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# Modeling Financial Type 2b Globalization and its Repercussion on the Real Economy

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## Abstract

The description of economic globalization still lacks a comprehensive formal and normative theory. The Globalization Types Model is a proposal to bridge this deficiency. Having modeled the globalization of physical trade flows, the so-called type 1 globalization with its different logics of subtypes 1a, 1b, and 1c, the aim now is to describe the globalization of finance, i.e. type 2b, and to integrate it into the Globalization Types Model. This paper analyses the repercussion of financial transactions on the evolution of economic cycles. Due to the mutual interactions of different systems, the modeling is not based on state equations but on principles of system dynamics with its positive and negative feedback loops. It puts the emphasis not on equilibrium but on transition modeling, i.e. on the triggering of state change. The result is a cognitive model showing the influence and systemic effects of financial transactions performed on commodity exchanges causing increased volatility of commodity prices and the repercussion on the industry value-chain. The model links the speculative part of financial type 2b globalization to physical demand and trade flows of globalization type 1, capital investments of globalization type 2a, as well as human migration of globalization type 3a and unemployment.

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**Keywords:** Globalization types; globalization model; financial globalization; financial speculation; price volatility; economic cycle

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## 1. Introduction

Economic cycles are described in scholastic literature as the imbalance of demand and supply; however, what is causing the imbalance usually is not taken into consideration by the modeling. We have not to go back

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to the “Black Friday” of 1929 to analyze the far leading interaction of finance and economy; crisis or abnormal economic situations have become more frequent in recent times. Take the subprime-generated financial crisis of 2007 which evolved in 2008 into a huge global economy crisis drawing many companies into bankruptcy, reducing global trade volume by 23% and increasing temporarily unemployment by an additional 20 million people, forcing governments to inject billions of dollars to avoid the disaster of a collapsing bank system. An example of another kind: High frequency computer assisted trading on stock exchanges lead to a temporary collapse of the Wall Street, already on October 1987 becoming famous under the label “Black Monday” which had consequences on the stock exchanges of Tokyo, Sydney, Hong Kong, making the tour around the world. The global information system makes the Butterfly-Effect become reality. If that is applied to commodity trading where prices are fixed for raw materials, prices which are of immense importance to the whole world industry and therefore economy, it is a disaster. The merely pure financial “paper trading” on commodity exchanges is already a multiple of real physically backed-up transactions, with misleading price notations through hysteric short-term behavior of speculative financial actors not reflecting anymore the real underlying price of the object of business. Moreover, new financial instruments for financial investors have been “invented” based on indexes of underlying assets, investments having rather the feel of betting and gambling. If these are based on stock indexes, this might not matter, but if physical commodities are stocked, as was the case with the Goldman Sachs copper ETF, blocking physically industry metal for speculation purpose, one should be concerned. In addition, if financial institutions are also managing physic warehousing and hindering consignment of e.g. aluminum ingots to industry in order to increase premiums for prompt delivery due to lucrative extended financing period supported by Contango and low interest rates, as it has been the case during recent years [1], the financial systems becomes a serious problem. The financial system is developing into a parasitic system with dangerous self-dynamic, a system which is not isolated but thru mutual interactions having heavy repercussions on the globally interlinked industry system - industry and services creating real value and progress for the whole society. Let us think back, what was the purpose of commodity and stock exchanges originally. It was a place where capital lenders met entrepreneurs and where hedging of physical positions could be settled with risk takers. Today, commodity and stock exchanges have mutated to a playground for casino capitalism harming and, in some cases, even impeding progress of industry and trade. Nobody denies the need for speculative operators taking the risk in the derivative markets, which are necessary that the industry system can work but not in a two digit multiple factor of really physically backed-up positions. Financial speculators like volatile markets with high  $\beta$ -factors, entrepreneurs and industrialist prefer stability. This is not a sustainable situation.

The present paper has not the intention to judge the ethic behavior of financial operators such as Soros, the inventor of hedge funds, neither his advocates of deregulation such as Krugman nor to discuss the ideas of his antagonist Stiglitz, or Minsky, and Kindleberger. It intends to show the harm of an exaggerated even locally confined financial speculation activity and its effects on the global scale of industry business. It is a proposal to describe in a simplified way, with all its limitations, the complex interactions of the financial system with the system of the real economy, all that in order to be integrated into a larger context, i.e. to finalize the comprehensive Globalization Types Model presented first in 2004 [2] and expanded upon in 2007 [3].

