Determining Equity Risk Premium in India: A Historical and Implied Approach

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Abstract

A key challenge often faced by investors, consultants and corporate finance professionals is quantifying the extra premium or the opportunity cost that must be demanded for holding the equity asset class. This paper, attempts to research on the equity risk premium (ERP) in India from two approaches, Historical and Implied (as of cut-off date of 31st December, 2020).Historical approach indicated the weighted annualised equity risk premium of 6.26 per centbetween the period of 2011 to 2020. On an Implied approach, the study indicated the equity risk premium of 6.48 per cent.While these analyses provide two varied estimates of ERP, each approach has its pros and cons. Hence, an average of these two estimates (rounded off), i.e. 6.37 per cent, has been considered as ERP for India from January 2021 and onwards.

Keywords

Equity Risk Premium; risk-free rate; free cash flow to equity; India; discount rate

1 Introduction

Equity Risk Premium (ERP) is a key variable in the field of investment and finance. It is an excess return of the equity market over a risk-free rate (government-bond market). In simple terms, it is that premium that investors desire for holding equity investments instead of risk-free assets. Hence, it becomes a crucial input for determining Asset Allocation, Capital Budgeting, Investment planning, and Cost of Capital.

Equity Risk Premium serves as a gauge for equity market sentiments as it provides for investor's confidence as a fulcrum for the opportunity cost of investing. A higher ERP expectation of the investors will lead to a higher discount rate, thus lowering the valuation of the equities. A risk-averse atmosphere in the market will demand a higher risk premium and vice-versa.

The significance of ERP can carry various perspectives. From the company's perspective, it is the constituent of its cost of equity capital. From the investor's perspective, it is an excess return that equity stocks would provide over bonds. From the valuation perspective, it is used as a discount rate for estimating the present values of various variables.

A lot of studies have been conducted to determine equity risk premium in the United States, and various other developed markets, but very few studies have been done for an emerging market like India. Intuitively, ERP in India shall be more than the other developed markets on the grounds of the country been a developing economy added with some risky economic indicators.Given the subjectivity associated with estimating such a premium, there are various questions about what approach to use, time period to be considered, market definition, and so forth. This risk premium must be reconsidered intermittently in accordance with the changes in the stock market performance and the forecast of economic trends of the country.

Various methods are applied to determine the equity risk premium, such as the historical approach, forward-looking approach, and survey approach. The Historical approach might reasonably suit well for the developed markets like the United States, but it won't fetch desired results for developing markets like India due to lack of availability of long-period data and frequent market adjustments. Also, the historical approach would be of less relevance today, as the risk aversion of investors changes over the period of time. It is a backward-looking approach. On the other hand, the survey method proves to vary significantly based on various factors such as recent stock price movements and who is surveyed. Under such circumstances, the forward-looking approach proves to be a good-fit to estimate ERP for the Indian market. Implied approach is conceptually superior and takes into consideration the fundamental premise, unlike the other two approaches.

2 Literature Review

Review of various literature based on the study of efficient markets and equilibrium pricing (Fama, 1991) depicts that the early success of Sharpe-Lintener-Black (SLB) facedunacceptability and rejection.Comparing SLB with various linked models, such as multifactor models, shows that these models are not mutually exclusive. Indeed, these models can be individually formed in various ways to put in place assumptions on risk aversion and opportunities in the portfolio.It is noted that these theoretical models of general economic equilibrium have failed to justify the higher values of observed ERP in US market

during 1889-1978.Moreover, also for the Indian context, Mehra (2006), in his study "The Equity Risk Premium in India", found thatthe theoretical value of average ERP as estimated under equilibrium approach is 0.11 per cent as against the realizedpremium of 9.7 per cent using Sensex as the benchmark for return on equity and thus, the study ended up treating ERP as a puzzle.

On the other side, Welch, Ivo. (2000), in "Views of Financial Economists on the Equity Premium and Professional Controversies", presented the results of the survey of 226 financial economists in the prediction of ERP for US Stock market. It finds thatconsensus derived for the long-term forecast of 30-year ERP at 7 per cent, which is too high in microeconomists' view. The short-term forecast was found to be within the range of 6 per centto 7 per cent, which is lower than the long-term forecast. It is criticised as financial economists did not have a firm opinion on ERP, as the methodology tends to be subjective.

Dimson, Marsh, and Staunton (2003), in their working paper "The Worldwide Equity Premium: A Smaller Puzzle", showed the annualized equity premium for the rest of the world as 4.2 per cent using the 1900-2005 data for 17 countries by employing the available data from the stock exchanges of various countries. They used the approach to estimate ERP as a difference between stock market returns and treasury yields. This analysis of ERP emphasizes the global ERP, which is of rare use to the investors situated in different countries, based onhigh volatility in equity assets' prices.

Continuing the study of ERP in India, Varma & Barua (2006), in their study "A First Cut Estimate of the Equity Risk Premium in India", used the data of Indian markets from 1981 to 2005. They have found that equity risk premium is about 8.75 per cent on a geometric mean basis and 12.50 per cent on an arithmetic mean basis. They measured the returns from the BSE Sensex index and assumed the risk-free rate to be 3 per cent.The study focused only on historical approach of ERP analysis and the assumed risk-free rate stands out to be very less, compared to the prevailing rates in India. Contrary to the usual approaches followed to estimate ERP, Aggarwal & Bhatnagar (2014), in their study "Equity Risk Premium Expectations in the Indian Capital Market", argued that the variables like Net Profit Margin, Return on Assets, Current Ratio, Beta, and Earnings Per Share determines equity risk premium. It also showed that the regression line which is formed from regression coefficient of each variables, aids in predicting the Equity Risk Premium.

In view of diversity of the existing literature in determining equity risk premium, this paper makes it precise to determine equity risk premium in India using a historical and implied approach, later which is a model backed by fundamentals which are against the traditionally practiced approaches, in Indian context. Lack of availability of long period data from the Indian market, does not make historical approach optimal choice to determine long-term ERP, as the risk aversion of average investor is likely to change over time. The market itself, on a broader perspective has changed significantly, resulting in premiumsthat may not be appropriate today.

3 Research Methodology

Two different methodologies have been applied for historical and implied approach, respectively. In case of historical approach, the period of study is based on data from the year starting 1st January, 2011 to 31st December, 2020, which is spread across the span of 10 years. The study period is further extended till 2030for the second stage of the implied approach.The study is based on secondary data, which issourced from the National Stock Exchange of India, Clearing Corporation of India Ltd., Centre for Monitoring Indian Economy Pvt. Ltd., and Ace Analyser.

Starting with the Historical Approach estimate, annualized returns of Nifty 50 TRI are calculated between the period of 2011 and 2020. Total return index (TRI) is taken for consideration, as it keeps in account both the capital gains and cash distributions in the form of dividends. This displays a more accurate representation of the index's performance than the normal calculated index. Yield on 10-year zero coupon bond issued by the Indian government between the period of 2011 to 2020, is measured as a proxy for a risk-free rate of return. ERP is than calculated by subtracting the risk-free rate from the Total return index for each of the respective years.

$$\text{Equity Risk Premium} = \text{Return on TRI Nifty 50} - \text{risk free rate of return}$$

For the better representation of the sample size, ERPs of subsequent years are weighted to make the analysis more relevant and useful. Thus, weighted average of ERP between the period of 2011 to 2020, is considered to be the annualized ERP for India under the Historical approach.

$$\text{Annualized ERP under Historical Approach} = \frac{\sum \text{Weighted Equity Risk Premium}}{\sum \text{Weight}}$$

On the other side, fundamentals and forward-looking estimates are used to determine ERP in the implied approach.The simplest way to compute the implied rate of return is by applying the Gordon Growth Dividend Discount Model, which states,

$$V = D_0 * \frac{(1+g)}{(R_e - g)}$$

where,
V = Total Market capitalization of index
D_0 = Dividends for current year
g = Expected growth rate in dividends
R_e = Expected return on equity

This again can be restated as,

$$R_e = \text{Dividend yield} * (1+g) + g$$

where,
Dividend yield = Dividend / Total Market capitalization of index

So, once the dividend yield and expected growth rates are determined, returns on equity can be ascertained and hence the Equity Risk Premium can be estimated.But such a case will not support this research as historically in India, the dividend yields have been very low, around 1 per cent, and the primary returns on equity comprises capital appreciation. Thus, using the Gordon growth model will lead to very low estimate of expected returns, and lower ERP.

