Imperial College London

Corporate Finance Online: Coursework 1

Fair Valuation of the S&P 500 Index using the Dividend Discount Model

Group 34

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Introduction

Shares constitute an ownership unit that may be of interest in a corporation or financial asset that allows for an equal distribution of any profits that are declared, which exist in the form of dividends (Ross, 2018). This can be evaluated to assess the potential returns in the future through various evaluation techniques that include both the Dividend Discount Model (DDM) and the Discounted Cash Flow (DCF).

The DDM is a quantitative measure used to forecast the price of the company's stock based on the theoretical application that its present-day price is valued as the sum of all its future dividend payments, once it is discounted back to the present value (Chen, 2018). On the other hand, the DCF is a method of valuation that projects an investment value estimate based on future cash flows. In general, the DDM is like the DCF valuation method except that the DDM mainly focuses on dividends. As is the case with the DCF method, it is worth noting that future dividends are worth less due to the time value of money (Ross, 2018).

In addition to this, greater valuation methods for the assessment of equity markets have been developed over time. This includes the price-earnings ratio that provides an indicator to the price's investors are willing to pay in relation to company earnings. There is also another popular valuation measure referred to as the Fed Model which looks at the relationship between earnings and bond yields (Board of Governors of the Federal Reserve System, 1997). Both valuation methods are closely associated with the DDM model in market evaluation analysis (Wetherilt & Weeken, 2002). Within this project, the chosen valuation technique that will therefore be utilised to analyse the fair value estimation of the S&P 500 Index is the DDM.

The application of this DCM model involves a multitude of approaches for scenarios with a dependency on zero-dividend growth and a constant dividend growth rate. The most commonly used approach that is used and will be implemented in this project for the fair valuation of the S&P 500 Index is stated in Equation 1 below.

$$P_0 = \frac{Div_1}{1+r_E} + \frac{Div_2}{(1+r_E)^2} + \frac{Div_n + (\frac{Div_n(1+g)}{r_E - g})}{(1+r_E)^3} \qquad \text{Equation 1}$$

Strengths and Weaknesses

The DDM model has no market premonitions or high-detailed yet potentially volatile factors. This is advantageous because it rids the market of noise whilst also making it comparable to foreign industries (as it has not been swayed by biases within). DDM being the only valuation technique with this philosophy makes it appealing for long term valuations. The relatively neutral stock price value derived from DDM makes it simple to draw comparisons

between stocks as the only discriminants are dividends (taken as constant) and returns. On the other hand, the model is susceptible to inaccuracies due to assumptions that must be made such as dividends being paid at the end of each year thus making it a requirement to calculate this from quarterly payments: an unreliable practice claiming summing quarterly dividends is not the equivalent to the total dividends at the end of the year.

The model is simplistic, so one parameter change alters the valuation meaning the source of data for the parameter change (dividends) must be reliable. Backlash from the simple approach is small compared to benefits, though some parameters such as marketing prowess (through influence or loyalty) are hard to factor in yet play a reasonable part in a stock's price.

On the other hand, the DDM method avoids the arduous calculation processes entailed in going through valuations of 500 companies (Standard & Poor's 500) which is what comes with choosing DCF analysis. While DDM is also suitable from companies from wholesale to insurance; a quality not evident in other models. It is also a good means of forecasting a stock by indicating if it is being overbought or oversold. This is done by predicting future dividends. Unfortunately, dividends are not the only way an investor receives returns and there is no reasonable way to monitor stock buybacks, so this causes an obstruction in the calculation of dividends. Predicting dividends also implies predicting the firm's borrowings which is a value decided by management (J. Berk, P. DeMarzo, 2016), which is a set of calculations and opinions that are hard to simulate.

One perceived large flaw of the DDM would be its lack of atonement for companies that pay no dividends – a prevalent trend for recent times (Facebook a key influencer of this point sitting at #5 of S&P 500). This makes for an undervaluation however for the case of other noise, the DDM deals with it well: for instance, Amazon and Walmart sometimes conserve each other's impact on the index by being competitors, and the DDM doesn't get faked out due to its simple formula not pricing too much in [$r_e = Div_1/P + growth$], where r_e is returns and P is the current yield.

