An Institutional Dynamics Model of the Euro zone crisis:

Greece as an Illustrative Example

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<u>*Abstract*</u>

The current turmoil in the financial markets forces us to question the validity and relevance of the present economic theories. Complex dynamics characterized by bounded rationality and strong impact of expectations on the markets provides an independent source of fundamental uncertainty and this one can lead to speculative bubbles in assets markets triggering growth of public debt. The neoclassical methodology based on logical empiricism and deductive reasoning has failed to show what is going on in the real world. We will employ the institutionalist's view and focus on the behavioral aspects of the system modeling decision making process. We illustrate this approach with a model drawn from the current Greek sovereign debt crisis and its bailout discussions. The main benefit expected is the increased realism of the model itself. The discrepancies between theoretical predictions and observed behavior have had a major negative impact on economic models and system dynamicists can contribute a significant amount of value to institutional economics.

<u>*Key words:*</u> *Asset Bubble, Financial Crisis, Private Debt, Public Deficit, Financial Crisis, Bailout, Greece*

1. Introduction

The current turmoil in the financial market forces us to question the validity and relevance of the present theories. Post Keynesian economists have denounced that the mainstream's models are inadequate in explaining the origins, nature and effects of financial crisis. Complex dynamics provides an independent source of fundamental uncertainty and this one, as discussed by Keynes himself (1936, 1937), can lead to speculative bubbles in assets markets and to over-reactions both in lender's and borrower's attitude toward risk. Keynes considers the state of confidence as the confidence of the speculators and the confidence of the lending institutions. Or as stated by Sau (Sau, 2009), under conditions of fundamental uncertainty the behavior of economic agents is so complex that a formal probabilistic treatment of expectations is not feasible. Moreover in complex economic systems the predictability that is so successful for hard sciences does not work, and theories claiming predictability and computability have misled policy makers and continue to do so. The relevance of complex dynamics has been particularly stressed by Rosser (1995; 2001) and Dugger (1979). Institutionalists believe that cultural anthropology, pragmatic instrumentalism and placing events within a known pattern (Radzicki, 1990) rather than physics provides the correct methodological foundations for economics (Radzicki, 1990). On the other hand the neoclassicals would accept logical empiricism (Caldwell, 1982) and deductive reasoning (Vienna Circle, 1920s) as their core methodology. Institutional economics separates itself from classical economics via its evolutionary view of economic change (Hamilton, 1999). Based on the work of Veblen and Ayres, Hamilton concluded that human nature is goal seeking and that the restrains are set by their cultural environment. Hamilton (1953, 1999) explained that the fundamental difference between institutional and classical economics is in the way that economic change is conceptualized. Institutional or Newtonian change is seen by Hamilton as taking place within a given social and economic structure while Darwinian, or evolutionary as occurring when there is an alteration of a society's social and economic structure itself (Radzicki, 2003). As stated by Radzicki (Radzicki, 2003) the institutional economics was developed by Quesnay and Smith through Ricardo, Marx and then through "American institutionalists" Veblen, Commons and Mitchell; Ayres, Galbraith, Schumpeter, Bulding and Georgescu − Roegen and Ayres. And this route has been influenced by the cybernetics of Norbert Wiener (1948). Radzicki (1988, 1990a, 1990b), Radzicki and Seville (1993) and Radzicki and Sterman (1994) showed the similarities between system dynamics modeling and institutional economics and proposed a synthesis of both methods that would be more powerful than the sum of the methodologies in isolation.

The main reason why the institutionalists were not successful is that the they have been missing suitable tools for an analysis of their models. They have also shared same beliefs with the system dynamicists but they have not been using formal modeling techniques (Radzicki, 2003). However they see the world from the same perspective as system dynamicists: they focus on the real world, they acknowledge that the future is uncertain and they adopt a holistic or system point of view (Holt, 1996).

SD is a methodology developed to analyze and manage complex feedback systems. Taking advance of this, we developed three part models simulating Greek economy.

The discussion in this paper will be based on the following problems that institutional economists identified:

- In an uncertain world expectations have significant effects (Arestis, 1992); uncertainty is present also in decision making process.
- A focus on the real world is important (Arestis, 1992).
- Bounded rationality, willpower and self-interest play a crucial role (Thaler, Mullainathan, 2000).

The solutions are:

- Represent the behavior of agents as actually is.
- Focus on the effects of expectations in mass psychology theory.
- Model bounded rationality.
- Unify macroeconomics and microeconomics – derive macroeconomic behavior from microeconomics.

System dynamics is well suited to address all the stated problems as SD is suitable for modeling complex systems that portray human behavior and micro – level decision making as actually is. Moreover unlike the institutional theories SD has a well developed theory of the dynamics behavior of socioeconomic systems that draws from behavioral decision theory, psychology, control theory, management sciences and a very intuitive set of modeling tools and techniques that are used to capture the dynamics behavior of complex systems (Radzicki, 2003).

The objectives of this paper are:

a. Discuss the role of expectations and bounded rationality on model behavior and show that SD can be used to model real behavior.
b. Analyze the growth of private debt and the transition from private debt to public deficits that result in high level of sovereign debt.
c. Make scenario analysis on the external bailout for Greece and the Euro zone as a whole.

The remainder of this paper is as follows. The next section provides the Greek case study. The third section presents a motivating example for this paper in regards to the EU bailout scenarios for Greece. The fourth concludes the paper.