#### **Nomenclature related to figure 3**

$e_1$	exogenous driven variable of unknown origin
$V_X$	volume of demand within the value-chain (pipeline) in countries Xs
$t_{XY}$	trade between country X and country Y (type 1 globalization, comprising subtypes 1a, 1b, 1c)
$p_{LME}$	commodity price $p$ fixed at commodity exchanges (e.g. London Metal Exchange)

$\beta$	beta factor indicating the relative volatility vs average market volatility sigma $\sigma$ ( $\beta > 1$ means excess)
$I_F$	investment of financial type (speculative investment)
$I_C$	investment of capital type (entrepreneurial investment, e.g. type 2a globalization of FDI)
$P_X$	production volume respective production capacity in country X
$U_X$	unemployment in country X
$E(W_X)$	expected discounted returns from capital investments in country X
$N_X$	number of companies in country X
$S_F$	savings derived from financial investments (paper investments), i.e. $\partial S_F / \partial t = st$ speculative earnings
$S_C$	savings from capital investments in corporate equity, i.e. $\partial S_C / \partial t =$ dividends plus It value increase
+/-	arrows showing positive (+) or negative (-) correlation between variables

## 2. Approach

The target of this paper is to model financial type 2b globalization, the globalization type which has been added to the Globalization Types Model [3] [4] first in 2009 after the subprime generated crisis of 2008 and has already been partially addressed in [5][6]. We do not here pretend to find the final equations governing the complex interactions, task which can be solved on a further occasion, but we do intend to model the dynamics of the functional relationship between the main variables of the two macro systems, on the one hand the financial system and on the other hand the industry system. The nature and underlying logic of the variables' relationships are derived from empiric considerations and consolidated theories. In addition, we will not rely on state equations suitable to model equilibrium, but we will use system dynamics modeling, which is appropriate to describe the multiple feedback reactions generated through mutual interactive loops because we are interested in what is triggering and fuelling evolution.

The model reflects heuristic and empiric knowledge under ideal assumptions; it does not pretend precision in detailed modeling but rather increased accuracy for common understanding. The Globalization Types Model is a scholastic-intended explanation of complex theories condensed into a comprehensive unifying globalization model which suits also to business schools for management education to explain the big picture of economic globalization leading finally to a normative behavior.

## 3. Modeling type 2b globalization

Financial globalization will be used here in a simplified manner in order to match the necessity to finalize the Globalization Types Model, which does not preclude to be expanded within a broader context in a second time. This means, that the number of variables involved also in the system dynamics model are simplified in order to increase understanding and accuracy rather than precision. Financial globalization of type 2b is composed of two parts and therefore modeled here in two consecutive steps:

- First, modeling financial investment logics as well as price building within the increased mutual interaction of financial markets located in different regions due to increased transparency given by today's telecommunication possibilities
- Second, modeling the increased mutual interactions of the finance world with the real economy and its repercussion on trade, employment, and business cycles, on which we will focus, being type 2b the integrating pivotal element of the Globalization Types Model.

### 3.1. The mutually influenced financial markets driving world prices

Today's information technology allows increased transparency of financial markets by real time interconnection of different financial market places. Of the financial market places we will apply here mainly commodity exchanges but also the money markets, but less the more regional stock exchanges. In the following, we will talk only about commodity exchanges where the raw materials of globalization type 1a are traded resulting in a world reference price for commodities. Commodity exchanges have been established in the main market regions of the triad competition, namely Asia, Europe, and America. These financial market places are highly interlinked as the financial globalization type 2b icon of the Globalization Types Model shows (figure 1), i.e. price fixings occurring on the Shanghai Futures Exchange will have effects on the London Metal Exchange and later on the Chicago Mercantile Exchange.

