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## Quantitative Evaluation of Using Fundamental Data in Credit Risk Assessment: Some Disillusions, Some Startling Facts, and a few Pleasant Surprises

### **Background**

This document is prepared by ASQI Systems team ([www.asqisys.com](http://www.asqisys.com)). At ASQI, we specialize in the application of machine learning, artificial intelligence, and quantitative methods to solve problems in the domain of finance. This document is based on our research in the relevance of fundamental data (i.e. data published by a company as income statement, balance sheet and cashflow statement) in predicting the likelihood of a default. While we believe in using macroeconomic data and alternate data in addition to fundamental data for credit risk assessment, this document outlines how fundamental data itself performs in default forecasting.

### **How to read the graphs**

Each of the below graphs is a summary of the ability of a given variable to differentiate between default and non-default. The X axis is arranged as deciles (1 to 10). In each case, 1 represents the “worst” and 10 represents the “best” as a variable is conventional understood. Hence, for growth, 10 is highest growth decile while for interest payment 10 is the lowest payment decile.

The Y axis represents the proportion of companies defaulting in each decile. These are actual defaults over our research horizon – between 2009 and 2018.

The expected behavior of the probability of default is falling from decile 1 to decile 10 i.e. highest pD for worst performers on a parameter and lowest for the best ones.

### **Summary of findings**

As noted in the subtitle of the document, there are several disillusionments, some startling facts and a few pleasant surprises that we came across in this analysis.

#### **Set 1: Serious disillusionments**

(variables that seem “sensible” but aren’t useful empirically)

1. Interest coverage ratio
2. ROCE
3. Current ratio
4. Annual PBIT margin

#### **Set 2: Mild disillusionment**

(variables seem “sensible” but their effect is too weak)

1. ROA
2. Quarterly PAT margin

#### **Set 3: Startling facts**

(generally well-behaved variables but surprising twists for the best performing companies)

1. YoY quarterly sales growth
2. Debt to equity ratio
3. Growth in net worth
4. Operating profit
5. Free cash flow

Set 4: A few good variables (some specific – even if less acknowledged – variables that do a good job of separating the wheat from the chaff)

1. Short term borrowings
2. Receivables days
3. Interest payment

Set 5: A flavor of alternate data (some of the alternative data variables we use; not an exhaustive list)

1. 1-year returns on stock of the company
2. Public shareholding
3. Dividend yield

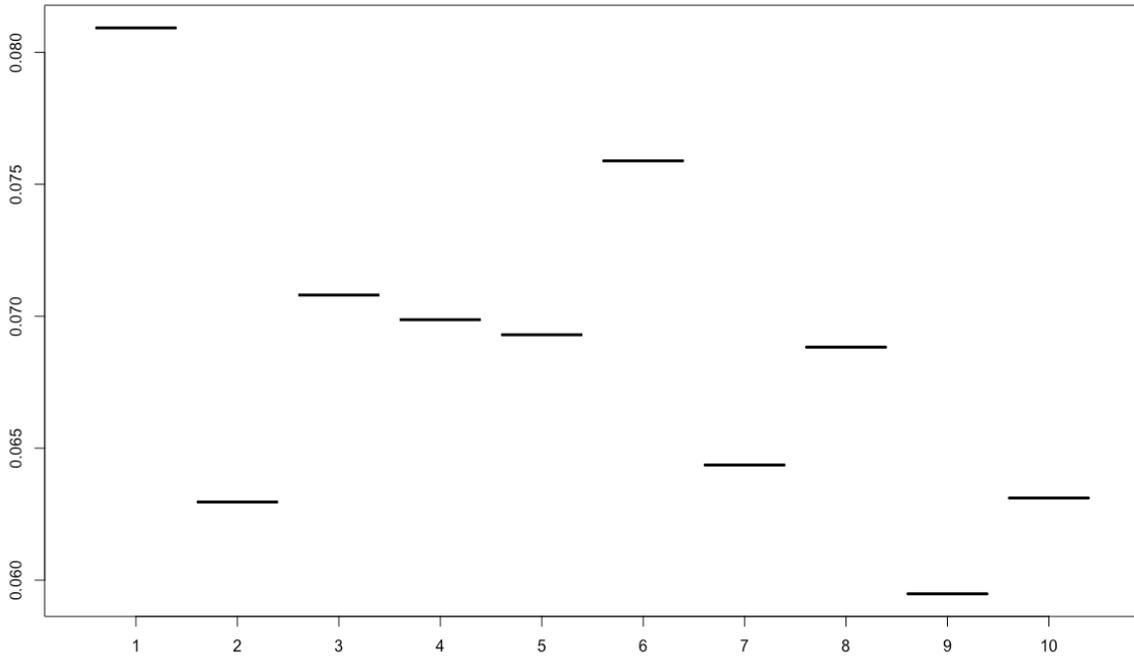
This document does not get into the details of the underlying causes of the above behaviour. However, at the general level the important point to keep in mind is Goodhart's law which states that "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes." In other words, if majority of the lenders and credit rating agencies focus on specific financial performance parameter (e.g. leverage, PAT margin etc) for the purpose of evaluating a borrower, the behaviour of borrowers would adjust to 'showcase' good performance on those specific parameters. This, taken to its logical conclusion, would tend to render these parameters useless. The only antidote to this phenomenon is continued revision of parameters of evaluation through empirical analysis.

