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A Framework for the Appraisal of Economic Crises

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Abstract

This paper presents a framework to integrate thoughts on business cycles. The model is a two-sided framework that captures thoughts on business cycles that are reminiscent of Newton's law $F = ma$ in Physics, though it is not as mechanical. One side (F) deals with policies, while the other side (ma) deals with the market mechanism such as in general equilibrium analysis. Any distortion in a sector on the ma-side can trigger a policy action on the F-side. The framework opens up a learning process that allows us to understand business cycles, and to steer the economy to desired goals.

Keywords: Business Cycles, Economic Crises, Bubbles, Policies, General Equilibrium

JEL Classification: B4, C5, C6, E3, G1

The Model

This paper proposes a general framework to try to integrate various business cycle models and explain economic fluctuations including the current crisis. The paper first introduces the Classical and Keynesian schools of thought relating to business cycles. Then it presents a framework, focusing on the comparison of its economic interpretation to physic interpretation. It then addresses the nature of "oscillation" which is a feature of business cycles. Several other essential phenomena such as price movements, income distribution, and endowment variations are spotlighted.

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Finally, the framework has some inherent policy implications on how to stabilize the economy.

Classical Model

The Classical economists check the states of the economy based on consumption, production, distribution and prices. Many economists, notable Leon Walras (1964), Kenneth Arrow (1964), Gerard Debreu (1959), Paul Samuelson (1966), Milton Friedman (1968), and Robert Lucas, Jr. (1961; 1983), have built systems to show how business cycle operates and have encapsulate it within a classical dynamic framework. Theories of Physics have some correspondence relationships with dynamicsin economics. Potential energy seems to correspond with economic endowments, and kinetic energy seems to correspond with swings of economic variables from their natural levels. Physics and economics systems seem to behave similarly under similar initial conditions, which allows our comparisons of them. The essential nature of the classical model is that it is self-regulating, and therefore, business cycles appears impossible. But that is more appearance than reality. Just as a democracy appears impossible without a benevolent dictator, capitalism appears impossible without policy makers. Things can and do go wrong in a self-regulating system.

Milton Friedman admits that cycles can occur in a self-regulating system if workers are fooled as in not perceiving the price level accurately. Workers can have imperfect information say of price increases. Price increases will lower real wages. It is possible that only the business owners knows about it and not the workers. Business will tend to hire more workers when real wages will fall, and this will increase output and inflation. So, deviation of actual from expected prices will cause deviation of actual output from natural levels of output. But in the long run, workers will catch on say by noticing inflation as GDP increases. They will use that observation to barging for and receive a higher wage, eliminating the price differences, and the economy will settle at its natural level of output. Essentially if the workers are not fooled, then we revert back to the classical model with no business cycles in employment and output, because real wages will not change from their original positions.

Robert Lucas, Jr. has worked on a New Classical Model, augmentingthe market clearing assumption and Friedman's imperfect information of the classical model with a new view, namely, Rational Expectations.

Essentially, Rational Expectation holds that people do not make the same forecasting errors over-and-over, so that if they used the best information they can get, the error they make will be distributed about the true forecast randomly, and therefore, the expected values of the error term will be zero.

The New Classical theory gives birth to a Real Business Cycle (RBC) theory. The word real applies because real shocks are emphasized, and the model is classical because it honors the supply side of the economy. In the RBC model, cycles are not due to actual and expected price deviations, but are based on fluctuation on the real natural GDP itself that can be caused by shifts in the production function. If the production function falls, then employment and output will fall, causing a cycle. Such a cycle can be detected by a Computational General Equilibrium simulation of consumption, investment, capital and labor inputs. Professor Robert Solow, the founder of neoclassical growth theory is puzzled to explain how RBC theory driven by aggregate demand factors has emerged from the premises of growth theory driven by supply side factors. (Solow 2003, p. 19)

Keynesian Model

John Maynard Keynes (1936) brought out some special cases when the self-correcting tendency will prevent markets from clearing. They include wage rigidity in the labor market, interest inelasticity in the goods and service markets, and liquidity trap in the money market. In his latter writings, Keynes will not mind reverting back to the self-regulating system. (Ramrattan and Szenberg 2012)

A New Keynesians model emerged around wage and price rigidity. New Keynesian economists tend to start with sticky wages and New Classical economists tend to start with sticky prices. A New Classical model developed by Sargent and Wallace (1975) demonstrates the idea that if both the government and the private sector have the same information, they would react rationally (Benassy 2001, p. 46). A New Keynesian Paradigm starts with the idea that Long-term contracts are negotiated between the workers and employers. They determine the contract wages, and then the government undertakes monetary policy. The three players are therefore embroiled in a game whose outcome determines employment, output, and prices. In period $t-2$ the private sector (workers and employers) is locked into wages contracts that were negotiated in an earlier period, $t-1$.