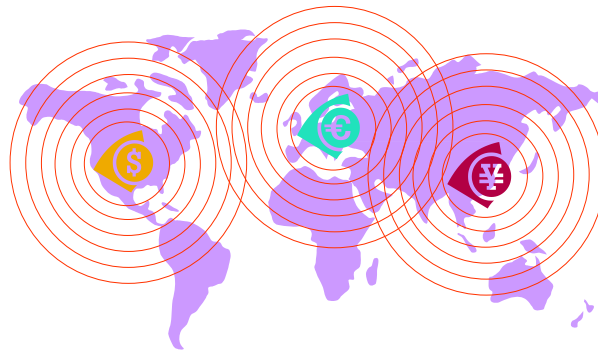


Fig. 1. Type 2b globalization icon visualizing the nature of financial globalization

The commodity prices, therefore, remain worldwide between all market places within a very narrow range, otherwise arbitrage transactions between different market places would happen, making local prices converge to an asymptotic world price. Exactly these arbitrage transactions are guaranteeing the converging pricing mechanism for a world reference price of raw materials traded on commodity exchanges. It is of utmost importance, that the prices of these commodities reflect the real value of the resource because they serve industry as reference prices for doing business and concluding short, medium, or long term contracts with customers within the value-add chain [1]. The price  $p_x(t)$ , i.e. the price for a certain good  $\alpha$  in the country or region  $X$  at time  $t$  is settled on commodity exchanges and is given by the demand  $d_x(t)$  and supply  $s_x(t)$  for financial transactions, documented by spot, future or option contracts, i.e. derivative paper contracts traded on the market place  $X$ , usually with physical delivery interest of the underlying asset, but not necessarily. The price depends not only on the instant balance of demand and offer but also on the previous official price settlement at a previous instant ( $t-1$ ), showing autocorrelation character of prices as well as the growth expectation in a successive time period ( $t+1$ ); this time period can shrink within the context of continuously traded assets. We will not enter here into how the price mechanism works, which is already part of consolidated scholastic literature. The demand to buy contracts  $d(t)$  and sell  $s(t)$  will depend on physical business needs but depends also on the demand from speculative origin and are especially influenced by speculation purpose, based on additional information  $j_x(t)$  available for the commodity, such as e.g. the  $\beta$ -factor but also “insider” type of information. The demand  $d_x(t)$  originates from business as well as financial operators. These interactions are beneficial when speculative operators take the risk, i.e. allowing the hedging operation for industry business operators, it is deleterious when actions are taken among financial speculative operators having then a rather gambling character, influencing with increased volatility artificially the

evolution of the price of commodities. Formula (1) shows the functional relationship of the price  $p_X(t)$  of a commodity  $\alpha$  on the marketplace X at a time t and the main driving variables which are mutually influenced by different market places X and Y.

$$p_X^\alpha(t) = f\left(\frac{d_X^\alpha(t)}{s_X^\alpha(t)}, j_X^\alpha(t), p_X^\alpha(t-1^-), p_Y^\alpha(t-1^+), r_{XY}(t-1^+), g_X^\alpha(t+1)\right) \Rightarrow \sigma, \beta \quad (1)$$

Indeed, the global interactions between the markets X and Y will also take into consideration for the fixing on market place X the price  $p_Y(t-1)$  traded before on another market place Y of the triad competition as well as the currency exchange rate  $r_{XY}(t-1)$  at the previous time period. These interactions are the reasons why we can talk about a globalized financial commodity market. Again, the price of commodities will be influenced on the one side by real physical need but also by speculative investment  $I_F$  according to formula (2) showing that it depends on available savings S, and the expected return  $E(\partial S_F/\partial t)$  from the speculative investment. Volatile markets with high  $\beta$ -factors are of great interest to speculators because they allow higher returns compared to the average market return; of course, they bear also a higher risk.

$$I_F = f\left(p_X^\alpha(t), S, E\left(\frac{\partial S_F}{\partial t}\right), \beta(I_F, \frac{\partial p}{\partial t}), \Omega_F\right) \Rightarrow p_X^\alpha(t) \quad (2)$$

The amount of speculation can be leveraged; this is the case the lower interest rates are, phenomenon not explicitly taken into consideration in formula (2) to keep the model simple. The variable  $\Omega_F$  is the set of multiple financial instruments available today to market operators to invest money, either for hedging real physical positions or to gamble with speculative investments. Therefore, increasing LME prices p will lead financial actors to participate in lucrative financial investments possibilities  $\Omega_F$  and to buy long positions, i.e. futures or call options, or selling even short positions, investing  $I_F$  for speculative purpose. Formula (1) and formula (2) are the simplified intrinsic logic describing type 2b globalization behavior of financial markets. The influence of an exaggerated activity of financial operators, having a significant effect on the real economy, is a system dynamics which is modeled in the next section.

