APPENDIX D

DISCOUNTED CASH FLOW ESTIMATES

The DCF Model

The standard alternative to risk premium models is the discounted cash flow model. This model infers the required rate of return by replicating the actions of an investor in valuing the firm's securities. To do this we need to define the costs and benefits attached to an investment. The cost is simply the price of the security (P_0, price at time zero) and the benefits, the stream of cash inflows expected at time t in the future (C_t). However, since the investor can always invest in alternative investments, future expected cash flows are not of equal value. As a result, future cash flows are "discounted," or reduced in value, to reflect this "opportunity cost." This is the basic idea behind using the discounted cash flow model,

$$P_0 = \sum_{t=1}^{\infty} \frac{C_t}{(1+K)^t}$$

where K is the discount rate or investor's required rate of return.

Once we estimate the stream of future cash inflows, we can equate them to the current price and solve for the investor's required rate of return. For example, this is the standard way of valuing bonds. At the end of every business day investment banks simply take the coupon payments on a government bond, its terminal value and use the last trading value for the bond to solve the above equation for the bond's "yield to maturity." This yield to maturity is published in the newspaper as an objective measure of the investors' required rate of return for a default free security. I use this DCF estimate as part of my risk premium estimates. However, we can take this a stage further and estimate the DCF required return on equity directly using the same procedure.

The expected equity cash flows are the future expected dividends. Unlike the stream of cash

flows on a bond the dividends are not contractual and are more difficult to forecast, particularly for individual stocks. Consequently, the DCF model is only used for low-risk dividend paying stocks or the market as a whole, where the expected dividends can be assumed to grow at some long run average growth rate *g*. In this case, each dividend is expected to grow at the rate *g*, so we can substitute $d_1 = d_0 * (1+g)$ into the valuation equation. Taking this process to infinity and using the value of a geometric series, we can solve to get:

$$P_0 = \frac{d_1}{K - g}$$

This says the stock price is equal to the expected dividend per share, divided by the investor's required rate of return, minus the dividend growth expectation, *g*. The advantage of this formulation of the problem is that we can easily rearrange the equation to obtain,

$$K = \frac{d_1}{P_0} + g$$

This states that the investor's required rate of return can be estimated as the expected dividend yield plus the expected growth rate in dividends. This is the direct analogy with the yield to maturity on a bond. This formulation of the model is often called the Gordon (or dividend discount) model after my late colleague Professor Myron Gordon of the University of Toronto.

However, it is important to note that the expected dividend yield plus growth equation ONLY holds if the constant growth model also holds since it is simply a rearrangement of it. This means that the constant growth rate assumption to *infinity* also holds. Otherwise, the use of the formula for a geometric series does not hold since if g>K the series does not converge. In practice this means that the formula is only useful, as mentioned above, for very low risk companies and the overall market since for other firms short run growth rates from security analysts for example are often in excess of any reasonable equity cost.

Further, it is important that the constant growth rate assumption essentially applies to earnings

book value and sales as well, at least as an approximation. It is then straightforward to show that increased dividends primarily come from increased future earnings, which are generated by the firm retaining some of its current earnings for re-investment. If we set *X* as the earnings per share and denote *b* as the fraction of earnings retained within the firm, then *(1-b)X* is the dividend and *bX,* the retained earnings.[1] Provided the assumptions of the DCF model hold, it is straightforward to show that dividends and earnings will then grow at a long run growth rate estimated as the product of the firm's retention rate *(b)* and its return on common equity *(r)*, which is referred to as its *sustainable growth rate*.[2] Note that while *K* is the return that investor's require, *r* is the actual return on equity (*ROE*) the firm is expected to earn.[3] These are different concepts.

An example may help to make these assumptions clear. Suppose, as in Schedule 1, the firm's book value per share is $20 and its return on equity expected to be 12%. In this case, its earnings per share are expected to be $2.40 and with a 50% dividend payout rate, its dividends per share and retained earnings are both expected to be $1.20. Moreover, since $1.20 has been retained and reinvested within the firm, next period's book value per share increases to $21.20. As a result, the firm is expected to earn $2.544 in the following year, i.e., 14.4 cents more. This additional 14.4 cents comes from earning the 12% return on equity on the $1.20 of retained earnings. The increase in earnings per share, dividend per share and retained earnings is 6% each year and is calculated directly as the product of the firm's return on equity of 12% and its retention rate of 50%. Moreover, the value of the firm's common stock can be calculated from equation (1), which also increases at this 6% rate, since only the dividend per share is expected to change.

The importance of Schedule 1 is in showing some of the implications of the dividend growth model. First, note that if the investor's fair rate of return is 10%, the stock price in Schedule 1 is

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[1] This assumes that the only change in shareholder's equity comes from retentions, that is, everything flows through the income statement.

2 This is consistent with industry practise and the Financial Post's definition in Schedule 3.

[3] There is an additional term (*sv*) if the firm repeatedly sells shares at a premium to its book value, but this term is small and usually dwarfed by estimation problems.

$30, determined as the expected dividend of $1.20 divided by the discount rate minus the growth rate (or 0.04). This price exceeds the book value of $20 by 50%. This is because the firm's return on equity (r) is 12% and the investor's required or fair rate of return (K) is only 10%. This is the reason why economists look at market-to-book ratios to infer the investor's opportunity cost. If market-to-book ratios exceed one for a regulated company, most economists immediately assume that the firm's return on equity exceeds the return required by stock-holders, implying that the regulator should lower the firm's allowed rate of return. In our example the *ROE* exceeds the required rate of return by 2% which results in a market to book ratio of 150%.

Second, it is the return on equity that drives the growth in both dividends per share and earnings per share, provided that the dividend payout is constant. If the dividend payout is gradually increased over time, then it is possible to *manufacture* a faster growth rate in dividends than earnings per share, from the same underlying level of profitability.

For example, in Schedule 2 the same data is used as in Schedule 1 except that the dividend payout starts at 50% and then increases by 2% per year. By the end of year 5 earnings per share have only risen to $2.99 instead of the $3.03 in Schedule 1, because less money has been reinvested within the firm. As a result, there is less capital to generate earnings. Thus the earnings in Schedule 2 only grow at a 5.6% compound growth rate, down from the 6% of Schedule 1. Conversely, since more of the earnings are being paid out as dividends, dividends per share are up to $1.73 instead of $1.52. This is a 9.6% compound growth rate, rather than the 6% in Schedule 1.

In the short-run, Schedule 2 demonstrates that the growth in dividends per share can be artificially manipulated by increasing the dividend payout. This is not sustainable in the long run, since the dividend payout cannot be increased indefinitely. Moreover, the manipulation can be detected by performing the basic 'diagnostic' check of tracking the behaviour of the firm's dividend payout over time, and the firm's return on equity. However, if the analyst is not aware of the change in the dividend payout, estimating the fair rate of return by adding this manipulated dividend growth rate to the expected dividend yield will overstate the investor's

required rate of return. It is important in this case to base the estimate of the investor's required rate of return on a long run sustainable growth rate, estimated from the underlying growth in earnings and dividends and the two components of growth.

The third implication of Schedule 1 is that the DCF estimate using the historic growth rate is appropriate only when the assumptions of the model hold. This means that non-dividend paying firms, firms with highly fluctuating earnings and dividends, and firms with non-constant expected growth cannot be valued accurately using the formula. Usually, these assumptions hold for pure regulated utilities since the allowed rate of return applies to the book value of equity both old as well as on new investments. However, it may not hold for utility holding companies (UHCs) that may own a variety of different operating divisions with added debt at the parent level. For non-regulated firms and UHCs, these assumptions are frequently violated. As a result, estimating the investor's required rate of return by using the formula $K=d_1/P_0 + g$, is tenuous and subject to significant measurement error.

DCF Estimates for the "Market" as a whole

In terms of DCF estimates we can go from the broad to the specific. By broad, I mean the market as a whole, since by holding a diversified portfolio an investor reduces the possibility of gains from one firm being the result of losses by another. In Schedule 4 is a graph of the dividend yield on the TSX Composite (Cansim V122628 plus recent date from the TSX) along with the yield to maturity on the long Canada (LTC) bond (Cansim V122501). The dividend yield on the TSX Composite finished out the year (December 2020) at 3.00%, while the LTC yield was 1.17%. This is a highly unusual situation, which has prevailed since the end of 2011. It is unusual since equities are a claim on real resources and should grow in line with the growth rate in profits and GDP. In contrast, the yield on the long Canada bond is fixed and is all an investor can earn when the bond is held to maturity. As a result, we would expect the TSX dividend yield to be below that on the long Canada bond. This inversion of normal market relationships is indicative of the recent anomalous level of long Canada bond yields.

In Schedule 5 is a graph of the after-tax profits and dividends earned and paid in Canada by Canadian corporations. The data is from the GDP accounts and goes back to 1956 and in both cases is scaled by dividing by GDP. The after-tax profits are those reported for tax purposes and do not reflect the accounting "games" that are often used to inflate accounting or GAAP profits to "please" investors. For example, non-cash items like capital gains are removed and inventories are adjusted to remove inflationary gains. As is to be expected, aggregate dividends (right side axis) are more stable than aggregate after tax profits. After-tax profits plummeted, for example, during the recessions in 1981, the early 1990s, marginally in the early 2000s and during the recent financial crisis. Overall, average (median) dividends have been 3.2% (2.7%) of GDP and average (median) after tax corporate profits 6.6%, (6.7%) but much more variable. Until recently after-tax profits have been above these long run averages and reached over 10.0% in 2008 before the financial crisis as high resource prices benefitted Corporate Canada.

Dividends are more stable than earnings as firms do not like to cut their dividends. This is important since some utility analysts "key" dividend growth forecasts off earnings forecasts. This is suspect since the greater variability in earnings means that their average growth rate always exceeds that of dividends in the same way that the arithmetic return always exceeds that of the geometric (compound) growth rate.[4] However, with this caveat, it is hard not to conclude that in the long-run dividends and after-tax profits grow at about the same rate as the overall economy but are much more variable. The average real Canadian growth rate since 1961 has been about 3.00%, which was pulled down by the -5.40% pandemic growth rate in 2020, while the Bank of Canada's operating band for inflation centres on 2.0%.[5] If the experienced growth rate over the last 59 years reflects the future growth rate, then we can expect long-run growth in dividends and earnings of 5.06% (1.02*1.030).

[4] The standard deviation of after-tax profits as a % of GDP has been about twice that of dividends.

[5] Schedule 6 has the Canadian CPI inflation rate back to 1914 and shows how successful the Bank of Canada's policy has been.

This growth estimate is probably marginally low once we account for the shift to a knowledge-based economy as it has become more difficult to estimate the value of productivity changes. Of note is that one side benefit of the pandemic has been a boost to the application of modern technology. This has resulted in a range of artificial intelligence (AI) applications as well as the well-known "Zoom" phenomenon and led to the dominance of tech stocks in the stock market. McKinsey Global Institute has recently estimated that the application of these technologies could raise productivity in Western Europe and the US by 1.0%.[6] We can also expect some short run growth as we pull out of the effects of the pandemic s indicated in the Government's Budget Brief'. With these caveats a ball-park figure for a DCF estimate for Canada as a whole is 8.21% ((1.03*1.0506)-1) which is probably a minor under-estimate.

An alternative estimate of future growth for the overall market is to use the "*br*" or sustainable growth rate. In Schedule 7 is the aggregate dividend payout from the GDP accounts. We can see very clearly the jump in the payout during the severe recessions in the early 1980s and 1990s, when Corporate Canada had serious profitability problems. The median dividend payout is 42%. This is more reliable than the average, which is biased due to very low earnings in some recessionary years. In Schedule 8 is the return on equity (ROE) earned by Corporate Canada as reported by Statistics Canada, where the median ROE is 9.83%. Again, we can see the business cycle as very low profitability in the mid 1990's and again in 2003 and 2009 which makes the median more useful. Combining the median retention rate (1-dividend payout) and median ROE gives a sustainable growth rate of 5.70% and DCF equity cost of 8.87%.

