Application of the dividend discount model to Infosys
Vinita Mungikar, Muralidhar. K.S.V
MBA student, School of Management Studies, JNTU, Hyderabad, Andhra Pradesh, India
vinitamungikar@gmail.com

ABSTRACT
This paper provides a detailed illustration of the Dividend Discount Model (DDM) applied to Infosys and thus evaluate the approximate actual value of its stock and compare it with its market value. This comparison would determine whether the stock is overpriced or underpriced. Based on this, the investors can take a decision regarding their investment in that particular stock and can also take a buy or sell decision. If the market price of the stock is higher than its intrinsic value, then the stock is overpriced. It is believed that it will realize its intrinsic value in the long run i.e. its price goes down, so the investors are suggested not to invest in that stock or sell the stock. Whereas, if the market price of the stock is lower than its intrinsic value, then the stock is underpriced. It is believed that it will realize its intrinsic value in the long run i.e. its price goes up, so the investors are suggested to invest in that stock or buy the stock. From the study it is found that the equity share price of Infosys is overvalued in the Indian stock markets after comparing the intrinsic value of the stock found in the study with the market value of the stock.

Keywords: Dividend, Expected dividends, Stock, Capital Asset Pricing Model, Intrinsic value, Market price.

1. Introduction

1.1 Dividend discount model

The Dividend discount model is a procedure for valuing the price of a stock using predicted dividends and discounting them back to present value. The simplest model for valuing equity is the dividend discount model. When an investor buys stock, he generally expects two types of cash flows - dividends during the period he holds the stock and an expected price at the end of the holding period. Since this expected price is itself determined by future dividends, the value of a stock is the present value of dividends through infinity.

Value per share of stock = \[ \sum_{t=1}^{\infty} \frac{E(DPS_t)}{(1+k_e)^t} \]

Where,

DPS_t = Expected dividends per share

k_e = Cost of equity

There are two basic inputs to the model - expected dividends and the cost on equity.
To obtain the expected dividends, we make assumptions about expected future growth rates in earnings and payout ratios. The required rate of return on a stock is determined by its riskiness, measured differently in different models - the market beta in the CAPM, and the factor betas in the arbitrage and multi-factor models. The model is flexible enough to allow for time-varying discount rates, where the time variation is caused by expected changes in interest rates or risk across time.

1.2 Two-stage dividend discount model

The two-stage growth model allows for two stages of growth - an initial phase where the growth rate is not a stable growth rate and a subsequent steady state where the growth rate is stable and is expected to remain so for the long term. While, in most cases, the growth rate during the initial phase is higher than the stable growth rate. The model is based upon two stages of growth, an extraordinary growth phase that lasts n years and a stable growth phase that lasts forever afterwards.

Value of the Stock = PV of Dividends during extraordinary phase + PV of terminal price

Terminal price \( P_n \) = \( \frac{\text{DPS}_{n+1}}{k-g} \)

where \( \text{DPS}_{n+1} \) is the dividend per share.

\( k \) is the cost of equity.

\( g \) is the steady state growth rate forever.

2. Review of literature

Equity analysts should value the stocks in same manner as the corporate value their projects. A security analyzer should always think about his valuation, the way a corporate manager would work on his project. For projects, managers would estimate cash flows and discount them to present and later, analyze and think whether to accept the project or not. Similarly an analyzer should work in the way for the valuation of a particular company.

Analysts refer to the values obtained through models as “Intrinsic values”. These values are compared with the current market value of the company and the extent to which there is change in these values is termed as over or under valuation of a company. These valuations can be taken as basis for Buy/Sell recommendations.

The price movement dependency on the efficiency of firm is a question which has been debated for long. As such there is no efficient valuation model which would answer the above question but as such traditionally the dividend discount model has been approved to be the closest for identifying price movement dependency on efficiency of firm. Many analysts believe that DDM provides a good approximate description of stock price determination, at least for the aggregate market.

These valuation models not only help the security analysts and portfolio managers but also corporate managers to a great extent. These valuations can be taken as basis for stock performance of company and the performance of managers as well. Corporate firms reward the managers on the positive performance of stock, to avoid the agency problems. The intrinsic values are tools to best judge their performance (Maddens 2007).
Market prices provide the necessary information on performance of managerial skills but the change in the prices in market is due to many reasons, very few being managerial. Thus the intrinsic value which is obtained by using valuation models serves the purpose of measuring managerial performances of company. Off late, various financial text books and also theories have been emphasizing the need for maximizing the intrinsic values than the market values. (Brigham and Houston 2007)