Hence, it becomes imperative to take into consideration dividendable cash flows as opposed to dividend yields. This is what makes free cash flow to equity (FCFE) a more appropriate than dividend yield. FCFE is the total amount of cash available to the equity shareholders, which is the amount the company has, after all investments, debts and interests are paid off.FCFE for the manufacturing and non-financial services companies is calculated in the following manner,

FCFE: Net Income + Depreciation – Increase in working capital – Capital Expenditure + Net Debt Increase

Financial services firms are different from other firms in the market on a various basis, which makes their method of calculating FCFE different from the rest of the firms. This is because, firstly, these firms operate under strict regulatory constraints on how to use their capital for operating and provision purpose. Secondly, debt for a financial services firm is more akin to working capital than to a capital source. Also, the accounting standards of financial services firm vary from the rest of the firms. Therefore, FCFE for Banking and Financial Services firm is calculated in the following manner,

FCFE: Net Income + Provisions – Increase in Regulatory Capital

With that, the three-stage model is applied to estimate future cash flows for each of the constituents of Nifty 50. The stages are classified according to the time period, stage-one, is the time period starting from 1st January, 2021 to 31st December, 2022. Time period between 1st January, 2023 to 31st December, 2029 is classified as stage-two. Time period beyond, 1st January, 2030, is classified as stage-three (terminal period)which represents the expected free cash flows to equity in perpetuity.

The next step is to estimate the growth rate in FCFE. There is no reliable estimate for the FCFE growth rate in the short to near term. Thus, the expected growth rate can be determined in the same way as we determine the growth rate in dividends, which is by multiplying the return on equity to the retention ratio.

Expected growth rate = Retention ratio * Return on equity

The use of retention ratio implies that whatever is not paid out as dividends is reinvested back into the firm. This welcomes a contention, that this is not consistent with the assumption that free cash flows to equity are paid out to stockholders that underlies FCFE models. It is far more consistent with replacing the retention ratio with the equity reinvestment rate, which measures the percent of net income that is invested back into the firm.

$$\text{Equity reinvestment rate} = 1 - \frac{(\text{Net Cap Ex} + \text{Increase in Working Capital} - \text{Net Debt Issue})}{\text{Net Income}}$$

$$\text{Return on equity} = \frac{\text{Net Income}}{\text{Book Value of Equity}}$$

Hence the modified FCFE growth rate is the product of equity reinvestment rate and return on equity. Thus, in the stage-one, the FCFE growth rate is used to forecast FCFE for the time period between 2021 and 2022. On the other hand, long-term estimate of the free cash flow to equity using growth rate as the product of equity reinvestment rate and return on equity is not sustainable.

In the stage-two of the model, the FCFE growth rate is linked with the growth rate in the nominal GDP.Now, GDP in terms of income approach can be defined as,

GDP = Proprietor's Income + Corporate Profits + Compensation of employees + Rent + Interest + Indirect Business Taxes + Depreciation + Net Foreign Factor Income

This again can be reframed as,

GDP = Profits + Compensation of employees + Rent + Interest + Indirect Business Taxes + Depreciation + Net Foreign Factor Income

Profits are nothing but the earnings. Thus, if the relative mix of the various components of GDP remains unchanged, the earnings growth should reflect the GDP growth. Therefore, over the period of time, earnings growth and free cash-flow to equity growth shall converge to GDP growth. This determination is corroborated by MSCI Barra (2010). The study examined the GDP in the United States and the corporate earnings data from 1929 to 2008 and observed that the growth in the GDP rate and aggregate corporate earnings growth rate has been remarkably similar throughout the last 80 years, thus leading to the conclusion that over the long run, aggregate corporate earnings tend to grow at the same pace as GDP.

A gauge of long-term GDP growth will comprise two components, the long-term expected real GDP growth and the long-term expected inflation.Estimates of long-term real GDP growth rate of India have been published by various reputed institutions. The average of all the estimates give 6 per cent growth rate in GDP over the next 10 years till 2030. Inflation, as ascertained by the government and RBI has provided for 4 per cent as its lower target range. This gives us a long-term estimate of inflation rate at 4 per cent.

Now with the expected real GDP growth rate of 6 per cent and the expected inflation rate of 4 per cent, the nominal GDP growth per annum in India is expected to be around 10 per cent.

Nominal GDP growth rate = Real GDP growth rate + Inflation rate

In the stage-three of the model, the yield on 10-year zero coupon government bond has been considered as a proxy to the perpetual growth rate for free cash flow to equity.Over the period of time, companies stop enjoying super annual growth rates, which makes the growth rate as determined under stage one and two, unsustainable.In order to ascertain long-term sustainable growth rate in free cash flow to equity, yield on 10-year zero coupon Indian government bond is considered as the growth rate.Thus, the growth rate in stage-three is determined to be 7.5 per cent.

The FCFE for the index isto be calculated by weighing the FCFEs of each of the index constituents by the weight of each constituent in the index as of 31st December, 2020. Also, the FCFE for the terminal period is to be capitalized using the Gordon Growth Model to arrive at the terminal value as on 31st December, 2030. The terminal value under this model is:

$$\text{Terminal Value} = \frac{\left(\text{FCFE}_{(n-1)}\right) * (1 + g)}{(R_e - g)}$$

where,
"n-1" is the period ending 31st December, 2030
"g" is the long-term sustainable nominal GDP growth rate

Based on these estimates of free cash flows to equity, implied market return(Re) is estimated, which equates the present value of such cash flows to the market capitalization of the index, as follows,

Market Capitalisation of Nifty 50 =

$$\sum_{1}^{n} \frac{FCFE_n}{(1+R_e)^n} + \text{Present Value of terminal value}$$

Equity risk premium under implied approach is thus calculated by subtracting the risk-free rate of return from the implied return from the market.

$$ERP = \frac{\text{Market return} - \text{Risk free rate}}{\text{Beta}}$$

4 Analysis and Interpretation

4.1 Historical Approach Estimate

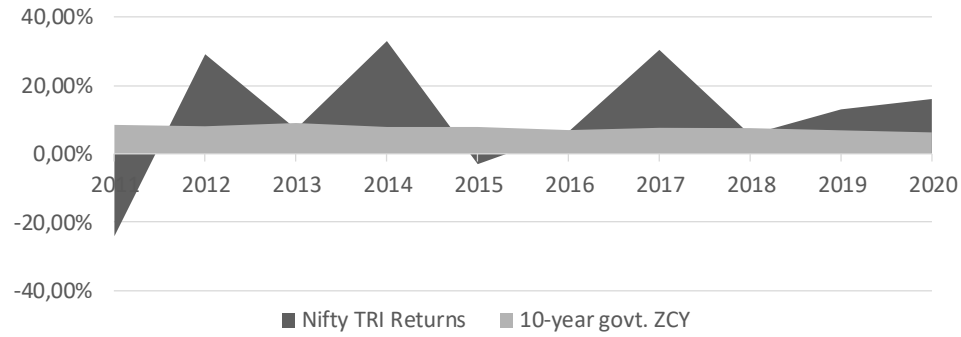
Index returns and 10-year Government Zero Coupon Yield (risk-free rate of return) are calculated for the respective years from 2011 to 2020, as shown in table 1.

Table 1 Historical Equity Risk Premium Calculation

Year	*Dates*	*Nifty 50 TRI*	*Index Returns*	*10-year ZCY*	*ERP*	*Weights*	*WERP*
2011	03/01/11	7727.31					
	30/12/11	5865.49	-24.09%	8.45%	-32.54%	0.50	-16.27%
2012	02/01/12	5881.28					
	31/12/12	7591.99	29.09%	8.04%	21.05%	1.00	21.05%
2013	01/01/13	7650.82					
	31/12/13	8204.85	7.24%	8.99%	-1.75%	1.50	-2.62%
2014	01/01/14	8201.82					
	31/12/14	10904.18	32.95%	7.84%	25.11%	2.00	50.22%
2015	01/01/15	10905.87					
	31/12/15	10575.63	-3.03%	7.84%	-10.87%	2.50	-27.17%
2016	04/01/16	10369.24					
	30/12/16	11040.41	6.47%	6.93%	-0.46%	3.00	-1.37%
2017	02/01/17	11031.91					
	29/12/17	14381.92	30.37%	7.59%	22.78%	3.50	79.72%
2018	01/01/18	14252.02					
	31/12/18	15048.98	5.59%	7.50%	-1.91%	4.00	-7.63%
2019	01/01/19	15114.9					
	31/12/19	17077.06	12.98%	6.86%	6.12%	4.50	27.55%
2020	01/01/20	17096.83					
	31/12/20	19833.19	16.01%	6.25%	9.76%	5.00	48.78%

ERP for various years have shown the varied range of results, and thus, in order to make study more meaningful, weights are applied to ERPs based on the years from 0.5 to 5.0 with an increment in weight of 0.5 for every subsequent year till 2020. Weighted average Equity Risk Premium would then provide meaningful results, as far-sighted data is of little relevance today.