The government can take a monetary policy that would react to shock, for instance, by redressing any price pressure that is put on wages fixed by long-term contracts. The ensuing Keynesian result will be ineffective, however, if the government is restrained only to the results in time period $t-1$ (Benassy 2002, p. 217).

The Framework is a System Models

The classical system exists in the form of a general equilibrium system aimed at price determination. In its background are constants—natural, psychological and institutional, and natural laws governing supply of labor, profits, and productivity. Like the second law of thermodynamics in physics where total energy is constant or conserved and where time-flow is irreversible, disorder or entropy tends to falsify deterministic predictions. Just as physicists study atoms and molecules both from their individual and aggregate statistical behavior, so too economists study microeconomics and aggregate macroeconomic behavior. Meanwhile, the structure of economies may be degenerating. Assets disappear from the economy as matter disappear in a black hole. Matter becomes organized after a Big Bang, and economies become re-organized or progressive again after downswings by government intervention.

One cannot overlook that life systems are not strictly comparable to atomic or molecular systems. Unlike physical matter, humans can think and so they can adapt their organization to changing environments. Human takes energy from its environment to sustain itself and the environment. Although life systems are autonomous they are still dependent on the environment. That relationship is made increasingly complexity. For instance, economists allow topological relationships between households and businesses in goods and services, and factor markets. That relationship become complex as one moves from a system of autarky, to one of partial division of labor, and to one of complete division of labor. (Yang 2001, p.13)

The Model

We glean from the above discussions that we should start with a deterministic general equilibrium model, which is balanced by policies such as built-in stabilizers, policy rules, or neutral policies. By built-in stabilizers we can name tax rates, by policy rules we can name the Taylor rule, and by neutral policies we can name the reliance on market forces.

That somewhat short list of policies appears sufficient to stabilize a classical system. The parts or subsectors of the economy are harmonized or equilibrated by them, and so there appears to be no use for a business cycle theory. If underemployment or incomplete information prevail, however, then some policies would be necessary. Fiscal, monetary, and exchange rate policies in pure or mixed forms that targets inflation and growth rates would be necessary. As an imitation of the physical sciences, such a model can be stated as follows:

$$\pm\alpha(py_j) = E_i\left(p, \left(\sum_{j=1}^{n} \theta_{i,j}\, py_j + p\omega_i\right)\right) \cdots (1)$$

Where E is the state of the economy with $i = 1 \ldots m$ Consumers, $j = 1 \ldots n$ Producers, ω indicates endowment, p is price, y is output, and θ is share of profits.

A simple way to think ofequation (1) is that a policy force which as indicated by the sign can be up, down, or neutral, is applied on the left hand side to counter cycles or motions that occur in the operations of the right hand side. The right hand side is a general equilibrium (GE) model (Debreu 1959, p. 80). The economic world has semblance of GE models such as the Arrow (1954)-Debreu (1959) model, the Overlapping Generation Models (OLG), or a Computational GE models, each capable of different emphases ofpolicies--fiscal or monetary. Crises occur as an inherent feature of the system or from different policy emphasis of policy makers in the GE models on the right hand side, and are counteracted by policy instruments on the left hand side of the equation.

Equation (1) has law of motion of the capitalist economy that resembles Newton's laws for the physical science. Early investigation of the economy by Pareto looked at its operation from Newton's first law point of view, namely, an economy like a planet will continue in a state of equilibrium or disequilibrium in the absence of a policy or a force. Newton's second law brings in force to change or steer the system. A force like gravity keeps a planet in an elliptical orbit. Other forces can displace the order of an economy. Such a force that displaces the planet in motion or an economy in our case was detected by the economists Alfred Marshall who argued that equilibrium is based on initial prices which are subject to change. The mathematical economist F. Y

Edgeworth thought that traders can re-contract when a better deal becomes available. (See Hicks 1982, pp. 29-30)

In general, Newton's first and second laws require the specification of initial conditions, namely the position, $x(t)$, and velocity, $\dot{x}(t)$ to make predictions. These initial condition can be plotted on a phase-space diagram between momentum ($P = mass \times velocity = m\dot{x}$) vs. position, because from $F = ma$, write $F = m\,\dot{v}$ to get $F = \dot{P}$. Now we can plot momentum vs. position on a phase-space coordinate and predict direction of changes, for given force we know the change in momentum, and given momentum, we know the change in position.

