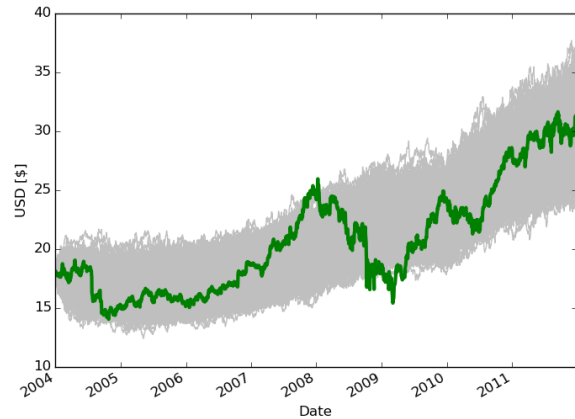# Predicting stock movements

By Johan Gudmundsson

Stocks are an interesting category of financial instruments. Over the long term, stocks have yielded higher returns than almost every other type of investment. Which is why stocks are a part of nearly all investment portfolios. Today most people own stocks directly or indirectly. But their movements are still not fully understood despite their popularity.

By definition is a stock is a share in the ownership of a company. The stock represents a claim on the company's assets and earnings. The intrinsic value of a stock refers to the shares claim on the value of the underlying business, taking into account both tangible and intangible factors. So in an ideal world, the price of the stock and its intrinsic value should be the same, but this is not the case.

The interesting part of modelling the stock market is that there are a lot of comprehensive theories, both from academia and from in-

The gray pattern represents 1000 simulation of the stock price of 'The Coca-Cola Company', while the green curve corresponds to the real stock price.

vesting practitioners. But there has been a lack of connection between between the people in academia and the practitioners of investing. The academic theories usually have idealized assumptions that do not hold in the real world. Meanwhile, the practitioners usually fall into the trap of seeing patterns that do not exist.

In the thesis, the idea of modelling the stock price as a random process which exhibits properties of reversion towards the intrinsic value is explored. The intrinsic value is calculated using the companies earnings, assets, etc. This model can be thought of as the stock price being connected to the intrinsic value with a spring. So if the stock price is larger than the intrinsic value, the stock price will experience a downward force towards the intrinsic value. If the stock price is lower than the intrinsic value the share price will experience an upward force. This will make the stock price oscillate around the intrinsic value. So using this it will be possible to predict in what direction the stock price will move.

This provides a way of simulating the stock price of a company, which is far more accurate than the conventional method, since the conventional method uses a random process without this spring function. But the new model is still a random process, so the simulated stock price will not be identical to the real data in every timestep and thus create a range of possible stock prices at a given time. This can be observed in the figure, where 1000 simulations of share price for 'The Coca-Cola Company' are plotted in gray, and the real stock price is plotted in green. In this case, the stock price is simulated using a random process which exhibits properties of reversion towards the intrinsic value of the company.