The dividend discount model (DDM) is typically the first stock valuation model introduced to finance students. The rationale for the model, along with the constant growth variant, is based on it being an application of the (net) present value concept. In virtually all finance textbooks, both the present value and the dividend discount model are derived intuitively rather than as an outcome of utility maximizing agents. DDM is often presented by viewing future dividends as the sum of cash flows discounted by investor required returns and expected dividend growth. More advanced stock valuation models, such as the capital asset pricing model (CAPM), can also be derived using intermediate theory. Doing so, however, requires the development of both the utility model and how the models handle risk. As such it is difficult to cover the topic adequately over the course of a usual term, considering utility theory tends to be located near the back of textbooks (Norman, Schlaudraff, White, Wills, 2012)

Modern finance theories focus on maximizing an investor’s return at a given level of risk (Mirza, 2005). CAPM was developed in the mid 1960s, in order to express the relationship between an asset’s risk and return (Sharpe, 1964;Lintner, 1965; Mossin, 1966). The underlying principle in the CAPM is that company or industry-specific events have very little impact on an asset’s required return. The relevant risk is the market risk, which refers to the sensitivity of the asset’s returns to the returns of the market as a whole, which is reflected in beta (Mirza, 2005).

In the studies conducted by Shin and Soenen (1998), Deloof (2003), Raheman and Nasr (2007) and Teruel and Solano (2007) it was concluded that there is a negative relationship between profitability of a firm and cash conversion cycle. Thus, it is possible to increase firm profitability through more efficient working capital management. To realize this, it is necessary that main elements of cash conversion cycle should be managed in a way they maximize firm profitability. An efficient working capital management will increase the growth opportunities and returns of stockholders.

It is not right to assume that companies grow over a constant rate in lifetime. During its lifetime it grows at different rates at different times, generally the company grows very fast in the early age and this growth is higher than the growth of economy as a whole and finally they grow at a rate lower than the economy. Automobile manufacturers in the 1920s, computer software firms such as Microsoft in the 1980s, and wireless firms in the early 2000s are examples of firms in the early part of the cycle; these firms are called supernormal or non-constant, growth firms. (Eugene F. Brigham, Joel F. Houston).

First, we assume that the dividend will grow at a non-constant rate (generally a relatively high rate) for ‘N’ periods, after which it will grow at a constant rate, ‘g’. ‘N’ is often called the terminal date, or horizon date. Second, we can use the constant growth formula, to determine what the stock’s horizon, or terminal, value will be ‘N’ periods from today.
3. Research objectives

The objective of study is to determine the approximate actual value of stock of Infosys and comparing with its market value and determine whether the stock is overvalued or undervalued.

4. Research methodology

The study is based on “Analytical Research” where, the intrinsic value of Infosys’ stock is calculated and is compared with the current market price to find whether the stock is overvalued or undervalued in the Indian stock markets. The data is collected from secondary data sources like Infosys’ annual reports.

5. Data analysis and interpretation

5.1 Applying Dividend Discount Model (DDM) to Infosys

The following table shows the dividends paid by Infosys for the period from 2005 to 2012. The dividends per share are clearly given in the annual reports of Infosys.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend per share (in ₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>11.5</td>
</tr>
<tr>
<td>2006</td>
<td>15</td>
</tr>
<tr>
<td>2007</td>
<td>11.5</td>
</tr>
<tr>
<td>2008</td>
<td>13.25</td>
</tr>
<tr>
<td>2009</td>
<td>23.5</td>
</tr>
<tr>
<td>2010</td>
<td>25</td>
</tr>
<tr>
<td>2011</td>
<td>60</td>
</tr>
<tr>
<td>2012</td>
<td>47</td>
</tr>
<tr>
<td>Average</td>
<td>26</td>
</tr>
</tbody>
</table>

(Source: Compiled from Infosys’ annual reports.)

5.2 Calculating future and present values of dividends for Infosys for 2013 - 2017

The dividend paid per share in the year 2012 is ₹47. However, because the dividends paid per share by Infosys over the period from 2005 to 2012 is not growing at a constant rate, so the average value for the period from 2005 to 2012 of ₹26 is used to estimate the future values of the dividend per share assuming a required rate of return of 13.39% and an expected growth rate of 9.07% (Calculations of expected growth rate are shown below).

Expected payout ratio = Dividends per share/Earnings per share = 47/145.83=0.32.

Expected growth rate = Retention ratio * Return on equity = (1-0.32)*(0.1339) = 9.07%.