A third law of motion can be invoked to address the economy in a global setting. This parallels Newton's third law. Countries, like particles in physics, exert forces on one another. As a first approximation, we can think of these forces as coming in pairs such as when we model the U.S. economy vs. the rest of the world (ROW). We can write the force exerted by the jthon the ith country as equal to the negative of the force exerted by the ith on the jth country as $\vec{F}_{i,j} = -\vec{F}_{j,i}$. In general, many countries or blocks of countries will exert forces on each other, which can be written as:

$$m_i \frac{d^2 \vec{r}_i}{dt^2} = \sum_{j \neq i} \vec{F}_{i,j} = m_i \frac{d\vec{V}}{dt} = \frac{dP_i}{dt}$$

Dimensional Analysis of the Model

We know how to calculate the dimension of Newton's first law, $F = ma$. Force is a weight, W, which is equivalent to mass times gravity (mg). From $W = mg$, we get $m = \frac{W}{g}$. Acceleration has the dimension length over the square of time (L/T^2). So, mass has the dimension FT^2L^{-1}, and force has the dimension mLT^{-2}. (Langhaar 1951, p. 6)

By analogy with mass and force, the dimensions of equation (1) resolves into a policy dimension on the left hand side, and a market dimension on the right hand side. By focusing on the dimension of relationship of variables in either dimension, partial solution may be obtained by policy makers or market analysts.

Partial analysis is difficult to resist in a GE setting where too many variables and dimension of the problems is involved. For instance, the Overlapping Generation Model, and the VAR models are scaled down GE models that compete with larger scale Walrasian models. Debreu was concerned to simplify the dimension of the GE model by grouping agents according to their endowment and preferences when dealing with large scale economies. Arrow was responsible for reducing the dimension by his contingent commodity specification where a commodity is contingent, like an HMO, which pays if you need health care.

In the market dimension, one dimension that is crises prone has to do with income distribution. Gerard Debreu extends the definition of the endowment to accommodate the share of profits. This is accomplished by defining a share of production and adding it to the agent's endowment. The share is defined by a constant, $(\theta_{i,j})_{\substack{i=1\cdots n \\ j=1\cdots m}}$, where $\sum_{i=1}^{m} \theta_{i,j} = 1, 0 \leq \theta \leq 1$. The augmented endowment equation then would be a new variable for the share of income: $w_i = p.\omega_i + \sum_{i=1}^{m} \theta_{i,j}\, p.y_j$. (Debreu, 1959, pp. 90; 102) On the policy dimension, an early concern was in regard to matching the number of policy instruments to the number of goals. More modern developments bring in time consistency, coordination, credibility and other constraints.

The general equilibrium framework incorporates uncertainty and expectation. Goods have time dates to reflect when they are exchanged, and exchange is conditioned on the state of nature that exists at the time of exchange. This approach prescribes one clearing date for all future markets, which avoids the need to specify an equation of expectation formation in the model. On the other hand, one can think of the future market as comprised of a series of spot markets, allowing for the setting of current price based on future expectation. One can see the possibility of building in how agents process different information regarding demand and supply shocks. With this second type of interpretation the price distribution resulting from solving the market equation for equilibrium can be different from the price distribution agents used to form their expectation. (Lucas 1983, p.285).

Brief History of the Right Hand Side of Equation 1

We used the Arrow-Debreu model on the right-hand side of equation (1) instead of a standard asset pricing model. A major asset pricing model is the CAPM, which focus on risk for an individual stock of a firm that is diversifiable (unsystematic) or not diversifiable such as market risk (systematic risk). (Figlewsky 1986, p. 116) This is the "premier model of market equilibrium in the securities market." (Ibid, p. 117) Risk is analyzable in term of a single factor such as the market for stocks, and duration analysis for fixed-income securities. (Zenios 1997, p. 6) While for financial economist like Fisher Black CAPM remained a "Pole Star", preference is shown for monetary phenomena in a general equilibrium. (Black, 2010)

We start with money, the most liquid form of asset involved in the right hand side. Traditionally, trade cycle is a monetary phenomenon in the sense that change in economic data affects risks and thus velocity. (Hicks 1982, p. 35) Money is lent out through the financial institutions, operating under the law of large numbers. (Ibid, p. 34) Money is demanded for future payments, which is based on imperfect foresight. Velocity of circulation is a risk-phenomenon. But the law of exchange or GE cannot determine the absolute level of money prices. (Ibid, p. 35) We therefore look at other ways cycles can be determine in the GE or the right hand side of equation (1).

CAPM links cash or riskless securities with the risky ones. According to Theorem I of Hicks, the link occurs because of "Substitution between money and a 'least risky' bundle of securities." (Ibid, p. 250) But according to Theorem II of Hicks, when money is not held, we will have "substitution between less and more risky securities." (Ibid, p. 252) Hicks' model is based on the individual maximization of the expected value, a mathematical expectation hypothesis of the utility derived from the individual chosen outcome.

