Regulatory Arbitrage and the Development of a “Nimbosian” Regulatory Architecture

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ABSTRACT:

Current regulatory policy is steeped in the political economy of the 1950's. Using the tools of the behavioral revolution in social science, regulatory policy has a specific view of the relationship between government and business. Namely that regulatory processes are fundamentally linear relationships that can be modeled using attributes of the agencies and those they regulate. However, this is not always the case. Policy makers are increasingly confronting issues that display non-linear dynamics. Hybrid warfare, systemic financial risk, and terrorism are only a couple of the policy issues that necessitate a new method to model the increasingly complex relationships between the agencies, individuals, and institutions they regulate and the organizations that participate in the process of "regulatory arbitrage". Until very recently these interactions could only be modeled with great difficulty due to the vast amounts of data needed.

Current regulatory policy debates have become stale. Focusing on the amount or even the necessity of regulation. What is needed is a fresh approach that refocuses regulatory policy so that it is more adaptable and flexible. Able to better deal with the volume, velocity and variety of change that occurs in today’s marketplace as companies seek to innovate.

This paper proposes a regulatory architecture that considers advances in agent based modeling and uses complexity theory as the basis for regulatory policy. In this theory, each regulation has a collection of connections that composes a network that functions as a complex adaptive system. The dynamics of this system can be modeled based on the regulatory arbitrage that occurs as actors interact with the system. The resulting structure of the network is constantly

changing; displaying emergent behavior. The key to understanding this new system lies in the balancing and quantifying of the "risk shifting" that takes place as a by-product of regulatory arbitrage as the actors engage in the system. Modeling these interactions takes the form of a three by three pay off matrix. These matrices create a risk profile for the regulation that can measured in terms of a fitness landscape. The key to balancing and quantifying systemic risk lies in the realization that there are multiple possible Nash equilibria that exist in a “band of risk”; some positive and some negative with respect to systemic risk. This paper details a theoretical model that explicates what this new regulatory architecture would entail.

Introduction

Current regulatory policy is steeped in the political economy of the 1950's. Using the tools of the behavioral revolution in social science, regulatory policy has a specific view of the relationship between government and business. Namely that regulatory processes are fundamentally linear relationships that can be modeled between agencies and those they regulate. However, this is not always the case. Policy makers are increasingly confronting issues that display non-linear dynamics. Hybrid warfare, systemic financial risk, and terrorism are only a couple of the policy issues that necessitate a new method to model the increasingly complex relationships between the agencies, individuals and institutions they regulate and the organizations that participate in the process of "regulatory arbitrage".

Regulatory arbitrage is the practice of shifting the regulatory burden for compliance actions to actors other than the company, organization et al. Companies, be they in finance, transportation or hospitality constantly engage in a game of regulatory arbitrage based on “risk shifting” designed to maximize benefits and minimize costs.

This multilevel game of incomplete information is expressed in government’s attempt to balance “systemic risk” while companies attempt to exploit so called “loopholes” in regulatory policy as they seek to innovate. Regulatory arbitrage is therefore among the byproducts of company’s efforts to innovate. Until very recently the interactions between the actors in engaged in this game theoretic construct could only be modeled with great difficulty. This is due to two factors: the vast amounts of data needed and the speed in which the analysis needs to be conducted to detect patterns which threaten system stability.

The Paradox of Regulatory Arbitrage

Considering the effect of regulatory arbitrage is a key component in any regulatory policy model as it systematizes the "shifting of risk" from the company to the larger society. In practice, this is not unlike the "rent seeking behavior" of firms seeking the lowest tax burden jurisdictions for their factories during the industrial era. However, current risk shifting is qualitatively different than it was in the industrial era in terms of the volume, velocity and variety of risk shift taking place. This will be covered in the next section of this paper. First, we must briefly consider regulatory policy making in the industrial era.

