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DEBT DEFLATION AND WORLD ECONOMIC GROWTH: SYSTEM DYNAMICS APPROACH

Short introduction: The world economy for nowadays is splitted in aspect of causal link effect for debt and inflation between China and the rest of the world. While China expects the economic situation to worsen due to deflationary processes, the rest of the world is experiencing the opposite process of inflation surge and further debt increase [11]. Two sides of the same coin reflect the fact that the world economy is increasingly sliding into a global crisis. The non – linear relationship are to be reflected using system dynamics approach. The main question we need to answer: "Why sudden increase in global debt happened and what is the effect of it on global economy and separate countries (case of China)?". Based on the difficulty of solving one problem in one study, efforts are mainly concentrated on the analysis of a separate aspect – deflationary processes in China and proposals for a way out of the current situation. At first, we present the steady – state equilibrium of the Chinese economy and then shock it with the sudden debt inflow and indirectly creates inflation and deflation side effects. The second question we are trying to answer: "Does deflation really reinforce debt level?" In our analysis we use P'HAPI concept, which allows us to use the holistic approach to problem solving to improve the performance of the world economy. We need to provide the simulation of the studied value (debt) and make appropriate changes to apply alternative effective policy measurement, because the debt situation in China threatens to melt down the world economy.

The problem statement: Global debt is one of the main causes of the global economy slowdown. The level of it may reach 366% of the output [5]. The crucial and diversion started in 2007 – 2008 with an increase in bank lending and a sharp increase, first, in domestic debt. It is known that China ranks second in terms of GDP in the world economy and has a moderately high level of national debt to GDP (77%)

and may increase to 100% in 2028 [10]. At the same time, the researchers note, China might fall into a sovereign debt trap thanks to the significant level of sovereign debt in China's debtor countries [1] and "faces challenges in dealing with the debt distress of some of its borrowers" [7]. Thus, there is a threat of unwinding the deflationary spiral. We represent causal diagram of deflationary spiral in Stella Architect based on [2] to convert it in basic stock and flow model filling it with real statistics of the Chinese economy.

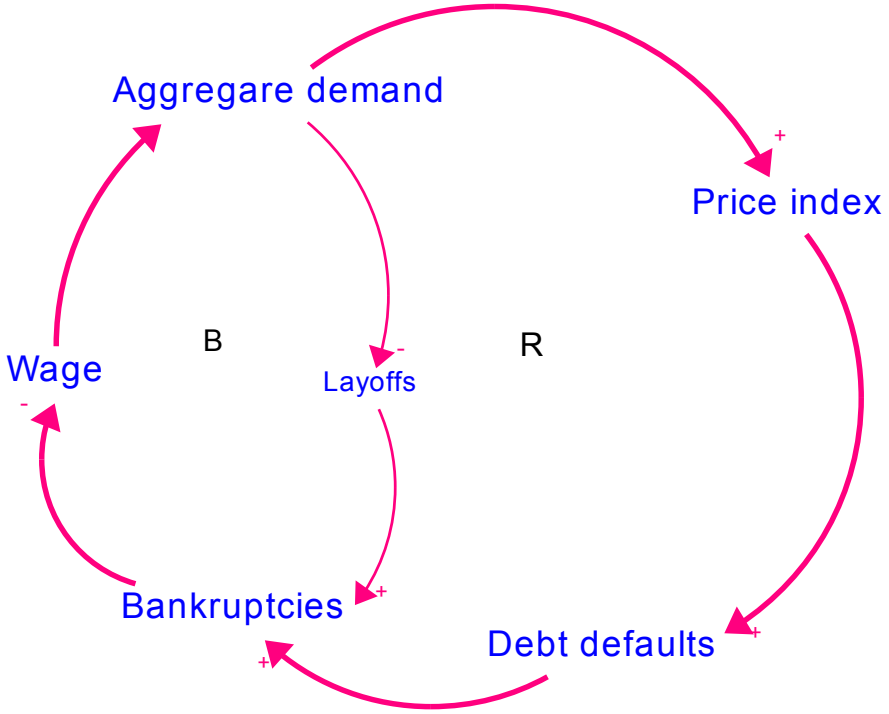

Figure 1. Feedback loop of debt spiral – demand side [2]

The tendency of deflation from the demand side has been studied in a holistic way (Figure 1). Variables, which are displayed above on the diagram, allow us to choose one, the most significant to draw the reference mode. We choose the dimensionless quantity – debt/ GDP, that connects two variables – aggregate demand (AD) and debt. We associate AD with GDP, because the former one refers to total demand for produced finished goods and services. We also assume the existence of global downturn due to severe economic decline in China, whose economy accounts for approximately 25% of global economic growth. This will be reflected on the reference mode and stocks and flows diagram.