These two DCF equity cost estimates of 8.21% and 8.87% would seem to be reasonable estimates assuming that the economy is neither in recession nor booming. In Schedule 9 is the Statistics Canada capacity utilisation showing that the economy is running below capacity. The median capacity utilisation levels since 1987 have been 83.4% & 81.4% for non-farm and manufacturing respectively. At the end of 2020, we were below these levels at 79.2% and 76.2 respectively. However, for several years we have been below "normal" due to weak commodity

[6] The pandemic's productivity dividend, *Bloomberg Business Week*, May 10, 2021.

prices that have hurt western Canada so the further rebound in business capacity is probably not as great as might be thought looking at solely at capacity utilisation.[7]

Offsetting the capacity data is the unemployment rate in Schedule10 which indicates the significant weakness in the service sector, where the overall unemployment rate peaked at 13.7% in May 2020. This rate even exceeded that of the significant restructuring that occurred in Canada due to the Free Trade Agreement in the early 1990's. However, by April 2021 it had dropped to 8.1% slightly higher than the average for 1987-2020 of 7.9% again indicating some short run above normal growth. This assessment is confirmed by the Bank of Canada's business outlook survey in Schedule 11, where there are clear indications of optimism on behalf of senior Canadian executives. I would therefore put the DCF fair return estimate for Canada at the higher of the 8.21-8.87% range.

In Schedule 12 is a graph of the dividend yield on the S&P500 index and in Schedule 13 a graph of the dividend payout rate for the firms in the S&P500 index. The median dividend payout since 1956 is 47.2% slightly higher than in Canada. This means that typically 52.8% of the earnings for S&P500 firms are reinvested to generate future growth in earnings. However, note from the graph that the S&P500 firms suffered significant problems in 2007-2009 during the financial crisis, which was not as evident in the Canadian data. In contrast, there is no evidence of the serious problems suffered by Corporate Canada in the recessions in the early 1980s and 1990s.

In Schedule 14 is the S&P ROE data for the S&P500 firms since 1977, where the median ROE 14.00%.[8] These are higher than the average Canadian ROE since the data is for the largest firms in the US economy and includes a large proportion of foreign earnings, whereas that for Canada is for all firms and only for Canada. If I pair the median payout with the median ROE the "*br*" growth rate for the S&P500 firms is 7.39%. Combining these with the current dividend yield on

[7] We need a boost particularly to the price of oil, but higher carbon taxes and limited pipeline capacity may limit a rebound even with higher commodity prices.

[8] The earnings of the SP500 firms include significant foreign earnings and they are much more profitable than average US-centric firms.

the S&P500 index of 1.58% gives a fair return on the S&P500 of 9.09%. Note the higher sustainable growth rate for the S&P500 is offset by its lower US dividend yield or put another way these US firms are perceived to have better long run growth prospects than Canada as a whole and investors are paying for that growth by driving prices up and dividend yields down. As a result, the combination of yield plus growth estimates for the S&P500 is not significantly higher than for Canada.

Using the DCF model to estimate the market's required return on equity (equity cost) would indicate a value of 8.21-8.87% for Canada and 9.03% for the US. These numbers look more accurate than they really are and bearing in mind the stage in the business cycle I would estimate a fair rate of return of 8.50-9.50% using these long run values.[9]

Individual company estimates

The DCF estimates for the overall market are more reliable than those for individual companies due to the significant measurement error attached to forecasting future growth rates. For example, the forecast growth rate for the economy is more accurate since the growth rate in profits for the overall market is constrained by the growth rate in the economy. Otherwise, corporate profits will inexorably increase as a share of GDP at the expense of wages and salaried income. However, these growth rates are mechanically estimated and may not reflect market estimates. Consequently, some use analyst forecast of earnings growth as a proxy for the sustainable growth rates in the former estimates. In my judgment these are no more reliable as can be illustrated by looking at a sample of US gas utilities.

Schedules 15 I extracted data on August 4, 2021 for a number of US electric utilities used in previous testimony before the Commission as well as in my own sample. Note, almost all these

9 Some also look at share buy-backs in addition to dividends as the "total" payout. There are two reasons for ignoring this. The first is that a significant amount of share buy backs is to offset equity dilution caused when executive share options are exercised. As a result, they are a component of executive compensation not the investor's return. Second, for the overall economy analysts often ignore share dilution resulting from new share issues. I judge that the combination of buybacks with dilution has created a minor element in the long run growth estimate.

US UHCs are integrated utilities as well as being holding companies as they include generation as well as distribution and transmission. In fact, several have nuclear generation plants. So, we might expect them to have higher equity cost estimates than for Newfoundland Power as primarily as distribution and transmission utility.

The Schedule 15 data contains the critical values for a mechanical DCF analysis. The average dividend yield based on the trailing dividend per share is 3.44% which is significantly higher than the yield on the S&P500 index as one would expect for lower-risk utilities. Using the forecast five-year analyst growth rates in a simply constant growth mode gives the K(*Est g*). These estimates range from 2.74% for Excelon to 10.78% for Southern with a median value of 8.95% which removes the impact of Excelon's low forecast growth. This may appear to be a reasonable estimate, but, there are several problems.

First, if these UHCs reflect the risk of regulated utilities they are clearly lower risk than the overall market, while an estimate of 8.95% is very similar to that for the overall US market estimated above. This is confirmed by their average (median) betas of 0.40 (0.37). Second, the average and median five-year growth forecasts are both over 5.0%, which is higher than most estimates of US long run GDP growth. Third, the average ROE in 2020 was 8.39% and the median 9.18% which are both almost the same as the estimated cost of equity. However, the average (median) Market or price to book ratio is 1.87 (1.84) and one of the most basic ideas is that when a firm earns more than an investor requires the market to book ratio goes above 1.0. With these market-to-book ratios, we would expect the equity cost to be below the ROE and it is not to any material extent. These observations indicate that the "optimism bias" amongst security analysts, where these "sell side" analysts tend to be optimistic about the companies they follow.

It has to be emphasised that the DCF model assumes growth *forever* at this constant forecast growth rate. The average forecast growth rate of 5.01% might seem reasonable but it is impossible for these utilities to actually grow their earnings at 5.01% forever if US GDP is growing at a lower rate. Further, as I will show this has not been the historic pattern.

In Schedule 16 is an article from the Economist (December 3, 2016) which clearly states:

> ***"Sell side analysts, whose firms make money from trading and investment banking, are notoriously bullish. As one joke goes, stock analysts rated Enron as a "can't miss" until it got into trouble at which point it was lowered to a "sure thing". Only when the company filed for bankruptcy did a few bold analysts dare to downgrade it to a "hot buy".***

"Optimistic" can be substituted for "bullish", but there is little doubt that security analysts are optimistic, which is to say their earnings forecasts are higher than what is actually expected. The Economist goes on to say that analysts are forecasting S&P500 earnings to be $130.83 in 2017 and $146.33 in 2018, but it is better to discount them to $127.85 and $134.30 respectively. The actual earnings were $109.87 in 2017 and$132.47 in 2018 below even the "discounted" values used by the Economist.

The analyst optimism bias is well known. At Schedule 17 is a Globe and Mail article from May 2010 reporting on an updated McKinsey study which found that analyst forecast accuracy did actually improve after the disciplinary effects of the global settlement where investment banks were fined for fraudulent reports and some analysts fired. However, as they also point out old habits soon re-emerged. At Schedule 18 is an extract from the Royal Bank of Canada's Investment Strategy Playbook (February 2016) reporting the exact same phenomena. This is essentially that analysts start out optimistic in terms of future earnings, which are some distance away, and then get more realistic as that date gets closer, or as a cynic might put it they get forward guidance from the company itself.

This analyst optimism bias has been in the academic literature for some time. Easton and Sommers[10] for example, have documented the optimism bias at 2.84% where they also state (page 986)

[10] "Effect of analyst's optimism on estimates of the expected rate of return implied by earnings forecasts, Journal of Accounting Research, 45-5, December 2007.

> Our estimate of the implied expected rate of return on the market from the value-weighted regression, after removing the effect of bias in analysts' forecasts, is 9.67% with an implied equity risk premium of 4.43%. Of course, this estimate of the equity risk premium is more reasonable than that obtained when all observations have equal weight.[8]

These estimates are in line with my own estimate of the expected return on the US market even though their estimates were based on data several years ago. More importantly there is no reason to believe that analyst optimism has suddenly disappeared. In fact, this optimism bias persists in current studies to the extent that authors refer to it as "well documented"[11] that is, researchers are so used to the optimism bias that they automatically take it into account. The Financial Times also noted that analyst optimism exists in Europe, where they quote Goldman Sachs that "going back 25 years analysts have been too optimistic about earnings growth in 20 years out of the 25 and by 8 percentage points on average over the whole period."[12] ***A Google search on analyst optimism bias on August 11, 2021 produced 9,680,000 hits up from 5,510,000 just over two years ago!***

Mark Grinblatt of UCLA recently looked at the optimism bias and a summary of his research[13] and reported that

> "When analysts were either most biased or most optimistic, it was by a lot: Among the 20 percent of companies about which analysts most optimistically forecasted earnings — those analysts' estimates were on the high side by about 50 percent. By contrast, among the 20 percent of companies about which analysts were least optimistically biased, earnings forecasts overshot actual results by less than 1.0 percent."

Of importance is that even amongst the least biased they are still biased, even though by less than 1.0%.

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[11] See Huang and Tan, for example, "Analyst target price optimism around the world," November 2013.

[12] Sarah Gordon, "European corporates thwart analyst's optimism," Financial Times, April 27, 2014.

[13] https://www.anderson.ucla.edu/faculty-and-research/anderson-review/analyst-bias

Recent research[14] has indicated that after the global settlement precipitated changes in the regulation of analysts to make them independent of investment banking, the star analysts left. This is consistent with the research of Espahbad et al[15] that there was a short run improvement in the forecast accuracy of analysts after new regulations were introduced, but that over the longer period forecast accuracy has actually declined. I therefore place little reliance on analyst growth estimates since they are inaccurate and known to be biased.

A standard way of alleviating the effects of analyst growth optimism is to use the sustainable growth rate, which indicates that growth in earnings and dividends generally comes from reinvesting earnings at a positive rate of return. From the data on the electric utilities in Schedule 15 their retention rate of earnings averages 15% with a median of 35% which is not contaminated by Excelon. As we would expect, these mature utilities normally reinvest less of their earnings than do typical companies so we would expect them to grow at less than the average earnings growth rate. With the recent ROE for each utility the sustainable growth rate averages just 2.33% and the median slightly higher at 2.41%. The difference between the median sustainable growth rate and the analyst forecast growth rate exceeds Grinblatt's observation where the "least biased" analyst forecasts undershoot by less than 1.0%.