Overall, the DDM method is a simple formula providing efficient valuation and predictions for company dividends to serve as an indicator that can check for overvaluation/undervaluation and a general of the stock which is as valid for the present as it is for the future.

Methodology

From the data in Table 1 of Appendix A we can calculate that the historical average for g has been 1.7% growth per quarter. When we plot the data as presented in Figure 1 in Appendix A, we can also see from the annual average dividend that this value has been accurate in the last few years. We can also use the more up-to-date data at (Multpl, 2018) (Spindices, 2019) (Quandl, 2018) to calculate an average annual dividend growth of 5.98% which makes the quarterly growth rate 1.50%.

It is widely accepted that US GDP is highly correlated to earnings growth in the US economy in the long term. Since S&P 500 is a broad-based index and captures 80 percent of the market capitalisation of the stock market (Amadeo, 2018), the US GDP growth rate can be used as a proxy for our dividend yield growth rate. The historical mean of US GDP growth rate is 6.45% (Multpl, 2018). 6.54/4 = 1.64% lines up with our other estimations.

We will take the average of our historical dividend growth and long-term US GDP growth as our quarterly estimation of g.

$$g = \frac{1.64+1.50}{2} = 1.57\% \qquad \text{Equation 2}$$

The annualised dividend rate for the S&P for the last 36 months, paid in monthly instalments is 1.73% (Ycharts, 2019), far below the historical average of 4.41% (Beers, 2018). In report published by the CME group, the 2019/20 financial year predicted quarterly dividends for the per share are the following: $14.00, $14.50, $14.00 & $14.50. The annual dividend payout projection for the years 2020-22 are the following: $58.950, $60.300 & $61.500 (CME, 2019).

The rate of return, R_E, is the amount of profit or return that an investor would expect to receive for risking their capital and investing in a market. It can be used to give an indication as to how profitable a market will be in the future and whether it would be worth the risk of investing. A smaller value of R_E, generally means that a smaller risk is involved in investing, which is often the case with the consistent companies of S&P 500 index (Murphy, 2019).

Although it is a good indicator whether an investment is worth the risk, it does not consider inflation. There are many ways to calculate the rate of return, one of which uses the Capital Asset Pricing Model (CAPM). The aim of using this method is to determine whether the price of a stock is valued fairly considering the risk and the time of investment compared to the expected return. Although this model is commonly used it is completely accurate as several assumptions are made which isn't always applicable. For the valuation in this report a predicted value of R_E was 8.4%. (Ycharts, 2019).

Macroeconomic Considerations

Since the great recession of 2007/08, the S&P 500 has grown by over 280%, and as of 22nd August, this economic recovery which began in 2008 is the longest period of economic expansion in the United States (Sraders, 2019). However, from the high 3% GDP growth rates witnessed in 2018 (Kelleher, 2018), forecasters from Goldman Sachs have predicted that annual growth rate to slow down to 1.8% in 2019 (Kelleher, 2018). Furthermore, the recent $1.5 trillion tax-cuts (Stewart, 2018) enacted by the Trump administration which lowered corporate taxes from 35% to 21% have inflated the stock market. A report published by Goldman Sachs have estimated that S&P 500 companies have spent over $650 billion (Stewart, 2018) since the tax cuts were passed into stock buy-backs. The average S&P 500 firm's share is currently selling at 18x forward earnings and 25x trailing earning (Berman,

2018) – such an inflated price is not indicative of actual earnings but of dangerous speculative bubbles.

Additionally. the federal deficit has already reached over a $1 trillion, consequently the tightening of monetary policy by the Federal reserve may not be enough to control future inflation – the CIP has reached 2.4%, higher than the Fed target of 2% (Cox, 2018). Consequently, the Federal reserve is considering increasing the interest rates to 2.5 % by the end of the year – with already there being nine straight rate increases since December 2015, which marked the end of quantitative easing (Fleming, 2019).