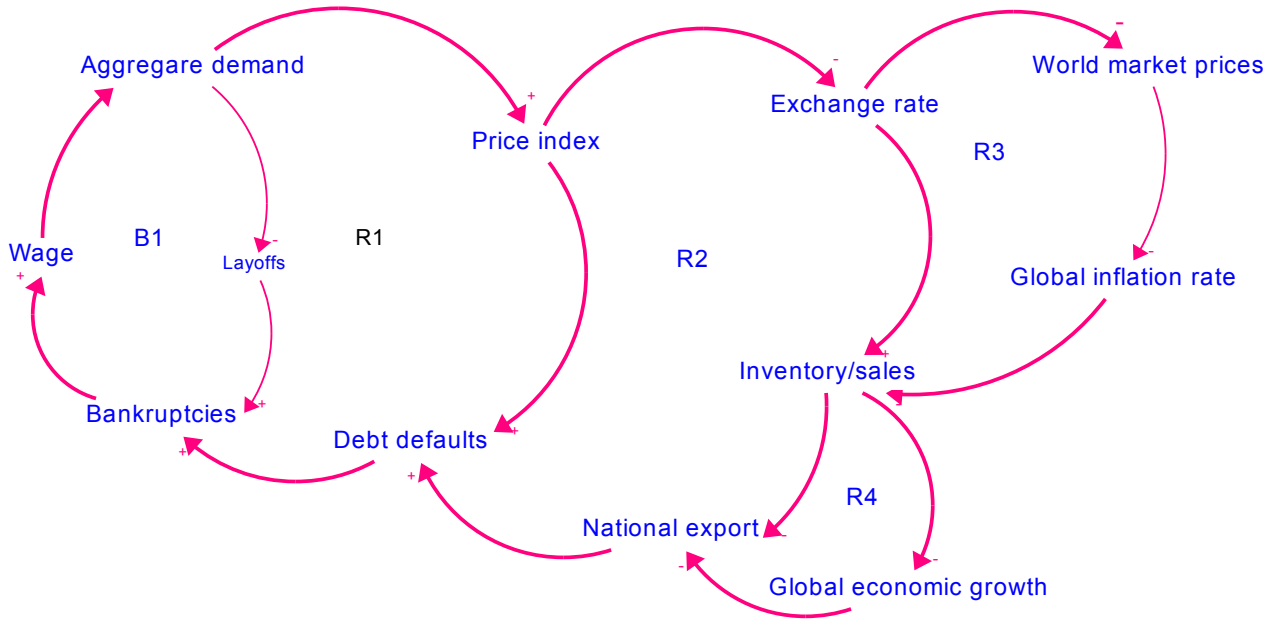

Figure 2. Extended feedback loop of debt spiral – demand and supply side

Hypothesis: According to [9, p. 3; 5] the attempt to resolve the problem leads to its aggravation in a form of policy resistance. In accordance with our hypothesis, debt deflation in a large economy may create the vicious cycle of economic downturn in a global economy. The reasons for policy resistance are the following:

- There is not one, but several economic cycles, the actions of which are counteracting and may create the precedent of side effects with corresponding policy resistance [3];
- The endogenous type of cycle contrary to exogenous is the possible cause of policy resistance existence and long – run equilibrium existence alternating with "new disturbances" [3];
- Disequilibrium occurs as a result of the government intrusion into market mechanism (price mechanism in our case);
- Active macroeconomic policy may lead to policy resistance with the effect of over- indebtedness and deflation. In turn the latter factors disturb the whole macroeconomic system.
- The main factor, which shocks the system and makes it unbalanced is the debt. 26 % of the global debt increase is accumulated by China [4]

Analysis: Drawing reference mode helps to identify the structure with appropriate behaviour. The most important variable we have chosen is the debt level in the country with deflationary trend. We reproduce the historical behaviour of it in its relationship with the increase in growth of the global economic slowdown. The higher the growth rate of China's debt, the faster the decline in global production.

The reference mode, presented above, represents this trend, corresponds to exponential pattern of behaviour, and matches with I. Fisher basic model.