Figure 1 Graphical Representation of Returns on Nifty TRI and 10-year govt. ZCY



$$ERP = \frac{\sum WERP}{\sum W} \quad (i)$$

It can be found from table 1 that,

∑WERP = 172.24%

∑W = 27.50

Thus, Historical Equity Risk Premium can be estimated by substituting values in equation (i). This presents the annualized ERP under the Historical approach to be 6.26 per cent. It elaborates that a risk-averse investor demanded an extra return of 6.26 per cent to invest in equities rather than risk-free securities. This premium was the price for the risk which a risk-averse investor wanted to take in their portfolio.
The rationale for using the last ten years data for the historical premium is that the risk aversion of an average investor is likely to change over time and that using a narrowed and more recent time period provides a more updated estimate. This has to offset against a cost associated with using shorter time periods, which is greater noise in the risk premium estimate.
The annualized standard deviation in Nifty TRI returns between time period of 2011 and 2020 is 16.44 per cent. The standard error associated with the risk premium estimate can be estimated in table 2.

Table 2 Standard errors in Historical Risk Premiums

Estimation period	*Standard Error of Risk Premium Estimate*
5 years	16.44% / √5 = 7.35%
10 years	16.44% / √10 = 5.20%
25 years	16.44% / √25 = 3.29%
50 years	16.44% / √50 = 2.32%

Even when using the data for the past 50 years, the data yields a standard error of 2.32 per cent. There are various reasons why there are, in fact, higher costs, logically, by using data even older than this. Firstly, the data is much less reliable from earlier time periods, when trading was traditional and record-keeping was more haphazard. Secondly, the market itself has changed completely over the time, resulting in risk premiums that may not be relevant today.
The entire data is weighted with higher weight to the recent data, thus getting more updated premiums while preserving the data. Hence, this cost of using the data for the past 10 years is to get a more updated premium. Thus, there are inferences from the above study that over the period of past 10 years, equities have delivered higher returns than 10-year zero coupon Indian government bonds, wherein equity risk premium stands at 6.26 per cent.

4.2Implied Approach Estimate

When an investor price any assets, they implicitly require an expected rate of return. So, to measure the implied rate of return that investors are expecting from the equity market can be derived by the,

Market Capitalization of Nifty 50 =

$$\sum_{t=1}^{t=n} \left(\frac{E(FCFE_t)}{(1+R_e)^t} + \frac{E(FCFE_{n+1})}{(R_e - g_n)(1+R_e)^n} \right) \quad \text{(ii)}$$

Here, E(FCFE) is the expected FCFE which is shown as calculated in appendix 1 of the paper. R_e is the dependent variable in equation (ii), which is the implied rate of return from the market. We solve the equation (ii) to determine R_e. The risk-free rate of return is then subtracted from the implied rate of return to get an estimate of Implied Equity Risk Premium.
Weighted Market Capitalization of Nifty 50 as of 31st December, 2020 is Rs. 4,79,791.38 crores. Growth rates in FCFE are 10 per cent and 7.5 per cent in stagetwo and three, respectively. Weighted E(FCFE) for all three stages are shown in table 3.

Table 3 Weighted E(FCFE) for all the three periods

Year	*FCFE (Rs. In crore)*
2020	11,598.63
2021 E (Period 1)	15,319.72
2022 E (Period 1)	20,151.27
2023 E (Period 2)	25,914.11
2024 E (Period 2)	28,505.52
2025 E (Period 2)	31,356.08
2026 E (Period 2)	34,491.68
2027 E (Period 2)	37,940.85
2028 E (Period 2)	41,734.94
2029 E (Period 2)	45,908.43
Perpetuity (Period 3)	45,908.43*(1+0.075) / (r_e – 0.075)

These figures than needs to be discounted to present value with the implied rate of return from the equity market. The present value of these cash flows is then equated with the weighted market capitalization to estimate the implied rate of return. Substituting the values in the equation (ii) gives the following result:

$$4{,}79{,}791.38 = 11{,}598.63 + \frac{15{,}319.72}{(1+R_{e)})^1} + \frac{20{,}151.27}{(1+R_e)^2} + \frac{25{,}914.11}{(1+R_e)^3} + \frac{28{,}505.52}{(1+R_e)^4} + \frac{31{,}356.08}{(1+R_e)^5} + \frac{34{,}491.68}{(1+R_e)^6} + \frac{37{,}940.85}{(1+R_e)^7} + \frac{41{,}473.94}{(1+R_e)^8} + \frac{45{,}908.43}{(1+R_e)^9} + \frac{45{,}908.43 * (1+0.075)}{(R_e - 0.075) * (1+R_e)^9} \quad \text{(iii)}$$

Solving for R_e in the equation (iii), we get the value of R_e as 0.1273. Thus, 12.73 per cent is the implied rate of return from the equity market in India. This shows that investors are expecting a return of 12.73 per cent from the equity market. In order to estimate Implied Equity Risk Premium, yield on 10-year Zero Coupon Government Bond (risk-free rate) is subtracted from the implied market returns. Hence, Implied Equity Risk Premium becomes,

$$\text{Implied Equity Risk Premium} = (\text{Implied Market Return}) - (\text{Risk free rate of return})$$

which is equal to 12.73 per cent minus 6.25 per cent. This gives 6.48 per cent as the implied equity risk premium in the Indian market.

Table 3ERP under both the approaches

Approach	*Equity Risk Premium*
Historical Approach	6.26%
Implied Approach	6.48%

The average equity risk premium of both the approaches, as mentioned in table 3 reaches out to be 6.37 per cent.

4.3 Statistical Tests and Analysis

A correlation test is applied to identify the relationship and strength between equity risk premium and various independent variables, including TRI Nifty and yield on 10-year zero-coupon government bonds.

The formula for correlation,

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{(\sqrt{\sum(X-\bar{X})^2}(\sqrt{\sum(Y-\bar{Y})^2}} \quad \text{(iv)}$$

where, r is the correlation coefficient.

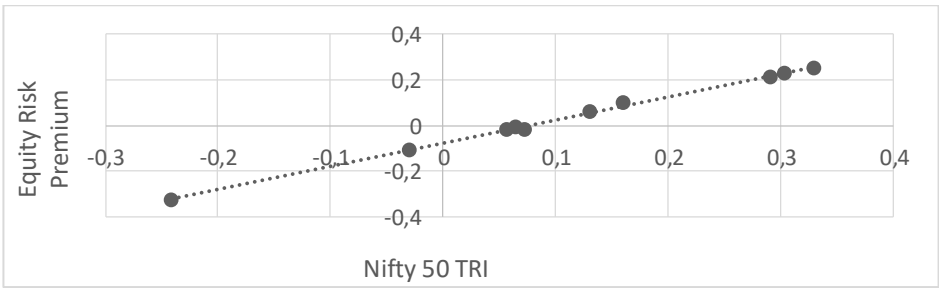
Table 4 Calculating the correlation between TRI Nifty returns and Equity Risk Premium

X *(Nifty TRI Returns)*	Y *(ERP)*	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
-0.2409	-0.3254	-0.35448	0.3627	0.125656	0.131544	0.128566351
0.2909	0.2105	0.17732	0.1732	0.031442	0.030002	0.030713597
0.0724	-0.0175	-0.04118	-0.0548	0.001696	0.003002	0.002256252
0.3295	0.2511	0.21592	0.2138	0.046621	0.045715	0.046165855
-0.0303	-0.1087	-0.14388	-0.1460	0.020701	0.021313	0.021005041
0.0647	-0.0046	-0.04888	-0.0419	0.002389	0.001755	0.002047583
0.3037	0.2278	0.19012	0.1905	0.036146	0.036294	0.036219761
0.0559	-0.0191	-0.05768	-0.0564	0.003327	0.00318	0.003252575
0.1298	0.0612	0.01622	0.0239	0.000263	0.000572	0.00038782
0.1601	0.0976	0.04652	0.0603	0.002164	0.003637	0.002805621

$\bar{X} = 0.11358,\ \bar{Y} = 0.03729,\ \sum(X-\bar{X})(Y-\bar{Y}) = 0.27342,\ \sum(X-\bar{X})^2 = 0.27040,\quad \sum(Y-\bar{Y})^2 = 0.27701$

Substituting these values in equation (iv) gives a correlation coefficient *r* of 0.999. This proves a very strong positive correlation between returns on Nifty TRI and Equity Risk Premium.