2. Case Study: Greece and the Euro Zone

The majority of the analysis of the models' behavior will be conducted on the Greek economy representing potential trigger for other EU defaults. Greece is at the moment most likely to default whereas the Greece's external debt amounts to 123% of national income and its gaping government budget deficit to almost 13% of GDP. But the problem is not only numbers; it is one of credibility (The Economist, 4th Feb 2010). Thanks to decades of low investments in statistical capacity, no one trusts the Greek government's figures nor does Greece's default history inspire confidence. Highly leveraged economies, particularly those in which continual rollover of short-term debt is sustained only by confidence in relatively illiquid underlying assets, seldom survive forever, particularly if leverage continues to grow unchecked (Rogoff and Reinhart, 2009). What makes default unpalatable is the fear of contagion— that if Greece were allowed to go under, the cost of borrowing for other troubled euro members would shoot up. Portugal, as the sell-off on February 3rd suggests, is next in line. Its public-debt ratio is 77% and rising. Its current-account deficit is almost as big as

Greece's. Italy has public debt of a similar scale, relative to GDP, to Greece's; but its budget deficit is only half as big and its current-account deficit is relatively small. The Italian bond market is the world's third-largest. Such a large and liquid market is less vulnerable to speculative attack than a small one, such as Greece's or Portugal's. Ireland is small, too, but its government has shown itself willing to take unpopular decisions to right its public finances. The Irish economy is more flexible so its medium-term prospects seem brighter (The Economist, 4th Feb 2010). And here is Spain. As Nouriel Roubini (New York Times, 5th Feb, 2010) suggests, Spain is bigger threat to the euro zone than Greece. EU has to act in order to hedge the spread of defaults from Greece to Portugal, Spain and Italy. Before the EU or IMF would lay ground for the bailout a scenario analysis has to be made about possible outcomes.

3. Institutional Dynamics Model: Expectations, Bounded Rationality, Impact of Asset Bubble on Financial Crisis and Growing Sovereign Debt

Humans make decision in the face of uncertainty following expectations and rules of thumb in their decision making processes (Radzicki, 2003). Consequently we have to turn to psychology (Earl, 1989), behavioral economics (Simon, 1979) and decision making literature to understand how individuals make decision in this complex world. Given that dynamic, nonlinear, feedback systems are unpredictable in principle, particularly in the long-run, and that economic agents must thus make their decisions about the future in the face of uncertainty, a logical question to ask is whether or not it is possible to model the way in which humans actually form their expectations (Radzicki, 2003).

The most successful at developing SD systems that mimic the actual human expectations formations process has been John Sterman.

According to Mullainathan and Thaler (2005) two main factors have been identified that cause human decision making to deviate from the rationality: bounded rationality that reflects cognitive abilities on knowledge that constrains human problem solving and bounded willpower, which explains why people make choices that are not in their long-run interest.

In the Euro zone the period between 1999 – 2009 has been organized in periods of booms and busts: the booms years were 1999-2001 and 2005-2007, the remaining years were the bust year. During boom years private debt increases spectacularly as the individuals were scarifying their long term interest. The latest boom period of 2005-07 stands out with yearly additions to private debt amounting on average to 35 percentage points of GDP. This was the over optimistic period of rising real estate prices. Thus the driving force of the cyclical behavior of government debt is the boom and bust character of private debt (De Grauwe, 2009).
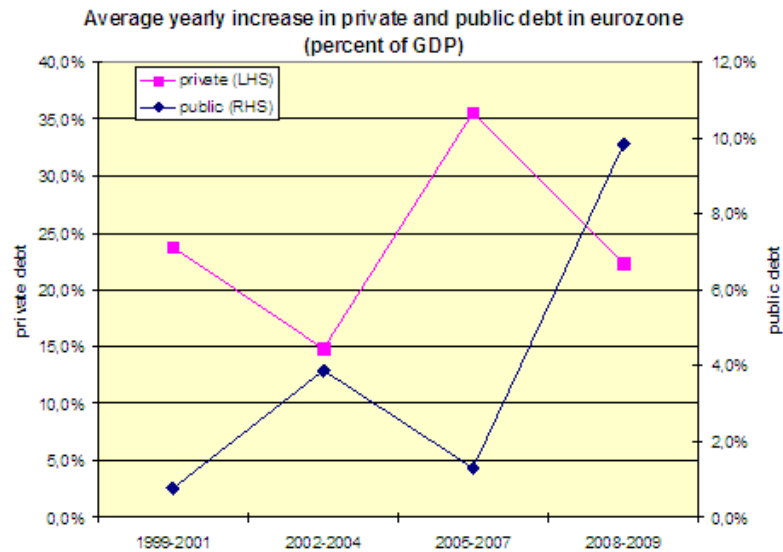
Figure 1: Average yearly increase in private and public deficit in the Euro zone (Source: De Grauwe, 2009).

During these boom periods, public debt growth dropps to 1 to 2 percentage points of GDP. The opposite occurs during bust years. Private debt growth slows down and public debt growth accelerates. Again the last period of bust (2008-09) stands out. Public debt increased by 10 percentage points of GDP per year, mirroring the spectacular increase of private debt during the boom years (but note that the surge of public debt during the bust years of 2008-09 are dwarfed by the private debt surge during the preceding boom years). Greece has been maintaining very high deficits, not just in recent crisis years, but also during the boom period of 2004-2006, when its deficit-to-GDP ratio averaged 5.2%; its deficit/GDP accelerated to 7.7% (the highest in Europe) in 2008, and now stands at 13% of GDP. However the behavior of public debt was still driven by the cyclical character of private debt (Calomiris, 2010) but there was some extra spending as the Greek authorities have mismanaged their economy and deceived everybody about the true nature of their budgetary problems (De Grauwe, 2010).

Using the Model showing the rising real estate (RE) prices we can see that the overoptimistic individuals and some extra spending are to be blamed for the present level of Greek sovereign debt. In order to understand why the individuals were "blind" and their expectations kept growing in regards to the real estate prices which caused the real estate bubble to grow we developed a model that mimicries the expectations of individual investors. The behavior of the model is diagrammed in Figure 2.