Let us know your comments at [asqi.systems@asqi.in](mailto:asqi.systems@asqi.in)

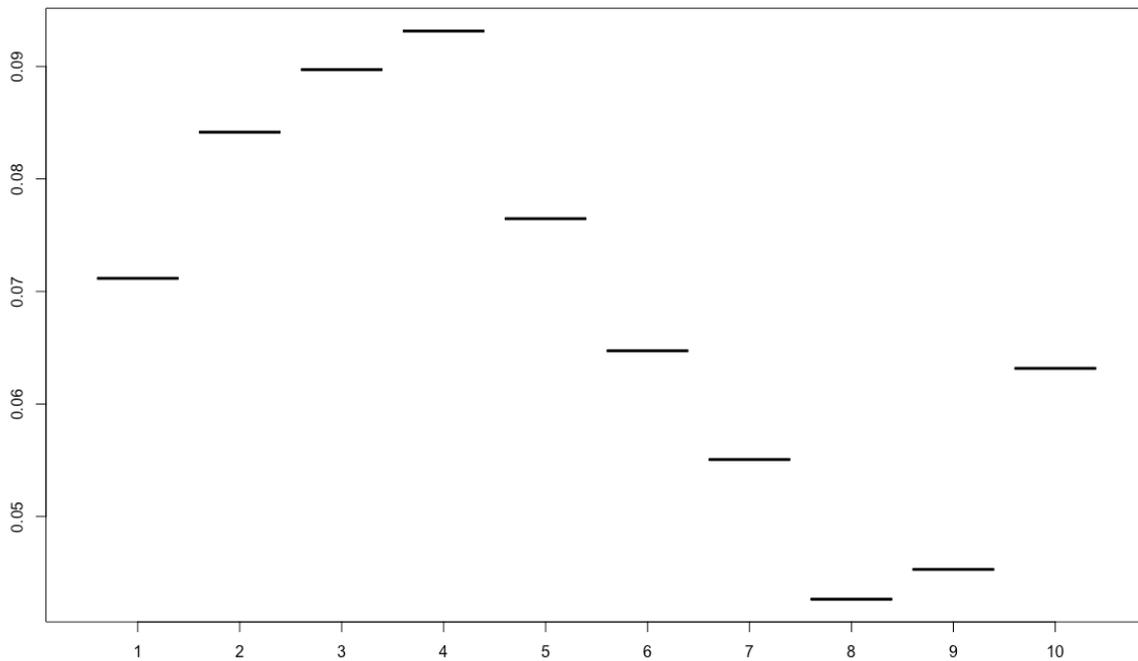
**Rest of the document covers the graphs.**

**Set 1: Disillusionment (variables that seem useful but aren't)**

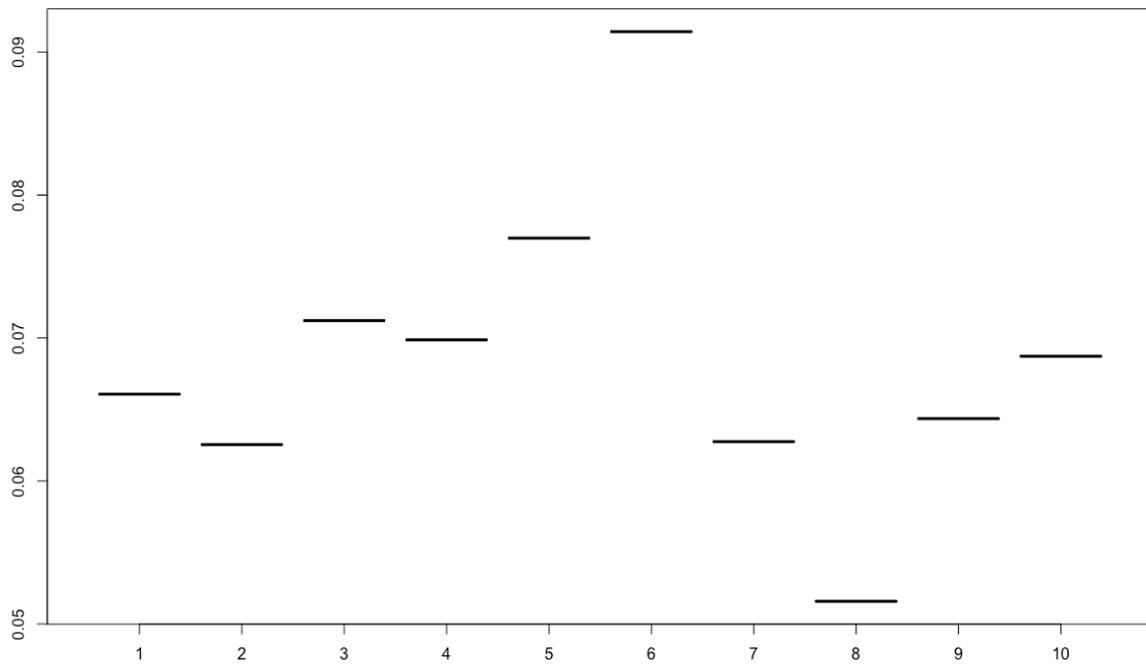
1. Interest Coverage Ratio: No discernible pattern across deciles!