Figure 2 Direction and strength between TRI Nifty Returns and Equity Risk Premium



Significance test of the result:

It is done to test whether the association is merely apparent and might have arisen by chance. The *t*- test is done in the following manner:

$$t = r\sqrt{\frac{n-2}{1-r^2}} \text{(v)}$$

t is entered at n-2 degrees of freedom, so the number of pairs of observation becomes 10 (n) -2 = 8. While the correlation coefficient, *r* for these data, is 0.999, we get the value of *t* by substituting the values in the equation (v) as 63.198.
Entering in the two-tailed probability distribution table in table A2, with 10 - 2 = 8 degrees of freedom, we find that at t = 63.198, P < 0.001, so the correlation coefficient may be regarded as highly significant.

Table 5 Calculating correlation between 10-year ZCY govt. bond and Equity Risk Premium

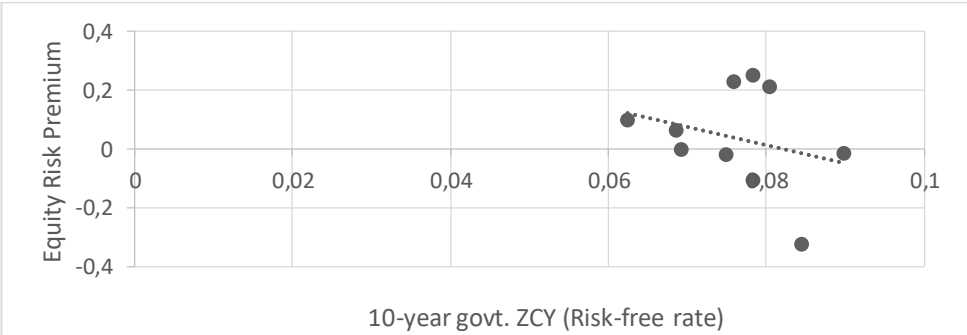
X *(10-year govt. ZCY)*	Y *(ERP)*	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
0.0845	-0.3254	0.00821	-0.36269	6.74041E-05	0.131544	-0.002977685
0.0804	0.2105	0.00411	0.17321	1.68921E-05	0.030002	0.000711893
0.0899	-0.0175	0.01361	-0.05479	0.000185232	0.003002	-0.000745692

0.0784	0.2511	0.00211	0.21381	4.4521E-06	0.045715	0.000451139
0.0784	-0.1087	0.00211	-0.14599	4.4521E-06	0.021313	-0.000308039
0.0693	-0.0046	-0.00699	-0.04189	4.88601E-05	0.001755	0.000292811
0.0759	0.2278	-0.00039	0.19051	1.521E-07	0.036294	-7.42989E-05
0.075	-0.0191	-0.00129	-0.05639	1.6641E-06	0.00318	7.27431E-05
0.0686	0.0612	-0.00769	0.02391	5.91361E-05	0.000572	-0.000183868
0.0625	0.0976	-0.01379	0.06031	0.000190164	0.003637	-0.000831675

$\bar{X} = 0.07629, \bar{Y} = 0.03729, \sum(X - \bar{X})(Y - \bar{Y}) = -0.003592671, \sum(X - \bar{X})^2 = 0.000578409, \sum(Y - \bar{Y})^2 = 0.277013$

Substituting these values in equation (iv) gives a correlation coefficient, *r* of -0.28382441. This proves a weak negative correlation between the risk-free rate and equity risk premium.

Figure 3 Direction and strength between 10-year govt. ZCY and Equity Risk Premium



Significance test of the result:

t is entered at n-2 degrees of freedom, so the number of pairs of observation becomes 10 (n) -2 = 8. While the correlation coefficient, *r* for these data is -0.28382441, we get the value of *t* by substituting the values in the equation (v) as -0.837.
Entering in the two-tailed probability distribution table in table A2, with 10 - 2 = 8 degrees of freedom, we find that at t = -0.837, P < 0.5, the correlation coefficient may be regarded as partially significant.

5 Findings

The equity risk premium is a fundamental and critical component in corporate finance, portfolio management and valuation. Based on our analysis, we observed that the annualized equity risk premium in India, under the historical approach, between the time period of 2011 to 2020, is 6.26 per cent. Covid-19 pandemic led to increased volatility and weakened investor confidence which led to the fall in the equity market by almost 30 per cent between January 2020 to March 2020. Time wasn't away when the investors were filled with optimism as the market was again pushed back to the pre-Covid levels. Hence, from a long-range perspective, we considered it appropriate to consider the cut-off as of December 2020 for the analysis. These estimates are again not free from noise, given the limited coverage period of 10-years which carries the standard error in these estimates to be 5.20 per cent.
ERP under historical approach is primarily driven by the rate of returns on the market, considering the fact that the standard deviation in the market returns in the past ten years is 16.44 per cent, compared to the standard deviation in the risk-free rate of 0.76 per cent. This is also backed by the correlation analysis between both the function. Market returns and ERP shows a strong positive correlation, while risk-free rate and ERP shows a weak negative correlation. It was evident that over the years, equity risk premium has shown an increase not due torise in the rate of equity returns, but due to falling interest rates. This in fact has been the trendobserved in most of the countries, that interest rates have been falling consistently, even observing therate of interest in negative number.
We observed that historical premiums tend to rise when markets are buoyant, and investors are less risk-averse, optimistic and falls as the market collapse and investors' fears rise, along with uncertainty.
The usage of the three-stage FCFE model results in an implied expected market return (approximately) of 12.73 per cent. This is the rate that equates the discounted cash flows of the market capitalization of Nifty 50 to the value of the index on 31st

December, 2020.Based on the risk-free rate of 6.25 per cent and an index beta of 1, ERP under implied approach is estimated to be 6.48 per cent.

6 Conclusion

After deliberately analyzing and considering the daily fluctuations in the equity market valuations as well as in government yields, we recommend the Equity Risk Premium in India in the range of 6.20 per cent to 6.70 per cent (6.20 per cent being the lower range, while 6.70 per cent being the upper limit of the range) from January 1, 2021 and onwards. However, based on arithmetic means of ERPs estimated under both the approaches as described above, we believe that an ERP (rounded) of 6.37 per cent can be considered as a reasonable premium for investing in the equity markets of the Indian economy.
The estimate will change over the period of time due to the changes in underlying demographics and participation in equity markets. There are other several determinants of equity risk premium as well, such as risk aversion, consumption preferences, economic risk, inflation, interest rates, information flow, liquidity, government policy, monetary policy and behavioral component. Further study shall be conducted on the influence and impact of the above-mentioned determinants on the economy's equity risk premiumHowever, the golden rule to be aware of is that the equity risk premiums are ever-changing and subject to various factors prevailing in the economy.

References

Siegel, J. J. (2005) 'Perspectives on the equity risk premium',*Financial Analysts Journal*,Vol. 61, No. 6, pp.61–73.

Rieger, M. O., Hens, T., & Wang, M. (2013) 'International Evidence on the Equity Premium Puzzle and Time Discounting',*Multinational Finance Journal*, Vol 17, No. 3/4, pp.149–163.

Mehra, R. (2006) 'The equity premium puzzle: A review',*Foundations and Trends in Finance*,Vol 2, No. 1, pp.1–81.

