On Exchange Medium and Speculation

Dedicated to my kindred spirit John Forbes Nash, Jr. whose life story saved my own.

Exchange medium looks much more efficient on paper than it is in reality because the very nature of exchange medium amplifies speculative behavior, which as far as I can tell is fundamental human behavior. Since, under the current economic system, the vast majority of transactions share a common finite set of commodities these exchange mediums are artificially valued above the goods in the other side of these transactions. The reality is that no party in these in transactions actually values these mediums for their utility but rather for the convenience, and indeed necessity, in obtaining goods that are actually valuable to each party. However this illusionary value of exchange medium significantly deludes most, if not all, humans into placing undue priority on activities that are perceived to grow their theoretical exchange medium balance, or the market value of their holdings in terms of exchange medium.

Definitions - Utility

The results of the utility functions for any tradable good have real and imaginary components, the imaginary part is the utility is composed of the exchange value of the good along with the perceived opportunity cost of holding that good in lieu of other goods and a real part which is the utility derived from the direct use of that good. The aggregation of these two components are defined as total utility.

Definition - Investment

The act of a party exchanging goods with third-party(s) to achieve utility greater than the sum utility of the goods parted with.

It should be self-evident that the most valuable resource every party possesses is their time which is extraordinarily finite. The fundamental problem of our society is that people equate growing their exchange balance with investing when in fact the growth of exchange balance is by definition only tangentially related to the holder's real utility. For goods that have no real utility for the holder it is not even tangentially related as there is by definition no real part; a great example are equities held by super-minority shareholders. With goods that have substantial real utility yet are easily tradable, real estate for instance, the real utility is very disconnected from the total utility since while the real utility function for every individual is unique the imaginary utility function is substantially collective as the exchange value of a good are distributions over the real utility and speculative beliefs of all interested parties.

The influence of the collective real utility and speculative beliefs of a good on individual total utility is simply a fact of human nature, however that the speculative beliefs are substantially over-weighted is an artifact of market structure. In any market structure employing exchange mediums the mediums have pure imaginary utility and therefore create an actual need for any individual to engage in transactions that have lower total utility than they would consider real. While the mere of existence of exchange medium in a market structure certainly results in a lower Gross-Market-Utility than a market structure free of exchange medium the existence of modern exchanges turns what historically could be considered a mere inconvenience to what is now is approaching what could be best described as an apocalypse.

Historically the speculative weight on imaginary utility was suppressed by the fact that exchanging most goods required a significant amount of time to complete and that, given the relative lack of publically available information and statistical tool, there was far less confidence in future projections in general and therefore could not trust their perception of future market value. However none of that is true anymore. Exchanges, even in the pre-information age, substantial reduced transaction time and provided historical data which gave general perception of a better understanding of future market valuations.

Definition – The Marketplace Game
The marketplace game is the complete simultaneous decision tree of all possible actions by all actors involved in a given marketplace at a point in time.

The marketplace game can be characterized as an infinitely recursive incomplete-information game with n-person simultaneous moves. All incomplete-information by definition are defined by mixed strategies. Nash proved that "For mixed strategies, which are probability distributions over the pure strategies, the pay-off functions are the expectations of the players." While pay-off functions are not exactly utility functions in modern economic terminology the definition used for utility function here includes the strategic profile of both the individual player and the distribution of all relevant players, thus it is likely safe to treat the pay-off function Nash is referring as a subset of this utility function and safely extend his proof to the marketplace game.

My knowledge of combinatorial game theory, which is the most modern theoretical branch dealing with recursive games is extremely limited, however the basic idea is that recursive games are an extended form of perfect-information repeated games. Repeated games with perfect information have rules that are clearly understood by all players and the actions of each player are common knowledge to all other players. The decision tree always consist of a simultaneous move by one or more of the players followed by subsequent simultaneous moves until the rules of the game dictate is over. Then the same game with same rules and players starts again with the same initial decision tree.

While recursive games have perfect-information their strategies are mixed as each player uses their knowledge of the other players' utility function to predict their next move and adjust their play accordingly; Bayesian Games, which are the primary accepted game model for dealing with mixed-strategy games, assumes that the player uses Bayes' theorem to update the probabilities they assign to the likely hood of a given player making a giving move, or better employing their interpretation of a strategic profile. While this provides a consistent mechanism that is based in reasonable understanding of human nature, that is also very easy to imperially calculate from historical data, it generally to understand to be in adequate since it is not only impractical for people to consistently apply Bayesian methodology correctly and that people interpret statistical data quite differently, but furthermore it is agreed there is human behavior such as intuition and emotion that is not governed by logic which is the foundation of any mathematical model.

