largely the same, though the differenced models, as expected, had lower adjusted R^2s.

3.2. E/P determinants

In Table 2 we explore the determinants of *E*/*P*. Regressions are reported for both a full slate of fundamental domestic regressors (dividend yield, dividend payout, earnings growth, economic growth, inflation, monetary growth, bond yield, and market return), and an extended empirical model that includes U.S. *E*/*P*. As stated above, regressions are presented for both the full sample and for one ending at the close of 2000 (the point after which Canadian aggregate earnings go negative). Because of the fact that there was strong evidence in favor of serial correlation, the regressions displayed include lags of *E*/*P* and the explanatory variables.[18] Specifically, it was necessary to incorporate two lags in order to reduce the serial correlation of the error term to manageable levels.[19] Note that the presence of these lagged terms suggests a slow mean reversion of *E*/*P* back to long-run levels.

For the purely domestic model (Eq. (1)), the coefficient signs were mostly as anticipated (again see Table 1). Except for the dividend payout ratio in the full sample regression, whenever we can conclude significance of a coefficient, the signs are in the expected direction. Earnings growth, the payout ratio and the dividend yield are all significant.[20] Bond yield always had the correct sign, but was never significant. Notice the clear importance of the first AR terms of *E*/*P*, and that the sum of the two AR coefficients is safely below one (consistent with stationarity).

Eq. (2) incorporates U.S. *E*/*P* as an additional regressor (again we include its two lags). This explanatory variable is highly significant for the sample stopping in 2000, suggesting that external forces (channeled through U.S. *E*/*P*) impact Canadian markets.

Recall that one potential criticism that can be levied is that some variables will have an impact on *E*/*P* that is essentially tautological. Eq. (3) accounts for this by dropping *D*/*P* and *D*/*E* and the contemporaneous terms of two other variables (earnings growth and market return) that include *E* or *P* through differencing. Notice that the overall explanatory power is only slightly reduced. Additionally, U.S. *E*/*P* (judging from the much higher *t*-statistics) now picks up some of what the variables have lost in explanatory power.

Explanatory power as measured by adjusted R^2 was very strong in every model. In most cases, the first-order autoregressive term of *E*/*P* had the highest computed *t*-value. *E*/*P* in Canada (and the U.S.) has a strong AR(1) component, as earnings yield is heavily influenced by its own past values.

[14] Since T-bills had a higher correlation with inflation than did bonds, it made sense to keep inflation and bonds.

[15] This was apparent by viewing histograms and skewness test-statistics.

[16] An informal way to evaluate stationarity is to simply look at the scatter plot of each series and determine whether its mean and variance look fairly constant over time. If it does not show a long-term trend up or down, and does not show increasing variance, there is a good chance it is stationary.

[17] These series appear to regress to the mean very slowly, sustaining trends for up to two decades. And this is likely why the tests show a possibility of unit roots. As none of the series show a full-term trend up or down, or increasing variance, we believe that there is not a non-stationarity problem here.

[18] Without any autoregressive terms, we obtained Durbin–Watson d statistics of around 0.34 — plus there was strong correlogram evidence of first-order serial correlation in the residuals.

[19] To deem serial correlation manageable, we generally look for both Ljung–Box and B–G LM levels to be greater than 0.05 (along with something very close to a white noise profile in the correlogram). We also consider a potentially more parsimonious specification, in which rather than including lagged independent variables we model the error term with an AR process. It can be interpreted as imposing a common factor restriction (for example see Hendry & Mizon, 1978) in the more general regression model incorporating the lags of the dependent and explanatory variables. This restricted version of the model is however rejected by a log likelihood ratio test.

[20] Note that dividend payout has the incorrect sign and is significant for the full sample, but has the correct sign and is significant when we stop the sample at the end of 2000. This seems logical since stopping the sample at the end of 2000 excludes the episode of negative earnings and dividend payout.