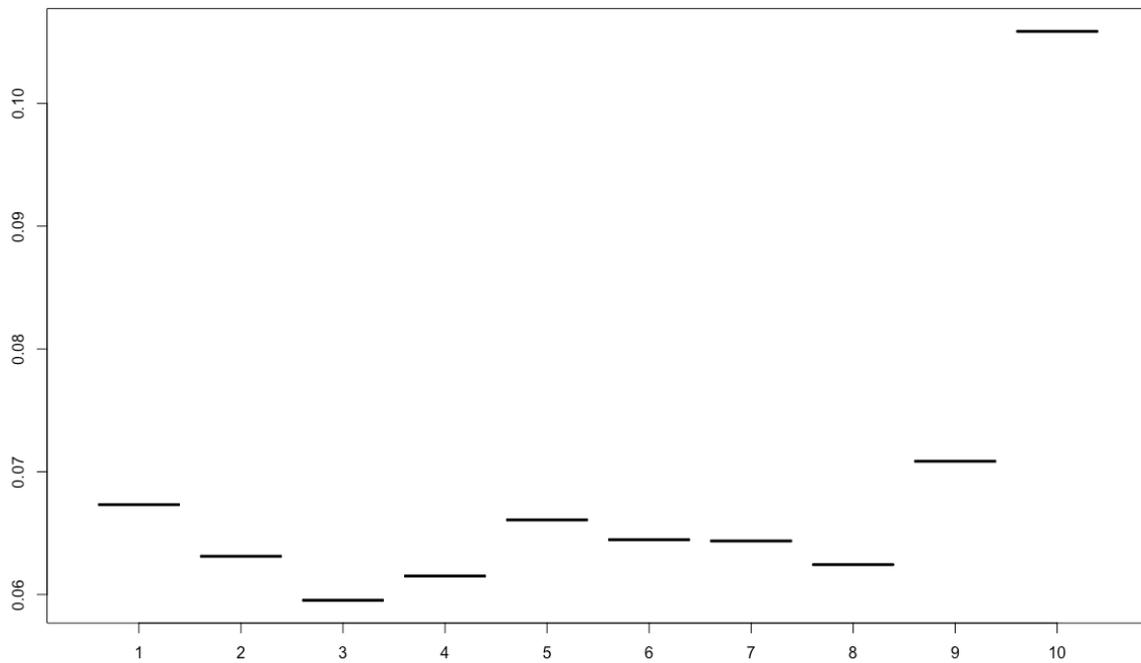
2. Current Ratio: A fairly confusing pattern peaking at 4<sup>th</sup> decile and bottoming at 8<sup>th</sup>!



3. ROCE: The peak around 6<sup>th</sup> decile and bottom at 8<sup>th</sup> while 1<sup>st</sup> and 10<sup>th</sup> similar!