Figure 2 presents a generic model. "Real Estate Expected Price" is modeled as a stock. The "RE Expected Price" influences "Price" which in turn influences the "Indicated Price" and the "Change in RE Expected Price". "Change in RE Expected Price" is representing the beliefs about the equilibrium price adjust in response to the gap between the "Indicated Price" and the current belief and adjusts via first order adaptive expectations to the actual price whereas the "Indicated Prices" is modeled as an individual's belief about the equilibrium price and takes the larger value of "Minimum Price" and "Price" (modeled in Vensim PLE Plus as MAX("Minimum Price","Price"). This is a reinforcing loop marked by R. Moreover the "RE Expected Price" influences the "Change in RE Expected Prices" and this is a balancing loop marked by B. In the model there are also other variable measuring "Effect of Costs on Price" and "Effects of Market Supply on Price". The model has one reinforcing loop and one balancing loop. The core of the dynamic hypothesis lies in the tension between

the reinforcing and the balancing loop. From our experience we can confirm that the dominant loop is the reinforcing loop so the real estate prices keep growing. Due to the fact that this expectation formation process marked by bounded rationality of economic agents is accomplished without a significant time delay, a system will adjust smoothly to its goal. Once reality sets in (as realized profits are compared with prior projections), the flimsy foundation of the expectations means that the re-evaluation is "sudden and catastrophic" (Harvey, 2002). Meaning that the individuals will not choose the larger value of "Minimum Price" and "Price" but the smaller value of them, whereas the "Minimum Price" can be considered a "Maximum Price" as the individuals believe that the "Price" is not set above the "Construction Cost per RE Unit". The individual's decision to change his »Indicative Price« from »Maximum Price« to »Minimum Price« that will settle at the "Construction Cost per RE Unit" Level triggers a series of defaults. Keynes especially stressed the importance of prediction in his 1937 article on QJE (Marchionatti, 2009). So he stated: "knowing that our own individual judgment is worthless, we endeavor to fall back on the judgment of the rest of the world which is perhaps better informed. The psychology of a society of individuals each of whom is endeavoring to copy the others leads to what we may strictly term a conventional judgment" (Keynes, 1937, p. 115). As a consequence the estimations of the investment opportunities depend on the "judgment of the rest of the world" or with a goal "to confirm with the behavior of the majority average" (Keynes, 1937). It seems that the financial markets are first blinded and see no risk, until the wake-up call and then they overreact making the resolution of the problem more difficult (De Grauwe, 2010).

The bubble burst can be considered as an imperfect substitute for the unavailable exchange rate devaluation: the Euro currency could not have been devaluated so the prices fell.
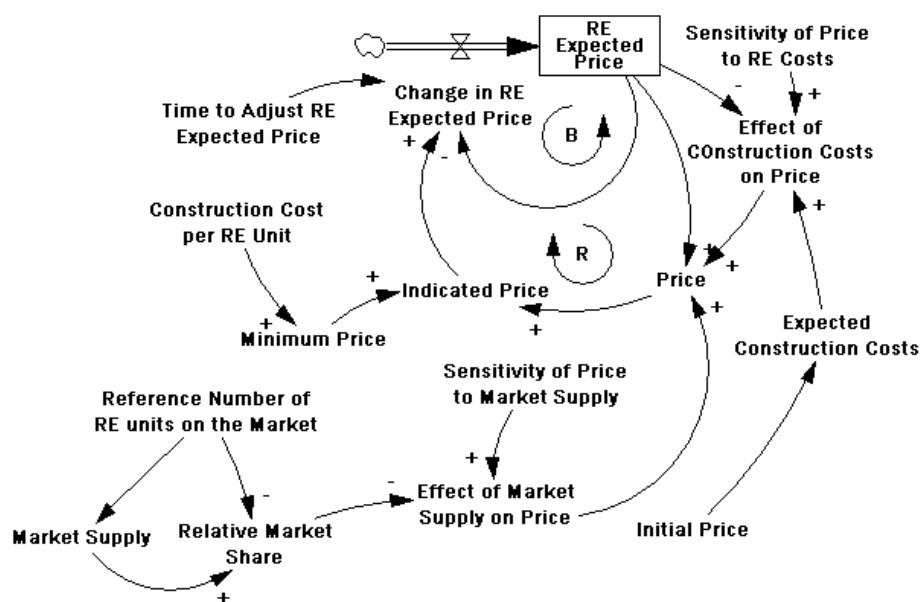

**Figure 2: The Process of Growth of Real Estate Price Expectations, with emphasis on why the RE prices kept growing –
Increase of**

This hindsight bias erodes the quality of the feedback humans use to sharpen their reasoning skills. The main problem is that humans try to predict the level of confidence that actually

relies on feedback. Consequently they are following the market psychology and not the long term returns in all of their (bounded) rational or irrational glory (Radzicki, 2006).

What we have described so far is the way individuals create their expectations and why the "RE Expected Price" keeps rising. The rising real estate prices result in growing private and there is a sudden drop in the price. Running the model gives the behavior for "RE Expected Price" in Sim1 (Figure 2). Model generates a steady growth of a housing prices.

