AI revolution in Financial Markets

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Analytics based Financial Innovation

ROBO-ADVISORS

HYBRID PRODUCTS BETWEEN MUTUAL FUND & DIRECT STOCK PICKS

TIMED SIP

Investopedia definition

What Are Financial Markets?

Financial markets refer broadly to any marketplace where the trading of securities occurs, including the stock market, bond market, forex market, and derivatives market, among others. Financial markets are vital to the smooth operation of capitalist economies.

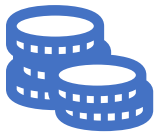
Financial Markets: The players

- Main Characters:
  - Firms
  - Households
  - Government
- Financial Intermediaries
  - Investment Banks
  - Exchanges
  - Investment Companies
    - Mutual Funds
    - Insurances
    - Wealth Management firms
  - Venture Capital and Private Equity

Financial Markets: Action Locations

Stock Markets

Debt Markets



Money Market

Commodities Markets

Options Markets

Which stock is a better buy?

- Stock A : $25
- Stock B: $50

Price is not relevant. What matters is the expected returns vs the risk you are taking.

All Analysis is done on percentage returns – not on prices.

Defining Return on an Investment

- Capital Gains Yield
- Dividend Yield

If you invest in a stock for a year and the price moves from $20 to $25. The stock also provided a dividend for $1 during that year. What is the return on investment?

Capital Gains Yield $= \frac{Change\ in\ Price}{Starting\ Price} = \frac{5}{20} = 0.25 = 25\%$

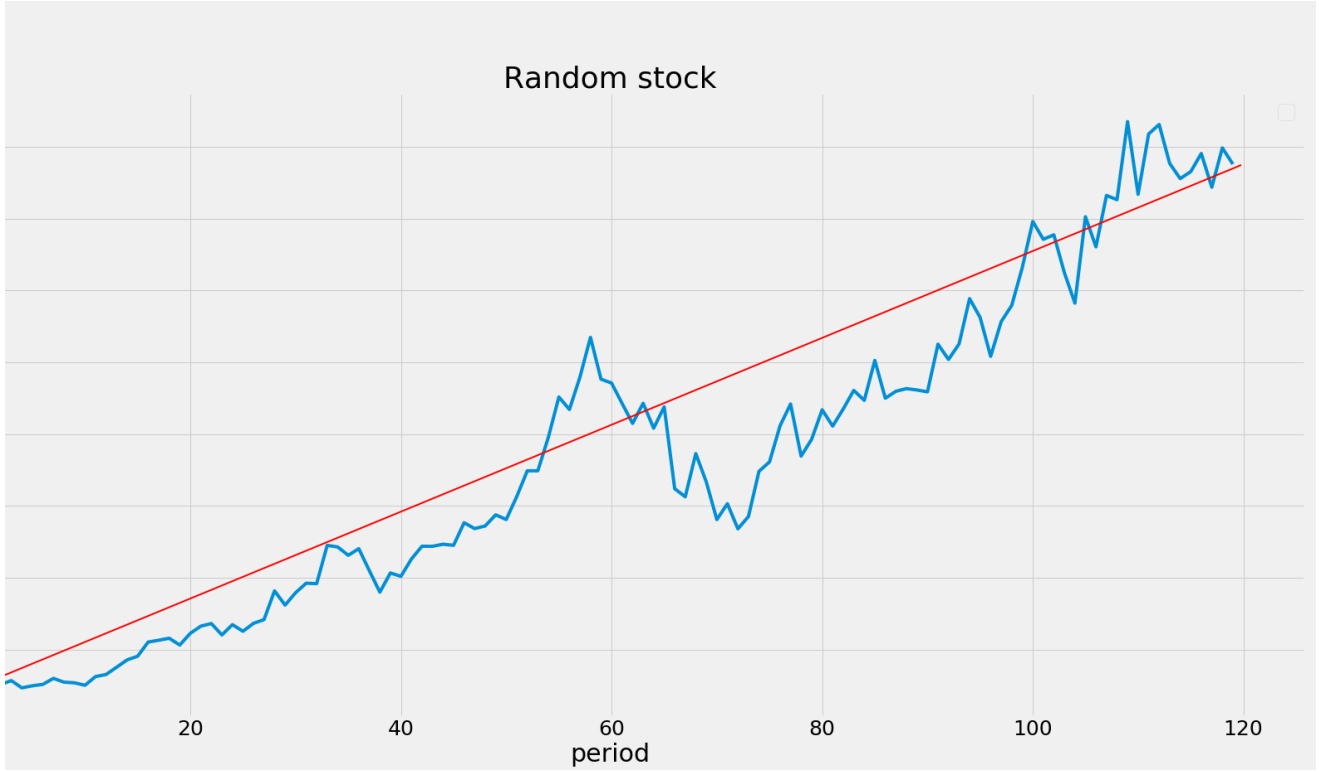
Dividend Yield $= \frac{Dividends}{Starting\ Price} = \frac{1}{20} = 0.05 = 5\%$

Total Returns = 25+5 = 30%

Which investment would you prefer?