In the industrial era, this risk shifting through rent seeking behavior was primarily geographical as companies sought out the lowest capital and labor costs. In terms of regulatory policy, cities were seen to be in competition for jobs and regulatory policies should reflect the types of industries they want to attract. Though radically different in terms of outlook the work first of Dahl (1961) and later Peterson (1981) and Domhoff 1990 advocates the position that governments are in competition with each other. I would extend this framework to include both sub national (i.e. state or provincial) and even national governments. Globalization has only exacerbated these trends as manufacturing and even service sector jobs have moved from developed to developing countries in search of reduced labor costs and increased productivity.

This "competitive model" has also applied to public good provision. One prominent example of this is the Tiebout hypothesis[1]. In this theory consumers "vote with their feet" as they seek the public goods (i.e. schools, parks, roads etc) that were best for them. In this way, it was thought that the optimal level of public goods would be provided as consumers "sorted" themselves according to their needs.

The key, in terms of regulatory policy then, was to get "consumer voters" to

1) "…reveal their preferences"
2) "Satisfy them in the same manner as in the private marketplace" and
3) "Tax [them]accordingly"

(Tiebout 1956, p. 418-419)

Fundamental to this model is the belief that the "costs of additional services are constant" and that "a doubling of the population requires a doubling of the services required". (Tiebout 1956, p. 421) Stated another way, there is a linear relationship between cost of services and provision of those services. Knowing this, city officials design policy in terms of enticing businesses and people to relocate to their municipality through the services they provide.

Another model that is often cited regarding regulatory policy is the "regime model" popularized by Clarence Stone in "Regime Politics". In this model, local business and political elites worked together to produce a regulatory system that allowed companies and consumers to benefit

[1] For more information about the Tiebout Hypothesis please see the link https://www.unc.edu/~fbaum/teaching/PLSC541_Fall08/tiebout_1956.pdf which contains the original article by Charles Tiebout.

through the building of coalitions he termed “regimes” (Stone, 1993, 14-18). Stone’s emphasis here is not just on the actors themselves but on their interactions over time.

What each of these models has in common is that they see regulatory policy making as a linear albeit complex process. Together, these authors provide powerful tools to explain regulatory policy making in the industrial era.

Regulatory Policy and the “Antenimbosian Dilemma”[2]

Given the large amount of scholarship and the large amount of empirical evidence, why has regulatory policy progressively floundered when it comes to contemporary challenges such as systemic financial risk or terrorism? Why are regulator’s and their agencies so behind the curve? One reason is that the political economy of regulatory policy has struggled and in many ways failed to adapt to the disruptive impact arising from technological change. As our world moves from an analog to a digital basis for everything from manufacturing to governing, we need new tools to understand both the economics and politics of this new digital era.

There are few places where this is more important than regulatory policy. Despite repeated failures (i.e. the Financial Crisis of 2008, Use of social media in planning and recruitment by terrorist organizations) current regulatory policy frameworks have failed to adapt to a new reality. Regulators and the agencies they work for face an Antenimbosian Dilemma. How to use

[2] The “Antenimbosian Dilemma” is a term of art that was first coined by author Jaron Lanier in his 2013 book “Who owns the Future”. He uses the term “Antenimbosian” to describe the era before the advent of large scale use of cloud computing. I have appropriated this term to describe current regulatory policy’s dilemma of trying to hold on to established regulatory frameworks while having to deal with disruptive forces brought on by the large-scale use of cloud based systems in economic and political arenas. Three such examples include high frequency trading, the use of Facebook and YouTube in various political movements including the Arab Spring, and Euromaidan and social media use by terrorist organizations such as Daesh (more commonly referred to as ISIS in the Western European and North American Media outlets)

so called “legacy” systems of regulatory compliance, to borrow a term from information control technology, when confronting contemporary challenges.

This dilemma is both an *ontological* and a *technical* one.

Ontologically, regulators are faced with issues that require qualitatively different responses than those of the 1950’s when most contemporary regulatory policy was developed. This is true in terms of the analysis that needs to be conducted. Moreover, it is true in terms of the framework that needs to be adopted to understand the nature of these new digital risks. As denoted in the previous section of this paper, risk shifting regularly occurs as a by-product of the regulatory arbitrage companies engage in as they seek to optimize their risk profiles vis a vie their competitors and the larger economy. If left unchecked this behavior has potentially destabilizing impacts on the larger economy as happened in the great recession of 2008. Where the risk profiles of various companies became unsustainable due to their overleveraged positions in terms of Collateralized Debt Obligations which led to a crisis in the credit markets.