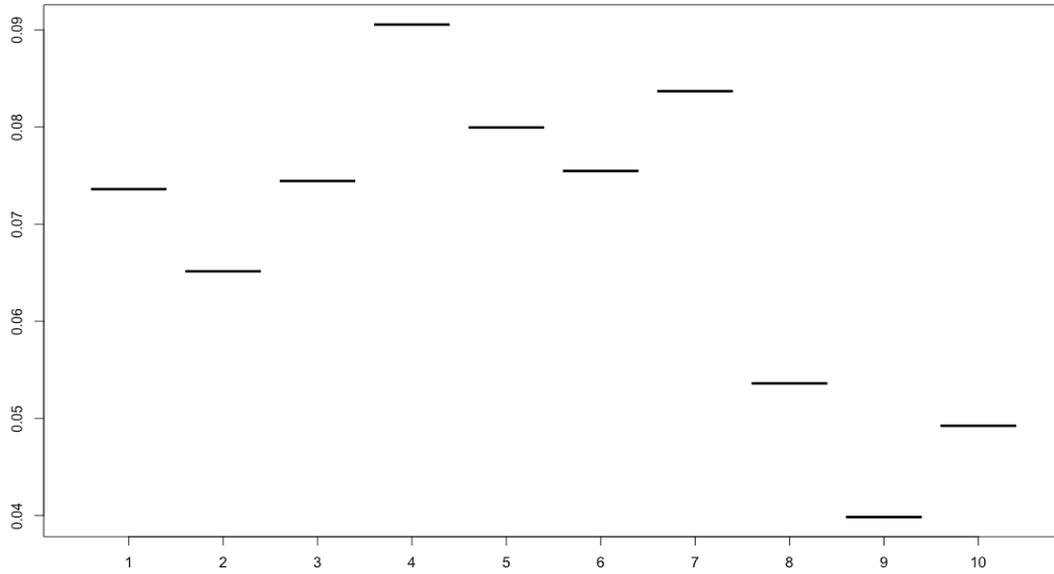


4. Annual PBIT margin: No variation for deciles 1 to 9, and a counterintuitive peak at 10<sup>th</sup>!

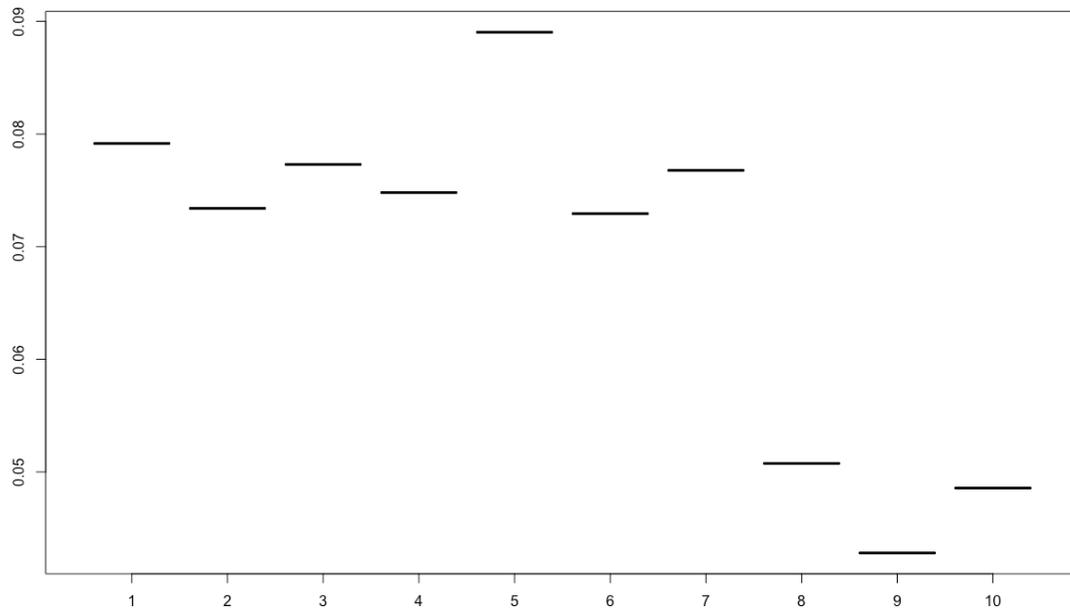


**Set 2: Mild disillusionment (variables seem useful but are weak at best)**

1. ROA: Only two broad groups with not much variation within groups.

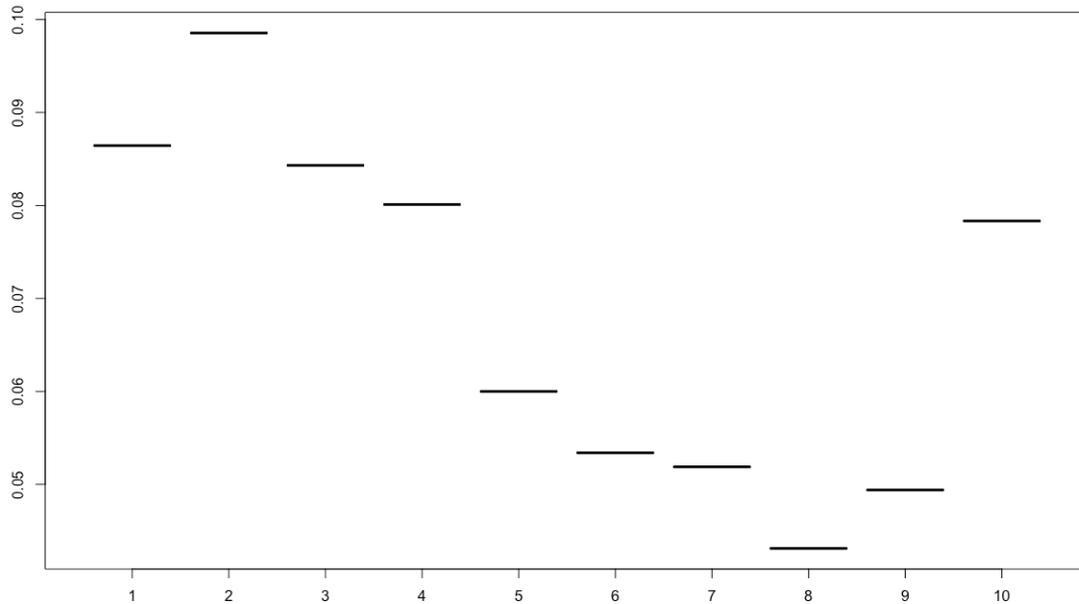


2. Quarterly PAT margin: Only two broad groups with not much variation within groups.

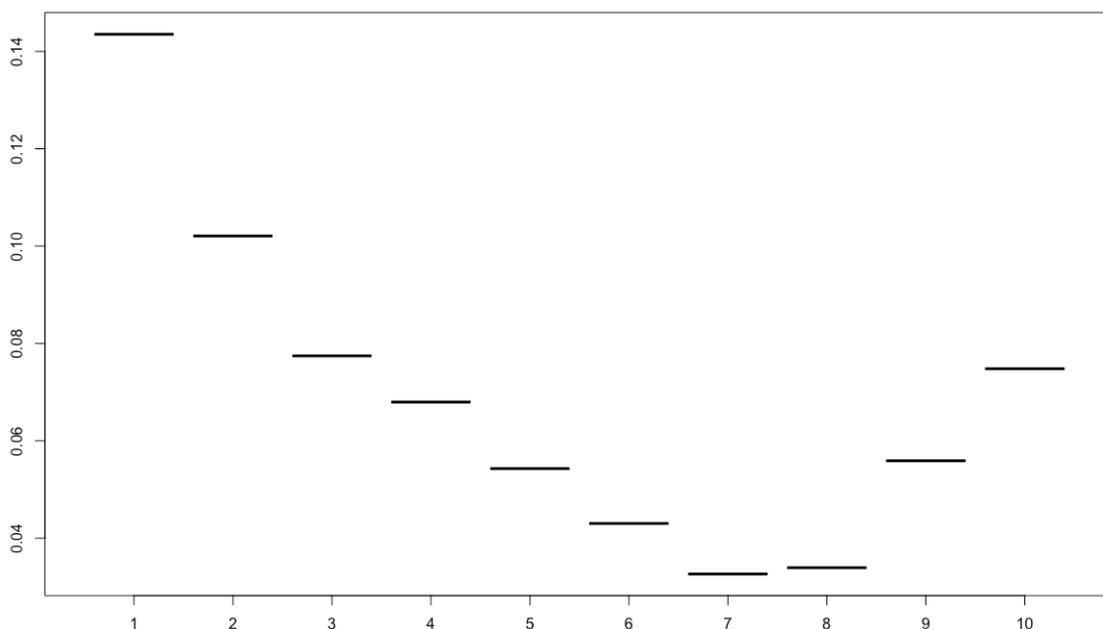


**Set 3: Startling facts (variables that show counter-intuitive behaviour)**

1. YoY Quarterly Net Sales growth: Well-behaved up to 8<sup>th</sup>, the 10<sup>th</sup> decile has fairly high pD!  
 (in other words, highest growth companies are also riskier than their less flashy counterparts with moderate growth)