Judea Pearl's recent research into causality in statistics, and the powerful framework he has developed, may provide a more robust method for calculating probability distributions over mixed strategies, which would possibly result in strategy profile definitions tailored more specifically to the individual players where a mixed strategy in a Bayesian Game would be a proper superset of mixed strategies in a Pearl game. The best way to introduce Pearl's statistical framework is with Simpson's Paradox, where I will be referring to his paper: http://bayes.cs.ucla.edu/R264.pdf.

Simpsons Paradox occurs when “an event C increases the probability of E in a given population p and, at the same time, decreases the probability of E in every subpopulation of p.” This has been considered a paradox because that is clearly not possible and in fact does not mean the data is bad, just that the conditional probability is invalid for some other reason. Until Pearl’s recent research while it was generally relatively easy for an experienced statistician to determine the cause of the problem and robustly account for it there was no mathematical framework to provide a general solution to demonstrate the reason for the paradoxical result under all but the most limited situations.

Players pick their strategies based on both the position of the game and their unique interpretation of the rules. While a players choice of strategy is a probability distribution over the available strategic profiles those strategic profiles are defined by the players understanding of the causal relationships between the variables they are observing. Therefore assuming a player updates their strategic probability distributions over the pure strategies is incomplete, we must assume they also adjust their casual relationships as well. Thus a formalization of this game design using Pearl’s statistical toolkit is highly advised.

The consequences of the game being both infinite in length and simultaneous implies that it is impossible for anyone to know the correct strategy at the point of decision making and only careful analysis of the subsequent moves enables us to score any one move. However by the very nature of the game the score changes with every subsequent move as one move may have laid the groundwork for a subsequent move that was inconceivable to anyone, not even the player who made the move who is being judged. An application of Gödel’s incompleteness theorem would prove this to be true.

Thus suddenly when we judge anyone for the consequences of their moves we must understand that the closer the present is to the past move the more incomplete our knowledge is of the long term effects of the move, and that the short term is temporary and only the long term matters.

Definition – Globalization
The compression of time and space. I borrowed this definition from Dr. Jim Bryant’s book “The Six Dilemmas of Collaboration” where he presents a modeling framework for resolving conflict and replacing it with collaboration, aptly coined as Drama Theory.

A globalization event occurs when advances in technology result in a compression of time and space.

A globalization event changes the rules of the game and the real utility functions of all become volatile as the actors understand the intricacies of the new game they now find themselves in. Historical strategies become invalided but it is impossible to understand why in short term and thus impossible to immediately develop effective strategies. Only through trial and error can these new strategies be developed and for some time the successes enjoyed as a result of the advances in technology are as spectacular as the failures suffered by a fundamental misunderstanding of the consequences of those very advances.

The Past

All economic research I have seen on the topic of speculation concludes that speculation directly causes asset bubbles which inevitably pop, this theory of utility demonstrates that the first peace-time since the European discovery of the Americas coincided with the advent of the modern exchange as for the first time in history people began to trust their perception of the future. Further the only peace-time depression that I am aware of, commonly said to be caused by the collapse of the Dutch tulip-bulb bubble, can now be better explained. First tulip-bulbs can be described as the first exchange medium to have substantial real value, as an appreciation for the beauty of tulips and the ability for it to naturally multiply through cultivation is very real to many parties however, like all exchange mediums, the imaginary utility had a far greater impact on the total utility than the real. Initially tulip bulbs were rare and therefore the classical economics of supply and demand dictate that their nominal value were substantial, however this was only temporary as the supply quickly increased through both the natural propagation of the bulb itself within Europe and individuals substantially investing time and resources in the procurement and transportation of the bulbs from the Americas to Europe.

Further because the total utility of procuring a tulip bulb was so much higher than the imaginary value the procurement of tulip bulbs ceased being a true investment and quickly approached pure speculation. So while classical economics would imply that the nominal value of the bulbs would fall with supply, and eventually it did, the high imaginary utility of kept the nominal value artificially high and in fact because it was an exchange as supply increased the effectiveness of the bulb as an exchange medium increased and as such did the imaginary value and thus the total value. The nature of tulip bulbs, literally being a less finite good than say gold or other traditional exchange mediums, meant that it was the first exchange medium to experience the effects of hyper-inflation and all the consequences that implies in classical economics.