There seems to be no settled way to treat money in the general equilibrium side of equation (1). The holding of money helps to study changes between nominal and real variables. It is introduced in the parts of subsectors as either cash-in-advance constraints, put in a utility function or in a production function. (Farmer 2000, p. 74) The very able general equilibrium theorists Frank Hahn was puzzled with the argument that "…by making money prices and wages low enough we can always make the Pigou effect "large enough"", but concludes that "the assertion that the "Pigou effect" ensures the existence of an equilibrium is unproven." (Hahn, 1984, pp. 155-157.

Oscillations of the Model

A few necessary and sufficient conditions are required for a complete view of cycles. One is that the model must deal with oscillation; another is that a full picture of the economy is needed. Oscillation is a necessary characteristic of boom and bust. Any general equilibrium model is capable of showing oscillation but would not be sufficient for it will have to be cast in a framework for that purpose. The framework should include the presence of market forces, policies adjustments, and the extent of stimulus.

We draw a parallel of oscillation with Newton's law: F = ma. An elastic spring attached to a beam will oscillate on the y-axis. Its acceleration is given by $a = m\frac{d^2y}{dt^2}$. Its velocity is $\frac{dy}{dt}$. By Hooke's law the elasticity of the spring is proportional to its displacement, kY, where k, is a constant. Fitting all this into the Newtonian framework yields the second order differential equation: $\frac{d^2y}{dt^2} = \frac{k}{m}y$, whose solution is an equation $y(t) = A\,Cos\sqrt{\frac{k}{m}}t + BSin\sqrt{\frac{k}{m}}t$. (Menger, 1943, p. 532)

One can easily characterize the oscillations for a second order differential equation by examining the coefficients of m for $\ddot{y}$, D for $\dot{y}$, and k for y . In the equation $m\ddot{y} + D\dot{y} + ky = 0$, the results of the preceding paragraph yields harmonic motion for $D = 0$. For $D > 0$, the oscillation will be damp. But if we add a forcing term on the right-hand-side in the place of zero, a forced oscillation will result. (Jones 1965, p.75) Such a consequence is usually the results of polices directed at steering the economy.

A mathematical example of business oscillation is Samuelson's multiplier-accelerator model. (Samuelson 1966) Samuelson model has 1. A consumption function: $C_t = \alpha Y_{t-1}$, 2. An accelerator: $\beta[C_t - C_{t-1}]$, 3. Government: $g_t = 1$, and 4. A national income identity: $Y_r = g_t + C_t + I_t$. From the solution: $Y_t = \alpha[1 + \beta]Y_{t-1} - \alpha\beta Y_{t-2}$, current GDP is pushed up by its recent past level, and pulled down by its level two periods ago.

The solution to the difference equation is of the form $Y_t = \frac{1}{1-\alpha} + \alpha_1[x_1]^t + \alpha_2[x_2]^t$, where the first term is gotten by setting all time periods for income equal, and

the other terms is the nature of a tried solution. A more complete analysis of oscillations are worked out in Matthews (1959 Ch. 2), and Evans (1969, Ch. 13).

A cycle should ascend descend and reconcile to usually, a neutral position say zero. These movements parallel physical cycles for the physical sciences as described by Newton law $F = ma$. In our model we may write m = market forces, which is captured in the Arrow-Debreu framework; a = ad hoc adjustments or economic policies such the FED low interest rate and inadequate responses such as TARP, and F = Stimulus such QEs and the government investment. We will show how these oscillation factors generate cycles through equation (1).

Cycles via Price Variations

One source of oscillations is price movements. In his *Treatise*, Keynes advocated that increase prices of consumer goods would yield windfall profits creating a boom. He later turned to under-investment and under-consumption theories of cycles in his *General Theory*, which is in contrast to Hayek's over-investment and over-consumption theory of cycles. (Machlup 1976, p. 26)

The GE part of equation (1) represents price oscillations in the following way. When the actual state of the world is known, Agents expectation would be rendered right or wrong. Wrong expectations may cause wrong allocation of inputs. Average expectation may escalate prices of contingent commodity. (Star 1977, p. 190) Differences in input and output prices results in cycles as demonstrated in Von Neumann and Dorfman-Samuelson-Solow Maximal Economic Growth models. (Vanek 1968, pp. 16-21)

Cycles via Distribution Parameter Variation

The distribution aspects of equation (1) can be framed within the post-Keynesian works. To list a few such works, we can name Piero Sraffa (1960) $w - r$ frontier, Kaldor (1956) distribution model that uses owner share model, and Samuelson (1962) surrogate production function, which appears more suited for our purpose. Kaldor gave us an analytically tractable model in this regard. He defined a profit to income ratio, where profit π = 1-(wage bill/income).

We can therefore consider models such as $\frac{\partial \pi}{\partial t} = K(Y - Y^*)$, which defines the share of profit to income over time as proportion to GDP gap. (Samuelson 1966, p.

1547) The state of income distribution overtime, therefore, would affect the market via the endowment specification.