Welch, I. (2000) 'Views of financial economists on the equity premium and on professional controversies', *The Journal of Business,* Vol 73, No. 4, pp.501-537.

McParland, C., Adair, A., & McGreal, S. (2002) 'Valuation standards',*Journal of Property Investment & Finance*, Vol 20, No. 2, pp.127–141.

Basil L. Copeland, Jr. (1982) 'Inflation, Interest Rates and Equity Risk Premia',*Financial Analyst Journal,*Vol 38, No. 3, pp.32–43.

Fernandez, P., & Carabias, J. (2006) 'Market Risk Premium',*IESE Business School*, Vol 81, No. 1, pp.101–141.

Donaldson, R. G., Kamstra, M. J., & Kramer, L. A. (2010) 'Estimating the equity premium',*Journal of Financial and Quantitative Analysis*, Vol 45, No. 4, pp.813–846.

DeLong, J. B., & Magin, K. (2009) 'The U.S. Equity return premium: Past, present, and future',*Journal of Economic Perspectives*, Vol 23, No. 1, pp.193–208.

Damodaran, A. (2020) 'Equity Risk Premiums (ERP): Determinants, Estimation and Implications',the 2020 Edition Updated: March 2020 Aswath Damodaran Stern School of Business Equity Risk Premiums (ERP): Determinants, Estimation and Implications. *SSRN Electronic Journal*, (March), pp.1–136.

Damodaran, A. (2009) 'Valuing financial service firms',*Stern Business*, (April), pp.1–34.

Asness, C. S. (2000) 'Stocks versus Bonds: Explaining the Equity Risk Premium',*Financial Analysts Journal*, Vol. 56, No. 2, pp.96–113.

Aro-Gordon, S. (2015) 'Equity Risk Premium in an Emerging Market Economy',*IOSR Journal of Economics and Finance Ver. II*, Vol 6, No. 6, pp. 2321–5933.

Aggarwal, N. (2014) 'Equity Risk Premium Expectations in the Indian Capital Market',*International Journal of Management & Business Studies,*Vol *4,* No. 3, pp.28–32.

MSCI Barra. (2010) '*Is There a Link Between GDP Growth and Equity Returns?* '

Booth, L. (1999) 'Estimating the equity risk premium and equity costs: New ways of looking at old data', *The Bank of America Journal of Applied Corporate Finance,* Vol 12, No. 1, pp. 100-112.

Booth, L. (2019) 'Estimating the equity risk premium and expected equity rates of return: The case of Canada', *Journal of Applied Corporate Finance,* Vol 3, No. 1, pp.113-125.

Busseti, E. (2019) 'Risk and return models for equity markets and implied equity risk premium',*St. Louis: Federal Reserve Bank of St Louis*.

Rietz, T. A., Mehra, R., & Prescott, E. C. (1988) 'The equity risk premium: A solution; the equity risk premium: A solution?', *Journal of Monetary Economics,* Vol 22, No. 1, pp.117.

Scott, M. F. G. (1992) 'The cost of equity capital and the risk premium on equities', *Applied Financial Economics,* Vol 2, No. 1, pp.21.

Mehra, R. (2006) 'The equity premium in India' (Working paper No. w12434), *National Bureau of Economic Research.*

Fama, E. F. (1970) 'Efficient capital markets: A review of theory and empirical work', *The Journal of Finance,* Vol 25, No. 2, pp.383-417.

Mehra, R., &Prescott, E. C. (1985) 'The equity premium: A puzzle', *Journal of Monetary Economics,* Vol 15, No. 2, pp.145-161.

Fama, Eugene F., & Kenneth R.French. (2002) 'The Equity Premium', *Journal of Finance,* Vol 57, No. 2, pp.637-659.

Berg, Tobias, & Christoph Kaserer. (2013) 'Extracting the Equity Risk Premium from CDS Spreads', *Journal of Derivatives,* Vol 21, No. 1, pp.8-26.

Arnott, Robert D., & Peter L. (2002) 'What Risk Premium is 'Normal'?', *Financial Analysts Journal,* Vol 58, No. 2, pp.64-85.

Asness, Clifford S. (2000) 'Stocks versus Bonds: Explaining the Equity Risk Premium', *Financial Analysts Journal,* Vol 56, No. 2, pp.96-113.

Dimson, Elroy, Marsh, Paul, Staunton (2006) 'The worldwide equity premium: A smaller puzzle', *Zurich Meetings paper.*

Appendix

All figures are in Rs. Crore unless specified otherwise

Table A1 Weights and Market Capitalization of Nifty 50 constituent companies as of 31st December, 2020

Sr. No.	*Company Name*	*Weightage (in %)*	*Market Capitalization*	*Weighted Market Capitalization*
1	Reliance Industries Ltd.	10.66	1,258,563.21	134,162.84
2	HDFC Bank Ltd.	10.37	790,414.14	81,965.95
3	Infosys Ltd.	7.64	534,894.85	40,865.97
4	Housing Development Finance Corporation Ltd.	7.61	458,332.33	34,879.09
5	ICICI Bank Ltd.	6.12	368,970.71	22,581.01
6	Tata Consultancy Services Ltd.	4.99	1,047,213.93	52,255.98
7	Kotak Mahindra Bank Ltd.	4.85	394,970.71	19,156.08
8	Hindustan Unilever Ltd.	3.55	562,812.71	19,979.85
9	ITC Ltd.	3.03	257,168.86	7,792.22
10	Larsen & Toubro Ltd.	2.61	180,783.53	4,718.45
11	Axis Bank Ltd.	2.55	189,863.01	4,841.51
12	Bajaj Finance Ltd.	2.33	319,082.05	7,434.61
13	Asian Paints Ltd.	2.07	265,170.23	5,489.02
14	Bharti Airtel Ltd.	2.03	278,069.76	5,644.82
15	State Bank of India	1.75	245,382.19	4,294.19
16	HCL Technologies Ltd.	1.7	256,753.42	4,364.81
17	Maruti Suzuki India Ltd.	1.69	231,079.16	3,905.24
18	Mahindra & Mahindra Ltd.	1.15	89,584.45	1,030.22

19	Nestle India Ltd.	1.09	177,329.84	1,932.90
20	Titan Company Ltd.	1.09	139,129.41	1,516.51
21	Sun Pharmaceutical Industries Ltd.	1.06	142,124.61	1,506.52
22	Dr. Reddy's Laboratories Ltd.	1.05	86,537.39	908.64
23	UltraTech Cement Ltd.	1.01	152,629.80	1,541.56
24	Tech Mahindra Ltd.	1	94,050.31	940.50
25	Wipro Ltd.	0.95	220,722.20	2,096.86
26	Bajaj Finserv Ltd.	0.89	141,733.24	1,261.43
27	HDFC Life Insurance Company Ltd.	0.88	136,608.13	1,202.15
28	IndusInd Bank Ltd.	0.84	67,686.26	568.56
29	Divi's Laboratories Ltd.	0.81	101,990.37	826.12
30	Power Grid Corporation of India Ltd.	0.81	99,321.73	804.51
31	Tata Steel Ltd.	0.81	72,506.50	587.30
32	NTPC Ltd.	0.8	98,302.43	786.42
33	Bajaj Auto Ltd.	0.74	99,659.45	737.48
34	Britannia Industries Ltd.	0.7	86,091.91	602.64
35	Cipla Ltd.	0.69	66,115.31	456.20
36	Hero MotoCorp Ltd.	0.67	62,122.10	416.22
37	JSW Steel Ltd.	0.64	93,594.78	599.01
38	Grasim Industries Ltd.	0.61	61,045.87	372.38
39	Adani Ports and Special Economic Zone Ltd.	0.59	98,285.99	579.89
40	SBI Life Insurance Company Ltd.	0.59	90,429.19	533.53
41	Eicher Motors Ltd.	0.59	69,149.28	407.98
42	Hindalco Industries Ltd.	0.58	54,034.37	313.40
43	Oil & Natural Gas Corporation Ltd.	0.56	117,059.50	655.53
44	Tata Motors Ltd.	0.55	56,790.79	312.35
45	Shree Cement Ltd.	0.53	86,641.42	459.20
46	Bharat Petroleum Corporation Ltd.	0.51	82,670.22	421.62
47	Coal India Ltd.	0.47	83,474.16	392.33
48	UPL Ltd.	0.43	35,631.26	153.21
49	Indian Oil Corporation Ltd.	0.38	85,621.78	325.36
50	GAIL (India) Ltd.	0.38	55,587.50	211.23

