

Chapter 17

Understanding Chaos as an Indicator of Economic Stability

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ABSTRACT

With what appears to be the increasing sensitivity of economic/financial systems to various events, whether they be natural disaster, changing financial products or government policy, the need to understand how volatility has changed in modern economic systems and how to recognize when volatility will occur is a topic that is extremely important. This topic has been categorized under various topics such as: business cycles, chaos, dynamic systems, fractals, Brownian motion and super cycles just to name a few. The author believes that all of these areas need to be considered at once when analyzing dynamic phenomena which may have varying degrees of the aforementioned. This chapter will implement a Hicksian Accelerator to develop a framework for stylized facts of general dynamic macroeconomic behavior. The chapter will then implement the model and begin the process of estimating the degree of and sensitivity to volatility in a macro economy.

INTRODUCTION

Over the last several years, increased attention has been brought, once again, to the business cycle and the impact policy and regulation has on economic/financial crises/panics. To this day, confusion still reigns. Largely because at present, there is still a wide divide in describing how crises or cycles occur and what if anything should be done about them. Historically some have treated cycles as natural events unable to be mitigated by man, while others would argue there are no such things as cycles or that cycles/crisis can be dealt with through appropriate policy. While the

author considers all of these arguments to have merit, perhaps the one thing that has not been talked about much in the recent debate of these issues is the change in the sensitivity of a system to various types of stimuli.

This chapter will develop a simple model with which to estimate the current macroeconomic sensitivity of a system in order to better understand the volatility that may be currently in a financial/economic system. A measurement of this type can serve as a guide when tracked over time, as to how an economy is evolving and whether or not it is becoming more or less stable. At this time it would be premature to be able to understand if a

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particular policy could stabilize a volatile system. That will require more longitudinal studies to form comparisons between countries and systems to look for similarities.

To the author, it appears to be the case that currently there is an increase in the sensitivity of economics systems. My hope, is that there is a link between increased sensitivity in an economy and recessions. If this is the case, then we can use measures of sensitivity as an early warning system for macroeconomic events. Many economists and policymakers, are trying to understand volatility in macro economies as well as the implication that policy has on these systems. I hope to unravel this mystery by allowing for the concept of chaos. That is, that behavior may appear to be random, but may not actually be so. This chapter will develop some stylized theoretical facts of a macro economy using the Hicksian Accelerator. Then the stylized facts will be compared to estimates of the model components from the United States, Germany and Canada as a beginning application of the concept to reality.

This is a beginning step in order to better understand the cycling behavior of macroeconomic equilibrium in a dynamic sense. What is becoming more evident is that macroeconomic equilibriums are not as stable in a long run sense as many economists believe. This chapter serves as a beginning of merging the concepts of dynamic systems that may contain chaotic behavior and conventional macroeconomic models. More research needs to be done on this topic. That being said, the realization that equilibrium is not static, although not new in economics has not been researched as often as the much simpler case of static equilibrium models.

BACKGROUND

The study of business cycles and cycling phenomena has a rich and varied history, from a study of them, to an attempt to understand cycles and to possibly control them. This idea has been

around for a long time and if it were possible, then understanding the nature of cycles would allow them to be used as an early warning system for economies and financial markets.

For early studies, one could look at the early work of authors such as F.A Hayek (1934) who thought about capital and how it is developed and how prices coordinate economic activity. The cycling work of Nikolai Kondratiev (2014) who during the 1920's found fifty four to sixty year cycles in many economic time series. This is also conferred by Edward Dewey (1971) who found numerous cycles that exist in most phenomena. One such example is his detection of a fifty four year cycle in the European wheat price from 1513-1856. Udney Yule (1926) sought rigor in measuring time-series and showed we need to use caution in correlations in time-series.

On the other side of the cycling ideological fence we had the early work of quantification by Ragnar Frisch in developing econometrics and starting the distinction between macro and microeconomics. As well as the more "natural" scientific movement from economists such as Erik Lundberg and Paul Samuelson. While I won't endeavor to give a detailed review of this larger history of the beginning study of cycles in this chapter, it is an interesting and important area to understand. The study of cycles was somewhat marginalized in the late 20th century and is just now beginning to be rediscovered and accepted as a useful tool to understanding economic phenomena. Instead, I will focus on the history of cycles since the "Keynesian revolution" in economics. During this period, cycles were not assumed to exist instead they were more of an artifact of randomness. As we will see, it could be possible that either idea is correct and so it becomes critical to understand which side is correct and when. Just as in physics sometimes it is useful to think of light as a wave and sometimes as a particle. The following authors serve as a good representative sample into the various routes others have taken in the investigation of economic cycles.

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