A simulation run begins with "Initial Price" of 100 in 2002 and reaches its peak in October 2007 and then in drops to the "Construction Cost per RE Unit" level.
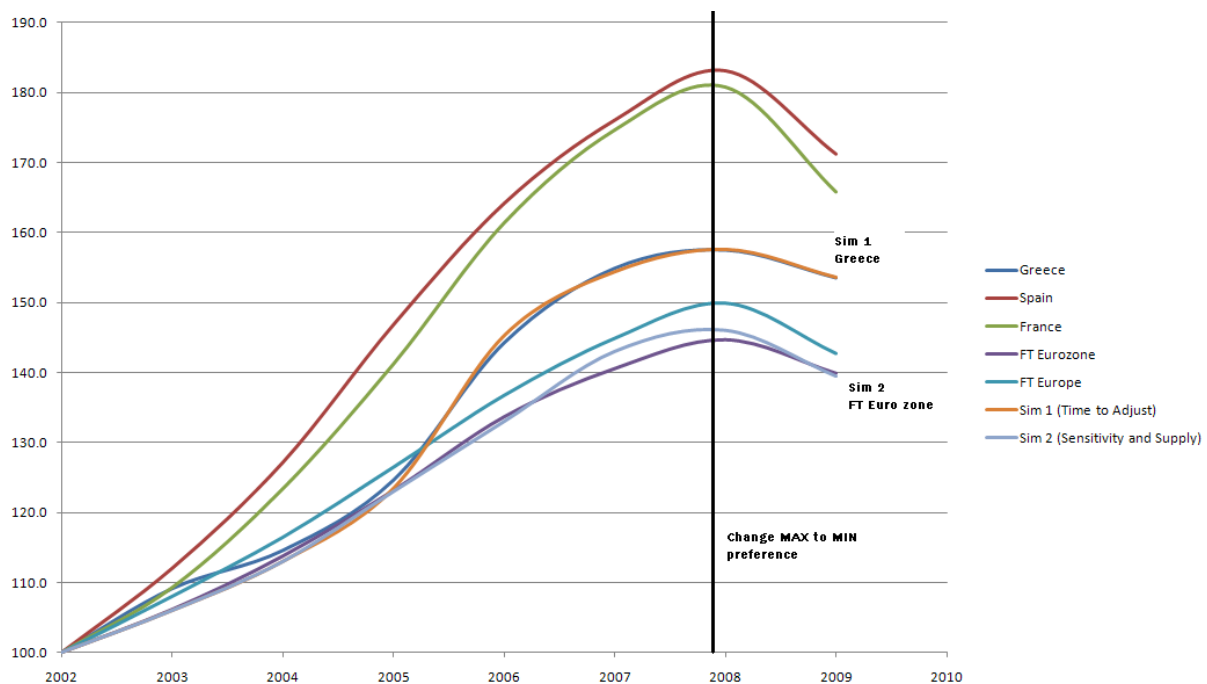

Figure 3: Simulation 1, what should happen, given the process in Figure 1 (FT Europe & FT Eurozone)

Inspection of Figure 3 reveals interesting behavior of the model in regards to the RE price determination. The orthodox economists could not explain the reinforcing loop that derives from the bound rationality of economic agents. Integration of System Dynamics into the existing economic model can help explain why the model generates a price spiral, e.g. why the classical approach models using the utility functions interacting at Nash equilibrium results cannot predict the real behavior (Nichols, Pavlov, Radzicki, 2006).

Credit squeeze triggered recession and financial crisis. Financial crisis is usually the result of individuals following certain rules during their decision making process. The markets affect psychology and psychology affects markets. Also, after an event occurs, humans tend to overestimate their pre-event knowledge of the outcome. One of the Forrester's articles in 2008 (Forrester, 2008) argued that financial crisis occurred only because many people sacrificed long term interests for short term gains. In the recent real estate crisis low interest rates generated easy credit. The public debt was growing under the influence of private debt.

Next we turn to SD to understand the dynamic behavior of a growing public debt.

The root cause behind the rising debt can be described with the following dynamic hypotheses: 1. In the boom phases the private debt is high, 2. In order to stimulate economy in the bust phases Greece could only use the expansionary fiscal policy that results in a larger deficit (the monetary policy is in the hands of the ECB – in the monetary union the central bank controls the overall money supply) 3. Greece was spending also extra amount of money in comparison to other EU members (the reason for that is disputable but can be assigned either to creative accounting, structural problems, government change) 4. The expansionary fiscal policy would probably result in a classical model in adverse effects in other countries. A fiscal expansion in a Newtonian model would push the Greek interest rates up and also raise the money supply. As a consequence classical model would argue that the income would rise in Greece. We will argue that this cannot happen and there are two root causes for that: a. Formation of expectations of speculators / bounded rationality of individuals and b. Lack of credibility of Greek government. 5. Greek government faced a combination of a heavy debt burden that cannot be inflated away (because it is denominated in a foreign currency or in the common euro) and an important fiscal deficit testing the sustainability of servicing that debt. This in turn stirs market sentiment and widens sovereign spreads – possibly triggering a self-fulfilling run and a default (only point 5 de la Torre, Levy – Yeati and Schmukler, 2010). 6. The crisis was also allowed to unfold because of hesitation and ambiguities by both the Euro zone governments and the ECB. The Euro zone governments failed to give a clear signal about their readiness to support Greece (De Grauwe, 2010).

Figure 4 is a generic model showing the transition from private debt to public debt. To understand the model let's begin with the "GDP". "GDP" in Figure 4 represents the real gross domestic product and we measure the error between the real GDP and "Perceived Value of GDP". This represents a balancing loop generating (B1) "expectation formation" oscillation. The main feedback loop is a reinforcing loop (R1) so the GDP keeps growing. If the model contained only the two loops, the growth of the GDP would be increasing with slight oscillation around the trend. But the system is not that simple. The striking force behind the "Private debt" is not the "GDP" but the "Perceived Value of GDP". "Perceived Value of GDP" is influence by the formation of expectation that the real estate prices and the economy in general will keep rising. High "Public Debt" will contribute the decline of the "Perceived Value of GDP". Lower "Perceived Value of GDP" will trigger the use of "Expansionary Fiscal Policy" that force the government to make additional spending and contribute to higher "Public Debt". The feedback is thus amplifying the input signal (R2). The "Private Debt" will depend on the "Perceived Value of GDP" which is falling in a period of crisis. Before in the boom period the "Expansionary Fiscal Policy" was used but due to high debt this policy is not available in the bust period where longer financial crisis is expected. The financial crisis will cause sudden drop of "Perceived Value of GDP" and this will result in falling "Private Debt" and rising "Public Debt". Greek government has been namely accumulating the "Public Debt" even in boom periods, e.g. during the boom period of 2004-2006 its deficit-to-GDP ratio averaged 5.2%, the same ration accelerated to 7.7% in 2008 and now stands at 13% of GDP. The cumulative effect of these deficits is an outstanding sovereign debt exceeding 123% of GDP. The reason why this level is unsustainable is because Greece is not expected to generate very large fiscal surpluses in the coming years. On the contrary Greece would have to increase its spending to reach higher growth. The spending would probably provide a transitory boost to the economy but then this effect would dissipate as financial resource to private sector would be reduced (not in the Financial Model – Hoisington, Hunt, 2009). The high level of Greek sovereign debt has raised concern among the Euro members. As Adam Smith warned two centuries ago "the practice of funding has gradually enfeebled