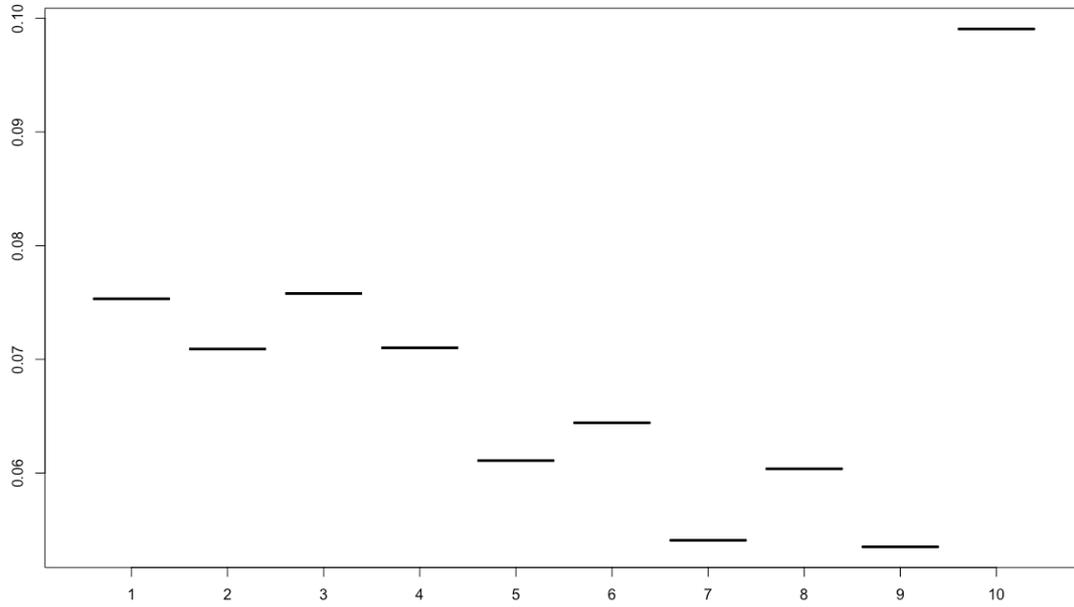


2. Debt to Equity Ratio: Well behaved up to 7<sup>th</sup> decile, steady rise thereafter!  
 (in other words, lowest debt to equity ratio probably prompt excessive subsequent debt addition)



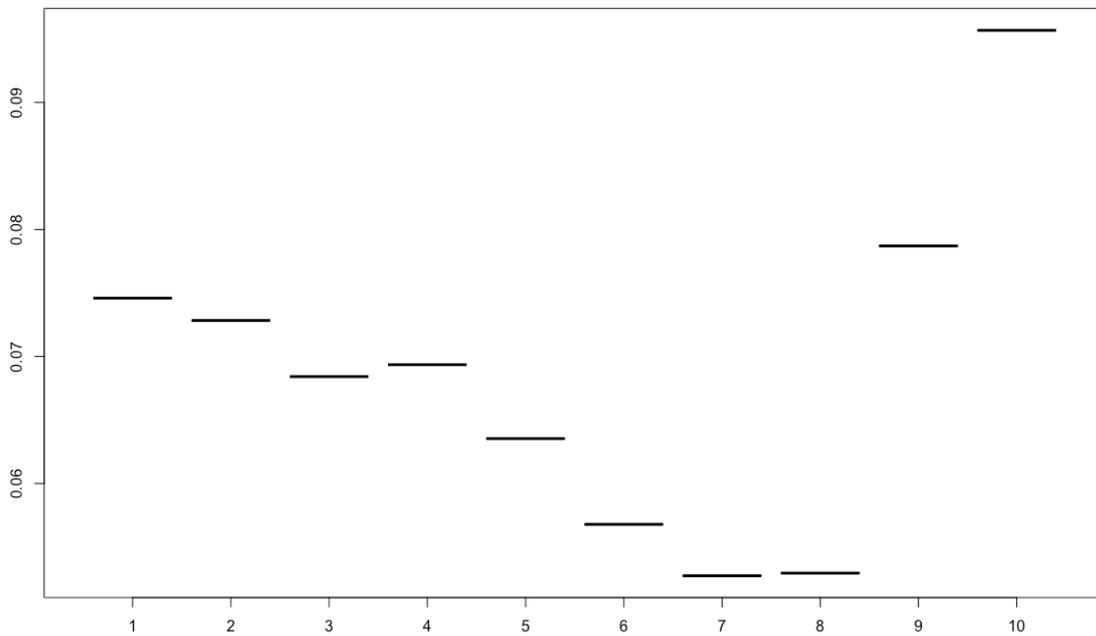
3. YoY Net Worth Growth: Weak per se but sudden jump at 10<sup>th</sup> decile!

(large increase in net worth probably prompts aggressive debt funded growth afterwards)