The DCF estimates using sustainable growth rates produce an average (median) equity cost of 5.85% (6.04%) consistent with their average (median) market to book (MB) ratios of 1.87 (1.84), and investors being happy with the average (median) earned ROE of 8.39% (9.18%). Further, we can always back out from analyst growth forecasts an implicit ROE. For example, with a median growth forecast of 5.63% and a retention rate of 35%, the implied future ROE is ROE =

14 Guan, Li, Lu and Wong, "Regulations and brain drain: Evidence from Wall Street Star Analysts' career Choices", Management Science (forthcoming)

15 Espahbad, Espahbad and Espahbad, "Did analyst forecast accuracy and dispersion improve after 2002 following the increase in regulation, Financial Analyst Journal, (Sept/Oct 2015)

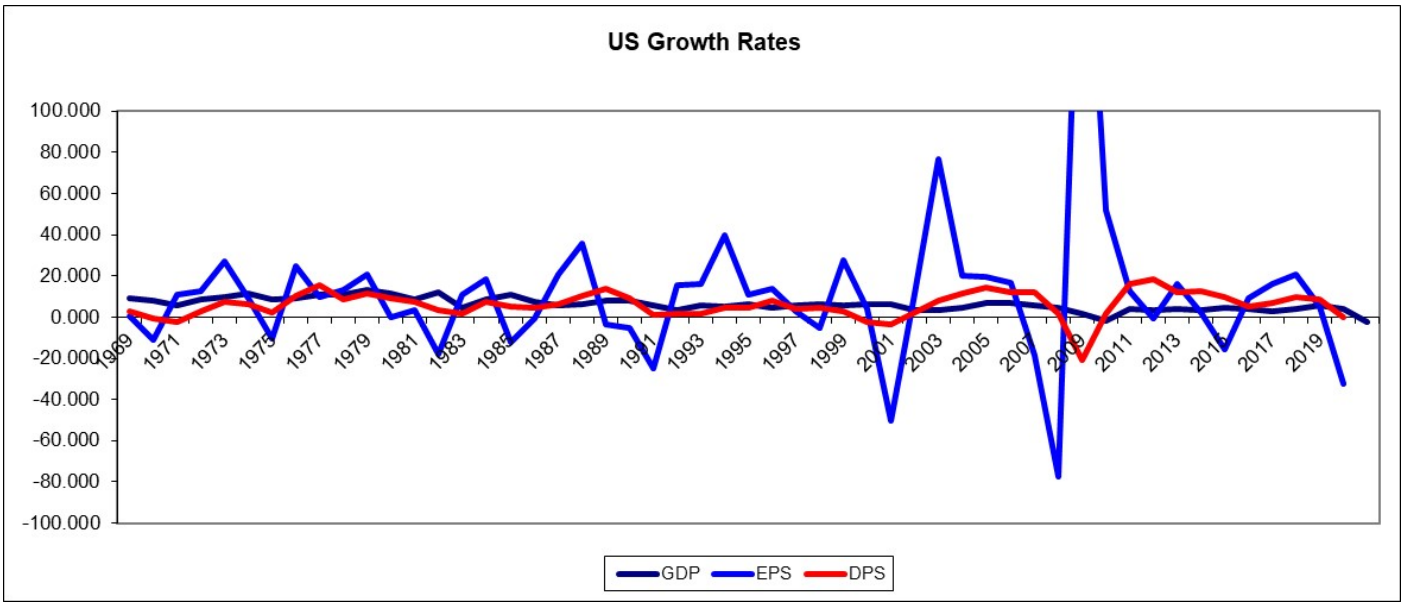
.0563/.35 or 16.28%[16] which significantly exceeds their current median ROE of 9.18% as well as the highest 2020 ROE earned by any of these 14 UHCs.

Earnings versus dividends

A final problem with the use of analyst forecasts is that they are based on earnings, not dividends, whereas the DCF model values dividends not earnings! As Schedule 5 showed earnings are more volatile than dividends even after we aggregate over all firms. What this means is that the short-term growth forecast for earnings is on average higher than for dividends, even if their long run, or compound, growth rates are unbiased and exactly the same. This is due to the common practise of smoothing dividend payments, or put another way, firms only increase their dividend after their fundamental earnings have increased and not as a result of temporary factors.

To illustrate the problem in using earnings rather than dividends I used the S&P Analyst Handbook for the S&P500 index. This index comprises the majority of the value of US companies and is representative of Corporate USA. It includes EPS and DPS data from which I calculated annual growth rates. I did the same for the nominal GDP series available in the Federal Reserve Bank of St Louis Economic data bank (FRED, GDPA). The following is a graph of the EPS and DPS growth rates starting in 1969 and finishing in 2020.

[16] This just reverses g = b*ROE.



The earnings series is clearly more volatile even for this index of 500 companies which diversifies away the unique results of any individual company. We can see for example, the dramatic effect of the financial crisis when 2008 aggregate EPS dropped from $66.17 to $14.88 for a growth rate of -77.5%. The EPS of the S&P500 then recovered to $50.87 with a 242.5% increase, but the average of these two growth rates of 83% still left earnings below their 2007 level. In contrast, DPS slightly increased in 2008 by 1.83% before dropping in 2009 by 21.06% as firms reacted to the lower earnings with a lag.

Over the entire period from 1967, the following is the data on average growth rates:

		GDP	EPS	DPS
Average		6.26%	11.14%	6.00%
Median		5.88%	10.98%	6.40%
Volatility		3.18%	39.87%	6.26%
Compound		6.21%	5.57%	5.81%
OLS		6.11%	6.03%	5.75%

US GDP grew at 6.26% (5.88%) using the simple average (median) of the annual growth rates whereas earnings per share for the S&P500 firms "grew" at almost twice that rate at 11.14%

(10.98%). In comparison, annual dividends per share grew at 6.00% (6.48%) only slightly less than GDP while the median actually grew slightly faster. The ordinary least squares estimate of the annual growth rates are 6.11% for GDP, 6.03% for earnings and 5.75% for dividends.

How can earnings grow so much faster than either GDP or dividends? The answer is that they can't in the very long run, as it is a *statistical oddity* similar to the difference between arithmetic (simple average) and compound growth rates. If a stock drops 50% and then increases by 100% then it is back to where it started and the compound growth rate is zero even though the arithmetic growth rate or simple average of -50% and+100% is +25%. The greater the volatility the bigger the difference between the arithmetic and compound growth rates of any economic series. The volatility of US GDP growth is only 3.18% versus almost twice that for dividends and 13 times that for earnings! The result is that the compound growth rate of US GDP was 6.21% over this 53-year period only slightly less than the simple arithmetic growth rate. In contrast, dividends per share grew at 5.81% or 0.19% below the arithmetic growth rate, but earnings grew at a compound growth rate of 5.57%, below GDP and fully 5.57% or exactly half the arithmetic growth rate. ***Generally, this means that the true long run growth rate of earnings is half that of the simply average growth rate due to the volatility in earnings.***

Finally, the "best" estimate of the growth rate is normally that obtained by using ordinary least squares (OLS) since this statistical procedure minimises the variability around the estimated annual growth rate. For GDP it lowers the growth rate estimate to 6.11%, which is almost the same as the earnings growth rate estimate of 6.03%. For dividends, it lowers the growth rate to 5.75% or 0.36% below the GDP growth rate. Possibly the lower dividend growth rate reflects the cumulative impact of share buybacks, but the problem is that the impact of these buybacks should show up in a higher earnings per share growth rate and it does not.

What this means is that analyst growth expectations are biased inputs into the constant growth model, even if the analysts themselves are neither fraudulent nor suffering from the optimism bias. This is because the limited growth forecasts that are available are all relatively short term

and at most for five years. This is short term relative to infinity. Long term, the best estimate for earnings growth for the overall stock market is the growth rate in GDP, since both EPS and DPS growth have tracked GDP growth over the last 53 years in terms of their compound growth rates.

I would also note that these comments obviously apply to the US utilities as well. Until 2018 S&P produced an Analyst Handbook that had earnings and dividends for the utility sector similar to that for the Index as a whole. Further S&P sub divided utilities into gas, electric and multi-utilities. However, even in the 2018 edition there was no data for gas utilities after 2015 since they had been acquired.[17] However, for the overall utility index the growth rates were as follows:

	EPS	DPS	GDP
Average	4.25%	3.10%	6.49%
Median	3.91%	4.10%	5.99%
Volatility	20.46%	12.81%	3.18%
Compound	2.04%	2.37%	6.45%
OLS	1.34%	1.67%	6.11%

Over the period from 1967-2017 US GDP grew on average (median) 6.49% (5.99%), both slightly above the full period due to the absence of the 2020 negative growth rate. In contrast, these US utilities had average (median) dividend per share growth of 3.1% (4.10%) with average (median) earnings growth of only 4.25% and 3.91%. The compound growth rates are even worse at 2.04% for earnings and 2.37% for dividends, while the least squares regression results are worse still at 1.34% and 1.67%. The reason for the latter two is that they implicitly put more weight on the later performance where the utility EPS was $12.01 in 2017, but was also $12.36 in 2009, and $10.48 as far back as 1993. So, there is little evidence of significant earnings growth.

[17] What is playing out in the utility sector is very similar to what happened prior to the passage of the PUHCA in 1935.

This evidence from the S&P500 utility data is for the larger utilities included in the S&P500 index and this reflects the problems of holding companies like Duke Energy and PG&E. However, this is also in the minds of investors in utility stocks in the U.S. From this data it is extremely difficult to justify U.S utilities growing at rates higher than the US GDP growth rate as is implied in the use of analyst growth forecasts. It is also difficult to justify including growth at the GDP growth rate when a multi-stage DCF model is used.[18] I would regard long run growth at 65-68% of the GDP growth rate as being reasonable based on actual experienced median growth rates.[19] This would mean 3.3-3.4% long run growth rates based on a 5% GDP growth rate, and a DCF equity cost of 6.8-6.9% when added to their current typical dividend yield of 3.4%. This estimate is consistent with the sustainable growth rate estimates and a risk hierarchy when compared with the overall stock market equity cost of 8.50-9.50%.

Conclusion

From the forgoing DCF estimates I draw the following conclusions:

- The overall equity market return in Canada is in a range 8.21%-8.87% and that in the US slightly higher at 9.09% with a reasonable range of at most 8.50-9.50%.

- The individual DCF estimates for US gas companies based on analyst growth forecasts would put their equity cost at 8.39-9.18%%. However, these forecasts are biased high and inaccurate estimates of their underlying DPS growth rates. Removing this bias by using sustainable growth forecasts lowers this estimate to 5.85-6.04%.

- Analyst earnings growth rate forecasts are optimistic (biased) estimates of dividend growth rates, since earnings are much more volatile. Over long periods of time, the growth rate of earnings and dividends for S&P500 firms is approximately that of US GDP. However, simple average growth rates of earnings, which are what analysts forecast, are almost twice as high as for dividends making them biased when used in the constant growth DCF model.

- Utility earnings and dividend growth rates since 1967 confirm that over this very long period neither have grown at close to the US GDP growth rate. This is what logic would

[18] Mr. Coyne includes analyst earnings growth forecasts in his first stage and then blends them into a long run GDP growth rate in the third stage. Each of these growth stages are demonstrably too high and biased.

[19] Actual ratios are EPS (3.91/5.99) or 65% and DPS 4.1/5.99 or 68%.

dictate since their dividend yields are twice that of the SP500 index meaning that with the same forecast growth rate their equity cost is higher. However, logic and actual beta estimates confirm that even these U.S. UHCs are lower risk than the overall stock market due to the impact of regulation on their operating subsidiaries.

- My best estimate is that U.S utilities can grow at 65-68% of the growth rate of U.S GDP which is the historic experience since 1967. This implies a DCF equity cost of 6.8-6.9%. Adding a 0.50% floatation cost allowance implies a fair rate of return similar to my estimates for Canadian UHCs

Given the errors attached to any estimate, I judge the DCF equity cost to be in a range 8.5-9.5% and the equity cost to a large generic US electric UHC around 7.0% consistent with the normal risk hierarchy and their market to book ratios.