any state which has adopted it"(in Scott, 2010). The Speculators (modeled in Figure 5) keep pushing the yields up and make substantial contribution to "Public Debt" increase (R3). The "RE Expected price" is modeled in Figure 2 and is the indication of overoptimistic or over pessimistic markets and also the variable that triggers financial crisis. The "Private Debt – Deficit Spending" representing the amount by which an individuals' spending exceeds their income is growing as a result of over optimism. From a system dynamics point of view, positive and negative feedback loops fight for control of a system's behavior. The »GDP« and the »Debt« loop are dominant an determine a system's time path. The relationship between the expenditures and debt has to be properly assessed and will depend on the national economy and its dependence on the outer world, e.g. its exposure.
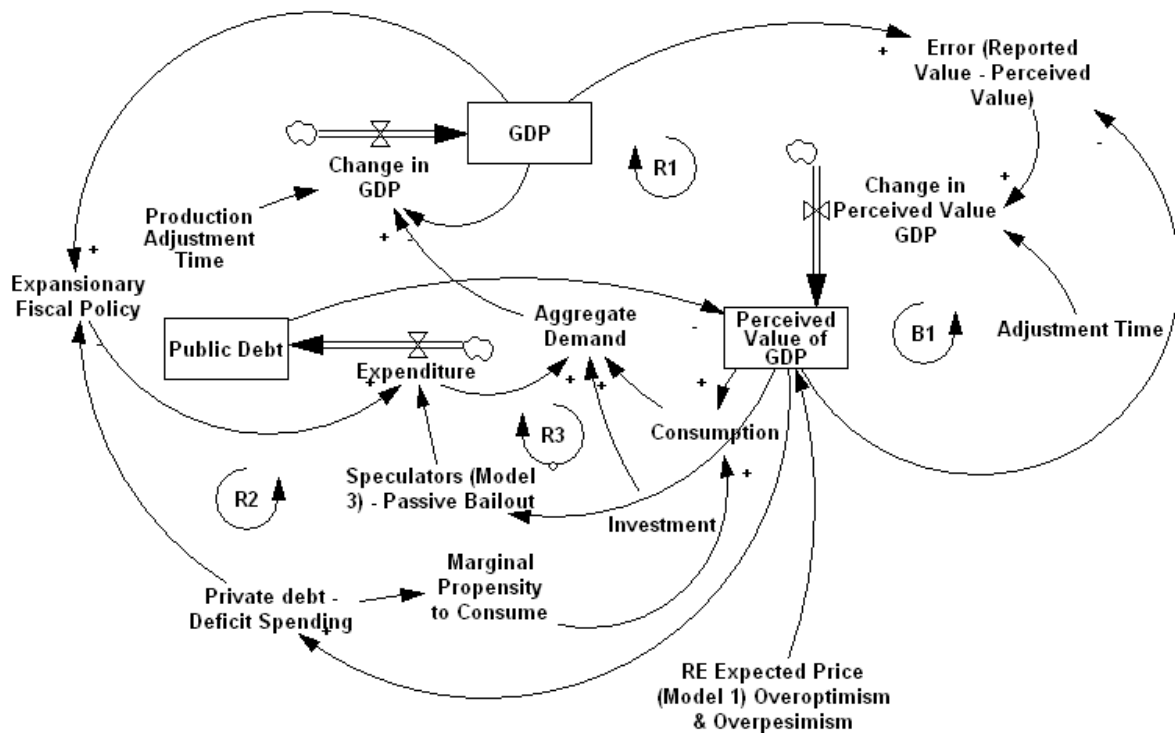

Figure 4: From Financial Crisis to Sovereign Debt Crisis

It is generally well understood that growth of financial crisis indicator influences growth of sovereign debt. Especially in Europe the only politics applied in crisis is fiscal policy as the monetary devaluation of s single country is impossible. Extensive fiscal policy influences the growth of sovereign debt as shown in Figure 4. Greece is a low productivity country that relies heavily on Maritime industry and Tourism where the policy makers have been pursuing debt fueled Keynesian economic policies which result in large sovereign debt and as pointed out by Irving Fisher (see Fisher's 1933 "Debt – Deflation Theory of Great Depressions") EU and it is well known that the high levels of economic distress result in prolonged economic crisis. Reinhart and Rogoff (2009) reiterate this old rule and write that once debt becomes excessive, countries will not find a solution to their problems but will usually go through the time consuming process of debt repayment and increased spending. Note also that according to Reinhart and Rogoff (2009) major economic contractions lead to deflation. In the Aftermath of Financial Crises (2008) Carmen Reinhart and Kenneth Rogoff find that the outcome of severe financial crises share three characteristics. First, they show that asset market collapses are deep and prolonged. Second, the aftermath of banking crises is

associated with profound declines in output and employment. Third, the real value of government debt tends to explode. This is what we will explore in the next section.

Greek sovereign debt represents a serious problem. Given the sovereign debt exceeding 123 % of GDP let us assume the average growth of 3% of the real GDP growth and an interest rate of 6% on Greek government debt. Under these assumptions, given the current level of Greek sovereign debt, an average surplus of 4.2% of GDP (before interest payments) would be necessary to avoid sovereign default. With government expenditures other than interest at about 44% of GDP, and tax receipts at about 40% of GDP, that implies that the government must either immediately and permanently cut non-interest spending by about 25%, or immediately and permanently raise taxes by about 28%, or if the two were done in equal combination, cut non-interest spending and raise taxes each by about 14%. Even being willing and able to embark on such an ambitious agenda of fiscal reform would not guarantee success. First, in the short term, Greece has a massive amount of debt coming due. To avoid default the Greek government must either convince the market immediately that its reform is credible or convince the European Union to roll over the 53 billion Euros of its debt that comes due in 2010 (Calomiris, 2010).