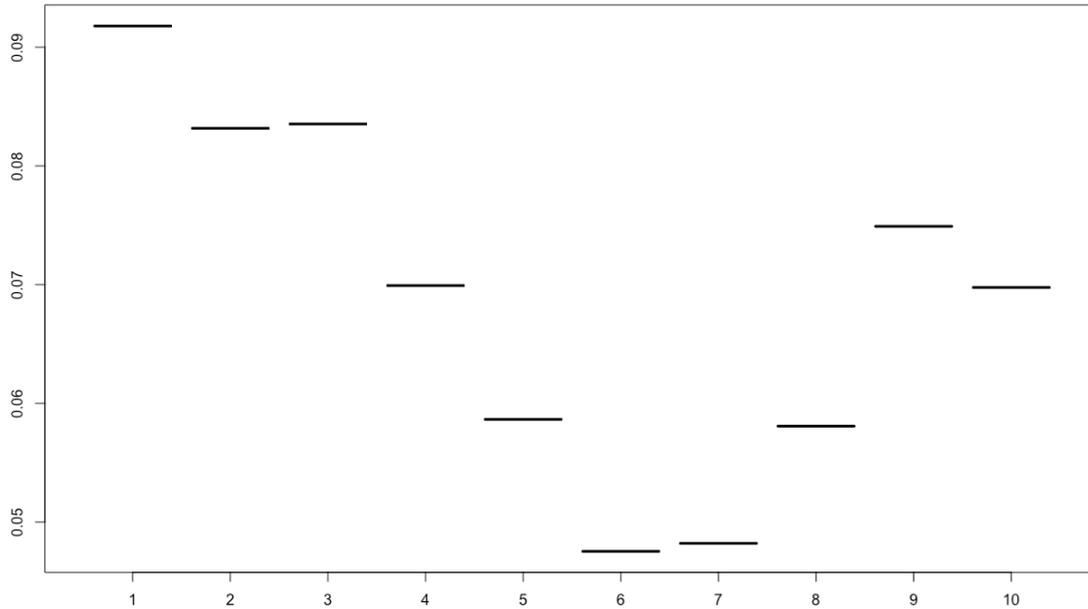
4. Operating profit: strange jump in 9<sup>th</sup> and 10<sup>th</sup> decile!

(highly profitable companies are riskier than their less profitable counterparts)



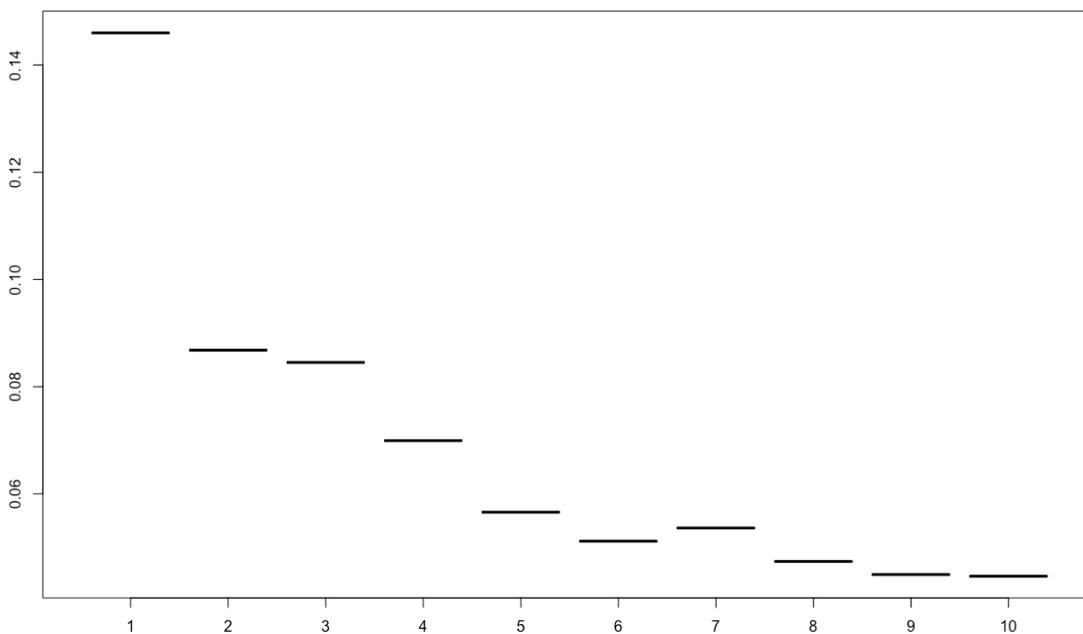
5. Free cash flow: Unexpected bottoming at 6<sup>th</sup> and 7<sup>th</sup> decile!

(low free cash flow is always a problem but high FCF can be worse than moderate FCF)