The share parameter of equation (1) captures time and uncertainty relating to future markets, contingent commodity market, and Arrow Insurance market in the GE side of its specification. "Uncertainty means that we don't know what's going to happen in the future. But we do know what might happen…At each date there is assumed to be a finite list of events that describes the condition of the economy in terms of all the economically relevant uncertainty events that may occur."(Star 1977, p. 185)

Cycles due to Endowment Variation

The variation of endowment normally takes place through the market mechanism. Much of the current crises is explained by over-value of endowment. Endowment crises affected both the business and household sectors.

Bad endowment in the GE model means a producer would not be able to take possession of output that it made contingent plans for. On the producer side, the producer chooses a contingent plan at current time that discounts future states of uncertainty, and maximized the present discount value of contingent output less contingent inputs. On the household side, the household will sell all its endowment forward.In both situation, plans are not realized.

Cycles due to Monetarist, Keynesian, and Institutional views

For Keynesians, cycles are inherent to the system, and for the monetarists, cycles have external causes. (Nikaido 1996, p. 217) Regarding the Fed interest rate policy, a monetarists view holds that: "…the actual interest rate (Federal fund rate) decisions fell well below what historical experience would suggest policy should be (from over 6 to 1 percent from 2000 to 2003) and thus provides an empirical measure that monetary policy was too easy…There has been no greater or more persistent deviation of actual Fed policy since the turbulent days of the 1970s.

So there is clearly evidence of monetary excesses during the period leading up to the housing boom." (Taylor 2011, pp. 151-152) [Bracket items inserted].

A Keynesian view holds, "…a modern society could increase the rate of growth at full employment by coaxing out a deepening of capital through expansionary monetary policy, while using an austere enough fiscal policy to prevent demand-pull inflation. These combined devices could, in effect, lower the share of full employment income going to consumption and yet not jeopardize full employment itself." (Samuelson 1966, p. 1544) In retrospect, Fiscal policies did not stop asset price inflation during that expansionary phase.

A post-Keynesian view holds that the value of a firm would remain invariant from a speculation point of view. This amounts to looking at the GE side of equation (1), using 1. Arrow securities, and 2. The Modigliani-Miller theorem. Arrow Security integrates uncertainty events such as "atmospheric conditions, natural disasters, technical possibilities…" into equilibrium analysis. (Debreu 1959, p. 98) Owning a security allow income transfers over time, and management of risks under uncertain states. For example, a security delivers one unity of commodity tomorrow if a certain state is realized and nothing otherwise. It is a vector with 1 in the i^{th} state, and zero otherwise: {0…1…0}. When such a state exists, the market is said to be complete.

A firm exists to product units of output and as a mechanism for investors to reduce risk in a later time period. Say the firm object is to produce two units of output in if state 1 prevails. An alternative to produce two units of state 1 is to buy two units of Arrow Debreu state 1 securities at a cost of $X. The same alternative is available for securities in different states beside state 1.

In terms of Arrow securities, the firm market value is $\sum_{s=1}^{s} p_s x_s$ where p_s is the market price for the security in states, and x_s is the payoff of the security at state s. This value is independent of the firm's financial structure--debt or equity, which is a proof of Modigliani-Miller value invariance proposition. (Duffie 1992; Strong and Walker 1987, p. 49) Duffie (1992) surveyed how this result can be extended to incomplete markets.

The neoclassical growth cycle model of Robert Solow depends upon the state of investment relative to the growth of the labor force. The post Keynes saving-investment cycle model of Kaldor and Pasinetti theory depends upon the share of

profits, and in the case of the dual Pasinetti theory of Samuelson and Modigliani, we look to the share of consumer as a dominant variable for cycles and growth. (Ramrattan and Szenberg 2007)

An institution view looks at the stability of institutional assumptions in a capitalist's economy. In addition to psychological and natural assumptions, Adam Smith has built more than a half-dozen institutional assumptions for the market mechanism to work—specialization, free trade, contractual relationship, unequal distribution, etc. One source of instructional instability was enunciated by Adam Smith in broad terms: "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in conspiracy against the public, or in some contrivance to raise prices. (Smith, 1937 [1776], p. 130) Over time, Smith's institutional assumptions were debated around concepts of stability and efficiency. As North put it, "although stability may be a necessary condition for human interaction, it is certainly not a sufficient condition for efficiency. (North 1990, pp. 83-84)

The Financial Crises Report, (2011) of the US details many institutional problems in the current crises. It considers capital availability, excess liquidity, and the role of GSE as competing views for explaining the crises. (2011, p. xv) Its many other findings include: 1. Human error (p.xvii). 2. Failure in financial Regulation and supervision (p. xviii). 3. Failure of corporate governance and risk management (Ibid). 4. A combination of excessive borrowing, risky investment, and lack of transparency (p. xix). 5. Government was ill prepared for the crises. (p. xxi). 6. Systematic breakdown of accountability and ethics (p. xxii). 7. Collapsing mortgage-lending standards and mortgage securities (p. xxiii). 8. OTC derivatives (p. xxiv), and 9. Failure of Credit Rating Agencies (p. xxv).