In Figure 6 we present the bailout model. The model is designed to explore the dynamic hypothesis of self rescue from the exploding debt. The rising "Debt" would trigger "Inflation" in any rising economy providing the "Financial Crisis Switch" would be set to off. The inflation would cause that the demand for government bonds would drop. The Greek government would have to reply by placing large number of state bonds on the market. Rising "interest rate" would result in lower bond prices / higher financing costs. The "Debt", "Supply of Government Bonds" and "Inflation" would keep rising without help from abroad (EU or IMF). The influence of speculators in this loop is marked as "Influence of speculators" and plays an important role. Many hedge funds were speculating on Greek debt respectively on their default. With the rising financing costs their betting strategies will become even more aggressive. This is a reinforcing loop (R1). The inflation would result in lower real debt (inflation namely lessens the real purchasing power of the masses and can be considered an indirect tax) so this is a balancing loop (B2). However we do not expect the inflation to occur − rather deflation . By rising the supply of sovereign bonds, debt can push bond prices down and yields higher, raising the cost of borrowing and pushing the "Financing Costs" up. However debt levels are not the sole determinants of risk. Monetary policy, perceived currency risk, inflation expectations, and risk appetite—which vanished during the financial crisis—also play important roles (Dadush and Stancil, 2010).mHigher debt can also raise expectation of tax increases and inflation and is consequently undermining business and consumer confidence. This will cause "Perceived Value of GDP" to fall and this will result in the growing "Public Debt" (R2). Growing "Public Debt" will impose the limits to the extra spending so this is a balancing loop.

If not stopped, the crisis will lead to increases in government bond yields in a significant number of Euro zone countries. This will put pressure on the governments to sharply contract fiscal policies, leading to deflationary effects and risking to pull down the Euro zone economies into a double-dip recession. Such an outcome would make it more difficult for the Euro zone countries to reduce their budget deficits and debt levels (De Grauwe, 2010).
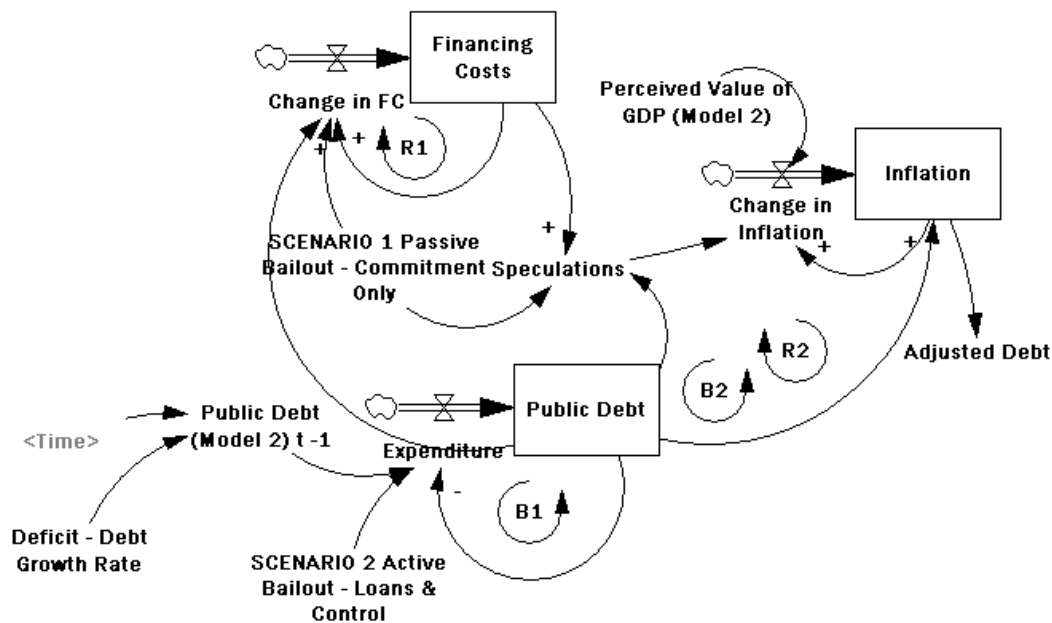
Figure 5 : BAILOUT MODEL – Sovereign Debt / Inflation / Financing Costs

But perhaps the most important factor in determining government bond yields—and thus, the impact of higher debt—is investor confidence in the country's governance, including, for example, the integrity and quality of its administration, the independence of its central bank, and its political cohesion (Dadush and Stancil, 2010). Or as stated by George Akerlof, Nobel prize laureate "Trust is easily ruined, but to rebuild it takes time."

Validity of the models

The results suggest that the model as a whole may be valid as it possesses some theoretical pleasing properties and is also capable of mimicking different aspects of human behaviour. The validity of the models was appraised as suggested by Peterson (1975, Appendix B) and Forrester and Senge (1980).

From Figure 2, 4 and 5 it appears that the partial models pass a majority of the tests because they mimic some of the observed behavior of the economy. Moreover we believe that its structure and behavior are appropriate for its purpose.

4. Does European have to act or can Greece rescue itself with a EU commitment to help if needed?

Following are two scenarios for how the crisis may develop over the coming year, with assessments of their probabilities and implications for financial markets based on the models modeled in previous sections. The first alternative is the underlined passive bailout. The passive bailout would mean that the EU would come up with a clear offer of standby loans. So the EU would not supply aid but the promise of aid. Greek government believes that the commitment would

discourage market participant from speculating on Greek bonds and hedge the financing costs. The Greek government is namely claiming that self rescue is possible but that they might fail because of rising borrowing costs. On the other hand we could argue that Greece will use the restrictive fiscal policy that will result in lower GDP growth and in further debt. Greece would namely have to generate surplus in order to cut its debt. The second alternative is <u>active bailout</u> where EU would grant immediate subsidies and loans to Greece and impose strict terms.