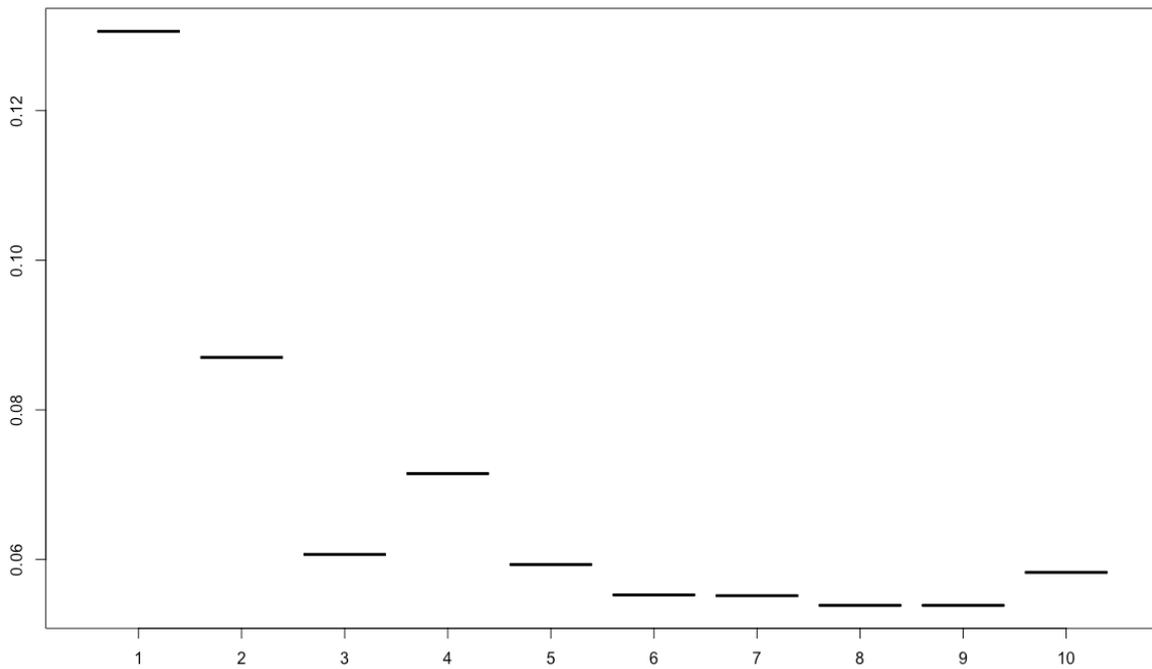


**Set 3: A few good variables**

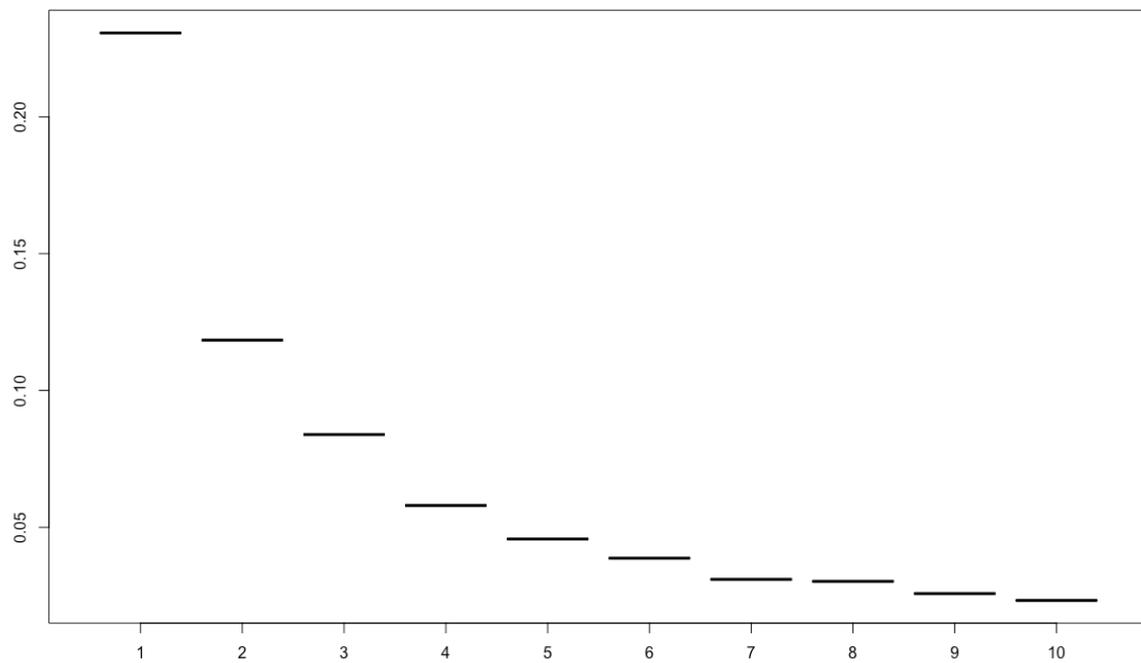
1. Short term borrowings: Fairly smooth fall from 1<sup>st</sup> decile to 10<sup>th</sup>.