A current view of the financial aspects of business cycles is change in utilization and its associated output, and a view of growth is change in output at normal levels of utilization. (Black 2010, p. 26) Another view is based on inequality, for instance, the economy grew rapidly since the 1980s, but increase income went more to profits.

A clear picture of this state is discerned since the 1980s, namely that the gap between the upper and lower quintile has been widening. Yet another view liken cycle to the state of short-term indebtedness and total bank deposits. Moessner and Allen have demonstrated states of those positions for the current Great Recession and the

Great Depression, illustrating that while both variables show decline, the decline in the Great Recession were smaller. (Moessner and Allen 2011, p. 1)

The financial world emphasizes quant vs. commonsense explanations. The argument is traceable to Gauss and Cauchy distributions. Benoit B. Mandelbrot has pointed out inconsistency with Gauss and Cauchy distributions. (Mandelbrot 1997, pp. 372, 396) However, his overarching criticismwas not that the distributions contradicted CAPM, APT, and Ito Calculus, but that those models used smooth rather than rough or fractal approximation.The Cauchy distribution was the first known stable law to the non-stable Gaussian distribution. We also know that the Cauchy distribution is not improper because it has an infinite variance. What the paper lacks is the appreciation that since 1928 with the publication of R. Fisher and L. Tippett's "Limiting forms of the frequency distribution of the largest and smallest member of a sample," *Proceedings of the Cambridge Philosophical Society*," financial practitioners have been making accommodating adjustments to the Gauss and Cauchy distributions. For instance, in the current crises situations, such adjustments are made under the "Generalized Extreme Value Distribution" (GEV) of the form:

$$GEV(x) = exp\left\{-\left[1+\gamma\left(\frac{x-\mu}{\sigma}\right)\right]\right\}^{-\left(\frac{1}{\gamma}\right)},$$

where μ finds the peak, σ is proportional to the standard deviation, and γ generates skewness and kurtosis.

Thus, modern applications make appropriate adjustment for asymmetry of skewedness in the distribution, and kurtosis, which measures fatness of the tails. Therefore, to show that "Tests of normality strongly reject the hypothesis of normality" is not proven, at least yet, and in no way provides a falsification of CAPM, APT, and Ito Calculus.

Bubbles

History revealed some major bubbles: Tulipmania in Holland in the 17th century, the South Sea bubble in the 18th century, the Dot.com bubble in the late 1990s, and now, the current Real Estate bubble.

In spite of the Fed policy to counter inflation through fiscal policies, securitization has allowed assets price inflation, first for the Dot.com, and recently for housing asset.

We can distinguish between, a Keynes-Hicks version of speculation that "...emphasizes not differences in beliefs, but differences in willingness to take risk or in initial positions as the foundation of a speculative market the conditions which allow a speculative market to arise" or a The Kaldor-Hicks version of speculation that is based on the willingness of the investors to pay a higher price for the asset than the price they are willing to hold the asset forever. (Tirole 1982, p. 1163) Those two versions are contrasted with a working theory that bases speculation on different beliefs of traders, and a model based on the quality of information that the trades have. In general, speculation requires the ability to forecast the psychology of the market, while enterprise is the ability to forecast the yield of an asset which turns into speculative bubbles when expected returns are like the return in a casino gambling. (Keynes 1936, p. 258). Where streams of return are like whirlpool, bubbles are fragmented. "Keynes has regarded speculative markets as mere casinos for transferring wealth between the lucky and unlucky, the quick and the slow." (Samuelson 1978, p. 425)

Economic Policies

What are the policies to deal with those crises situations? The typical policy during the crises period is associated with policies of the Fed. Policies aimed at getting out of the crises would include such policies of the Fed, namely Greenspan's put option, and Bernanke's Quantitative Easing and low interest rates, TARP, and President Obama's stimulus bill.

In order to continue our framework for explaining the current crises, we have to focus on the left hand side of equation (1), where we find counter balances to the operation of the market on the right hand side. More specifically, we are focusing on $\pm\alpha PY$. Stimulus is seen as a push/pull force. Its coefficient would be negative during a bubble, and positive during crises. Its effect would be strong, depending on leakages to the economy (weak multiplier), and the propensity to stimulate, i.e., percent of GDP. This propensity is limited by the size of the budget deficit.

As a fall out of modern policies, the Economic Stimulus Act of 2008 that rebated $100 billion to individual and families during May, June and July of 2008, and the TARP $700 Billion stimulus package, we learn one indeterminacy about policy, namely, that we do not know the optimal amount.