We will test the two alternative bailout scenarios below:

1. EU makes commitment to help Greece if needed. Greece makes progress towards this year's deficit and there is no further rating downgrade. (Passive Bailout).
2. EU / IMF grants to Greece loans and imposes strict regulations (Active Bailout)

There are different places to intervene in a systems / in the economy (replicated from Donella Meadows, 1999 available: sustainer.org/pubs/Leverage_Points.pds). We will focus on the following leverage points:

- Constants and parameters (*taxes, retirement age, fees*)
- Structure change
- The mind or paradigm that the system arises out of (*lack of confidence in Greece, speculator's attacks*)

4.1. Passive Bailout

- POLICY:
    o Change constants and parameters (higher taxes, lower government spending, cut benefits, lower salaries and wages)
    o Change the mind paradigm (loan commitment will discourage speculators)
- RESULT:
    o Lower financing costs, discourage speculators and lower public debt in comparison to the "no loan commitment" scenario.
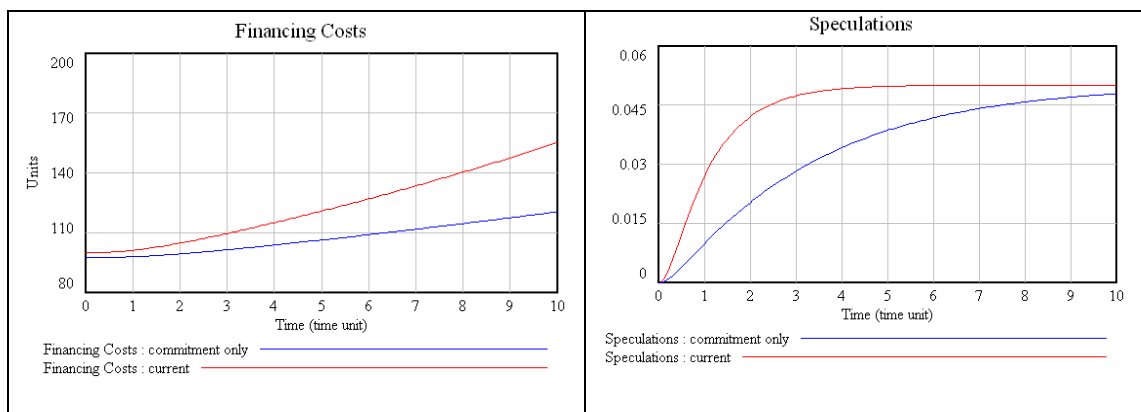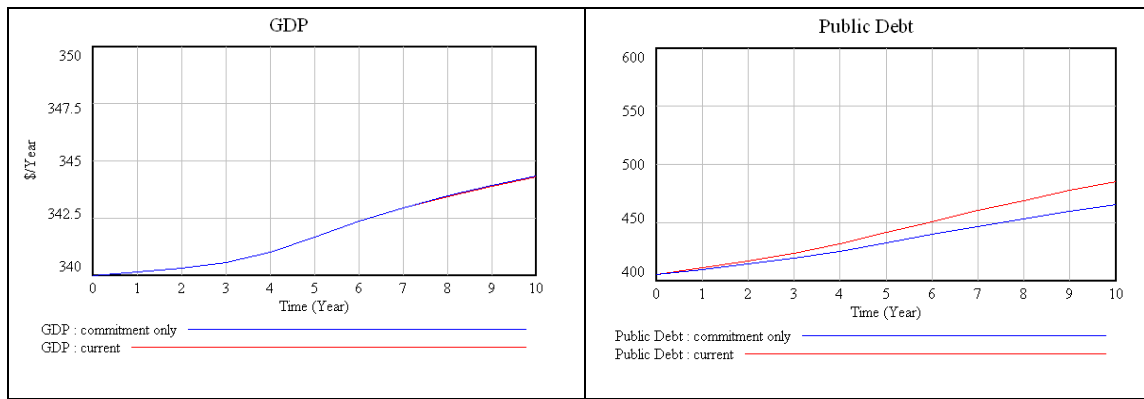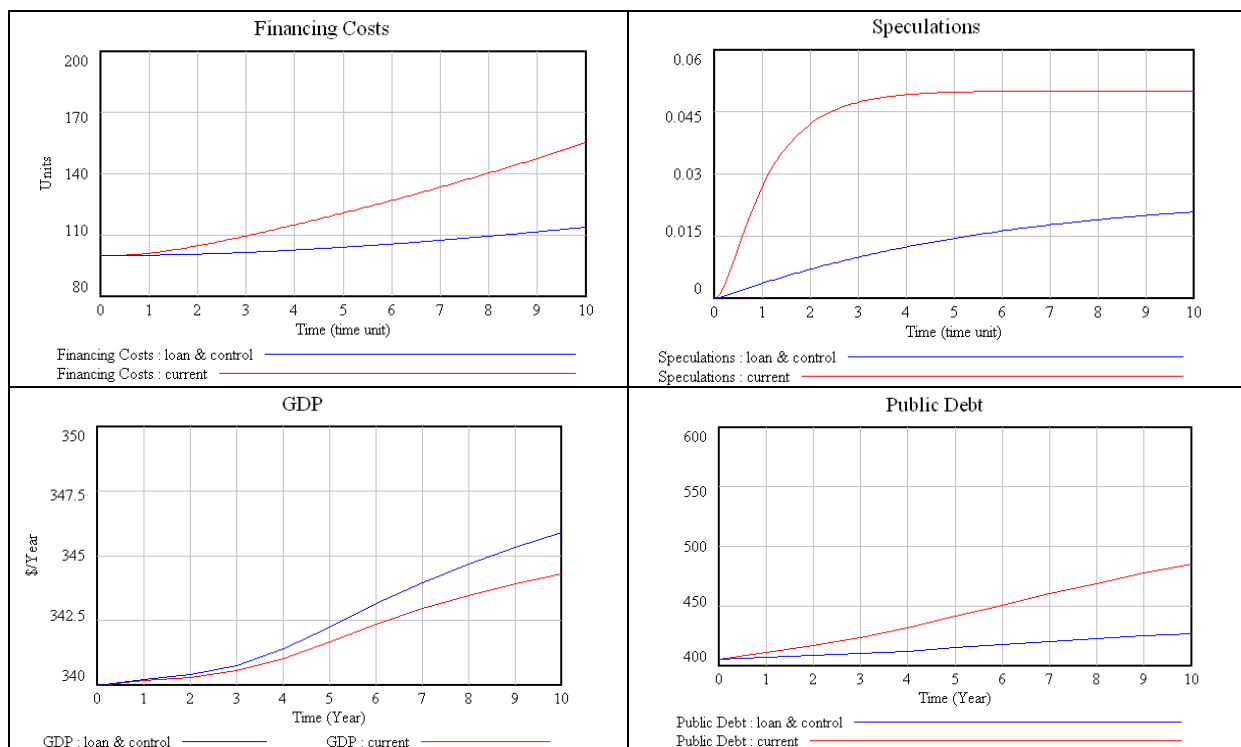
Figure 6: Financing Costs in Units 100 = pre crisis rate, Speculations (% of all market participants), GDP in billion US dollars and growth of Public debt in billion US dollars