Addressing these issues, governments pass legislation and use regulations to control or minimize this risk. However, companies regularly find innovative ways to circumvent or by pass these regulations all together. Even when complying with these regulations individuals and organizations find innovative ways to shift that risk onto other parties or the larger economy. Given that this cycle is recursive why don’t governments develop ways to address the issues proactively? Anticipating issues before they become threats to the system.

One reason government’s actions often don’t anticipate individuals’ or organizations’ actions is that regulations are a response to public demands for action. This cycle of demand and action operates in a “linear” fashion. The traditional issue attention cycle first enunciated by Anthony Downs is illustrative of this fact. The figure below reveals how the public’s, and, in many ways government’s, attention progresses in a linear fashion from a pre-problem phase to a post problem phase.

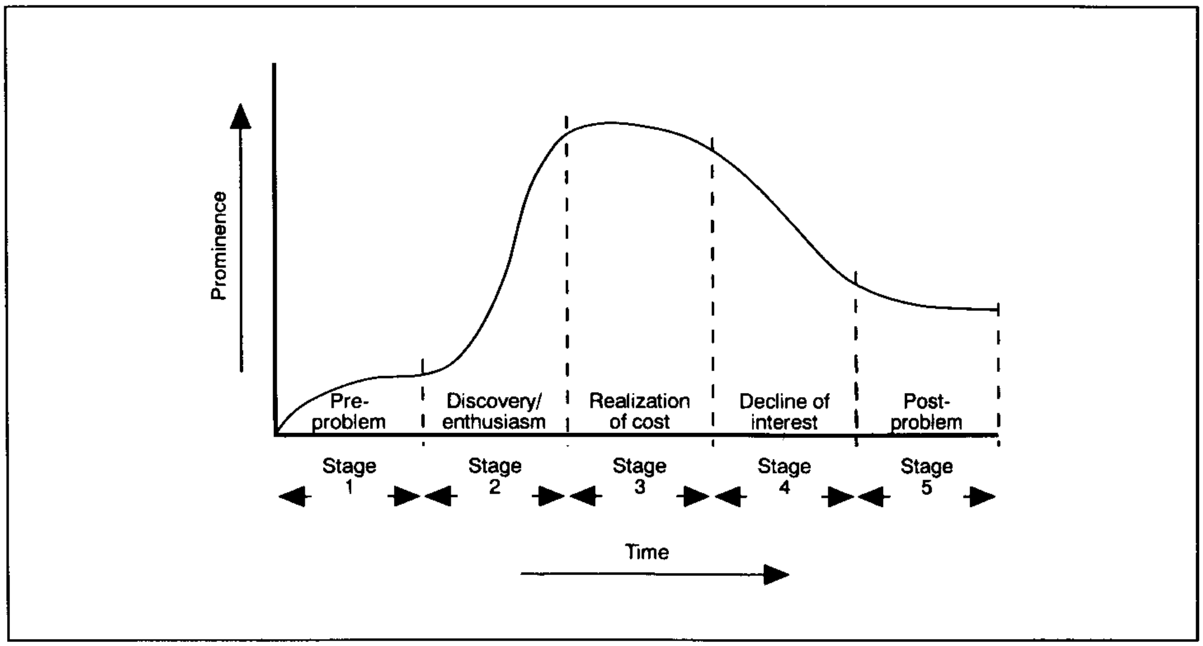

Figure 1: Taken from *Social Movements* Staggenborg, S. Oxford University Press, 2008, p. 106

There are other depictions of this cycle that are circular and recursive but the result is the same. Government action is reactive not proactive. Like general’s fighting the last war, regulatory policy is often behind the curve in addressing changes in practice by those under their authority.

