Dylan McDowell

David Barrus

Econ 499

21 February 2018

Research Topic

1. Craft of Research Ch.5-6 Summary

In Chapter 5, the author spends time discussing how to create a plan that will best allow efficient research. he grins by stating that it is possible to just jump into resources and get lost in the huge amount of information that will be out there to digest. He suggests that it's best to start with understanding the resources that are available. He breaks it down into three different kinds of sources: 1. Primary Sources 2. Secondary Sources , 2. Tertiary Sources. These sources are pretty self-descriptive in what exactly they provide to a researcher. The primary source being the genesis of what problem you are trying to solve and then leveraging other research that has been done using the same primary source., and then finally consulting with books and articles that synthesize the information found typically in secondary sources.

The author then dives into where it is possible to get these sources from. Ultimately, he suggests that starting at a library is always a good idea and speaks upon how valuable a knowledgeable librarian can be. He also suggests that experts in the field you are studying can be a valuable asset as long as you don't expect them to have all the answers. Finally, he talks about then consulting with resources or other articles to move along your research . Towards the end of the chapter he speaks on the best places to find sources within the internet or online databases.

In Chapter 6, the author dives into the proper way to utilize data and some of the contextual expectations readers have when reading a paper. Readers expect to see quantitative analysis, as

well as citations form other proven sources of literature. Even sometimes readers expect personal accounts or anecdotes from the experimental units of a study

## 2. Research Topic

Many people have a strong belief in the law of averages. Or rather, they believe that is is often the culmination of their actions that influence their future decisions. Nassim Nicholas Taleb, a prominent scholar and risk analyst, believes in quite the contrary. Most often it is the unexpected events that have the largest influence in shaping the trajectory of future outcomes. Taleb says,

> I don't particularly care about the usual. If you want to get an idea of a friend's temperament, ethics, and personal elegance, you need to look at him under the tests of severe circumstances, not under the regular rosy glow of daily life. Can you assess the danger a criminal poses by examining only what he does on an ordinary day? Can we understand health without considering wild diseases and epidemics? Indeed the normal is often irrelevant. Almost everything in social life is produced by rare but consequential shocks and jumps...(Taleb)

There is importance in studying the improbable. One major event that comes to mind when thinking about massive unexpected shifts is the state of the economy. Many economists over the years have attempted to learn about the nature of the economy. Some experts believe that it is possible to predict a recession in the economy, while others believe that the intricacies obfuscate the ability to tell the signal from the static.

This research paper will attempt to validate the former by building upon the previous models of Hamilton, Chauvet, and Piger. While many models have been constructed through research, we seek to add upon the class of dynamic-factor mixed-markov switching models (DF-MMS). In

the past, ARIMA models have been shown to be restricted under the assumption of linearity (Hamilton). DF-MMS models allow for non-linear estimation which better suits the analysis of economic data.

Currently, the Federal Reserve employs a DF-MMS model when projecting probability of recession in real-time (FRED). This projection takes into account four different indices: non-farm payroll employment, the index of industrial production, real personal income excluding transfer payments, and real manufacturing and trade sales. The DF-MMS model applied to these indices was developed by Chauvet in 1996 and is still currently used today. While these indices provide valuable insight, we intend to improve upon the model by adding in US Treasury Bond spreads and USD futures prices as possible indicators for economic regime switches.

Another aspect to which Chauvet's model could be improved is establishing a three state unobserved regime switching model as opposed to the two state model employed in the literature. This is because the economy will often experience times of expansion, times of minor recession, and unexpected drastic contractionary periods. By allowing for three states instead of two, it will be possible to detect more subtle movements and features in the state of the economy.

Several other papers have improved upon the model of Chauvet by using Bayesian Estimation methods for the parameters (Chauvet and Piger). These topics will be explored in throughout the research but at a given point in time a final method of estimation will be decided upon for the final model.It is also important to note that previous models continue to gain accuracy as they age given the new data further smooths out the probabilities of recession. The goal is to build a model that is accurate in the present as well as accurate into the future.