As the stimulus was done from the Keynesian perspective, the relevant question turn on the optimal amount of ΔG. Politics would not allow a trial-and-error method, and this is where the science of economics bows to political economy.

Novelties of Equation (1) for Policy Making

The overall framework of equation (1) has some novelties to offer in addition to explaining the general approach to business cycles. The general approach deals with the specification of initial conditions to predict cycles. Such initial conditions can be related to the $C + I + G$ components of GDP. Consumers want to capitalize on cheap credit, investors want liquidity through securitization, and government seeks to expand the home ownership rate. *The Financial Crises Report*, (2011) discusses the conditions.

One novelty resides with the way policy makers and regulators look at the performance of the economy: Left hand side vs. Right hand sideobservation of equation (1). The object of such an observation is to disclose information about the event horizon of a potential economic crisis. The problem requires empirical observation of the event-horizon. J. B. Taylor hinted at such observational disclosure when he supposed that thefall in the Federal fund ratebelow what was historical experienced (from over 6 to 1 percent from 2000 to 2003) is an indication of easy credit policy. Others have examined policy coordination and time-inconsistency problems.

Failure in Keynesian policies to effect recovery is due to his inability to specify the optimal amount of stimulus. The relationships between the variables such as consumption and income is not linear, and investment relationships were not attempted by Keynes, but subjected to animal spirit.

One can extend the novelty of our model for quantum mechanics types of effects. The first step in development of an event-horizon theory for crises is concern with the metric that is need for the event-horizon.

A suitable metric would measure the deviation between the trajectories of economic performances from the trajectory of investment practices. If the former follows a hyperbolic trajectory, while the latter follows a straight line trajectory then the deviation would widen over time. The literature already has the ingredients for this type of analysis. Samuelson specified his theory of long-term investment in a utility mold.

Risk tolerance is of the linear form $-\frac{U'(C)}{U''(C)} = a + bC$, which includes exponential, logarithmic, quadratic, and hyperbolic special case. The exponential special case over time $U(C,t) = e^{-\rho t}V(C)$, turns into a Hyperbolic Absolute Risk Aversion (HARA) by making $V(C) = \frac{1-\gamma}{\gamma}\left(\frac{aC}{1-\gamma} + b\right)^{\gamma}$, which includes unbounded utility functions. (Morton 1970, p. 18) The exponential special case $U(C,t) = C^r$, is a Constant Relative Risk Aversion (CRRA), which deals with investments irrespective of a person's age for instance. For the restrictions $r < 0$; $r = 0$, and $r > 0$ the relative risk function is $\frac{1-r}{C}$, the same result is obtained if one adds constants and slopes to the exponential special case. (Walker 2008, p. 1339)

