# NICMAR

EXPLANATORY PERFORMANCE AND PREDICTING ACCURACY OF EQUITY VALUATION METHODS FOR CONSTRUCTION FIRMS IN INDIA: AN EMPIRICAL STUDY

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### NATIONAL INSTITUTE OF CONSTRUCTION

**MANAGEMENT AND RESEARCH**

**PUNE**

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**Date: 27.01.2020**

**DECLARATION**

We declare that the Project Work titled “Explanatory Performance and Predicting Accuracy of Equity Valuation Methods for Construction Firms in India: An Empirical Study” is bonafide work carried out by us, under the guidance of Prof. Harish Kumar Singla. Further we declare that this has not previously formed the basis of award of any degree, diploma, associate-ship or other similar degrees or diplomas, and has not been submitted anywhere else.

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#### CERTIFICATE

This is to certify that the Project Work entitled “Explanatory Performance and Predicting Accuracy of Equity Valuation Methods for Construction Firms in India: An Empirical Study**”** is bonafide work of Mr. J Nehal Reddy in partial fulfilment of the academic requirements for the award of Post Graduate Programme in Advanced Construction Management (PGP ACM). This work is carried out by him, under my guidance and supervision.

# *Signature of Guide*

**Prof. Harish Kumar Singla**

***Signature of Head***

**Head of PGP ACM**

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Date:

**EXECUTIVE SUMMARY**

Construction sector in India will remain buoyant due to increased demand from real estate and infrastructure projects. USD 650 Billion will be required for urban infrastructure over the next 20 years. As India’s urban GDP is expected to reach USD 7.5 trillion by 2030, accruing 75% of India’s total GDP, the country needs to develop over 170 million houses until 2030. With advancements in science and technology, economies from all corners of the globe have become interdependent and firms that do business in emerging and frontier economies are accessible to both consumers and investors from developed nations. With the ever-increasing growth of emerging economies, such as the BRIC nations, investors are looking for more and more ways to diversify their portfolios to include securities from these markets. However, a major issue that many fund managers and individual investors face is how to properly value companies that do the majority of their business in emerging market economies.

This paper provides academicians and practitioners with an overview of the applicability of income oriented and market oriented valuation models in an emerging economy. The contribution of this paper is to add empirical evidence to this research area. The purpose of this paper is to empirically examine the comparative accuracy and explanatory performance of discounted cash flow (DCF) & P/E multiple (PE\_M) valuation models for the Indian Construction sector to increase the valuation accuracy.

From the research conducted, it was observed that

**CHAPTER 1**

**INTRODUCTION**

**1.0 VALUATION**

Valuation is the analytical process of determining the current (or projected) worth of an asset or a company. There are many techniques used for doing a valuation. An analyst placing a value on a company looks at the business's management, the composition of its capital structure, the prospect of future earnings, and the market value of its assets, among other metrics. The concept of intrinsic value, however, refers to the perceived value of a security based on future earnings or some other company attribute unrelated to the market price of a security. That's where valuation comes into play. Analysts do a valuation to determine whether a company or asset is overvalued or undervalued by the market. Many people make the mistake of thinking cash-on-hand is the most important asset for a business, but the truth is that there are all kinds of important assets, including cash, inventory, real estate, investment, buildings and equipment. These assets are further classified into real vs. financial assets. It is important for an investor to understand the distinction between real vs. financial assets because changes in either of these types of assets can affect the trajectory of the business. Knowing the difference between real vs. financial assets and the difference between real investment and financial investment can help you refine the business goals and objectives.

**1.1 Purpose of the Study**

As mentioned, there are many business valuation methods out there. The best valuation approach typically depends upon why the valuation is required, the size of business, industry, and other factors. For instance, in a sale scenario, the majority of small private firms are sold as asset sales, while the majority of middle-market transactions involve the sale of equity. These scenarios would dictate different approaches to business valuation. The purpose of this study is to examine the comparative accuracy of valuation models for the Indian Construction firms and if time allows, propose a composite model to explore whether combining valuation models may improve valuation accuracy. Other factors that might come into play are management structure, projected earnings, share price, revenue, and more. Several studies have been conducted to inspect capability of one or more of these valuation models to generate rational assessments of values, but these outcomes are uneven.

**1.2 Background**

Nevertheless, having surveyed wide-range of literature available on valuation, we find that even after having the standard-setting work (Copeland, Koller, Timothy and Murrin (1990)) on valuation, the empirical studies (Frankel and Lee (1995; 1996), Kaplan and Ruback (1995), Penman and Sougiannis (1998), Francis et al. (2000), Levin and Olsson (2000), Plenborg (2002), Jiang and Lee (2005), Gross (2008), Dermine (2010) among others) have shown differing results on the subject of the most appropriate valuation model. Also, there is a little empirical evidence for construction industry. We moreover find that nearly all the studies in the literature are conducted in respect to developed nations and we are using those models as a proxy for valuing companies in developing nations. Getting driven with these concerns prevalent in previous research, we decided to empirically examine the comparative accuracy and explanatory performance of DCF (discounted cash flow), P/E multiple (PE\_M) valuation models for the Indian construction sector and check the valuation accuracy because previous literature shows that no particular method is convincingly accurate and precise in all circumstances. This paper attempts to provide academicians and practitioners with a snapshot of the applicability of valuation models by comparing the two methods stated above.

**1.3 The Three Main Categories of Valuation Methods**

In general terms, there are three approaches to valuation.

1. The first, discounted cashflow valuation, relates the value of an asset to the present value of expected future cashflows on that asset.