- A investment in project that gives a guaranteed return of 10%
- A investment in project that projects return in the range of 0% to 20% (average of 10%)

Financial Risk: Definition



- Uncertainty in the outcome
- Risk = Std(daily % price changes)

Source: https://marketbusinessnews.com/financial-glossary/risk-definition-meaning/

Risk Return Trade Off For Asset Classes

Source: http://www.onemint.com/2017/articles/understanding-risk-return-for-various-investment-asset-classes/

Data Sources

- Professional Data Sources
  - Bloomberg (Very comprehensive)
  - Reuters
- Free/Cheap Data Sources
  - Yahoo
  - Quandl
  - financialmodelingprep.com
  - BSEINDIA.com
- Economic Data
  - https://fred.stlouisfed.org/ (US focussed)
  - TradingEconomics.com
  - https://www.indiadatahub.com/
  - https://www.smartdubai.ae/data/get-data

Investment Styles

01

Value Investing

02

Growth Investing

03

Momentum Investing

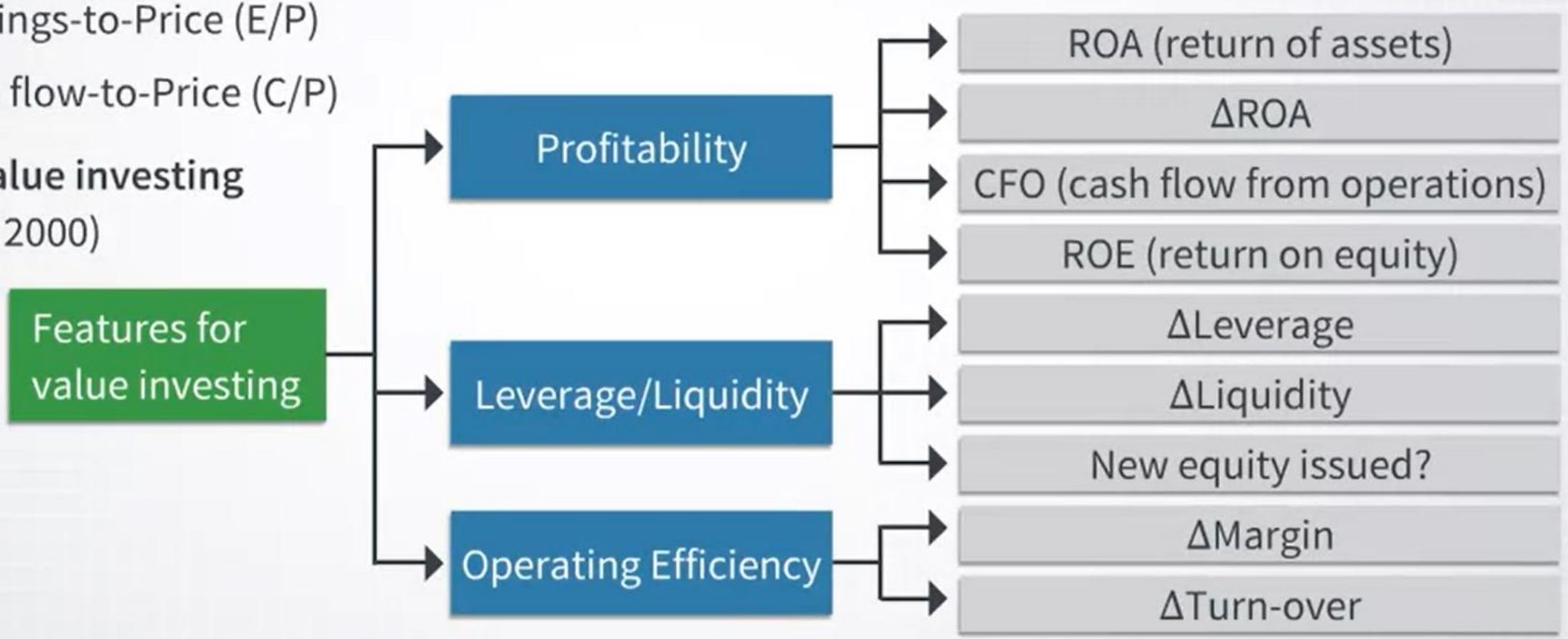
Variable Selection for Value Investing

Value investing (Fama and French 1992):

