AN INVESTIGATION INTO THE LIKELIHOOD THAT A CENTRALLY PLANNED ECONOMY CAN PROVIDE GREATER ECONOMIC GOOD THAN SPONTANEOUS ORDER CREATED BY THE FREE MARKET

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123 Pages

This paper will address whether it is possible for an economy, planned by experts, to result in greater economic good than can be achieved by spontaneous order created by the combination of individual choices that make up the free market? This paper approaches the question by studying the viability of economic forecasting because planning an economy requires making economic forecasts. There are at least three domains that impact forecasting: the nature of forecasting and modeling in general in a chaotic environment, the effect of asset bubbles, and the impact of black swan events. There is a great deal of research focused on modeling and forecasting in general and in the economy specifically. There is also substantial research dealing with the growth and collapse of asset bubbles. There is very little research investigating black swan events.

A lack of an overarching synthesis that shows how these three domains tie together represents a significant gap in the research. Merging the research on models and forecasting with research on government economic interventions and past economic disasters resulting from bubbles and the failure of governments to predict and respond to them will help close this gap. This synthesis will demonstrate the impossibility of economic forecasting. It will show that since forecasting is impossible, then planning is also impossible. It will propose a research-supported role of government in the economic sector and an appropriate government action designed to eliminate asset bubbles by directly addressing rent-seeking, the desire to make a quick profit without adding any value. It is this rent-seeking that creates the bubbles.

Demonstrating that central economic planning can never provide more significant economic benefits than the free market and what actions the government might take instead will also help fill the gap in the research mentioned earlier. Narrowing this gap in the research will be of great value to those evaluating the differences between the free market and planned economies.

KEYWORDS: centrally planned economy, free markets, forecasting, modeling, chaos theory, asset bubbles, black swans

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CHAPTER I: INTRODUCTION

The United States is at a crossroads. Public pressure from some quarters to move the United States government toward socialism is increasingly influencing public policy. While many proposals are closer to fascism than socialism, the difference is hardly significant given that both systems require the government to plan and control the economy and diminish or eliminate the free market. One of the requirements for effective government planning of the economy is its ability to make accurate economic forecasts, and the goal of this dissertation is to determine the extent to which that accurate forecasting is possible.

The answer to this question is crucial as it may decide the economic direction of the United States for the rest of this century and beyond. Accordingly, both policymakers and the public need to know which direction will benefit the greater economic good. There are three possible directions at this crossroads - left, right, and straight ahead. The road left leads to a centrally planned economy (CPE); the road right leads to a renewal of the free market and a reduction in the attempts of the government to control that market. Finally, the road straight ahead leads to continued indecisive actions and cobbled together policies that attempt to compromise the conflict of visions between those who wish to turn left and those who wish to turn right. Unfortunately, this conflict has proven to be increasingly divisive, and answering this question may lead to a reversal of that trend (Newport and Dugan, 2017).

Newport and Dugan (2017) report polling data conducted by the Gallup organization, and their findings indicate increasing divisiveness. Figure 1 below shows an increase in the divisiveness of forty-four percent regarding the size of the federal government in the past fourteen years.

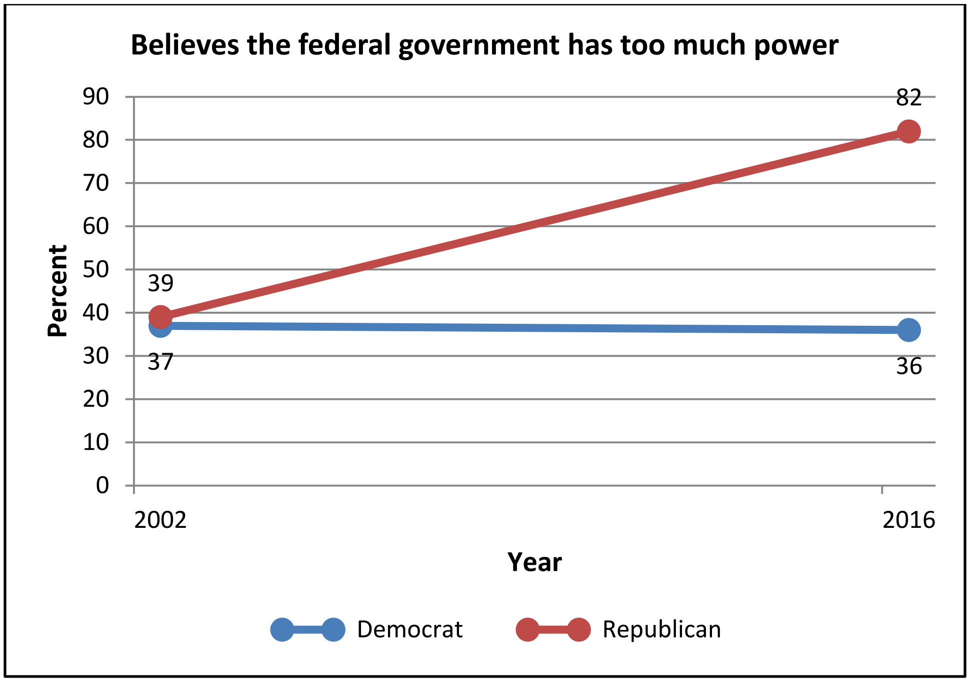


Figure 1

Figure 2 indicates that divisiveness on the degree to which the government should be responsible for healthcare has increased twenty-three percent in fifteen years.

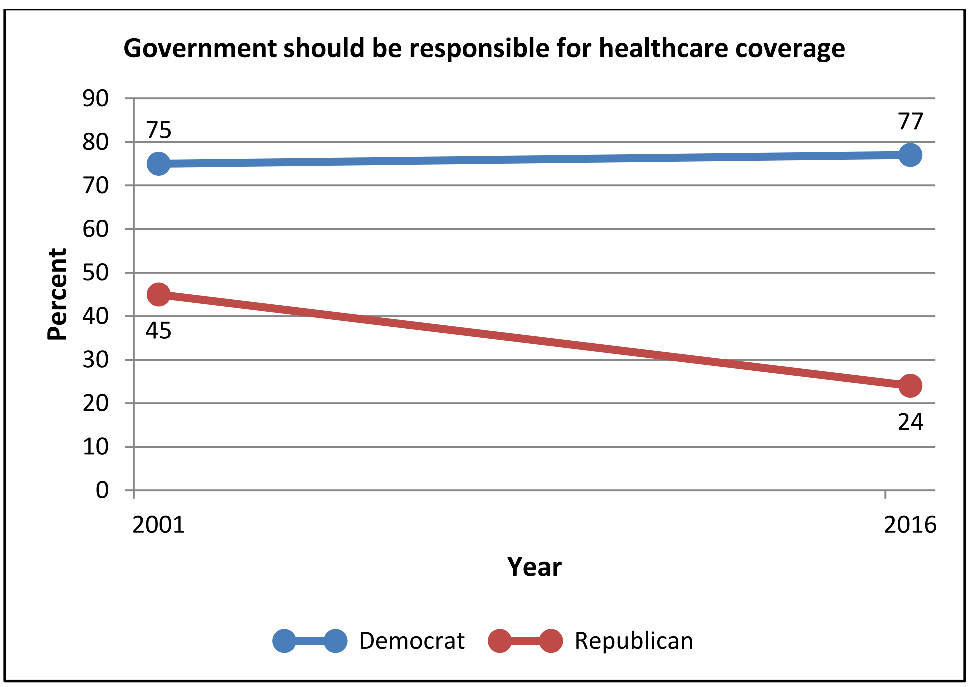


Figure 2

Finally, Figure 3 shows that the belief that "upper income" people pay too little taxes has increased in its divisiveness by thirteen percent in fourteen years. Answering which path leads to the greater economic good may mitigate or reverse this increasing divisiveness.

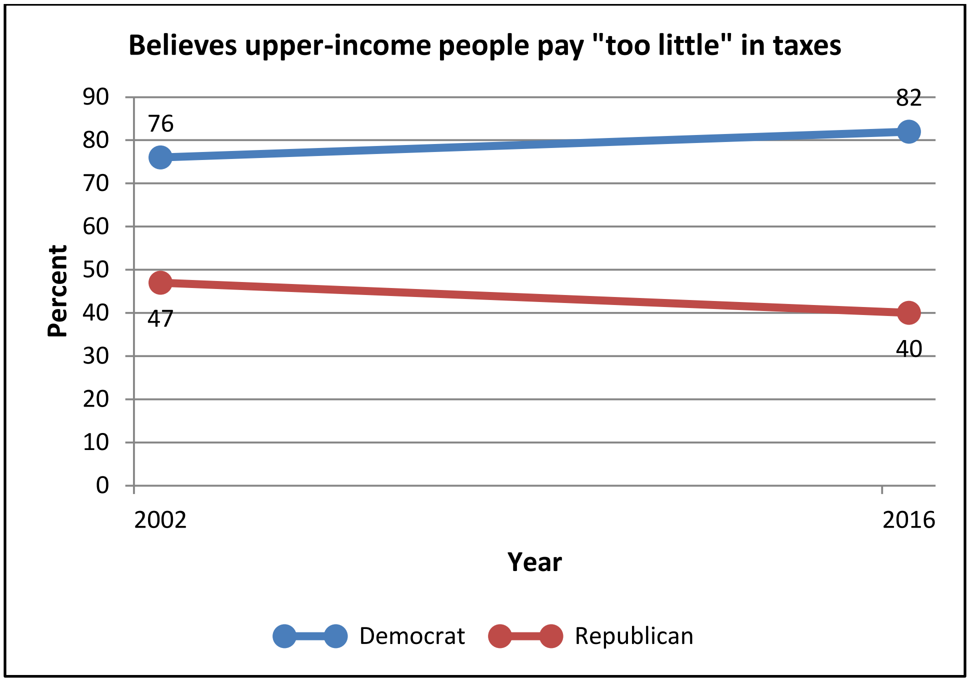


Figure 3

Even if divisiveness were not an issue, the question is still important in its own right. We are at the crossroads now, and if policymakers and the public do not have complete and accurate information about which path is most likely to lead to the outcome they desire, the results may be disastrous. The purpose of this research was not to investigate whether a CPE is moral or more theoretically satisfying. Instead, the purpose of this research was to investigate whether a CPE can produce a more significant benefit for the population than can be achieved by the spontaneous order inherent in the free market.

There is considerable confusion about what socialism, fascism, and free-market capitalism are and, possibly more important, what they are not. Therefore, before proceeding, definitions and explanations are warranted. A centrally planned economy is "an economic system in which the elements of an economy (as labor, capital, and natural resources) are subject to government control and regulation designed to achieve the objectives of a comprehensive plan of economic development" (Merriam-Webster 2021).

Lately, the words socialism and fascism have been carelessly bandied about in ways that muddy and confuse the issue. For example, the above definition clarifies what a centrally planned economy is, but many use socialism to mean other things. The social democracies of Europe are not socialist; they are not CPEs. These governments are better characterized as embracing welfare-state capitalism (Malleson 2014, 228). Socialism is also not Rawl's property-owning democracy (Pogge and Kosch 2007, 8). Neither is it democratic socialism. However, the democratic socialists see it as a road to true socialism as expressed on their website: "We must replace it with democratic socialism, a system where ordinary people have a real voice in our workplaces, neighborhoods, and society. We believe there are many avenues that feed into the democratic road to socialism" (dsausa.org). None of these clarifications are arguments that any of these systems or philosophies are desirable; only that they are not socialism or CPEs.

Free-market capitalism is "an economic system characterized by private or corporate ownership of capital goods, by investments that are determined by private decision, and by prices, production, and the distribution of goods that are determined mainly by competition in a free market" (Merriam-Webster 2021).

The misuse of the terms free-market and capitalism suffers from many of the same problems as a centrally planned economy, fascism, and socialism. The word capitalism is the most misused and misunderstood. This misuse has created undeserved negative feelings in the public mind. Much of the negative perception of capitalism results from transferring government failure to market failure.

One example that serves particularly well is health care in the United States. In 1900, the average American spent about one hundred dollars per year in today's dollars on healthcare. As the quality of medicine increased, the costs rose to about five percent of annual income (Moseley 2008). Hospitals had a problem maintaining a steady income during the Great Depression, itself a government failure, so in 1930 Baylor University Hospital offered a deal to 1250 Dallas public school teachers. The terms of this deal were that the teachers would each pay fifty cents a month and, in return, would get up to twenty-one days of hospital care at no additional charge (Morrisey 2014, 3-26).

This plan quickly caught on with other hospitals and eventually got the name Blue Cross. It became somewhat readily available but not widely used until the government-imposed wage and price controls in World War II. With a labor shortage and the inability of firms to increase pay to attract workers, they began to offer health insurance based on the Blue Cross model. In 1943 the IRS determined that these benefits should be tax-free and, in 1954, increased the benefit further (Moseley 2008). By 1960, most firms offered health care benefits, and in constant dollars, between 1960 and 2015, medical professional incomes rose three hundred percent. During the same period, the median income for all workers was raised only by less than one-tenth that much (Tabarrok 2019). This inflationary behavior was entirely predictable since separating the consumer and producer by intermediaries prevents the consumer from 'shopping' for the best deal, so prices rise. There is apparent competition, but it is a medical monopoly.

Free-market capitalism (FMC) relies on competition to regulate prices and increase productivity. Therefore, it is one of the responsibilities of the government to guarantee competitiveness by preventing monopolistic trade practices. Unfortunately, the government has been derelict in its duty in this regard. Tepper and Hearn (2019) list these examples:

- Two corporations control 90 percent of the beer Americans drink.

- Five banks control about half of the nation’s banking assets.
- Many states have health insurance markets where the top two insurers have an 80 percent to 90 percent market share. For example, in Alabama one company, Blue Cross Blue Shield, has an 84 percent market share and in Hawaii it has 65 percent market share.
- When it comes to high-speed internet access, almost all markets are local monopolies; over 75 percent of households have no choice with only one provider.
- Four players control the entire US beef market and have carved up the country.
- After two mergers this year, three companies will control 70 percent of the world’s pesticide market and 80 percent of the US corn-seed market (3).

Regulating these monopolistic practices is one of the legitimate roles of government intervention into the economy and the government has been unduly lax in doing so.

Another fundamental problem is the difficulty of piercing the ‘corporate veil.’ The problem was serious fifty-five years ago when the Yale Law Review (1967) wrote, “Shareholders of real estate, entertainment, shipping, and manufacturing enterprises, for example, have successfully used limited liability to escape personal responsibility for the torts of their corporations. As a consequence, plaintiff law firms in metropolitan areas will often have two to three cases a year in which their client's recovery is thwarted by the corporate fiction.” In the ensuing half-century, the problem has only gotten worse. Common sense and common law indicate that everyone should be accountable for their actions and not be able to resort to legal loopholes to avoid responsibility.

Capitalism has had its failures, but the cause of most of these is corrupted capitalism, often called cronyism or crony capitalism. This corruption of capitalism occurs when government acts to advantage some actors over others. Aligica and Tarko (2014) discuss three components shaping cronyism: the basic microeconomic foundation of rent-seeking, the institutional-structural component of the embedding environment in which rent-seeking happens, and the ideological component providing legitimacy to the associated structures and processes (161).

Some of the most common types of government-granted privileges given to individuals and businesses providing them an unfair advantage are bailouts, loan guarantees, monopoly advantage, no-bid contracts, occupational licensing, certificates of need, regulatory capture, subsidies, tariffs, and other measures to restrict foreign competition and tax privileges. Most of these are advances by interest groups in the form of lobbying. Hansen (2012) explains,

> Lobbyists threaten national economic welfare in two ways. First, lobbyists facilitate activity which economists term rent-seeking. One common form of rent-seeking occurs when individuals or groups devote resources to capturing government transfers, rather than putting them to a productive use, and lobbyists are often the key actors securing such benefits. Second, lobbyists tend to lobby for legislation that is itself an inefficient use of government resources, such as funding the building of a 'bridge to nowhere' (197).

There are numerous forms of corrupted capitalism, but occupational licensing laws are one of the most subtle and damaging to the economically vulnerable. Occupational licensing is a form of government regulation requiring a license to pursue a profession or vocation for compensation. While some forms of occupational licensing may be necessary to protect public safety, many others are not. For example, requiring surgeons to receive some certification to be allowed to practice medicine may be helpful, but often, occupational licensing is merely a way for established businesses or industries to use the power of the government to reduce competition. It is also one of the fastest areas of growth for corrupted capitalism. In the 1950s, only one in 20 U.S. workers needed government permission to pursue their chosen occupation. Today, it is closer to one in three. Research has shown that licensing neither protects public health and safety nor improves products and services, but it is highly effective in limiting the number of people who can create a job for themselves and earn a livable wage (Meyer 2018).

Most states have 'certificate of need' (CON) laws or 'certificate of public convenience and necessity' (CPCN) laws. These laws are a type of licensing requirement that prevents many new businesses from starting. Unlike other licensing laws, CONs and CPCNs do not require education or training qualifications to obtain a business license. Rather, CONs and CPCNs prevent new businesses from opening unless they can show to the state that new competition is in the public interest or necessary or needed. These laws often become what Sandefur calls 'competitor's veto laws' (Sandefur 2015, 1010). These laws are used regularly as a way for existing businesses in an industry to restrict the entry of competing businesses. This is a corruption of capitalism by government not the free market.

As damaging as rent-seeking and corrupted capitalism are to the economy, more severe damage occurs beneath the surface. This is the damage that results from the harm done to the reputation and understanding of capitalism and free markets in the public mind. On the one hand, the government corrupts capitalism by its actions and, on the other, blames capitalism itself for the ensuing corruption.

The government's failures to control monopolies, tinkering with wage and price controls, and corrupting capitalism to benefit a few at the expense of many have created public pressure to change the United States economic system. The current pressure to transition the United States toward a CPE makes this research necessary. It has become critically important to answer whether a CPE can result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices, which make up the free market. Furthermore, the repeated failures of CPEs may indicate that fundamental socio-economic principles prevent their success. For example, Hayek (1988) postulated that the forecasting necessary to a CPE is impossible; hence, effective planning is impossible (84). Therefore, this paper will ask the research question: Is it possible to forecast economic variables with sufficient accuracy to allow a centrally planned economy result in greater economic good than can be achieved by a free market? The answer to this question is essential to the public and policymakers in determining the nation's course.

Since many believe that economic experts would do a better job controlling the economy than the public, it was first necessary to investigate the efficacy of economic forecasting and its viability for planning the economy. Sound planning requires sound foresight since it is impossible to plan the future without knowledge of what will happen in the future. Christopher Bullock (1716) coined the often-repeated truism, " 'Tis impossible to be sure of any thing but Death and Taxes" (21). Advocates of central economic planning base their advocacy on the assumption that economic experts can overcome this truism and be sufficiently sure of the action of the economy to devise sound economic plans. They believe that central planning by economic experts would make sounder decisions for the people than the people would make for themselves through free markets. Hayek (1988) says they cannot because "What cannot be known cannot be planned" (84).

We live in an uncertain world in which making predictions with certainty is seldom possible. Some relatively accurate scientific models are helpful in the physical sciences, but even those are not certain. This paper will explore the limits of forecasting models, mainly as applied to economics. A discussion of the extent to which the world is ordered and predictable or more unruly is also necessary to answer whether it is possible to plan well enough to direct a nation's economy.

If planning an economy is analogous to growing a garden in a greenhouse where the variables are within the gardener's control and forecasts about plant progress and needed amendments are accurate, then a centrally planned economy (CPE) might succeed. However, if the economy is more like a fenced outdoor garden subject to the effects of weather, insects, weeds, and unknown soil conditions, then a CPE's success seems more unlikely. If the economy is more like an unfenced outdoor garden with animal predators that make predictions of their own regarding what crops will be edible at what time and plan to arrive at the right time to devour the harvest, then a CPE seems doomed to almost inevitable failure. If the economy is more like a greenhouse garden, then forecasting future behavior should be relatively straightforward, and most of those favoring a CPE assume that experts can perform this forecasting successfully. On the other hand, if the economy is more like the natural world with the weather, insects, and weeds, forecasting future behavior becomes more problematic. Finally, if the garden is more like planting a garden in a wild area with predators that seem to know when crops will mature better than the gardener, the possible success of CPEs becomes still more difficult or impossible.

One might argue that a farm is much like one of the last two gardens, but farms are on a much larger scale than gardens and, as a result, are far more able to withstand attacks by insects and predators. The number of predators available to damage crops in a farming area is far lower than in a garden surrounded by natural habitat.

This research answers the question of whether a CPE, or socialist model, is practical, based upon the possibility of accurate forecasting. However, it does not argue the politics of socialism or fascism versus free markets. Furthermore, it makes no moral judgments about the competing economic systems. Those discussions, while valuable, are outside the realm of economics and therefore better left to experts in other fields.

The question of whether a CPE can result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices that make up the free market can best be answered by breaking it into parts. It is necessary to address the question across three domains that affect economic forecasting: the first is the accuracy of mathematical modeling in forecasting economic trends in a chaotic environment, the second is the prediction and mitigation of boom-and-bust cycles, and the third is the effect of unpredictable "black swan" events. First, Makridakis and Taleb (2009) address the domain of mathematical modeling, explaining that it "fails when complex systems are involved" (843). Second, Kunieda and Shibata (2016) address the domain of boom-and-bust cycles or bubbles, saying, "Because asset bubbles are a symptom of financial frictions, a policy that cures the root cause of inefficiency and instability should be proposed" (83). This paper will propose such a solution.

Finally, Taleb (2007) addresses the third domain, "black swans", by explaining that people often use recent history in which no significant catastrophic events occurred to conclude that they will never occur. "We are now subjected to the classical problem of induction: making bold claims about the unknown based on assumed properties of the known" (198). The COVID-19 pandemic is an example of a black swan affecting the economy unpredictably.

Chapter II of this dissertation reviews the existing literature on the topic. The review finds reliable sources in each of the three domains, but none that address the combined effect of these three domains on economic forecasting. Moreover, finding current sources that address these issues directly in some of these areas has proven challenging. However, this paper will present evidence from the literature in these three domains and examine the implications of the combined effect of the three domains.

There is a great deal of existing research in the first domain of modeling and forecasting in general and still more focused on economic forecasts in particular. There is also substantial research in the second domain dealing with the growth and collapse of asset bubbles. In addition, there is a third domain, black swan events, rare, unpredictable events with severe consequences. However, there is little research that explores this third domain and its effect on economic forecasting. Furthermore, there have been no attempts to synthesize the research in these three domains into a single meta-domain that can be analyzed as a whole to determine the combined effect on forecasting. Thus, first, the investigation will address each domain in turn.

The research into the first domain, the viability of economic forecasting, is broken down into more granular pieces that can be examined separately and then collectively. This division is necessary because the existing research does not often delineate the differences in the types of systems that are forecasted. There are simple systems that can be described very well by elementary mathematical formulae. For example, given the characteristics of a guitar string, its length, its temperature, and the tension applied to the string, one can calculate that plucking the string will sound a particular, predictable pitch. These simple systems do not require investigation because they are trivial. Furthermore, no one has suggested that the economy is a simple system of this type.

Except in simple systems like the one above, a complete understanding of the present is necessary to predict the future. As systems increase in complexity, the assumption that the present is wholly understood logically fails. It fails because everyone understands the present based upon models, sometimes mathematical, often mental (Senge 2006, 163). All models, whether the most sophisticated statistical and mathematical models or a simpler mental model, are simplified versions of reality whose value lies in making something easier to understand. However, due to their simplicity, they are never entirely accurate. Cardell (2019) uses the example of a doll. A doll is a model of a human, but it is an incomplete model. It is a simplified representation of a person. It might be accurate enough to explore fashion or practice aspects of parenting or learning about human proportions but does not help understand the circulatory system. “Any model that accurately reflects all aspects of the system being modeled is no longer a model but a copy. As a copy it loses its ability to simplify reality.” Virtually all human beings tend to extend their mental models beyond their effective range. They metaphorically look inside the doll and decide that humans are full of cotton (5). Furthermore, even an actual living human is not a completely accurate model of another human being or even a completely accurate model of that same human being an hour earlier or an hour later.

Experts in the natural sciences using mathematical models are generally more successful than social scientists; however, even those mathematical models have failings like the example of the doll. They are never entirely accurate because they are simplifications.

The failure to thoroughly understand the present makes predicting the future impossible. Cardell (2021) explains the problem using an example from physics. The equation, which is a mathematical expression of a model, predicts the speed of a falling object at a future time using the equation $V = V_0 + gt$, where V is the velocity of the object at any time, V_0 is the initial velocity, g is the acceleration caused by gravity and t is time. This formula appears simple enough; if one knows V_0, g, and t, one can precisely calculate V. However, it is not nearly as simple as it appears. An engineer would quickly point out that this equation only applies at standard temperature and pressure in a vacuum. These conditions never exist in the actual world and therefore provide only an estimated range of possible outcomes.

In each set of circumstances, it may be possible to predict a ninety percent probability that a given object of a specific size, shape, and weight, falling for six seconds in the air on earth with an initial altitude of sixteen thousand feet with the barometric pressure being between 27.9 and 28.1 inches of mercury with the temperature being sixty-two degrees Fahrenheit will be falling between forty-five and forty-nine meters per second. The non-engineer might wonder why the answer is so uncertain given such a simple formula. The engineer would answer that too many variables are not included in the formula to make a more precise calculation possible. For example, every cubic meter of air through which the object falls encompasses roughly ten septillion molecules in independent motion. Each of them interacts with the others and the object in unpredictable ways. To arrive at an absolute answer, one must, among other factors, be able to predict the position and motion of each of these septillion molecules. It would also have to account for temperature and pressure changing unpredictably as the object descends. That is, a complete understanding of the present would be needed to make a more accurate prediction about the future.

While these systems are complex, the relationships are straightforward if all the facts could ever be made known. However, as the number of actors in a system increases, the complexity of the relationships among the actors becomes even more complex. The introduction of complex relationships in addition to complex systems results in chaotic systems.

Harari (2018) explains that “Chaotic systems come in two shapes” (loc 3670). Level one chaos is chaos that is not self-referential. For example, the weather is a chaotic system of this type; every action triggers “ripples” that radiate outward in all directions in a system of this type. Edward Lorenz discovered chaos theory accidentally when he made a slight alteration in one of the input variables in a weather model he was working on, and the change resulted in a dramatically divergent outcome. He described it as the ‘butterfly effect,’ which he explained using a metaphor describing how a butterfly flapping its wings in Brazil could contribute to a tornado in Texas (Lorenz 1972). This type of chaos implies that any action may precipitate outcomes that are impossible to predict, no matter how small.

Harari (2018) defines level two chaos as the “chaos that reacts to predictions made about it” (loc 7353). The stock market is an example of such a system. Predictions of future stock prices affect buying and selling, which results in price changes.

Combining the research on models and forecasts with research on government economic interventions and past economic disasters resulting from bubbles and the failure of governments to predict and respond to them will demonstrate the impossibility of economic forecasting. Showing that forecasting is impossible can be extended to prove that planning is also impossible.

Chapter III of this dissertation describes the methods used to research the failure of expert forecasting and the creation of models to describe these failures. If forecasting is impossible, then discovering theoretical justifications for this impossibility becomes essential to complete our understanding. These theoretical justifications will lead to proposed research-supported roles of government in the economic sector. As in Chapter II each domain will be addressed by investigating each of the three domains in turn. First, data was collected to assess historical forecasting accuracy. This collection includes thirty years of forecasts of personal consumption expenditures (gRPCEs) by the staff of the Federal Reserve and comparing the projections with the results. It also includes examining existing data on the accuracy of the Federal Reserve and others to forecast other aspects of the economy. The data show a history of forecasting failure. The data collected and analyzed on gRPCEs show an average error of about eight percent with some errors as much as thirty-five percent in either direction with a standard deviation of thirteen percent for predictions one year in advance.

In addition to data collections, creating system dynamics models in the first two domains provides explanations for those economic behaviors. These system dynamics models are graphical representations of complex systems many of which have equations that cannot be solved, only numerically evaluated. In the first domain, two system dynamics models have been created that explain the chaotic behavior of the economy based upon interrelated but straightforward inputs. In the second domain, a system dynamics model explains asset bubbles as a function of profit-motivated speculation. This model leads to proposed appropriate government action designed to eliminate asset bubbles by directly addressing the rent-seeking that creates them. This proposal may prevent asset bubbles from forming and collapsing. Constructing models concerning black swan events was not pursued since their random occurrence is not suitable for modeling. Discovering whether CPEs can provide more significant economic benefits than the free market and what actions government might take instead will be of great value to those seeking to improve public economic policy.

Chapter IV presents both the data analysis and the models in each of the three domains. These results of all three are then combined into an integrated whole to answer the research question. As in the previous two chapters, this chapter presents the findings in each of the three domains. There are sections on failure due to chaos, failure due to bubbles, and failure due to black swans. Examining the data from the personal consumption expenditures from 1985 to 2015 demonstrates failure in all three domains. The general errors are the results of chaotic behavior. The extremes are attributable to the asset bubble of 1985-87 and the housing bubble of 2007-8. Finally, the black swan pandemic of 2020 is responsible for the most significant errors in economic forecasting history. The data indicate a forty-three percent chance of chaos distorting the gRPCE projections severe enough to upset planning, a nineteen percent chance of an asset bubble creating such a distortion, and a five percent chance of a black swan doing so. Combining these probabilities results in a fifty-six percent probability that at least one of these events will create a severe distortion in the gRPCE. This indicates that gRPCE forecasting is not as good as flipping a coin. Planning based upon the kinds of odds is unsound and likely to do more harm than good.

Chapter V of this dissertation presents a summary of the research, draws conclusions, and presents recommendations. What is the answer to the research question: Is it possible to forecast economic variables with sufficient accuracy to allow a centrally planned economy result in greater economic good than can be achieved by a free market? The preponderance of the evidence uncovered in this investigation indicates that the answer to the research question is no.

The evidence shows that a centrally planned economy cannot result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices that make up the free market. The evidence shows that turning right at the crossroads would be the best course, followed by straight ahead and lastly turning left.

This research recommends that the government's efforts to 'reform' free-market capitalism be limited to serving as an impartial referee whose task is to ensure that everyone is playing by the rules. This recommendation includes eliminating all forms of corrupted capitalism, including bailouts, loan guarantees, monopoly advantage, no-bid contracts, occupational licensing, regulatory capture, subsidies, measures to restrict foreign competition by tariffs and other means, and tax privileges. That would boost the economy and reassure the citizenry that free-market capitalism is fair and beneficial to all.

Finally, this research presents solutions in each domain. In the domain of chaos, the solution is to mitigate every forecast by acknowledging its inherent inaccuracy or possibly to abandon the attempt, knowing that it is not helpful. Attempting to control a complex system in a top-down manner is analogous to using the conscious mind to control all the autonomic functions of the human body. It is impossible, and that impossibility must be acknowledged. In the domain of bubbles, the recognition that profit-motivated speculation is the proximal cause of these bubbles leads to proposing a special tax that is likely to dampen or eliminate asset bubbles at their origin and provide a greater incentive to make wise economic investments.

In the domain of black swans, the proposed solution is that government mimics the behavior of private citizens regarding black swans. Citizens prepare for black swans by readily having the necessary tools and supplies to see them through a tumultuous event. This preparedness may include emergency savings, a survival stock of food, a generator, and emergency first aid supplies. The recent pandemic, which many label as a black swan, shows how fatally unprepared the government was to cope with an event of this magnitude despite the 1918 Spanish flu pandemic warning. Furthermore, the government's wrong-headed attempts to mitigate the economic fallout triggered the most severe inflation in decades instead of solving the problem. The other thing citizens do to prepare is to buy insurance. While the government cannot go out and buy insurance, it can self-insure. Instead of borrowing to help the citizens in a pandemic, the government should create a special fund consuming five percent of the annual budget until at least six months of annual expenditures are acquired. Then the government, like its citizens, would benefit both from the additional security and from receiving interest on its savings.