2. The second, relative valuation, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable such as earnings, cashflows, book value or sales.

3. The third, P/E ratio The latter are often called real options. There can be significant differences in outcomes, depending upon which approach is used. One of the objectives in this book is to explain the reasons for such differences in value across different models and to help in choosing the right model to use for a specific task.

**CHAPTER 2**

**REVIEW OF LITERATURE**

Research studies on residual income accounting have provided theoretical arguments and empirical support for the view that the book value of equity, as well as earnings, is a key determinant of company value (Ohlson, 1995; Barth et al., 1998; Collins et al., 1999). (Lev and Sougiannis, 1996; Abarbanell and Bushee, 1997; Myers, 1999) examined the ability of additional signals, beyond earnings and the book value of equity, to predict future earnings, and explain company value. The fundamental variables put forward by Fama and French (1992) are: firm size (market capitalization), the book-to-market ratio, financial leverage, and the earnings-to-price ratio. One possible extension of the residual income approach is to incorporate additional determinants of company value which consider specific factors that influence firms in particular industrial sectors. Dimitrios C. Ghicas, Nikolaos Iriotis, Aphroditi Papadaki, and Martin Walkery, 2000 explored construction sector in UK considering incomplete contracts as variable and investigated the ability of incomplete contracts information to explain the earnings forecasts associated with the IPOs of construction firms in the Athens Stock Exchange (ASE). It provided empirical findings showing a significant positive association between stock returns subsequent to initial equity offerings and incomplete contracts. This association holded even when there were controls for ex ante uncertainty, size, leverage, earnings-to-price, and book-to-market ratios. The significant association between stock returns subsequent to the initial public offering and incomplete contracts at the moment of the public offering suggested inefficient utilization of the incomplete contracts information by the investment bankers and the stock market, it also pointed out the relevance of future revenues that had not been recognized by the accounting system in security valuation.

Kaplan and Ruback [1995] provide evidence on the ability of discounted cash flow estimates to explain transaction values for a sample of 51 firms engaged in high leverage transactions.Their results indicate that the median cash flow value estimate is within 10% of the market price, and that cash flow estimates significantly outperform estimates based on comparable or multiples approaches. Frankel and Lee [1995; 1996] found that AE value estimates explain a significantly larger portion of the variation in security prices than value estimates based on earnings, book values, or a combination of the two. Penman and Sougiannis (1998) provided a comparative analysis of dividend, cash flow, and abnormal earnings-based value estimates using infinite life assumptions. Irrespective of the length of the time horizon, PS found that abnormal earnings (AE) value estimates have significantly smaller (in absolute terms) mean signed prediction errors than free cash flow (FCF) value estimates, with dividend discount (DIV) value estimates falling in between. Moreover Jennifer Francis, Per Olsson and Dennis R. Oswald (2000) found AE value estimates more accurate, that explained more of the variation in security prices than FCF or DIV value estimates did and supported greater reliability of AE value estimates by the sufficiency of book value of equity as a measure of intrinsic value, and by the greater precision and predictability of abnormal earnings. Berkman, Bradbury, and Ferguson (2000) in their study compared the estimates of value obtained from conventional discounted cash flow and price earnings valuation methods to the market price. They suggested that the best discounted cash flow method and the best price earnings comparable method have similar level of accuracy. Levin and Olsson (2000) conferred that the company’s anticipated performance stays steady after the valuation horizon and that its expected development, as termed by its factors, holds indeterminately if the stable state condition is sustained. They also claimed that the

steady state condition is required for the three models to yield matching estimates when terminal values are used. Therefore, any desecrations in the steady state condition can originate internal discrepancies in valuation models and thus have a substantial impact on the equity value estimates. Plenborg (2002) also reasoned that Cash flow model (CFM), Dividend discount model (DDM), and Residual income model (RIM) valuation methods should provide consistent and matching estimates of intrinsic firm value, provided that the conjectures of the different variables are consistent with each other within a clean surplus relationship and all the assumptions are indistinguishable. Furthermore, for all sets of accounting rules, these models offer analogous estimates of value when infinite horizon forecasts are engaged. Conversely, these zero-error conditions are very limiting. Basically, forecasts are made over finite horizons so different accounting principles yield different estimations of value with finite-horizon forecasts. For this reason, steady state terminal values, which usually have substantial weight in equity valuation, are calculated in practice to correct inaccuracy lead by the truncated forecast horizon, and such calculations are required for all clean-surplus accounting approaches.

Gentry Reilly and Sandreho (2003) proposed an integrated valuation system (IVS) which allows for academia and practitioners to simulate alterations in the firm's financial strategy and the effects of these reforms on the value of a stock. Also, they theoretically suggested the conditions when the dividend discount model value estimates are equal to the cash flow model value estimates. They also stated that the only time for the equivalency situation is when the pay-out ratio is equal to one as well as the return on investment equals the cost of equity. Benada (2003) evaluated empirically whether, over five year valuation horizon, the DDM, FCF, and the RIM are empirically equivalent. Their results presented experimental support for these predictions of equivalence between these three price-based valuation models. Additionally, it was found that the price-based valuation models, within each class of the CFM and the RIM, outclassed the non-price based valuation model complemented with the supremacy of the RIM over CFM in both methods. Jiang and Lee (2005) also suggested that for equity valuation, book value and accounting earnings in residual income model hold more suitable information than dividends alone. Lundholm and O’Keefe (2001), Fernandez (2003), have criticized prior studies (e.g. Penman et al. (1998), Francis et al. (2000), and Courteau et al. (2000)) which lead an empirical support for the three theoretically equivalent valuation models, the DDM, FCF and the RIM comparison worthy, and concluded that there is nothing to gain from this comparison. Although, Lundholm et al. and Fernandez both were correct in theory but concerns related to forecast horizons and steady state conditions put forward by Planborg