One reason this occurs is that regulators and often regulatory policy is also seen in terms of linear dynamics. This must change. Moreover, policy makers need to change their analytic perspective to one that sees that in practice, regulatory arbitrage displays characteristics of non-linear systems, especially that of emergent behavior. Stated another way, regulatory policy is in fact a complex adaptive system. Where there are many interacting parts, that respond to feedback and change their strategy to adapt to their environment. Once regulators and regulatory policy makes the ontological leap from viewing regulatory arbitrage as a linear to a non-linear, indeed complex behavior, regulators and regulatory policy will be able to better adapt to contemporary threats to the system.

Technically, the Antenimbosian Dilemma has more to do with developing a system to model and track regulatory arbitrage in the digital age we have created. This begins also with a change in mindset. At least initially. Whereas regulatory arbitrage used to be primarily geographical. That is a company, be it service related or a manufacturer, threatens to move to another city or even another country if concessions are not given. Now it is also temporal.

Previously risk shifting often occurred over a long period. Sometimes it took years or months. Now, depending on the issue, such as the financial crisis of 2008, risks that endanger the entire system can occur in weeks or even days.

The key point here is that regulatory arbitrage has changed in three important ways that are challenging technically:

1) The variety of ways risk shifting occurs
2) The volume of risk shifting that occurs and
3) The velocity with which risk shifting occurs.

Furthermore, impacts from regulatory arbitrage in the digital era can have significant impacts not just in the short term but also in the long term. Uber presents an apt example of this regulatory arbitrage through risk shifting. As a part of its contract Uber requires car insurance from each of its drivers before they can work for the company. Uber does not pay the liability claims as other commercial transportation companies do. When the individual Uber driver is involved in an accident or other civil infraction the driver pays the fine and their insurance bears the costs of the repairs and increased premiums to their policies.

Over time, these accidents are included in the actuarial models of insurance companies that determine the rates of policy holders in a larger area. This produces increased insurances rates for all citizens regardless of their employment status with Uber thus shifting the risk of liability for these actions from Uber to the larger society. This gives Uber an advantage in terms of costs effectively providing Uber a subsidy which is used in setting prices below that of their competitors. This risk shifting also has the benefit of not having to adhere to various regulations that other companies such as taxi cab companies must comply with currently. This represents an indirect governmental subsidy which should be included in any calculation of their actual benefit to any geographic area.

This type of regulatory arbitrage represents a type of rent seeking behavior which leads to distortion of the market based mechanism of risk/reward in term of assessing risk to system sustainability. Moreover, current regulatory policy sees this type of “regulatory arbitrage” as a zero-sum game with government in the role of preventing or moderating “systemic risk” in terms of approaching a single equilibrium point as denoted by the work of Nash. As a result, governmental approaches to regulatory arbitrage have been routinely “behind the curve” as they seek to moderate systemic risk.

The key issue here lies *not* in eliminating systemic risk but in balancing or "optimizing" risk for each system.

In practice, there is not one but many Nash equilibria. Some positive, some negative to systemic risk. The fluctuations of the stock market are emblematic of this phenomenon. Where market capitalization and other financial fundamentals do not in practice determine equity valuation as those engaged in trading take positions both long and short based largely on algorithmic trading models.

In practice, any complex adaptive system contains "optimization principles" (West, 2017, 115) that can be found and used to achieve this balance but until recently they were hidden due to a lack of data and the ability to model the effect of systemic risk in real time. Thus, the key to equilibria lies not in suppressing risk but in allowing it to flow in ways that allow the system itself to grow and contract in a more stable manner.

The paradox of regulatory arbitrage is that risk shifting should not be eliminated from the system but rather should be made the fundamental organizing principle of the system itself.

This issue will be the subject of the next section.

Addressing the Paradox of Regulatory Arbitrage: Developing a "Nimbosian" Regulatory Architecture

By how would you model this type of non-linear, even complex behavior? A first step is to change the assumptions upon which a system is modeled. As stated in the previous section current models are based primarily on linear dynamics which assume a zero-sum model. However, ones based on complex adaptive systems require a different set of assumptions.

One of the fundamental assumptions of a complex adaptive system is that market behavior is based not on the sum of the actions of the actors but on their interactions. The market displays emergent behavior in which market actions can't be traced to a single actor. In practice, the whole is more than sum of these individual's actions. Stated another way, individual utility maximization in terms of rational self-interest is not the best model for a complex adaptive system.