TableA2 Distribution of t (two-tailed)

			Probability			
d.f.	*0.5*	*0.1*	*0.05*	*0.02*	*0.01*	*0.001*
1	1	6.314	12.706	31.821	63.657	636.619
2	0.816	2.92	4.303	6.965	9.925	31.598
3	0.765	2.353	3.182	4.541	5.841	12.941
4	0.741	2.132	2.776	3.747	4.604	8.61
5	0.727	2.015	2.571	3.365	4.032	6.859
6	0.718	1.943	2.447	3.143	3.707	5.959
7	0.711	1.895	2.365	2.998	3.499	5.405
8	0.706	1.86	2.306	2.896	3.355	5.041
9	0.703	1.833	2.262	2.821	3.25	4.781
10	0.7	1.812	2.228	2.764	3.169	4.587

Table A3FCFE components of the Nifty 50 constituent companies for the year ending 2020

Sr. No.	*Company Name*	*Net Income*				*Depreciation/Provisions*				*CapEx*	*Increase in working capital*	*Net Debt Increase*	*Tier-1 Capital/Required Solvency Margin*	*Regulatory Margin*
		Q3-2021	Q2-2021	Q1-2021	Q4-2020	Q3-2021	Q2-2021	Q1-2021	Q4-2020	TTM	TTM	TTM	31/12/20	31/12/20
1	Reliance Industries Ltd.	14894	10602	13233	6348	6665	6626	6308	6332	50039	-6694	-49438		
2	HDFC Bank Ltd.	8769.3	7702.8	6927.2	7280.2	4323	4420.1	4344.5	4216.5					
3	Infosys Ltd.	5197	4845	4233	4321	826	855	756	749	98	2236	817		
4	Housing Development Finance Corporation Ltd.	5176.7	4599.6	3613.6	4116.2								109881.2	94004.59
5	ICICI Bank Ltd.	5498.1	4882.3	3117.6	1251.3	2700.2	3049.9	7704.5	6598.2				136056.4	120134.2
6	Tata Consultancy Services Ltd.	8701	7475	7008	8049	1024	998	976	951	202	-4028	1331		
7	Kotak Mahindra Bank Ltd.	2601	2946.6	1852.5	1905.1	674.03	473.22	1119.3	1262.1				69073.74	60155.62
8	Hindustan Unilever Ltd.	1937	1974	1898	1515	286	265	257	271	1084	-949	65		
9	ITC Ltd.	3526.5	3368.1	2511	3856.5	413.49	404.6	418.99	413.23	-56.13	936.27	42.82		
10	Larsen & Toubro Ltd.	2466.7	5520.2	303.14	3197.0	702.1	713.12	672.23	710.94	-868.2	35732.3	20197.3		
11	Axis Bank Ltd.	1317.9	1836.6	1099.5	-1262	4625.6	4606.1	4440.7	7834.2				101653.0	89743.03
12	Bajaj Finance Ltd.	1145.9	964.88	962.32	948.1	-2311	1441.5	1514.2	941.31				6603.3	7109.51
13	Asian Paints Ltd.	1238.3	820.37	218.45	461.89	193.17	193.58	191.17	194.5	-310.5	1178.43	-36.7		
14	Bharti Airtel	853.6	-763.2	-15933	-5237	7503	7421.1	7226.8	7055	3246.4	1074.2	17103		

	Ltd.													
15	State Bank of India	6257.5	5245.8	4776.5	6909.9	10801	11221	12562	14021				274416.7	223150.9
16	HCL Technologies Ltd.	3969	3143	2931	3172	1187	1092	1065	996	254	24254	-1000		
17	Maruti Suzuki India Ltd.	1996.7	1419.6	-266.9	1322.2	742	766.5	784	823.6	-1362	-7858	-9		
18	Mahindra & Mahindra Ltd.	704.39	135.56	-97.62	-1335	847.08	1192.8	1163.1	1202.6	-656.7	4430.25	6641.23		
19	Nestle India Ltd.	483.31	587.09	486.6	525.43	95.5	91.11	92.42	91.35	354.47	65.91	-45.26		
20	Titan Company Ltd.	525	175	-291	346.25	96	94	93	102.08	-21.82	274.72	93.61		
21	Sun Pharmaceutical Industries Ltd.	1852.4	1812.7	-1655	399.84	531.94	498.6	495.92	575.98	234.05	-806.1	-376.14		
22	Dr. Reddy's Laboratories Ltd.	27.9	771.8	594.6	781.1	311.2	316.5	292.3	274.1	187	-178.1	-862.5		
23	UltraTech Cement Ltd.	1584.3	1234.3	797.43	3242.7	673.91	672.42	646.18	672.36	-939.7	2317.17	-3493.8		
24	Tech Mahindra Ltd.	1309.8	1064.6	972.3	803.9	358.4	371.7	383.2	398.2	-176	1873.5	7421		
25	Wipro Ltd.	2968	2465.7	2390.4	2326.1	791.2	657.8	615.2	579.6	482	4197.4	1890.4		
26	Bajaj Finserv Ltd.	1289.9	986.29	1215.1	194.43	123.84	114.01	125.38	127.09				11861.24	12154.16
27	HDFC Life Insurance Company Ltd.	263.44	327.83	450.54	311.65								4400	3780
28	IndusInd Bank Ltd.	830.41	663.08	510.39	315.25	1853.5	1964.4	2258.8	2440.3				41440.74	33159.16
29	Divi's Laboratories Ltd.	470.62	519.59	492.06	388.23	68.18	61.13	56.2	49.78	847.72	1250.93	4.09		
30	Power Grid Corporation of India Ltd.	3367.7	3094.1	2048.4	3313.4	3073.3	2894.8	2958.8	3018.6	-3625	2331.39	908.64		

31	Tata Steel Ltd.	3697.2	1565.4	-4417	-1481	2274.7	2261.1	2110.8	2224.1	-290.8	8184.67	13927.4		
32	NTPC Ltd.	3766.4	3435.9	2890.4	1442.5	3041.6	3014.8	2936.6	2613.2	36805	110.32	27093.5		
33	Bajaj Auto Ltd.	1716.2	1193.9	395.51	1353.9	65.02	64.32	63.79	63.27	-5.37	5308.09	72.07		
34	Britannia Industries Ltd.	455.75	498.13	542.58	372.24	48.58	48.49	47.96	48.47	-7.56	-1597.2	7.45		
35	Cipla Ltd.	748.15	665.43	577.91	245.95	248.43	256.06	268.98	345.8	-490.2	775.75	-822.5		
36	Hero MotoCorp Ltd.	1019.1	958.49	59.14	604.63	179.61	183.46	178.54	182.62	442.68	188.03	-25.36		
37	JSW Steel Ltd.	2681	1593	-561	231	1230	1149	1047	1108	8225	2498	12470		
38	Grasim Industries Ltd.	1383.9	923.86	236.56	1505.8	1007.1	1016.6	985.72	1036.9	1049.4	4732.09	-3136.8		
39	Adani Ports and Special Economic Zone Ltd.	1561.4	1387	758.02	334.39	594.06	461.82	454.67	449.55	1696.8	2843.99	6298.01		
40	SBI Life Insurance Company Ltd.	232.85	299.73	390.89	530.67								4359.61	3802.14
41	Eicher Motors Ltd.	532.59	343.34	-55.18	304.28	122.9	104.83	98.2	108.92	-28.28	3145.09	-6.01		
42	Hindalco Industries Ltd.	1877	387	-709	669	1655	1708	1544	1322	10260	2535	18745		
43	Oil & Natural Gas Corporation Ltd.	2643.1	4335.3	119.75	-6189	6494.8	5623.7	5847.9	6771.7	5499.6	-9480.9	8428.13		
44	Tata Motors Ltd.	2906.4	-314.4	-8438	-9894	6128.7	5601.4	5599.3	5814.8	6282.1	1611.67	15313.7		
45	Shree Cement Ltd.	630.87	529.97	329.6	535.95	322.26	309.72	300.15	464.67	-570.1	-2884.6	-79.08		
46	Bharat Petroleum Corporation Ltd.	1565.2	2263.0	2035.3	-1847	1072.8	1064.9	1072.7	1043.4	5728.0	-5054.9	4011.5		
47	Coal India Ltd.	3085.3	2948.1	2079.6	4637.9	915.91	852.31	852.6	1029.4	5354.8	1461.99	924.2		
48	UPL Ltd.	794	463	551	617	542	533	522	595	875	5523	3562		