### 3.2. The repercussion of financial markets on the real economy

To model the effects of speculative finance on the real economy we will proceed in two steps: first we will enter into some typical empiric observations and then take these insights to model the systemic behavior of financially driven volatility to the consequence on industry value-chain and on entrepreneurial investment decisions.

Empiric observations, in an ideal contingent context, show that demand V is usually positive correlated to commodity prices; i.e. increasing demand will lead to increasing commodity prices. The same is valid for the production level of supply; i.e. increasing demand will lead to increase the production activity and may also lead to increase the production capacities by capital investments  $I_C$  to be able to follow and satisfy physical demand. This is reflected by the business, or in a larger context, the economic cycle. Usually, again in our idealized contingent context, physical demand is preceding price evolution at the beginning of an economic cycle, i.e.  $p=f(V)$  but not necessarily during the rally, i.e. the uptrend, or the throwback, i.e. the downswing. In certain conditions, price evolution is auto-correlated by financial speculation on the price itself  $p_t=f(p_{t-1})$ , i.e. a particular behavior given, or at least influenced, by speculative transactions on the commodity exchanges, and

can lead even to  $V=f(p)$  giving origin to a positive, self-reinforcing feedback reaction, dynamic made visible in figure (3). Let us observe business cycles, represented here by the demand  $V$ , and the behavior of some selected related variables (figure 2).

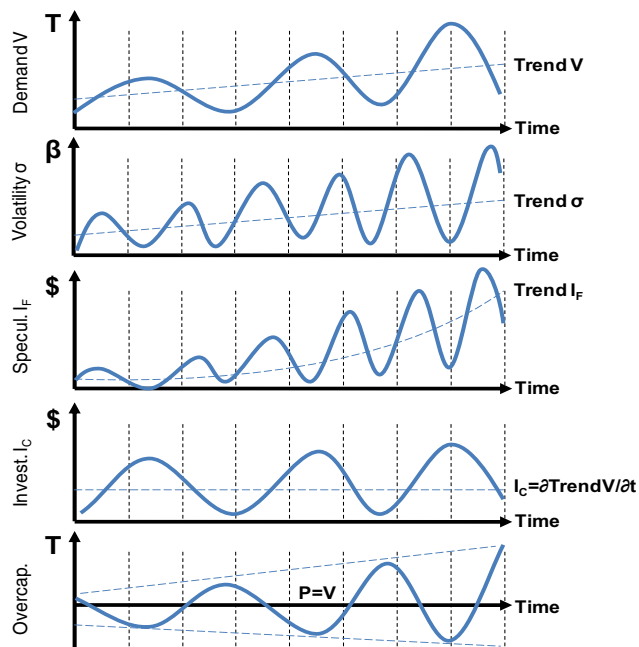


Fig. 2. Empiric observation of different variables linked to the business cycle of demand  $V$  (qualitative emphasized drawing)

We notice that volatility  $\sigma$  of prices shows increasing trend and amplitude, which has, it should be noted, been increasing also in reality during recent years [7] and shows twice the frequency of price cyclicality, respectively of demand  $V$  cyclicality. Indeed, also the demand  $V$ , based on our idealized assumptions that prices are positive correlated to demand, follow the same evolution of prices; we have therefore omitted the graphical representation of price evolution which can be assimilated to the demand  $V$ . If we approximate the idealized cyclical price evolution to the trigonometric function  $\sin(\tau)$ , then volatility has the function  $\cos(2\tau)$ . Indeed, volatility reaches its maximum during up- and downswing and reaches its minimum during top and bottom of business cycles. Financial investments  $I_F$  in price speculations are positive correlated to volatility and show the same frequency (and earnings)  $\cos(2\tau)$ , even with exaggeration being allowed to deal with naked short sales, i.e. selling not covered positions. Whereas usually industry earnings are correlated with demand, they show half the finance investment frequency and may suffer losses during the recession of business cycle. In addition, corporate equity investment and turnaround management need to deal with unions, and consequent arising issues and problems that the financial investor does not have. All this is the reason why financial capitalism is more attractive than entrepreneurial capitalism, although it does not generate progress for society and has also negative effects [8]. Moreover, it may happen that the capital investment  $I_C$  comes operationally on stream when the peak has already passed; resulting overcapacities are the consequence. In the following, we will use these observable patterns and relationships to model the dynamic interactions of the two macro systems of finance and real economy taking also ideas from a simpler dynamic model [8].