Under-valued stocks have:

- High Book-to-Market Equity (B/M) (B = Tangible Assets - Depreciation Liabilities)
- High Earnings-to-Price (E/P)
- High Cash flow-to-Price (C/P)

F-score value investing
(Piotroski 2000)



Growth Investing

- Rapidly Expanding Industries
- Might not be very profitable right now (High P/E ratios)
- No dividends
- Strong earnings growth
- Examples: AMZN , TSLA

The existence of momentum is a well-established empirical fact. The return premium is evident in 212 years (yes, this is not a typo, *two hundred and twelve years* of data from 1801 to 2012) of U.S. equity data,[3] dating back to the Victorian age in U.K equity data,[4] in over 20 years of out-of-sample evidence from its original discovery, in 40 other countries, and in more than a dozen other asset classes.[5] Some of this evidence predates academic research in financial economics, suggesting that the momentum premium has been a part of markets since their very existence, well before researchers studied them as a science.

Momentum Investing

- Core idea: Stocks that have gone up, will continue to go up (at least in the short-term)

Momentum Investing

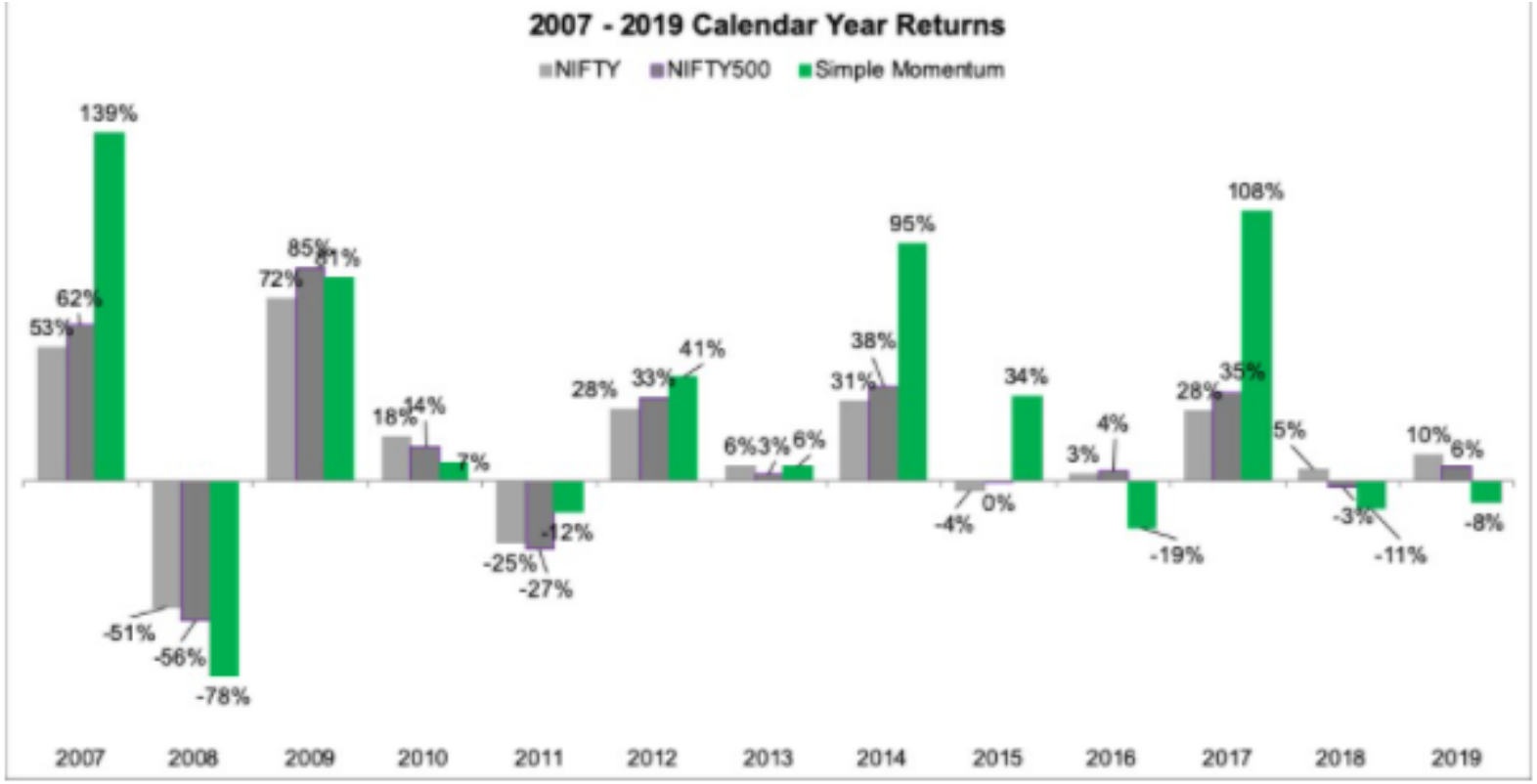
Simple Momentum BackTest

Jan 2007 - Dec 2019	NIFTY	NIFTY500	Simple Momentum
Annual Return	8.86%	8.69%	12.58%
Avg Monthly Return	0.92%	0.94%	1.50%
% +ve Months	53%	54%	63%
Monthly Volatility	6.6%	7.0%	9.9%
Maximum DrawDown	-56%	-62%	-79%
Worst Month (Nov 2008)	-23%	-24%	-37%

- Exists across asset classes
- Pro: Outperforms benchmarks in India (& elsewhere)

Source: https://www.capitalmind.in/2019/12/momentum-investing-basics-india/

Momentum Investing



- Con: Higher Volatility & Higher Drawdowns

Source: https://www.capitalmind.in/2019/12/momentum-investing-basics-india/

Analysis Using Fundamental Data

Right way to look at Fundamental data

- Earnings
  - $1Billion vs $5Billion
- Need more information to judge
  - Margin
  - What is the value of the company?
  - Are the earning’s increasing?
- Earnings-per-share
- PE

Fundamental Indicators: Earnings

- Relevant Earnings for Shareholder = Net Earnings – Preferred Dividends

- How much of that earnings is likely to come to the shareholder?

Earnings Per Share (EPS)

$$\text{EPS} = \frac{\text{Total Earnings}}{\text{Outstanding Shares}}$$

PE Ratio (Price-to-Earnings)

$$\text{PE} = \frac{\text{Stock Price}}{\text{Earnings Per Share}}$$

Reliance Industries Ltd.