(2002), Levin and Olsson (2000), and Jennergren (2008), were disregarded, which empirically supported the comparison of valuation models as these implementation matters resulting from applying it. Xavier and Vinolas (2003) offered a new corporate valuation method “Financial and Economic value added,” or FEVA which assimilated the Economic value added (EVA), DCF, and Modigliani and Miller (MM) methodologies. It holds a thorough analysis of financial and economic corporate value drivers. They propose that the new formula is specifically consistent with prior approaches, and holds the norm of one value and superior value estimates. Kenton (2004) believed that no single method is convincingly the most specific and exact in all circumstances. Thus, analysts quite often perform more than one method when they value a company. Kenton intended to bridge and instigate further research on it by recommending basic guidelines to combine value estimations. It is logical to compare and combine since each particular assessment offers information; hence being dependent on only single estimate might overlook information. As a result he proposed five thumb rules for coalescing two or more value estimates into a better superior value estimate. Yoo (2006), stated that coalescing some simple valuation estimates of a firm, each one of which is grounded on a stock price multiple to older accounting performance measure of the similar firms improves the valuation precision. Vardavaki and Mylonakis (2007) presented the notional frame for the methodical sequence of actions prerequisite for equity valuation and inspected the relative descriptive power of several equity valuation models when used on companies in the UK food and drug retail sector which as a result sustained the outcomes of prior studies that the combined valuation model is more informative since the accurateness of equity value estimate is superior for combined valuation model. It can be authenticated through the point that this model is in cooperation of economics and accounting features of the considered firms.

Liu, Nissim and Thomas (2007) inspected whether valuations established on cash flow multiples are superior than earnings multiple and found that in spite of instinctive assertions that operating cash flows are better than earnings as a measure of value, security prices are well described by reported earnings than by reported operating cash flows. Imam, Barker and Club (2008), discovered that both earnings multiples and DCF are used by analysts. On the other hand, book value multiples are less favored by the analysts in their study. Demirakos, Strong and Walker (2010) recommended DCF models are outperformed by earnings multiples. Additionally, Nissim (2011) in research stated that book value multiple accomplishes a lot more than other multiples and acclimatizing the book value multiples on ROE considerably improves the valuation accuracy of book value multiples. He also determined that in previous decade book value multiples have accomplished much better results than earnings multiples. In support of this, Deng, Easton and Yeo (2009) and Lie and Lie (2002) also advocated same on their analogous outcomes. Most of the work here was done on industrial sectors, some on banking and few on construction sector.

**CHAPTER 3**

**RESEARCH METHODOLOGY AND DATA**

**3.1 Data**

We took the data of construction sector companies from Centre for Monitoring Indian Economy (CMIE’s) prowess database, considering 70 Indian construction firms listed on Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) for the purpose of this study. Secondary data is collected. The study uses 9 years’ data starting from 2010 to 2018. Further, we split the data into two parts; the first part includes data from March 2010 to March 2015 for the purpose of earnings estimation and computation of intrinsic values. Second part includes data for price i.e. our proxy for market values from March 2018 for the purpose of comparison between computed intrinsic values and observed market values.

**Identified list of study variables**

|  |  |
| --- | --- |
| Earnings before interest tax depreciation and amortization | Operating income / EBI |
| Book value of equity | Market value of equity |
| Earnings per share | Price earnings growth |
| Enterprise Value | Price per share |
| Equity | Debt |
| Return on Equity | Capital Expenditure |
| Effective tax rate | Net Sales/ Revenues |
| Interest Rate | Assets |
| Cash flow | Growth Rate |
| Cost of equity | Dividend |
| Return on Investment | Discount rate |

**3.2 Research Methodology**

The study will use data for a certain period of time. Further, the data will be split into parts for the purpose of earnings estimation and computation of intrinsic values. The estimation and computation of Intrinsic Value will be based on Discounted Cash Flow (DCF), Price to Earnings Multiple (P/E). Further comparison was made between the estimates to arrive at the intrinsic values using these approaches. Moreover, comparisons of the models will be done based on prediction errors and the explanatory performance of market value on value estimates. Details of the models is discussed, studied and performed; shown in the next chapter.

**P/E Ratio Method:**

It is the ratio of the company's stock price to the company’s earnings per share. It is a common measure of how expensive a stock is.

Formulas and variables required for P/E Ratio method

*V =EPS1 x (P/E)*

P/E Two Measures= Industry Average and the company average of last 7 years

EPS1= EPS 2017 X growth in EPS over last 7 years

Benefits:

It helps investors analyze how much they should pay for a stock on the basis of its current earnings and also shows market is overvalued or undervalued.

**Discounted Cashflow Method:**

It can be used to value companies where the first stage has an unstable initial growth rate and there is a stable growth in the second stage which lasts forever. It is assumed that the dividend paid by a company also grows in the exact way i.e., two such stages.

Formulas and variables required for Discounted Cashflow Method:

*DCF (Discounted Cash Flow) Formula =ΣCFn / (1 +Ke)^n*

CFn = cash flow in period n

Ke = Cost of Equity

n = life of the asset which is valued.

It is not possible to forecast cash flow till the whole life of a business so cash flows are supplemented by incorporating a terminal value for the period thereafter. Terminal Value is a very important part of Discounted Cash flow formula and account for as much as 60%-70% of the Firm’s value and thus warrants due attention.