CHAPTER II: LITERATURE REVIEW

This literature review examines the literature to find evidence supporting or refuting Hayek's belief (Hayek 1988) that "What cannot be known cannot be planned" (84). It appears there is sufficient evidence that Hayek was correct. It examines the previous research surrounding whether an economy, planned by experts, can result in greater economic good than can be achieved by spontaneous order created by the combination of individual choices that make up the free market? Its division into several relevant sections leads the reader through research on the nature of free-market and planned economies, the weakness of modeling, how economic models fail, and the problems of chaotic systems, asset bubbles, and black swans.

It seems wise to qualify this literature review by saying that the reader will surely notice that it contains fewer recent references than might be desirable. The research into the effectiveness of forecasting has diminished in recent years. The research into asset bubbles has also slowed substantially, and research concerning black swans has also become less available. However, many existing works are highly cited in more recent literature and therefore may be considered seminal.

What Is a Centrally Planned Economy?

Gwartney (2019) defines socialism, the most common version of centrally planned economies, this way, "A system of economic organization in which (1) the ownership and control of the basic means of production rest with the state and (2) resource allocation is determined by centralized planning rather than by market forces" (36). In planned economies, political forces rather than market forces move the economy.

Higgs (2012) explains that government is necessary because there are some tasks only government can perform. He agrees with Mises saying, a strong but limited government allows its citizens to be productive and free (3). However, Higgs is concerned that the United States may be moving toward fascism or socialism (2).

Rothbard (2009) describes controlled economies as an economic order in which the government owns or controls the entire production system. They are the forced abolition of the market, the state's monopolization of the entire economy. He adds, "There are two and only two ways that any economy can be organized. One is by freedom and voluntary choice—the way of the market. The other is by force and dictation—the way of the State" (loc 958).

Forrester (1969), the founder of system dynamics, in *Urban Dynamics*, presents a systems approach to dealing with government economic planning by analyzing the problems of an aging city. He used a system dynamics model run on an IMB 360/67 to make all the calculations required by the interrelated differential equations. He extensively used the model in Lowell, MA, and later Boston, Concord, and Marlborough, MA. It is a seminal book because it is essentially a theory of the forces that constrain human communities that constrain human history. It is also an indication that centrally planned economies oppose those constraints and could be why they have never succeeded in the long term.

What Is Free-market Capitalism?

Sternberg (2015) writes that it is necessary to develop a concise and accurate definition of capitalism that makes it unambiguously clear what it is and what it is not. She argues that this is necessary because many forms of hyphenated capitalism, such as welfare capitalism and crony capitalism, misuse the term and, in fact, impute to capitalism characteristics that are anti-capitalist. She says that absent a precise definition, those advocating for capitalism are “handicapped” by being forced to attempt to defend an amorphous term that, for many, incorrectly includes aspects that are undefendable (380). She defines capitalism, writing, "Capitalism is an economic system characterised by comprehensive private property, free-market pricing, and the absence of coercion" (385).

What Free-market Capitalism Is Not

Free-market capitalism is not the big-government quasi-capitalism existing in the United States today. True free-market capitalism is far more like the markets envisioned by the nation's founders. The most meaningful change between the current state and original intent is the growth of the federal government, which has taken several forms: federal spending, federal regulations, federal usurpation of states' rights, and federal economic manipulation. The Founder's intended government's role to be divided among the nation, the states, the localities, and the people. The Founders envisioned a federal government that was somewhat stronger than the Articles of Confederation provided, but only somewhat more. The size and power of the federal government have grown to encompass a far more significant role than the Founders would have imagined. In 2016, federal taxes took sixty-five percent of all taxes collected, leaving twenty percent for the states and fifteen percent for localities (Taxpolicycenter.org n.d.). In 1840, federal government revenues were about one-third of all revenue collected. Just prior to the Civil War, federal revenues rose slightly reaching about thirty-nine percent. In 1870, federal revenue had ballooned to sixty percent of revenue (Chantrill 2019). Money is power. If we accept that the Founders might have equated local government as synonymous with the people, the federal government now has two-thirds of the power, the states' one-fifth, and the people less than one-sixth.

The federal government has now assumed far more power than the enumerated powers the Constitution granted it. Higgs (2012) provides a thorough accounting of the growth of the federal government's power but focuses primarily on the period since 1900. It might be instructive to examine the time before that to see if what happened then directly affected what happened later. It may also be illuminating to examine whether the crises were the proximal cause or if they were 'ratchets', as Higgs describes, doing the heavy lifting in service of other forces (2012, 30). Higgs questions why crisis did not engender 'Big Government' in the nineteenth century (2012, 258). It is possible that they did.

Growth usually follows one of three patterns: linear (arithmetic), exponential (geometric), or logistic. Linear and exponential growth both occur in the absence of limits and are relatively rare. Logistic growth, in the beginning, looks just like exponential growth but levels off as it approaches a limit. The graph below (Figure 4) shows Federal Spending as a Percent of GDP as a function of time. It also offers a logistic model of the data. The model shows how growth in spending might have occurred after smoothing out all the anomalies. This model asserts a 16% per decade increase in spending as a percent of GDP and a limit of 40%.

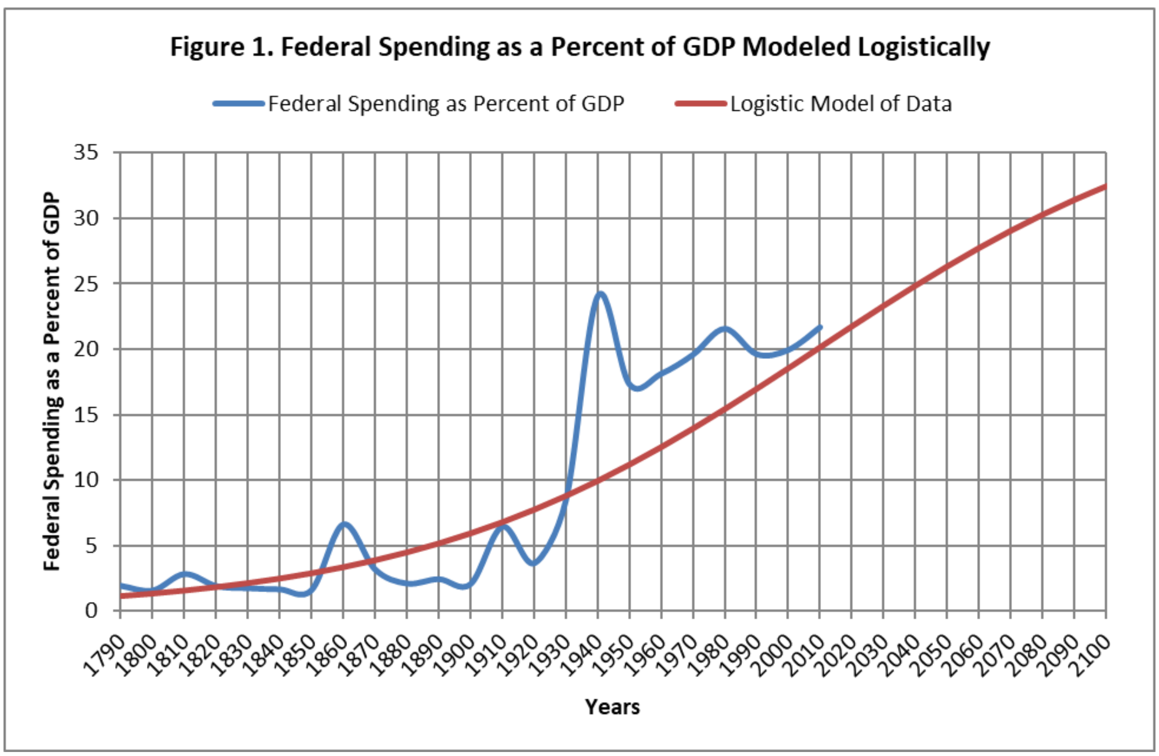


Figure 4

The blue line is the actual data smoothed by decade (Senate.gov 2015), and the red line is the model. The model fits the data well enough to support the hypothesis that crises, including the Civil War, did indeed engender ‘Big Government’ but that the Civil War was still early in the growth pattern when the rate of change was still relatively low. Figure 5, below, shows the data not smoothed by decade (Senate.gov 2015).

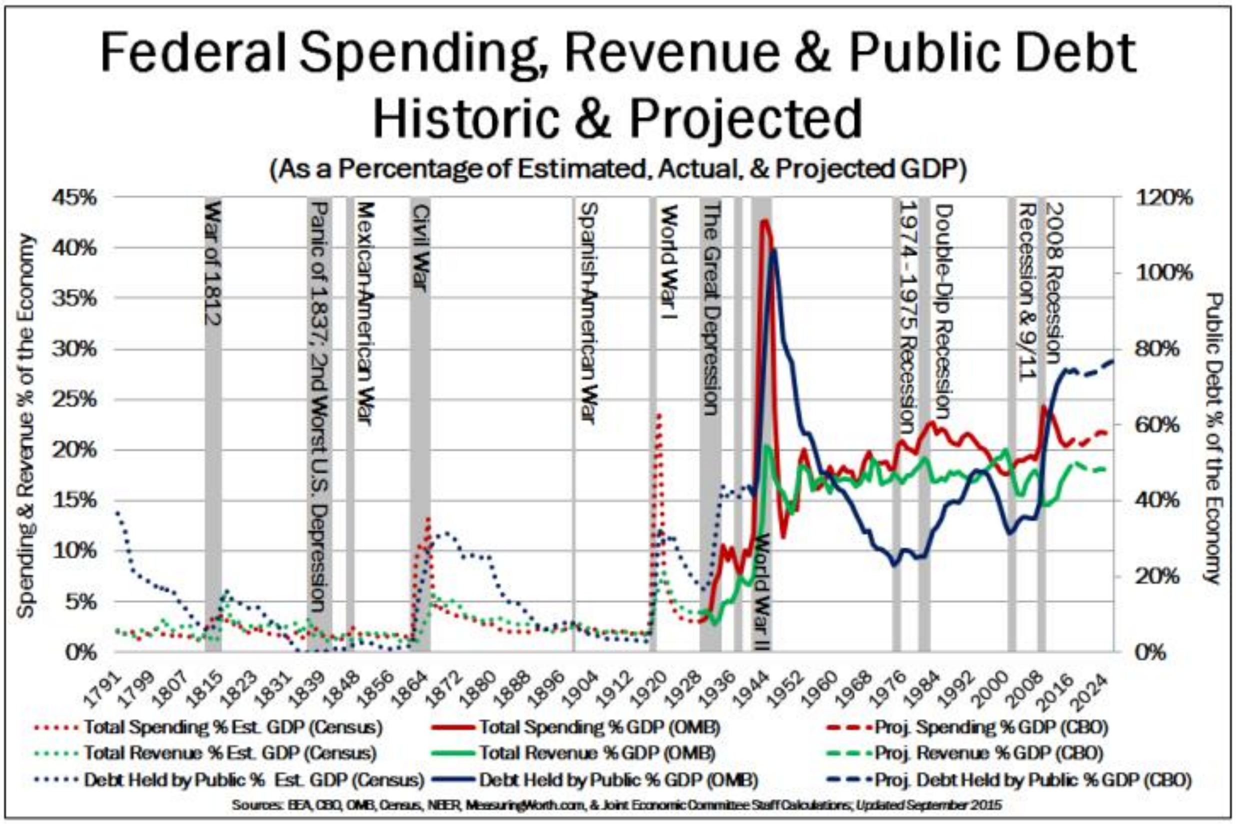


Figure 5

Sen. Thomas Hart Benton predicted in 1826 that any increase in federal spending would have a catastrophic multiplying effect saying, “The actual increase of federal power and patronage…will be, not in the arithmetical ratio, but in geometrical progression” (Weisberger 1997). Benton’s prediction of exponential growth preceded the mathematical explanation of logistic growth, but he foresaw the first half of the curve correctly. Average federal spending from 1790 to 1860 was 1.63% of GDP; however, from 1870 to 1910, it increased abruptly, averaging 3.19% of GDP, a growth of 96% or about double. (Senate.gov 2015). Another measure of government growth is the Official Registers of the United States. By 1861, the volume had grown to 592 pages. By 1891, the Official Register had nearly doubled to 990 pages (Weisberger 1997).

Based on the above arguments, Higgs 'Crisis Hypothesis' can be seen to include the antebellum period; however, the mathematical model suggests an underlying 'natural growth' that is exploiting these crises. One candidate for that underlying factor is the psychological changes that occur as an enterprise matures. For example, the Founders were governmental entrepreneurs, probably the first in human history. However, succeeding generations have become less entrepreneurial and more managerial; they have no perceived vested interest in inventing government but simply managing it.

This psychological change is not unique. All organizations, countries, religious movements, and long-term human endeavors fall prey to the cultural equivalent of the principle in physics called entropy. This principle states that the arrow of energy points from organization to disorganization, and anything put together will immediately begin slowly falling apart. In any culture, national, corporate, religious, or other, the descendants of those who established the culture begin to resemble the entrepreneurs, the originators, less and less. The driving organizational force of the entrepreneur grows weaker as time passes.

There is psychological research that shows that entrepreneurs and managers are fundamentally different from each other. Some of these differences include entrepreneurs being more self-confident, believing that they can control the outcomes in their environment, being highly resilient in the face of stress, and tending to have lower levels of neuroticism than managers (Usc.edu n.d.). It is reasonable to suggest that as the time from the founding of an enterprise increases, the people involved move away from being entrepreneurs and toward being managers. During this progression, the population and its leaders become increasingly risk intolerant (Sari Pekkala Kerr, Kerr, and Xu 2017). Consider the westward expansion of the United States; the trailblazers, the entrepreneurs, were quite different from the pioneers who followed them. Following those pioneers were settlers who were quite different from the pioneers and bore no resemblance to the trailblazers. This progression seems to be present in all human endeavors and may be the driving factor behind the logistic growth of statism in the United States. Looking at the psychological differences between entrepreneurs and managers, they would respond very differently to crises. Therefore, early crises, like the Civil War, would have a more negligible effect on people closer to the entrepreneurial type and a more significant effect as the population shifts toward the managerial type.

One of the problems deriving from the growth of government power is the growth of actors using government to achieve their own ends. The French economist Frédéric Bastiat described cronyism and its effects most succinctly in a pamphlet in June of 1850. He said, "As long as it is admitted that the law may be diverted from its true purpose — that it may violate property instead of protecting it — then everyone will want to participate in making the law, either to protect himself against plunder or to use it for plunder. Political questions will always be prejudicial, dominant, and all-absorbing" (Bastiat 1850). Protecting capitalism from corruption necessitates that the law must not be allowed to "be diverted from its true purpose". It may be instructive to review how this diversion was allowed to occur in the United States.

There is sufficient evidence that the increase in government intervention in the economy of the United States has its roots in the latter part of the nineteenth century and very early twentieth (Weinstein 1968, ix). The evidence indicates that this increase in intervention is the result of cronyism. Kolko (1965) makes the case that it began with the railroad barons of the late nineteenth century when increasing competition was causing them serious problems. These problems led them to seek political solutions that increased regulation (3–5). Once these railroad barons had ‘broken the ice’ and diverted the law from its true purpose and the ever-increasing cycle began as Bastiat predicted, as everyone began to see the law as a financial tool to be exploited.

It did not take long for the power-seekers to learn that, in Rahm Emanuel’s words, “You never want a serious crisis to go to waste” (n.d.). Higgs (2012) posits that the growth of the federal government was a direct cause of the sort of thinking described in Emanuel’s premise. Higgs describes the progression from the depression of the 1890s that ultimately led to the 16th Amendment allowing an income tax, the creation of the Federal Reserve, and the Adamson Act, which created a minimum wage (106-122). Following this increase in federal control was the exploitation of the crises of World War I, the Great Depression, World War II, and the Cold War. Each of these crises led to an increase in federal control that resulted in a far different distribution of power than was intended by the Founders. The Founder’s intent was for the government’s role to be divided among the nation, the states, the localities, and the people. They envisioned a federal government of limited power; instead, it has grown to encompass a far more significant role than they would ever have imagined. As previously mentioned, from 1840 to 2016, federal taxes about doubled as a fraction of all taxes collected from about one-third to about two-thirds.

One of the most seriously flawed results of federal intervention may have produced the most disastrous results of all. It is the story of Dr. Ancel Keys and the American diet. It is an example of what Franks (2016) warns about; “Professionals are a high-status group, but what gives them their lofty position is learning, not income. They rule because they are talented, because they are smart. A good sociological definition of professionalism is “a second hierarchy"—second to the main hierarchy of money, that is—based on credentialed expertise" (22).

In the 1950s, the American Heart Association invested millions in heart disease research (Teicholz 2014, 48). In 1961, Keys, who had no nutrition science or cardiology training, managed to get himself and an ally onto the AHA nutrition committee. Keys hypothesized that saturated fat and cholesterol were influential factors in heart attacks and strokes. Without evidence supporting that position, Keys and the company persuaded the committee to include recommendations for 'reasonable substitutions' corn or soybean oil for saturated fats (Teicholz 2014, 48). Later that year, Keys was featured on the cover of Time magazine along with Keys' advice to cut dietary fat down to fifteen percent of total calories (Teicholz 2014, 49). The rest of the media picked up the ball and ran with it. Study after study failed to provide evidence to support Keys claims, but his outsized reputation kept him from being discredited. At the same time, other researchers produced credible research indicating that it was not fat but carbohydrates that were the actual culprit (Teicholz 2014, 59).

"When Congress adopted the diet-heart hypothesis, the idea gained ascendancy as an all-ruling, unassailable dogma, and from this point on, there has been virtually no turning back" (Teicholz 2014, 103). In 1980, the USDA released its *Dietary Guidelines for America.* (Teicholz 2014, 135). The result has been an epidemic. As of 2016, the latest year for which official data is available, almost 40% of adults in the United States were obese, almost double the 1988-1994 period when just over 22% of adults were obese (Byrnes 2018).

This debacle might be some of the most substantial evidence that statist intervention, influenced by lobbyists pursuing their own agendas, can cause real disasters. The United States government may be responsible for the millions of early deaths of people who trusted that their government knew what it was doing when it did not.

Any attempt by the government to affect the economy is an experiment that has an uncertain outcome. Using a country of three hundred fifty million people as guinea pigs to test a theory that has the potential to ruin countless lives is unjust. If experiments are necessary, they should happen at the lower levels of government. Policy experiments should be held to the same standards as drug trials since they have as much or more potential to harm.

Cronyism and rent-seeking require statist intervention, the exercise of government power, to have any effect. If the state has the power to intervene, those affected by those interventions will attempt to manipulate them. In an interview, Hayek suggests a division of power to eliminate the possibility of government intervention. He suggests an upper house with the responsibility for setting general rules of conduct and a lower house that created specific laws to enforce the provisions of the upper house. He says, “The first unable to discriminate and the second unable to take any coercive action except to enforce general laws” (Hayek n.d.). Whether or not this could work as well as he imagines, it is not practical as a way forward in the United States as it would require an entirely restructured constitution.

Aligica and Tarko discuss three components shaping cronyism: the basic microeconomic foundation of rent-seeking, the institutional-structural component of the embedding environment in which rent-seeking happens, and the ideological component providing legitimacy to the associated structures and processes (2014, 161). The institutional-structural component includes, "Monetary policy … comprises the Federal Reserve's actions and communications to promote maximum employment, stable prices, and moderate long-term interest rates--the three economic goals the Congress has instructed the Federal Reserve to pursue" (Board of Governors of the Federal Reserve System n.d.). By definition, anything the Fed does is an intervention into the economy, and there is no evidence that these interventions are necessary or even helpful and a great deal of evidence that they have occasionally caused severe harm.

For example, Milton Friedman showed that the Great Depression of the 1930s occurred primarily because of actions by the Federal Reserve and showed how policy changes could prevent it from happening again. Ben Bernanke, when the Federal Reserve chairman, publicly told Friedman, "Regarding the Great Depression," he declared, "you're right. We did it. We're very sorry. But, thanks to you, we won't do it again" (Wapshott 2011, 269). However, Bernanke made his own mistakes leading to the 2007-2009 recession (The Financial Crisis Inquiry Commission 2011). As a result, many would argue in favor of abolishing the Federal Reserve. Investment editor Lance Gaitan explains, "Central banks are partnerships created between bankers and politicians. The political side gets spendable money (created from nothing) without having to raise taxes, while bankers get commissions or interest payments in perpetuity. A sweet deal for both sides!" (Gaitan 2017).

There are numerous forms of cronyism, but occupational licensing laws are one of the most subtle and damaging to the economically vulnerable. Occupational licensing is a form of government regulation requiring a license to pursue a profession or vocation for compensation. While some forms of occupational licensing may be necessary to protect public safety, many others do not. Occupational licensing is often used as a way for established businesses or industries to use the power of the government to reduce competition. As mentioned in Chapter I, in the 1950s, only about five percent of U.S. workers needed government permission to pursue their chosen occupation. Today, it has risen to about thirty percent. Meyer (2018) shows that licensing neither protects public health and safety nor improves products and services, but it is highly effective in limiting the number of people who can create a job for themselves and earn a livable wage (Meyer 2018).

Take, for example, the case of Kine Gueye. Kine grew up in a village in Senegal where every girl learns traditional African hair braiding. She moved to the United States and settled in

Louisville, Kentucky. She sometimes worked 12 hours a day braiding hair in her Louisville home, earning between $80 and $250 per customer. As her practice expanded, so did her family. She married, had children, and moved her practice into a storefront (Erickson 2018). When she began advertising her services, the government shut down Kine because she did not have a cosmetology license. Getting such a license would require nearly two years of school and $16,000 tuition. She had the necessary skills, and her work posed no threat to public safety. She fought back, and eventually; Governor Matt Bevin signed a bill in 2016 exempting hair braiders from the state's cosmetology regulations. Nevertheless, a cronyist policy had attempted to prevent her from earning a living, and since the bill only exempts braiders, other budding entrepreneurs will have to fight for exemptions of their own.

The most disturbing trend in American politics today is a shift toward an acceptance by much of the population of socialism as a viable form of government. Much of this shift is due to what many perceive as a failure of capitalism. However, virtually all the failures cited are not failures of capitalism but the corruption of capitalism by elitism, cronyism, and rent-seeking. The results are alarming. Aligica and Tarko conclude that cronyism "may be emerging as one of the most important challenges to democratic market capitalism (be it in the neoliberal or social-democratic form). Hence, the endeavor to better understand its nature, structure, functioning, and dynamics as well as the variety of its ideological disguises, becomes an important and challenging task" (2014, 173).

Aligica and Tarko's concern is well-founded; in 1982, the Democratic Socialists of America had only six thousand members, by 2012, the membership had increased to about sixty-five hundred. However, since 2012, the membership growth has been alarmingly rapid. In 2019, the membership had grown eight hundred sixty percent, to more than fifty thousand, and is now doubling every two years (Schwartz 2017). Using the Democratic Socialists of America website data, performing an exponential regression yielded the equation below.

$$n = 6500(1.395^t).$$

Here n is the membership in the Democratic Socialists of America and t is the time in years since 2012. The regression has an R-squared value of .96, indicating that the regression equation explains ninety-six percent of the variation in the data. An R-squared value of .96 is considered an exceptionally good correlative fit. If this trend continues, the Democratic Socialists of America will outnumber both the Republicans and Democrats by 2047.

The growth of public acceptance of socialism is not the only reason for concern. Creeping socialism is equally worrisome. The power of the federal government grows with revenue. As discussed earlier, from 1790 to 1860, the average federal spending consumed 1.63% of GDP. From 1870 to 1910, it nearly doubled, averaging 3.19% of GDP, a growth of ninety-six percent (senate.gov 2015). As concerning as that growth was, in 2018, the United States government spent more than six times that much, taking 20.8% of GDP (Usgovernmentspending.com 2019).

In *The Road to Serfdom*, Hayek says, “It is one of the saddest spectacles of our time to see a great democratic movement support a policy which must lead to the destruction of democracy, and which meanwhile can benefit only a minority of the masses who support it” (2007, 4988). Many refer to this shift as the slippery slope theory. Alves and Meadowcroft use data to attempt to refute Hayek’s slippery slope theory saying,

“Hayek’s slippery slope hypothesis is therefore left in a very uncomfortable position: if government expenditure can sustainably account for half (or in some cases even more) of GDP with no apparent decline in economic or political freedom, and therefore no apparent signs of a slippery slope materialising, then very little of salience would appear to be left in the argument" (2014, 851).

Alves and Meadowcroft may not have examined their data closely enough since performing regression analysis on their data concludes that Hayek was correct. Once we have performed an exponential regression on the average of the ten countries supplied by Alves and Meadowcroft (Figure 6), we find that the average government will control one hundred percent of GDP after sixty years. The r-squared value, .95, of the resulting equation, indicates that it models the data provided exceptionally well.

Alves and Meadowcroft seem to have incorrectly concluded that because it has not happened thus far, it would never happen, but their data does not support that conclusion.

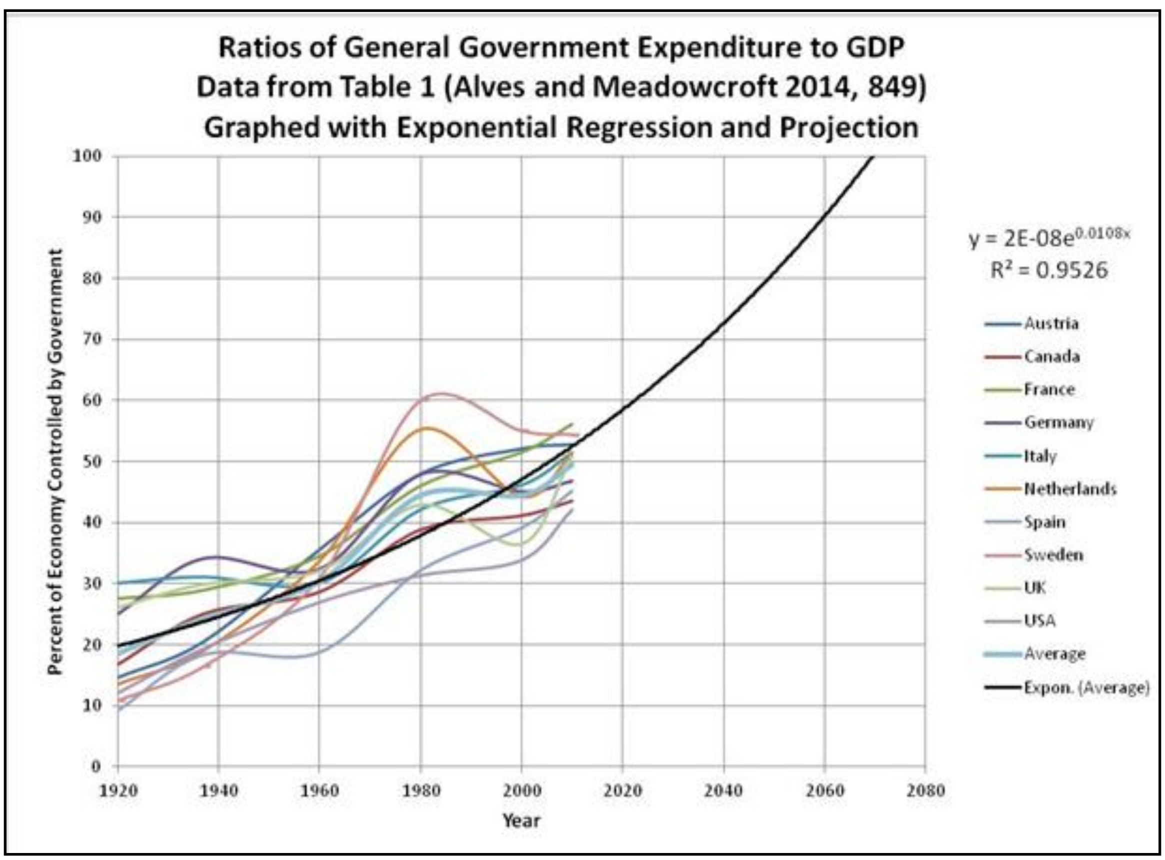


Figure 6

As damaging as cronyism is to the economy, the damage it does to the public perception of capitalism is a more significant problem. “A free market is by definition a business environment in which companies produce products and services valued by consumers at a cost they are willing to pay, free from special advantages created by government” (Winters 2019). However, people who do not understand that a free market includes freedom *from* cronyism then mistakenly channel the contamination caused by cronyism into an attack on capitalism itself. Policies that provide protections, special preferences, or subsidies to their friends or sponsors to give them an unfair advantage over their competition are destroyers of free markets, not innocent participants.

Some would argue that government needs to intervene when the free-market sets value unfairly. This assertion is an economic fallacy. One of today's current trends is a campaign for a fifteen-dollar-per-hour minimum wage based upon the notion that anything below that is not a living wage. It is also a form of cronyism, lobbying by special interest groups. Some of those making these arguments for a minimum wage say that everyone deserves their fair share of the GDP. Frank (2016) says it this way, "Workers' share of the gross national product (as opposed to the share taken by investors) hit a record low in 2011—and then it stayed there right through the recovery. It is there to this day; economists now regard its collapse as a quasi-permanent development" (1-2). This reasoning ignores the fact that GDP stands for Gross Domestic *Product*. The argument fails because it uses a measure of production to evaluate income. The correct conclusion would not be that those whose incomes are insufficient are underpaid but that they are underproducing. That is not to say they are lazy but may need to look for ways to exploit their skills and talents to create more economic value. Furthermore, Mitchell shows the actual cost of cronyism reduces GDP by twenty percent over thirty years (2012).

The Viability of Economic Forecasting

Thus far, centrally planned economies (CPEs) have never succeeded in providing more significant economic benefit to their citizens than free-market capitalism. Sound economic planning years in advance is essential if they are ever to do so. This planning requires accurate forecasting. Accurate forecasting requires a complete understanding of the current state and what the current state and current actions will produce in the future. Understanding the difficulty of this task requires an investigation of models, both mental and mathematical. Every aspect of our perception of the world is made comprehensible through mental models (Senge 2006, 163). Reality is incomprehensible, so we create mental simplifications that are at our level of comprehension. These are models, as a doll is a model of a human, or a toy car is a model of the real thing. We need models, but we need to be aware that these models are simplifications and have limited accuracy. To understand the failure of economic planning, we must understand the nature and use of models.

One serious flaw in most models is their failure to incorporate the fact that nothing in the real world exists in isolation; everything is part of a system. People tend to base conclusions on the facts before them ignoring the complex subtleties of the system encompassing those facts. Senge (2020) explains, people “still mostly see things as separate. A chair. A tree. A person. How is it that this habit of awareness persists in the face of a century of scientific evidence to the contrary?” The object’s place in the system is more important than the object itself (58).

Richardson (1979) presents the advantages and disadvantage of using models in a variety of contexts. She explains that “While physical principles are well understood and stable enough to be predictable, social, economic, and political behavior is not well understood, not stable, and not very predictable (with some exceptions) except within broad limits“ (2).