Traditionally the explanation for the tulip bulb bubble is that fools saw the continuous rapid increase in the nominal valuation of these bulbs as an opportunity to place a low risk bet on the future nominal value of the bulb, and certainly that did happen in great extent to the middle-class and lesser extent in the more knowledgeable upper class, however it is hard to believe that those in economic power, especially at that time, were engaging in outright gambling and that while the majority of people were engaging in this kind of foolish behavior it is very unlikely that in terms of economic power they actually represented only a small minority. Thus the behavior was driven by what is in fact understandable high imaginary utility and what today is considered madness of crowds does not even necessarily arise from the wrapped perceptions and confidences of future expectations but is a fundamental artifact of exchange medium itself.

The Great Depression is widely claimed to be a direct result of poor financial regulations and monetary policy. It is undeniable that the financial regulations during the asset bubble were inadequate to deal with the realities of an exchange system that dramatically compressed the investment in the execution of transactions; the largest problem was that information regarding the balance sheets of one party was not accurately or verifiably available to third-parties. In the past fraud statutes adequately protected the marketplace from deceptive practices as there was both ample time before most transactions to do proper due diligence and ample time to enforce the statutes before the transaction was beyond rectification, that is the party in violation did not have the ability to engage in enough transactions such that their exchange medium balance could not cover the damages to the trading partner.

This information deficiency was particularly problematic with financial institutions as it was practically impossible for depositors to reasonably determine the reliability of any such institution. The advent of modern exchanges coincided with the creation of financial institutions with a nature and scale that had never happened before and in essence the business processes, and thus financial regulations, were experimental at best. Before the modern exchange the only ethical way a financial to pay interest to depositors such that the depositors capitalization was secure and be able to pay interest on those deposits was to provide credit to third-parties with a percentage of the available deposits. These institutions were almost exclusively limited to depositors and debtors in a very localized region. Market places at the time were more tightknit, more specifically

The creation of the modern exchange fueled this expansion since for the first time there were perceived asset management practices that, with the proper capitalization, seemed to be a guaranteed way to perpetually grow the exchange-medium balance sheet of that institution and thus deluded even the most knowledgeable into believing that interest could be returned to depositors without risk to anyone's capital. The real utility functions of third-parties was much better understood by all parties since they belonged to the same community, mostly held similar beliefs and had often significant first, at most second or third, hand knowledge of their trading partner meaning that each party also understood the differences between their world view and their trading partners world view. Many people call this a more trusting time, but trust has connotations that imply integrity which of course was not always the case, more accurately would it could be described a more understood time.

The disincentive for fraud was extremely strong in the pre-exchange economy not because people have any better values or integrity than they do today, and considering the long and unfortunate history of humanity when it comes to conflict quite the opposite is probably true, but because getting caught in fraudulent behavior meant all parties in the economy would know of the fraud and would treat future business dealing with the fraudulent party accordingly with was further compounded by the reasonable correlation of utility functions between family and friends as it is known that children are impressible and impressions last life times, thus the fraud effects everyone the person knows. This correlation, in reality and perception, strengthens on a historical basis as information and education were hyper-localized to the point where the vast majority only knew what they were taught and the only people teaching were close acquaintance. Disowning an acquaintance as the result of a poor or fraudulent decision negatively impacting a trading party, no matter how strong the bond, may be harsh by modern standards but it was economic necessity in historical areas as anything less would dramatically, and negatively, effect the trading ability of anyone associated to the bad actor.

Since the creditors in a pre-exchange economy had much more accurate information about their debtors their loans were much less likely to fail. In the early days of the exchange-ear leading up to the Great Depression creditors could not react to this information disparity and did not properly adjust their balance sheet requirements and when the overheated economy started to fail so did the loans and thus the financial institutions who wrote those loans.

However bad loans were enough to sink some financial institution's fell for their belief that there existed an equity trading strategy that was not possible to fail and thus took even lower balance sheet requirements. The across the board constant rise in equity prices in the twenties only further deluded them that their strategy was full proof, but of course in reality it was probably actually harder to lose money investing in equities in the 1920's than it was to make money. The problem was that, due to their mere fact that equities could be easily traded, the growth in the imaginary utility of equities was

mistaken for real valuation since historically it was rare for an organization to rapidly lose total utility in any short period of time.

This sudden across the board growth in total utility seemed reasonable since technology was developing at a quicker and quicker pace the real utility of everyone was increasing and convinced everyone that the good times would never end. After all to war to win all wars had been fought and won and for the first time in human history the world was changing day to day before everyone's eyes.