SCHEDULE 1

YEAR	BEGINNING BOOK VALUE PER SHARE	EARNINGS PER SHARE	DIVIDEND PER SHARE	RETENTIONS PER SHARE
1	20.00	2.40	1.20	1.20
2	21.20	2.54	1.27	1.27
3	22.47	2.70	1.35	1.35
4	23.80	2.86	1.43	1.43
5	25.24	3.03	1.52	1.52

ASSUMPTIONS: Return on Equity = 12%
Dividend Payout = 50%
Cost of Equity = 10%

SCHEDULE 2

YEAR	BEGINNING BOOK VALUE PER SHARE	EARNINGS PER SHARE	DIVIDENDS PER SHARE	RETENTIONS PER SHARE
1	20.00	2.40	1.20	1.20
2	21.20	2.54	1.32	1.22
3	22.40	2.69	1.45	1.24
4	23.70	2.83	1.59	1.25
5	24.90	2.99	1.73	1.26

ASSUMPTIONS:

Return on Equity	=	12%
Dividend Payout	=	50% + 2% p.a.
Required Return	=	10%

Definition of the Sustainable Growth rate

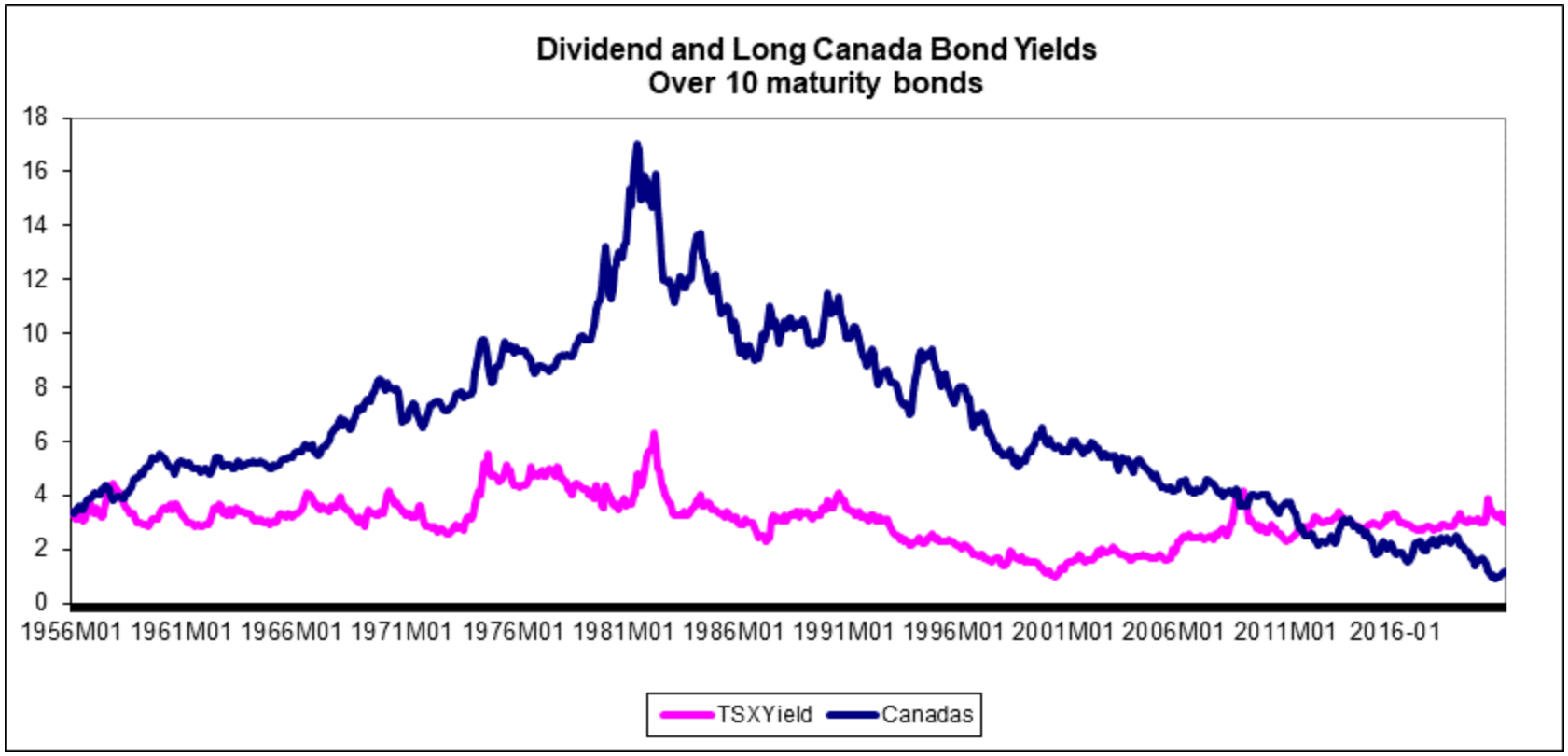
(from the Financial Post Corporate Analyzer data base)

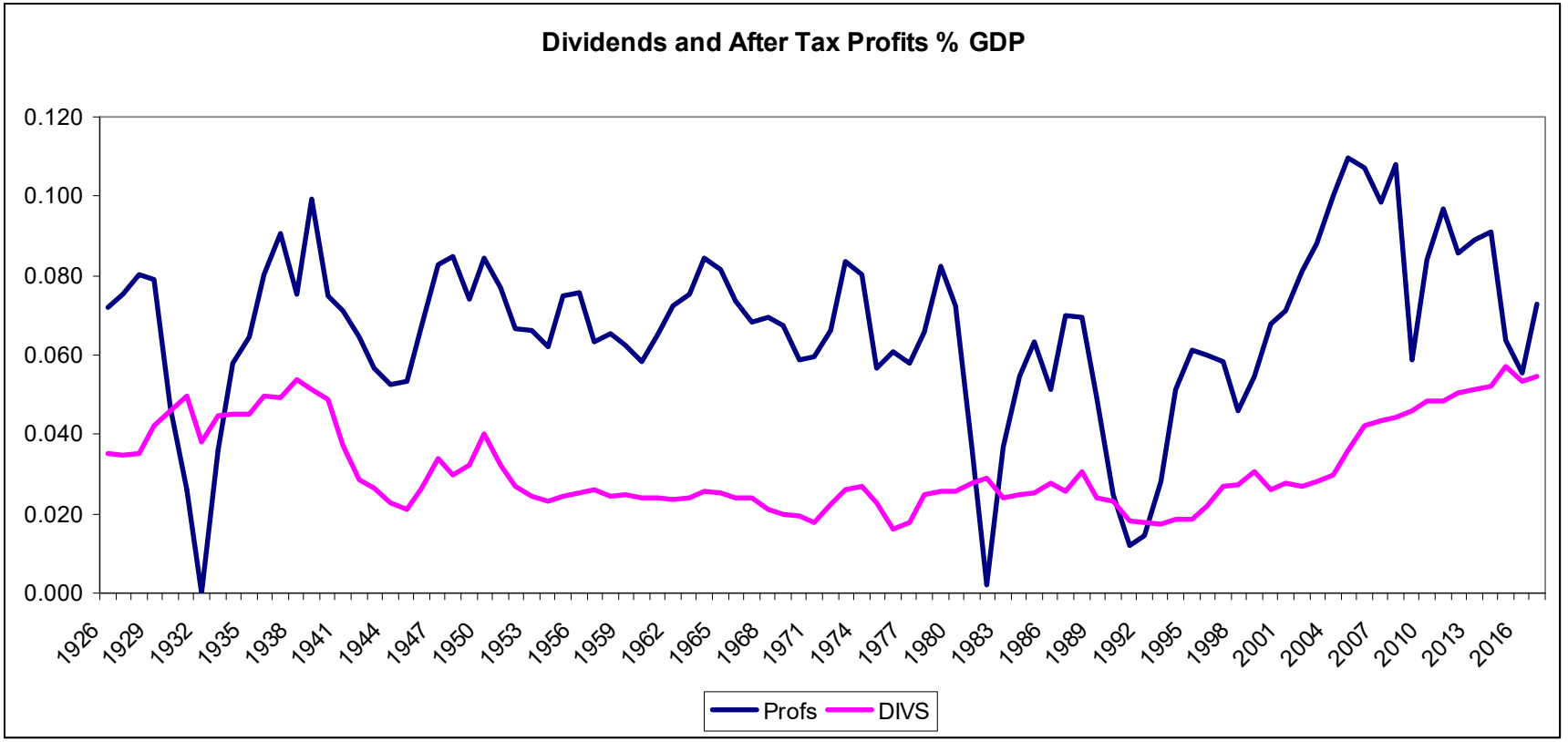
Sales (CY – 1)

X401 - Sustainable Growth (%) - This calculation is the rate at which company sales can increase without the company experiencing financial strain or requiring additional financing to fund continued growth. Many executives believe growth should be maximized. In reality, uncontrolled growth can result in financial strain or worse, bankruptcy, if not managed properly. Conversely, lack of growth can make a company vulnerable to a takeover. To determine the possible strategies the company may employ in managing their growth, see the Growth Rates Section which describes the ratio combination of Sales Growth and the Sustainable Growth rate.

$$ROE \times \left(1 - \left(\frac{\text{Common Dividends}}{\text{Net Income before Discontinued Operations} - \text{Preferred Dividends}}\right)\right)$$