A better model is one borrowed from physics. Specifically, a phase transition model is better suited to a complex adaptive system. In this model, the same quantity can exist in different forms depending on underlying conditions. For example, water can exist in three forms physically; a solid, a liquid and a gas and yet is still chemically the same.

The idea here is to find that quantity which can exist in different forms but remains the same depending on underlying conditions. This quantity can then be used to model the effects of the regulatory policy. The key in terms of application is finding the point at which the phase transition occurs.

This paper proposes that the quantity that stays the same for regulatory policy is data. Whatever level, mico, meso or macro, data is used to make decisions. This data can exist in three forms. At the base level, all regulatory activity can be recorded in terms of data. Trades made, commodities bought and sold. The next form of data is information. Information is data that has a context. Trades made at a specific time and with certain market conditions. The percentage of a zip code living at or below the poverty level. These are both pieces of information. The third form of data is evidence. Evidence is data which has a context and influences decision making. Decreases in infant mortality due to income support for single unwed mothers is a piece of evidence that could be used to determine if a health program is having the desired effect.

In each case data was the quantity collected and analyzed yet remains fundamentally the same in each instance. Data records if and where and when the trade occurred or the funds were dispersed and what was the policy output and policy outcome.

Once the quantity had been selected there needs also be a way to measure the impact of this quantity to detect where the phase transition occurs. In physical terms phase transitions are measured in terms of heat exchange in the form of temperature. As the temperature changes the distance between water molecules changes as well. The lower the temperature, the less active and closer together the water molecules are to each other. The higher the temperature the more active the water molecules and the farther apart they become given the same atmospheric pressure.

In terms of regulatory arbitrage the measure to be used is risk. The main idea of this new model is to assess the interactions of individuals and organizations in terms of their effect on systemic risk. There are three phases in this new model based on the interactions of the actors. Actions that decrease systemic risk, actions that leave risk the same and actions that increase risk. The crucial point to be discovered in this new model is the phase transition points in which each of these states occur. However, since the effects of this model are not linear two important additional phenomena are also present.

The first deals with what are termed “network effects”. Network effects describes how a system responds to growth induced changes. These effects can be either positive or negative. Furthermore, these can make the system larger in some areas and at the same time make it smaller in other areas. Counterintuitively, positive effects can make the system smaller whereas negative effects can make the system bigger. The key point here is that network effects represent more than mere orthogonality, they represent multilevel interdependence.

In practice, this means that the topology of systemic risk is unlike the current model of systemic risk. Current regulatory policy sees systemic risk as a linear phenomenon expressed in terms of a Nash equilibria. This theory proposes a different perspective based on that of complexity theory. In this theory, there is not one but multiple possible Nash equilibria that exist in a “band of risk” that is sustainable over time; some of which are positive, some negative. This allows the actors in the system more flexibility to assess systemic risk and act accordingly since they often know the “loopholes” before regulatory actors do.

This new regulatory policy system also sees equilibria as a dynamic not a static state. Thus, Nash equilibria are not one dimensional but multidimensional.

Multidimensional Equilibria and the Presence of “Fitness Landscapes”: Tracking Regulatory Arbitrage in a “Nimbosian” Regulatory Architecture

The presence of multi-dimensional equilibria (ME) has important implications for regulatory policy. Among the most important questions include: What is the nature of multidimensional equilibria? What do they look like and how do they interact?

A key initial consideration is that the presence of ME necessitates a broadening of our conception of two important facets of regulatory systems: 1) the structure of regulatory networks 2) the interactions present in these networks.

Explicating the structure of regulatory networks in the presence of ME requires rethinking the nature of these networks morphologically, that is structurally. A useful concept in this regard comes from biology. Specifically, the morphological species concept is an interesting application where the morphology of a species is determined by its phenotype not genotype. Stated another way, networks can be classified by their function (i.e. regulatory arbitrage) and not just their form. This more functional approach can link together heretofore unrecognized connections and thus change perception of which actors are involved and what activity characterizes the network.