Sector: Refineries

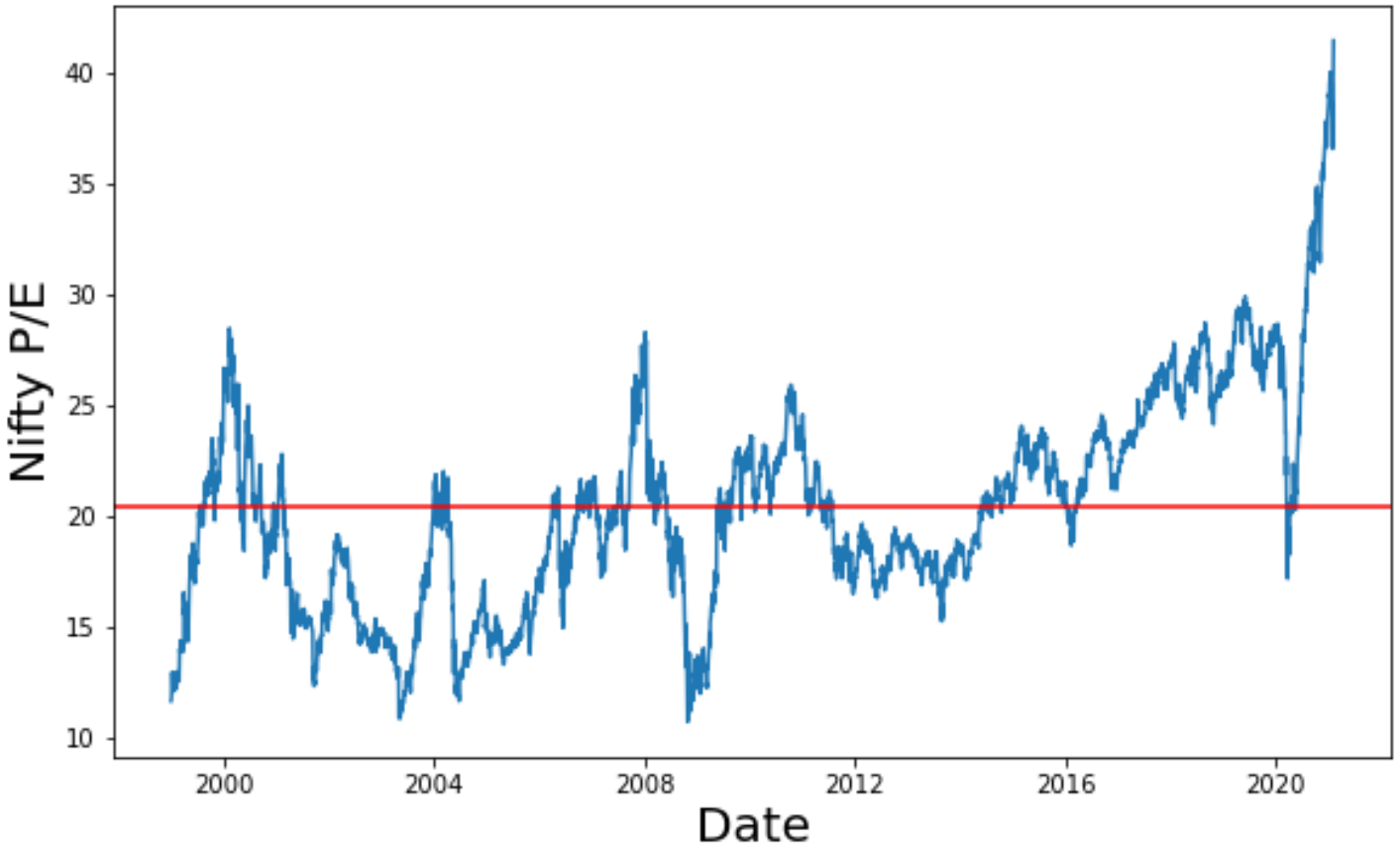
1,923.75

Face Value	10	P/B	2.61
TTM EPS	65.55	Dividend Yield	0.34
TTM PE	29.35	P/C	19.24
Sector PE	37.84		
Book Value Per Share	736.42		