49	Indian Oil Corporation Ltd.	4359.1	6025.8	2226.8	-7783	2723.1	2656.3	2613.1	2652.5	13783	-7537.0	13794
50	GAIL (India) Ltd.	1883.6	1111.7	654.33	4728.3	560.91	545.87	521.11	639.89	5831.9	-943.19	2756.9

TableA4FCFE for the subsequent years of the Nifty 50 constituent companies

Sr. No.	*Company Name*	*FCFE 20*	*FCFE 21*	*FCFE 22*	*FCFE 23*	*FCFE 24*	*FCFE 25*	*FCFE 26*	*FCFE 27*	*FCFE 28*	*FCFE 29*
1	Reliance Industries Ltd.	-21775	-21002	-20256.5	9850.00	10835	11918.50	13110.35	14421.39	15863.52	17449.88
2	HDFC Bank Ltd.	47983.8	59439.5	73630.30	80993.3	89092.6	98001.92	107802.1	118582.3	130440.5	143484.6
3	Infosys Ltd.	20265	26049.0	33484.08	36832.4	40515.7	44567.32	49024.05	53926.45	59319.10	65251.01
4	Housing Development Finance Corporation Ltd.	1629.60	1648.05	1666.70	1833.37	2016.71	2218.38	2440.22	2684.24	2952.66	3247.93
5	ICICI Bank Ltd.	18880.3	21222.3	23854.84	26240.3	28864.3	31750.79	34925.87	38418.46	42260.31	46486.34
6	Tata Consultancy Services Ltd.	40339	57443.1	81799.56	89979.5	98977.4	108875.2	119762.7	131739.0	144912.9	159404.2
7	Kotak Mahindra Bank Ltd.	3916	4109.20	4311.88	4743.07	5217.38	5739.12	6313.03	6944.33	7638.76	8402.64
8	Hindustan Unilever Ltd.	8333	9815.79	11562.42	12718.6	13990.5	15389.58	16928.54	18621.40	20483.54	22531.89
9	ITC Ltd.	14075.2	17428.3	21580.26	23738.2	26112.1	28723.33	31595.67	34755.23	38230.76	42053.83
10	Larsen & Toubro Ltd.	-381.1	-379.16	-377.16	2200.00	2420.00	2662.00	2928.20	3221.02	3543.12	3897.43
11	Axis Bank Ltd.	12588.4	14164.6	15938.08	17531.8	19285.0	21213.59	23334.94	25668.44	28235.28	31058.81
12	Bajaj Finance Ltd.	6113.1	7203.20	8487.58	9336.3	10269.9	11296.97	12426.67	13669.34	15036.27	16539.90
13	Asian Paints Ltd.	2606.8	3222.9	3984.66	4383.12	4821.44	5303.58	5833.94	6417.33	7059.06	7764.97
14	Bharti Airtel Ltd.	20908.6	28275.8	38239.08	42062.9	46269.2	50896.22	55985.84	61584.43	67742.87	74517.15
15	State Bank of India	20531.1	22073.6	23732.07	26105.2	28715.8	31587.39	34746.13	38220.74	42042.81	46247.09
16	HCL Technologies Ltd.	-7953	-6835.8	-5875.61	5500	6050.00	6655.00	7320.50	8052.55	8857.81	9743.59

17	Maruti Suzuki India Ltd.	16798.4	22561.7	30302.31	33332.5	36665.8	40332.38	44365.62	48802.18	53682.40	59050.64
18	Mahindra & Mahindra Ltd.	6681.1	7796.6	9098.25	10008	11008.8	12109.77	13320.75	14652.82	16118.10	17729.91
19	Nestle India Ltd.	1987.1	3942.6	7822.55	8604.8	9465.29	10411.82	11453.00	12598.30	13858.13	15243.95
20	Titan Company Ltd.	981.04	1132.2	1306.82	1437.5	1581.25	1739.37	1913.31	2104.64	2315.11	2546.62
21	Sun Pharmaceutical Industries Ltd.	4707.8	5199.6	5742.71	6316.9	6948.67	7643.54	8407.89	9248.68	10173.55	11190.91
22	Dr. Reddy's Laboratories Ltd.	2498.1	2872.5	3303.04	3633.3	3996.68	4396.35	4835.99	5319.59	5851.54	6436.70
23	UltraTech Cement Ltd.	4652.5	5183.7	5775.56	6353.1	6988.43	7687.27	8456.00	9301.60	10231.76	11254.94
24	Tech Mahindra Ltd.	11385.6	16857.0	24957.87	27453.6	30199.0	33218.92	36540.81	40194.89	44214.38	48635.82
25	Wipro Ltd.	10005	11650.2	13566.10	14922.7	16414.9	18056.47	19862.12	21848.33	24033.17	26436.48
26	Bajaj Finserv Ltd.	4469.07	5061.9	5733.46	6306.8	6937.49	7631.24	8394.36	9233.80	10157.18	11172.90
27	HDFC Life Insurance Company Ltd.	733.46	802.18	877.34	965.0	1061.58	1167.74	1284.51	1412.96	1554.26	1709.68
28	IndusInd Bank Ltd.	2554.71	2719.21	2894.31	3183.7	3502.12	3852.33	4237.56	4661.32	5127.45	5640.19
29	Divi's Laboratories Ltd.	11.23	11.25	11.26	12.3	13.62	14.99	16.49	18.13	19.95	21.94
30	Power Grid Corporation of India Ltd.	25971.6	35931.1	49709.94	54680.9	60149.0	66163.94	72780.33	80058.36	88064.20	96870.62
31	Tata Steel Ltd.	14269.1	17398.4	21214.02	23335.4	25668.9	28235.85	31059.44	34165.38	37581.92	41340.11
32	NTPC Ltd.	13320	14768.9	16375.41	18012.9	19814.2	21795.68	23975.24	26372.77	29010.04	31911.05
33	Bajaj Auto Ltd.	-314.52	-310.35	-306.23	1200	1320.00	1452.00	1597.20	1756.92	1932.61	2125.87
34	Britannia Industries Ltd.	3674.4	8722.8	20707.34	22778	25055.8	27561.46	30317.61	33349.37	36684.31	40352.74
35	Cipla Ltd.	2248.7	2544.8	2880.01	3168.01	3484.82	3833.30	4216.63	4638.29	5102.12	5612.33
36	Hero MotoCorp Ltd.	2709.6	3201.9	3783.66	4162.02	4578.23	5036.05	5539.65	6093.62	6702.98	7373.28
37	JSW Steel Ltd.	10225	13004.9	16540.67	18194.7	20014.2	22015.63	24217.20	26638.92	29302.81	32233.09
38	Grasim Industries Ltd.	-821.7	-810.53	-799.48	4000	4400.00	4840.00	5324.00	5856.40	6442.04	7086.24
39	Adani Ports and Special Economic Zone Ltd.	7758.1	9924.8	12696.58	13966.2	15362.8	16899.15	18589.06	20447.97	22492.77	24742.04

40	SBI Life Insurance Company Ltd.	896.6	976.01	1062.38	1168.62	1285.48	1414.03	1555.43	1710.97	1882.07	2070.28
41	Eicher Motors Ltd.	-1562.9	-1326.2	-1125.37	400	440.00	484.00	532.40	585.64	644.20	708.62
42	Hindalco Industries Ltd.	14403	17881.4	22200.06	24420	26862	29548.28	32503.11	35753.42	39328.77	43261.64
43	Oil & Natural Gas Corporation Ltd.	38056.4	44953.2	53099.95	58409.9	64250.9	70676.03	77743.63	85518.00	94069.80	103476.7
44	Tata Motors Ltd.	14824.2	19169.4	24788.22	27267	29993.7	32993.12	36292.43	39921.67	43913.84	48305.22
45	Shree Cement Ltd.	6798.8	10110.7	15035.87	16539.4	18193.4	20012.75	22014.02	24215.42	26636.96	29300.66
46	Bharat Petroleum Corporation Ltd.	11608.6	14972.5	19311.35	21242.4	23366.7	25703.41	28273.75	31101.13	34211.24	37632.37
47	Coal India Ltd.	10508.6	13486.5	17308.27	19039	20943.0	23037.30	25341.03	27875.13	30662.65	33728.91
48	UPL Ltd.	1781	1947.8	2130.33	2343.3	2577.70	2835.47	3119.01	3430.91	3774.01	4151.41
49	Indian Oil Corporation Ltd.	23022.2	28126.6	34362.79	37799	41578.9	45736.87	50310.56	55341.62	60875.78	66963.36
50	GAIL (India) Ltd.	8514	9936.2	11596.03	12755.6	14031.1	15434.31	16977.74	18675.52	20543.07	22597.38