The work of complexity theorist Stuart Kauffman is helpful in this regard. Specifically, Kauffman's work discusses the role of self-organization and co-evolution in determining the structure of a network which is a part of a complex adaptive system. Using Kauffman's theory Serena Chan makes a significant point to keep in mind and that is "There is no separation between the complex adaptive system and its environment" (Chan, S. 2001). In other words, the system, in this case the financial system, is also connection to other systems such as the regulatory system. In this way change in a CAS occurs in terms not just of evolution but "co-evolution" as a CAS adapts to other systems. Stated another way, equilibrium in a CAS is not unidimensional, it is multidimensional.

Given this phenomenon how do you model ME? One possibility is to use a genetic algorithm to track changes in ME in terms of risk shifting in regulatory arbitrage. Another method is to track the co-evolution of a system and its environment in terms of a characteristic common to all actors in the system.

Two characteristics play important roles in terms of the new proposed system:

1) Initial Conditions
2) Fitness Landscapes

Complex adaptive systems are significantly affected by their initial conditions. The work of Lorentz revealed that small changes in the initial conditions of a complex system such as meteorological systems produced profound changes that were not linear in character. Decades of research by Lorentz and others has shown that this phenomenon occurs in virtually all CAS (Chan, S. 2001, pp. 4-5). Thus, a first step in creating the new system would be to research what are the initial conditions upon which the new system would be created.

This could be done using two methods. A network map or sociogram of an existing regulation would need to be created. A network map of a proposed regulation would need to be created using an agreed upon set of initial conditions.

How would this map would work in practice? This is one application of fitness landscapes.

Fitness landscapes are “an array of all possible survival strategies” available to a CAS (Chan 2001. p. 4). In these landscapes, there are a range of values that lead to so called optimal (in terms of system performance) or maximal performance. Specifically, there are two types of optima; local and global. Local optima refer to performance that is incrementally better given initial conditions. Global optima refer to maximum possible performance. Please see figure 2 below for a visualization of a fitness landscape.