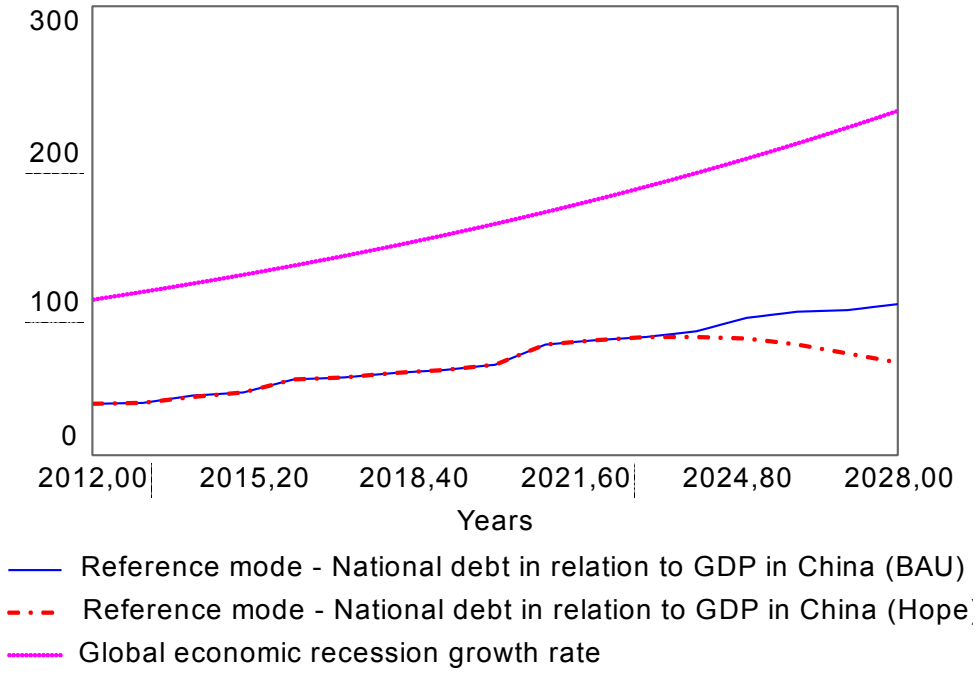

Figure 3. Reference mode for national debt level in China

We keep the first model simple and present it with one stock – debt level, measured in billions of USD with the critical feedback loops. The model runs in years, so the units of flows are USD/year. We also use fit statistics in Stella Architect programme and [Hovmand P.]computer simulation to test the model for generating the behavioural reproduction test and the underlying structure, especially the replication of the amplitude, the mean and phasing by decomposing the error into three parts with Theil statistics using the

The presented below model has one stock, debt inflow and outflow with some parameters to be adjusted. We estimate the fit between simulated behaviour of global

economic recession and national debt and observe a huge gap between them. To estimate this gap, we create the module "Global economic slowdown" fit and compare it with BAU (Business as usual) reference mode. We use in this part of analysis the actual statistics, presenting the numeric display tool to report fit statistics. That could be correlation between two parameters and R – squared and the mean – squared error. We also implement inequality statistics: mean structure: standard deviations amplitudes and phasing measurement. The final values of fits are reflected in the right column of the tab.