She goes on to explain what a model is and is not, how a model is constructed and enumerates seven limitations of models. She lists them as incompleteness, the assumption that the future will be like the past, data problems, the clarity of operational status, the uncertainty of input data, the limitations imposed by the original purpose, and giving undo confidence to the apparent precision of a model. She discusses each of these in detail and, in addition, provides questions that a model user should have asked and answered before using a model. She concludes by saying, “The proper use of models can add considerable insight to the policymaking process, but model output should be regarded only as approximations. Only if policymakers are aware of the limitations inherent in models can mathematical modeling enhance the policymaking process” (2).

In writing about forecasting with models during the 2020-21 pandemic Siegenfeld, Taleb, and Bar-Yam (2020) say that models can help discover methods to mitigate the virus' spread. However, they caution that,

> It is important to distinguish between what models can and cannot predict. All models' assumptions fail to describe the details of most real-world systems. However, these systems may possess large-scale behaviors that do not depend on all these details. A simple model that correctly captures these large-scale behaviors but gets some details wrong is useful; a complicated model that gets some details correct but mischaracterizes the large-scale behaviors is misleading at best (16092).

They conclude their article by saying that using models to forecast elements of the pandemic illustrates the "difference between academically relevant research and policy-relevant analysis" (16095).

They say that "The former can tolerate assumptions and models that are exploratory in nature, increasing our knowledge of the wide range of conditions that might happen at some time in the future or some location—or even in an alternative reality—thereby increasing the scope of our understanding. The latter must focus on validated assumptions and real-world risk, including uncertainty in both our data and our understanding" (16095).

Sterman (2002) speaks particularly bluntly, saying, "All decisions are based on models … and all models are wrong" (525). He explains that these two statements are the most difficult to grasp because they are profoundly counterintuitive. However, failure to accept them is to surrender to what philosophers call naive realism; they believe that it is true because they think a thing is true. He argues that "human perception and knowledge are limited, that we operate from the basis of mental models, that we can never place our mental models on a solid foundation of Truth because a model is a simplification, an abstraction, a selection, because our models are inevitably incomplete, incorrect—wrong" (525).

He expresses the difficulty in recognizing the limitations of our beliefs and asks, "how are we to make decisions if all models are wrong?" (525). He advocates striving to develop enhanced critical thinking skills and confidently and continually challenge our mental models and uncover our biases. He discusses the difficulty of walking a fine line between acknowledging the limits of our understanding and not allowing our humility to prevent us from acting decisively (525).

Makridakis (1981) explains that the evidence indicates that forecasting can be reasonably accurate when continuations of set patterns or associations are concerned. However, when systemic changes occur, forecasting accuracy is dramatically less precise. Furthermore, the probability of such changes occurring is seldom known beforehand. In addition, as the forecasting distance increases, the probability that systematic changes will occur in these patterns or associations also increases, creating even more significant forecasting errors (11). He summarizes by saying, "To be specific, forecasting the continuation of an existing trend is easy; however, predicting changes in trends ... is almost impossible" (11). By way of example, he adds, "the prediction of continuations of growth in economic variables can be achieved without difficulty, while the prediction of recessions is inaccurate" (11).

Makridakis concludes that we must accept the following:

> (a) forecasting cannot be accurate when systematic changes from established patterns are involved; (b) explanatory or causal models cannot answer adequately 'if then' type question where systematic changes from established relationships are concerned; (c) it is extremely difficult or impossible to predict systematic changes from established patterns or relationships by quantitative models because these changes are not, by definition, recurrent; (d) whether people accept it or not, their judgment exhibits serious biases which are particularly pertinent in the type of tasks required by forecasting, planning and strategy; (e) forecasting includes monitoring, understanding and adjustments which are tasks equally critical for extrapolative forecasting: (f) planning and strategy must explicitly recognize the separation between continuations of established patterns or relationships and systematic changes, and the need to formalize the decision—making process involved in doing so (20).

Atkinson (2004) presents two views of economics: one based on Newton’s theory of science and the other more like Darwin’s. The Newtonian view sees economics as static: as individuals exercise their natural right to pursue their interests unburdened by disturbing elements, they would be promoting the good of society and their welfare. Consequently, this state of natural harmony may be disturbed only by external forces but restoring the balance should happen quickly. The Darwinian view sees economics as evolving and shaped by human institutions rather than the humans outside of the institutions. This article presents a unique and vital view not found in more current publications.

Dantas (2015) presents another view of economics and all the social sciences based primarily on Hayek's postulate about the complexity of social phenomena. Hayek's premise revolves around the notion that social scientists in general and economists, in particular, cannot study this sort of complexity under laboratory conditions. They cannot explore events in a way that allows them to "repeat, manipulate and decompose" those events. This failure makes it impossible for these social scientists to make precise predictions like those in the natural sciences that can use a laboratory setting (2).

Okes (2003) explains that the anachronistic idea that organizations, including government organizations, are more like machines than living organisms not tenable. He says that in complex adaptive systems, cause and effect are nonlinear, bidirectional, and self-organizing. He claims that because of this, "Maximum performance of the system is achieved when it operates at the edge of chaos" (35).

Foster (2005) explains that recent work in complex systems creates fundamental problems for economists since virtually all economic systems are complex. He says that economic systems have four basic properties:

- They are dissipative structures that transform energy for the good of the system.
- It is both a whole and a part of greater wholes.
- It exhibits some degree of irreversibility.
- It can only be understood through a study of the "explicit historical time dimension" (875).

Conventional economic theory makes assumptions about the system that are not warranted. Most conventional theorists assume that they have a well-ordered state or are at least capable of achieving one. Since these structures can evolve, they necessarily involve an intermingling of order and disorder. He concludes by saying, "The behaviour of complex adaptive systems cannot be captured by constrained optimisation models. This is a fundamental departure from the presumptions inherent in conventional economics. Such systems have to be analysed 'in' time, and this limits the way that mathematics can be used" (889).

As we have become more sophisticated, our models have become more complex, and we have developed mathematics to support them, but they are still constrained. Hritonenko and Yatsenko (2013) explain that mathematical models or models of any kind are not copies of the world as it is; no, they are always simplifications of the world as it is, that can help us learn by discovering essential features of the part of the actual world we are studying.

> In theoretical research or decision-making practice, people use models because they do not possess an absolute knowledge of reality" (2). Models always begin as mental

> models. Research can improve and provide justification for these mental models. Mathematical models are derived from these mental models and therefore are limited in their ability to inform by the mental model that underlies them. “However, they allow for finding new insights that are impossible to obtain by other scientific methods (Hritonenko and Yatsenko 2013, 2).

Forrester (1971) explains that planning failure frequently results from the problem space existing as a self-regulating system (6-8). Such systems can change to correct for the influence of outside events and interventions. Adam Smith’s ‘invisible hand’ is an example of this kind of self-regulation (Smith 1776, 312-313). Koppl (2018) refers to it as spontaneous order (10). Makridakis and Taleb (2009) explain that the ability to forecast “fails when complex systems are involved. Moreover, such a failure becomes more pronounced in complex social systems where the actions and reactions of people can and do affect future outcomes” (843). Batistsky and Domotor (2007) approach it more theoretically, saying that “stochastic models of chaotic systems, while predictively [sic] successful in some cases, are in general predictively as limited as deterministic ones” (79). Orrell and McSharry (2009) explain that it is impossible to model complex systems using the kinds of direct mathematical laws used in fields like physics. Equations in complex systems merely represent simplifications of reality. They are too easily affected by outside forces and minor changes in the values of the input variables (738).

Gooyert and Größlerb (2018) indicate that distinguishing between applied and theoretical system dynamics (SD) modeling and other forms of mathematical models can be helpful because they each have their own research design decisions and different quality criteria. It is appropriate to view applied SD as a response to the problem-owner who wishes to alter the current situation. In this case, it is often necessary to follow all the steps of textbook SD to collect empirical data on a specific situation and expand the system boundaries until considering all the hypothetical variables that impact the system's behavior have. On the other hand, theoretical SD models are often more oriented towards a small incremental step in a larger research agenda. It is often challenging to develop a convincing theoretical contribution to the current scientific debate by mixing too many aspects in a fundamental modeling study. Therefore, theoretical SD studies do not necessarily adhere to textbook paradigms, may not always collect empirical data, and may have restrictive system boundaries that exclude some variables. Deciding which to use depends upon the intended outcome of the project and the effectiveness of SD in achieving that outcome. They point out that there are some overlaps whereby applied models can have theoretical implications and vice versa. By pointing out how these two types of studies differ, they hope to clarify the distinction and provide a framework for evaluating each type of study and related publications.

Dodder and Dare (2000) report on the work of the Santa Fe Institute in 1987. They explain that real-life economic systems had complex features that current approaches tended to “assume away” (7). They say that the economists involved in the study recognized, for the first time, that there was an essential difference between individual actors and the “aggregated economic system that emerges from their interactions” and that these “interactions of these heterogeneous agents lead them to self-organize into network-based structures that may never settle into equilibrium (7). That lack of equilibrium means that the initial conditions are constantly changing, and therefore the system is chaotic.

Kirman (2016) claims that the quest for economic equilibrium is a quixotic adventure. It is quixotic because it is chaotic. The complex interactions between the various actors in the economy are constantly evolving. Individuals change their minds, firms change their product lines, and marketing strategies and institutions change their objectives and operating procedures. As these interactions change, disrupting any existing equilibrium, they create a new stage forcing the actors to accept changing roles (546). In his conclusion, he says that markets and the economy are susceptible to unpredictable shifts in direction that may or may not result from underlying fundamental changes (565). He does not say so, but this is analogous to acknowledging that predicting precisely when and where a tornado may spawn is impossible and for much the same reasons.

Pascale, Millemann, and Gioja (2000) explain that as the understanding of complexity theory has increased, recognition grows that organizations are living systems. They explain that organizations have the same characteristics as any other living species, including creating, propagating, and cooperating to achieve dominance in their environment. For example, species that reproduce more rapidly than their competitors in nature gain a numerical advantage. Organizations, like species, learn from their environment and change to meet it through the efforts of their employees. This adaptation creates innovation which results in increased market share.

The authors use case studies to draw parallels between nature and business to demonstrate the similarities between organizations and living systems and point out the advantages of this way of thinking. One of their examples is that of Cemex, the world's third-largest cement company. Cemex cement truck drivers leave with their loads of cement with no preordained destinations, much like ants scavenging for food, and like ants they have simple goals, delivering as much cement as possible and avoiding duplicating the efforts of other trucks. Using this emulation of living organisms, the company can promise to deliver cement where and when customers want it on two hours' notice. As a result, Cemex has bested the competition in several major markets (185-6).

The Accuracy of Experts Using Models

Models may be mental or, more formally, mathematical, but both are subject to error. A striking example of a failed mental model is the previously discussed, United States dietary guidelines. Teicholz (2015) reports that according to an investigation by The British Medical

Journal, the expert report underpinning the next set of US Dietary Guidelines for Americans fails to incorporate relevant scientific research into its reviews of critical topics, which leads to wrong conclusions. These omissions in the report suggest that the committee creating the report is unwilling to consider any evidence that contradicts the recommendations made in the last thirty-five years based on the original flawed mental model. As it has a significant impact on the diet of Americans and that of most Western nations, the expert advice underpinning the US government's dietary guidelines should consider all relevant scientific evidence, and it does not.

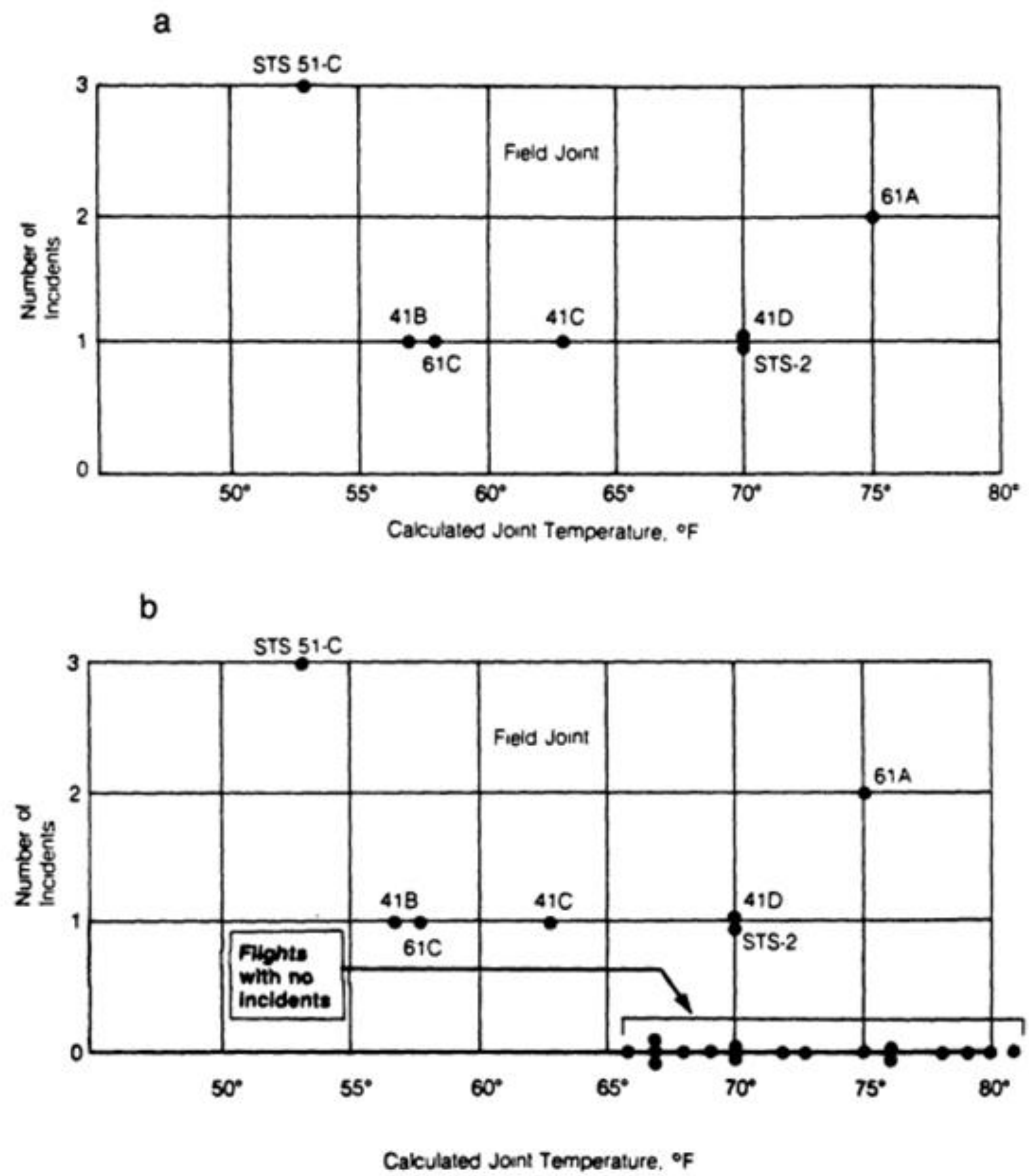
Experts, like everyone, tend to place too much confidence in their models. In comparing expert predictions with novices, McBride Fidler and Burgman (2012) found that the experts, while more often correct, dramatically overstated their confidence in their predictions.

Bang and Frith (2017) make a convincing case that the isolated decision-makers, such as those found in government agencies, suffer from this overconfidence, and rarely make decisions as efficiently and effectively as groups, such as those found in a free market. By way of example, they point out that in the Wason selection task, a well-known logic problem where researchers found that only 10 to 20% of individuals provided the correct response. In comparison, this figure climbed to around 70% in groups. This evidence bolsters the conclusion that free markets always perform better than planned markets since many people are involved.

Every motivated action is a prediction. This is true of all life capable of action. When an organism acts, in doing so, it is predicting the outcome of that action. Lower life forms make these predictions by instinct, while humans make them by reason. Humans believe that reason will consistently outperform instinct, but evidence indicates that this might not be so. Tetlock (2005) describes a Yale University experiment comparing a group of students' ability to predict with that of a Norwegian rat. The study involves a T-shaped maze with food placed at one end of the T's crossbar. The researchers randomly placed the food on one side or the other, but their process guaranteed that, on average, one side would have the food sixty percent of the time and the other only forty. The rat did not take long to head for the sixty percent side almost every time and therefore succeeded in finding food sixty percent of the time. Rather than using a statistical method, which is essentially what the rat did, the students tried to find patterns that would allow them to predict where the food was, which resulted in their predicting the correct side only fifty-two percent of the time, slightly better than flipping a coin. Tetlock explains this, saying, "Human performance suffers because we are, deep down, deterministic thinkers with an aversion to probabilistic strategies that accept the inevitability of error. We insist on looking for order in random sequences" (39-40).

This sort of thinking is not limited to funny stories about Yalies and rats; it can have much more severe ramifications. Consider the case of the Space Shuttle Challenger; everyone by now knows that failed O-rings caused the disaster during a much colder than typical launch. However, Dalal, Fowlkes, and Hoadley (1989) present a more comprehensive view. Figure 7, graph a, shows the data the NASA administration was looking at; it includes every case of a previous O-ring problem. It does not appear from this data that O-ring failure is well correlated with temperature. Like the Yalies in the previous example, the NASA administration thought deterministically, looking for a pattern and seeing none, they drew a fatal conclusion.

On the other hand, Figure 7 (946), graph b, tells a different story. It includes the data from all flights, not just those with O-ring failures, and it is clear that temperatures below sixty-five degrees Fahrenheit have a far greater probability of failure than those above. If we were to design a T-maze like the one above and put food in the above sixty-five-degree side eighty-four percent of the time and in the below sixty-five-degree side one hundred percent of the time, the rat would have chosen 'do not launch' (946).



Joint Temperature Versus Number of O-Rings Having Some Thermal Distress Identified by Flight Number. Panel b includes flights with no incidents.

Figure 7

Athletes and musicians know that part of the purpose of training and practice is to make performance intuitive. If one must think about what to do, performance will be inefficient. Part of the training is to develop an instinct, like the aforementioned rat. Most people have heard the advice about taking multiple-choice tests; "if you do not know the answer, go with your gut, do not think about it". On the other hand, sometimes, this sort of thinking can lead us astray. For example, teen drivers are, in part, more prone to accidents because their limited experience leads them to conclude that performing a risky action a dozen times with no ill effects means that the risky action is safe.

The lesson of all this is that people are not particularly good at predicting the future. NASA got it wrong, and they ARE rocket scientists. Interestingly, rocket scientists may be less prepared in some respects than is the average person. The rocket scientist training leads them to use mathematical models to make predictions. If they had performed a linear regression on the data in Figure 7, graph a, the resulting mathematical model would have shown a risk at thirty-one degrees lower than at fifty degrees, and it would have resulted in a coefficient correlation of .1, an indication that O-ring failure was not a function of temperature. The mathematics correctly found an equation, F(failure) = 3.8 - .0343T(temperature), but that equation relied on an inappropriate data set and provided an insufficient warning.

Current climate models are a good illustration. Anyone who claims to know what the world temperature will be like at the end of this century is wrong. Green, Armstrong, and Soon (2009) explain some of the many problems with current climate models. They explain that as they examined ice-core data going back eight hundred thousand years, they found the changes observed in the past century are part of a typical pattern. Their model has proven to be as accurate in predicting past behavior as the Intergovernmental Panel on Climate Change models. However, going forward, their model predicts a future that does not include catastrophic climate change but will probably continue to follow the historical patterns revealed in the ice-core record. This century, the climate is unlikely to experience unusual climate change (831).

Choosing who is right and wrong is impossible, but equally valid models producing opposite answers is the salient point.

Blaufus, Bob, Lorenz, and Trink's (2017) study reveals that experts fail to succeed in financial matters. An investigation of German tax professionals working for either taxpayers or the government revealed that laypeople were better at predicting how courts would rule on tax issues than experts. According to the same study, the experts experienced significantly more overconfidence in their predictions than laypeople.

Dror, Kukucka, Kassin, and Zapf (2018) make several important points, including that it is critical not to confuse expert consensus and confidence with accuracy. They use several examples of expert failure from forensic science. For example, they explain that DNA experts often reach different conclusions from the same data, yet each of the different experts expresses strong confidence in their findings. They also explain that the same expert often comes to different conclusions using the same data but at two separate times.

Weather is an example of a system governed by non-linear dynamic interactions. It was one of the first to be discovered and possibly the best example. Lorenz (1963) demonstrated that the solutions under the influence of a 'strange attractor' are unstable. This instability tells us that if one examines two points in the system arbitrarily close together, the two solutions calculated at these points may be nearly identical for some time but then will begin to diverge in a manner that creates two vastly different results. The length of time required for this to occur depends upon the initial proximity of the two initial states. These circumstances define a state of chaos in which complex systems become independent of their initial conditions. In this state, they are continuously unstable and can easily be altered by what one might otherwise think of as insignificant events. Systems in this state are utterly unpredictable over more extended periods no matter how well the system is understood because it is sensitive to the initial conditions of which the system has become independent. No matter how well one measures the initial conditions, the system itself will create a new set of initial conditions after a time. Lorenz (1972) follows up on this, saying that it does not appear to be possible “Regardless of what any theoretical study may imply” to provide, “conclusive proof that good day-to-day forecasts can be made at a range of two weeks or more” (2). The title of this presentation before the American Association for the Advancement of Science is the now famous quote, “Predictability: Does the Flap of a Butterfly’s Wings in Brazil Set Off a Tornado in Texas?” Put simply; weather forecasts are about as good as they are ever going to get.

All these complex systems, like the weather, are such that the best we can do is to essentially extrapolate past patterns into the future, hoping there will be continuity, at least in the short run. Makridakis, Hogarth, and Gaba (2010) tell us that while the future may resemble the past, the future will not be the same as the past (84). They conclude in their study that expert forecasters did not demonstrate superior ability to make successful predictions compared to "knowledgeable individuals" (795). Likewise, McBride Fidler and Burgman (2012) conclude that "expert status is a poor guide to good performance" (789).

The Accuracy of Experts Using Models in Economic Forecasting

Hofman, Sharma, and Watts (2017) discuss the predictability of human behavior. They find that it is possible to make trivial statistical predictions if one states the limits of their accuracy. The authors explain that non-trivial but far less accurate forecasts such as those involving stock market movements or presidential elections can be somewhat accurate a week or so in advance but are more like gambling than calculating the earth’s position in orbit. Finally, they address black swans, rare, unpredictable events with far-reaching results. Since predicting these events is impossible, they can create tidal change in every area of human endeavor. Models can help us understand phenomenon but are not effective at forecasting. They close by saying, "Properly understood, in other words, prediction and explanation should be viewed as complements, not substitutes, in the pursuit of social scientific knowledge" (488).

According to Koppl, Kauffman, Felin, and Longo (2015), economic evolution is unstable and therefore does not have any entailing laws that govern its dynamics. As a result, economic dynamics are not causal, and the economy is a creative phenomenon. Economic dynamics are creative, and as such, the implicit framework of analysis for the economic landscape changes in ways that cannot be predicted using algorithmic methods or based upon fixed rules. An econosphere characterized by start-ups, politics, and social entrepreneurship solves the frame problem. The course of economic evolution is not predictable, and the number of traded things, for which they use the term "cambiodiversity," increases as time progresses. The metatheoretical framework described by this paper describes how all the diverse actors interact to achieve what they refer to as 'novelty intermediation.' To illustrate innovation intermediation, they offer examples from the Renaissance in Italy to Silicon Valley. The authors provide no automatic policy prescriptions because of the framework's main negative result. However, it may lead toward a new economic system that is more appropriate for a creative society.

Tacchella, Mazzilli, and Pietronero (2018) argue that the economic modeling of gross domestic product requires a fundamental rethinking that is more scientific and less dogmatic. Many make attempts to achieve this through economic complexity. They explain how low-dimensional representations can effectively forecast growth and affect our general thinking about the driving forces of economic growth and the characteristics of economic development. According to them, economic complexity is a universal phenomenon that implies a more solid and more profound correlation between economic complexity and macroeconomics. Finally, they argue that there is considerable room for improvement regarding integrating economic complexity and dynamical systems into conventional macroeconomics. In their opinion, it may be possible to improve the accuracy and the understanding of economic growth and development.

Taleb (202) explains the difference between binary forecasts, that an event will either happen or not happen, or if a metric will go up or down in each time frame, and the real-world payoff, benefit, or harm, caused by the event. He says that using one as a proxy for the other occurs too frequently, particularly in economic circles. Thus, this use of one to indicate the other is unwarranted and unsound. He concludes by saying, “If a mistake doesn’t cost you anything – or helps you survive or improve your outcomes– it is clearly not a mistake. And if it costs you something and has been present in society for a long time, consider that there may be hidden evolutionary advantages to these types of mistakes –of the following sort: mistaking a bear for a stone is worse than mistaking a stone for a bear” (1239).

A national economy is a non-linear dynamic system of the same type as the weather and is equally impossible to forecast beyond the short term. Fair (2011) puts it this way, “The results thus suggest that the degree of uncertainty of any particular forecast of the macroeconomy that one can never eliminate is large. Any forecast is based implicitly or explicitly on assumptions about asset price changes, which one has no ability to forecast” (107). This is reinforced by Kuttner (1999) who says, “In recent decades, economists at both ends of the spectrum, as well as those in the middle, have had one thing in common: Most have been profoundly wrong about the economy” (23).

Makridakis and Taleb (2009) explain that based upon a massive body of research, we can conclude that reality teaches us that accurate forecasting is not possible. Furthermore, we cannot assess the level of uncertainty and that empirical evidence covering decades shows “the disastrous consequences of inaccurate forecasts in areas ranging from the economy and business to floods and medicine" (716).

By way of support for this contention, we examine the Federal Reserve of the United States (the Fed) attempts to forecast economic conditions in the United States. Edge, Kiley, and LaForte (2010) performed a systematic analysis of the performance of the Fed staff and other forecasters and found that none of them were in close agreement and none of them produced results accurate enough to facilitate making economic policy even as far in advance as within the current month (745-747). Frendreis and Tatalovich (2000) compared the economic forecasts of the Administration's Office of Management and Budget (OMB), the Congressional Budget Office (CBO), and the Fed from 1979 to 1997 for GDP growth, inflation, and unemployment and found that the mean absolute error of one group's predictions was often more than double, occasionally approaching triple, one of the other group's (627). In addition, the mean absolute error for GDP Growth varied from 1.89 to .78 during a period when real GDP growth typically varied between -2 and positive 4 percent. An error of almost two in a range of six is large enough to render it useless as a policy-making tool (627). The fact that the three groups often could not even agree on the basics exacerbates this error, for example, the CBO making an optimistic forecast while the Fed was making a pessimistic forecast (627).

Jansen and Kishan (1996) studied the accuracy, reliability, and efficiency of Fed's forecasting and concluded that "Over the entire sample period, the Fed's forecasts of current quarter unemployment, current quarter output growth, and the one-quarter-ahead unemployment rate are biased. This bias means that the Fed made systematic forecasting errors" (107).

Joutz and Stekler (2000) also studied the accuracy of the Fed's forecasts and reached similar conclusions. Their data show that even within the current quarter, the forecasts are consistently not reliable enough to guide creating sound economic policy. Forecasts three and four quarters out are beyond worthless. Even one quarter ahead, the general direction of GDP was not being forecast with sufficient accuracy to be of use (36).

Tulip reports that while the FOMC's approach has improved for short horizons, long-horizon errors have increased. He says that the more basic difficulty is that a previously relied upon, a predictable portion of economic variations no longer exists (1229).

Gaeto and Mazumder conclude that the FED chairs forecasting accuracy has steadily declined since 1997. They say explicitly that," This demonstrates that Fed chairs have gotten worse with their public predictions about growth, inflation, and unemployment over this period (1997-2015), less specific with their forecasts, or indeed both at the same time" (982).

The Accuracy of Experts Using Models Worsened by Asset Bubbles

Bubbles can further show government failure to forecast well enough to act helpfully. These bubbles or boom and bust cycles are a frequent cause of tough economic times. Speculative frenzy, failed government monetary policies, or both typically cause these challenging times. The majority opinion seems to be that the cause of these challenging times is speculative frenzy but often exacerbated by failed government monetary policy. These bubbles result from the desire to get rich quickly, rent-seeking, and are of no benefit to the economy. Real economic growth requires real growth in value and takes time because real value does not change rapidly. Quinn and Turner (2020) explain that. "Bubbles can encourage overinvestment, overemployment [sic] and overbuilding, which ends up being inefficient for both businesses and society." They go on to add that, "The most severe economic effects usually occur when the bursting of a bubble reduces the value of collateral backing bank loans. This value reduction, coupled with the inability of bubble investors to repay loans, can result in a banking crisis (2).

The past four hundred years have seen dozens of asset bubbles. The first well-documented one was the Tulipmania Bubble, a speculative bubble in tulip bulbs taking place in the Netherlands from 1634 to 1637. After importation, the tulip's novelty, beauty, and scarcity suddenly caused tulips to become very desirable. Tulips can be planted and produce more bulbs and seeds over several years, which led many to think of tulips as a sound economic investment (Chang et al., 2016, 498). As tulip prices rose, speculators began buying bulbs for the sole purpose of reselling them a short while later at a significant profit, that is, "flipping" them (Mackay 2013, 1586-1751). A market in futures contracts developed because it takes time for bulbs to beget more bulbs. A default on one of these contracts was the proximate cause of the bubble bursting and led the tulip bulb market to dramatically crash as buyers left the market and sellers were desperate. As a result, contracts stopped being honored, destroying confidence in the tulip bulb market. The government attempted to help assuage the tulip market meltdown by honoring contracts at ten percent of their face value, which caused the market to plunge even further. The catastrophic popping of the tulip bulb bubble brought an end to the Dutch Golden Age and began an economic depression that lasted for several years (Hayes 2019).

The next example, the South Sea Bubble, occurred in the early 18th century and revolved around the shares of the South Sea Company, a British international trading company. The company obtained a monopoly in trade pursuant to a treaty made following the War of the Spanish Succession. Anticipating extensive profits from trade with the gold and silver-rich South American colonies led speculators to bid the South Sea Company's shares to levels far beyond actual value (Mackay 2013, 1786-1941). It was not long before virtually all segments of society were engaged in rampant stock speculation. The stock price was £128 in January of 1720 (Carswell, 1960). It rapidly rose to £1000 per share by August 1720 (Kleer 2015, 276). The South Sea Bubble finally burst, and stock prices completely collapsed to £150 per share in

September 1720 (Carswell, 1960). The behavior of South Sea stock was typical of most bubbles, with a rapid rise and an even faster decline (Temin and Voth 2004, 1658).

Frehen, Goetzmann, and Rouwenhorst (2013) describe the result this way, “The crash in the equity markets in 1720 was a significant setback for financing of enterprise. The success of the public insurance corporation depended on the external demand for shares and the availability of public investment capital. These dried up with the global contraction of securities markets following the crash in Great Britain” (596).

The next bubble occurred contemporaneously with the South Sea Bubble and was called the Mississippi Bubble in France. It began with the French government bordering on insolvency primarily due to debts incurred during the War of Spanish Succession. The French government defaulted on segments of its debt, cut interest payments, and raised taxes which had the effect of severely depressing the French economy and induced wild fluctuations in the value of its gold and silver-backed currency.