Figure 1: Event-Horizon

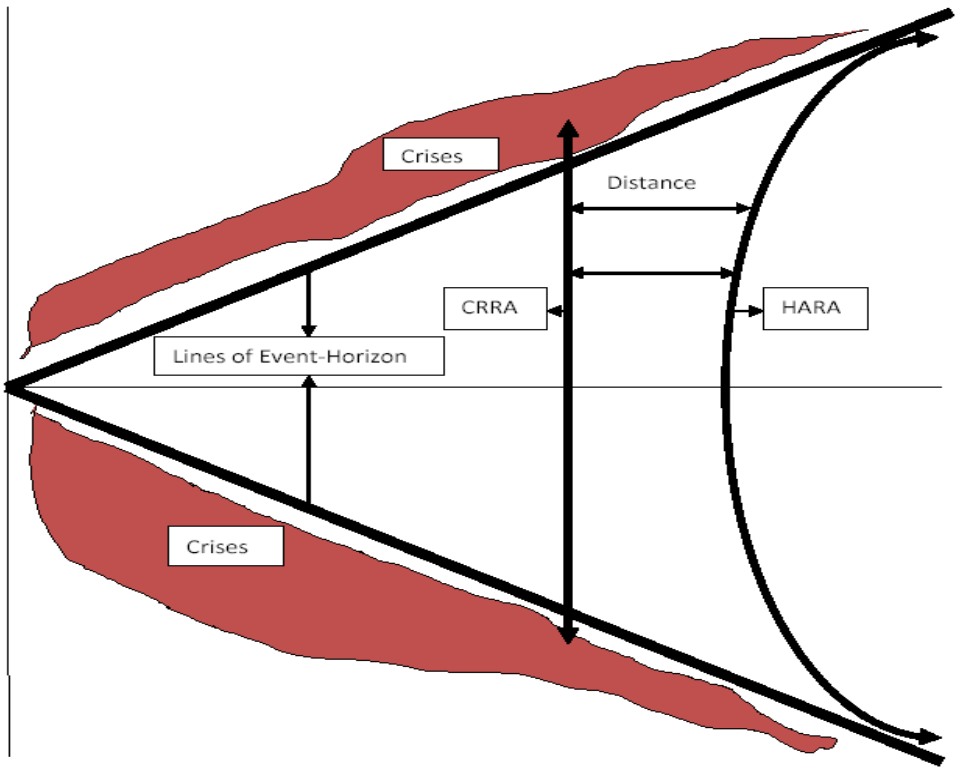

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Figure 1 illustrates the event-horizon for a cycle. The HARA curve show policy makers trajectory as it accelerates towards the event horizon. The CRRA line shows a similar path for business trajectory. The differences between the two trajectories widens over time. When the CRRA path enters the crises region, we expect it is no longer observed by policy makers

In the current crises investors have followed a straight line path to the event-horizon by dilating capital. The home loan at a local bank took the shortest path towards multiplying the maximum return to investments through securitization. On the other hand we say that the trajectory followed by policy makers is hyperbolic because we see loosening up of credit criteria for loans over time.As the divergence between these two trajectories increased, regulator (Government) got a dimmer and dimmer view of the investor's trajectory over time.

Significance of the Horizon View

At the event-horizon, some investment activities were no longer observable. Government scrambled to maintain control by bailing out what they perceived as reversible. Some event were not reversible because the law of motion could not predict their source of origin. For instance prices were returning to their market values which their notes and deeds did not reflect. Some investments such as bank capital and liquidity were reversible via bail out monies.

One main theory that the horizon view is valid for cycles was advanced by former FED chairman Ben Bernanke (1983). The credit hypothesis theory posited a significant relationship between failed-bank deposits and the fall of industrial output the Great Depression. With the backdrop of event horizon, we should question whether such deposits are lost or not. We can think that the information is not lost but remains in the surface structure of the event horizon. But the precise nature of that structure of information is yet to be explored. The location of lost assets of financial institutions need to be analyzed from the point of view of an event horizon. In case this appears as a strange view, we should recall that the former Soviet Union suddenly transformed from a communists to a capitalists country, indicating chaotic type of instability but its assets remained intact netting the loss of some countries to the EMU.

Conclusion and Implications

The framework we get a picture of business cycle from the joint view of market and policy aspects. The economy works well when the sectors of the GE side are true, or real. If the GE side is only symbolic or imaginary, then a false picture is generated.

Many view of the true or real cycle theories are possible. The classical economists divide the economy between the real and monetary sides. Money is a veil for them, housed in the imagination. The Keynesian compromised that money can affect the real side if it is used as to steer the economy. But even Keynes agreed that liquidity trap can occur, disabling monetary policies. Combined with other rigidities such are sticky wage-prices, and inelasticity of the MPK, the market mechanismis fragmented, and require government policies.

The sectors of the economy takes on a harmony position when there is no unexpected shock built up or formation of rigidities in the economy. The right hand side equation (1) is not guaranteed to work. To illustrate with the Arrow-Debreu GE model, when the sectors are harmonious, they form a sphere, although the analysts speak only of a convex part. The market keeps the sectors in balance through a continuous mapping between the convex objects, each representing a sector of the economy.

The mapping is not possible when harmony is distorted, representing problems in the economy. Just one hole will reduce the sphere to a torus, a problem in one sector can create policy problems, calling for the government to act.

To continue our torus example where harmony among the sectors produces equilibrium, a distortion in a sector would need some policy to bring it back in line with the other sectors. One topological way of this possibility is through the Borromean rings. To take a three sector view, we can hook up the real, monetary, and labor sector by engaging three Borromean torus one for each sector. Normal economic practices would be possible if they remain hooked up, even though one or the other or all of them are flattened. It would be as though one person's life continues in the presence of inhibition, anxiety, or symptom. However, a crises of a threatening magnitude, would occur if one of the rings is broken, allowing the other in the Borromean link to separate.

In the current crises, the monetary ring broke, leaving the real and labor side separated. The monetarist would say that this happened in the Great Depression in the 1930s as well. Keynes would say that in addition, all the rings have buckled, and like moebus strips, they become singularized into liquidity trap, interest inelasticity, and wage rigidity for the money, real, and labor sector respectively. New institutions need be forged to make room for the unfolding of the buckles.

In a crises situation, the torus or to further simplify, string-rings becomes so punctured that a new arrangement for GE needs to happen. A mapping such as Brower or Kukutani would not work. The torus is so flattened that it requires one to declare a false economy where new symbolic and imagination has to be forged to get back to wholeness. One needs to tap into the unknown unconscious to find a way out. Such are the ingredients for a revolution in economic thinking.

The great depression needed the Keynesian revolution, and stagflation needed supply side revolution to break through, and what revolution is needed for the Great Recession is still to be discovered.

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