Finally, international trade, and the global rise in protectionism with new and expensive tariffs and other buyers also threaten corporate incomes. With the current 25% tariffs on $200 billion of Chinese imports, with an additional 10% on a further $200 billion, Donald trump has begun a trade war which has already adversely affected the economy, with GDP growth figures downgraded by 0.44%.

Furthermore, Trump has indicated that American adopt similar protectionist measures against other trading partners, thus further fuelling the costs incurred by American businesses.

Results

The fair value estimation is done on a constant growth assumption. The growth figure calculated at 1.57% is done on a quarterly basis, which is required to be projected annually to a figure of around 6.28% when multiplied by a factor of 4, whilst the market return is estimated that to be 8.4%. Both these figures are calculated on approximations of an annual value over a duration of 20 years.

$$Perpetual\ Value = \frac{Div_1}{r_E - g} \qquad \text{Equation 3}$$

$$Perpetual\ Value = \frac{58.950}{0.084 - 0.062} = 2679.54$$

The current market price on the S&P 500 Index is $2782.24 as of February 20th 14:00 EST. According to our valuation the S&P 500 is 3.8% overvalued.

To conclude, it is clearly evident that the S&P 500 Index will witness a correction in value in the coming months. As highlighted earlier, the current macroeconomic environment indicates that we are near the end of the business cycle, thus an economic downturn as predicted by numerous experts is at the horizon.

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Appendix

Table 1: the numerical data collected over a specified time interval on the quarterly dividends per share and its respected price.

S&P 500 Quarterly Data

QUARTER END	CASH DIVIDENDS PER SHARE	PRICE
31-12-18	$14.19	2,506.85
28-09-18	$13.66	2,913.98
29-06-18	$13.10	2,718.37
29-03-18	$12.79	2,640.87
29-12-17	$12.78	2,673.61
30-09-17	$12.31	2,519.36
30-06-17	$12.12	2,423.41
31-03-17	$11.72	2,362.72
31-12-16	$12.02	2,238.83
30-09-16	$11.36	2,168.27
30-06-16	$11.28	2,098.86
31-03-16	$11.04	2,059.74
31-12-15	$11.35	2,043.94
30-09-15	$10.79	1,920.03
30-06-15	$10.69	2,063.11
31-03-15	$10.55	2,067.89
31-12-14	$10.47	2,058.90
30-09-14	$10.02	1,972.29
30-06-14	$9.76	1,960.23
31-03-14	$9.19	1,872.34
31-12-13	$9.52	1,848.36
30-09-13	$8.91	1,681.55
30-06-13	$8.61	1,606.28
31-03-13	$7.95	1,569.19
31-12-12	$8.93	1,426.19
30-09-12	$7.77	1,440.67
30-06-12	$7.45	1,362.16
31-03-12	$7.09	1,408.47
31-12-11	$7.28	1,257.60
30-09-11	$6.50	1,131.42
30-06-11	$6.49	1,320.64
31-03-11	$6.16	1,325.83
31-12-10	$6.03	1,257.64
30-09-10	$5.66	1,141.20
30-06-10	$5.58	1,030.71
31-03-10	$5.46	1,169.43
31-12-09	$5.66	1,115.10
30-09-09	$5.35	1,057.08
30-06-09	$5.44	919.32
31-03-09	$5.96	797.87
30-09-08	$7.04	1,166.36
30-06-08	$7.10	1,280.00
31-03-08	$7.09	1,322.70
31-12-07	$7.62	1,468.36
30-09-07	$6.90	1,526.75
30-06-07	$6.69	1,503.35
31-03-07	$6.52	1,420.86
31-12-06	$6.87	1,418.30
30-09-06	$6.09	1,335.85
30-06-06	$6.02	1,270.20
31-03-06	$5.91	1,294.83
31-12-05	$6.08	1,248.29
30-09-05	$5.43	1,228.81
30-06-05	$5.36	1,191.33
31-03-05	$5.34	1,180.59
31-12-04	$5.33	1,211.92
30-09-04	$4.88	1,114.58
30-06-04	$4.66	1,140.84
31-03-04	$4.56	1,126.21
31-12-03	$5.06	1,111.92
30-09-03	$4.32	995.97
30-06-03	$4.09	974.50
31-03-03	$3.92	848.18
31-12-02	$4.26	879.82
30-09-02	$3.90	815.28
30-06-02	$4.15	989.81
31-03-02	$3.77	1,147.39
31-12-01	$3.98	1,148.08
30-09-01	$4.14	1,040.94
30-06-01	$3.84	1,224.38
31-03-01	$3.78	1,160.33
31-12-00	$3.98	1,320.28
30-09-00	$4.09	1,436.51
30-06-00	$4.12	1,454.60
31-03-00	$4.08	1,498.58
31-12-99	$4.05	1,469.25
30-09-99	$4.45	1,282.71
30-06-99	$4.18	1,372.71
31-03-99	$4.01	1,286.37
31-12-98	$4.00	1,229.23