Table 2
Regression results for *E*/*P* fundamental determinants

Regression no.	(1)		(1a)		(2)		(2a)		(3)		(3a)	
Sample period	1957:3–2003:4		1957:3–2000:4		1957:3–2003:4		1957:3–2000:4		1957:3–2003:4		1957:3–2000:4	
	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat
Constant	−0.0033	−1.809	−0.0022	−1.236	−0.0012	−0.679	0.0019	1.063	0.0003	0.155	0.0023	1.301
E/*P* lag 1	1.0132	13.487	1.1000	14.386	0.9349	12.612	0.9515	12.470	0.8178	20.823	0.8651	23.880
E/*P* lag 2	−0.0816	−1.058	−0.1494	−1.930	−0.0574	−0.784	−0.0787	−1.094				
Bond yield	0.0599	0.771	0.0553	0.907	0.0077	0.100	0.0112	0.192	0.1458	1.499	0.1979	2.649
Lag 1	0.0219	0.214	0.0576	0.718	−0.0120	−0.123	0.0238	0.322	−0.2153	−2.269	−0.2461	−3.413
Lag 2	−0.0917	−1.211	−0.1188	−1.997	−0.0527	−0.715	−0.0802	−1.440				
D/*P*	2.1893	12.857	2.1991	16.429	2.0104	8.795	1.9355	11.121				
Lag 1	−2.2932	−7.873	−2.7157	−10.982	−2.4155	−6.624	−2.6519	−9.181				
Lag 2	0.2568	1.069	0.6129	2.821	0.4508	1.588	0.7462	3.167				
D/*E*	0.0029	2.399	−0.0032	−2.859	0.0029	2.555	−0.0037	−3.524				
Lag 1	−0.0013	−0.850	0.0053	3.654	−0.0012	−0.856	0.0042	3.197				
Lag 2	−0.0010	−0.856	−0.0015	−1.267	−0.0010	−0.928	−0.0012	−1.082				
Earnings growth	0.0101	10.432	0.0054	4.969	0.0090	9.515	0.0041	3.993				
Lag 1	−0.0058	−4.263	−0.0029	−2.091	−0.0053	−4.075	−0.0023	−1.814	0.0029	2.366	0.0020	1.482
Lag 2	0.0007	0.593	0.0011	1.027	0.0011	0.979	0.0017	1.742	−0.0004	−0.300	0.0015	1.080
Inflation	−0.0324	−0.310	−0.0161	−0.196	−0.1355	−1.338	−0.0793	−1.037	−0.0812	−0.560	0.0249	0.226
Lag 1	0.0790	0.756	0.0708	0.862	0.0232	0.231	0.0603	0.797	0.0320	0.222	0.0673	0.614
Lag 2	0.0832	0.799	0.0558	0.685	0.0039	0.039	0.0012	0.016				
Economic growth	−0.0030	−0.166	−0.0012	−0.088	−0.0004	−0.024	−0.0049	−0.366	−0.0308	−1.432	−0.0505	−3.016
Lag 1	0.0386	1.563	0.0301	1.534	0.0241	1.012	0.0134	0.728	0.0369	1.771	0.0481	2.935
Lag 2	−0.0109	−0.662	−0.0029	−0.219	−0.0159	−1.002	−0.0073	−0.591				
Monetary growth	0.0134	0.701	0.0156	1.050	0.0193	1.068	0.0258	1.885	0.0236	0.916	0.0190	0.972
Lag 1	0.0046	0.176	−0.0035	−0.173	0.0097	0.396	0.0004	0.023	0.0014	0.053	−0.0043	−0.216
Lag 2	−0.0052	−0.273	−0.0043	−0.291	−0.0061	−0.328	−0.0075	−0.534				
Return	0.0158	1.458	0.0092	1.048	0.0101	0.958	0.0046	0.561				
Lag 1	0.0293	2.515	0.0148	1.573	0.0233	2.073	0.0073	0.827	−0.0060	−0.433	−0.0045	−0.423
Lag 2	0.0142	1.320	0.0076	0.871	0.0104	1.020	0.0025	0.307	0.0152	1.167	0.0048	0.472
U.S. *E*/*P*					0.1490	1.633	0.1976	2.776	0.8657	9.896	0.8341	12.192
Lag 1					0.1706	1.219	0.1438	1.353	−0.6524	−6.755	−0.7076	−9.597
Lag 2					−0.1848	−1.895	−0.2315	−3.094				
R^2 (adjusted) %	97.38		98.15		97.63		98.43		95.24		96.87	
Durbin–Watson *d*	2.036		2.038		1.973		1.940		1.763		1.912	
B–G LM test	0.071		0.046		0.299		0.108		0.001		0.002	
Ljung–Box *p*-value	0.319		0.144		0.597		0.322		0.005		0.007	

p-values of Breusch–Godfrey LM test and Ljung–Box test (both using four lags) are presented.

3.3. E/P predictability

With Table 3 (Eqs. (1) and (2)), we begin to explore *E*/*P* predictability. From this point on we just present full sample results.[21] Of course, only information that market participants have at their disposal can be utilized for predictive purposes. Thus in Eq. (1) of Table 3 we lag explanatory variables used in Table 2 (where we include only variables that were significant at the 5% level). We find that lagged dividend payout and market return now become insignificant while lagged dividend yield, earnings growth and U.S. *E*/*P* continue to be statistically significant even when once lagged. To keep the model simple, we replace our previous regression model with only a once-lagged dependent variable.[22] One apparently anomalous result is the (significant) sign reversal on *D*/*P*.[23] With Eq. (2) we cut to the essentials of this slow-moving mean-reverting AR process by

[21] Nevertheless results are robust to dropping 2001–2003.
[22] While there is still evidence of serial correlation, the point here is not to "optimize" our regression model in any sense.
[23] We have no obvious interpretation for this.