The projected dividend per share for year 2017 is ₹40. The terminal value for year 2017 is ₹526 which is equal to ₹42 divided by the required rate of return, 13.39% minus the anticipated growth rate of 5.4%, which is assumed to be the same as the growth rate of the economy. The present value of P₅ is ₹281. Calculations are shown below.
Table 2: Expected and present values of Expected dividends of Infosys

<table>
<thead>
<tr>
<th>Year</th>
<th>E(DPS) (in ₹)</th>
<th>PV[E(DPS)] (in ₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>2014</td>
<td>31</td>
<td>24</td>
</tr>
<tr>
<td>2015</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td>2016</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>2017</td>
<td>40</td>
<td>21</td>
</tr>
</tbody>
</table>
(Source: Authors’ own)

\[
\text{DPS}_6 = \text{DPS}_5 \times (1+g) = 40 \times (1+0.054) = 42.
\]

\[
P_5 = \text{DPS}_6 / (r-g) = 42 / (0.1339-0.054) = 526.
\]

\[
\text{PV} (P_5) = 526 / (1+0.1339)^5 = 281.
\]

Table 3: Dividend, Terminal value (P₅) and present value of P₅ of Infosys for 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend (in ₹)</th>
<th>P₅ (in ₹)</th>
<th>PV(P₅) (in ₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>42</td>
<td>526</td>
<td>281</td>
</tr>
</tbody>
</table>
(Source: Authors’ own)

The discounted present value of the dividends per share of the five years from 2013 to 2017 is ₹115 and the present value of the terminal value is ₹281. The total share price of Infosys is ₹396. The actual market value of share of Infosys on May 2, 2013 is ₹2286.90.

Table 4: PV [E(DPS)], PV(P₅) and their total value for Infosys

<table>
<thead>
<tr>
<th>PV[E(DPS)] (in ₹)</th>
<th>PV(P₅) (in ₹)</th>
<th>Value of share (in ₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>281</td>
<td>396</td>
</tr>
</tbody>
</table>
(Source: Authors’ own)

Initially, Infosys’s dividend is assumed to grow at an extraordinary rate of 9.07% for 5 years and the expected dividends are calculated accordingly. After 5 years, it is assumed that the extraordinary growth period comes to an end and the dividends grow at a normal rate which is equal to the growth rate of the country’s economy. The normal growth can be less than or

---

1 E(DPS) - Expected dividends per share for Years 2013 to 2017, assuming a growth rate of 9.07%.

PV[E(DPS)] - Present value of expected dividends per share for years 2013 to 2017 discounted at the required rate of return on equity for Infosys of 13.39%.

2 P₅: Terminal Value of the dividend per share by the end of year 2017. PV(P₅): Present value of P₅.
equal to the growth rate of economy but cannot be more than that. The present value of dividends is calculated by discounting the expected dividends using the cost of equity, which is calculated using capital asset pricing model (CAPM). The approximate actual value of share is the sum total of the present values of the expected dividends during the period 2013 to 2017 and the present value of the terminal value of price of share by the end of the year 2017.

6. Findings

1. The intrinsic value of Infosys’ stock is found to be ₹396 and its market value on May 2, 2013 was ₹2286.90.

2. Infosys’ stock is overvalued in the Indian stock markets.

7. Limitations of the study

The study doesn’t focus on identifying the reasons behind the deviation of the market value of the Infosys’ stock from its intrinsic value. This study is limited only to Infosys.

8. Conclusion

The Dividend Discount Model (DDM) is applied to calculate the approximate actual value of a stock and this value is compared with the market value of the stock. This comparison enables the investors and financial analysts to take a decision of investing in a particular company. The dividends paid per share by Infosys during 2005-12 are growing, but not at a constant rate, so it is assumed that the growth is in two stages, according to the Two-stage Dividend Discount Model. Initially, it is assumed that the dividends grow at an extraordinary rate of 9.07% for 5 years. After 5 years, it is assumed that the growth of the dividends returns back to a normal growth rate, which lasts forever. The normal growth rate is assumed to be equal to the growth rate of the economy which is equal to 5.4%. By the application of DDM to Infosys, the approximate actual value of its stock is found to be ₹396 and the actual market value of share of Infosys on May 2, 2013 is ₹2286.90. The conclusions that can be drawn from the comparison of the actual and market values are as follows

1. There is a wide gap between both the values.
2. The stock’s market value is more than its actual worth.
3. For investors:
   i) The stock may not give high rate of return.
   ii) The profit margins will be very low.
   iii) It is a sell stock.
4. For the company:
   i) The stock is over-valued.
   ii) The expectations from investors will be high.
   iii) The company should consider intrinsic values rather than market values.
9. Future work

Similar kind of study can be carried out to compare the intrinsic (actual) value and the market value of another company’s stock and guide the investors in their investment decisions. The study can also focus on finding the reasons behind the deviation of the market value of a company’s stock from its intrinsic value.

Reference


6. Annual reports of Infosys from 2005 to 2012.