When the stock markets finally did crash those banks who held stock had to close and depositors, who could not know if their financial institution had the balance sheet to absorb the losses rushed to withdraw their money and made their fears a reality. People demanded government do something, and government indeed had to do something, and when Hoover was seen at not doing enough the United States turned to a radical and untested brand of Keynesian economics.

The Present

The departure from the gold standard is still a highly contested debate more than 80 years later. In hindsight fiat currency was the right exchange medium then as much as it is the wrong now. The deflationary bias of the gold standard, that Milton Friedman so easily rationalized away, was hampering the economy. However today all exchange mediums, including precious metals, are having the exact same effect because of their pure imaginary utility.

Fast forward to the early days of the information age; which is where society is today. Starting in the 1990's information technology made it possible to trade complex financial instruments such as options, futures and derivatives with speed and scale never before seen. Suddenly these instruments, designed to help protect large companies from tail events and manage cash flow for companies requiring real commodities for their operations, had exponentially rising imaginary utility with flat or decreasing real utility.

More than that the compression of the execution time of these instruments and the increased market for them, for both their designed purpose and now for pure speculation, inspired a generation of traders to believe in the fallacy that they could grow their exchange balances risk free. While there are tons of different trading strategies they all boil down to buying contracts that are worth more than their purchase value at time of maturity and hedging that with contracts that due the exact opposite. So the only for that strategy to fail is if the underlying asset performed far worse or better than anticipated, and when that happened the idea was to double down, borrow money and do it again and again until it paid off.

The first organization to apply this strategy on large scale was Long Term Capital Management, headed by one of the most respected traders in the world at the time, John Meriwether. They employed many strategies on many different kinds of assets and financial tools and were incredibly successful from their founding in 1994 right until they collapsed in 1998. Eventually the globalization event that was happening caught up with their strategy; the Russian's experienced a financial crisis due their adaption to both post-Soviet leadership, free market economics and the information age; in effect Russia was experiencing the effects of both exchange and information globalization events at the same time; however they at least had the lessons from the Great Depression to guide their financial regulations so it was not nearly as crippling for them as it was for the US when the exchange became reality there.

A highly leveraged Long Term Capital Management trading strategy was based on currency hedges, including the rubble and when the rubble collapsed so did that trading strategy and so did the firm. An amusing tidbit is that the trading strategy was proved right, the currency hedge would have eventually paid off, but it simply took too long for that happen. They were actually so highly leveraged that if the federal government was concerned if LTCM couldn't pay their debts the entire financial system would have collapsed, so they bailed them out.

Even at the time people questioned whether that bailout would encourage other large firms to take obscene risks, knowing that if everything went to hell they would be bailed out; a sentiment that seems to have been proven true by the financial collapse of 2008. They were indeed delaying a coming financial apocalypse however it is reasonable to suggest that in 1998, and really not even today, our society was not ready for an economic system that would solve this problem once for all. The moral hazard of institutional risk taking deriving from LTCM's bail out is real, however the real problem remains that as long as assets have high imaginary value there will be much speculation in trading.

Collateralized debt obligations were first offered in 1987 as a way to spread the risk of debt among many financial institutions as way of allowing large-banks to recapitalize outstanding loans so that they could give out more loans. Until information age exchange trading these CDO's actually had relatively little imaginary value as the concept of debt is a well understood concept in finance and the complexity of the deals meant that it took time to both prepare and sell, given the buyer ample time to do proper due diligence on the loans they were buying.

Once collateralized debt obligations became exchange traded the instruments changed hands so quickly and frequently that the only due diligence an investor did was look at a ratings agency credit grade on the notes. These rating agencies, like everything, are imperfect and their grades are predictions, however their predictive methodology had been invalidated by the information age globalization event. Since there was suddenly more information available financial institutions began extending more and more credit, especially in the housing market because traditionally mortgages had been one of the safest investments, and in combination with these new fool proof trading strategies financial institutions thought they could push the bounds of their balance requirements.

However with this sudden availability credit and information technology making it easier to find, buy and sell real estate meant that real estate began having imaginary utility like never before. Ordinary people began purchasing real estate with intention of living there, or at the very least selling the property within a few years when historically most people held homes for a few decades before selling them, and often misrepresented their intentions to mortgage officers who either did not care or did not investigate properly. Thus the rating agencies had plenty of information to base their grades on but not only did they often have inaccurate, in spite of the amount of, information they also were using rating models invalidated by the high imaginary utility of the property which never existed before.