2. Receivable days: Steady fall in the bottom half.

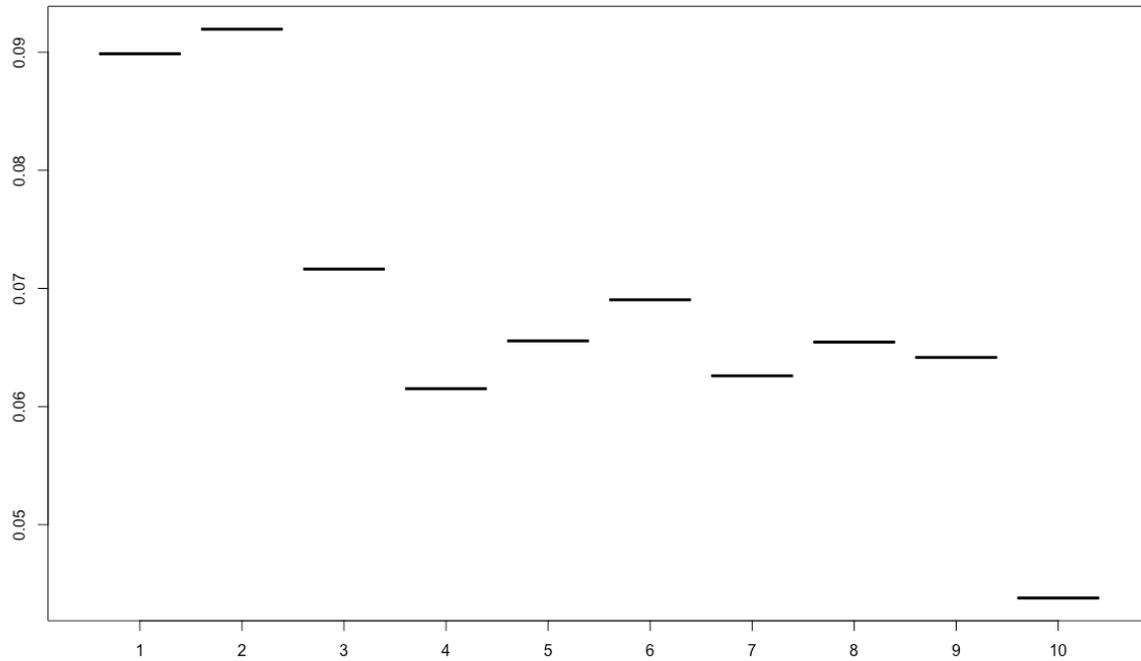


3. Interest payment: very smooth fall from the 1<sup>st</sup> to 10<sup>th</sup> decile.

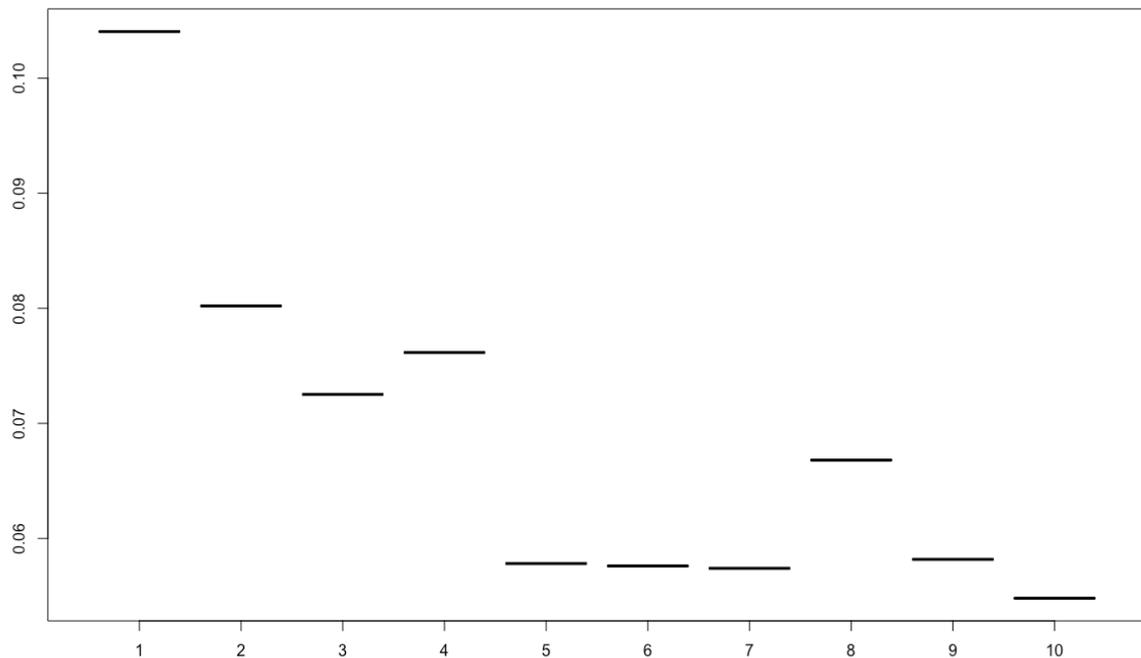


**Set 5: A flavour of some of the alternative data we use**

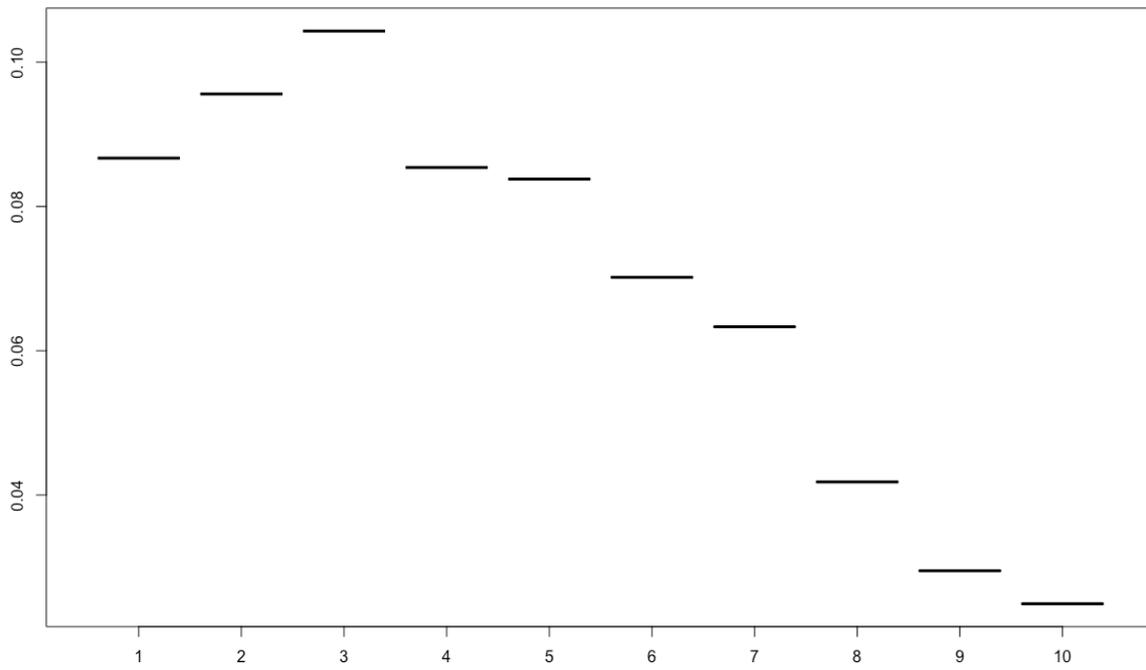
1. 1 year returns on the stock of the company: well behaved in bottom half, 10<sup>th</sup> decile is distinctly better than the rest!



2. Public shareholding: Top half is similar pD but bottom half allows fair degree of distinction!



3. Dividend Yield: Surprisingly linear from 3<sup>rd</sup> decile onwards!



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