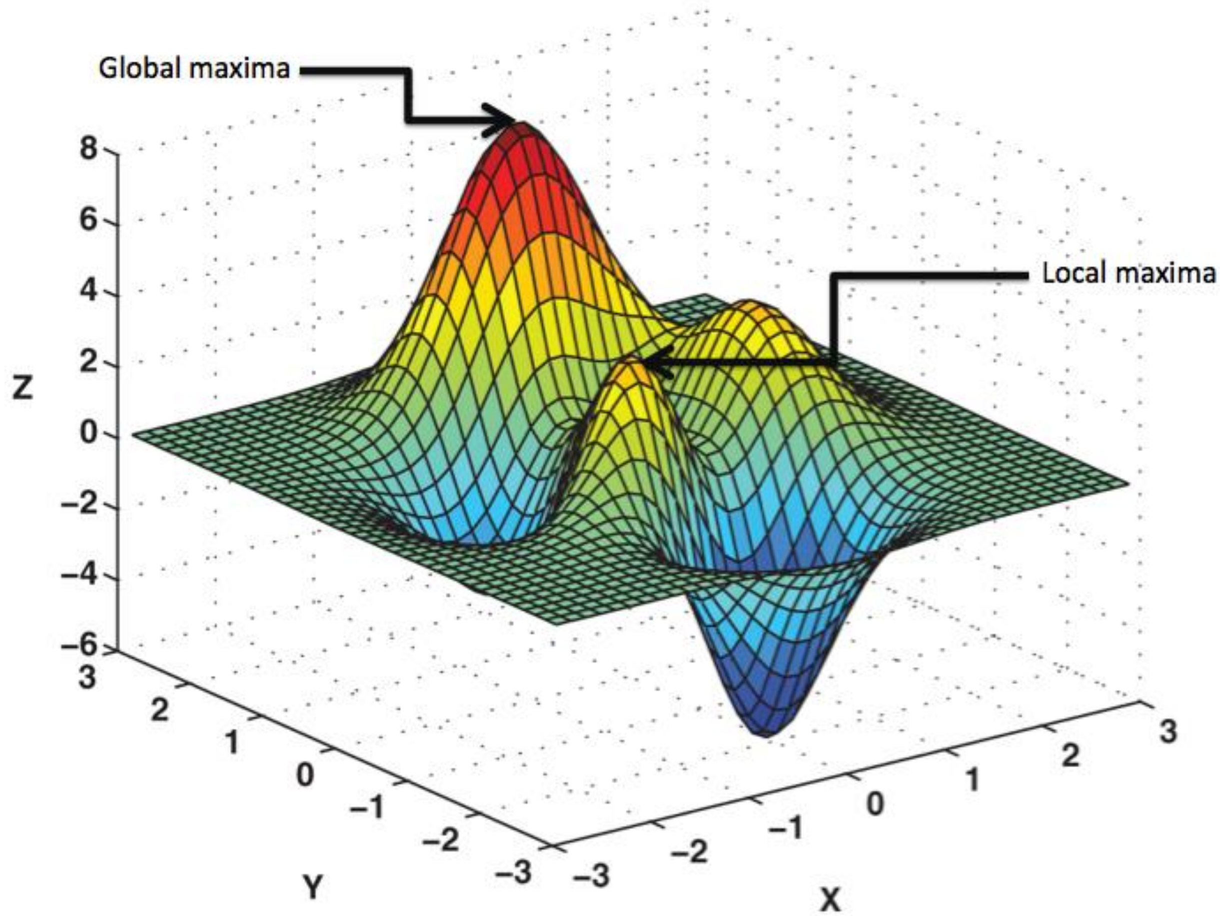

Figure 2 An example of a fitness landscape used in computational finance. Graphic produced by Turning Finance and found at http://www.turingfinance.com/fitness-landscape-analysis-for-computational-finance/ (Accessed on 6/10/17)

These fitness landscapes are multidimensional and have been applied to various subjects ranging from biology to computational finance. This paper proposes applying them to regulatory policy.

There an array of possible survival strategies for each regulation which represents its fitness landscape. These possible “survival strategies” are analogous to the optimization principles mentioned in a previous section. Further, these optimization principles are analogous to the multiple equilibria posited as a model based on a “Nimbosian” regulatory arbitrage. Finally, these survival strategies are important in that they are “self-organized”. The result of interactions not controlled or directed by either governments or markets.[3]

Measuring Fitness Landscapes Through the Creation of Risk Profiles

How would you measure these fitness landscapes? By creating a risk profile for each regulation that functionally serves as its fitness landscape. In this fitness landscape, there are “multiple possible survival strategies” that are analogous to the multidimensional equilibria (ME) posited in the previous section. These ME represent a risk profile that is sustainable overtime but is not linear in character. There is no fixed point at which equilibrium must be maintained. Instead there is a “band of risk” within which the system can operate.

These ME are determined not by a governmental entity but by the self-organized behavior emerging from the interactions between the actors. In practice, interactions are occurring in real time so balancing of systemic risk is like that of a pressure cooker. Pressure inside the cooker allows faster than normal cooking at a given temperature due to increased pressure but this is regulated with a valve that lets out steam to maintain optimal pressure.

So where does regulatory policy play a role? It sets the initial conditions based on the risk profiles determined by analysis of the patterns of regulatory arbitrage measured in the pattern of

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[3] For more information on fitness landscapes and optimization problems see the work of Kauffman and Lorentz

risk shifting occurring in the market. Systemic risk is thus maintained in an optimal band using a regulatory policy system designed not to eliminate risk but to use it to optimize performance.

But what about those actors whose actions are outside of the fitness landscape? This is where the concept of local and global maxima come into play. If the actors wish to take greater risk then they must pay a premium that covers the "downside" of the risk. This will be returned to them if the risk does not occur but will be retained if it does. Thus, over time, it is posited that those actors pursuing local optima (maxima in this case) will have more sustainable returns just as experienced trader's whose Sharpe ratios are "significantly higher than the broader market".[4]

Decades of research has shown that optimal performance requires innovation and that all innovation requires risk. The question is what is the optimal level of risk. Too much and the system overheats as in the financial crisis beginning in late 2007 to 2008. Too little risk and there is economic stagnation as in the recessions of the 1990's in Japan. The crucial point is to identify the phase transition points from too little, to optimal to unsustainable risk in terms of the interactions of the actors in the network.