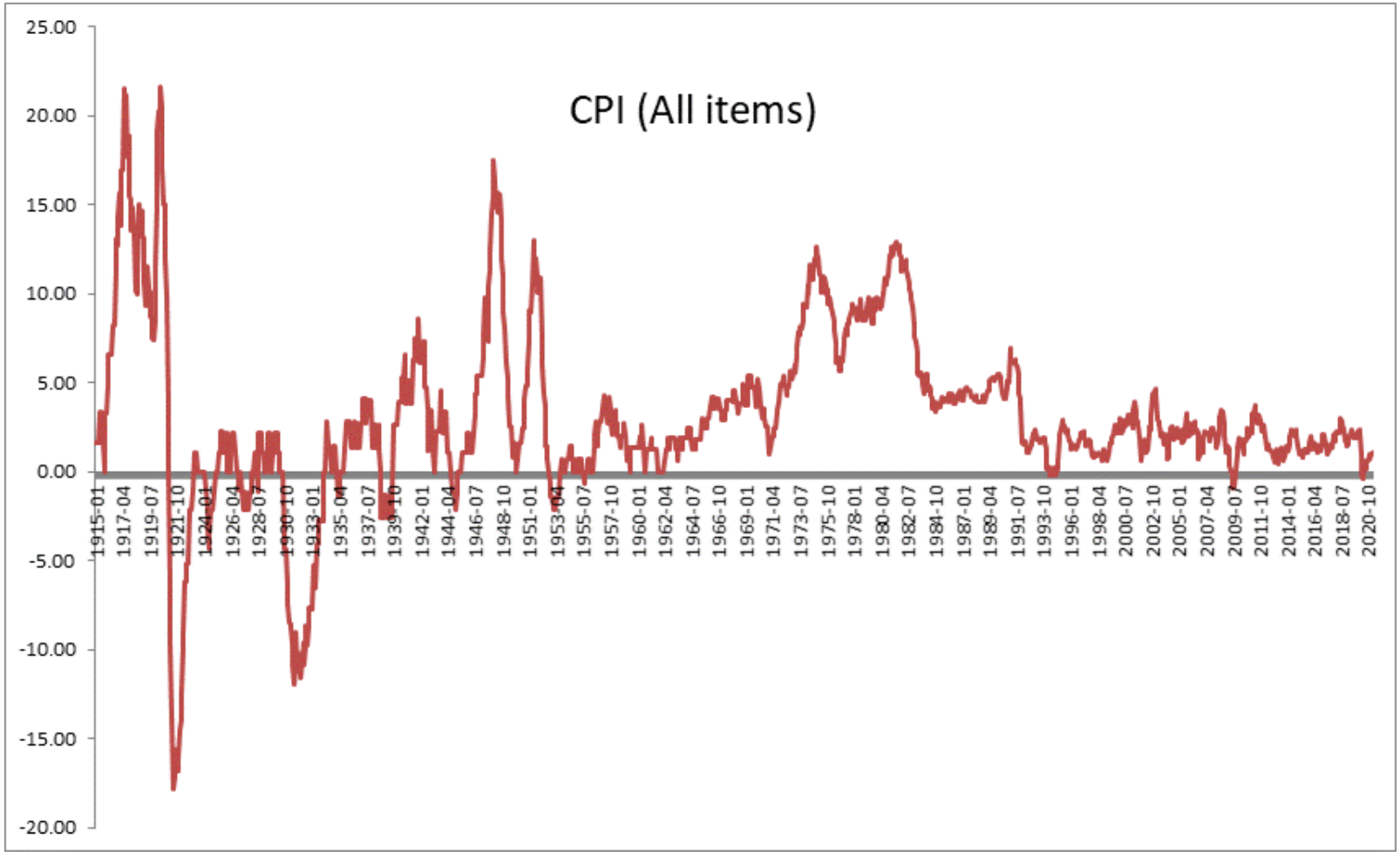
SCHEDULE 4

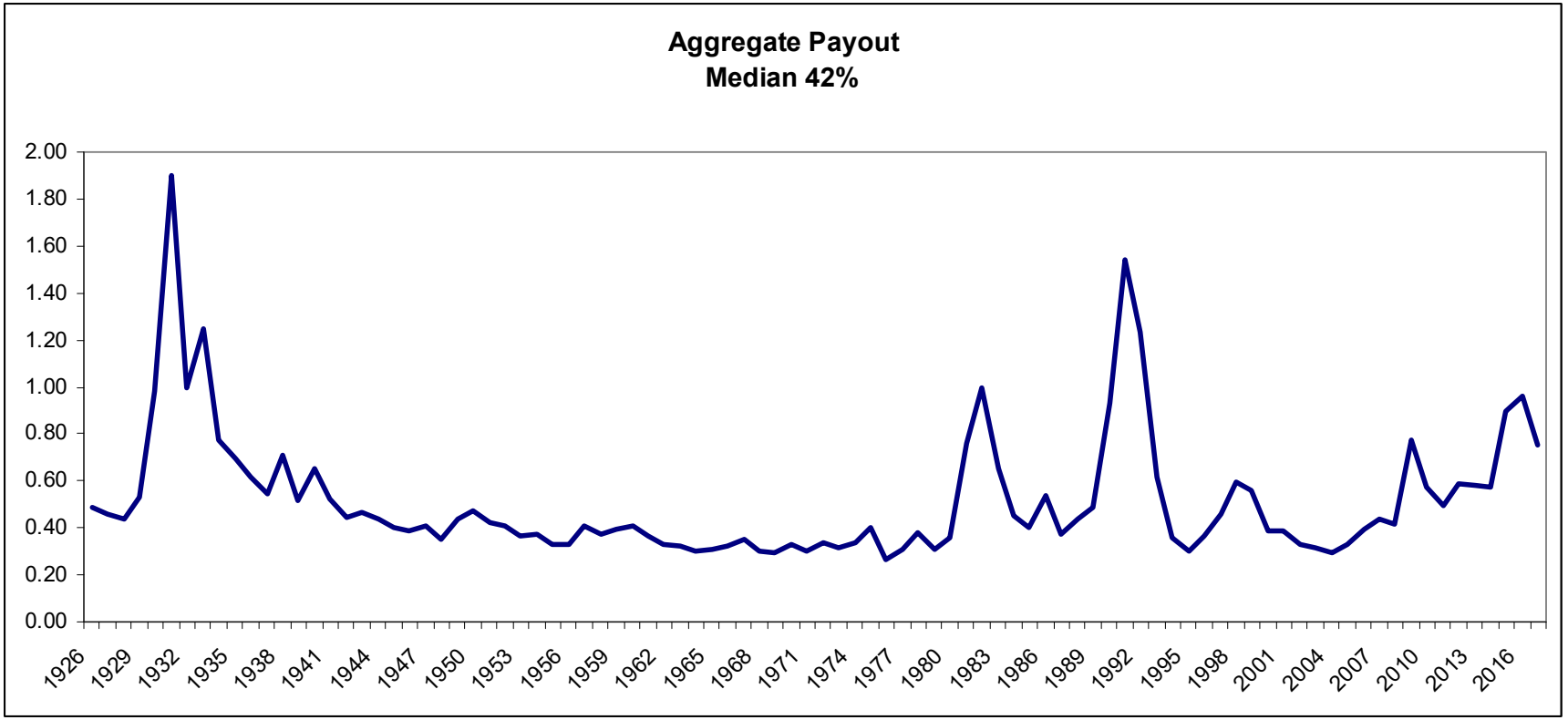

Dividend and Long Canada Bond Yields
Over 10 maturity bonds
18
16
14
12
10
8
6
4
2
0
1956M01 1961M01 1966M01 1971M01 1976M01 1981M01 1986M01 1991M01 1996M01 2001M01 2006M01 2011M01 2016-01
TSXYield
Canadas

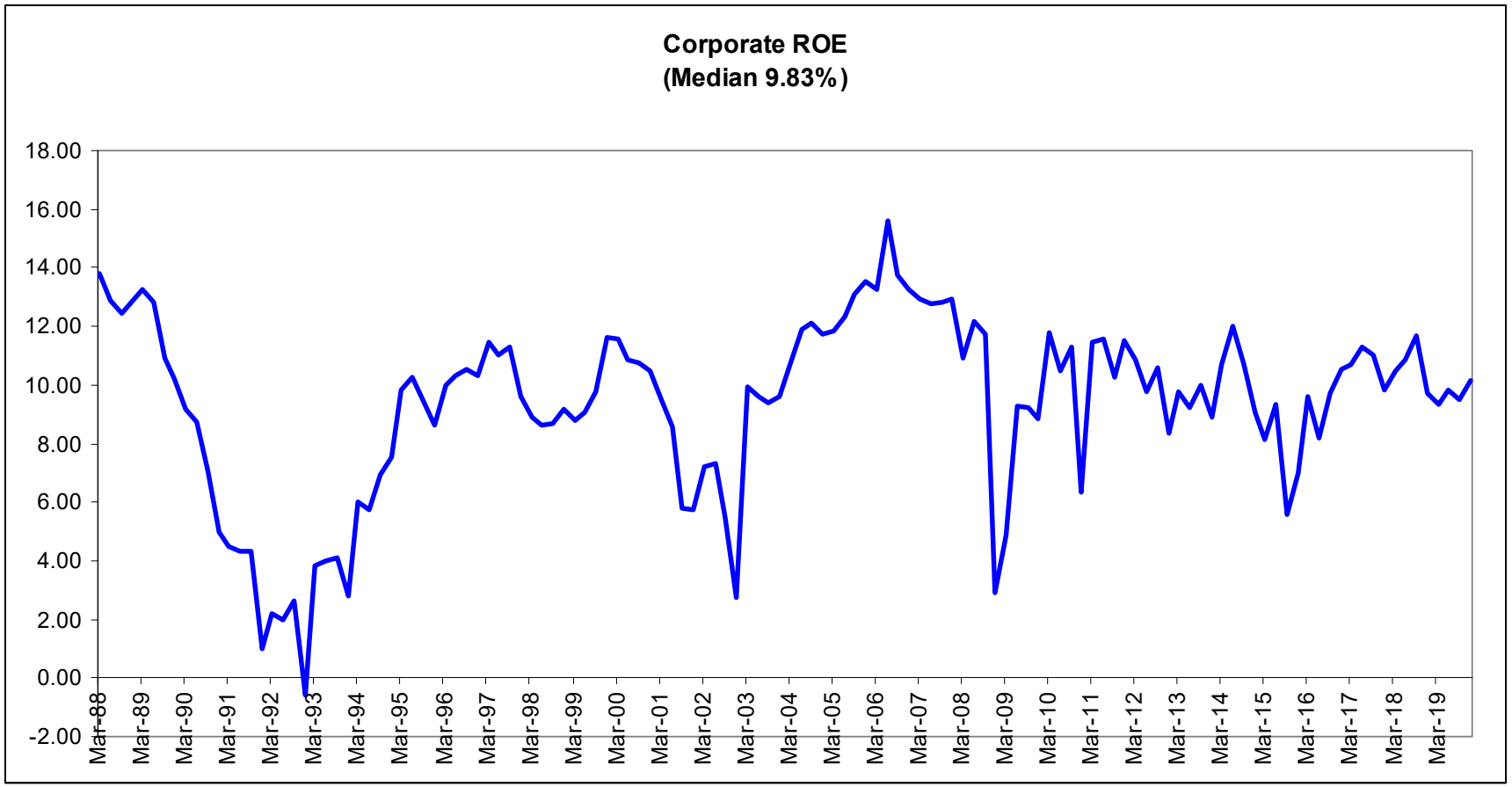


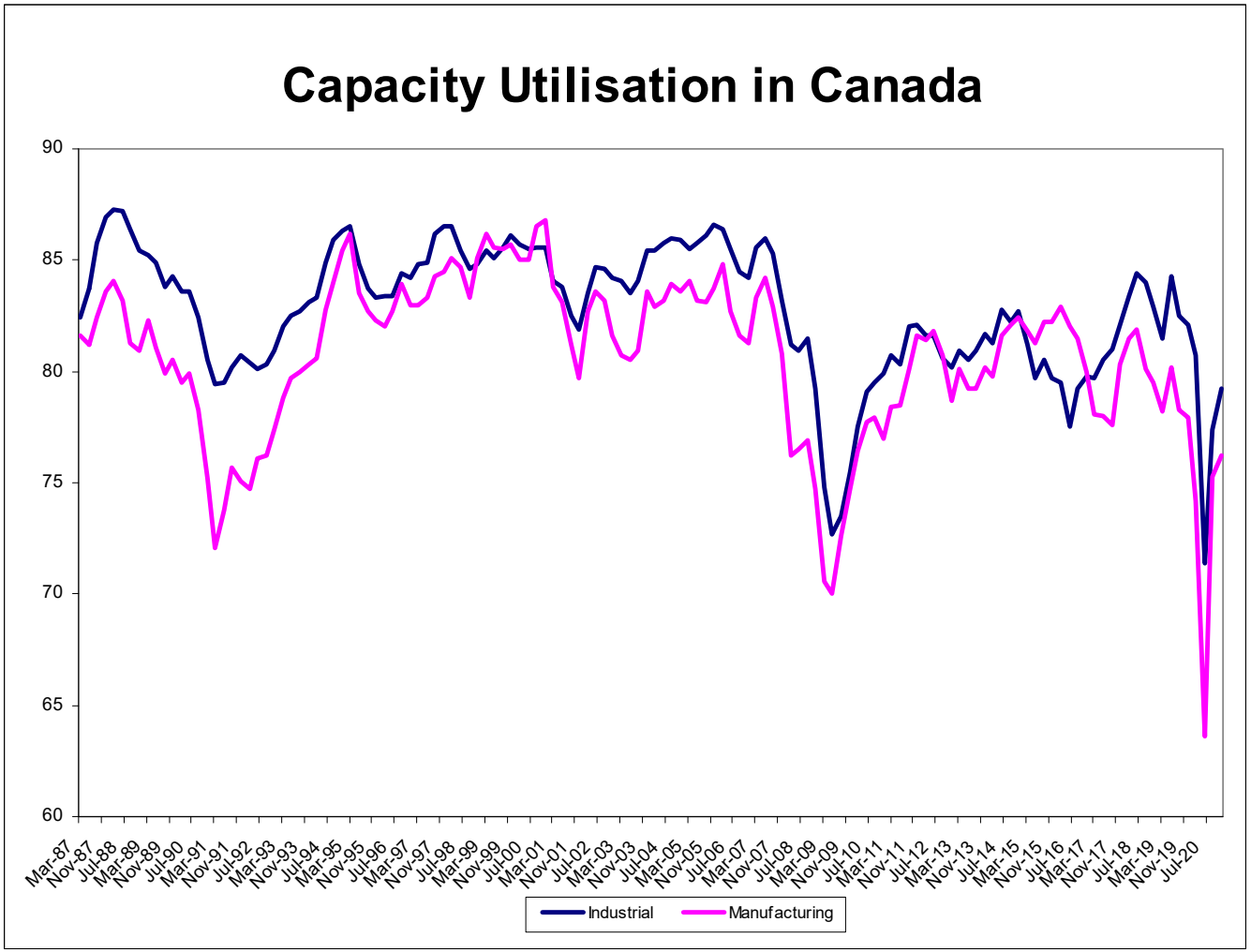
Note: Statistics Canada issued a new revision of the GDP accounts starting in June 2012 where there was a substantial revision to profits and dividends to reflect the importance of inter corporate dividend payments.

