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RESEARCH ARTICLE

A WHITE PAPER ON EQUITY MARKET VALUATION INDEX

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ABSTRACT

This paper presents a new approach to look at equity market valuations. The paper formulates a derivative of three valuation based ratios widely used by investors and fund managers. The derivative "Equity Market Valuation Index" converts valuation ratios in to an index that rages between 0-100. It uses the principal of mean reversion to identify extreme valuation points of equity markets. The derivative makes valuations easy to understand even for investors with no background knowledge of finance and investments. The construct is to help investors identify high risk "Bubbles" and attractive "Burst" phases in equity markets.

INTRODUCTION

Financial Bubbles, Bursts and Investment madness have existed for as long as man kind established financial markets. The definition of" Bubble"asper Oxford dictionary is"a good or for tunate situation that is isolated from realty or unlike lyto last" and" asignificant, usually rapid, increase inassetprices that is soon followed by acollap seinprices and typically arises from speculation or enthusiasmra ther than in trinsic increase invalue". But probably them ost common definition of abubbleisascenario where common people get motivated to invest tin any asset in which they have no business of beingin volved. Someof the well-known bubbles are tulip bubble of1 600 in Europe, internet stocks bubble of 1999, reale state bubble of 2007and equity market bubble of 2008. Another popular definition of bubble is deviation from thelong term price trend and decoupling of asset price from its fundamentals.

Talking about them ost famous asset bubbles seen by mankind, the three most famous bubbles are the South Sea Company bubbleof1711–1720, the Mississippi company bubbleof1719– 1720, and the Dutchtuli pmania of the early seventeen thcentury all of which saw draw downs from peak to trough of 88-99%. Talking about investment bubbles in asset classes, financial assets are different to commodities orart, and they carry as teady stream of cash flows that makes it possible to find in trinsic value of anasset. But fear and greed of investors drive the prices in short run and some times make them highly over orunder priced. At then do f the day many retail invest or send uplosing money by entering at the wrong end of the valuation cycle of financial assets.

Whileman kind has seen bubbles in many asset classes,this paper focuses on indentify ingequity market bubbles and bursts by implement ingasimpletool that is easy for even smalles tinvestor to understand. Equity market sin India haveseen many bubbles and bursts; the examples are the market bubblesin1995-96, 2000-2001and 2008. Equity market sasanas set class have been analyzed in past based on valuation sandbases it is possible to identify abubble or burst scenario. Themost common methods of identifying equity market valuation are Price/ Earnings, Price/ Book Value and Dividend Yield Ratio. But for many retail and small investors, classic valuation method sare difficult tounder stand.

For example market P/E of 22.34 or Divid end Yield of 1.76% will not makes enseto many retail investors. In this paper we haved evelopeda derivative of classic valuation tools in such manner that a smallest invest or with no prior knowledge of equity market scan understand ther is kinvolved at the time of making investment. Forease of understanding, we will call the derivative"Market Valuation Index". This chapterisins pired from work of MebaneT. Faber' sarticle Learning to Love

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Investment Bubbles: What if Sir Isaac New tonhad been a Trend follower? Due credit goes to the author.

Background studies

As this paper attem ptstoconce ptualizea new derivative of stock market valuation methods, there is no exact literature of evidence available from history, but there is enough havailability of literature on impact of valuation methods like P/E Ratio,P/B Ratio and Divid end Yield. We look at some the significan this torical work in this chapter. (Campbell and Shiller) in their research "Valuation Ratios and Long-Run Stock Market Outlook" used Price to Earnings Ratio and Dividend Yield to predict stock market prices. They found based on historical data that these two ratios have predictive ability and can be used for equity market price forecast.

(Campbell and Shiller) in their paper "Valuation Ratios and Long-Run Stock Market Outlook: An Update", found Price to Earnings Ratio and Dividend Yield data useful in forecasting future stock price changes. They examined aggregate US annual US data from 1871 to 2000 and aggregate quarterly data for twelve countries from 1970-2000. (Rapach and Wohar) in their paper "Valuation Ratios and long-horizon stock price predictability", used annual data for 1872-19997 for US. They examined the predictability of real stock prices based on price-dividend and price-earnings ratios. In line with the extant literature, they found significant evidence of increased long-horizon predictability; that is, the hypothesis that the current value of a valuation ratio is uncorrelated with future stock price changes could not be rejected at short horizons but could be rejected at longer horizons based on bootstrapped critical values constructed from linear representations of the data.