As stated in a previous section, regulatory policy needs to be refocused so that instead of trying to suppress or eliminate risk shifting this should be made the basis of the evaluation of systemic risk. Every company engages in the practice of risk shifting as it seeks to innovate so regulatory arbitrage is a natural byproduct of the system itself. Measuring this risk is daunting to say the least.

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[4] The Sharpe Ratio is a measure of performance per unit of risk taken as applied to traders and asset managers. For more information on the use of Sharpe ratios in risk arbitrage see the work of John Coates and Lionel Page.

This is a herculean task for at least two reasons:

1) The volume, velocity and variety of data being created each day in the economies of the developed and developing world
2) The need to analyze this data in or near real time.

Focusing on the creation of risk profiles based on fitness landscapes makes this task more tractable. How will these risk profiles be created? This paper proposes using a 3x3 payoff matrix in which each actor's actions are reflected in terms of how they contribute to systemic risk.

	Increase Risk	Leave Risk the Same	Decrease Risk
Compliance			
Partial Compliance			
Non-Compliance			

Each action will be coded based on its effect on systemic risk. "1" for increasing risk, "0" for leaving risk the same and "-1" for decreasing risk. This payoff matrix will be feed into an algorithm that computes the effect of actions on systemic risk. This creates a possibility of 9 different outcomes.

Using this payoff matrix, a "risk profile" can be created for each actor involved in the market. Using these risk profiles a model of the interactions of the actors can be developed to establish the levels of systemic risk present in the system.

But how can you process all these interactions? The computing power alone needed to process even a small amount of them would be enormous. Until recently, this was an intractable problem.

However, in the last 3-5 years something has changed and that is the advent of large scale quantum computing. While there are different methodologies of creating a quantum computer the processing power is relatively the same. Using the quantum mechanical effect of super positioning in which quanta can be both on and off at the same time, quantum computers have processing power many times that of non-quantum computers. There are now even commercially available products including the D-Wave or IMB Q which are being used in products under development. A D-Wave 2000Q was sold this year to Lockheed Martin for use in its new "Temporal Defense System". This system is alleged to be able to "enable the cyber security firm to perform real-time security level rating, device-to-device authentication and identify, detect and prevent threats."[5] Given this level of computing power computing real time analysis of the risk profiles of the actors is now much closer to being a possibility.

Conclusion and Next Steps

This paper has proposed a novel regulatory system based on a cloud based or "Nimbosian" regulatory architecture. Unlike the current regulatory architecture, a "Nimbosian" regulatory architecture posits a non-linear relationship among actors. Furthermore, it posits that the interactions between actors display self-organized emergent behavior that represents a complex adaptive system. It suggests replacing current regulatory policy, that focuses on systemic risk,

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[5] For more information on this sale see the following link http://www.cnbc.com/2017/01/26/quantum-computer-worth-15-million-sold-to-tackle-cybersecurity.html

with a system that focuses on the risk shifting that occurs as the by-product of regulatory arbitrage.

This new regulatory architecture also posits a revision to the construct of linear unidimensional Nash equilibria with that of multidimensional equilibria (ME) based on the application of complexity theory. The construct of ME is then used as the basis for the creation of risk profiles for each regulation that are measured using the construct of fitness landscapes based on the work of Kauffman.

But how would this be done in practice? To begin with you would need to develop a model based on a simulation. A first step toward this could be achieved using agent based modeling (ABM) as demonstrated in the work of Krachovskaya who developed an ABM for the derivatives market that focused on the presence or absence of central counterparts.

This would be the next step in the research. At this point, this paper posits that risk shifting in the form of regulatory arbitrage can result in potentially destabilizing impacts on the equilibrium of the system. Given this, the next logical step in developing a “Nimbosian” regulatory architecture lies in mapping a risk profile for a regulation and researching the mechanism through which data in the form of information spreads through such an architecture.

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