SCHEDULE 6

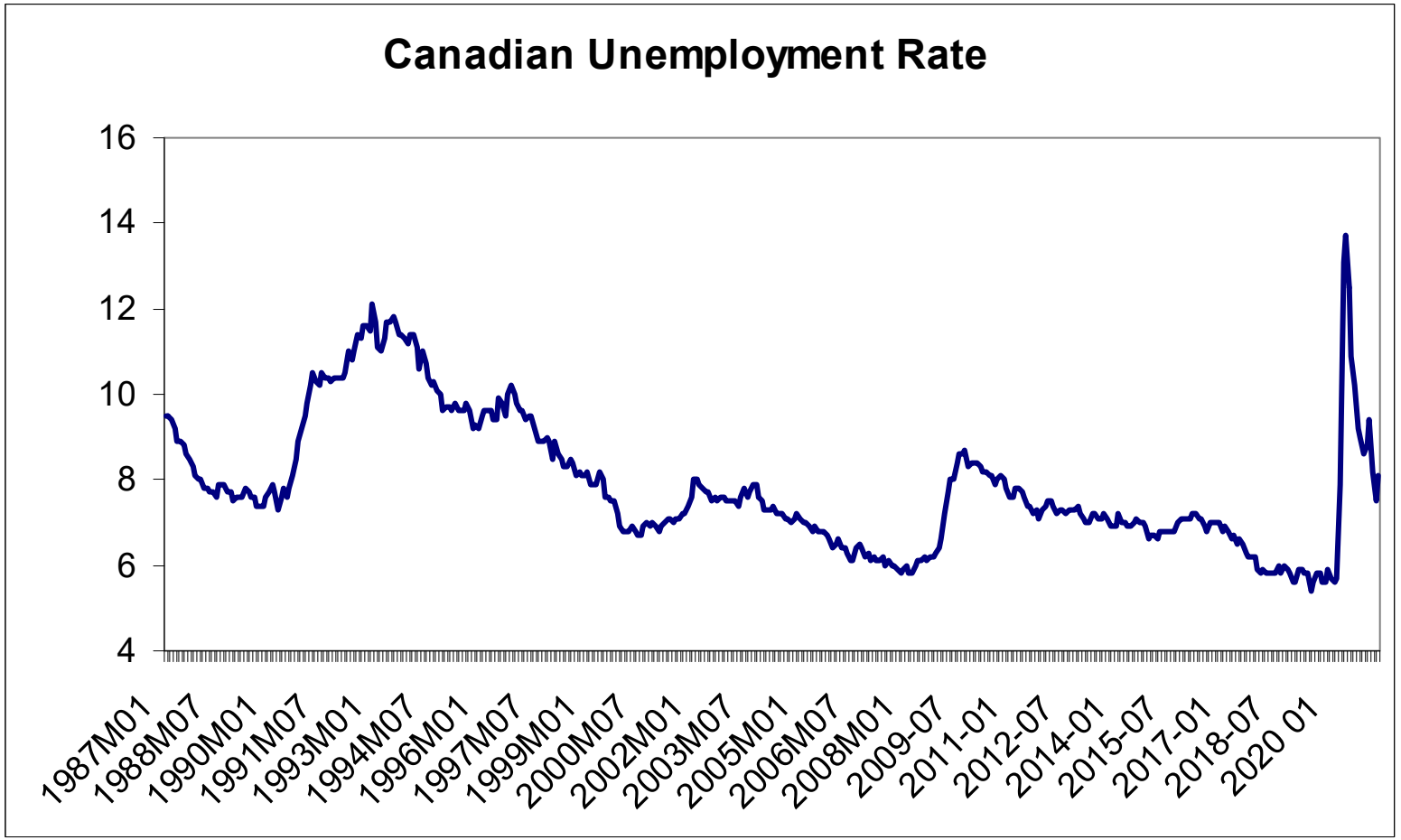

CPI (All items)
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
1915-01
1917-04
1919-07
1921-10
1924-01
1926-04
1928-07
1930-10
1933-01
1935-04
1937-07
1939-10
1942-01
1944-04
1946-07
1948-10
1951-01
1953-04
1955-07
1957-10
1960-01
1962-04
1964-07
1966-10
1969-01
1971-04
1973-07
1975-10
1978-01
1980-04
1982-07
1984-10
1987-01
1989-04
1991-07
1993-10
1996-01
1998-04
2000-07
2002-10
2005-01
2007-04
2009-07
2011-10
2014-01
2016-04
2018-07
2020-10


Aggregate Payout
Median 42%
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
2016


Corporate ROE
(Median 9.83%)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
Mar-88
Mar-89
Mar-90
Mar-91
Mar-92
Mar-93
Mar-94
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Mar-14
Mar-15
Mar-16
Mar-17
Mar-18
Mar-19


Capacity Utilisation in Canada
90
85
80
75
70
65
60
Mar-87
Nov-87
Jul-88
Mar-89
Nov-89
Jul-90
Mar-91
Nov-91
Jul-92
Mar-93
Nov-93
Jul-94
Mar-95
Nov-95
Jul-96
Mar-97
Nov-97
Jul-98
Mar-99
Nov-99
Jul-00
Mar-01
Nov-01
Jul-02
Mar-03
Nov-03
Jul-04
Mar-05
Nov-05
Jul-06
Mar-07
Nov-07
Jul-08
Mar-09
Nov-09
Jul-10
Mar-11
Nov-11
Jul-12
Mar-13
Nov-13
Jul-14
Mar-15
Nov-15
Jul-16
Mar-17
Nov-17
Jul-18
Mar-19
Nov-19
Jul-20
Industrial
Manufacturing

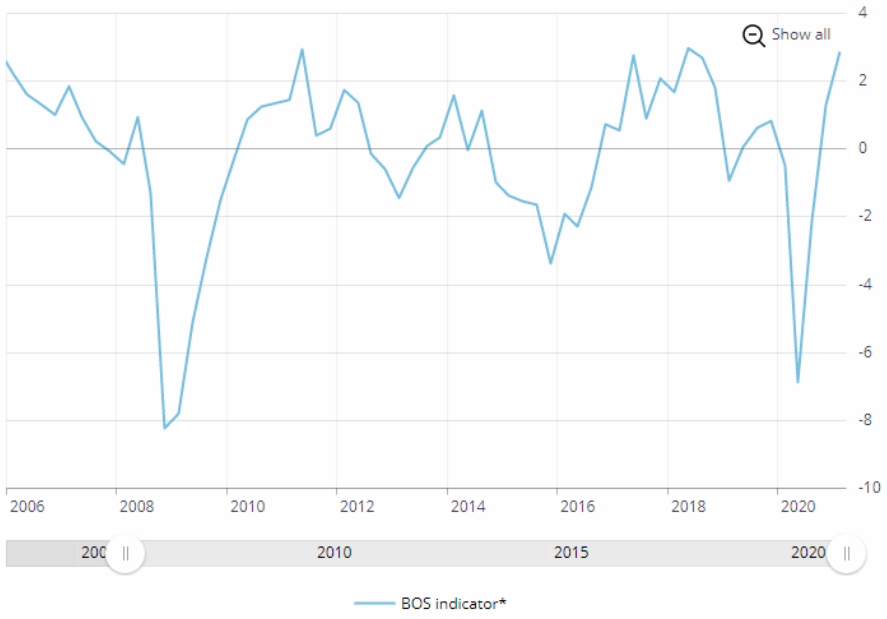
SCHEDULE 10


Canadian Unemployment Rate
16
14
12
10
8
6
4
1987M01
1988M07
1990M01
1991M07
1993M01
1994M07
1996M01
1997M07
1999M01
2000M07
2002M01
2003M07
2005M01
2006M07
2008M01
2009-07
2011-01
2012-07
2014-01
2015-07
2017-01
2018-07
2020 01

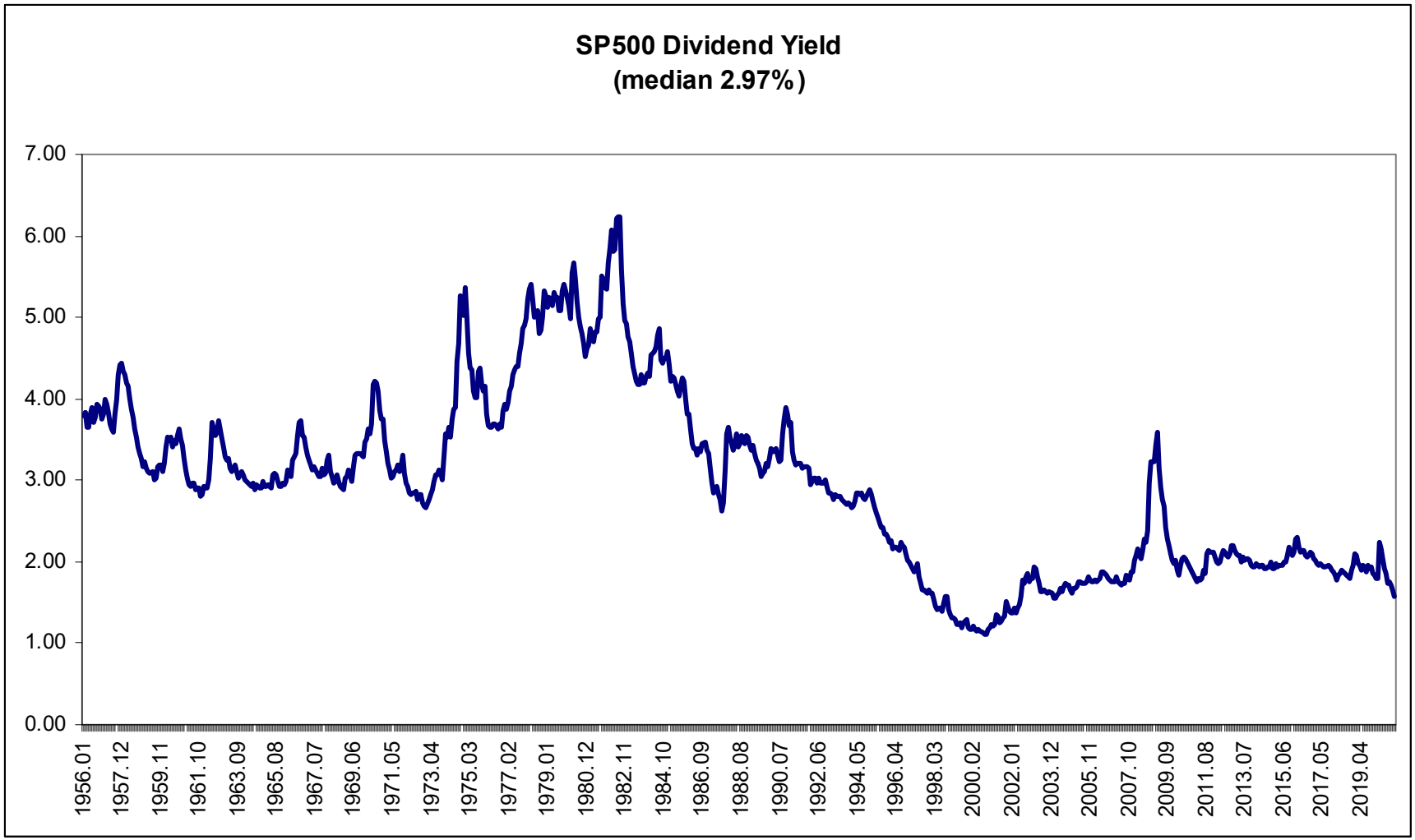
The recovery continues to broaden, but weakness remains

The Business Outlook Survey indicator moved up again, signalling further improvement in business sentimer (**Chart 1**). Business confidence across all regions has strengthened. Many firms consider the impacts of the pandemic on their activities to be behind them. Firms' outlooks for domestic and foreign demand have impro from low levels a year ago, as most businesses are no longer preoccupied with pandemic-related uncertainty some businesses tied to high-contact services continue to report weakness in demand.