Table 3
Regression results for *E*/*P* and market return (MR) predictability (one quarter ahead)

Regression no.	(1)	(2)	(3)	(4)	(5)
Dependent variable	*E*/*P*	*E*/*P*	MR	MR	MR
Constant	.0046 (1.680)	.0031 (1.863)	.0102 (0.792)	−0.1398 (−0.683)	−0.0146 (−0.698)
Lagged *E*/*P*	0.8750 (16.972)	0.9506 (41.483)	0.2443 (1.352)	–	−0.0397 (−0.152)
Lagged *D*/*P*	−0.2846 (−2.027)	–	–	1.2713 (2.024)	1.3718 (1.503)
Lagged *D*/*E*	−0.0002 (−0.116)	–	–	–	–
Lagged earnings growth	0.0024 (1.999)	–	–	–	–
Lagged MR	0.0136 (0.810)	–	–	–	–
Lagged U.S. *E*/*P*	0.1747 (3.198)	–	–	–	–
R^2 (adjusted)	.911	.903	.004	.016	.011

T-statistics are presented in brackets adjacent to coefficient-estimates.

only including a once-lagged dependent variable as an explanatory variable. The explanatory power drops only slightly.

It is interesting to compare short-term and long-term predictability. Table 4 (Eqs. (1) and (2)) repeats the same two estimations but now the prediction is for two years ahead, not just a single quarter ahead. All variables are now rendered statistically insignificant and the adjusted-R^2 is relatively low. In fact, one does much better just trimming the model to one whose only independent variable is an eight-quarter lagged *E*/*P* value. The coefficient on the latter is safely significant. Taking these tables together, we can conclude that changes in *E*/*P* are not entirely random.

3.4. Aggregate return predictability

Now that we have established that there is some predictability in *E*/*P*, we consider whether there is also predictability in aggregate returns. Referring to Table 3 (Eqs. (3) to (5)), we present a regression of single-quarter market returns on lagged *E*/*P* (that is, *E*/*P* at the beginning of the quarter), lagged *D*/*P* and lags of both. In all three cases, the R^2 is quite low, which suggests short-term predictability is quite low. Notably, though, the dividend yield, not the *E*/*P* ratio, has the greater explanatory power.

Previous research using U.S. data suggests some predictability in *longer-term* returns based on multiples. Unfortunately if we want to avoid using overlapping data, given that reliable Canadian stock market history is a short one, it is only reasonable to work with returns whose intervals of calculation are as long as two years. So in Table 4 (Eqs. (3) to (5)), we regress two-year market returns on *E*/*P* and *D*/*P* in effect at the beginning of the two-year return interval. Now the explanatory power increases markedly, as evidenced by much higher R^2s. And once again the dividend yield appears to dominate.

We also investigated returns following very high and very low levels of *E*/*P* (and *D*/*P*), similar to Bleiberg (1989), and Good (1991). Specifically, we ranked years by beginning of year *E*/*P* (or *D*/*P*) and then calculated average

Table 4
Regression results for *E*/*P* and market return (MR) predictability (two years ahead)

Regression no.	(1)	(2)	(3)	(4)	(5)
Dependent variable	*E*/*P*	*E*/*P*	MR	MR	MR
Constant	0.0186 (0.764)	0.0327 (2.368)	.0091 (0.743)	−0.0177 (−0.984)	−0.0178 (−0.971)
Lagged *E*/*P*	0.7903 (1.562)	0.4713 (2.381)	0.1933 (1.104)	–	−0.0568 (−0.268)
Lagged *D*/*P*	−0.2245 (−0.189)	–	–	1.2803 (2.251)	1.4055 (1.883)
Lagged *D*/*E*	0.0192 (0.917)	–	–	–	–
Lagged earnings growth	−0.0042 (−0.440)	–	–	–	–
Lagged MR	0.0314 (0.182)	–	–	–	–
Lagged U.S. *E*/*P*	−0.1528 (−0.345)	–	–	–	–
R^2 (adjusted)	.042	.175	.010	.156	.117

T-statistics are presented in brackets adjacent to coefficient-estimates.

returns for the lowest third, the middle and the highest third groups. For *E*/*P* the results were somewhat as expected, with the lowest to highest thirds generating average returns of 6.5%, 13.3% and 12.3% respectively. Still the difference between the bottom and top third average returns was statistically insignificant. Once again results were stronger for *D*/*P*, with the lowest to highest thirds generating average returns of 5.4%, 9.7% and 17.0% respectively. In this case, the difference in average return between the top third and the bottom third was significant in the neighborhood of 5%.

4. Concluding remarks

A substantial variation in the Canadian *E*/*P* ratio can be explained by a combination of the lagged level of the *E*/*P* along with variability in logical explanatory factors. The most important determinant of the future *E*/*P* is its current level, suggesting slow-moving mean reversion. Because of this, *E*/*P*s can be predicted, especially by taking into consideration past *E*/*P* levels. Nevertheless, *E*/*P* predictability does not imply predictability in aggregate returns. Indeed, short-term returns are essentially unpredictable. But consistent with U.S. evidence, longer term returns do have a predictable component especially using the dividend yield.

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