They found increased statistical power at long horizons in finite samples providing a possible explanation for the pattern of predictability in the data, they found via Monte Carlo simulations that the power to detect predictability in finite samples does not increase at long horizons in a linear framework. An alternative explanation for the pattern of predictability in the data is nonlinearities in the underlying data-generating process. They considered exponential smooth-transition autoregressive models of the price-dividend and price- earnings ratios and their ability to explain the pattern of stock price predictability in the data

(Lee)in his research entitled "Nonlinearity in Valuation Ratio and Its Implications on Long- Horizon Return Predictability" found that the log of real price-dividend ratios from 1872 to 2001 can be described as a logistic smooth transition auto regression model. The estimation shows that the series is in a regime where this process shows non stationarity for most of the period after 1959. Some earlier studies which reported highly predictable stock returns only after WWII and the excessive bias from 1970s to late 1990s in the coefficient of the forecasting variable can be explained using regime switching behavior. (Wu and Hu) in their paper "Price-Dividend ratios and stock price predictability" examined out- of-sample predictability of real stock prices based on price-dividend (PD) ratios. Their research focused on the significance of the time-varying mean and nonlinear dynamics of PD ratios in the empirical analysis. Empirical results supported the proposed nonlinear model of the PD ratio and the stationarity of the trend-adjusted PD ratio. Furthermore, their paper rejected the non- predictability hypothesis of stock prices statistically based on in- and out-of-sample tests and economically based on the criteria of expected real return per unit of risk. They used US data for the period 1872-2007.

(Malliaropulos) in his work "Are long horizon stock returns predictable? A bootstrap analysis" examined empirical evidence of predictability of long-horizon real and excess stock returns in the UK using univariate as well as multivariate Variance Ratio tests. In order to estimate the sampling distribution of the test statistics, artificial histories of stock returns were generated from their empirical distribution using the bootstrap method. This allowed the construction of significance levels of the test statistics which were free from distributional assumptions. The empirical results indicate that there is no evidence of mean reversion in stock prices even if wider information set to forecast stock returns is used and that the significance of historical Variance Ratio statistics have been overstated by previous studies. This means that stock prices themselves are not efficient tools of price predictability!

(Domian and Reichenstein) in their paper entitled "Long-Horizon Stock Predictability: Evidence and Applications" updated prior studies and presented a new evidence on the predictability of stock market returns. They examined the ability of two earnings yields to predict one- through 10-year real S&P 500 returns for 1881-2008 and 1953-2008. The upshot is that, as of year-end 2008, stock prospects looked better than they were since at least the early 1990s. Based on evidence from Shiller's (2000) model and a variant of that model, long-horizon stock prospects appear to be in line with historical averages, where stocks significantly outperform Treasury bonds and bills.

(Coakley and Maria) in their paper "Valuation ratios and price deviations from fundamentals" examined US stock price deviations from fundamentals by analyzing the time-series dynamics of post-1870 S&P valuation ratios. They employed a non-linear, two-regime framework that allows for different behavior over phases of the stock market cycle. Persistence in the ratios implies prolonged price deviations from fundamentals stemming from short run continuation fueled by investor sentiment during bull markets.

However, the pull from fundamentals ensures that valuation ratios and prices move toward their equilibrium levels in bear markets. Impulse response functions highlight sluggish adjustment and indicate that the effects of positive shocks are more pronounced and long-lasting in bull markets. The main conclusion was that, while market sentiment plays an important transitory role, valuation ratios do mean revert and so prices reflect fundamentals in the long run.

METHODOLOGY

- Data: NSE S&P CNX 500 indices daily data for P/E, P/B and Dividend Yield is used for the period 1st January, 2000 to 31st December, 2014. The data is

collected from the data archive of website of National Stock Exchange.