Under the Perpetual Growth Rate Method, the terminal value is calculated as

*TVn= CFn (1+G)/( r-g)*

Where,

TVn = Terminal Value at the end of the specified period

CFn = represents the cash flow of the last specified period

G = Growth in Cash flow (CAGR)

g = the growth rate

R= ROI (Required rate of Return)

**4 Data Analysis and Findings**

The company data for analysis was captured using CMIE-Prowess IQ using suitable filters. The historical data of 10 years i.e., from year 2010 till 2018 was selected for analysis considering the unvarying nature of it. The number of observations were 70 and variables concerning the P/E & DCF methods as mentioned in section 3.2 were captured.

* 1. Yearly Data & Variables

Yearly financial data of all 70 companies were collected from year 2010 till 2018 considering 26 variables viz. Company Name, Industry group, Profit after tax, Total liabilities, fully paid up equity capital, Net worth, Tangible net worth, Total outside liabilities, return on total assets, Total assets, Land and building gross, Plant & machinery-computers and electrical installations-gross, Furniture, social amenities and other fixed assets-gross, Transport & communication equipment and infrastructure-gross, Net cash flow from operating activities, Net cash inflow or (outflow) from investment activities, Net cash inflow or (outflow) from financing activities, Sum of Cash Inflow, Closing Price, Shares Outstanding, Market Capitalisation, Face Value, EPS, P/E, P/B, BV per Share, Enterprise value and, NIFTY closing

The list of companies are as follows

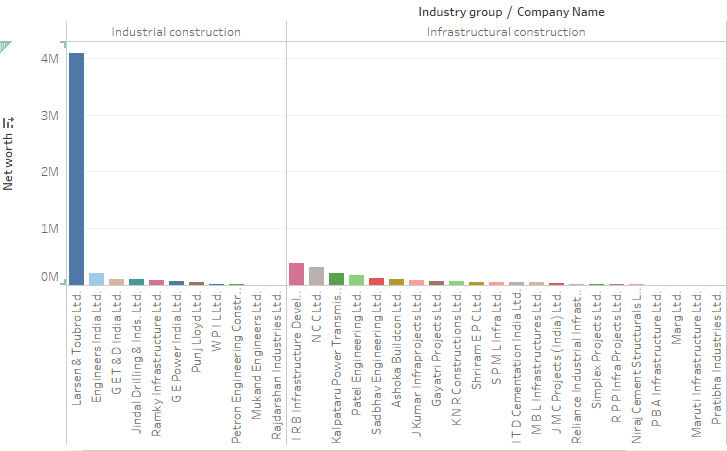
|  |  |  |  |
| --- | --- | --- | --- |
| **Serial Number** | **Company Name** | **Serial Number** | **Company Name** |
| 1 | A M J Land Holdings Ltd. | 2 | Ajmera Realty & Infra India Ltd. |
| 3 | Anant Raj Ltd. | 4 | Ashoka Buildcon Ltd. |
| 5 | Bajaj Electricals Ltd. | 6 | Brigade Enterprises Ltd. |
| 7 | D L F Ltd. | 8 | Elpro International Ltd. |
| 9 | Engineers India Ltd. | 10 | G E Power India Ltd. |
| 11 | G E T & D India Ltd. | 12 | Gayatri Projects Ltd. |
| 13 | Geecee Ventures Ltd. | 14 | Godrej Properties Ltd. |
| 15 | Housing Development & Infrastructure Ltd. | 16 | I R B Infrastructure Developers Ltd. |
| 17 | I T D Cementation India Ltd. | 18 | Indian Hume Pipe Co. Ltd. |
| 19 | J Kumar Infraprojects Ltd. | 20 | J M C Projects (India) Ltd. |
| 21 | Jaiprakash Associates Ltd. | 22 | Jindal Drilling & Inds. Ltd. |
| 23 | K E C International Ltd. | 24 | K M F Builders & Developers Ltd. |
| 25 | K N R Constructions Ltd. | 26 | Kalpataru Power Transmission Ltd. |
| 27 | Kamanwala Housing Construction Ltd. | 28 | Kolte Patil Developers Ltd. |
| 29 | Lancor Holdings Ltd. | 30 | Larsen & Toubro Ltd. |
| 31 | M B L Infrastructures Ltd. | 32 | M V L Ltd. |
| 33 | Manjeera Constructions Ltd. | 34 | Marg Ltd. |
| 35 | Maruti Infrastructure Ltd. | 36 | Mukand Engineers Ltd. |
| 37 | N C C Ltd. | 38 | N E L Holdings Ltd. |
| 39 | Niraj Cement Structural Ltd. | 40 | Oberoi Realty Ltd. |
| 41 | Omaxe Ltd. | 42 | P B A Infrastructure Ltd. |
| 43 | P V P Ventures Ltd. | 44 | Parsvnath Developers Ltd. |
| 45 | Patel Engineering Ltd. | 46 | Petron Engineering Construction Ltd. |
| 47 | Phoenix Mills Ltd. | 48 | Poddar Housing & Devp. Ltd. |
| 49 | Pratibha Industries Ltd. | 50 | Prerna Infrabuild Ltd. |
| 51 | Prime Property Devp. Corpn. Ltd. | 52 | Punj Lloyd Ltd. |
| 53 | R D B Realty & Infrastructure Ltd. | 54 | R P P Infra Projects Ltd. |
| 55 | Rajdarshan Industries Ltd. | 56 | Ramky Infrastructure Ltd. |
| 57 | Reliance Industrial Infrastructure Ltd. | 58 | Rodium Realty Ltd. |
| 59 | S P M L Infra Ltd. | 60 | Sadbhav Engineering Ltd. |
| 61 | Satra Properties (India) Ltd. | 62 | Shervani Industrial Syndicate Ltd. |
| 63 | Shri Krishna Devcon Ltd. | 64 | Shriram E P C Ltd. |
| 65 | Shristi Infrastructure Devp. Corpn. Ltd. | 66 | Simplex Projects Ltd. |
| 67 | Skyline Millars Ltd. | 68 | Sobha Ltd. |
| 69 | Supreme Holdings & Hospitality (India) Ltd. | 70 | W P I L Ltd. |