TableA5 Weighted FCFE for the subsequent years of the Nifty 50 constituent companies

Sr. No.	*Company Name*	*FCFE 20*	*FCFE 21*	*FCFE 22*	*FCFE 23*	*FCFE 24*	*FCFE 25*	*FCFE 26*	*FCFE 27*	*FCFE 28*	*FCFE 29*
1	Reliance Industries Ltd.	-2321.22	-2238.82	-2159.34	1050.01	1155.01	1270.51	1397.56	1537.32	1691.05	1860.16
2	HDFC Bank Ltd.	4975.92	6163.89	7635.46	8399.01	9238.91	10162.80	11179.08	12296.99	13526.69	14879.35
3	Infosys Ltd.	1548.25	1990.15	2558.18	2814.00	3095.40	3404.94	3745.44	4119.98	4531.98	4985.18
4	Housing Development Finance Corporation Ltd.	124.01	125.42	126.84	139.52	153.47	168.82	185.70	204.27	224.70	247.17
5	ICICI Bank Ltd.	1155.48	1298.81	1459.92	1605.91	1766.50	1943.15	2137.46	2351.21	2586.33	2844.96
6	Tata Consultancy Services Ltd.	2012.92	2866.41	4081.80	4489.98	4938.98	5432.87	5976.16	6573.78	7231.15	7954.27
7	Kotak Mahindra Bank Ltd.	189.93	199.30	209.13	230.04	253.04	278.35	306.18	336.80	370.48	407.53
8	Hindustan Unilever Ltd.	295.82	348.46	410.47	451.51	496.66	546.33	600.96	661.06	727.17	799.88
9	ITC Ltd.	426.48	528.08	653.88	719.27	791.20	870.32	957.35	1053.08	1158.39	1274.23

10	Larsen & Toubro Ltd.	-9.95	-9.90	-9.84	57.42	63.16	69.48	76.43	84.07	92.48	101.72
11	Axis Bank Ltd.	321.01	361.20	406.42	447.06	491.77	540.95	595.04	654.55	720.00	792.00
12	Bajaj Finance Ltd.	142.44	167.83	197.76	217.54	239.29	263.22	289.54	318.50	350.35	385.38
13	Asian Paints Ltd.	53.96	66.71	82.48	90.73	99.80	109.78	120.76	132.84	146.12	160.73
14	Bharti Airtel Ltd.	424.44	574.00	776.25	853.88	939.27	1033.19	1136.51	1250.16	1375.18	1512.70
15	State Bank of India	359.30	386.29	415.31	456.84	502.53	552.78	608.06	668.86	735.75	809.32
16	HCL Technologies Ltd.	-135.20	-116.21	-99.89	93.50	102.85	113.14	124.45	136.89	150.58	165.64
17	Maruti Suzuki India Ltd.	283.89	381.29	512.11	563.32	619.65	681.62	749.78	824.76	907.23	997.96
18	Mahindra & Mahindra Ltd.	76.83	89.66	104.63	115.09	126.60	139.26	153.19	168.51	185.36	203.89
19	Nestle India Ltd.	21.66	42.98	85.27	93.79	103.17	113.49	124.84	137.32	151.05	166.16
20	Titan Company Ltd.	10.69	12.34	14.24	15.67	17.24	18.96	20.86	22.94	25.23	27.76
21	Sun Pharmaceutical Industries Ltd.	49.90	55.12	60.87	66.96	73.66	81.02	89.12	98.04	107.84	118.62
22	Dr. Reddy's Laboratories Ltd.	26.23	30.16	34.68	38.15	41.97	46.16	50.78	55.86	61.44	67.59
23	UltraTech Cement Ltd.	46.99	52.36	58.33	64.17	70.58	77.64	85.41	93.95	103.34	113.67
24	Tech Mahindra Ltd.	113.86	168.57	249.58	274.54	301.99	332.19	365.41	401.95	442.14	486.36
25	Wipro Ltd.	95.05	110.68	128.88	141.77	155.94	171.54	188.69	207.56	228.32	251.15
26	Bajaj Finserv Ltd.	39.77	45.05	51.03	56.13	61.74	67.92	74.71	82.18	90.40	99.44
27	HDFC Life Insurance Company Ltd.	6.45	7.06	7.72	8.49	9.34	10.28	11.30	12.43	13.68	15.05
28	IndusInd Bank Ltd.	21.46	22.84	24.31	26.74	29.42	32.36	35.60	39.16	43.07	47.38
29	Divi's Laboratories Ltd.	0.09	0.09	0.09	0.10	0.11	0.12	0.13	0.15	0.16	0.18
30	Power Grid Corporation of India Ltd.	210.37	291.04	402.65	442.92	487.21	535.93	589.52	648.47	713.32	784.65
31	Tata Steel Ltd.	115.58	140.93	171.83	189.02	207.92	228.71	251.58	276.74	304.41	334.85
32	NTPC Ltd.	106.56	118.15	131.00	144.10	158.51	174.37	191.80	210.98	232.08	255.29
33	Bajaj Auto Ltd.	-2.33	-2.30	-2.27	8.88	9.77	10.74	11.82	13.00	14.30	15.73

34	Britannia Industries Ltd.	25.72	61.06	144.95	159.45	175.39	192.93	212.22	233.45	256.79	282.47
35	Cipla Ltd.	15.52	17.56	19.87	21.86	24.05	26.45	29.09	32.00	35.20	38.73
36	Hero MotoCorp Ltd.	18.15	21.45	25.35	27.89	30.67	33.74	37.12	40.83	44.91	49.40
37	JSW Steel Ltd.	65.44	83.23	105.86	116.45	128.09	140.90	154.99	170.49	187.54	206.29
38	Grasim Industries Ltd.	-5.01	-4.94	-4.88	24.40	26.84	29.52	32.48	35.72	39.30	43.23
39	Adani Ports and Special Economic Zone Ltd.	45.77	58.56	74.91	82.40	90.64	99.70	109.68	120.64	132.71	145.98
40	SBI Life Insurance Company Ltd.	5.29	5.76	6.27	6.89	7.58	8.34	9.18	10.09	11.10	12.21
41	Eicher Motors Ltd.	-9.22	-7.82	-6.64	2.36	2.60	2.86	3.14	3.46	3.80	4.18
42	Hindalco Industries Ltd.	83.54	103.71	128.76	141.64	155.80	171.38	188.52	207.37	228.11	250.92
43	Oil & Natural Gas Corporation Ltd.	213.12	251.74	297.36	327.10	359.81	395.79	435.36	478.90	526.79	579.47
44	Tata Motors Ltd.	81.53	105.43	136.34	149.97	164.97	181.46	199.61	219.57	241.53	265.68
45	Shree Cement Ltd.	36.03	53.59	79.69	87.66	96.43	106.07	116.67	128.34	141.18	155.29
46	Bharat Petroleum Corporation Ltd.	59.20	76.36	98.49	108.34	119.17	131.09	144.20	158.62	174.48	191.93
47	Coal India Ltd.	49.39	63.39	81.35	89.48	98.43	108.28	119.10	131.01	144.11	158.53
48	UPL Ltd.	7.66	8.38	9.16	10.08	11.08	12.19	13.41	14.75	16.23	17.85
49	Indian Oil Corporation Ltd.	87.48	106.88	130.58	143.64	158.00	173.80	191.18	210.30	231.33	254.46
50	GAIL (India) Ltd.	32.35	37.76	44.06	48.47	53.32	58.65	64.52	70.97	78.06	85.87