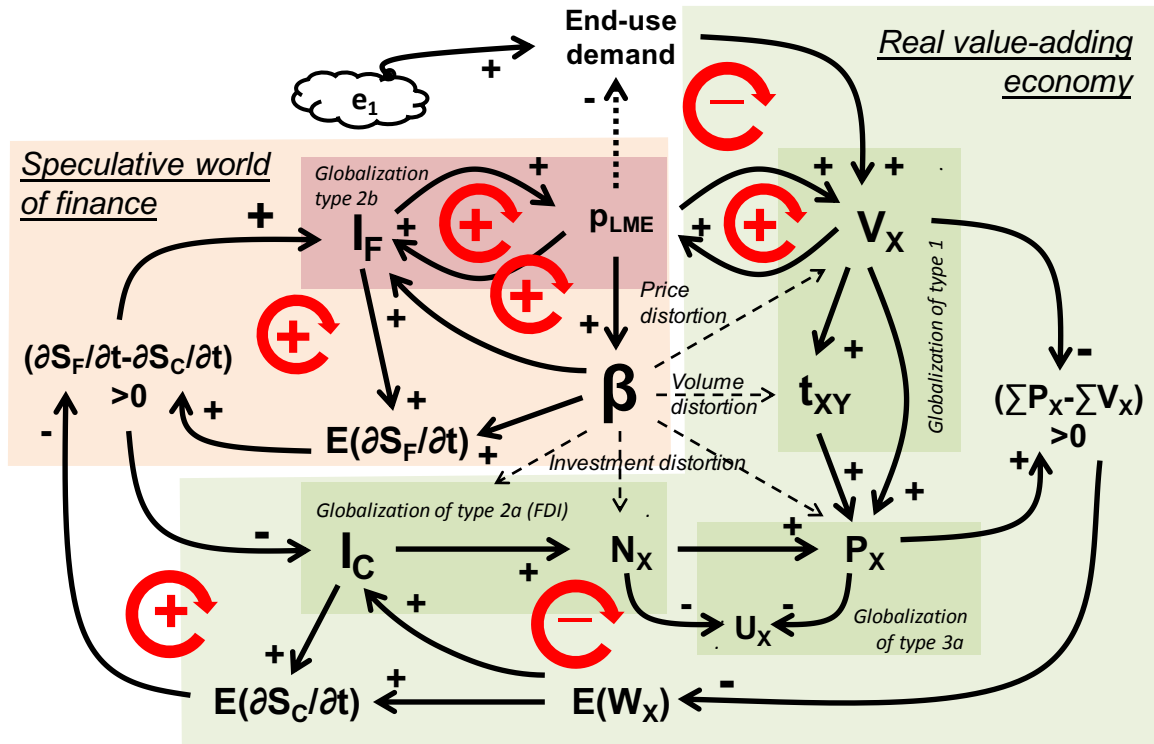


Fig. 3. Simplified system dynamics model of financial type 2b globalization showing the central importance of volatility with numerous destabilizing positive feedback loops and its amplifying effects on other globalization types of the real economy

Figure 3 represents a cognitive model showing the interactions between the different subsystems during an economic cycle. An increasing end-use demand triggered by an exogenous driven variable  $e_1$  will lead the volume  $V_X$  for a good, or a set of goods in countries X, to increase along the whole value-add chain; this is also called the pipeline-filling effect [9]. Increasing demand will usually also increase trade  $t_{XY}$  between different regions leading to globalization type 1; this phenomenon and the evolution of its globalization degree has extensively been analyzed by measuring economic globalization, for examples see [10]-[12]. Increasing demand means increasing demand for basic raw materials, such as aluminum or copper, traded at commodity exchanges, e.g. the LME, which will lead to an increase in commodity prices.