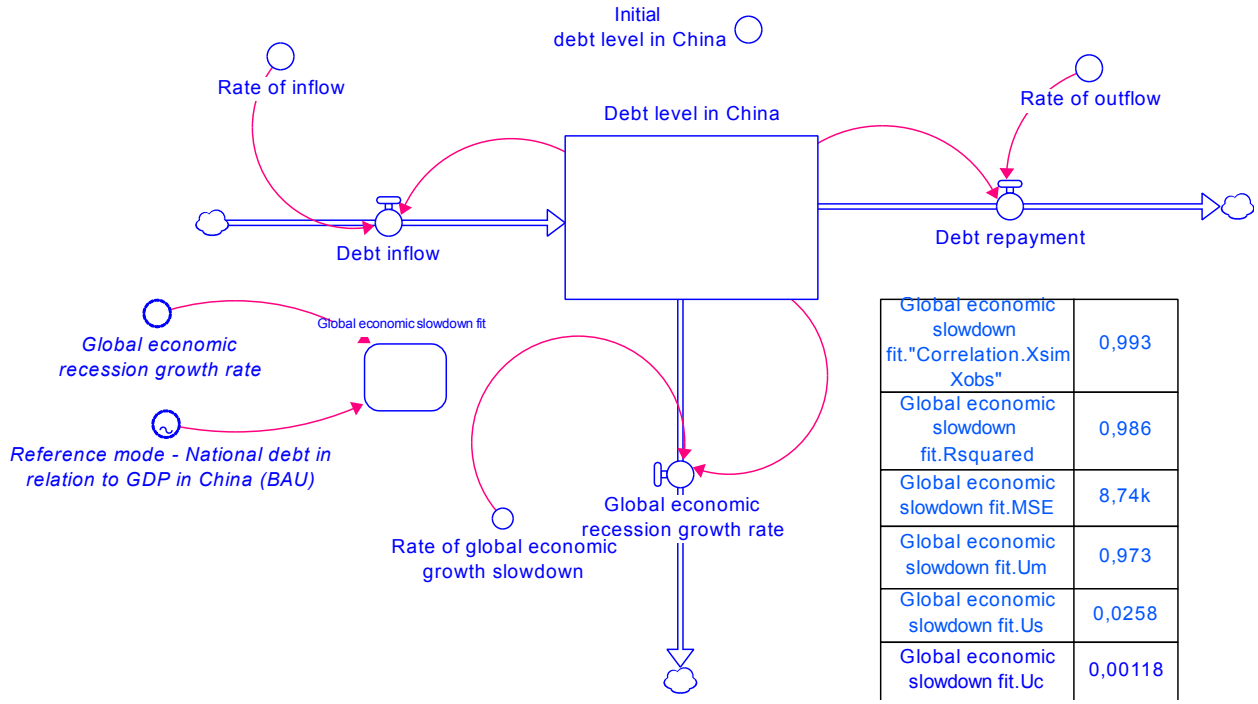

Figure 4. Model fitting of simulated behaviour

Policy recommendation: To improve the situation we need to add some additional loops into the model, which have been presented below. The result of analysis shows that sacrificing economic growth ratio leads to overcoming of the debt crisis in separate large country. Nevertheless, the following step would be to neutralize the global economic slowdown, though according to [Rosen] it will only get worse (Figure 5).

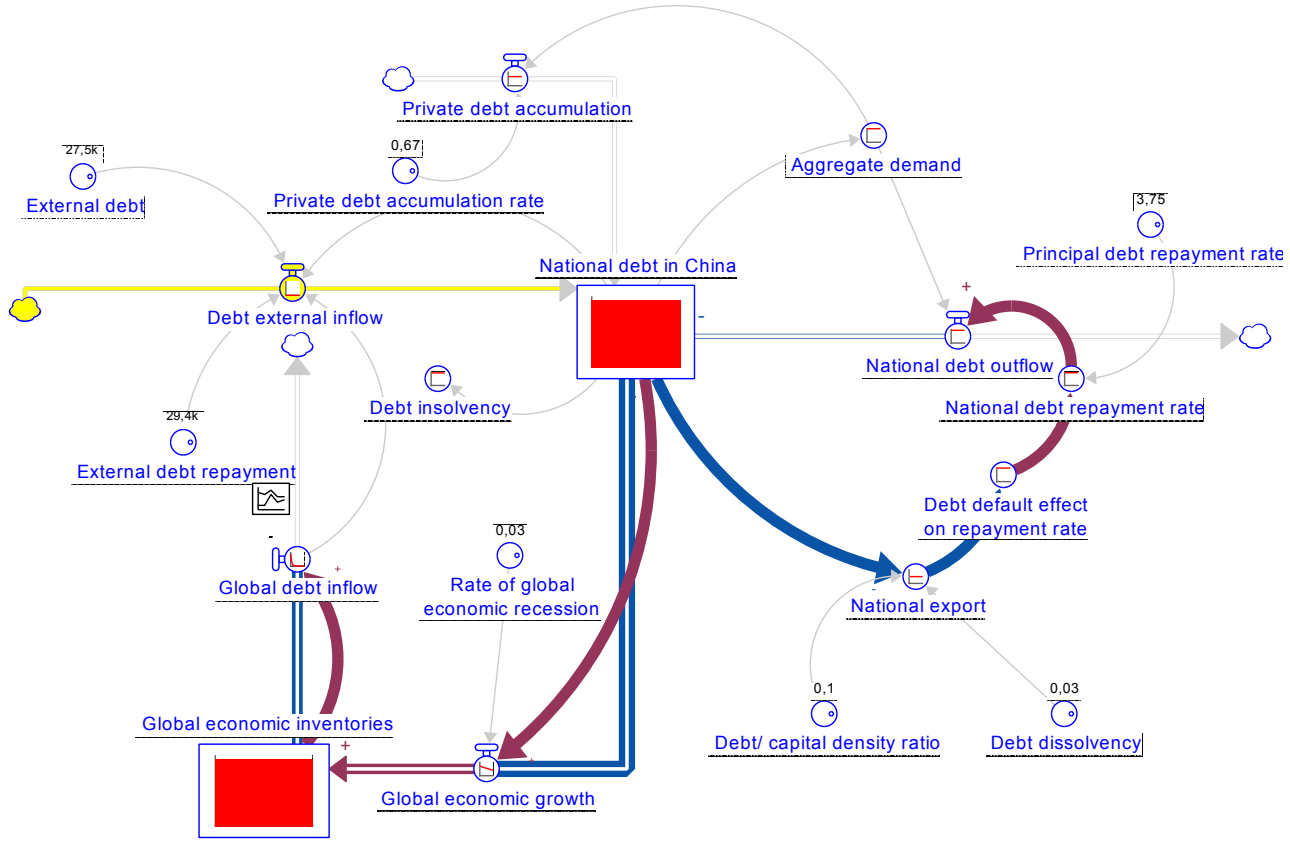

Figure 5. Debt stabilizing in separate large country and global economic slowdown.

The global economic growth under debt pressure requires the analysis of the stabilization effect for inventories in the long run and the decrease of debt [12].

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