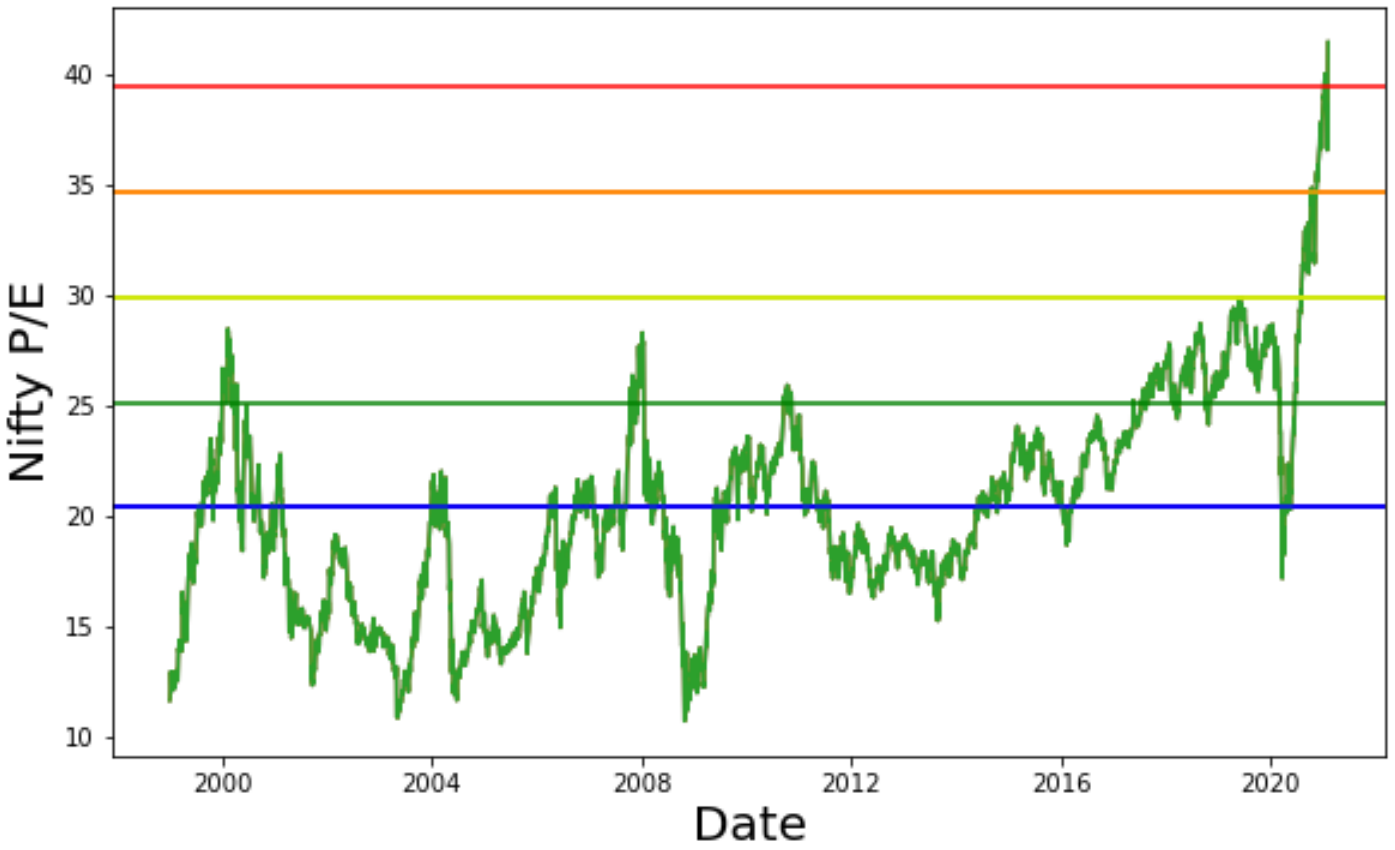
General Wisdom

- Nifty Average PE = 20
- If PE ratio > 25 ➔ Market is too Expensive. So Sell stocks
- If PE ratio < 15 ➔ Stock is cheap. Buy the Stock