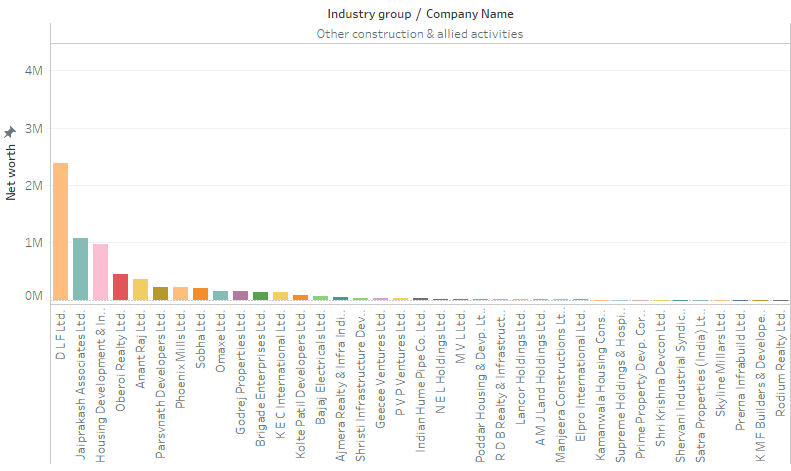
* 1. Data Interpretation

|  |  |
| --- | --- |
| *Descriptive Statistics for P/E population* | |
| M-Cap of Companies over the years | |
| Mean | 71961 |
| Median | 15318 |
| Standard Deviation | 226050 |
| Minimum | 40 |
| Maximum | 1267178 |
| Count | 32 |

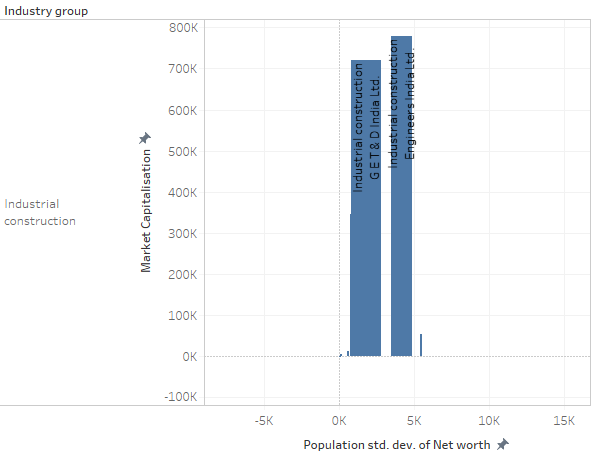
|  |  |
| --- | --- |
| *Descriptive Statistics for DCF population* | |
| M-Cap of Companies over the years | |
| Mean | 26341 |
| Median | 5083 |
| Standard Deviation | 61398 |
| Minimum | 43 |
| Maximum | 327682 |
| Sum | 842922 |
| Count | 32 |

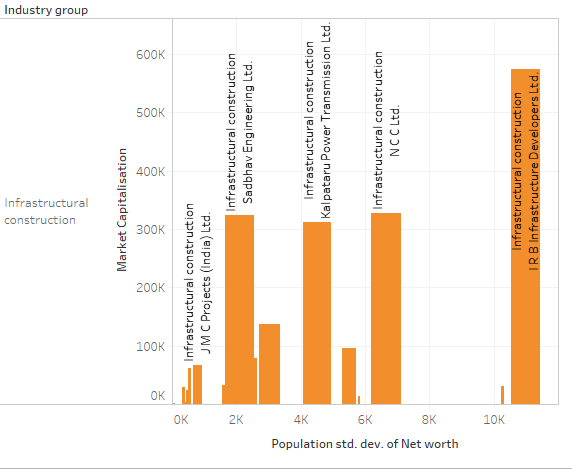
The nature of companies from the pool of 70 were categorized as:

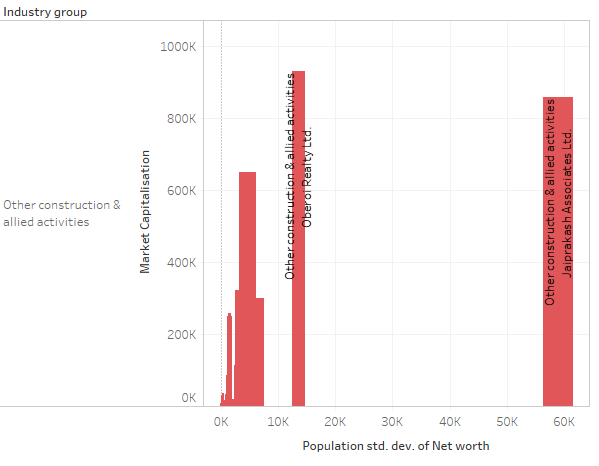




The following shows the spread of data across







4.3 Data Cleaning

Any observation containing the null/missing values which attributed towards an error in calculations was removed systematically and the remaining observations were undertaken for statistical analysis. The number of observations (Companies) selected for P/E & DCF valuation method was 32. The list of companies considered for the valuation methods are as follows:

|  |  |
| --- | --- |
| **DCF** | **P/E** |
| **Company Name** | **Company Name** |
|
| Anant Raj Ltd. | A M J Land Holdings Ltd. |
| Brigade Enterprises Ltd. | Ajmera Realty & Infra India Ltd. |
| D L F Ltd. | Anant Raj Ltd. |
| G E T & D India Ltd. | Ashoka Buildcon Ltd. |
| Gayatri Projects Ltd. | Brigade Enterprises Ltd. |
| Geecee Ventures Ltd. | D L F Ltd. |
| Housing Development & Infrastructure Ltd. | Engineers India Ltd. |
| I T D Cementation India Ltd. | Gayatri Projects Ltd. |
| Jaiprakash Associates Ltd. | Geecee Ventures Ltd. |
| Jindal Drilling & Inds. Ltd. | Godrej Properties Ltd. |
| K M F Builders & Developers Ltd. | I R B Infrastructure Developers Ltd. |
| Kolte Patil Developers Ltd. | Indian Hume Pipe Co. Ltd. |
| Lancor Holdings Ltd. | J Kumar Infraprojects Ltd. |
| M B L Infrastructures Ltd. | J M C Projects (India) Ltd. |
| Manjeera Constructions Ltd. | Jindal Drilling & Inds. Ltd. |
| Mukand Engineers Ltd. | K M F Builders & Developers Ltd. |
| Oberoi Realty Ltd. | K N R Constructions Ltd. |
| Omaxe Ltd. | Kalpataru Power Transmission Ltd. |
| Petron Engineering Construction Ltd. | Kolte Patil Developers Ltd. |
| Phoenix Mills Ltd. | Lancor Holdings Ltd. |
| Prime Property Devp. Corpn. Ltd. | Larsen & Toubro Ltd. |
| Punj Lloyd Ltd. | Manjeera Constructions Ltd. |
| R D B Realty & Infrastructure Ltd. | N C C Ltd. |
| R P P Infra Projects Ltd. | Oberoi Realty Ltd. |
| Ramky Infrastructure Ltd. | Omaxe Ltd. |
| Reliance Industrial Infrastructure Ltd. | Phoenix Mills Ltd. |
| S P M L Infra Ltd. | R P P Infra Projects Ltd. |
| Satra Properties (India) Ltd. | Reliance Industrial Infrastructure Ltd. |
| Shervani Industrial Syndicate Ltd. | Sadbhav Engineering Ltd. |
| Skyline Millars Ltd. | Shri Krishna Devcon Ltd. |
| Supreme Holdings & Hospitality (India) Ltd. | Sobha Ltd. |
| W P I L Ltd. | W P I L Ltd. |

* 1. Calculations

4.4.1 For P/E valuation method

The CAGR of EPS & P/E from 2010 to 2015 was calculated using the following formulas:

CAGR (EPS)=

CAGR (P/E)=

4.4.1.1 Value of the firm (V. Firm) – Predicted

= CAGR (EPS) x EPS 2015 & = CAGR (P/E) x P/E 2015

= CAGR (EPS) x EPS 2016 & = CAGR (P/E) x P/E 2016

= CAGR (EPS) x EPS 2017 & = CAGR (P/E) x P/E 2017

Value per share (VPS)

= x

= x

= x

Value of the firm (V. Firm) – Predicted

= x Shares Outstanding-16

= x Shares Outstanding-17

= x Shares Outstanding-18

4.4.1.2 Value of the firm (V. Firm) – Real

= x Shares Outstanding-16

= x Shares Outstanding-17

= x Shares Outstanding-18

**4.4.1.3 Hypothesis Testing**

The purpose of the test is to determine whether the difference between these two populations is statistically significant.

H0: µ1 = µ2 ("the paired population means i.e., & are equal")

H1: µ1 ≠ µ2 ("the paired population means i.e., & are not equal")

