

Chapter 7

Fractal and Wavelet Market Analysis in Pattern Recognition

ABSTRACT

Fractal geometry can be seen as a universal language by which nature can be explained or at least described and quantified. Financial markets are one of them. Therefore, in this chapter, I set my focus on complex dynamics, an area that was around for about one hundred year ago and continues to inspire much ongoing research. I show that wavelet-based modelling underlies the process that generates financial market data. It is a method that decomposes a time series into several layers of time series, making it possible to analyze how the local variance, or wavelet power, changes both in the frequency and time domain. Then I calculate the local Holder exponent which is applied to estimate stable and unstable fixed point, or regularity and singularity and based on them, one can adapt its buy-sell strategy timely. The model successfully detects the hoarding effect, noise traders, and the pattern of the short-run price fluctuation. An algorithmic construction of the model is developed in Wolfram Mathematica 9 and MatLab R2016b.

You are looking anomalies; you are looking if the efficient market hypothesis is true. So the random walk theory is true if we do not have enough data. When we are looking anomalies and you have enough data, then the probability that these anomalies are being random is not high. They are there persistent for a sufficiently long time. But these things fade after a while and anomalies could get washed up. (Jim Simons, 2015)

DOI: 10.4018/978-1-5225-3259-0.ch007

INTRODUCTION

In the world, there are two camps of people: those who believe that things happen for a reason and those who believe things happen at random, for no reason. Well, whatever you believe, you should watch the interview held with Jim Simons, co-inventor, mathematician, hedge fund manager and philanthropist. This is one of his rare public appearances.

The link for the interview was sent to me in a very same day I bought the book titled: “The Physics of Wall Street” by Weatheral James Owen. The most interesting part is that Jim Simons is one of the most successful hedge fund managers in the world, and I didn’t even know that such a person exists. Renaissance Technologies are founded in 1982 and is still one of the best hedge fund firms. In 2016 the fund returned 21.5%, equal to approximately \$2.35 billion in profits.

The interview was very fascinating and informative. Each word bears a deeper meaning, and you simply have to listen carefully. His story confirmed my doubts that have increasingly grown after each chapter. Then I began reading the introduction section of the book “The Physics of Wall Street”. The first few sentences are very important:

Warren Buffet isn't the best money manager in the world. Neither is Gorge Soros or Bill Gross. The world's best money manager is a man you've probably never heard of – unless you are a physicist, in which case you'd know his name immediately. Jim Simons is coinventor of brilliant pieces of mathematics called the Chern-Simons 3-form, one of the most important parts of string theory. He's the kind of a scientist whose name is uttered in hashing tones in the physics department of Harvard and Princeton.... And yet, there he is, the founder of the extraordinarily successful firm Renaissance's signature fund in 1988, with another mathematician named James Ax. Renaissance employs about two hundred people. A third of them have PhDs not in finance, but rather, like Simon, in fields like physic, mathematics and statistics. According to MIT mathematician Isadore Singer, Renaissance is the best physics and mathematics department in the world – which, say Simon and others, is why the firm has excelled. Indeed, Renaissance avoids hiring anyone with even the slightest whiff of Wall Street bona fides. PhDs in finance need not apply' nor should trader who got their start at traditional investment bonus

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