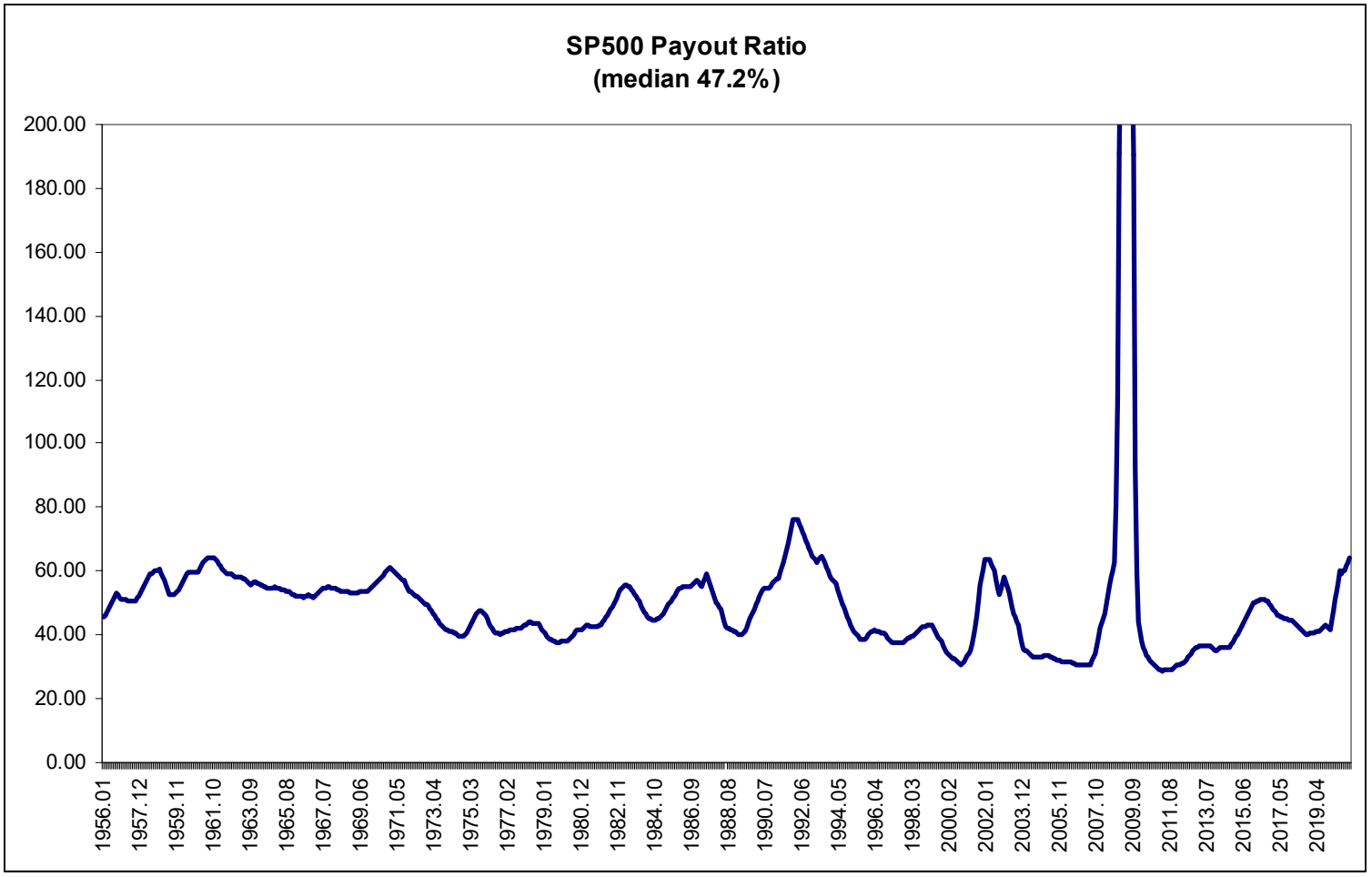
Chart 1: Business sentiment continues to improve



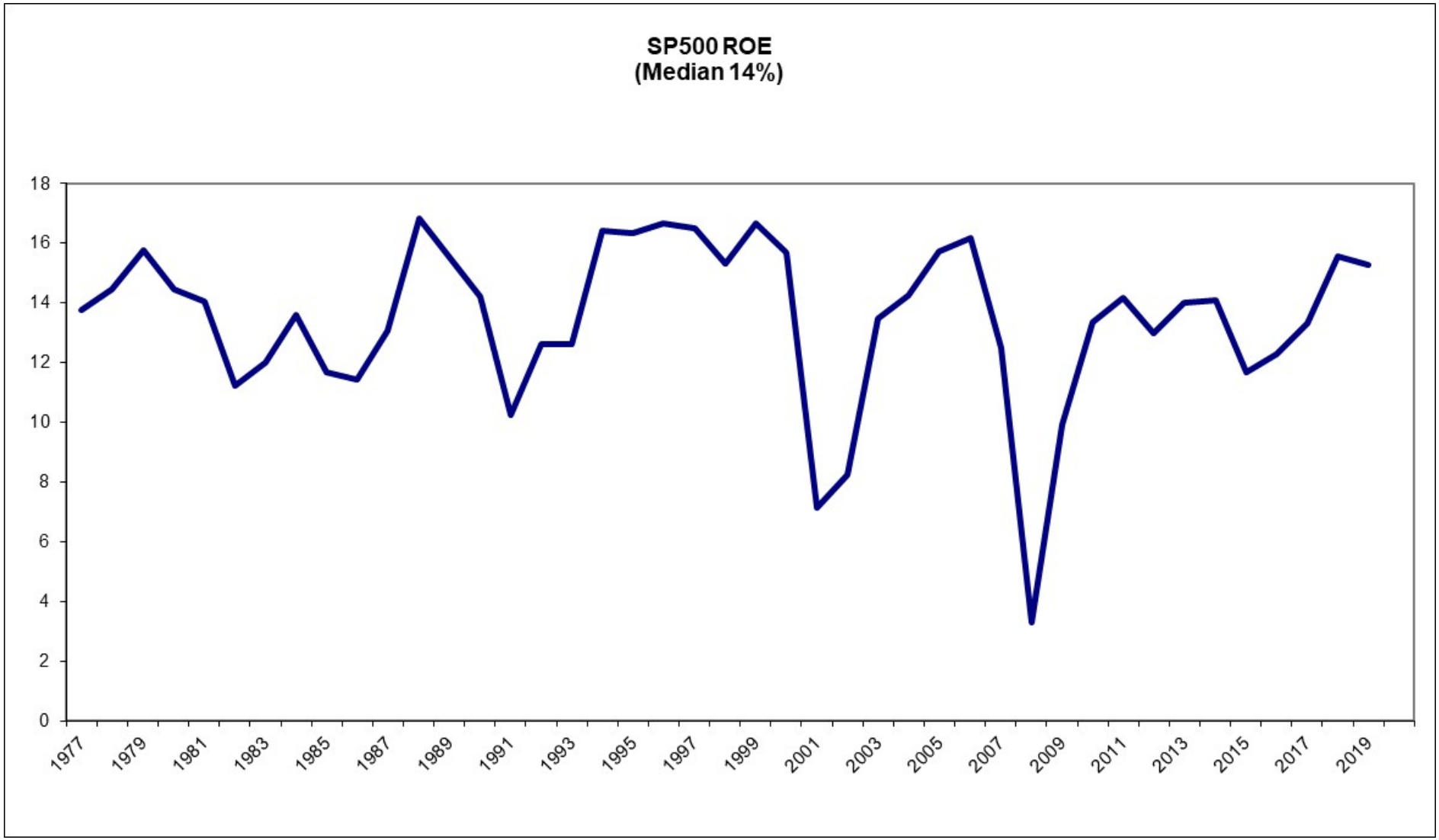
* The BOS indicator is a summary measure of the main survey questions that gauges overall business sentiment.


SP500 Dividend Yield
(median 2.97%)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1956.01
1957.12
1959.11
1961.10
1963.09
1965.08
1967.07
1969.06
1971.05
1973.04
1975.03
1977.02
1979.01
1980.12
1982.11
1984.10
1986.09
1988.08
1990.07
1992.06
1994.05
1996.04
1998.03
2000.02
2002.01
2003.12
2005.11
2007.10
2009.09
2011.08
2013.07
2015.06
2017.05
2019.04

SCHEDULE 13


SP500 Payout Ratio
(median 47.2%)
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
1956.01
1957.12
1959.11
1961.10
1963.09
1965.08
1967.07
1969.06
1971.05
1973.04
1975.03
1977.02
1979.01
1980.12
1982.11
1984.10
1986.09
1988.08
1990.07
1992.06
1994.05
1996.04
1998.03
2000.02
2002.01
2003.12
2005.11
2007.10
2009.09
2011.08
2013.07
2015.06
2017.05
2019.04

SCHEDULE 14


SP500 ROE
(Median 14%)
18
16
14
12
10
8
6
4
2
0
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019

US Electric UHC Data

					US Electric's Financial Data											
		5 year Growth														
		Past	Future	# Analysts	Yield	K (Est g)	ROE	Retention	SUST G	K	MB	DPS	EPS	Beta	Market CAP	
Duke Energy		0.38	5	12	3.6	***8.78***	2.3	-1.17	-2.69	***0.81***	1.78	3.84	1.77	0.25	82.10	
Allete Inc.,		1.25	7	5	3.47	***10.71***	5.38	0.19	1.02	***4.53***	1.61	2.48	3.06	0.47	3.73	
Eversource		4.45	6.81	14	2.67	***9.66***	8.84	0.36	3.14	***5.90***	2.13	2.34	3.63	0.32	30.33	
OGE Energy		9.96	3.8	6	4.6	***8.57***	10.36	0.15	1.51	***6.18***	1.89	1.58	1.85	0.65	6.83	
Pinnacle West		13.63	3.4	10	3.98	***7.52***	10.1	0.35	3.49	***7.61***	1.55	3.22	4.92	0.3	8.82	
Evergy		-0.13	5.8	5	3.13	***9.11***	8.7	0.36	3.13	***6.36***	1.71	2.08	3.25	0.36	15.19	
Alliant		8.33	5.45	7	2.57	***8.16***	10.54	0.37	3.91	***6.59***	2.6	1.54	2.45	0.34	14.99	
American Electric		6.58	6.2	12	3.28	***9.68***	11.13	0.38	4.20	***7.62***	2.08	2.92	4.69	0.26	44.38	
Entergy		1.88	5.8	10	3.62	***9.63***	14.75	0.53	7.79	***11.69***	1.89	3.76	7.97	0.55	20.82	
PNW		13.63	2.8	10	3.98	***6.89***	4.91	0.35	1.70	***5.74***	1.55	3.22	4.92	0.3	8.82	
Southern		3.96	6.5	11	4.02	***10.78***	9.52	0.13	1.19	***5.26***	2.4	2.58	2.95	0.44	67.80	
Excelon		5.11	-0.47	12	3.23	***2.74***	3.81	-0.38	-1.44	***1.74***	1.43	1.53	1.11	0.44	45.70	
POR		1.78	7.1	9	3.29	***10.62***	6.14	0.09	0.54	***3.85***	1.66	1.65	1.81	0.37	4.43	
PNM		4.02	4.9	2	2.71	***7.74***	10.99	0.47	5.13	***7.98***	1.96	1.29	2.42	0.51	4.10	
	Average	5.35	5.01		3.44	***8.62***	8.39	0.15	2.33	***5.85***	1.87			0.40	25.57	
	Median	4.24	5.63		3.38	***8.95***	9.18	0.35	2.41	***6.04***	1.84			0.37	15.09	
PNM merging with AVANGRID August 8 2021 announcment. Data as of August 11, 2021																
All data from Capital IQ as reported by Yahooo Finance																

ment of Lloyd's itself on a hypothetical hacker-caused blackout of the entire power grid of the American north-east. It estimated this would cause direct losses to business revenues of $222bn, and a total dent in GDP of over $1trn over five years.