John Law (1705) had published an academic tract, *Money and Trade Considered*, in which he presented theories advocating the forerunner of the central bank, saying, "Sovereign authority … is necessary to save men from doing themselves mischief" (Pollard 1953, 623). He argued against using gold or silver to back currency and suggested instead using paper money or fiat currency. He theorized that this would stimulate commerce (Garber 1990, 41). When the French government sought his advice, he saw this as an opportunity to test his monetary theory. The resulting bubble "was inherently political, engineered by John Law in an unsuccessful attempt to reduce the French government's debt burden” (Quinn and Turner 2020, 9). Law was permitted in 1716 to create a national bank, the Banque Générale. The Banque Générale built up its reserves by issuing stock and earning profit by handling the French government's finances (Garber 190, 41).

Law purchased the Mississippi Company in 1717 and received a trade monopoly to develop France's North American colonies all along the Mississippi River. In July 1719, the Company purchased the right to mint new coinage. In August, it bought the right to collect all French indirect taxes, and in October, it took over the collection of direct taxes. "Finally, a plan was launched to restructure most of the national debt, whereby the remainder of existing government debt would be exchanged for Compagnie [Company] shares" (Garber 190, 43). Law had amassed an incredible amount of power through this cronyism as his companies now controlled both France's foreign trade and its finances.

From January to December of 1719, the Company's public shares went from five hundred livres per share to 10,000 livres per share. As with the South Sea Bubble, people of all social classes speculated in Compagnie des Indes shares. In January 1720, company shares began to fall as astute investors realized that earnings could not provide the promised dividends and began to take their profits in gold coins. Law tried to curb the sell-off by printing more money and limiting payments in gold to one hundred livres (Vogel 2010, 31). Nevertheless, Law's devaluations and the sell-off caused Company shares to collapse from 10,000 livres to 1,000 livres by December 1720 (Vogel 2010, 31). Share prices continued to fall, reaching five hundred livres in 1721 (Moen, 2001). The collapse Mississippi Bubble at about the same time that Britain's South Sea Bubble burst plunged France and much of Europe into an economic depression so severe that it created the conditions that eventually led to the French Revolution fifty years later (Moen, 2001).

This scenario repeats repeatedly over the next four hundred years. A sample of the lengthy list includes The British Railway Mania Bubble 1844-1846, America's Stock Market Bubble 1929, Kuwait's Souk al-Manakh Stock Bubble, America's Stock Market Bubble 1987, Japan's Bubble Economy 1980s, the Dot.com Bubble, and the American housing bubble in 2007-2008.

Economic bubbles "command enormous attention, yet there is little consensus about their causes and identification of the main characteristics" that might allow intervention to dampen their growth or results (Girdzijauskas et al., 2009, 268). Quinn and Turner (2020) use the analogy of a fire triangle to explain what causes bubbles to 'burn'. They label the three sides of the bubble triangle as marketability, money and credit, and speculation.

Vijayan (2008) discusses the 2008 bubble-busting saying that while greed and lack of appropriate regulatory oversight get much of the blame for meltdown, there was also an information technology failure. Further, he asserts that an overreliance on models that failed to predict the risks associated with the recently introduced financial investments was also a significant factor (8).

Rodrigue (2020) has presented the most widely distributed investigation of bubbles or boom and bust cycles. He points out that bubbles often begin due to innovation of some sort, usually technological or financial. He identifies four phases in the Boom-and-bust cycle: stealth, awareness, mania, and blow-off (Chapter 3).

In the stealth phase, the 'smart money' recognizes a developing opportunity that entails some risk in an unproven venture, but that holds promise for substantial appreciation in the future. Although these investors are not planning to 'make a killing' and sell out, their analysis indicates that excellent returns are possible in the long term and are investing on that basis (chapter 3).

In the awareness phase, other investors notice the indications that the smart money had seen earlier, and institutional investors start putting in more money driving the price higher (2020, chapter 3).

One characterization of the mania phase is the media touting the asset and the speculators and members of the public beginning to buy. These folks are looking for what Rodrigue (2020) calls “the opportunity of a lifetime” (chapter 3). However, these new buyers are not ‘investors,’ as they generally ignore the fundamental value and merely base their enthusiasm on the increase in the assets price. Put plainer, this phase has nothing to do with logical investing and everything to do with rent-seeking, causing the price of the asset to rise to levels utterly unsupported by the fundamentals.

In the blow-off phase, it all comes tumbling down (Rodrigue 2020). This phase sees the price fall far faster than its movement on the way up (chapter 3).

It is common to hunt about for economic reasons for these bubbles, but the reasons are not economic; they result from rent-seeking. It may be that central banks exacerbate the problem by loosening or failing to tighten credit, but these central banks are incapable of forecasting trends with sufficient accuracy to make this possible (Cardell 2021). This behavior constitutes a notable exception to Adam Smith’s (1776) dictum that persons in the market operate in an informed way they always act in their genuine best interest. Chang et al. (2016) show that “when hype and speculative investment surrounds a company or market sector, the findings in this chapter suggest that investors may be willing to reduce due diligence and take unmeasured risks in sectors with which they lack experience” (505). Hageback (2017) says Jung gave new insight into how humanity makes decisions by introducing archetypes. Scientists have confirmed that a sizable portion of information gathering, and decision-making is unconscious. A Jungian archetypal activation intends to maintain the psychological equilibrium of an individual, which might lead to irrational paths for the population. Hageback explains that viewing seemingly irrational behavior from a holistic viewpoint as a function of law-bound logic that repeatedly and predictably recurs throughout history is indicated. He proposes the use of big data and the indepth analysis of symbols as representations of archetypes to produce time series that replicate this unconscious thinking and assist in determining whether archetypes play a significant role in the formation of financial bubbles.

The Accuracy of Experts Using Models Worsened by Black Swans

Burdekin (2020) analyzes the economic and financial effects of the 1918-1919 Spanish Flu pandemic. Figure 8 below shows the extent of the pandemic (Census Bureau 1918 and 1919).

US Monthly Deaths Attributed to Spanish Flu, 1918-1919.

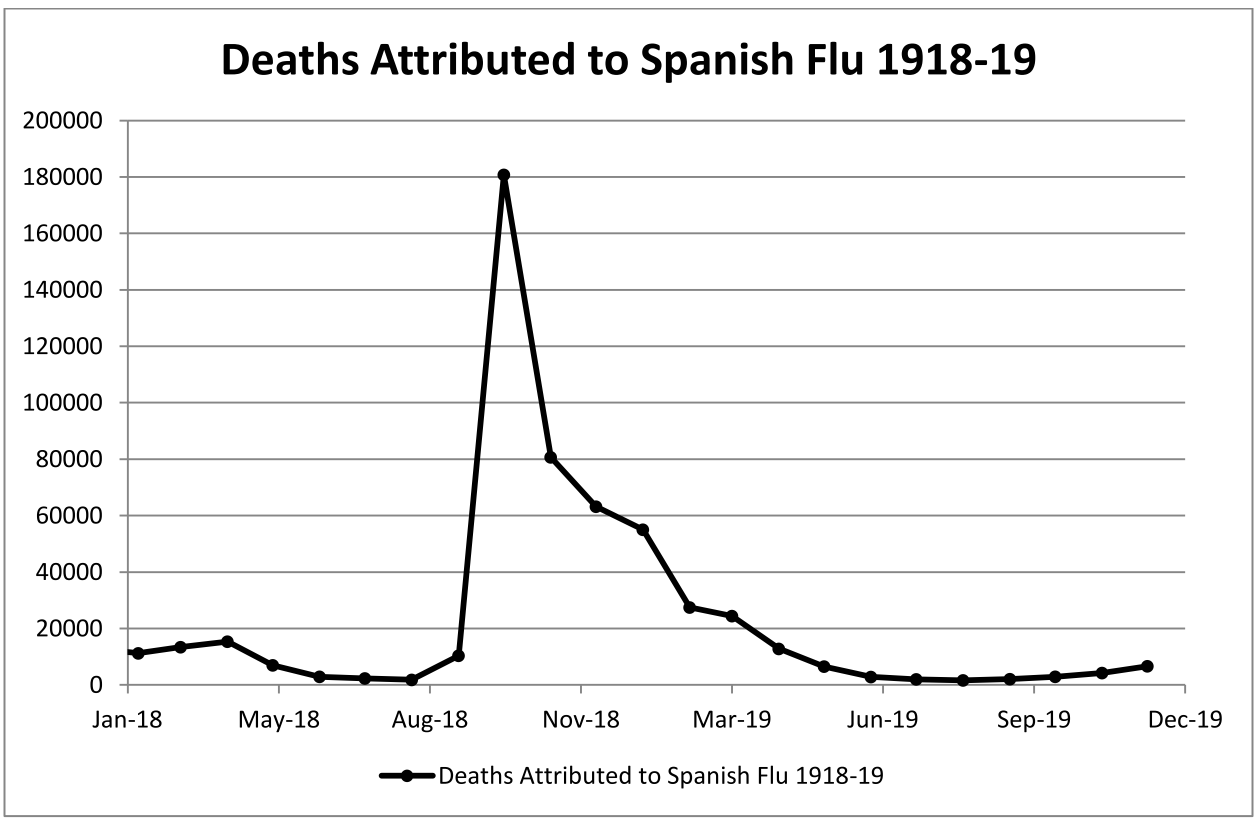


Figure 8

Figure 9, below, shows some of the economic effects. Note the ‘ragged’ shape of graph of the M1 money supply in the center area at the peak of the pandemic as well as the erratic behavior in the consumer price index at the same time. Much like events in the 2020-2021 Corvid 19 pandemic, there were worldwide supply chain disruptions that magnified the economic effect. He concludes that “Combining US data with nine European countries for which both monthly death and stock market data are available for 1918-1919; the empirical results show the deaths variable to be statistically significant with the expected negative sign” (3).

Correia, Luck, and Verner (2020) explain that the non-pharmaceutical interventions (NPI) were milder than those imposed by some countries in Europe during the COVID-19 pandemic and that these milder NPIs did not seem to exacerbate the economic problems. However, they say that more severe measures, including business closures, increase the economic cost of NPIs (16).

US Monthly M1 Money Supply vs. Consumer Price Index, 1915-1921.

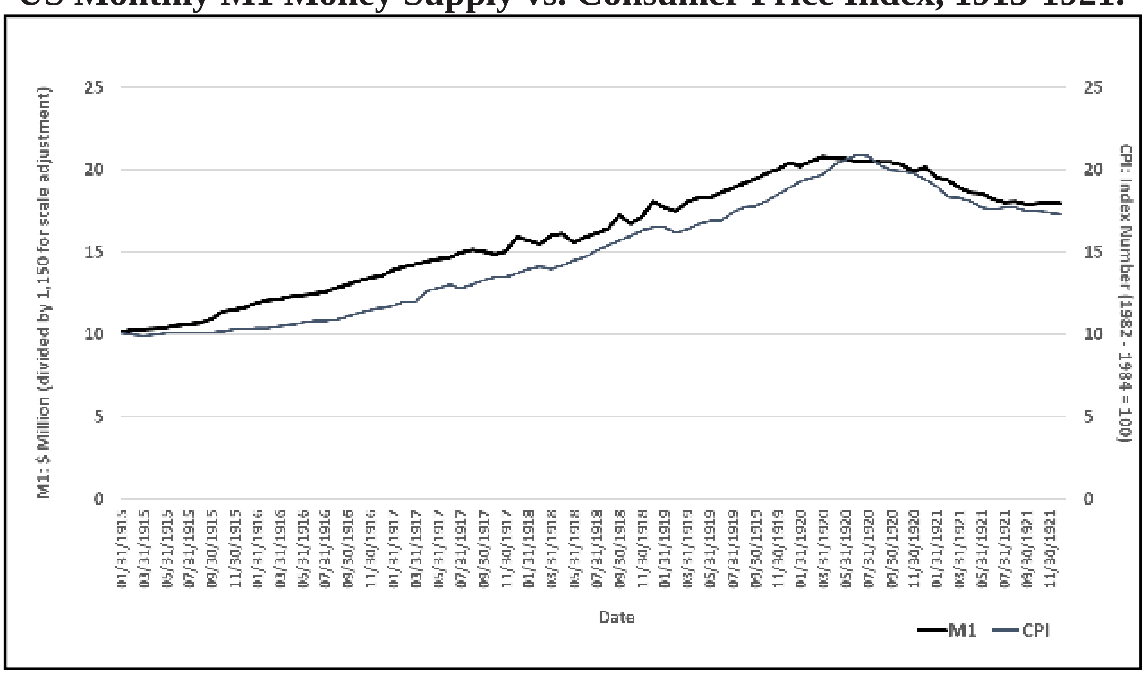


Figure 9

Barro, Ursúa, and Weng indicate that the evidence thus far does not indicate that the COVID-19 pandemic will have a more significant effect than the Spanish Flu pandemic. They say that “In effect, countries have been pursuing a policy of lowering real GDP—particularly as it relates to travel and commerce—as a way of curbing the spread of the disease. There is clearly a difficult tradeoff here concerning lives versus material goods, with little ongoing discussion about how this tradeoff should be assessed and acted upon” (18). Gordon (2020) says that the COVID-19 pandemic is likely to do greater economic damage than the Spanish Flu pandemic (54).

Solutions Suggested in the Literature

It is essential to find solutions that eliminate or mitigate these bubbles as they can have devastating effects. “In extreme cases, such radical changes in financial and economic conditions may give rise to social upheaval and political instability (Thorton 2004, 24). Chang et al. (2016) conclude that “All the economic bubbles have reflected that risk management, guidelines, and analysis are essential” but usually ignored (505).

Virtually every source available that offers a solution describes methods for using monetary policy to solve the problem of bubbles instead of finding ways to address rent-seeking. For example, Schwartz (2009) explains the 2008 housing bubble this way:

> It has become a cliché to refer to the asset boom as a mania. The cliché, however, obscures why ordinary folk become avid buyers of whatever object has become the target of desire. An asset boom is propagated by an expansive monetary policy that lowers interest rates and induces borrowing beyond prudent bounds to acquire the asset. The Fed was accommodative too long from 2001 on and was slow to tighten monetary policy, delaying tightening until June 2004 and then ending the monthly 25 basis point increase in August 2006 (19).

"The Austrian economists agree. Austrian business cycle theory is based on Austrian capital theory and posits that we alter the rate of interest produced by the free market at our peril" (McDonald and Stokes 2013, 439). Aliber and Kindleberger (2015) agree that economic booms and their ultimate collapse were to some extent made possible by loose credit (340). Surowiecki (2014), speaking of the 2007 recession, says, "lots of people who were supposedly very smart took lots of very foolish risks, betting borrowed billions on dubious mortgage derivatives" (17).

Horowitz (2012) addresses boom and bust cycles both within the context of the Great Recession (GR) and in general. He says that many have alleged that the GR and such cycles, in general, result from deregulation or lack of regulation and therefore indicate fundamental faults in the capitalist system. Furthermore, he says that if these critics looked more closely, they would see that "misguided government policy" caused the GR rather than fundamental problems with the free market. These policies created the unsustainable boom that led to a crash (65). He documents the details of his assertion and concludes that the government policies created a series of micro-economic failures caused by the misallocation of resources that resulted from those policies (67). In his conclusion, he says that "it was a classic example of the undesirable unintended consequences of government intervention, both through expansionary monetary policy and misguided attempts to bolster the housing market" (68).

Taylor (2014) presents an analysis that comes to many of the same conclusions as Horowitz. First, he explains that the recession and the slow recovery have caused economic instability to more than triple. Taylor supports this by citing the increase in the standard deviation of the percentage gap between real GDP and potential GDP from one-and-one-half percent for the twenty years preceding the recession to five and one-half percent in the five years following the recession. While he does not blame government policy outright, he says that "policy should at least be on the list of possible causes of the crisis and severity of the recession" (61). Finally, he says that considering policy as the cause is justified due to changes in monetary policy, regulatory policy, and fiscal policy, "each becoming more discretionary, more interventionist, and less predictable" in the period leading up to the GR [Great Recession] (61).

Some seem to indicate the futility of government 'fixing' bubbles. "It has important implications for the way we think about policy responses to downturns. If a downturn originates in a negative productivity shock that tightens credit constraints, the government might have little to do unless it has an advantage in lending vis-à-vis the private sector. But if a downturn originates in a negative investor sentiment shock that bursts a bubble, the government might have an important role to play in coordinating expectations and taking the economy back to the bubbly equilibrium" (Carvalho, Martin, and Ventura 2012, 99-100).

“Needless to say, the conclusions should not be taken at face value when it comes to designing actual policies. This is so because the model may not provide an accurate representation of the challenges facing actual policy makers” (Gali 2014, 746).

Stockman (2013) quotes Greenspan before the Senate Finance Committee, saying, “That presupposes I know that there is a bubble … I don’t think we can know there has been a bubble until after the fact. To assume we know it currently presupposes that we have the capacity to forecast an imminent decline in [stock] prices” (358).

“Though in the long-term perspective any new market or new technology would cause another bubble to grow, there are no other ways for economy to develop just through the cyclic process” (Girdzijauskas et al. 2009, 278).

Some scholars hint at possibilities, “Because asset bubbles are a symptom of financial frictions, a policy that cures the root cause of inefficiency and instability should be proposed” (Kunieda and Shibata 2016, 83). Taleb and Martin (2012) address the ‘Great Recession’ following the busting of the housing bubble in 2007-2008. They conclude that preventing future problems revolving around firms that are too big to fail and government intervention requires ‘skin in the game.’ By this, they mean extreme accountability. They explain that Hammurabi’s code used this principle even in ancient times. They quote from it, “If a builder builds a house for a man and does not make its construction firm, and the house which he has built collapses and causes the death of the owner of the house, that builder shall be put to death” (50). They are not suggesting summary executions, but we must find ways to hold all actors accountable for their words and deeds.

Other scholars suggest other solutions; “Theoretical results and numerical exercises suggest that a small trading tax may be effective in reducing speculative trading, but it may not be very effective in reducing price volatility or the size of the bubble” (Scheinkman and Xiong 2003, 1208).

All the above proposals suggest methods, most of which have been tried and failed, failed because they approach the problem from the wrong direction. The only way to prevent a bubble is to address the root cause, which we have established is rent-seeking. It is impossible to prevent rent-seeking itself; Jeremiah 6:13 tells us that “For from the least to the greatest of them, everyone is greedy for unjust gain; and from prophet to priest, everyone deals falsely.” Since the problem is not caused by ‘legitimate’ investing, and since we will never eliminate human greed, we must find a solution that addresses rent-seeking directly. The only way to eliminate the effects of rent-seeking is to eliminate the possibility of profiting from that rent-seeking.

Conclusion of Literature Review

This literature review has found compelling evidence that Hayek was correct in his assertion that "what cannot be known cannot be planned" (Hayek 1988, 84). It has examined the previous research surrounding whether an economy, planned by experts, can result in greater economic good than can be achieved by spontaneous order created by the combination of individual choices that make up the free market? It has concluded that the self-regulating system that is the free market will always produce greater good than can any centrally planned system. This conclusion leads to the question of the government's role in economic affairs. Of course, the most critical role is to protect property rights and maintain a level playing field free of corruption and cronyism. Nevertheless, as the recent pandemic has shown, there is also a role for government to prepare for black swans, unforeseen disasters that harm the economy.

In our daily lives, most of us acknowledge the unknowable nature of the future. We buy car insurance, home insurance, life insurance, and medical insurance. In doing this, we acknowledge that it is better to be prepared for unforeseen events than to try to predict them. Public policy should follow the same course; let the free market do what it does but prepare for what might happen if and when things go wrong. Makridakis, Hogarth, and Gaba (2010) explain that from their research, "the key is not to develop precise plans based on predictions, but to have emergency plans for a variety of possibilities" (89). Government economic policy should be more like FEMA than the Federal Reserve. That is what the citizens do; government should heed their wisdom.

CHAPTER III: METHODOLOGY

The current pressure from some constituencies to transition the United States toward a centrally planned economy (CPE) makes it valuable to question whether a CPE can result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices that make up the free market. Furthermore, the repeated failures of CPEs may indicate that fundamental socio-economic principles prevent their success. For example, Hayek (1988) postulated that the forecasting necessary to a CPE is impossible; hence, effective planning is impossible (84). Therefore, this paper will ask the research question: Is it possible to forecast economic variables with sufficient accuracy to make a centrally planned economy more successful than a free market? The answer to this question is essential to the public and policymakers in determining the nation's course.

This chapter will describe the methods used to answer the research question. The pattern used in the first two chapters will be continued here, that is, there will be separate methods for each of the three domains as well as for the aggregation of the three domains. The three domains that affect economic forecasting are: the accuracy of mathematical modeling in forecasting economic trends in the presence of chaos, the prediction, and control of asset bubbles, also called boom and bust cycles, and the effect of unpredictable "black swan" events. Reliable sources in each of the three domains were presented in Chapter II, but no sources were found that addressed the combined effect of these three domains on economic forecasting. This chapter will build on the evidence presented in these three domains and then combine the results from all three to answer the research question.

Methodology of the First Domain: Chaos

In the first domain, the existing studies have already shown that forecasting the most commonly investigated economic variables is not accurate enough to guarantee sound policy decision-making. These investigations have included gross domestic product (GDP), unemployment rate, and inflation rate. For example, Frendreis and Tatalovich (2000) found in their study of GDP that the average errors ranged from eight out of sixty to nineteen out of sixty, thirteen to thirty-two percent (630).

While these studies are of some benefit in answering the research question, they are not enough since the government would control these variables in a CPE. Therefore, it became necessary to seek a new measure beyond government control and analyze that variable. The variable chosen is real personal consumption expenditures, a measure of aggregate personal consumption expenditures by all individual consumers. This variable is usually abbreviated PCE, but to eliminate confusion with the already used abbreviation, CPE, the variable will be abbreviated gRPCE. This collection includes thirty years of the Federal Reserve staff forecasts of real personal consumption expenditures (gRPCEs) and comparing the projections with the results. Finally, all that remains in this step is to report the results broken down by magnitude, direction, and total errors when the described quantitative analyses are complete.

After examining the results of the quantitative analyses of the gRPCE, the next step was to justify those results theoretically. This step will explain the results first as if the economic environment was simple and then explain them in the complex, chaotic environment that is the economic reality. The separation is necessary because most forecasting tools assume a non-complex economic environment, so it is necessary to investigate that possibility even though the evidence indicates the assumption is faulty. Chaotic environments exist when a vast number of autonomous or semi-autonomous actors are each capable of influencing the behavior of other actors in the system. The weather is a prime example of such a system. Weather is created by the interactions of air, water, and surface molecules, all affecting the behavior of other molecules, which affect the behavior of still others, in an infinite set of feedback loops. Economics is also a chaotic system. Economics today is comprised of a worldwide market of about eight billion people. Each of these eight billion has the potential to influence millions of others, and many do. As a chaotic system, one would expect accurate forecasting to be impossible. Aggregated evidence from previous studies will show that this is born out in attempts at economic forecasting.

System dynamics models were created in Vensim and provide a possible explanation for the existing inaccuracy. These models will present possible explanations for the observed chaos within the system and evaluate the possibility of finding mechanisms to mitigate the chaos. The models also illustrate how this chaotic behavior occurs and using multiple runs with slightly altered parameters will show how divergent the results can be. These models may clarify the theoretical impossibility of predicting the economy any helpful distance in advance. Just as Lorenz's (1963) first weather model was less complex than the reality, the models created of the economy will also be simple; however, even in the simple form, it will generate radically unpredictable behavior (130). The models will establish the relationship between the variations of the collective desire of humanity to improve GDP and the variations in GDP, such as standard of living, which is complex in itself since the difference between desired GDP and actual GDP produces changes in the collective desire. These changes, in turn, modify the difference between the desired state and the actual state. Of course, all this is contingent on the properties of the economic system, such as resistance to change, change propagation, and other factors that collectively become parameters in the models.

Finally, the sum of the evidence will show whether the cause of forecasting errors is inadequate methods that will improve in the future or if the environment is sufficiently chaotic to eliminate the possibility of substantially increased accuracy. These steps conclude the independent analysis of the first domain. Once the analysis of the first domain is complete, the paper will present practical solutions to any uncovered deficiencies that may involve reducing dependency on forecasting. These solutions may require decreased use of monetary policy as the primary tool and replacing it with changes in fiscal policy that allow the market greater freedom to regulate itself. That completes the independent analysis of the first domain.

Methodology of the Second Domain: Bubbles

The second domain, the study of asset value overshoot and collapse, often called "bubbles" or "boom and bust" cycles, is the study of the historical record of these events to find a typical pattern. While the historical record is rich with descriptions of many, if not all, of these asset bubbles, there appears to be only one attempt to study them as a collection, and it does not include the most recent examples (Rodrique 2020, chapter 3). However, the existing evidence suggests a typical pattern, and if matching more current examples to this pattern or a modification of this pattern proves successful, further analysis becomes possible.

The analysis of the second domain begins with a study of the history of asset price bubbles or boom and bust cycles. As in the first domain, once discovering a pattern, the next step will be to interpret the data by preparing a system dynamics model that mimics the composite behavior of the asset bubbles to present a possible theoretical reason for the existence of these bubbles. This theoretical explanation will allow an evaluation of the forecastability and moderation or prevention of these bubbles.

The history of several historical bubbles, including the first three, the Tulipmania bubble, the South Sea bubble, and the Mississippi bubble, was collected. A random selection of subsequent bubbles followed these three; the DJIA from 1928 to 1930, the S&P 500 in 1986 and 1987, the Nikkei 225 from 1987 thru 1991, the Nasdaq 100 from 1994 thru 2003, the Tesla stock bubble in 2014 and 2015, and the Bitcoin bubble in 2017 and 2018. The commonalities of these bubbles were then analyzed and compared with the results obtained by Rodrigue. Rodrigue's (2020) results show a striking similarity among these bubbles and display the same general pattern (chapter 3). This general pattern suggests that they may be slightly different manifestations of a common cause. The compared histories indicate that widespread speculation by many in the general population, not accustomed to asset investment and hoping to make a quick profit, is a primary precipitating factor. These asset bubbles have proven to be exceedingly difficult, if not impossible, to predict and control. Unfortunately, these bubbles are also the proximal cause of many of the worst economic downturns in human history, and no economic policy is complete without a plan to address them.

Constructing a system dynamics model to present a possible set of relationships that could explain the behavior of these bubbles may provide a path toward a solution. Once completed and run, if the model generates behavior that favorably compares with historical norms finding such a solution should be possible. All historical attempts to remedy these bubbles have been by adjusting monetary policy, and all have failed and often made the situation worse. This conclusion will lead to a new solution consisting of a tax designed to eliminate profits derived from short-term speculation and reward long-term investment. As with the proposed solutions in the first domain, this solution moves the policy from the monetary policy arena into the realm of fiscal policy. That will conclude the independent analysis of the second domain.

Methodology of the Third Domain: Black Swans

The analysis of the third domain begins with background information. 'Black swans' are statistically unlikely events that occur at infrequent intervals. Taleb (2007) says, "We are now subjected to the classical problem of induction: making bold claims about the unknown based on assumed properties of the known" (198). He refers to studying relatively recent events and projecting the observed behavior into a much broader arena. These assumed properties, gleaned from these limited examples of the known, he refers to are an ongoing problem in many policy areas. He uses the example of a 200-year flood. Flood records typically cover periods long enough to include 100-year floods but do not have the scope to include 200-year floods. Therefore, we cannot know of the existence of 200-year floods, or for that matter, 500-year floods or millennial floods, and we cannot predict what damage they might do. Taleb (2007) coined the phrase black swan events to refer to them (198).

Makridakis and Taleb (2009) follow up by saying that based upon a large body of evidence; the conclusion is that reality shows that accurate forecasting is impossible. Furthermore, it is not even possible to assess the level of uncertainty and that historical studies covering almost a century show "the disastrous consequences of inaccurate forecasts in areas ranging from the economy and business to floods and medicine" (716).

According to Marani, Katul, Pan, and Parolari (2021), based on historical information, estimates of the likelihood of intense epidemics are unreliable or nonexistent. They present an analysis of epidemic trends and patterns spanning four centuries. Epidemic intensity has a constant probability distribution with a slowly decaying algebraic tail, suggesting that severe epidemics are less likely as the epidemic intensity increases. This result suggests, together with recent estimates of disease emergence from animal reservoirs associated with environmental change, a high probability of observing pandemics like COVID-19 (lifetime probability of experiencing it currently at 38%), which may double in the next decade.

The third domain, black swan events (BSEs), requires a somewhat different approach than the first two domains. Taleb (2010) coined the term "black swan" to describe sporadic events that will occur. He lists three attributes of a black swan:

1. It is an unpredictable outlier.
2. It has an extreme impact.
3. Explanations made after the fact will attempt to make it appear predictable.

He lists examples including World War I, the rise of the personal computer, the spread of the internet, the collapse of the Soviet Union, the attack on Pearl Harbor, and the 9/11 terrorist attacks (15).

Since these events are, by definition, unpredictable, rather than focusing on forecasting, it is more reasonable to focus on the response. In this vein, it is reasonable to seek evidence to indicate whether a CPE or a free market economy (FME) can better respond to BSEs. Since no historical evidence allows the direct comparison of CPE and FME response to the same BSE, it will be necessary to use alternative methods. One way to do this is to examine the governments' (federal, state, and local) response to the recent COVID-19 pandemic and evaluate the success or failure of the government in mitigating the economic harm induced by that pandemic. To accomplish this, we will compare data published by the Board of Governors of the Federal Reserve System on the economic fallout generated by the governments' response to the pandemic. Evaluating this economic data in the light of medical evidence regarding the public health effects of the governments' response allows a judgment about the correctness of the governments' response. For example, a finding that the economic harm produced was minimal compared to the public health good achieved, leads to a conclusion that the governments' response was successful; however, if the economic harm produced was severe and the public health effects minimal, it would be reasonable to conclude that the governments' response was a failure. Either way, we can examine whether the response was more like a response expected from a CPE or closer to that of an FME.

Methodology of the Combined Domains

After analyzing the three domains separately, it will be possible to assemble them into a coherent whole. This combination of the three domains is essential since considering the combination is necessary to forecast an economy any helpful distance into the future. Moreover, this assemblage allows the interpretation of the whole to answer the research question: whether a CPE can result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices that make up the free market.

CHAPTER IV: DATA ANALYSIS AND RESULTS

Results in the First Domain: Chaos

Discovering Economic Chaos

While the results of the studies Federal Reserve forecasting accuracy described above are of some benefit in answering the research question, they are not enough since, in a CPE, the control of these variables would reside with the government. Therefore, it was necessary to seek a new measure beyond government control and analyze the forecasting accuracy of that variable. The variable chosen is the growth in real personal consumption expenditures quarter over quarter (gRPCE), which measures aggregate personal consumption expenditures by all individual consumers. It is derived from a broad collection of products and services purchased by individuals in the United States. The following is the official description of the data set used, "Several data sets contain the projections from the Greenbooks of the Federal Reserve Board of Governors. The Greenbook is produced before each meeting of the Federal Open Market Committee. Using an assumption about monetary policy, the Research staff at the Board of Governors prepares projections about how the economy will fare in the future. These projections are made available to the public after a lag of five years." (Federal Reserve Staff, 2020).

The graph below, Figure 10, displays the percent error in the forecast made each quarter for the same quarter one year ahead. This analysis examines thirty years of Federal Reserve forecasts of gRPCEs and compares the projections with the results.

The data collected covers the forecasts from the first quarter of 1985 through the first quarter of 2015. Subtracting the forecasts made in every quarter for that same quarter one year ahead yielded the absolute error in the prediction. Normalizing the results involved converting the absolute values into percentages. The percent error calculation is straightforward; it divides the absolute error in the forecast by the range of forecast values in the thirty years studied.

