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# Fundamental Financial Analytics

## OVERVIEW

Ever since capital markets have existed, analysts and portfolio managers have been searching for stocks to invest in. Fundamental financial analysis has been a longstanding approach, and involves the quantitative and qualitative analysis of a listed company's financial statements, the market environment and its competitors.

For many years, actuaries have been using analytic techniques to identify accurate and reliable predictors – statistics that can be used to forecast future financial changes.

In this article we discuss the combination of both these techniques – namely the use of analytic techniques to identify reliable and accurate predictors used in fundamental financial analysis in order to model the drivers of shareholder return. Naturally, this approach is called fundamental financial analytics.

Fundamental financial analytics can be used to investigate the high level relationships between listed companies' financial ratios and total shareholder return (TSR) in order to answer such questions as:

- Are there statistically significant relationships between listed companies' financial ratios and TSR?
- What are the most important financial ratios in assessing TSR?
- What are the optimal levels of the financial ratios?

In very broad terms, TSR is affected by internal quantitative measures (financials under company influence) and external measures, such as price, perception and prospects.

Fundamental financial analytics focuses on the relationships between the internal quantitative measures, such as return on equity (ROE) and net debt to equity and shareholder return, rather than share price dependent financials, such as dividend yield and other qualitative measures.

In technical terms, the approach uses a generalised linear model (GLM) to model the relationships of company financials to TSR. GLMs have successfully been used for many years by actuaries pricing general insurance products by modelling the relationship between rating factors and expected claims cost. The method is particularly effective at distinguishing the predictive power of different rating factors and their interactions.

## THE MODEL

The explanatory variables consisted of the financial ratios (e.g. ROE, net debt to equity) covering the balance sheet, P&L and income statement of the majority of the top 200 ASX companies over the last 15 years. Mining stocks were excluded as the financial operation of these companies is different to other industries.

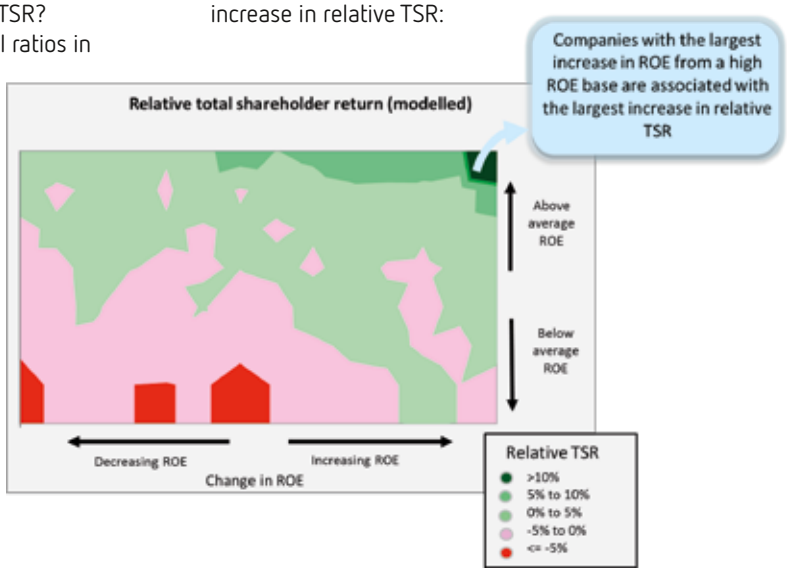
We examined the relationship between the relative TSR (i.e. the change in share price plus dividends relative to the mean of the data) at the balance date to the financial ratios at the previous balance date. As we calculated the relative TSR, its mean over all companies is zero at each balance date.

The data was filtered to exclude TSR, which we considered was more influenced by the external measures than the internal financial ratios. A number of financial ratios in company returns are highly correlated to each other, so we excluded correlated financials from the model.