Increasing LME prices  $p$  will lead financial actors to participate in lucrative financial investments possibilities  $\Omega_F$  and to buy long positions, i.e. futures or call options, investing  $I_F$  for speculative purpose according to formula (2) representing the globalization type 2b of the Globalization Types Model. This fuels artificially the LME price, because the amount  $I_F$  has risen during the last years to a multiple, estimated at ten times, of physically backed-up positions, i.e. for real industry business relations needing hedging contracts. The increased volatility is reflected by high  $\beta$ -factors which encourage further speculations creating a positive, destabilizing feedback loop as shown in figure 3 and formula (3). Should “corner” or “squeeze” techniques also be applied to manipulate price quotations then we are entering a fraudulent system of speculation. At the end, the speculative inflated price level gives a distorting view of the commodity prices, which may lead to further physical hedging positions of industry operators to protect against artificially fast



rising price quotations [8]. Where financial operators are able to easily settle their positions, industry operators risk then to have high valued commodities in their overstocked inventories.

$$\frac{\partial p_{LME}}{\partial t} = f\left(V_X, I_F \xrightarrow{\text{bull,bear}} \beta\left(I_F, \frac{\partial p}{\partial t}\right) > 1\right) \neq 0 \Rightarrow \frac{\partial I_F}{\partial t} > 0 \quad (3)$$

Increasing local demand  $V_X$  and interregional trade  $t_{XY}$  will lead to increase production level  $P_X$  absorbing overcapacities and this will also reduce unemployment  $U_X$  according to formula (4). Unemployment is a major concern in today's economies as this leads to mass migration to fast rising regions of emerging economies  $Z$  or rich regions in so-called advanced economies  $K$ . This migration phenomenon is modeled by globalization type 3a which has partly been addressed in [6] to complete the Globalization Types Model. According to the balance of under- or overcapacity, entrepreneurial business cases for brown field capacity extension or green field FDI (Foreign Direct Investment) are conceived and calculated for viability taking into consideration variables with expected discounted revenues  $E(W_X)$  of formula (5) where  $X$  stands for  $K$  or  $Z$  and  $g_X$  denotes growth in  $X$  and  $L_X$  for labor cost in  $X$ .

$$\sum_{A,Z} \dot{P}_X = f\left(\beta\left(I_F, \frac{\partial p}{\partial t}\right), \frac{\partial^2 V_X}{\partial p \partial t}, \frac{\partial^2 t_{XY}}{\partial V_Y \partial t} : \xrightarrow{\text{bull}} \frac{\partial^2 (\sum P_X - \sum V_X)}{\partial V_X \partial t}\right) > 0 \Rightarrow \frac{\partial^2 U_X}{\partial P_X \partial t} < 0 \quad (4)$$

$$E(W_X) = f\left(V_X, g_X, L_X, (\sum_X P_X - \sum_X V_X)\right) > 0 \Rightarrow \frac{\partial I_C}{\partial t} > 0 \quad (5)$$

The expected revenues from the business case will lead to entrepreneurial capital investments  $I_C$ ; whether these are performed locally in  $K$  or via FDI  $i_{KZ}$  in  $Z$  is shown in formula (6) where  $r_{KZ}$  indicated the currency exchange rate between country  $K$  and  $Z$ . Capital investment may lead to new facilities following type 2a globalization pattern [3]-[6]. New facilities  $N_X$  will increase the available production capacities  $P_X$  and by creating jobs reduce unemployment  $U_X$  as shown in formula (7). This increase of production capacities will change the balance of under- and overcapacity and impact further capacity investment projects inducing a negative, stabilizing, feedback circuit. Due to the fragmented value chain and the increased volatility, the pipeline-filling effect is further exaggerated and managers tend to adapt capacities not to the real end-use demand but to the inflated pipeline-filling perception [13].

$$i_{KZ} = i_C \left( S, \frac{E(W_Z)}{E(W_K)}, r_{KZ} \right) \quad (6)$$

$$\sum_A^Z \dot{N}_X = f\left(\beta\left(I_F, \frac{\partial p}{\partial t}\right), I_C : \xrightarrow{\text{bull}} \frac{\partial P_X}{\partial t}, \frac{\partial^2 U_X}{\partial N_X \partial t}\right) > 0 \Rightarrow \frac{\partial^2 (\sum P_X - \sum V_X)}{\partial V_X \partial t} > 0 \quad (7)$$

