The role of loss-limit of dealers in financial market crisis

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Facing with the current world-wide financial crisis, scientists are expected to explain the cause of large market fluctuations and give ideas for the way to stabilize the market. In this paper we focus on the regulation for dealers so-called the loss-limit that is widely applied to market dealers to prevent unlimited extension of loss. For example, this regulation is set to a market dealer in such a way that if his accumulated loss in a given period exceeds a given threshold value, then, he has to stop dealing and he must finalize the loss at the moment. This loss-limit obviously works to stop enlargement of individual loss, however, as we show here, this loss-limit sometimes works negatively to the whole market, namely, it enlarges market price changes causing even a market crash.

We have already constructed a kind of agent-based models of dealers which reproduce most of known stylized empirical market statistics such as power law distribution of price change, non-Poissonian transaction interval fluctuations and market potentials [1][2]. Our dealer models are consisted of minimal number of parameters needed to reproduce the market statistics.

Here, we add the effect of loss-limit to our numerical model and observe the resulting change of market behaviors. We assume that traders have an upper limit of loss in a given period and they try to avoid exceeding the loss limit. For example, if a dealer, who is near the loss limit, has Dollar in the Dollar-Yen market and if the Dollar rate goes down, then he tries to sell Dollar at any rate immediately not waiting until the exchange rate's trend reverses. We show this loss limit effect bring sudden collapse of exchange rate as shown in the following Figure. Namely, the loss limit can sometimes enhance instability of the whole market increasing the risk of financial markets in general.
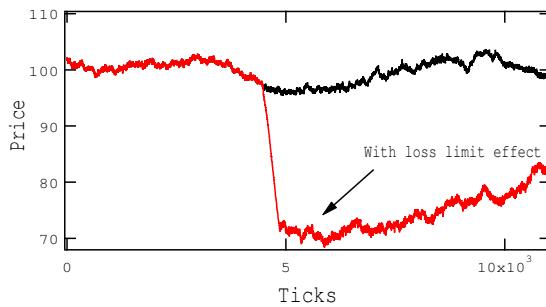

Figure 1: The example of collapse caused by a loss limit effect. Both time series are produced by our artificial market by using same random numbers. So we can find only one time series until around 5000 ticks but one model with loss limit effect for dealers have crash while the other model without loss limit effect keep same fluctuations.

References

[1] Kenta Yamada, Hideki Takayasu, Misako Takayasu, Physica A **382** (2007), 340-346.
[2] Kenta Yamada, Hideki Takayasu, Misako Takayasu, arXiv:0809.0481.