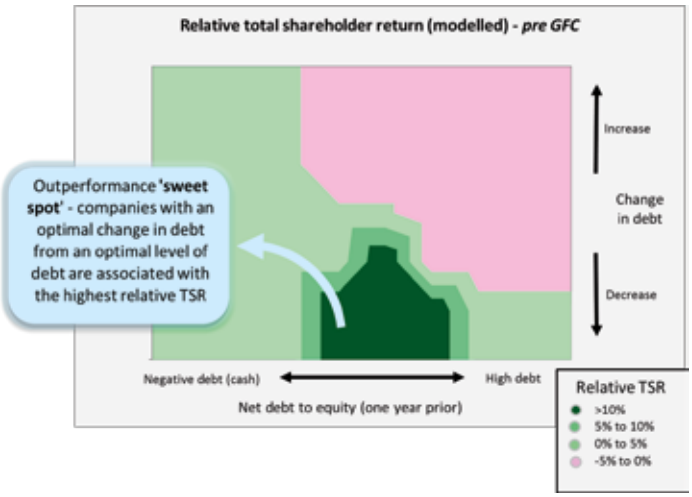
## THE FINDINGS

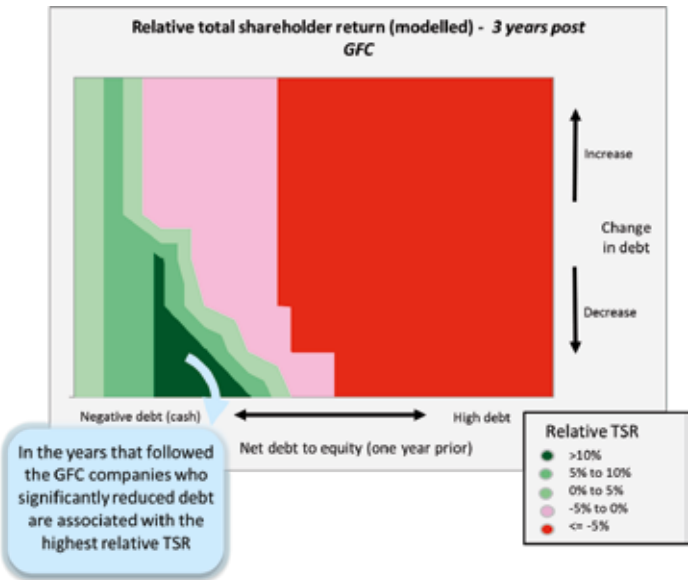
We found statistically significant relationships between many financial ratios and relative TSR. Further, our analysis showed multi-dimensional, non-linear (though intuitive) relationships between a number of companies' financial ratios and relative TSR.

For example, the chart below shows that companies with the largest increase in ROE from a high ROE base are associated with the largest increase in relative TSR:



Some financials, such as net debt to equity, showed distinct time dependency; others, such as ROE, were less dependent on time. The modelled relative TSR by net debt to equity and change in net debt to equity pre the GFC and the years immediately post the GFC are shown below.



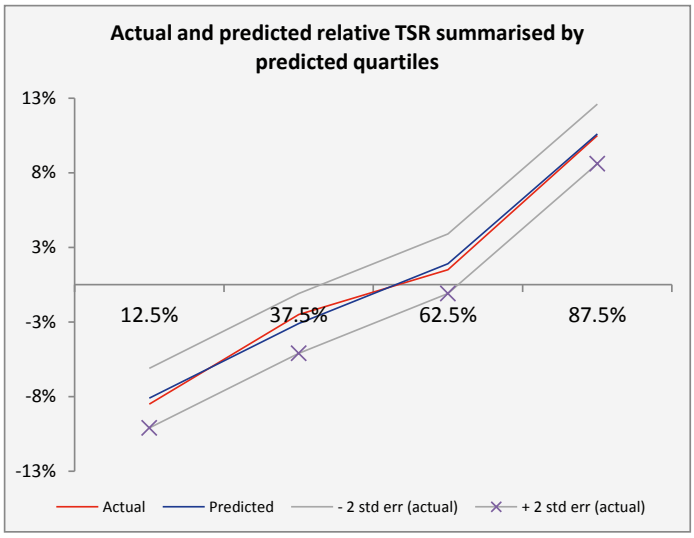

The modelling can be viewed as a deconstruction of how the company financials influence equity market behaviour. In our model, each of the financials contributes to an overall predicted relative TSR, which then allows ranking of each company at each balance date.

## VALIDATION

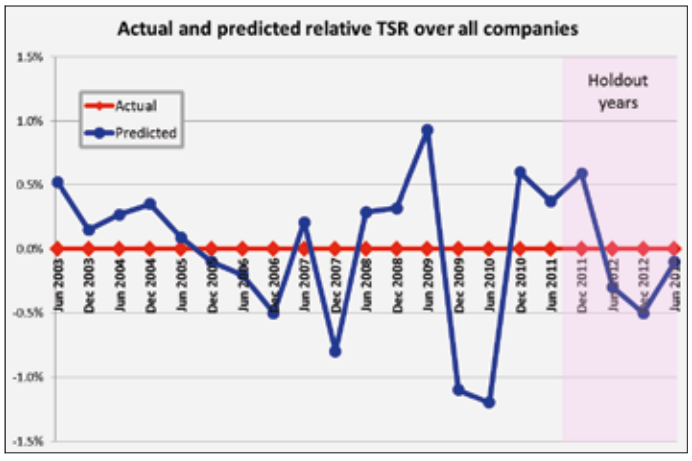
In any application of analytic techniques, it is critical to validate the model fit. A number of tests were used, including significance tests, correlation tests, time dependency tests and numerous comparisons of predicted and actual relative TSR.

For example, the following chart compares the overall actual and predicted relative TSR by predicted quartile band. This type of comparison is typically used to highlight areas of model misfit.

The following chart essentially shows that companies with a predicted relative TSR in the top 25% outperformed those in the bottom predicted quartile by an actual relative TSR of around 18%.




The research was conducted over a number of years, which allowed us to test holdout or out-of-time data – data not used in fitting the model. As mentioned earlier, as we modelled relative TSR, the mean over all companies at any point in time is zero. The chart below shows the actual and predicted relative TSR at each balance and interim date.




This comparison can highlight model bias by time. The mean prediction error of relative TSR for the holdout period (post June 2011) is consistent with the modelled data, suggesting the model remains appropriate over this out-of-time period. There remained considerable differentiation in actual relative TSR between the top and bottom predicted quartiles in the holdout data.

## USE AND CONTINUING RESEARCH

In practice, fundamental financial analytics has been used to assist top 200 ASX companies understand the financial settings which should position them for above average TSR. These financial goals can also be used to align executive remuneration with shareholder interests.

We believe this approach, which combines statistical analytic techniques with fundamental analysis, has a lot of potential. Currently, we are investigating including price related financials, such as trailing dividend yield, for possible funds management applications. A