Phase Based Economics

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This project aims at applying the concepts of steady-state dynamics to economic systems. Using concepts from large scale statistical mechanics, thermodynamics, and perturbation theory, I attempt to build a model for predicting value based on environmental fluctuations. In the broadest sense, an economic system is any entity that generates societal value based on its perceived utility. All goods and services are singular entities that can be grouped together based on their interactions to build lager composite economic systems. I establish the idea that easily traced perturbations of known frequency will periodically "phase-shift" a collection of the systems composite macro states. For the presentation I attempted a crude proof of concept from a small sample of stock market data from two companies I perceived to strongly interact with one another. The stock market data is the simplest real-time feedback of a whole net of different valued companies; which I my model are analogous to individual, partially open economic systems/entities. It is my hope that this type of modeling can be used "drive" consumer based trade, and be brought to promote global economic and geological stability.

* Caveat all Figures including data are simply referenced here. They are included in my presentation slides

INTRODUCTION

Due to my limitations in time and resources I will seclude this paper to the analysis posed by my class presentation. As a quick connection to thermodynamic mathematics I claim that all entities perceived value is analogous to a physical systems measured energy. Stock trading companies are multi-faceted systems composed of inter-related singular entities fluctuating in value. I claim that the current stock value of a company is a measure of the superposition in values of all its composite entities. Statistical mechanics comes into play when one attempts to describe the value of large composite systems such as stock trading corporations. That is to say that a company determines its worth by doing statistical averaging of the values of all its goods and services. These individual values can be modeled as statistical Poisson distributions with a fluctuating mean value.

Quick example: a company whose main service is shipping some produce derives its value from the statistical efficiency of its ability to distribute, and the general worth of its shipments. The individual products in the shipments may vary in quality, and the mean quality of the whole shipment may fluctuate in time.

The general idea behind my model is that if the frequencies of these fluctuations are known to a good approximation, and the correlative relationship between entities are well established, then trends can be predicted for the intermediate future to a high accuracy. The example I will briefly probe in my presentation looks at two arguably inter-connected companies. One being The Hershey Company, a well established entity that derives a large portion of its public value from the company's ability to produce and sell its chocolate based products. The second is Cosan Ltd, a Brazilian based producer and seller of various goods, including sugar, which is how I tie it in to the Hershey company. Since sugar is a crucial ingredient in Hershey products, I argue that fluctuations in Cosan's stock will correlate with fluctuations in Hershey's stock. The perturbations I used to establish predictive trends were holidays that had an element in the mass consumption of these goods. Since holidays occur with a definite frequency of once per year, analyzing how both sets of data shift around these dates can give essential information about how the Elliot waves of differing frequencies within the data sets are phased by each other.

It is important that I take a moment mention my philosophy on stock data. I take these entities essentially as quantum systems, with the value being some measurable of the system. Since it is impossible to know about all the interactions affecting the exact value of an entity, measurements are imposed by simulated approximations. The stock market is essentially a quantum simulator for extrapolation of the supposed value of each company, with all of society serving as the effective processor. I assume crashes arise when a sequence of errors overestimate the value of entities; eventually these errors become known and the whole system must force an adjustment by "crashing" the stock values. The quantum simulator seems like an appropriate analogy to me due to the entangled nature of correlative value/utility among entities.

ANALYSIS

The two holidays I decided to analyze around were Valentines day, and Halloween. I assumed that both of these holidays had a heavy element in American consumption of chocolate around that time. As such I plotted the NYSE data from these two companies for four years spanning from 2012-2016. Within these I marked the location of these holidays, and highlighted the regions around them. These regions are what I estimated to be the areas most affected by the local Dirac perturbation (the holiday).

Something to note about the Hershey data is that the first two years signal a general rising trend which on its own might be taken as an independent trend from the holidays, but one that could still have a foreseeable effect on Cosan. This would be taken as a low frequency prevailing trend; if compared side by side this trend indicates that in the long term, as Hershey stock value rises, Cosan's will drop. This makes sense if we assume that the stock value is an indicator of the current perceived value of sugar. Since Hershey purchases sugar, a devalued sugar price would lead to additional surplus in profits from Hershey products, which correlates to higher stock prices. Thus in general we can take the fluxes of both companies to be negatively correlated with one another.

It should be noted that my following section about the effects of the yearly holiday perturbation is my personal analysis, and as it stands should be taken as opinion. I plan on cementing the mathematical approximation to validate my analysis on a later basis.

Moving on to the perturbation analysis, we see that in these regions it appears that the data sets become positively correlated, and some sinusoidal flux periods can be seen within these regions. I note that in the first two years, where incremental growth is witnessed in the Hershey plot, that this sinusoidal flux is tapered and not as evident. In the later, stabilized years, these fluxes are much more pronounced. Looking at these graphs we can estimate that the Holidays themselves caused these various Elliot waves of harmonic frequencies to form around them. One interesting characteristic about valentines day is that in the stable years there is an increase in pricing leading up to the date, the a progressive fall beginning near the date. Sociologically this makes sense as traders would be expected to assume a rise in consumption and trade of Hershey products leading up to valentines day, then have this rate drop after the holiday, thus forming the well defined Elliot waves around the data sets.

FUTURE PROSPECTS

I wish to establish stronger relationships between economic systems at different scales, how their means to measure and exchange value (currencies) are themselves established, and these in turn phase all other systems/entities. I also wish to expand the vocabulary in describing this topic. I attempted to be as broad as possible in this paper so that the rudimentary concepts might be connected to any scale. However, the scaling between singular goods/services to conglomerate corporations and global organizations introduces levels of abstraction that simply cannot be ignored, and specific relationships bridging these scales need to be established at some point to make a full comprehensive model.

For a better understanding of the stock market data analysis, it would also be helpful to extend the model to include a relation between one stock value, and the general progression of the whole market. This would provide crucial sociological information on the possible volatility of the stock market in general. I need to establish the construction of Elliot waves as multi amplitude, sinusoidal sums, that become phased according to real world perturbations. I want to proof mathematically that prediction of real world stock affecting perturbations is what leads to Elliot waves in the stock pricing, but crashes are the result of high error becoming evident.

My immediate efforts would go towards cementing these concepts with mathematical proofs. I would expand the concepts relating perturbations of specific frequencies to fluctuations in a broad spectrum of frequencies. This is tying in the concept that the individual goods will have fluctuations in value, but perturbations that directly affect this value will phase shift all of these fluctuations. As conglomerate economic systems are composed composed of multiple trading platforms for these goods, the perturbations would lead to phasing effects on a collective of trends, but not all. Therefore it is necessary to analyze multiple interdependent entities under various forms of perturbations to understand the correlative trends to a higher degree of accuracy.

Something to briefly discus as it should be evident from this type of analysis, is that these fluxes are initially taken to a rough approximation to their overlapping contributions in all systems. As such they should amount to a high degree of error. I argue that this can be remedied through the inclusion of multiple approximation algorithms, that each take different perturbative frequencies into consideration. When one cross references the information out of these models, the greatest overlap should lead to the most stable pricing estimation.

CONCLUSION

My current modeling of these stock based economic systems is severely limited, thus no strong predictions can be affirmed. However, I believe that with further analysis trends can be affirmed, with increasingly higher degrees of accuracy. These trends can then be correlated to separate, but not dissociated systems. As the relationships between systems are further cemented, they can provide better predictions for future trends. The accuracy of this mode of modeling will be limited by the computational limit of the machine running it. In a future paper I would like to go in depth on how each aspect of this model weighs in on the total computational necessity to run it.