High  $\beta$ -factors lead to potential higher earnings, i.e. expected saving increases  $E(\partial S_F / \partial t)$ , which are compared against alternative returns from, e.g. capital investments. Financial investments, however, as we have discussed above, are usually more attractive than capital investments leading to further investments in



financial instruments  $I_F$  increasing further the dynamic of the destabilizing positive feedback reaction according to formula (8). Such comparisons are also performed by entrepreneurial investors. However, their business and management background, as well as their shared written corporate mission statements, lead them to prefer corporate equity investments  $I_C$  creating value for customers and shareholders. Nevertheless, if the difference should become too high, it might generate a positive destabilizing feedback loop, potentially reducing capital investments  $I_C$  in favor of  $I_F$  financial investments. This shows that easy to realize financial investment revenues might damage the industry systems, as in the past the British experience has shown by neglecting the industry and favoring the financial sector.

$$E\left(\frac{\partial S_F}{\partial t}\right) = f\left(I_F, \beta(I_F, \frac{\partial p}{\partial t})\right) > 0 \Rightarrow \frac{\partial I_F}{\partial t} > 0 \quad (8)$$

As soon as the commodity prices reach exaggerated levels, disillusion prevails and may lead to reduce demand  $V_X$  in all countries  $X$ , pulling a stabilizing but deleterious effect of economic downtrend with reduced trade flows  $t_{XY}$  according to formula (9), where the summation extends over globalization type 1a (OD), type 1b (AB), type 1c (ZK), with reduced production  $P_X$ , increased unemployment  $U_X$  and leading to overcapacity. The higher the  $\beta$ -factor, the higher will be the repercussion to the pipeline filling and emptying effect.

$$\sum_{OD, AB, ZK} \dot{i}_{XY} = f\left(\beta(I_F, \frac{\partial p}{\partial t}), \frac{\partial V_Y}{\partial p} : \xrightarrow{\text{bear}} \frac{\partial P_X}{\partial t}, \frac{\partial^2 U_X}{\partial V_Y \partial t}\right) < 0 \Rightarrow \left(\sum_X P_X - \sum_X V_X\right) > 0 \quad (9)$$

Formula (9) can be seen as one of the elements linking finance via speculative-increased volatility to the real economy. The cognitive model reveals also that the expected increase of savings from financial investments according to formula (8) will increase speculation to the harm of capital investment  $I_C$  according to formula (10) and therefore on the number  $\partial N_X / \partial t$  of investments in new companies.

$$\frac{\partial I_C}{\partial t} = f\left(E\left(\frac{\partial S_F}{\partial t} - \frac{\partial S_C}{\partial t}\right) \xrightarrow{>0} \frac{\partial I_F}{\partial t} > 0\right) < 0 \Rightarrow \frac{\partial N_X}{\partial t} < 0 \quad (10)$$

$$\frac{\partial N_K}{\partial t} = f\left(E\left(\frac{\partial S_F}{\partial t}, \Omega_F\right), \frac{\partial N_Z}{\partial t}, t_{ZK}, \dots\right) \quad (11)$$

In addition, the variation of companies  $\partial N_K / \partial t$  in high price economies  $K$  is partly given by formula (6), but also according to formula (11). I.e. it depends on the alternative financial investments possibilities  $\Omega_F$  and the expected revenues, which describes the pure profit thinking of economic actors. It depends also on the number of new companies  $\partial N_Z / \partial t$  in emerging low price country  $Z$  and the trade volume  $t_{ZK}$  from low price region  $Z$  to high price region  $K$  and the resulting competitiveness  $\pi$  [3], not shown here, of the companies in high cost economies  $K$  [14] which is modeled by globalization type 2a as well as 1b and 1c and describes rather the strategic business thinking of management; in addition it depends on other additional variables not further specified here due to the 10 pages limitation.

#### 4. Conclusive considerations

Financial globalization is a far reaching topic having much more influence than depicted above in this simplified model, where only the effects of speculation on commodity prices and the consequence of volatile commodity prices on the dynamics of the real economy have been exemplarily modeled. Nevertheless, despite this is not the primary goal of this paper to judge the negative influence of limitless financial speculation on the real economy, the 90% in excess speculation compared to the real need, requires to be resized.

With this paper and the modeling of financial type 2b globalization and its central importance on the evolution of other globalization types of the real economy, an essential corner stone of the Globalization Types Model has been outlined but not yet fully accomplished. Indeed, it leaves space for improvement and to further detail the modeling. Now, this at the same time theoretic and empiric modeling needs to be confirmed by econometric evidence.

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