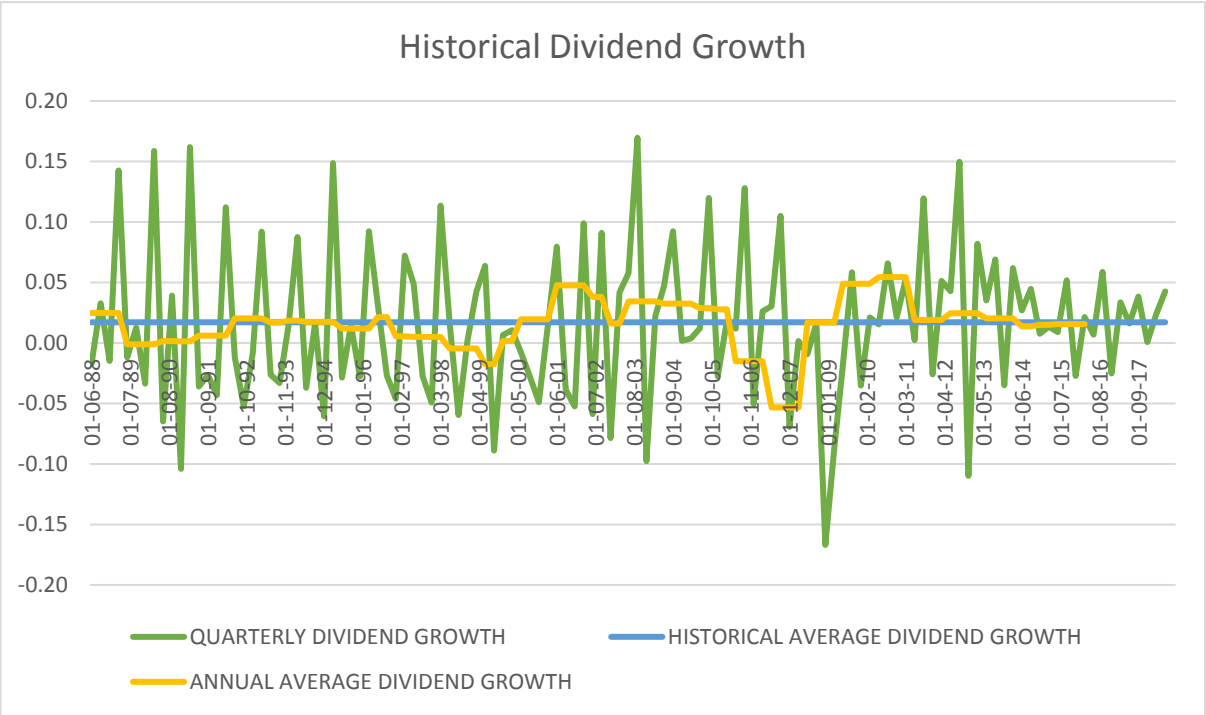

Figure 1: Graph to illustrate the dividend growth on a quarterly and annual basis between 1988 and 2017.