4.2. EU chooses active bailout

The EU gives emergency aid to Greece to resolve the crisis. It might take a wide range of steps, from having state-owned financial institutions buy Greek debt to accelerating the disbursement of routine economic aid to Greece, providing Greece with a debt guarantee, or establishing a bailout fund. The EU treaty attempts to ban bailouts of euro zone members but legal obstacles could be circumvented if necessary, perhaps by declaring aid "bilateral" (Reuters, 18th Feb 2010).

There are at least two reasons why the EU will bailout Greece:
- A large part of Greek bonds are held by European financial institutions, especially German
- A failure to bail out Greece could trigger contagious effects in sovereign debt market.

Figure 7: Financing Costs in Units 100 = pre crisis rate, Speculations (% of all market participants), GDP in billion US dollars and growth of Public debt in billion US dollars

- POLICY:
    o Change structure of the system (strict regulations and control, drastic changes in Greek economic and budgetary policies (De Grauwe, 2010))
    o Change the mind paradigm (loan commitment will discourage speculators)
- RESULT:
    o Lower financing costs, discourage speculators and lower public debt in comparison to the "no loan commitment" scenario and to the "commitment only" passive bailout.
    o Higher GDP growth in comparison to the passive bailout.

Given that strong economic growth is the best long term debt reduction strategy and that the global recovery is still dependent on government support, policy makers, particularly those in the advanced economies worst-hit by the crisis, must maintain stimulus efforts in the short term (Dadush and Stancil, 2010)

5. Conclusion

As the new "after financial crisis"-era begins to unfold, economists must start using new tools in order to rethink and redesign the socioeconomic systems. Economics has always relied on a careful modeling of decision – makers. Nevertheless, the discrepancies between theoretical predictions and observed behavior have haunted the field for many decades (Brocas, Carillo, 2010) The system dynamicists can contribute a significant amount of value to institutional economics in the following ways: provide a clearer understanding of feedback, provide a medium for bringing behavioral theory explicitly into pattern models, helping to define and expand the corpus of holistic economic theory, offering insights into socioeconomic evolution and assisting in the production of new pattern models (Radzicki, 1990). Current economic system are marked by their complexity in which "irrational" individuals are forming expectations. This type of complexity is not very welcome since this may lead to speculative dynamics. In this case a positive feedback aggregate beliefs cease to bear a relationship to realistic possibilities (Su, 2009). There are indeed serious epistemological problems associated with complex economic systems which imply that there exist serious bounds on the rationality (Dequech, 2001; Rosser, 2001; Marchionatti, 1999). This can lead to group dynamics as analyzed by Keynes for the well – known "beauty contest" where each party tries to guess the average state of expectations of the other parties. So every individual is more interested in the sentiment than in the fundamentals. If the result of one s decision depends on the decision taken by others than this would imply that there is a special interdependence in the market. Interdependence in itself is not a source of fundamental uncertainty, since it may merely generate complexity in a constant, or predictability changing environment (Sau, 2009). Everyone has to consider organic interdependence, where the whole may be more than the sum of its parts. "Organic interdependence creates fundamental uncertainty in the sense that expectations must be about other people's expectations and this spreads fundamental uncertainty" (Dequech, 2001). We also believe that most policy makers in human systems contribute to the problems they are trying to solve. Many economists have argued that even if individual consumers suffer from bounded rationality, markets will be set right who can figure out even the most complex problem. But they were wrong (Thaler, Sunstein, 2008 / New York Times). Regulators should therefore help people manage complexity by requiring simplicity from financial instrument creators and strict disclosure rules and the synthesis of economics and SD will help.

"Yet the ability of governments and investors to delude themselves, giving rise to periodic bouts of euphoria that usually end in tears, seems to have remained a constant." (Reinhart, Rogoff, 2009).

It seems that actually the EU cannot choose between bailout and no bailout and cannot choose between inaction and action, because ultimately the EU will be forced to act. If the EU comes in earlier and in a more systematic fashion, the cost for everyone will be lower and the chances of fast recovery stronger (Johnson, 2009).

To put the Greek problem in perspective, loans required to fund half of its 2010 projected fiscal deficit would amount to about 0.1 percent of the GDP of its Euro area partners. Bearing in mind the inevitable contagion effects from Greek default onto the major European economies, and the currency instability as the euro comes under attack, providing support would only make sense (Dadush and Stancil, 2010).

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