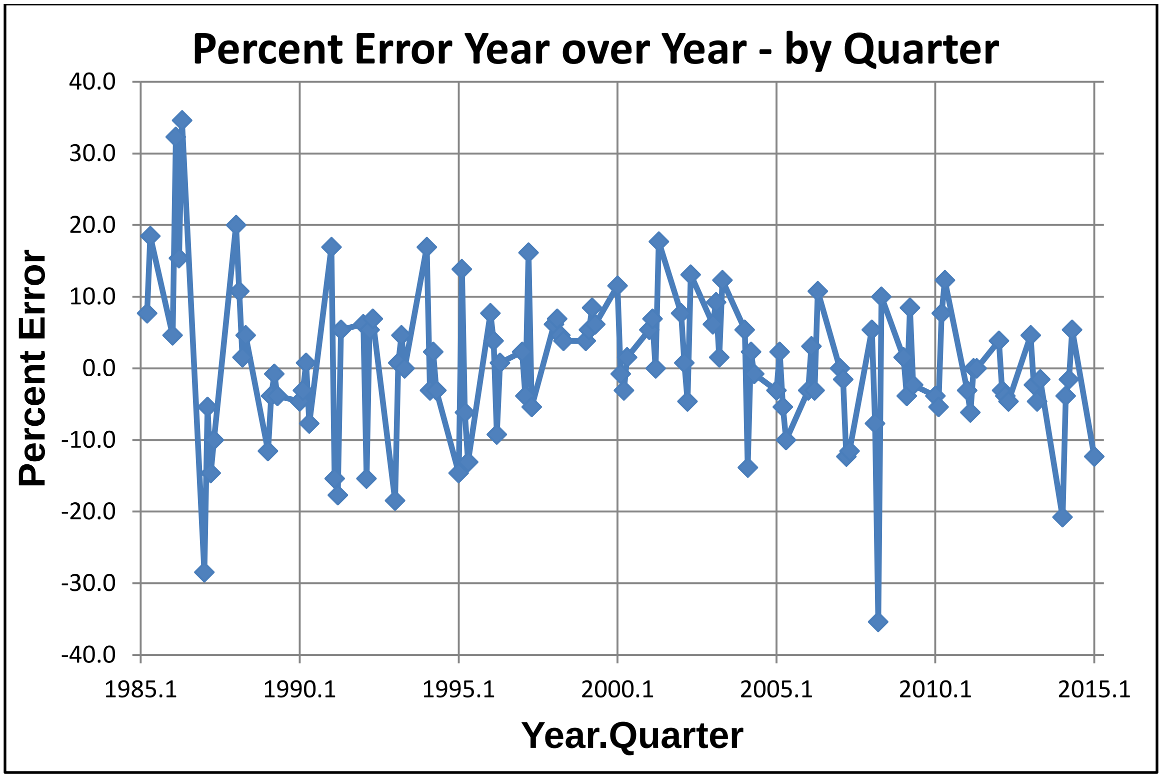


Figure 10

The mean percent error over the period was 7.6 percent, the maximum upside error was 34.6 percent, the maximum downside error was 35.4 percent, and the standard deviation of the errors was 12.9 percent.

Examining the data from the gRPCE demonstrates failure in all three domains. The general errors are the results of chaotic behavior. The data shows that ninety-six of the 119 forecasts were not affected by black swans or asset bubbles. Of those 96, 41 were in error by at least five percent. Therefore, there is a 41/96 or a forty-three percent chance of chaos distorting the gRPCE projections by greater than five percent, an amount severe enough to upset planning.

Modeling Economic Chaos

What makes an economy function? There are many possible answers. This section will propose two possibilities and create models based on those possibilities and project behavior based on the assumptions inherent in each of those possibilities. The first possibility is wealth-based. The individuals in an economy, personal or corporate, have wealth. The assumption is that all these individuals desire to increase their wealth. To acquire this wealth, they create value for the economy. Of course, some will try to increase their wealth by rent-seeking, that is, obtaining wealth without creating value, but since their economic effect is limited, it is reasonable to ignore them here.

Three primary variables drive the activity in an economy; what actors have, what they want, and what they do to move from what they have, closer to what they want. For most actors, this movement from what one has, to what one wants is called work but labeling it creating value makes more sense. In the economy, all these actors combine, at any point in time, to create aggregate have, aggregate want, and aggregate value creation. The driving variable is value creation; in general, when aggregate value creation is positive, aggregate wealth increases; however, when aggregate value creation is negative, that is, aggregate consumption exceeds aggregate creation, aggregate wealth decreases.

We can use simpler terms for this discussion, calling aggregate value creation production, as in the production of value. Likewise, we can simplify aggregate wealth to wealth and rename the aggregate desire for more wealth as objective. These three are interdependent. Actors' production is affected by current wealth and current objectives, wealth, in turn, is affected by objectives and production, and objectives are affected by production and wealth. These relationships can be expressed mathematically as a system of differential equations, letting P=production, W=wealth and O=objectives and t=time:

dP/dt = W - P, that is, the change in production equals wealth less current production

dW/dt = P - PO - W, that is, change in wealth equals production less production multiplied by objectives less current wealth.

dO/dt = PW - O, that is, objectives equal production multiplied by wealth less current objectives.

Since the effects of each of these variables on the others are not uniform it is necessary to introduce balancing constants or factors. These can be called pf, wf, and of. We can then rewrite the differential equations as:

dP/dt = pf(W-P), dW/dt = wf*P - PO - W and PW - of*O

The balancing factors values, while somewhat arbitrary, are chosen to best estimate the magnitude of the effect of the modified variable on the system. A system dynamics model created in Vensim simulation software can thoroughly describe the elements and relationships of the system. Figure 11 shows the model diagram.

Since this is the first of several system dynamics models a brief explanation of these models may be necessary. System dynamics models usually have two primary components, stocks, represented by a box, and flows, represented by a pipe with a valve on it, flowing into or out of a stock. In mathematical terms, the stock is the integral or accumulated sum of the flow, and the flow is the derivative or rate of change of the stock. The other features of the model can be variables or constants and the arrows indicate control, that is, an arrow from A to B means that A controls B. When the stock has an arrow leading directly or indirectly back to the flow into or out of that same stock the system becomes a differential equation(s) since representing the system in conventional mathematical terms includes both an object and its derivative. In Figure 11 on page 76, there are three stocks using the labels discussed above, Production, Wealth, and Wealth Objective. Each of these is fed by a flow labeled dProduction, dWealth, and dObjective. The valve on each of these flows is in every case controlled by a scale factor, the stock receiving the flow and one or two of the other stocks in the model.

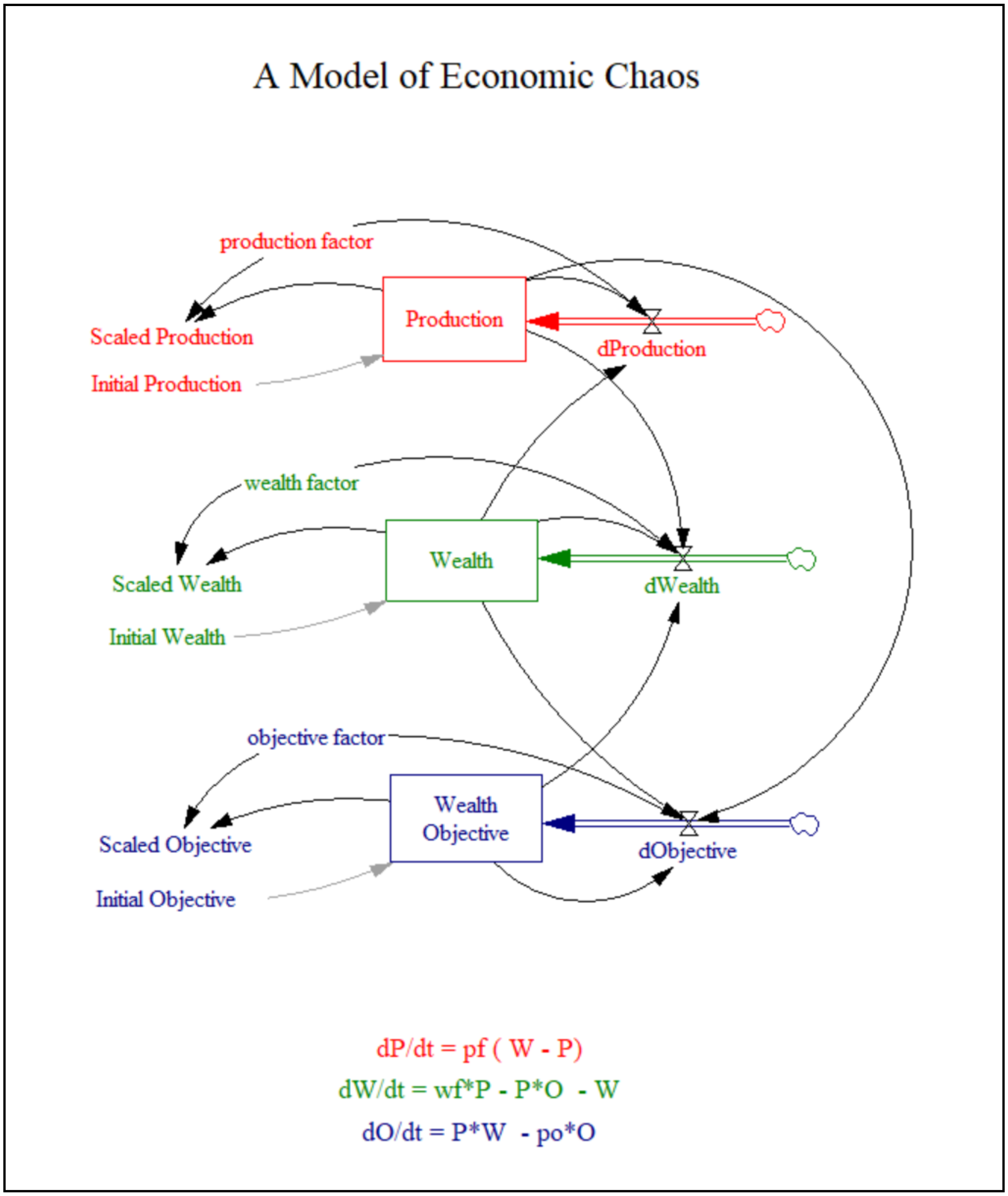


Figure 11

Since the flows are affected by the stocks they feed, the equations are differential equations and since those flows are also affected by other stocks in the model, the result is a system of differential equation. Systems of differential equations often cannot be solved mathematically but must be evaluated numerically by calculating the changes in hundreds or thousands of steps. This is usually done by a computer, however the computer code typically used can by exceedingly opaque creating the need for a system dynamics model to illustrate more transparently the underlying assumptions and connections. The system dynamics program, in this case Vensim, translates the drawings, into which numerical parameters have been entered, into equations that are numerically evaluated in thousands of individual steps. The results of these calculations can be displayed as tables or graphs. In models involving thousands of steps tables are of little value so graphs are the preferred method of displaying the results. The graphs that follow the models show each of the points that were calculation connected with lines between each set of two points.

When the model is run it generates the phase diagrams shown in Figures 12 through 14. These phase diagrams show the general tendencies of the relationship between the variables as opposed to a one-to-one correspondence between the two variables.

Figure 12 shows a loose association between increased production and increased wealth. However, there are areas where this is not precisely true. For example, looking at the area bounded by 0 on the left and 15 on the right, and 0 on top and -10 on the bottom, we can see that in this space, production is positive while wealth is negative. This sort of interaction happens all the time in an economy. One example is when one increases production without an increase in compensation in hopes of a resulting increase in the rate of compensation, as in working harder in hopes of getting a raise. However, after getting the raise, the individual may decide to ‘coast,’ work less diligently but still see their wealth increasing. When taken as a whole across millions of independent actors, these perturbations result in the chaotic, unpredictable behavior shown in Figure 12.

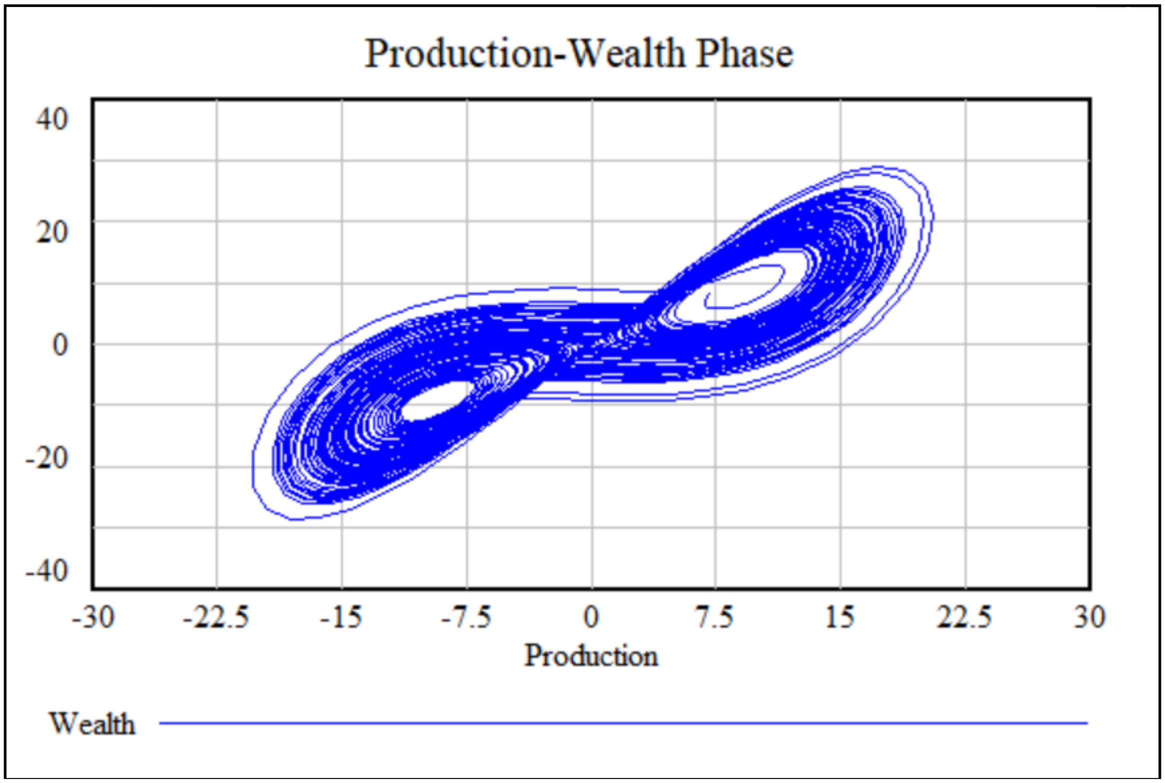


Figure 12

Figure 13 on the following page may appear completely different, but it exemplifies the same kind of behavior. In this case, the behavior creates an unexpected 'mirror image' in which both an increase or decrease in production produces similar changes in the wealth objective. The dichotomous method by which people evaluate their current situation may be the cause of this unusual result. One way is by comparing oneself to one's past self, and the other is by comparing oneself to one's peers. Also, as one decreases production, one sees the need to set higher goals, and as one increases production, one sees that higher aspirations are realistic. As in the previous example, the phase diagram shows general trends but no specific, predictable results. Millions of individuals behaving independently produce unpredictable and sometimes unexplainable results that are the essence of chaos.

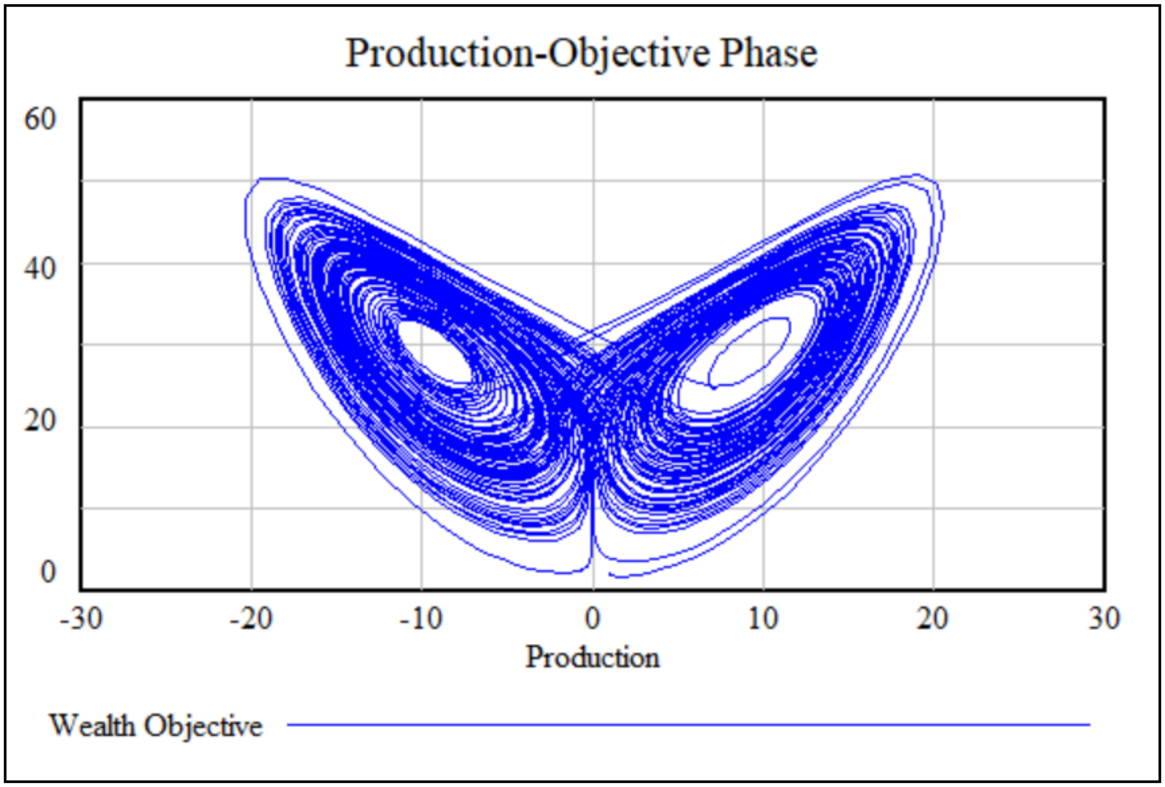


Figure 13

The same is true of Figure 14. Choosing a point on the horizontal axis does not yield a unique point on the vertical axis. The behavior displays a similar ‘mirror image’ in which either increasing or decreasing wealth can cause a similar change in the wealth objective. If we start at the beginning, near 0, 0, it is possible to construct a narrative that goes like this; wealth begins increasing, which allows an initial increase in wealth objective, which leads to giving up wealth to increase education this leads to a temporary decrease in wealth objective. However, after completing education, the wealth objective is lowered but not as low as the original starting level, and the process begins again. This description is an oversimplification of one of many narratives. However, as in the previous examples, the collective behavior of large numbers of individuals produces chaos rather than a functional relationship that would indicate that wealth at a specific level produces this objective level result and only this result.

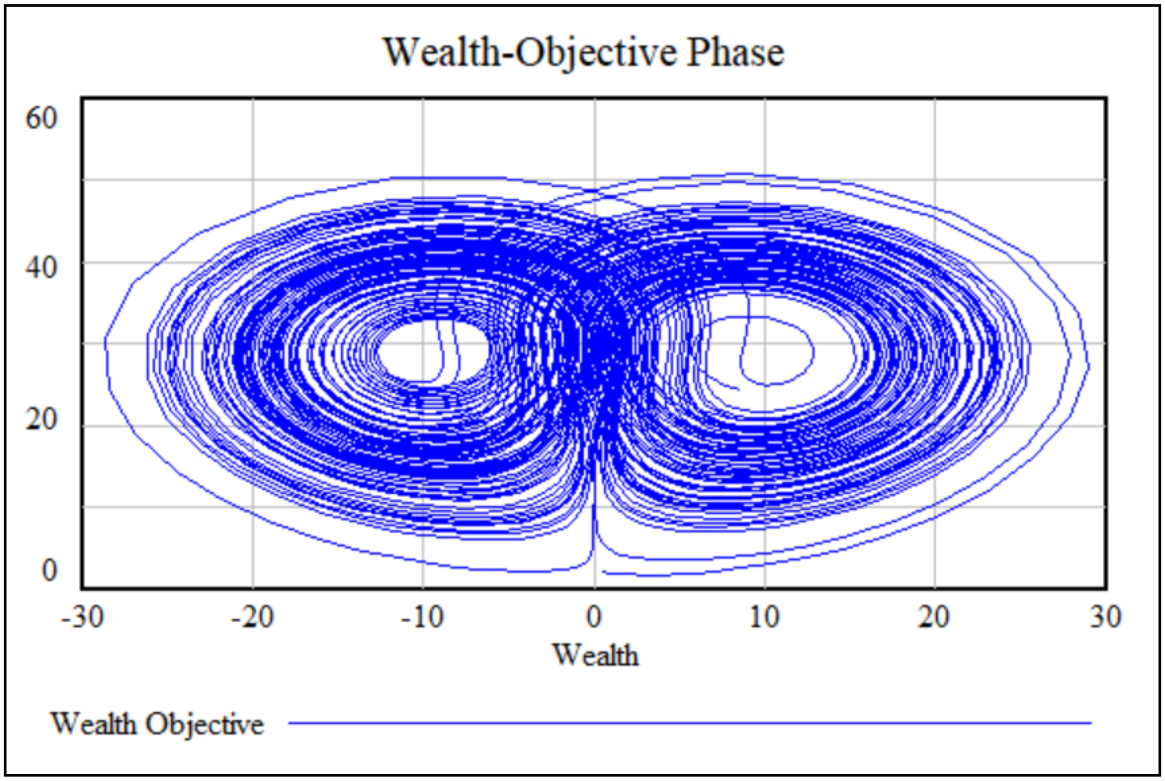


Figure 14

Graphing the variables makes it apparent that the behavior is chaotic. No functional relationship exists between any two of the variables in any of the diagrams since knowing a specific value for the independent variable provides no insight into the value of the dependent variable. For example, if we choose to examine the economy's behavior displayed in Figure 12, when the production value is seven, the equations return wealth values of anywhere between negative ten and positive fifteen.

Of course, it is more common to refer to a country's aggregate production in an economy as gross domestic product or GDP. Scaling the variables and graphing GDP over time leads to the result displayed in Figure 15.

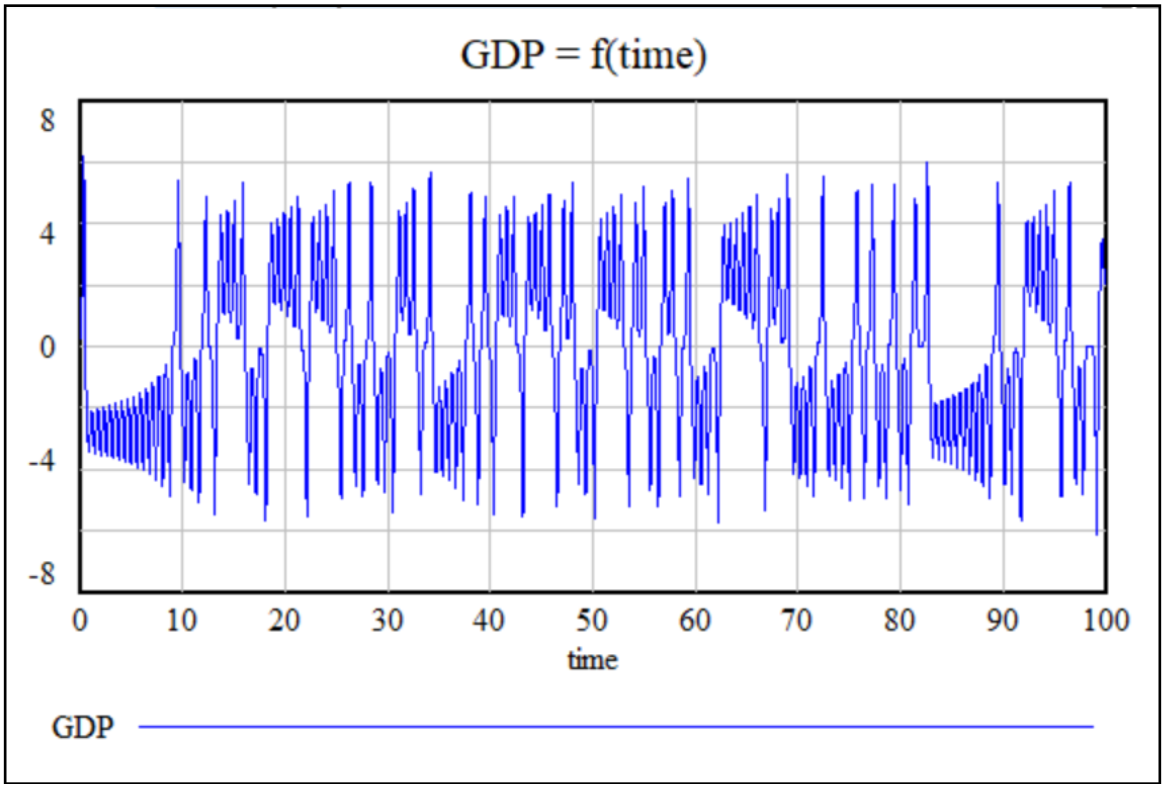


Figure 15

While this does represent a functional relationship it is still chaotic since insignificant changes in input variable produce similar but not identical output. The implication is that GDP is chaotic and completely unpredictable. This is amplified by the fact that tiny changes in the parameters result in vastly different outcomes. Therefore, what we see in the Figure 15 shows behavior similar to actual GDP in that it oscillates erratically in a fairly limited range.

A second possibility to explain economic behavior is standard of living based. In this model, the central assumption is that everyone desires to improve their financial circumstances and improve their standard of living (SoL). Furthermore, the model assumes that the individual 'measures' standard of living in two ways; one by comparing the current standard of living with that in the past, and the other by comparing one's standard of living with those around them. Therefore, this model contains a stock measuring SoL compared to the past and another comparing SoL with others. This dualism creates friction between the two, and the stock, perceived change in SoL, measures the friction. Finally, the aggregate individual value creation, motivated by the interaction of the other three, feeds the remaining stock, which measures SoL. Like the previous model, numerically evaluating the equations is necessary because they are too complex to solve analytically.

While examining this model and the results of running the model, it is worth noticing that the frictions, measured in this model and the previous one, are by no means unique. They are similar to the frictions described in Lorenz's weather models. Two air or water masses moving past each other create similar frictions that create eddies in water and tornados and hurricanes in the air. Human beings are incredibly complicated, and a part of that complexity is the capability to simultaneously hold somewhat contradictory ideas in mind. For example, we want to have our cake and eat too. These contradictions play out in the economy constantly; we want to save and spend, want bigger and better, and also want to down-size, we want to earn more money, but we want time to enjoy spending what we are earning. These and many more scenarios would create the same kinds of friction displayed in this model and the previous one. Even in a small town, the economy has the behaviors described in these models and dozens or hundreds of others. Furthermore, while any one of these models can create chaos, the combined effect of many frictions operating simultaneously creates a substantially more complex chaotic environment. Since the actors base many of their decisions on their reaction to the chaos they observe, this feedback creates an extraordinarily complex level two chaotic environment. Figure 16 below displays the standard of living model, and Figures 17 through 20 on subsequent pages show some of the run results.

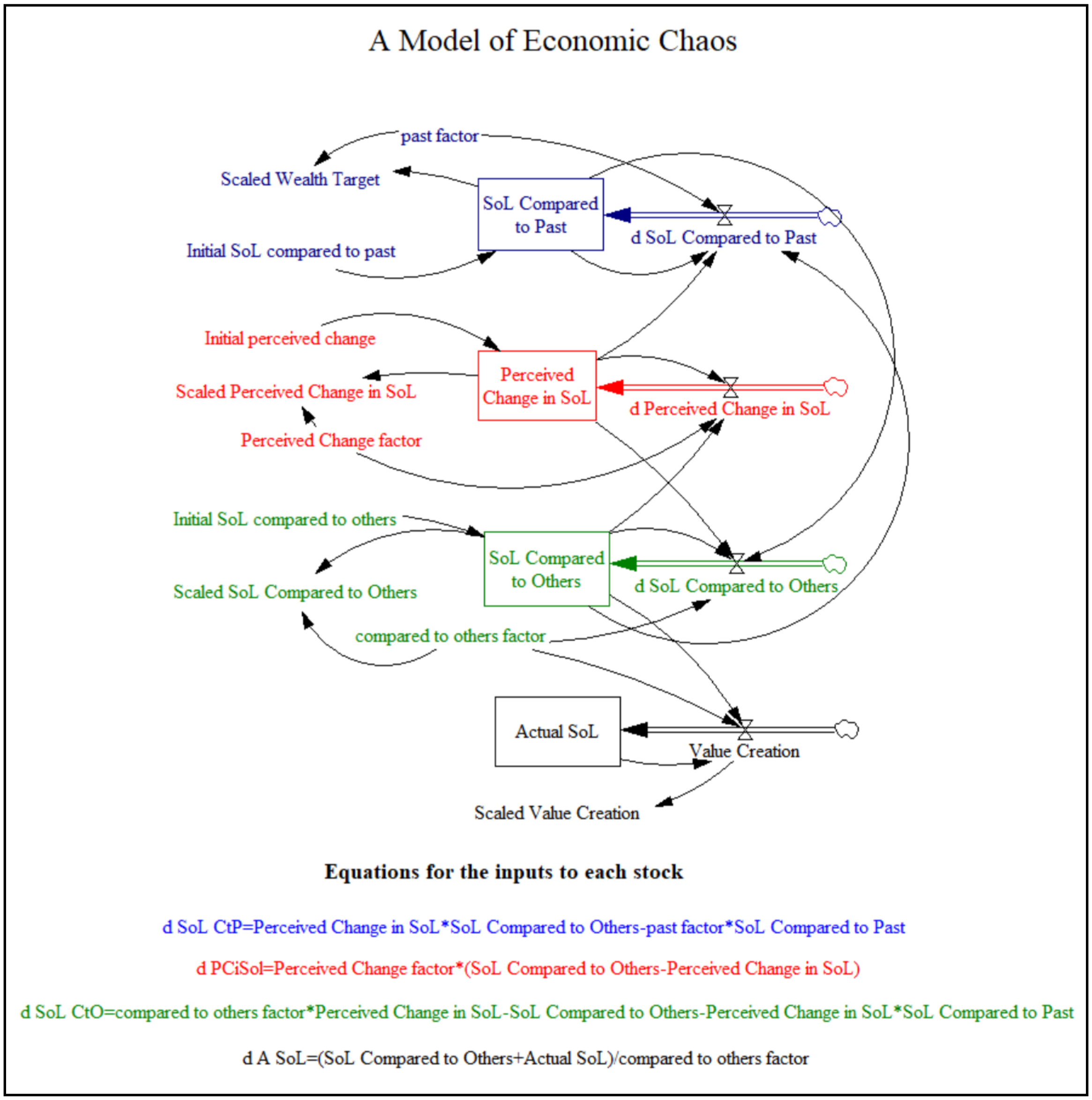


Figure 16

As was true in the previous model, notice that all of the first three stocks are affected by their own values as well as the values of the other two. The final stock is controlled by both its own value at any time as well the aggregated value of standard of living compared to others with has been perturbated by the friction present.

Figures 17 through 19 display behavior similar to that shown in Figures 12 through 14 but not identical. This is why multiple frictions create even greater chaos.