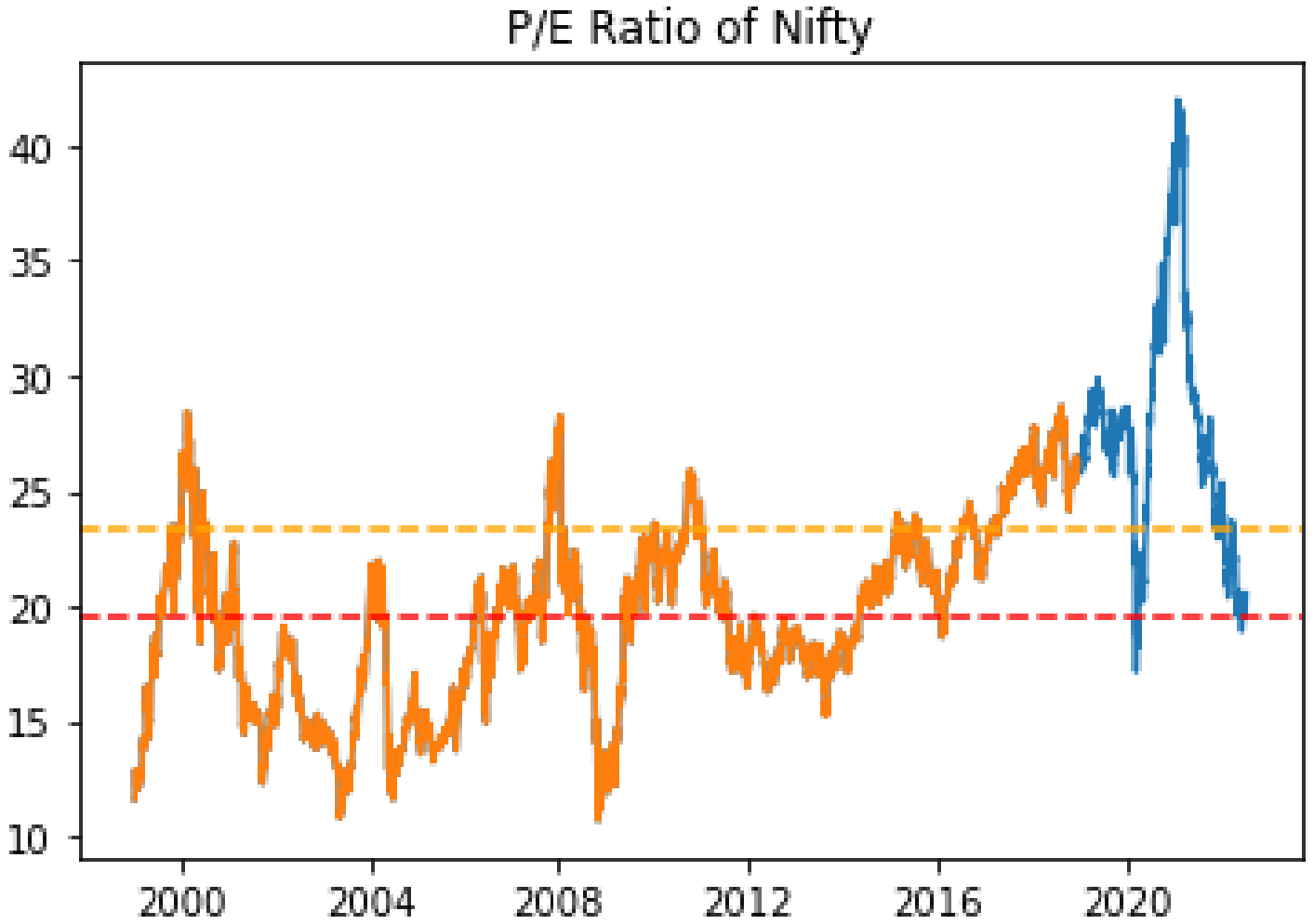
Nifty50 Index PE



Nifty50 Index PE



Nifty50
Index PE



Payout Ratio Formula

$$\text{Payout Ratio} = \frac{\text{Total Dividends}}{\text{Net Income}}$$

$$\text{Payout Ratio} = \frac{\text{Dividends Per Share}}{\text{EPS}}$$

$$\text{Current Dividend Yield} = \frac{\text{Most Recent Full-Year Dividend}}{\text{Current Share Price}}$$