Confidence interval percentage considered: **95%**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **VFIRM-16-Predicted** | **VFIRM-17- Predicted** | **VFIRM-18- Predicted** | **VFIRM-16-P-Real** | **VFIRM-17-P-Real** | **VFIRM-18-P-real** |
| 2340.63 | 2650.64 | 3001.72 | 842.17 | 1227.79 | 831.74 |
| 6211.20 | 6078.58 | 5948.80 | 5013.89 | 11474.56 | 5851.95 |
| 10571.26 | 9036.99 | 7725.40 | 11597.52 | 21144.74 | 10659.35 |
| 35018.27 | 32713.09 | 45839.48 | 29585.51 | 45848.63 | 34994.11 |
| 18228.56 | 22929.91 | 24101.86 | 17099.67 | 42983.30 | 29865.97 |
| 177822.60 | 152528.34 | 130856.58 | 198727.07 | 462613.04 | 316351.57 |
| 154018.67 | 136853.62 | 129676.48 | 101662.40 | 126138.37 | 79167.88 |
| 30064.44 | 172970.56 | 210200.24 | 23770.22 | 40140.75 | 32917.00 |
| 3492.84 | 4098.61 | 4809.44 | 2562.40 | 3736.38 | 2817.72 |
| 66058.08 | 59807.33 | 57330.35 | 65368.49 | 150381.68 | 149066.55 |
| 86591.35 | 87663.46 | 88748.85 | 68993.29 | 83648.05 | 57573.98 |
| 24514.45 | 29266.59 | 34939.95 | 18323.01 | 21881.08 | 16306.06 |
| 31844.40 | 35933.17 | 40546.93 | 15518.16 | 22691.56 | 10067.76 |
| 8777.90 | 9165.96 | 47855.88 | 7463.05 | 20993.65 | 14616.72 |
| 3143.74 | 2514.47 | 2011.16 | 4847.96 | 5048.23 | 3286.86 |
| 20.30 | 15.45 | 11.76 | 57.81 | 55.98 | 20.06 |
| 97801.35 | 119558.04 | 146154.69 | 24035.94 | 45593.18 | 30019.78 |
| 42285.09 | 45339.06 | 48613.59 | 38041.25 | 72772.97 | 60222.90 |
| 14032.37 | 16819.28 | 20170.33 | 6344.37 | 27769.10 | 18152.56 |
| 1364.25 | 1232.86 | 1114.13 | 934.30 | 1405.26 | 821.72 |
| 1106040.59 | 1544255.35 | 1436543.50 | 1258733.34 | 1761318.67 | 2016805.87 |
| 501.84 | 432.43 | 372.62 | 694.62 | 894.40 | 624.32 |
| 38002.27 | 34277.66 | 33404.91 | 44738.82 | 74411.00 | 52895.94 |
| 91691.06 | 92446.55 | 99740.98 | 100048.79 | 162872.55 | 161883.35 |
| 24476.55 | 24152.62 | 23832.97 | 28944.63 | 42167.50 | 39078.71 |
| 54368.50 | 58140.35 | 62222.91 | 55958.93 | 95170.86 | 86282.78 |
| 2612.64 | 2879.13 | 3172.81 | 5266.39 | 6805.83 | 2942.11 |
| 7219.05 | 6811.51 | 6426.96 | 5842.43 | 8129.75 | 5098.12 |
| 69879.96 | 83307.06 | 99314.10 | 46845.25 | 73096.20 | 36177.47 |
| 249.63 | 223.56 | 200.21 | 407.01 | 517.28 | 510.11 |
| 29686.96 | 29022.15 | 28808.62 | 23719.23 | 58651.76 | 43104.96 |
| 4978.46 | 5740.46 | 6619.09 | 3323.89 | 6549.41 | 8329.85 |

t-Test type: Paired Two Sample for Means

|  |  |  |
| --- | --- | --- |
|  | *VFIRM-2016-Predicted* | *VFIRM-2016-P-Real* |
| Mean | 70122.164 | 69228.495 |
| Observations | 32 | 32 |
| Pearson Correlation | 0.996 |  |
| Hypothesized Mean Difference | 0.000 |  |
| Df | 31 |  |
| t Stat | 0.154 |  |
| P(T<=t) two-tail | 0.879 |  |
| t Critical two-tail | 2.040 |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | *VFIRM-2017- Predicted* | *VFIRM-2017-P-Real* |
| Mean | 88402.027 | 109316.672 |
| Observations | 32 | 32 |
| Pearson Correlation | 0.978 |  |
| Hypothesized Mean Difference | 0.000 |  |
| Df | 31 |  |
| t Stat | -1.588 |  |
| P(T<=t) two-tail | 0.122 |  |
| t Critical two-tail | 2.040 |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | *VFIRM-2018- Predicted* | *VFIRM-2018-P-real* |
| Mean | 89072.415 | 103979.557 |
| Observations | 32 | 32 |
| Pearson Correlation | 0.982 |  |
| Hypothesized Mean Difference | 0.000 |  |
| Df | 31 |  |
| t Stat | -0.714 |  |
| P(T<=t) two-tail | 0.481 |  |
| t Critical two-tail | 2.040 |  |
|  |  |  |

* + 1. For DCF valuation method

Growth of net CF (in %) = from 2010-2015 & the cumulative growth % was found out for the same period. And was found as

= x

= x

= x

= x

= x

= x

= , = & =

=

=

=

**Hypothesis Testing**

The purpose of the test is to determine whether the difference between these two populations is statistically significant.

H0: µ1 = µ2 ("the paired population means i.e., & M-Cap are equal")

H1: µ1 ≠ µ2 ("the paired population means i.e., & M-Cap are not equal")