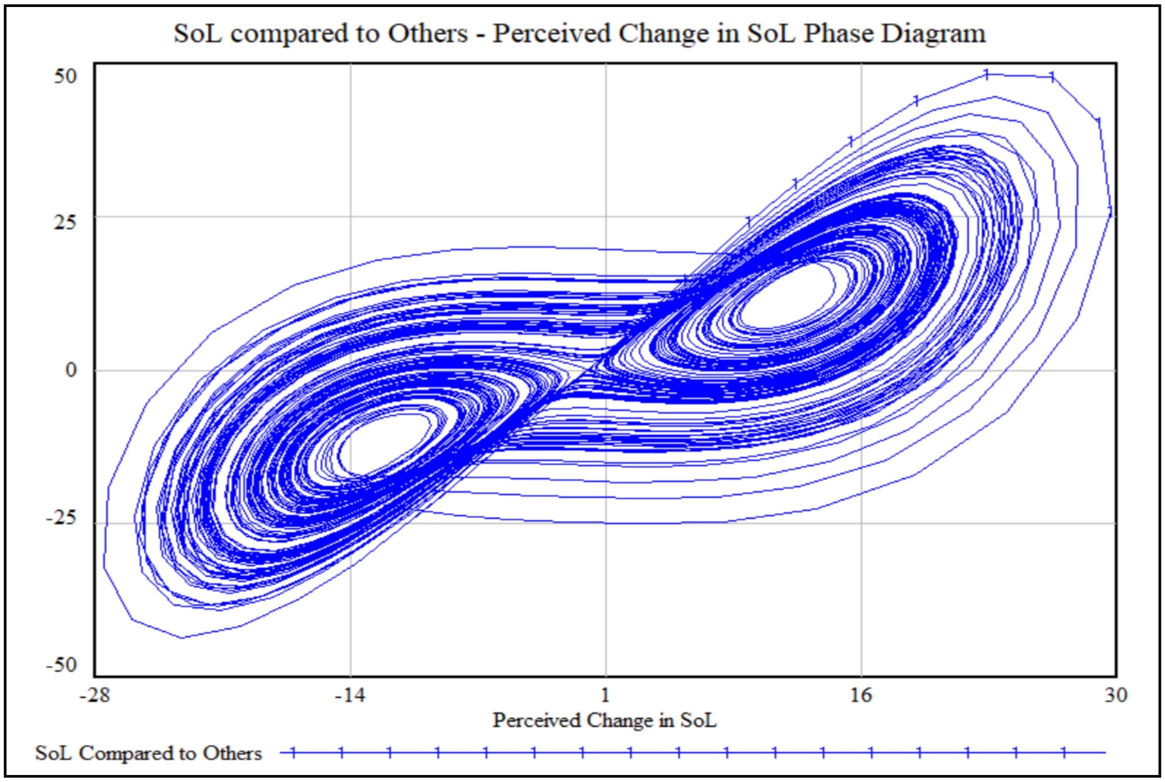


Figure 17

As was the case in Figure 12, Figure 17 shows general trends at the extremes. When the perceived change in the standard of living is high, the perception of the standard of living compared to others tends to be high. Similarly, when the perceived change in the standard of living is low, the perception of the standard of living compared to others tends to become low. Again, however, no clear trend exists in and around the center. These apparent contradictions result from the friction created by the difficulties inherent in trying to make a static evaluation of a state, based upon two unrelated measures that are sometimes parallel and at other times in direct opposition.

Similar types of behavior are clear in Figure 18 below. As when comparing the standard of living compared to others with the perceived standard of living, when comparing the perceived change in the standard of living with the standard of living compared to the past, we see similar behavior. We see that the general trend is more robust than in the previous comparison in that when either is positive, the other is also positive and when one is negative, so is the other. However, positivity and negativity vary greatly, so no prediction is possible.

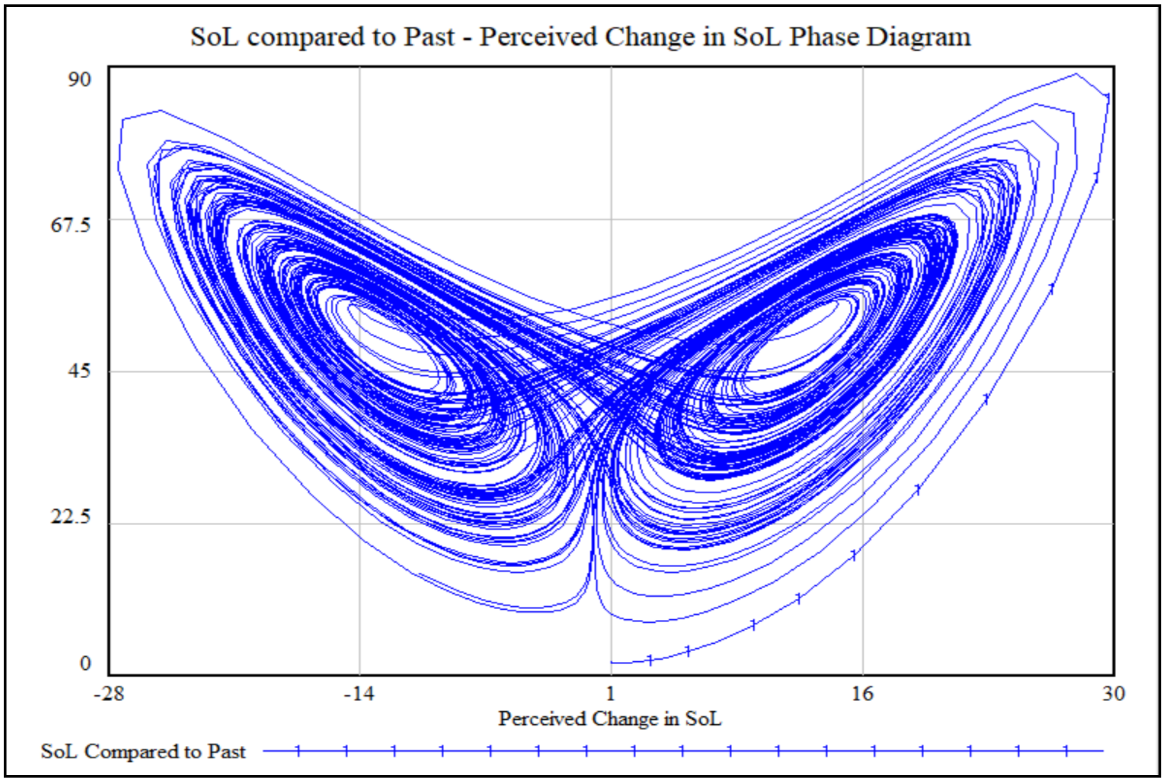


Figure 18

Figure 19 displays behavior similar to Figure 14 in the previous model. In this case, the aggregate standard of living compared to the past is always positive as one would expect, and the standard of living compared to others varies widely from positive to negative. This friction partly exists because of the mental dualism discussed earlier and because 'others' is a large, diverse group. For example, individuals might see that they are better off than they were last year and better off than their neighbor to the south, who had previously been better off than they were. At the same time, they may acknowledge that they are not as well off as their neighbor to the north, who had previously been less well off. This comparison with others likely includes comparisons with dozens of neighbors, friends, and acquaintances. In turn, these neighbors, friends, and acquaintances change their behavior in response. This reaction creates level two chaos and makes any functional relationship impossible. The lack of this functional relationship means that it is impossible to predict the dependent variable's behavior based upon the independent variable's value.

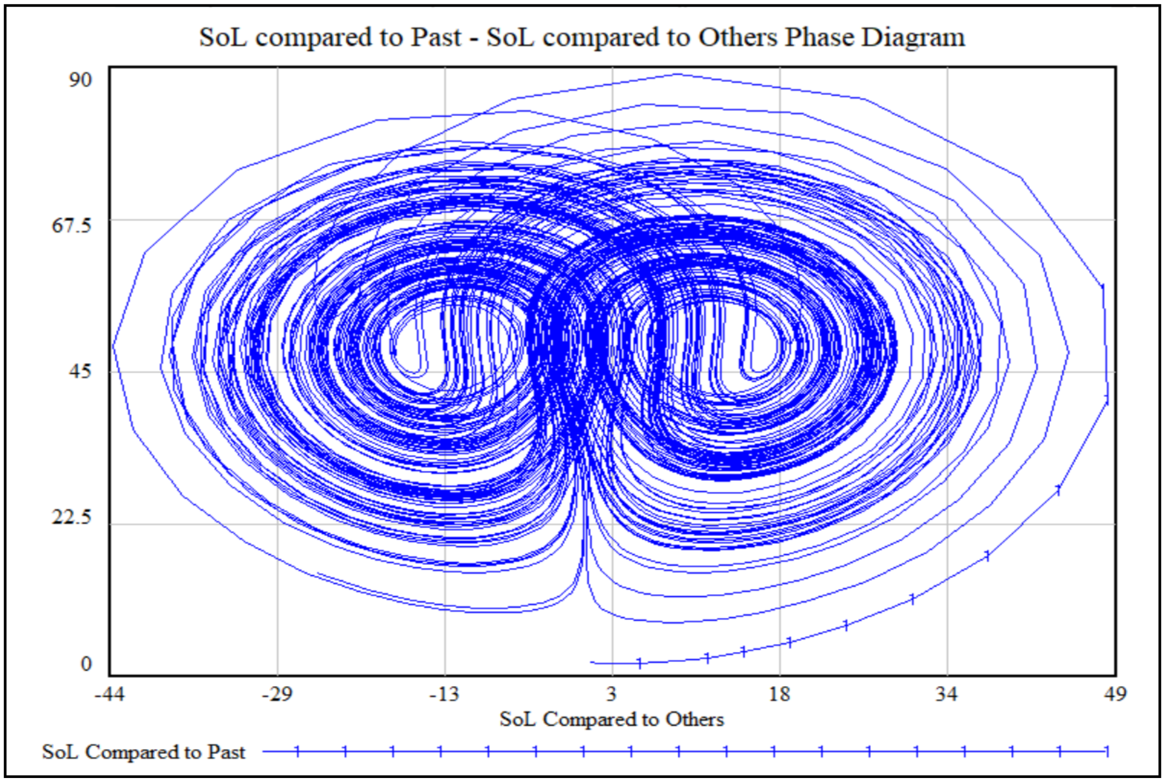


Figure 19

Figures 20 and 21 are displayed together on page 87. They are displayed together to allow the reader to make direct comparisons between them. While they both display the chaotic behavior of the rise in SoL, they do not do so in precisely the same way. This change in behavior was triggered by changing the input parameter, Initial SoL compared to Past, from 2.0 to 2.001. Note that this is a change of only five ten thousandths of the initial value and any change of this magnitude produces similar differences, some greater and some smaller. This is classic chaotic behavior, it is the same phenomenon that Lorenz (1972) observed in his weather models, and which christened the

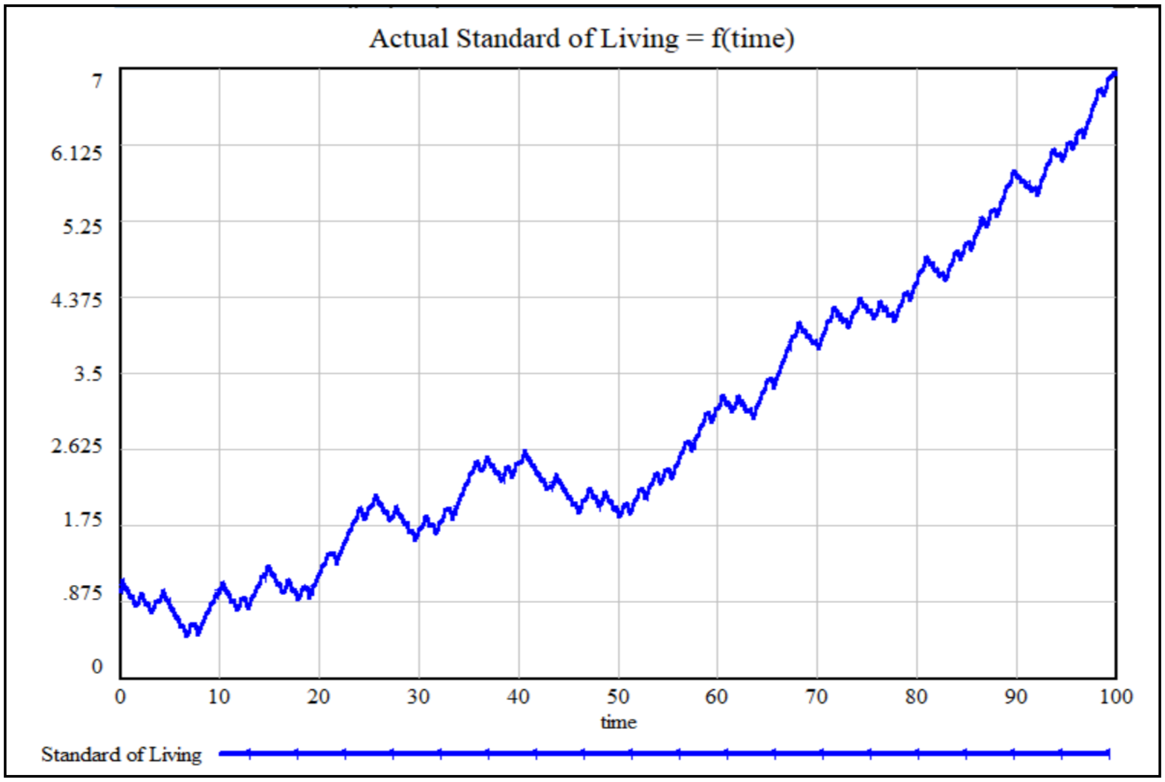


Figure 20

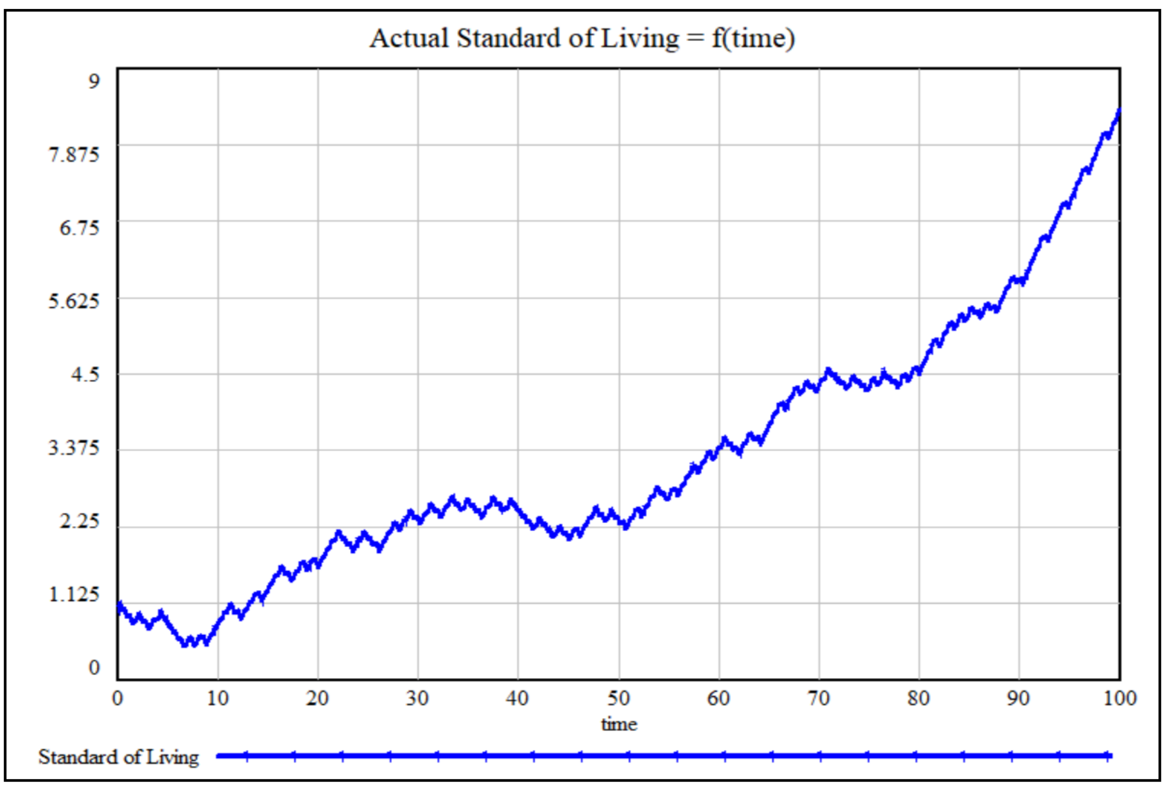


Figure 21

name, the butterfly effect. This instability confirms that the behavior is indeed chaotic. The results produced by these models demonstrate that economic behavior is chaotic. Of course, models are not proof; they are tests of assumptions. However, when combined with the evidence presented earlier, it seems likely enough that economics is a chaotic system that it is reasonable to shift the burden of proof to those may who claim that it is not chaotic.

Results in the Second Domain: Bubbles

Results of Bubbles on gRPCE

Referring back to the data collected on the gRPCE 23 of the 119 Federal Reserve forecasts (Figure 10, page 73), twenty-three of the forecasting errors greater than five percent were attributable to asset bubbles. The extremes are attributable to the asset bubble of 1985-87 and the housing bubble of 2007-8 as well as the less pronounced dotcom stock bubble of 2000-3. Therefore, there is a 23/119 or nineteen percent chance of an asset bubble causing a forecasting error greater than five percent.

Discovering Bubble Behavior

Below are graphs of the data collected on the historical bubble episodes. These bubbles include the first three; the Tulipmania bubble Figure 22, the South Sea bubble, Figure 23, and the Mississippi bubble, Figure 24. A random selection of subsequent bubbles followed these first three; the DJIA from 1928 to 1930, Figure 25, the S&P 500 in 1986 and 1987, Figure 26, the Nikkei 225 from 1987 thru 1991, Figure 27, the Nasdaq 100 from 1994 thru 2003, Figure 28, the Tesla stock bubble in 2014 and 2015, Figure 29, and the Bitcoin bubble in 2017 and 2018, Figure 30.

The graphs have the essential areas of similarities indicated by colored circles. The red circles mark what Rodrigue calls the first sell-off or the exit of the fundamentalists, those investors that use underlying fundamentals to guide their investment decisions. The orange circles indicate what Rodrigue calls "the new paradigm" or what could be called the exit of some of the mixed-mode investors that Rodrigue calls "institutional investors" but have some traits of the fundamentalists and some traits of speculators. The green circles mark what Rodrigue calls the "return to normal" It is speculators jumping in at what they believe is a buying opportunity that cause this. Finally, the purple circles indicate what Rodrigue calls the "despair" and the "return to the mean". These result from speculators and mixed-mode investors giving up, and the fundamentalists see the renewed undervaluing of the asset and begin reinvesting. This point does not trigger a new cycle as one might think because the speculators and mixed-mode investors consider the asset toxic, and only the fundamentalists will invest in it again for quite some time.

Figures 22 through 30 on the following pages are displayed without individual comment since the actual data shown in the graph is unimportant. They are presented to illustrate a pattern that is best seen by viewing the graphs in uninterrupted succession.