ADF Test

Time Series	ADF Statistics	P-Value
P/E Ratio	-4.24	0.01
P/BRatio	-2.35	0.43
Divid end Yield	-3.10	0.11

The ADF test statis tics suggest that P/B Ratio time series is not stationary and cannot be incorporated in the index construction. P/ER atio time seriesis found to bestationary at1% level of significance and Divid end Yield is found to be stationary at10.9% level of significance. Based on the test the valuation index is constructed using P/ER atio and Divid end Yield.

IndexConstruction:

The proposed index is constructed in following steps

(i) Mean Computation the mean of P/ER atio and Divid end Yield is calculated on rolling bases. As the time series progresses the first value of P/E and Divid end Yield is keptstatic. The formula to compute mean is as follows.

P/EMean(PEM)=(∑P/Ei)/n (1)
n=numberofobservations
DYMean(DYM)=(∑DYi) /n
(2) n=numberofobservations

(ii) Distance From Mean The difference between daily P/E Ratio and PEM and Divid end Yield and DYM values is calculated by using natural log difference toavoid base effect.The formula is summarized ine qu ation 3 and4.
P/E Distance (PED) =logn (P/Ei)- logn (PEMi)(3)
DYDistance(DYD)=logn(DYi)-logn(DYMi)(4)

(ii) Index Calculation

The proposed index in this paper is calculated using PED and DYD values .The percent ilefor PED and DYD isc alculated.The average of both multipliedby100 gives the finalv alue.

Equity Market Valuation Index=
[{(Rank (PED)-1)/n-1) + (1-(Rank (DYD)-1/n-1))}/2]* 100(5)
Wheren =number of observations

The index isconstructedonthe principal of mean reversion found to be present in the time series of P/E Ratio and Divid endyield. The index measures the distance of P/ERatio and Dividend yield from it saverage. The distance is then converted to percentile.The Index value ranges between 0-100.

The value of index will indicate, where the present day valuation stands compared to history, the value of 90 would mean that the valuation is in 90thpercentile and a value of 10 would mean that the valuation is in 10thpercentile.

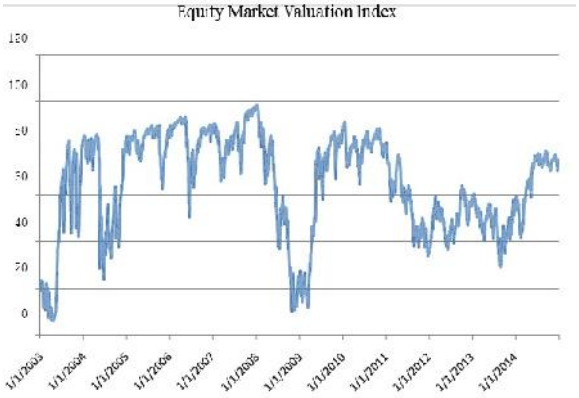

Figure 1

The index

Interpretation

Index Value	Interpretation
0-10	Extremely Attractive Valuation
11-20	AttractiveValuation
21-50	BelowAverageValuation
51-80	Above AverageValuation
81-90	HighValuation
91-100	Extremely High Valuation

Application

To test the effectiveness softhe “Equity Market Valuation Index”, fives tocks are randomly picked up and hypothetica lposition sare created. Therule is set as enter when EMVI valueis15 or below and exit when the value is90orabove.Ther and omly selected stocks from largecap universeareas follows,Tata Steel, Reliance Capital, Arvind ,Century Textiles and Infosys.

Date	EMVI	Action	Tata Steel	Reliance Capital	Arvind	Century Textiles	Infosys
27/1/2003	11.8	Buy	153	45.88	20.23	45.74	165.5
07/2/2006	90.05	Sell	408.75	399.22	86.68	298.57	532.82
18/11/2008	13.7	Buy	164.75	476.13	13.79	157.26	495.46
11/1/2010	90.4	Sell	648.50	831.59	42.40	518.59	1070.32

Port folio Performance

Trade	Portfolio Return (%)
1	408.09
2	184.31

This analysis is only to demonstrate the application part of the Equity Market Valuation Index. There are multiple applications for it. The prime motive for developing this index is to help retail and small investors identify attractive valuation based entry and rewarding exitpoints for theire quity investments.

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