

# Equity Trees and Information Theory

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## Abstract

Recently some sophisticated algorithms have been developed for the analysis of very complex sets of data that might naturally be thought of in terms of networks. Recently a popular theme has been the application of information theory based methods to the analysis of time series. Mutual information captures high order interactions which can be missed completely by correlation analysis. In this paper we apply these techniques to the dynamics of equity trees in financial markets. Previously these methods had only been applied to static trees or, alternatively, simpler correlation techniques had been applied to dynamic asset trees. We find that there are significant differences between the results achieved using previous approaches and the results we find using this alternative method.

Our approach was to take a set of 130 highly capitalised equities traded in the financial markets for which the day close prices were available from Jan. 1<sup>st</sup> 1995 to April 1<sup>st</sup> 2008. The equities were chosen according to three simple criteria: they had to be traded on the market, have their data available for the time period and they had to be amongst the highest capitalised within their market sub-sector on the day their data were downloaded.

The significance of this result is in the underlying assumptions regarding the relationships being modelled by these asset trees. We have been able to show that using a measure of the relatedness between equities based on information theory provides two important results. The first is that a more accurate representation of the equity tree dynamics results from using this technique. The second is that there are qualitatively different outcomes which are overlooked by more conventional correlations which only capture the linear relationships between equities.

## KEY WORDS

Financial Markets, Information Theory, asset tree

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