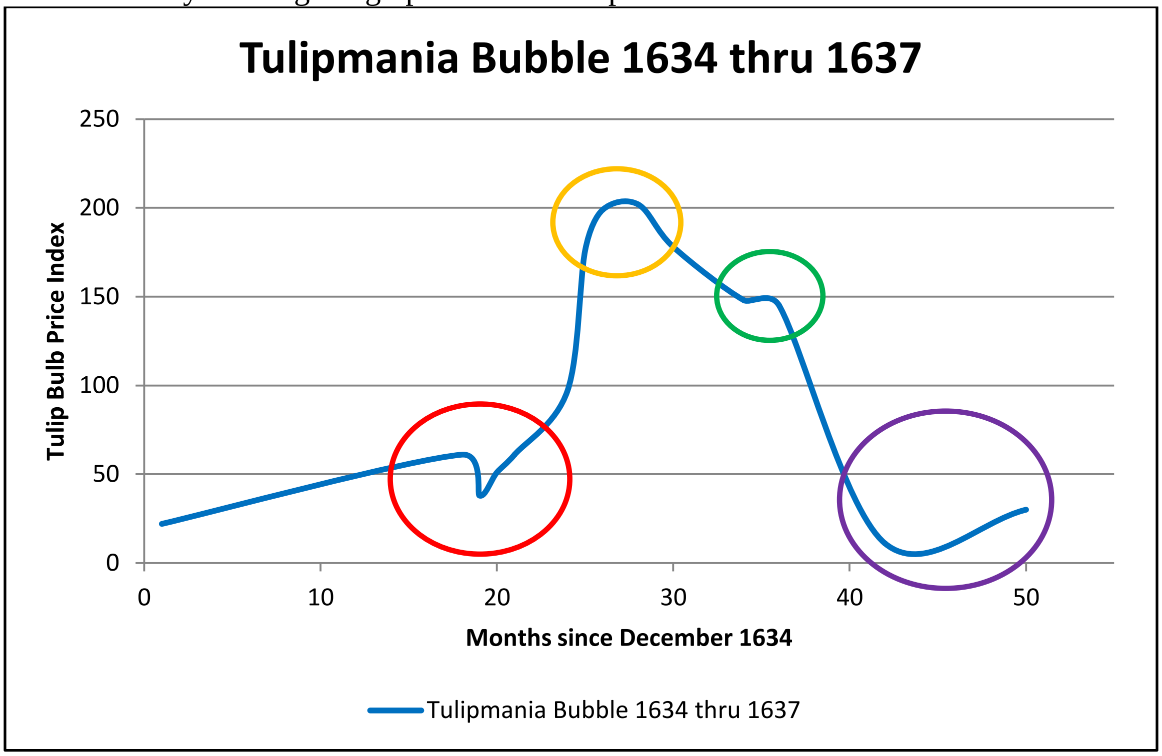


Figure 22

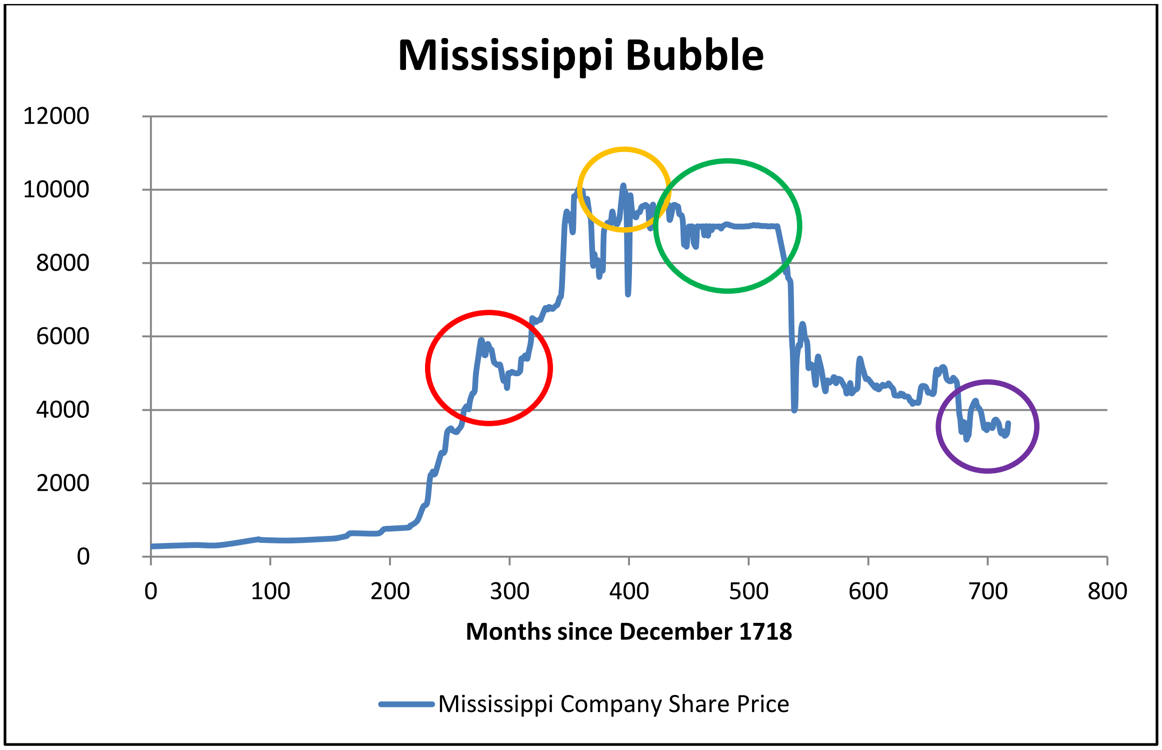


Figure 23

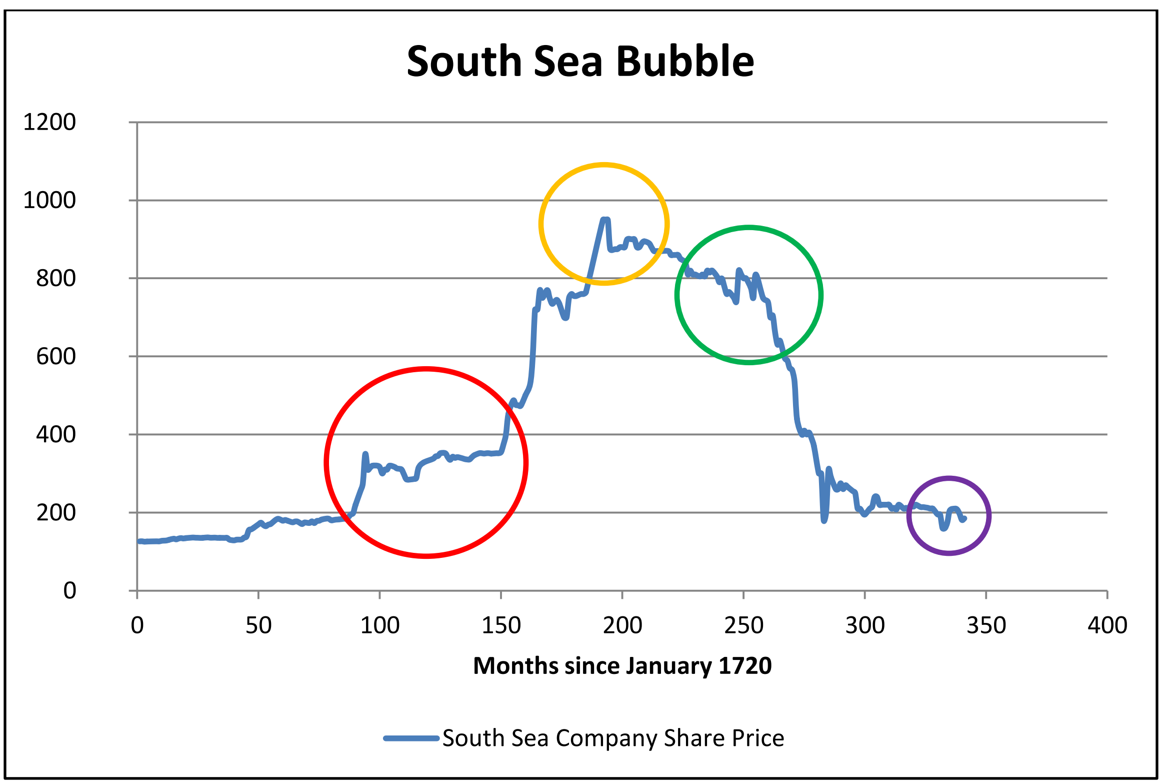


Figure 24

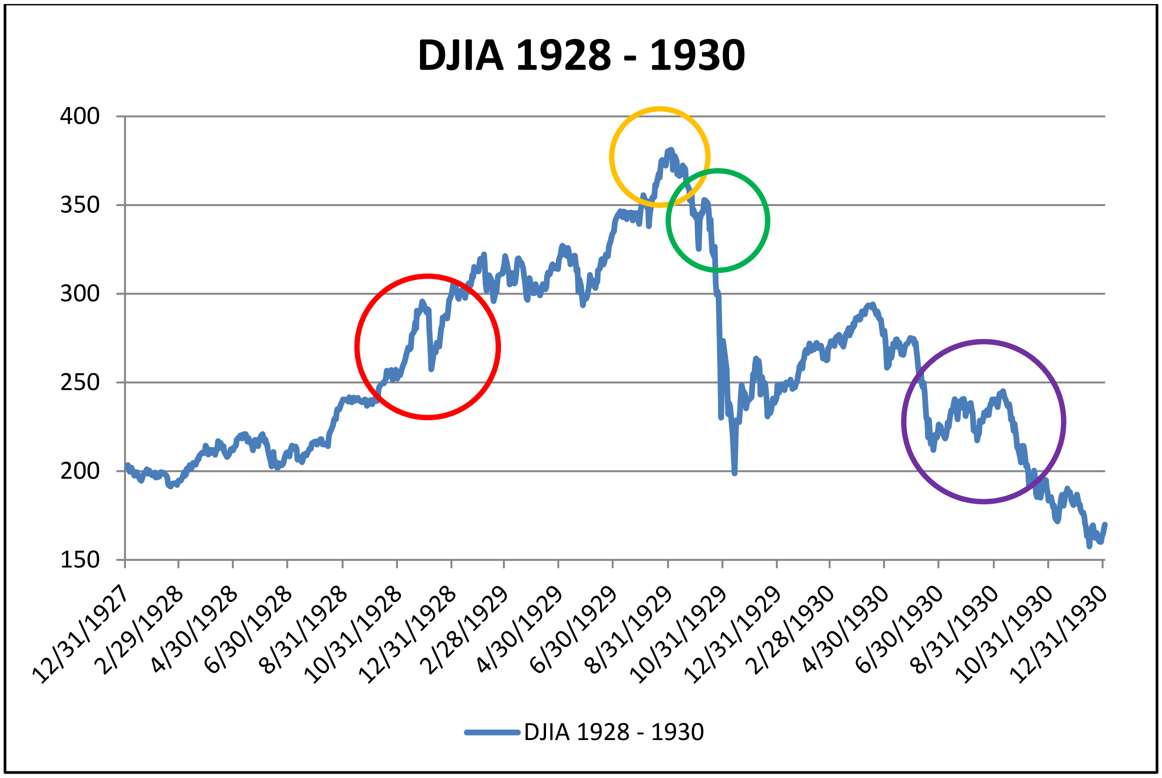


Figure 25

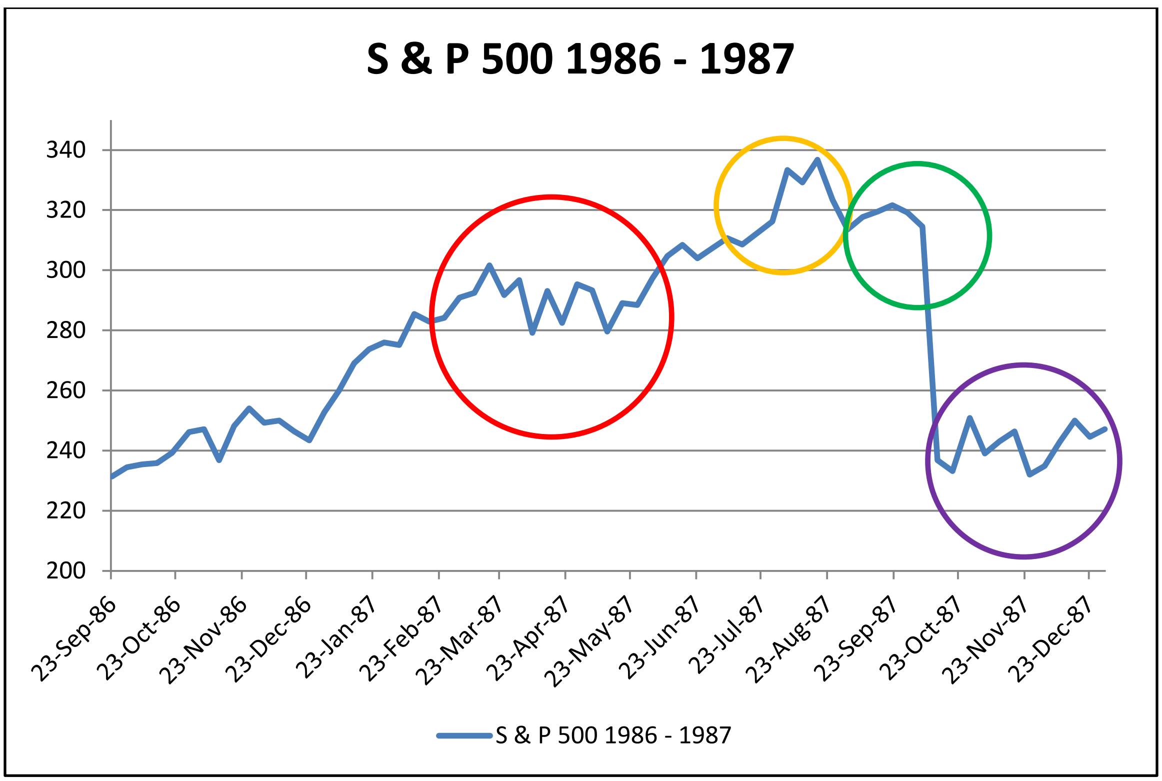


Figure 26

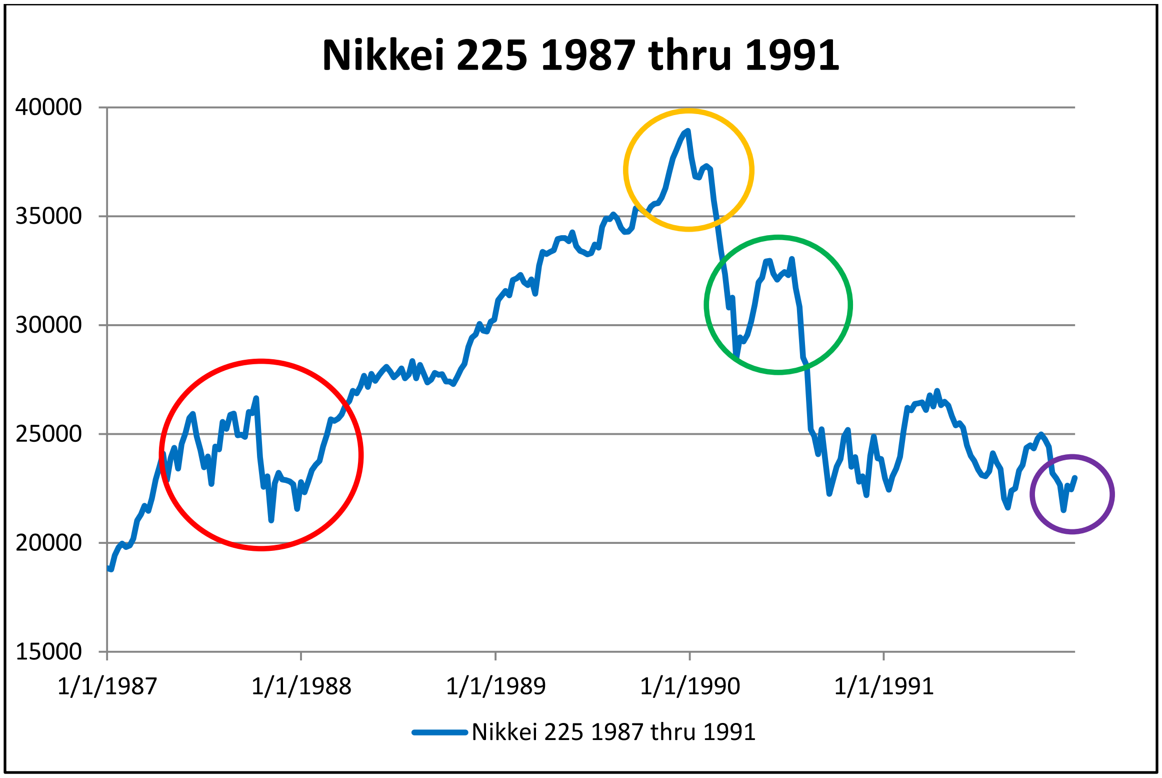


Figure 27

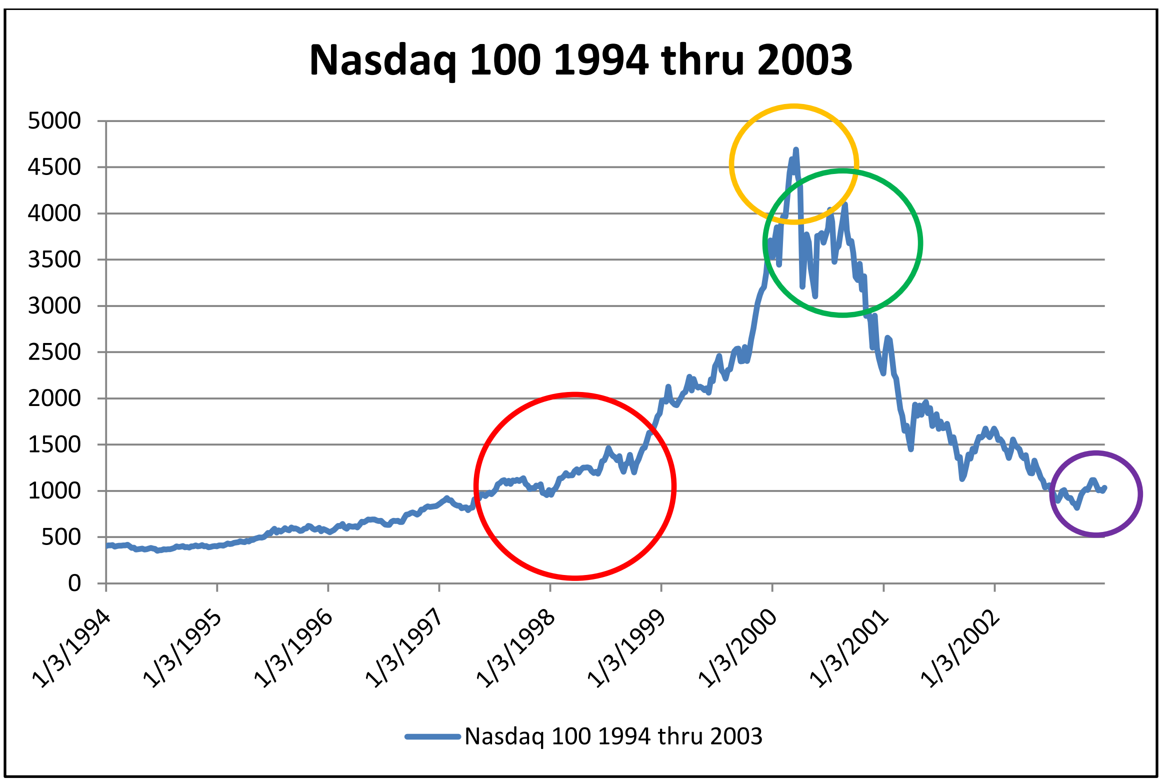


Figure 28

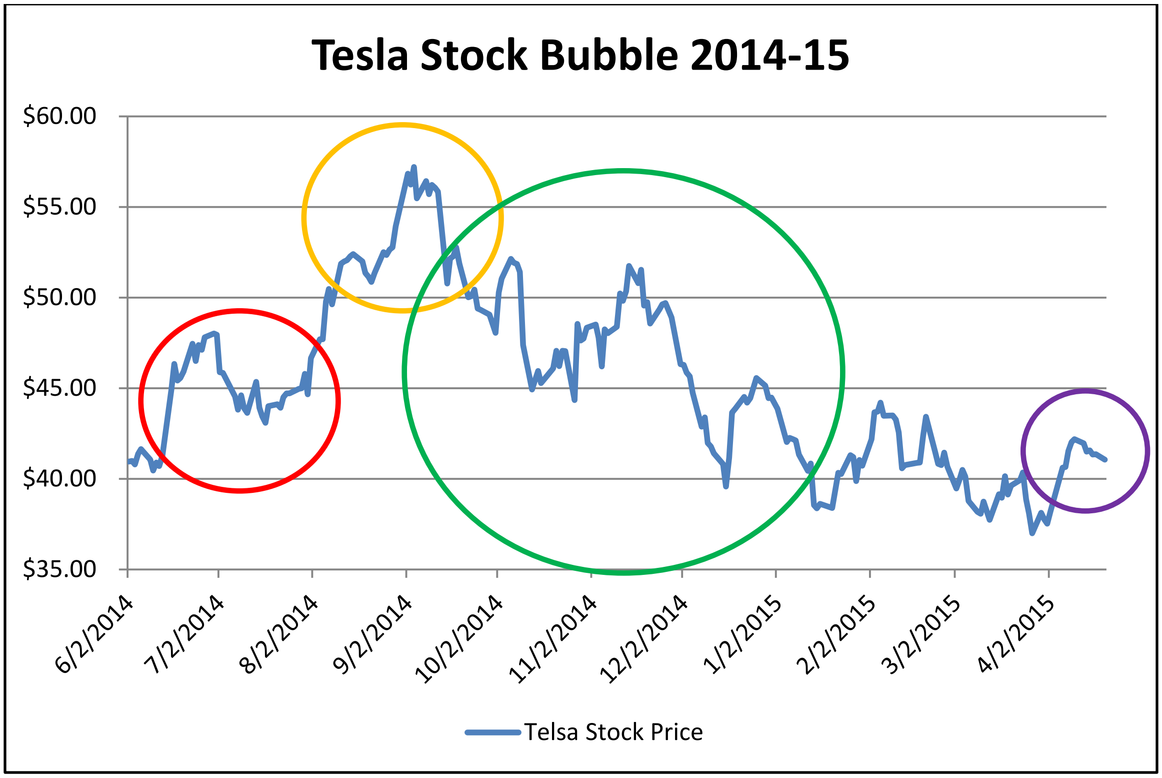


Figure 29

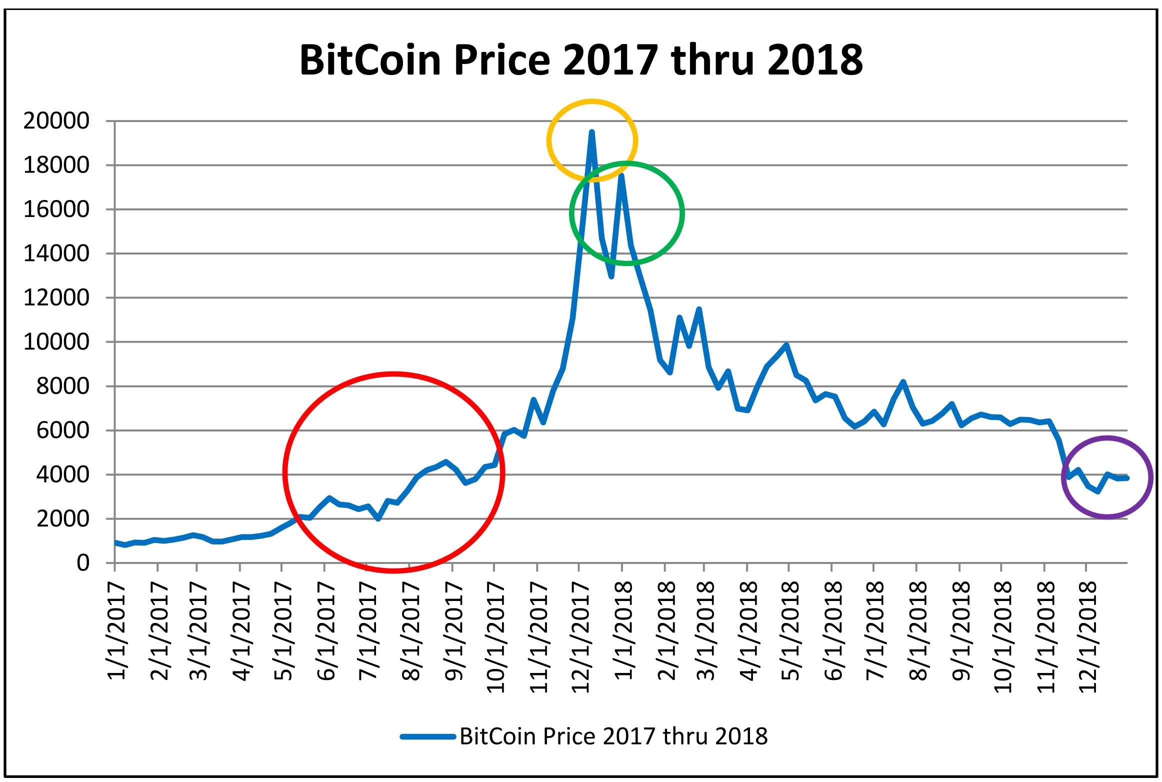


Figure 30

Figure 31 below shows Rodrigue's summary diagram. The parts indicated by the colored circles in the preceding graphs are labeled. It is clear that Rodrigue's diagram reasonably summarizes the patterns seen in Figures 22 through 30. Rodrigue does not claim that every bubble looks precisely like his diagram, but it has essentially the same elements. The key elements are those circled in Figures 22 through 30, the first sell-off, the new paradigm, the denial and return to normal, the despair and return to the mean. The time scale and asset value magnitude can vary widely, but the general pattern remains the same. Rodrigue explains that the bubble begins when the 'smart money' recognizes an undervalued asset class; their investment causes the price to rise. This buying attracts the attention of institutional investors who begin to purchase. Now that this buying has increased the price further, the asset is overvalued, so the smart money exits.

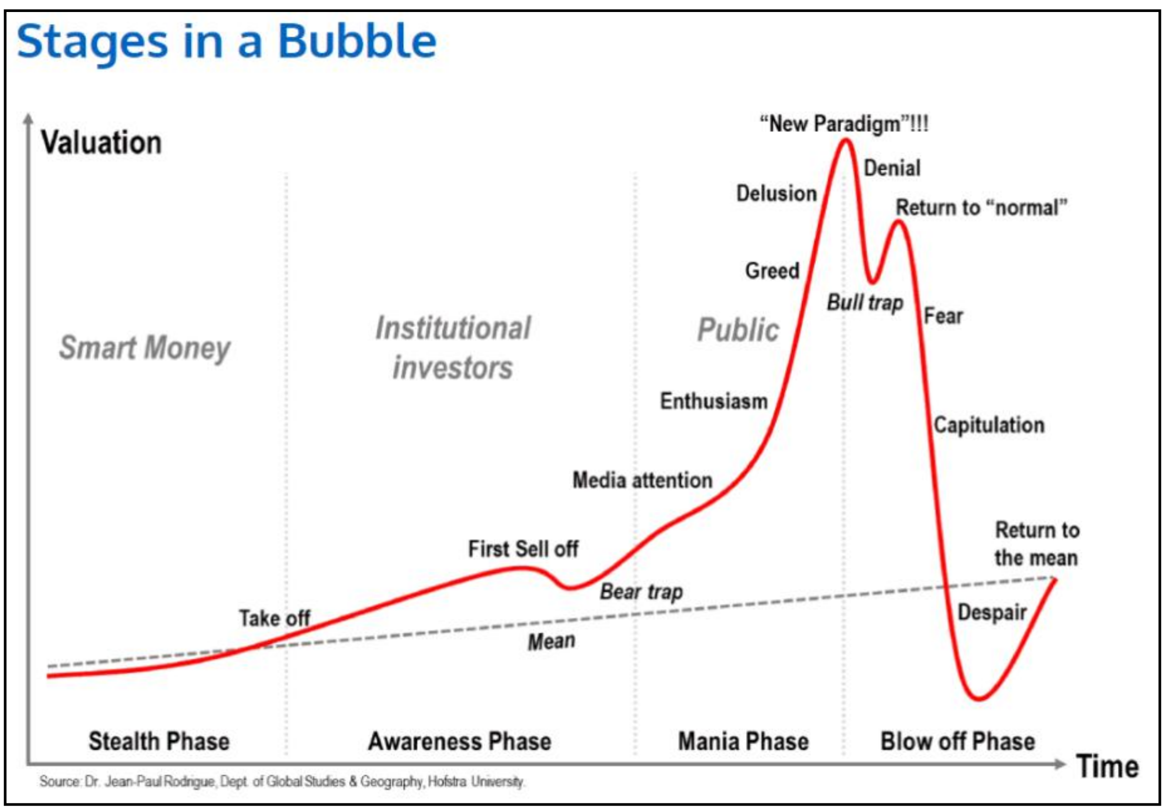


Figure 31

As the price resumes its increase, the public begins to buy in first with enthusiasm but later greedily. The delusion follows that this is sustainable and seen as the new paradigm, the new 'true value.' Then, the price drops, and the bulls deny its reality seeing it instead as a buying opportunity; this causes the asset to rise again but without reaching its previous heights. The next drop instills fear and panic selling, rapidly taking the price to below actual value, and the smart money buys in again, and the price returns to its uninflated value. The other investor classes stay on the sidelines since the asset has already burned them once.

Modeling Bubble Behavior

A system dynamics model, shown below, seeks to explain Rodrigue's diagram. Figure 32 displays the model showing the asset price as a function of supply and demand over time. It shows the asset price depends on aggregate demand which is a composite of smart money demand (SM), institutional investor demand (II), and public demand (P).

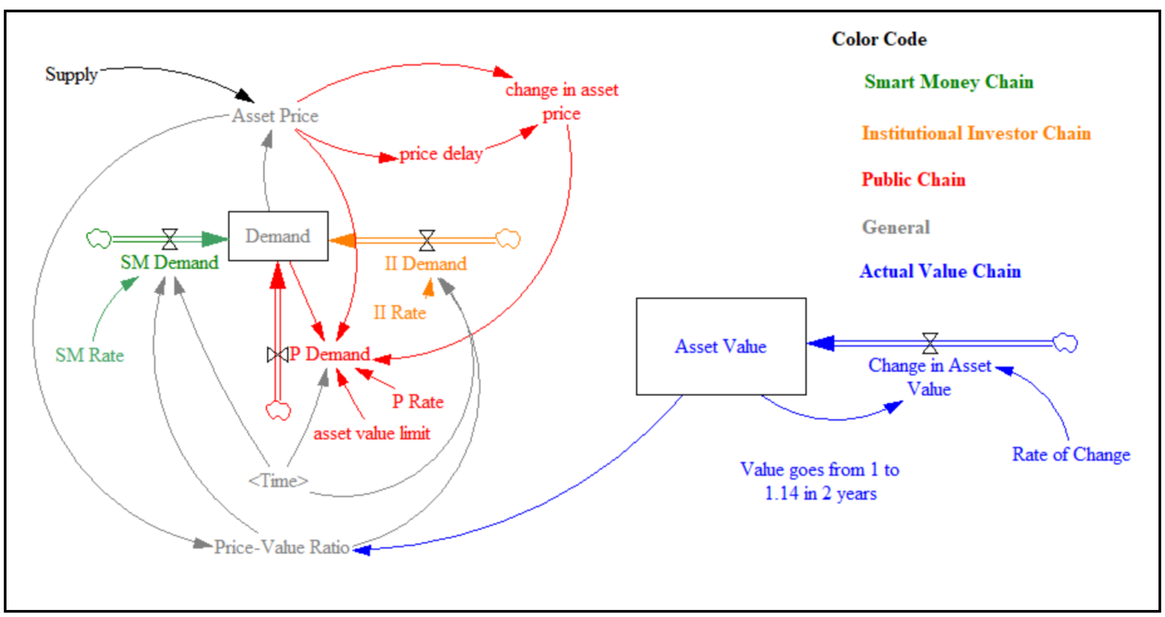


Figure 32

It is clear from the model that while the smart money and the institutional investors to a lesser extent are basing their demand on fundamentals, primarily the price to value ratio, the public is basing its decisions primarily on asset price changes and extrapolating those changes into the future to predict behavior.

It is important to restate that models are not proof but attempts to learn and to try to explain. This model may be only one of many possible models that can explain the behavior Rodrigue presents in his book. However, while this model is not the only possible explanation for the behavior it does generate data that compares very favorably to Rodrigue's description. Figure 33 displays the graph generated when running the model.

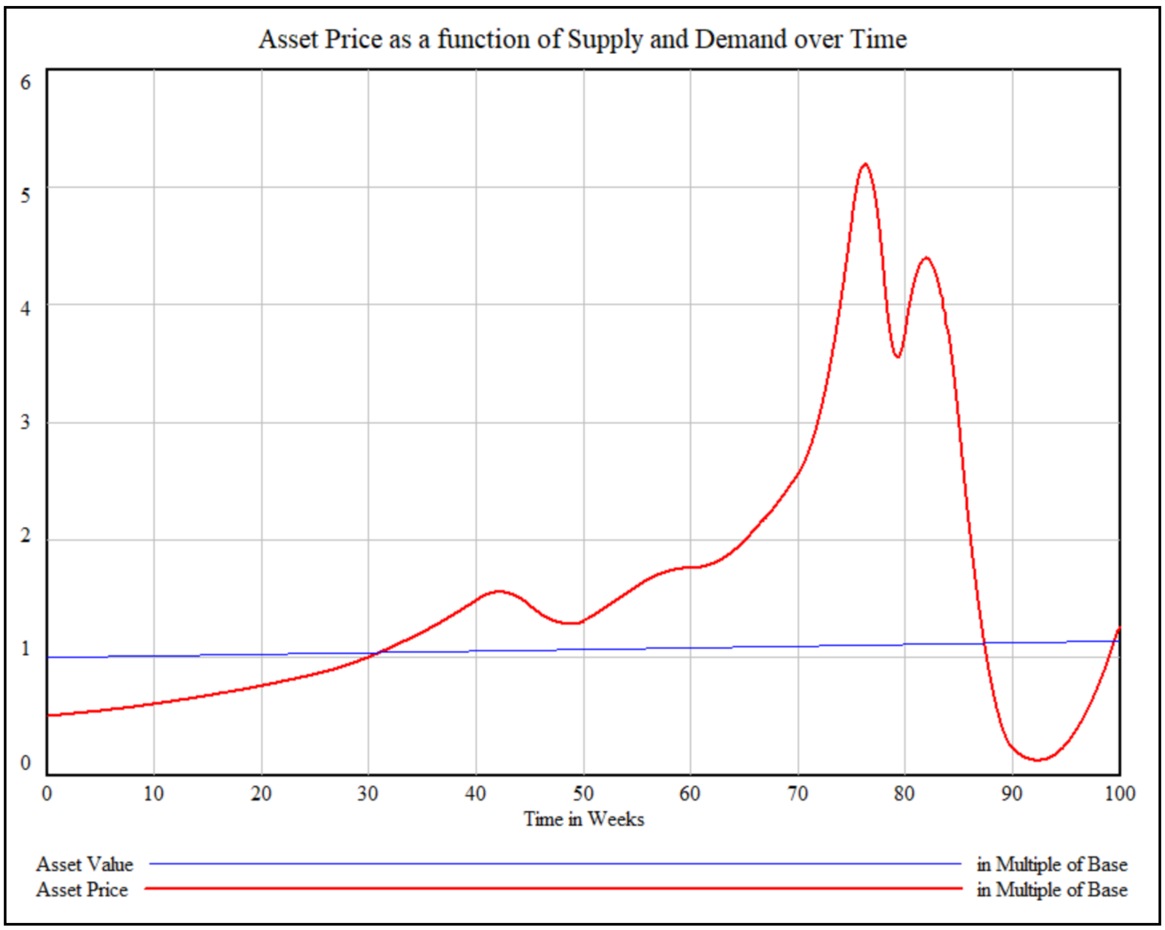


Figure 33

The model successfully captures the nuances of Rodrigue's explanation and can therefore is a reasonable explanation for the behavior of asset prices. The seven percent was derived from the average annual increase of the S & P 500 minus the average rate of inflation. The blue line is the likely 'real' value of the asset arrived at by adding a seven percent per year increase. It is clear that the graph it generates is similar in every respect the graph published by Rodrigue and displayed in Figure 31. As with his graph, the red line is the behavior of the asset price as it varies over time.

If we accept the model as an explanation, we can base our proposed solution on the problem as described by the model. The advantage of using a system dynamics model is that it lays bare all the assumptions about the relationships governing the model. It is the assumptions behind any model where true debate resides.

Results in the Third Domain: Black Swans

Results of Black Swans on the gRPCE

None of the ten blacks swan events not caused by asset bubbles in the past two hundred years with an economic effect greater than five percent were in the time period in which the gRPCE data was collected. However, since there were ten blacks swan events not caused by asset bubbles in the past two hundred years this implies a 10/200 or five percent chance of a black swan event affecting the economy by greater than five percent.

Discovering the Economic Effect of Black Swans

Since black swan events (BSEs) are, by definition, unpredictable, forecasting them is out of the question. Although there is insufficient data to compare government success or failure in coping with BSEs, it is reasonable to examine the effects of the recent pandemic on the economy. There have been three BSEs not caused by an asset bubble in the past seventy years. Those caused by asset bubbles were eliminated since they were covered in the previous section. The first was caused by the unexpected invasion of South Korea by the North in 1950 that began the Korean War. The second was the OPEC oil embargo in 1973, in which the twelve nations of OPEC stopped selling oil to the United States. The third is the current CoVid-19 pandemic. Figure 34 shows the history of the quarterly real personal consumption expenditures as a percent change from the previous quarter. The Korean War and the current pandemic are visible, and the OPEC embargo in about the center is the only other dip below six percent.

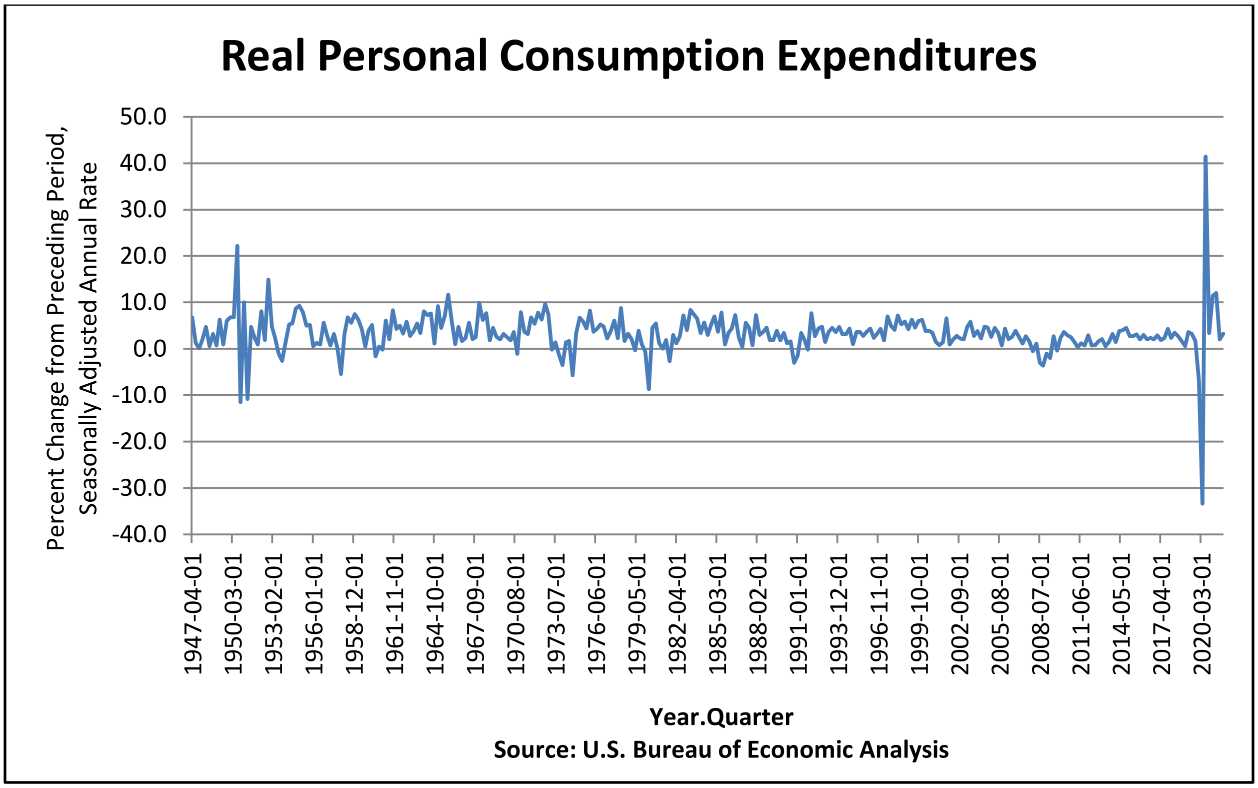


Figure 34

It is clear from the graph shown in Figure 34, that the current pandemic has been far more devastating to the economy than the others have. As an example, the Monetary Policy Report of June 12, 2020, states, “After having increased at a solid 2.7 percent pace in 2019, real PCE fell at an annual rate of 6.8 percent in the first quarter of 2020, one of the largest quarterly drops in the history of this series” (Board of Governors of the Federal Reserve System, 14).

While the projections from the first quarter of 2019 will not be formally released for public use until 2024 since public release is five years after the fact, it is reasonable to believe that the projection would have been near the .22 average change in percent rate from the previous month of 2019. The Report goes on to say, "real PCE collapsed, falling 6.7 percent in March and a record 13.2 percent in April.

Although indicators point to an increase in May—which is consistent with some relaxation of government restrictions—taken together, the April data and May indicators point to an unprecedented decline in second-quarter consumer outlays" (Board of Governors of the Federal Reserve System, 14).

While the effect on the United States and the world economy was devastating, it is becoming increasingly apparent that government action in response to the pandemic caused much of the economic impact and may have been unnecessary.

A recent study at Johns Hopkins University concluded,

> "Overall, our meta-analysis fails to confirm that lockdowns have had a large, significant effect on mortality rates. Studies examining the relationship between lockdown strictness (based on the OxCGRT stringency index) find that the average lockdown in Europe and the United States only reduced COVID-19 mortality by 0.2% compared to a COVID-19 policy based solely on recommendations. Shelter-in-place orders (SIPOs) were also ineffective. They only reduced COVID-19 mortality by 2.9%" (Herby, Jonung, and Hanke 2022, 40).

Since the government restrictions caused virtually all the economic effects rather than the pandemic itself, it is reasonable to conclude that the government created the economic fallout by the inappropriate use of government power to attempt to mitigate the effects of a BSE. The government responses at all levels of government, while varying somewhat from place to place were more like a CPE response than an FME response. While we have no way of knowing how an FME response might have fared, it is reasonable to suggest that it could hardly have been worse than what occurred. Due to its severity, this one example seems sufficient to conclude that government taking actions likely to affect the economy in response to BSEs is unwise at best and, considering the devastation caused, bordering on criminal at worst.

Results in the Combined Domains

Combining the results of the gRPCE study from the three domains is a simple procedure. The separate chances of disrupting the economy by greater than five percent are a forty-three percent chance due to chaos, a nineteen percent due to asset bubbles and a five percent chance due to black swan events. The calculation is $(1-(1-.43)*(1-.19)*(1-.05)) = .56$ or a fifty-six percent chance that at least one of these events will create a forecasting error of greater than five percent. Forecasts that are incorrect forty-four percent of the time are not forecasts, they are guesses.