Many insurers are turning to outside expertise. Matt Webb of Hiscox, a specialist insurer, describes an "arms race" between analytics firms such as RMS and Symantec, offering their long-standing modelling prowess (RMS is already well-trusted on hurricane modelling, for example) to help insurers understand their cyber-liabilities.

But even if exposures are better understood, limiting them may prove tricky. Kevin Kalinich of Aon, an insurance-broker, points to the near-impossibility of drawing a line, for example, between cyber-war or cyberterrorism and "normal" hacking. Cyber-crime knows no geographical bounds, unlike, say, a Florida hurricane. Mr Webb reckons that insurance policies will at a minimum need explicitly to recognise that cyber-risks are covered or to exclude them—just as many policies already include exemptions for terrorism or war.

Although insurers are already helping companies with more humdrum data breaches, the industry still lacks a clearly formulated response to a larger-scale cyber-calamity. Inga Beale, CEO of Lloyd's, is optimistic that the market, thanks to its exacting modelling exercises and its unique risk-sharing structure, is better equipped than most. But only a devastating, real-life cyber-attack would test how effective its preparations have been. ■

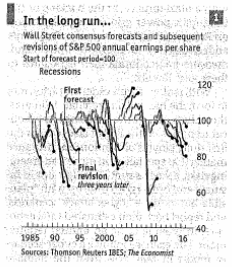
Analyst forecasts

Discounting the bull

Stock analysts' forecasts tend to be wrong in reassuringly predictable ways

"SELL-SIDE" analysts, whose firms make money from trading and investment banking, are notoriously bullish. As one joke goes, stock analysts rated Enron as a "can't miss" until it got into trouble, at which point it was lowered to a "sure thing". Only when the company filed for bankruptcy did a few bold analysts dare to downgrade it to a "hot buy".

Economic research shows that there is some truth to the ribbing. The latest figures from FactSet, a financial-data provider, show that 49% of firms in the S&P 500 index of leading companies are currently rated as "buy", 45% are rated as "hold", and just 6% are rated as "sell". In the past year, 30% of S&P 500 companies yielded negative returns.



Profits forecasts made more than a few months ahead have a dismal record of inaccuracy. According to Morgan Stanley, a bank, forecasts for American firms' total annual earnings per share made in the first half of the year had to be revised down in 34 of the past 40 years. Studying their forecasts over time reveals a predictable pattern (see chart 1).

In theory, a diligent share analyst should do his own analysis—that is, by projecting a firm's future revenue and expenses, and discounting them to the present. Such models, however, are extremely sensitive to different assumptions of growth rates. Since no one can know the future, analysts cheat.

Three statistical sins are common. Analysts can look at comparable companies to glean reasonable profits estimates, and then work backwards from their conclusions. Or they can simply echo what their peers are saying, and follow the herd. Or, most important, they can simply ask the companies they are following what their actual earnings numbers are.

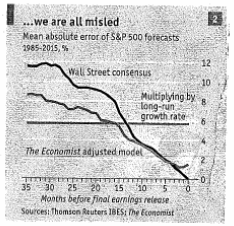
Surveys conducted by Lawrence Brown of Temple University found that two-thirds of sell-side analysts found private calls with company managements to be "very useful" in making their estimates. Analysts' need to maintain relationships with the companies they cover must colour their projections. They are judged primarily on the accuracy of their short-term forecasts, so there is little risk in issuing flattering, if unrealistic, long-term projections. In the short run, however, they have an incentive to issue ever-so-slightly pessimistic forecasts, so companies can "beat" expectations. Since the financial crisis, company profits have exceeded short-term analyst forecasts around 70% of the time.

So are forecasts are useless? Simply taking the market's earnings figures from the previous year and multiplying by 1.07 (corresponding with the stockmarket's long-run growth rate) can be expected to yield a more accurate forecast of profits more than a year in the future.

Yet the very predictability of the errors in analysts' forecasts suggests they could be informative, if they are properly interpreted. Taking forecasts of S&P 500 earnings from 1985-2015, *The Economist* has built a simple statistical model to try to take out the bias that taints Wall Street's prognostications. After controlling for the forecasts' lead time and whether or not they were made during a recession, we find that even our relatively crude model can improve upon the Wall Street consensus for forecasts made more than a quarter in advance (see chart 2).

Adjusting for bias in short-term forecasts is harder. It is tempting simply to accept the errors—after all, they tend to be off by just a little. Data from Bloomberg show that the 320 S&P 500 companies that beat earnings expectations in 2015 did so only by a median of 1.4%. An alternative is to look at crowdsourcing websites such as Estimize. There punters—some amateur, and some professional—are shown Wall Street consensus estimates and asked to make their own forecasts. Estimize users beat Wall Street estimates two-thirds of time.

To some extent, judging Wall Street by its ability to make accurate predictions is silly. Harrison Hong, an economist at Columbia University, reckons that stock analysts should be viewed "more like media". The latest forecasts aggregated by Thomson Reuters suggest that the S&P 500 will yield earnings per share of $130.83 in 2017 and $146.33 in 2018. According to our model, that would imply that they believe the actual numbers will be closer to $127.85 and $134.30. Share analysts want to tell the truth. They just like making it difficult. ■



Wall St.'s woeful forecasting not getting better

David Parkinson The Globe and Mail

PublishedFriday, May. 21 2010, 6:00 PM EDT

http://www.theglobeandmail.com/globe-investor/investment-ideas/wall-sts-woeful-forecasting-not-getting-better/article4353202/

Nearly a decade ago - about the time the bursting tech bubble had raised serious questions about conflicts of interest in Wall Street equity research - consulting firm McKinsey & Co. did a study on the accuracy of analysts' company earnings forecasts. The results were discouraging: Analysts were routinely over-optimistic about earnings growth, too slow to revise forecasts when economic conditions changed, and prone to increasingly inaccurate forecasts when the economy slowed.

Since then, major scandals involving tainted research have come to light, Wall Street's biggest firms have paid $1.4-billion (U.S.) in penalties for those practices, and regulators have put rules in place aimed at creating equity research with more independence and distance from the investment-banking side of the business. Unfortunately, McKinsey reports, the changes have had little effect on the accuracy of analysts' projections.

Downturn reveals same old habits In an update of the 2001 study, McKinsey researchers found that from 2003 to 2006, analysts' earnings projections actually did look less unrealistically rosy. In each of those years, analysts, on average, actually underestimated S&P 500 annual earnings for significant portions of the year - and undershot through the entire year in 2005 and 2006.

But lest we think this was evidence of a new kind of thinking within Wall Street research departments, the Street's wide-eyed optimism came back with a vengeance starting in 2007.

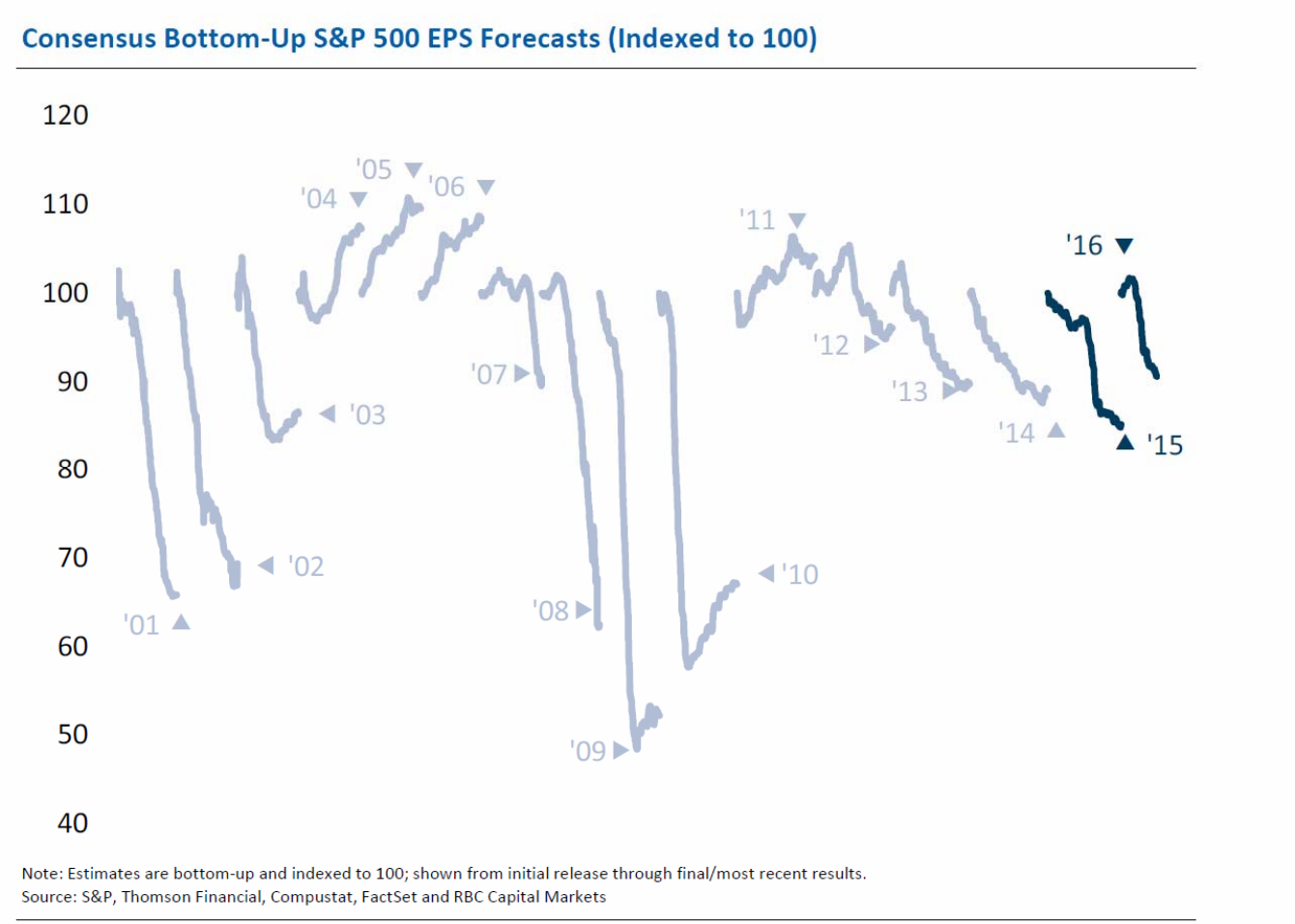
Going back over the past 25 years, McKinsey found that, on average, analysts' earnings-growth forecasts "have been nearly 100-per-cent too high." Annual S&P 500 consensus growth forecasts have typically been in the 10- to 12-per-cent range, while actual earnings growth has averaged 6 per cent.

Broken-clock accuracy Looking at five-year rolling average growth estimates, there have only been two periods in the past 25 years when the earnings met or exceeded analysts' forecasts. Both were in recovery periods after the U.S. recessions of the early 1990s and the early 2000s.

"This pattern confirms our earlier findings that analysts typically lag behind events in revising their forecasts to reflect new economic conditions," McKinsey researchers wrote. "When economic growth accelerates, the size of the forecast error declines; when economic growth slows, it increases."

This pattern means that when the analysts are accurate with their forecasts, it's sort of the same way a broken clock is accurate - twice a day.

"As economic growth cycles up and down, the actual earnings S&P 500 companies report occasionally coincide with the analysts' forecasts."



Source: RBC Investment Strategy Playbook, February 2016