Confidence interval percentage considered: **95%**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DCF 2016**  **Predicted** | **DCF 2017**  **Predicted** | **DCF 2018**  **Predicted** | **Market Capitalization 2016** | **Market Capitalization 2017** | **Market Capitalization 2018** |
| 375.96 | 569.57 | 1280.81 | 11597.29 | 21114.14 | 10682.49 |
| 4.18 | 11.11 | 10.73 | 53.70 | 42985.97 | 29872.60 |
| -89071.66 | 217422.68 | -560888.06 | 7608.20 | 462697.78 | 316744.33 |
| -17.82 | -0.63 | -0.22 | 117.20 | 112686.08 | 75277.68 |
| -59.37 | -204.86 | -106.40 | -168.40 | 40129.83 | 32918.89 |
| -6.72 | -8.40 | -9.49 | -1276.60 | 3735.88 | 2816.85 |
| 158596.17 | 729697.24 | 2876051.90 | -353.20 | 28427.26 | 11917.60 |
| -8661005.72 | 95395448.58 | -1080301653.83 | 833.80 | 33801.15 | 19412.00 |
| -98.67 | 10.07 | -0.37 | -533.10 | 63243.88 | 18729.92 |
| 481412.40 | -6245065.95 | 87760759.75 | 18.40 | 5049.96 | 3286.46 |
| 471.04 | 723.41 | 1083.92 | -3.30 | 56.77 | 20.95 |
| -188.42 | 296.00 | -366.92 | 97.60 | 27763.93 | 18157.67 |
| 9269.75 | 64166.57 | 209676.78 | 47.10 | 1407.38 | 820.13 |
| 1216621.70 | -9058589.50 | 69318465.56 | -80.60 | 1084.04 | 1518.94 |
| 33864216.05 | -1792715168.87 | 96914346059.79 | 20.60 | 893.73 | 624.17 |
| 877107.35 | 14910457.73 | 240556932.72 | 1.50 | 661.94 | 290.42 |
| -512824277.30 | 12909421604.98 | -325938039793.46 | -499.90 | 162941.15 | 161912.08 |
| 13528.66 | -50412.91 | 163154.48 | -323.90 | 42131.14 | 39094.99 |
| 146643093.91 | 7806426176.04 | 413111113073.21 | 37.70 | 1104.00 | 288.34 |
| -4248526004.18 | -229414297381.58 | -12365867944853.20 | -427.00 | 95164.89 | 86246.07 |
| 917562.84 | -11303063.91 | 142957468.54 | 0.20 | 810.37 | 407.31 |
| -9881245.44 | -99972399.89 | -1020428705.04 | 1901.30 | 8154.98 | 1406.15 |
| 2293811.08 | -200784468.77 | 12695145940.54 | -16.30 | 880.59 | 707.76 |
| -17.07 | -11.40 | -6.24 | 154.00 | 6806.17 | 2941.47 |
| -6976052.23 | -89603832.25 | -1178747400.93 | -625.40 | 12769.41 | 9351.22 |
| -1299.07 | 9969.25 | -74653.49 | 8.20 | 8126.06 | 5100.78 |
| 5.58 | -8.26 | 6.10 | 162.30 | 5634.98 | 1451.35 |
| 0.00 | 0.00 | 0.00 | -3.20 | 1498.21 | 929.25 |
| -35.55 | -76.93 | -184.55 | 37.70 | 1550.53 | 2002.35 |
| 6348.00 | 42493.41 | 706849.43 | -13.50 | 134.75 | 150.84 |
| -353025.02 | 43342069.08 | -213313171.04 | -0.30 | 865.99 | 771.62 |
| -100.36 | -136.62 | -147.61 | -205.30 | 6550.29 | 8329.37 |

t-Test type: Paired Two Sample for Means

|  |  |  |
| --- | --- | --- |
|  |  | *M-Cap 2016* |
| Mean | -143775940.00 | 567.71 |
| Observations | 32.00 | 32.00 |
| Pearson Correlation | 0.08 |  |
| Hypothesized Mean Difference | 0.00 |  |
| df | 31.00 |  |
| t Stat | -1.08 |  |
| P(T<=t) two-tail | 0.29 |  |
| t Critical two-tail | 2.04 |  |

|  |  |  |
| --- | --- | --- |
|  |  | *M-Cap 2017* |
| Mean | -6586045928.59 | 37526.98 |
| Observations | 32.00 | 32.00 |
| Pearson Correlation | -0.11 |  |
| Hypothesized Mean Difference | 0.00 |  |
| df | 31.00 |  |
| t Stat | -0.91 |  |
| P(T<=t) two-tail | 0.37 |  |
| t Critical two-tail | 2.04 |  |

|  |  |  |
| --- | --- | --- |
|  |  | *M-Cap 2018* |
| Mean | -3.804E+11 | 2.701E+04 |
| Observations | 3.200E+01 | 3.200E+01 |
| Pearson Correlation | -1.861E-01 |  |
| Hypothesized Mean Difference | 0.000E+00 |  |
| df | 3.100E+01 |  |
| t Stat | -9.829E-01 |  |
| P(T<=t) two-tail | 3.333E-01 |  |
| t Critical two-tail | 2.040E+00 |  |

**5 Conclusion, Limitations and Recommendations**

5.1 P/E Valuation method results

After conducting the hypothesis testing, the following results were obtained.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | P(T<=t) two-tail -2016 | 0.879 | >0.05 (Null hpyth. Accepted) | | P(T<=t) two-tail - 2017 | 0.122 | >0.05 (Null hpyth. Accepted) | | P(T<=t) two-tail - 2018 | 0.481 | >0.05 (Null hpyth. Accepted) | |  |
| Hence it was observed that the paired population means i.e., & are equal with 95% confidence interval.  5.2 DCF Valuation method results  After conducting the hypothesis testing, the following results were obtained.   |  |  |  | | --- | --- | --- | | P(T<=t) two-tail 2016 | 0.29 | >0.05 (Null hpyth. Accepted) | | P(T<=t) two-tail 2017 | 0.37 | >0.05 (Null hpyth. Accepted) | | P(T<=t) two-tail 2018 | 3.333E-01 |  | |  |
|  |  |

Hence it was observed that the paired population means i.e., & M-Cap are equal with 95% confidence interval.

**5.3 Limitations**

1. Only 9 year’s data were considered due to CMIE database. Higher sample size could’ve resulted in achieving far more accurate results.
2. Other valuation methods could have been undertaken but considering the academic time-frame, the research was limited to 2 methods only.
3. Combination of different valuation methods to find an empirical valuation method(s) for more accurate results would have given substantial benefit to the industry practitioners.
4. Sophisticated software for data analytics & tests using artificial neural networks could’ve improved accuracy.
5. Other variables (as mentioned in calculation section) were not considered.

**Recommendations**

1. Further comprehensive data frames (big data), sophisticated analytics for data manipulation & better analytics will give a clear picture of valuation of overall to specific category of the industry.
2. This study can be furthered to take advantage of newly framed economic policies, projects, development schemes, etc.
3. New variables can be found directly contacting with companies for creating a whole new kind of valuation method.
4. **References**

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