CHAPTER V: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The research results indicate that the public pressure from some quarters to move the United States government toward socialism is increasingly influencing public policy in the United States in a direction that is likely to fail. These results indicate that a centrally planned economy (CPE) cannot succeed. It does not seem possible for a CPE, planned by experts, to result in greater economic good than can be achieved by spontaneous order created by the combination of individual choices that make up the free market. While the evidence is incomplete, the early indications are that CPEs are unlikely to succeed because planning an economy requires making economic forecasts that are not and will never be sufficiently accurate due to the separate and combined effects of chaos, bubbles, and BSEs.

The introduction of this paper used the analogy of two gardens; the early evidence points to the economy being more like the weather than the environment in a greenhouse. Now that the research summarized in this paper is complete, the economy has proven to be very much like the weather. While some might dream of eventually controlling the weather, the existing evidence shows that is not now and never will be possible because there are far too many variables that will never be controllable. Since the economy has proven similar, successfully controlling the economy may also never be possible. It is of great concern that attempting to dramatically change the economy of the United States in the absence of evidence of likely success places the economy at grave risk. Placing a national economy at risk should never be considered for ideological reasons instead of economic realities.

Conclusions

The research question presented at the beginning of this paper was: Is it possible to forecast economic variables with sufficient accuracy to allow a centrally planned economy result in greater economic good than can be achieved by a free market? The preponderance of the evidence uncovered in this investigation indicates that the answer to the research question is no. The evidence shows that a centrally planned economy cannot result in greater economic good than can be achieved by spontaneous order, as is created by the combination of individual choices that make up the free market. The evidence shows that turning right at the crossroads introduced in Chapter I, would be the best course, followed by going straight ahead and lastly turning left.

This research has found that the economy is uncontrollable and that attempts to do so are more likely to do more harm than good. This study has shown that three domains, chaos, bubbles, and black swans, negatively impact attempts to control the economy. It has demonstrated that any one of these is capable of disrupting planning and control significantly and that their combined effect is such that decisions about what to do at any time to improve the economy stand a smaller of success than what flipping a coin would achieve.

Recommendations

Recommendations for Solutions in the First Domain: Chaos

In the first domain the challenge is to survive and thrive in a chaotic environment. Three of the most translated and read texts ever written give part of the answer. The Bible says, “Ship your grain across the sea; after many days you may receive a return. Invest in seven ventures, yes, in eight; you do not know what disaster may come upon the land” (Ecclesiastes 11:1-2).

Shakespeare’s Antonio in Merchant of Venice said it this way, “Believe me, no. I thank my fortune for it —, My ventures are not in one bottom trusted, Nor to one place, nor is my whole estate, Upon the fortune of this present year. Therefore, my merchandise makes me not sad” (Act 1, Scene1).

Cervantes' Sancho gave his answer as, "es parte del sabio guardarse hoy para mañana y no arriesgar todos sus huevos en una canasta" translated to, "'Tis the part of a wise man to keep himself today for tomorrow, and not venture all his eggs in one basket" (Don Quixote, 1615).

All these admonitions include the assumption that the world is chaotic place and advise, as a defense against chaos, diversification. Intentionally or not these ancient texts are advocating the advantages of a free market where economic control is diversified by spreading the decision-making across millions of producers and consumers rather than a CPE in which all the eggs are in one basket.

The second recommendation involves the idea of a middleman. The purpose of the middleman is to bring the consumer and producer together to negotiate price. This is a role that government fills poorly because rather than allowing consumer and producer to negotiate, government injects its agenda and often makes the situation worse. One of the popular criticisms of the free market today is the problem of student educational debt. This is a problem created by government intervening in the free market in education.

In the twenty-year period from 1997-98 to 2017-18 federal grant aid to college students in constant dollars more than tripled (Total Grant Aid n.d.). Reliance on federal money has the effect of removing the consumer, the student, from the producer, the educational institution. This means that consumers are constrained from negotiating the value with the producers. Setting 'fair' value is what free markets do best and what controlled markets do poorly. Separating consumer and producer tends to reduce 'smart shopping' since, in this case, the consumer is not paying the full price of the product. This has the inflationary effect of allowing prices to rise without any accompanying increase in product quality. Subsidizing costs provides an incentive for costs to rise, and McPherson and Schapiro found that, "public four-year institutions tended to raise tuition by $50 for every $100 increase in federal student aid" (2006, 1428). Educational institutions have no incentive to cut costs and the evidence indicates that the increases in costs are not devoted to improving instruction. In fact, in the past thirty years instructional spending has decreased from forty-one percent to twenty-nine percent of institutional budgets (Simon n.d.). During that same period tuition has increased eight times faster than wages (Maldonado 2018). Therefore, students thirty years ago, who could, with a little help from their families work their way through college with a part time job are now eight times less likely to be able to do so and many must rely on government aid or debt or both. Furthermore, those students thirty years ago would have had a greater percent of institutional budgets devoted to their educations.

Figure 35 shows a system dynamics model created to investigate the relationship between government aid and tuition cost. The model uses an initial tuition cost of $3360, the cost of tuition in public four-year colleges in 2018 dollars (Cost of Tuition n.d.). The maximum acceptable tuition is an assumption. Assumptions are the basis of all models, and it is essential to identify them so that the reader can question the assumptions. In this case, it seems reasonable to believe that a ten-fold increase in tuition would be the most that would be accepted.

The fraction of the limit remaining is simply the fraction of the Maximum Acceptable Tuition that remains in the Cost of Tuition at any time. When run, this model produces the results shown in Figure 36. By year 30, the 2018-19 school year, the cost of tuition has increased threefold, from $3360 to a bit over $10000. The rate of increase is calculated from the published data on tuition cost increases (Cost of Tuition n.d.). As in the system dynamics models presented earlier, the arrows indicate controls. In this model, the Cost of Tuition is directly controlled by where it began, the Initial Cost of Tuition. It is also controlled by the Cost of Tuition itself, the fraction of the limit remaining, and the Rate of Increase control The Increase in Tuition. The Maximum Acceptable Tuition controls the fraction of the limit remaining. Since the Rate of Increase is derived from inflation-adjusted dollars, the Rate of Increase is not due to inflation.

The Cost of Tuition is rising independent of inflation and as mentioned above, does not reflect an increase in spending on improving instruction.

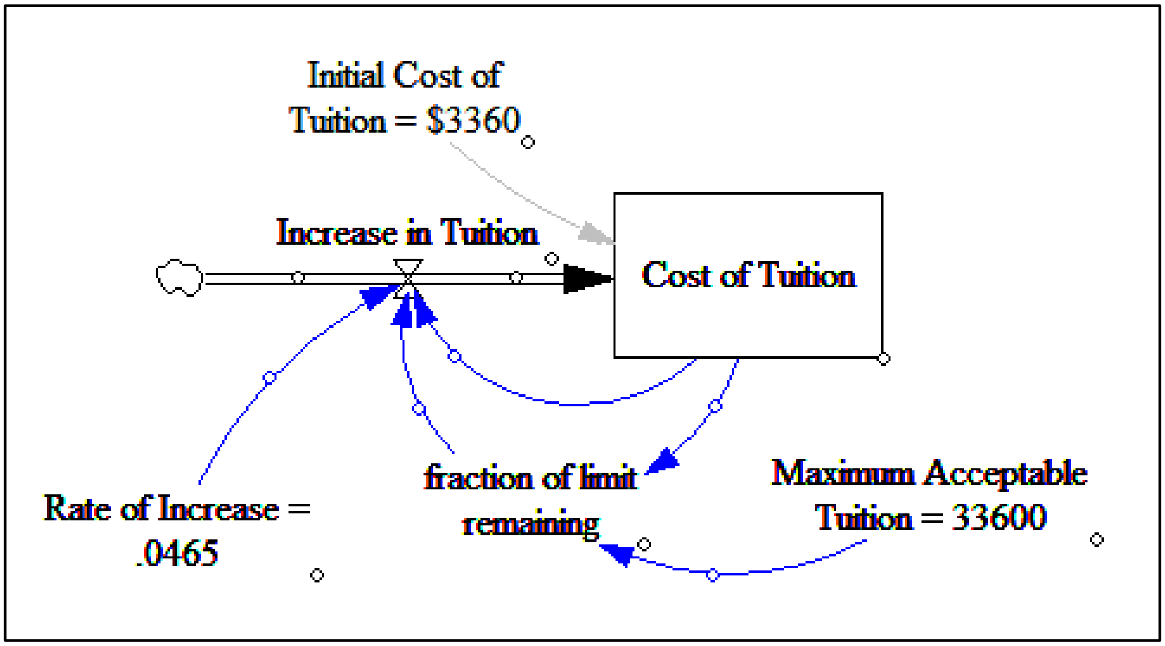


Figure 35

The best explanation for this increase is that, as described above, the increase in government aid causes the Cost of Tuition to rise. This explanation is reasonable when one considers that since students and parents are not paying the total value of the cost of education, they are more careless in choosing how best to spend the money they have available. As tuition rises, students and parents adapt to the increased cost rather than seeking lower-cost alternatives. If government aid were not available, students and parents would feel pressure to shop more carefully and make sure that every increase in the cost of education was accompanied by a corresponding increase in the quality of education received. The graph on the next page shows the rise in tuition in constant (2018) dollars as a function of time in years. Rather than increasing due to time, we would want to see rising tuition as a function of instructional quality.

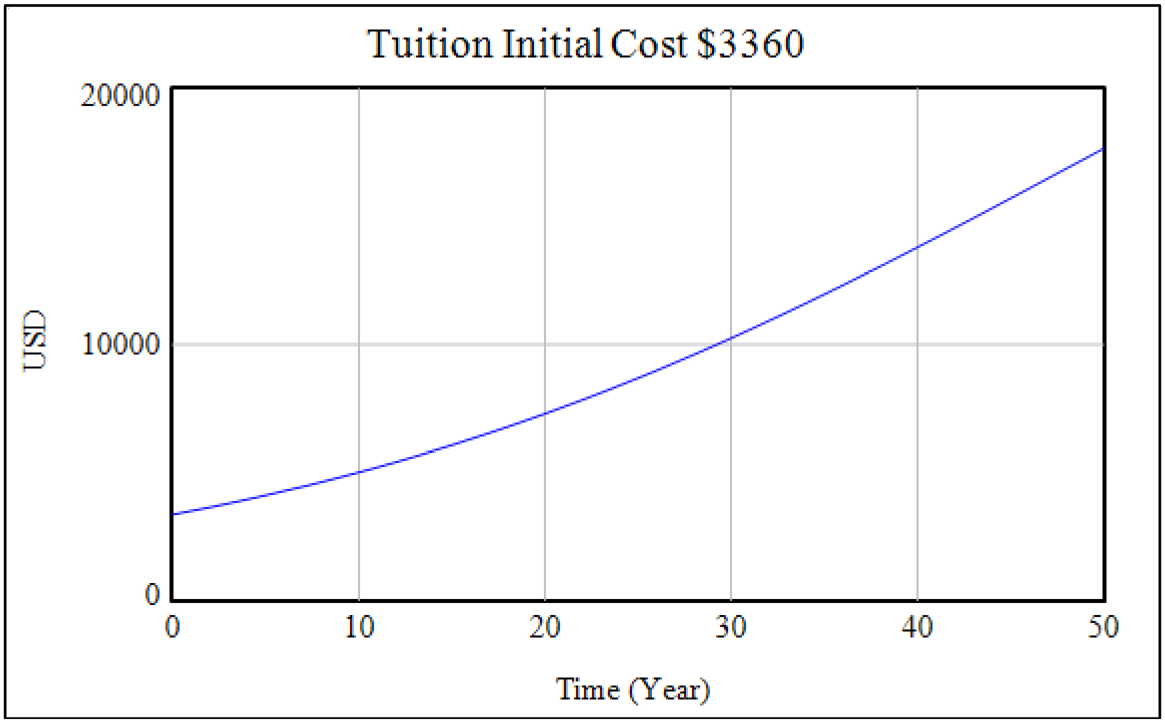


Figure 36

The structure of the model includes another assumption, that the data would best be modeled with a logistic equation. That equation is shown below in general form and then in specific form using the numbers from our model.

Cost of tuition, *C* is expressed as a function of time, *t*. C_f is the limit to the annual tuition, $3360, C_i is the initial amount of annual tuition, $3360 and *r* is the rate of increase, .0645.

$$C = \frac{C_f}{1 + \frac{C_f - C_i}{C_i} e^{-rt}} = \frac{33600}{1 + \frac{33600 - 3360}{3360} e^{-.0465t}} = \frac{33600}{1 + 9e^{-.0465t}}$$

The results of the calculations are expressed in Figure 37. The center column is the cost generated by the equation and the right-hand column is the actual data (College Board n.d.). Actual data almost never exactly matches a mathematical model because actual data tends to change inconsistantly. The mathematical model ‘smooths’ those changes. It is appearant however that the mathematical model matches the data very well.

Years Since 1989	Modeled Cost per Year	Actual Cost per Year
0	3360	3360
10	5050	5020
20	7383	7560
30	10400	10230

Figure 37

When the data in Figure 37 is graphed the result is shown in Figure 38 on the following page.

It is a severe error to interpret this model or any model as fact. A model is a possible explanation of the data based on the assumptions in the model. This model does, though, present an essential point of view in this discussion. Notice that the model contains no variable for quality of education or student life; it only contains a theoretical structure that expresses the belief that the separation of consumers and producers results in rising prices. The model indicates that this theory can accurately explain the behavior of the data without the need for any other factors. It clearly shows that the government injecting money into education could be the only factor driving up costs.

Creating a very similar model to address the rising cost of healthcare would be equally demonstrative. In healthcare, as in education, the consumer is separated from the producer by insurance companies. There is no advertising by healthcare providers seeking customers based on lower cost. The providers understand that the consumer is in no position to comparison shop for less expensive alternatives. Keeping the free market from adjusting prices based on value as measured by consumers creates imbalances in the economy that other segments of the economy must correct.

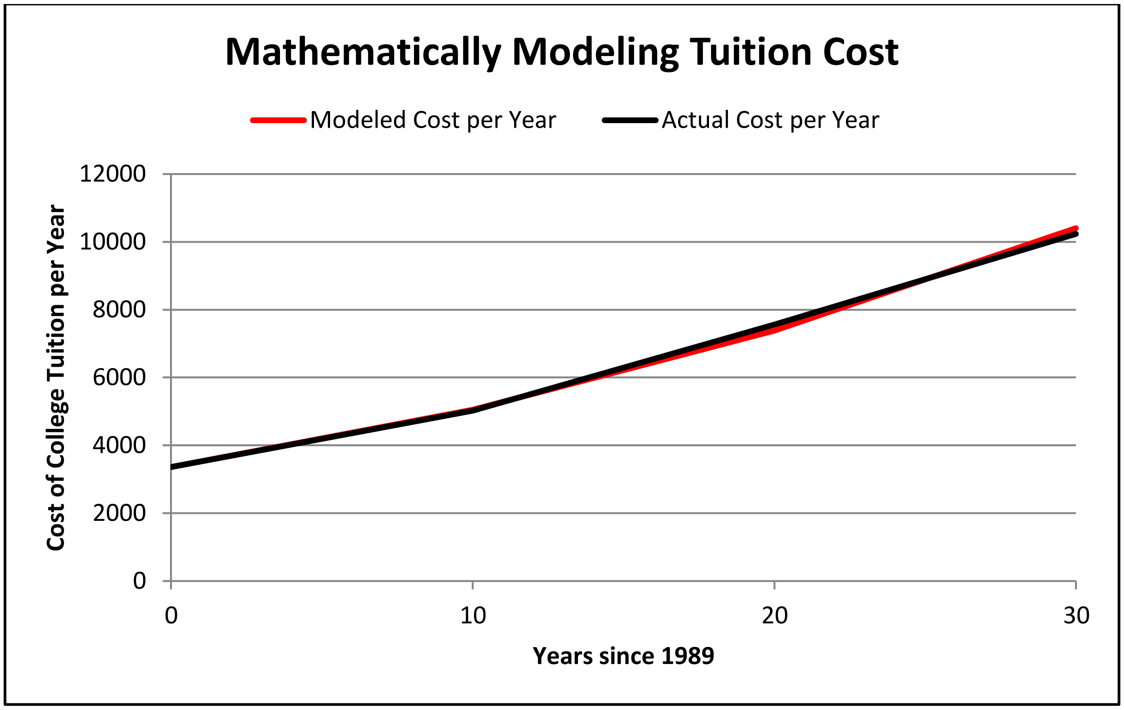


Figure 38

Therefore, the recommended solution for dealing with the chaos presented in the economy is to allow the free market do what the free market does better than any alternative, allow the negotionation of value between the consumer and the producer.

Recommendations for Solutions in the Second Domain: Bubbles

The Federal Long-term Investment Protection Tax

Since the problem of asset bubbles is not caused by 'legitimate' investing but by speculation. Speculation is driven by greed and since we will never eliminate human greed, we must find a solution directly addressing greed. The only way to eliminate the effects of greed is to eliminate the possibility of profiting from that greed. A scaled capital gain tax that favors long-term investment over speculation would be an excellent way to do that. One solution might be a new tax law called the Federal Long-term Investment Protection Tax or F.L.I.P. Tax. This FLIP tax introduces ample protection for long-term investing and a severe tax penalty for 'flipping' an asset. In addition, this new tax law would require reporting any investment asset trade or sale, including the date of purchase and purchase price of the asset and the date of sale and the asset's selling price. Then the profit from the sale, if any, would be taxed on a sliding scale.

A possible formula for the tax could be $T = .75^t$, where T is the amount of tax to be paid on the sale and t is the amount of time elapsed between the purchase and the sale of the asset. Figure 39 is a graph of the function.

With this tax system, holding an asset for less than four years puts the tax rate above the highest marginal rate for ordinary income under current tax law. The asset would have to be held for between six and a half and seven and a half years to get to the rates that current tax law allows after one year. After seven and a half years, the rate continues to descend until, at thirty years, it is essentially zero. There are three tangible benefits of this plan:

1. It provides a massive disincentive to 'flip' an asset. This tax would have the effect of dramatically reducing if not eliminating speculation. Engaging in a highly leveraged and speculative investment would create an even more significant disincentive since the tax raises the risk-reward ratio beyond acceptable levels.
2. It has the benefit of significantly increasing the rewards for the long-term investor. Rewarding the long-term investor is essential because of its positive effects on the national economy and its guarantee, to the investor, of greater rewards. It also would benefit the average homeowner by making the sale of a home held for a longer term or by applying the proceeds of sale from one home to another home as is allowed by current tax law, to have the profit from the ultimate sale tax-free.
3. The only way to eliminate market crashes is to eliminate the booms or bubbles.
   If this tax reduces speculation to the expected extent, it will soften or eliminate asset bubbles.

Some might worry that the tax early on is excessive; they might be concerned about the need to sell an asset in case of an emergency. However, this is not a cause for concern since the principal of the investment remains whole; the investor can get their money back at any point since only the profit is taxed.

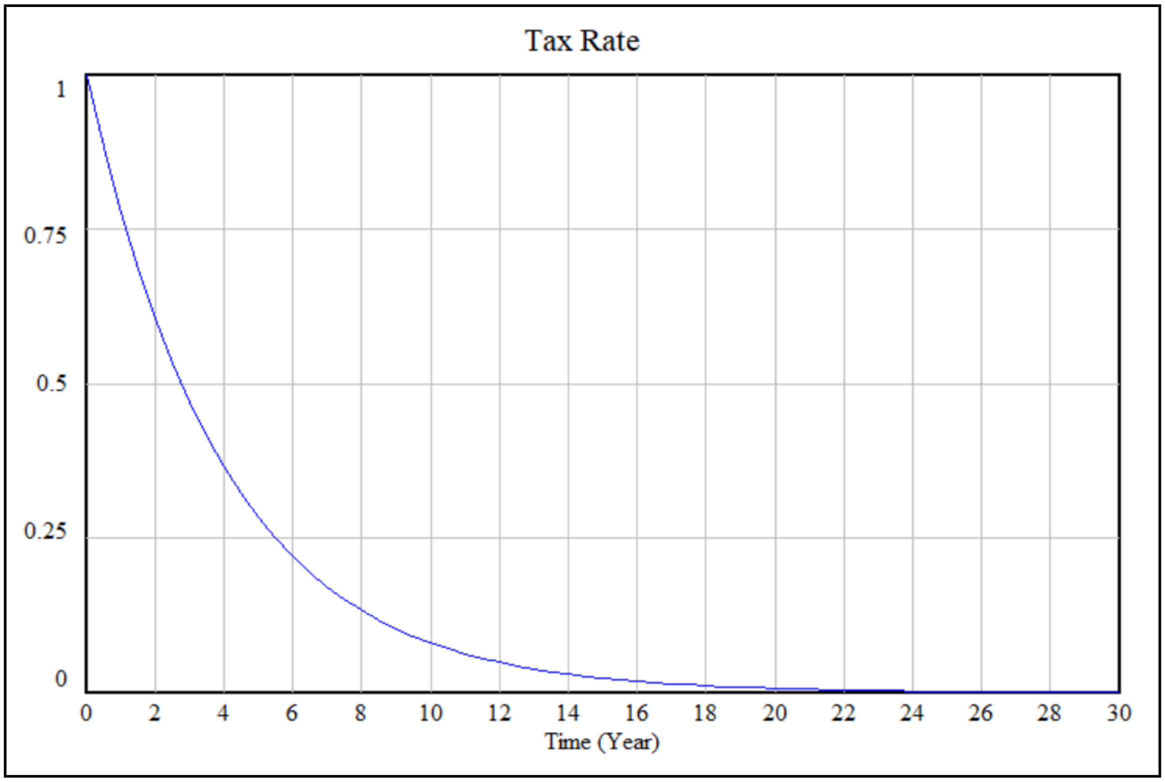


Figure 39

Figures 40 and 41 below show how the investment would play out over ten and thirty years, assuming a seven percent growth rate, compared with that same investment with no tax. After about fifteen years, the tax has essentially no effect on the value. Figure 41 shows more clearly the earlier part of the curves. As we zoom in, we can better see the disincentives of flipping an asset.

So, the Federal Long-term Investment Protection Tax is a possible solution to the problem of bubbles that effectively shifts policy from monetary policy to fiscal policy and does so in ways that benefit the economy as a whole and the individual long-term investor. The shift from monetary policy to fiscal policy is also more democratic than current regulatory methods because it transfers the policy from the hands of unelected, unresponsive regulators to the people's elected representatives.

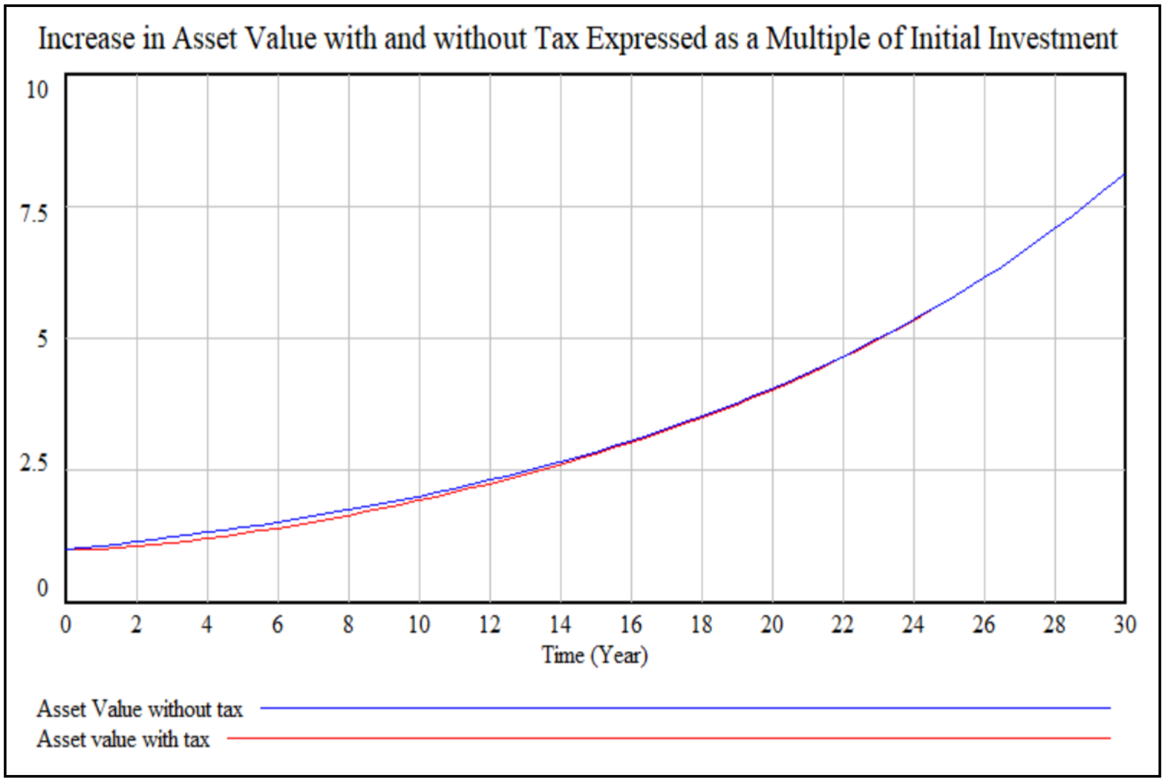


Figure 40

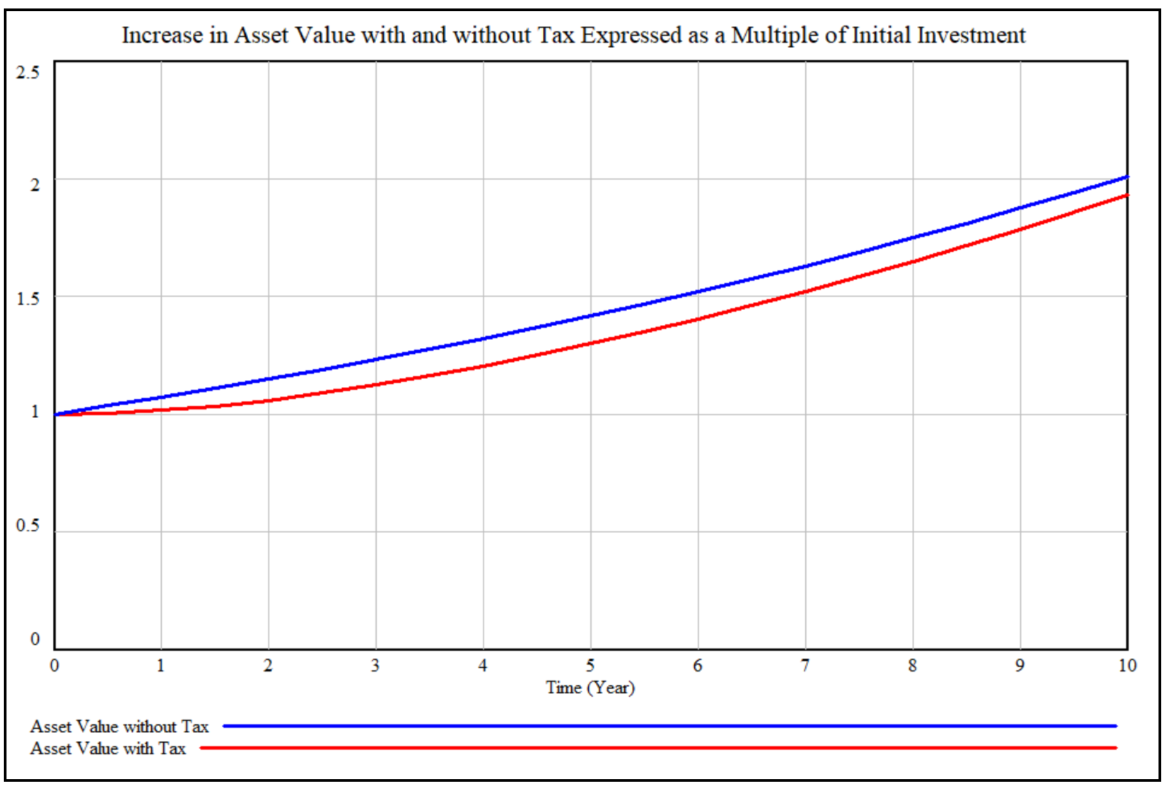


Figure 41

Recommendations for Solutions in the Third Domain: Black Swans

Humanity has been dealing with black swan events throughout its history. However, it has never approached BSEs by trying to forecast them since humanity has recognized that they cannot be forecast. Instead, humanity always has dealt with them by preparing for the worst. The first efforts involved storing up food and supplies for times of drought or disaster. Later, wise folks created 'rainy day' funds so that the resources to deal with them would be available when disaster struck. Today, many people prepare for disaster by stockpiling food; the LDS church suggests its members store a one-year supply. In addition, many people have bugout bags, backpacks loaded with at least three days of provisions, ready to go in case of an emergency.

The most common modern preparation for black swan events is insurance. Most people have car insurance, health insurance, life insurance, and home insurance, all held in preparation for unexpected events. Of course, it is not practical for the government to purchase insurance, but it is feasible for the government to self-insure. For example, instead of borrowing to help the citizens in a pandemic, the government could create a special fund consuming five percent of the annual budget until at least six months of annual expenditures are acquired. Then the government, like its citizens, would benefit both from the additional security and from receiving interest on its savings. The government should prepare for disaster in much the same way its citizens do, including helping individuals plan for disaster. One way to do this would be to eliminate income tax on funds held in savings up to the account holder's annual income. Taking steps to prepare the government to mitigate the effects of a BSE might include the government doing what its more prepared citizens do, avoiding debt, living within its means, and having plans for unlikely emergencies. Government economic policy regarding BSEs should be an enhanced version of the Federal Emergency Management Agency (FEMA) rather than the

Federal Reserve managing the economic fallout. That is what the citizens do; government should heed their wisdom.

Final Words

The free market and true capitalism are almost miraculous in that they can order an economy with no direction. It is reminiscent of how the human body or any complex organism functions. In complex living organisms, the conscious mind, much like government, is incapable of regulating the mechanisms that allow the organism to flourish. Instead, the cells in an organism, much like the citizens in a national economy, act in their own best interest and do what they must so that they can live, grow, and reproduce. Occasionally, the process goes wrong, as in cancer, when cells pursuing their own best interest produce an undesirable result for the organism. This is when conscious effort, in the form of treatment is required to control rogue cells pursuing their own best interests as in corruption. That is similar to a legitimate role of government in the economy. However, the body and the free market both work incredibly well for the most part. One could ask if the organism would be better off under conscious control but imagine extra brainpower that would be required to manage the thirty-seven trillion cells in the human body directly; if one could consciously direct one cell every second, it would take one million one hundred forty-seven thousand years to give every cell just the first command.

This drive to pursue their best interests, by what some think of as subordinate entities, like cells in the body or producers and consumers in an economy, is the reason there is always a flourishing black market in countries that have tried CPEs. These black markets are the ultimate proof that CPEs are not what the citizens of a country want or need. Producers and consumers want to be free to negotiate value and pursue their best interests in the manner that only free-market capitalism provides.

The free market and true, uncorrupted capitalism are almost miraculous in that the spontaneous order created by the combination of individual choices that make up the free market can order an economy with no organized direction and can do so in the best interests of the citizenry. No other economic system has ever provided greater good to more people.

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