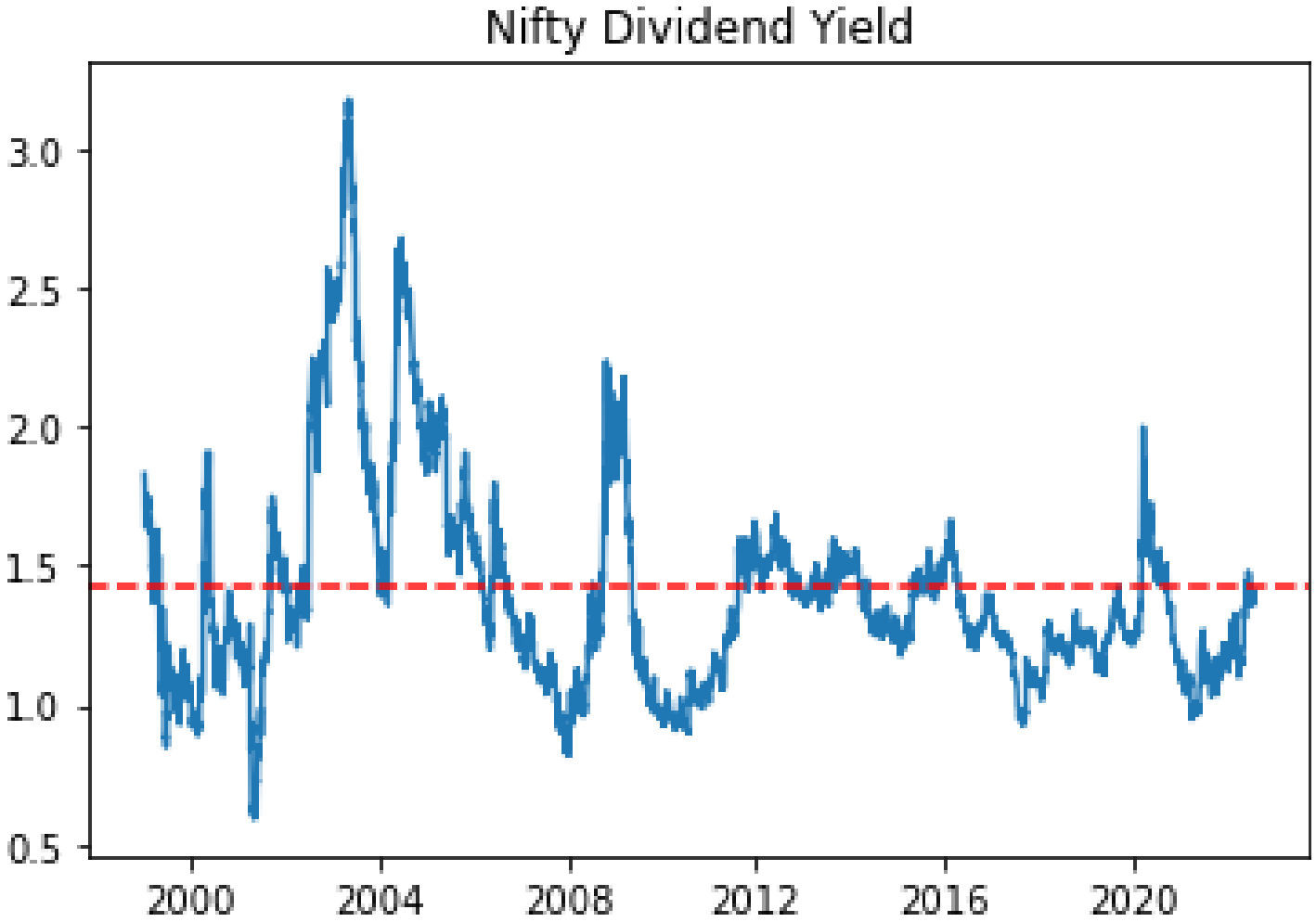
$$= \frac{\$1}{\$20}$$

$$= 0.05$$

$$= 5\%$$

Dividends related Measures

Nifty Dividends Yield



Traditional Programming

Traditional Rule Based Engine / RPA

If PE ratio > 25 ➔ Market is too Expensive. So Sell stocks

If PE ratio < 15 ➔ Stock is cheap. Buy the Stock

ML approach for building Trading Strategies

Date	monthly_ret	quarterly_ret	monthly_volatility	quarterly_volatility	monthly_DivYield	SMA_20_DivYield	monthly_PE_ret	SMA_20_PE	monthly_PB_ret	SMA_20_PB	SMA_22	SMA_66	Signal
31-03-2015	-0.040	0.039	0.009	0.010	0.032	-0.010	-0.040	0.021	-0.029	0.010	1.576	1.091	Down
30-06-2015	-0.008	-0.020	0.010	0.010	0.036	0.006	0.003	-0.023	-0.049	0.003	-1.657	-0.268	Up
30-09-2015	0.000	-0.052	0.012	0.012	-0.014	0.033	0.009	-0.024	0.000	-0.022	-0.890	2.038	Up
31-12-2015	0.001	0.017	0.008	0.007	0.021	0.013	0.002	-0.020	0.000	-0.020	-1.745	-0.034	Down
31-03-2016	0.110	-0.016	0.011	0.012	-0.102	0.029	0.108	-0.024	0.107	-0.024	-2.443	-2.845	Down
30-06-2016	0.016	0.074	0.008	0.009	-0.053	0.026	0.007	-0.011	-0.009	0.002	-0.892	-3.187	Up
30-09-2016	0.000	0.065	0.009	0.007	0.040	-0.036	-0.008	0.029	-0.006	0.022	1.820	0.040	Down
31-12-2016	-0.005	-0.062	0.008	0.009	0.007	0.008	0.015	-0.020	-0.006	-0.008	-0.894	2.046	Up