If that wasn't enough to cause a financial crisis credit default swaps put it over the top; CDS's were first offered in the early 1990's as an insurance product for large financial organizations to protect their debt holdings. Until the early 21st century these products were indeed insurance products and that inspired a brilliant mathematician named David Li to write about his Gaussian Copula Function which demonstrated a way to correlate the market price of credit default swaps on collateralized debt obligations to the level of risk of the underlying product in the CDO. This formula was probably true at the time as the speculation on CDS's was minimal as only very large financial institutions were purchasing them, however once these swaps were being traded with more and more frequency their

imaginary value sky rocket and there was suddenly little correlation between the risk of the underlying investment and the price of the swap. Yet very few understood that and even ratings agencies began trusting Li's copula function when they rated the CDO's and performing less than the required due diligence to derive their ratings.

Here are three examples occurring right now that should cause concern that our financial system is on the brink of collapse:

1. Credit Default Swaps are being priced lower on municipalities across the board because Lehman Brothers bought so many of them for pure speculation and their liquidators have caused demand to outstrip supply.
2. The US debt rating was bravely downgraded by the S&P as a reflection of their concern for government being able to adequately fix regulations and engage in proper monetary policy, yet the market is placing higher value on US debt than equities.
3. The price of gold has outstripped the value of platinum several times in the past nine months because the market is concerned that even though platinum is for more useful and rarer than gold, the down turn in the economy will deflate the real utility of platinum and that gold's high imaginary utility will make it more in demand.

The Future

Many of the financial regulations enacted during the pre-exchange era were necessary to protect the public from systematic inaccurate information, a problem that could not be solved then but is being solved as we speak today by organizations like Microsoft and Google. Windows 8, set to be released at the end of next year, will be the first operating system with identity federation at its core.

Identity federation is a concept where every organization has an identity repository that they trust and then they provide a public hash validation key which they use to sign any information they exchange with third-parties who they have a trust relationship with. The operator of each hub decides which hubs to provide and what questions they can answer about users identity, for instance say Facebook comes up with a method for verifying the account holder's identity details and then participates in Microsoft's identity hub network (which they have already started to do so), then an mail order cigarette company want to confirm that the person ordering the cigarettes has the proper age. They can ask Microsoft, if they trust Microsoft that is, who asks Facebook and then the vendor gets the age.

Of course what if someone does not feel comfortable with Facebook sharing their age? No problem, the identity request can literally ask "Is the holder 18 or older" and instead of getting an age back the identity requestor gets a yes or no answer and can trust it because they trust Microsoft and Microsoft trusts Facebook to have verified information. There will need to be public policy ensuring account holders dictate to who and what information gets shared. While Microsoft is already going to support this as any requests going through their system will need to be explicitly be authorized by the account holder it is reasonable to suggest not every company will take their users' privacy as seriously as Microsoft does.

The information age is progressing faster and more powerfully than any other era in human history and keeping up with the changes will be a constant challenge for policy makers, financial institutions, organizations and individuals and therefore the only solution is to attempt to equate our perspectives and perceptions of space and time with one another. A federated universal exchange with not only the business processes to trade good but also to trade time, knowledge and perspective in a way that is verifiable, secure and fair. All men were created equal yet all men are not equal, however through understanding we can become more equal.

As Gene Roddenberry, perhaps one of the greatest visionaries of all time, asked through the voice of Wesley Crusher "... so time and space and thought are not the separate concepts we understand them to be?" The answer is remarkably yes and so much more and you have the proof. Q.E.D.

Some Thoughts from Giants

"Be not astonished at new ideas; for it is well known to you that a thing does not therefore cease to be true because it is not accepted by many." -Baruch Spinoza, Author of "Ethics"

"Anyone paying attention knows that speculation is the root of all evil." – Oliver Stone through Gordon Gekko

"Even the striving for equality by means of a directed economy can result only in an officially enforced inequality – an authoritarian determination of the status of each individual in the new hierarchical order." – Friedrich von Hayek, Founder Austrian Economics

"All human situations have their inconveniences. We feel those of the present but neither see nor feel those of the future; and hence we often make troublesome changes without amendment, and frequently for the worse." – Benjamin Franklin, Founder, United States of America

"For a good book has this quality, that it is not merely a petrifaction of its author, but that once it has been tossed behind, like Deucalion's little stone, it acquires a separate and vivid life of its own." -Johann Peter Gustav Lejeune Dirichlet, Founder, Dirichlet Distribution Functions