As mentioned previously, it is the unlikely that has the most profound effect in society. By developing a better understanding of the elusive nature of the economy it is possible build an economy that is protected against the improbable. If the probability of recession can be estimated

in real time then then it should be expected that the world would experience an extreme shift in paradigm and how companies approach risk in the market place. This is the ultimate problem we seek to solve by building upon the body of research.

## 3. Literature Review

The nature of the economy has been studied since the dawn of free market capitalism and for hundreds of years, it has surprised even the most well-read intellectuals in unique ways. In regards to the research on recession prediction, there have been several papers published in the field that have been highly regarded in moving forward the understanding of market structures and papers that have also been criticized. This section of the paper will detail out the summaries and methodologies used by these iconic papers and provide a discussion on how they apply to the research of this paper.

In a paper titled, "A New Approach to the Economic Analysis of Non-Stationary Time Series and the Business Cycle" by James D. Hamilton is the leading paper that proposed econometricians move away from auto-regressive linear models into utilizing unobservable regime switching markov models. This concept has been popular among modern researchers and has been cited by over 8,742 authors [1]. This foundational paper has influenced the work of hundreds of researchers but is not without its flaws. Hamilton used a minimal model when writing the paper, citing only the current value of Real GNP as an independent variable. Also, Hamilton proposed making inferences about population parameters using maximum likelihood estimation. While this is an accepted method, other authors have gone on to later improve upon population parameter estimation using Bayesian Estimation techniques.

Another paper on, perhaps, the other end of the spectrum is a relatively recent paper published in 2010, titled "Neural Network Methods for Forecasting Turning Points in Economic

[1] According to Google Scholar 2018

Time Series" (Zhang et al.) goes into attempting to forecast changes in the business cycle using neural network models and 13 indicators of economic activity. While these methods are fairly new to the field of economics they have been well studied in fields such as statistics and computer science over since the early 1950s. Zhang's paper goes deeper into studying models that do not require as strenuous assumptions as linear models do. In this sense he is pushing forward Hamilton's idea of implementing non-orthodox statistical methods to make inference about a population. While this paper does not implement a neural network it is important to look at the less-accepted methods in the field to see what research might affect the current research in the future.

One last paper that was monumental in influencing the research done is this paper is titled, "A Comparison of the Real-Time Performance of Business Cycle Dating Methods" (Chauvet and Piger) in this paper Chauvet focuses not only on the appropriate statistical model but also finding factors that can deliver a quicker analysis that remains accurate. Many other research papers have documented rather accurate results but used factors that were only published once or twice a year. Chauvet was able to create a composite index on four different indices that are published roughly four times a year and still provides high accuracy using a hidden markov model. This model is paramount to the discussion and the model in this paper will be based off the work of Chauvet.

There are many more sources that could be cited and will be cited within this paper, but these are a few of the important works that should be explicitly discussed when referring to the research at hand. Ultimately, these papers provide historical context to the problem at hand, a forward looking technical perspective, and a robust accurate model. Our research can now be unfolded with these topics in mind so that a proper analysis can be done.

Works Cited

Chauvet, Marcelle and Jeremy Piger. "A comparison of the real-time performance of business cycle dating methods." *Journal of Business  Economic Statistics* 26.1 (2008): 42–49. Print.

FRED. "US Reccession Probabilities." 2018. Web. 24 Jan. 2018.

Hamilton, James D. "A new approach to the economic analysis of nonstationary time series and the business cycle." *Econometrica: Journal of the Econometric Society* (1989): 357–384. Print.

Taleb, Nassim N. *The Black Swan: The Impact of the Highly Improbable*. New York: Random House, 2007. Print.

Zhang, Dabin, et al. "Neural network methods for forecasting turning points in economic time series: an asymmetric verification to business cycles." *Frontiers of Computer Science in China* 4.2 (June 2010): 254–262. Web.