31-03-2017	0.033	0.160	0.006	0.006	0.000	-0.018	0.006	0.010	0.039	-0.019	-1.808	-6.598	Up
30-06-2017	-0.011	0.045	0.003	0.005	-0.059	0.025	-0.005	0.003	-0.030	0.019	1.246	-1.637	Up
30-09-2017	-0.010	0.029	0.006	0.006	0.245	-0.183	-0.004	0.022	-0.035	0.038	1.936	1.066	Up
31-12-2017	0.015	0.067	0.007	0.006	0.009	0.019	0.015	-0.019	0.017	-0.020	-2.045	-2.863	Up
31-03-2018	-0.036	-0.032	0.009	0.008	0.142	-0.025	-0.042	0.014	-0.034	0.012	1.320	3.346	Up
30-06-2018	0.009	0.058	0.006	0.006	0.008	0.007	-0.041	0.033	-0.011	0.022	0.320	-1.146	Up
30-09-2018	-0.065	0.010	0.008	0.007	0.070	-0.038	-0.079	0.042	-0.089	0.049	2.404	1.552	Down
31-12-2018	0.012	-0.025	0.010	0.011	0.000	-0.004	0.008	-0.004	-0.003	0.008	-0.586	-1.854	Down
31-03-2019	0.068	0.090	0.006	0.007	-0.089	0.057	0.093	-0.046	0.082	-0.039	-3.256	-5.729	Down
30-06-2019	-0.012	0.023	0.007	0.009	0.016	-0.008	-0.024	0.010	-0.026	0.019	0.476	-0.905	Down
30-09-2019	0.033	-0.019	0.016	0.012	-0.015	0.052	-0.037	0.019	0.023	-0.042	-1.926	-1.125	Up
31-12-2019	0.001	0.049	0.006	0.006	0.008	-0.003	-0.001	-0.004	0.000	-0.004	-0.797	-3.685	Down

Core ML problem: What is the relationship between predictors & the target variable?

Traditional Programming vs ML

Traditional Rule Based Engine / RPA

ML Based Learning System

More Fundamental Indicators

ML with Fundamental Predictors


Questions?