Quantitative Finance > General Finance

# Stability of the World Trade Web over Time - An Extinction Analysis

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The World Trade Web (WTW) is a weighted network whose nodes correspond to countries with edge weights reflecting the value of imports and/or exports between countries. In this paper we introduce to this macroeconomic system the notion of extinction analysis, a technique often used in the analysis of ecosystems, for the purposes of investigating the robustness of this network. In particular, we subject the WTW to a principled set of in silico "knockout experiments," akin to those carried out in the investigation of food webs, but suitably adapted to this macroeconomic network. Broadly, our experiments show that over time the WTW moves to a "robust yet fragile" configuration where it is robust to random failures but fragile under targeted attack. This change in stability is highly correlated with the connectance (edge density) of the network. Moreover, there is evidence of a sharp change in the structure of the network in the 1960s and 1970s, where most measures of robustness rapidly increase before resuming a declining trend. We interpret these results in the context in the post-World War II move towards globalization. Globalization coincides with the sharp increase in robustness but also with a rise in those measures (e.g., connectance and trade imbalances) which correlate with decreases in robustness. The peak of robustness is reached after the onset of globalization policy but before the negative impacts are substantial. These analyses depend on a simple model of dynamics that rebalances the trade flow upon network perturbation, the most dramatic of which is node deletion. More subtle and textured forms of perturbation lead to the definition of other measures of node importance as well as vulnerability. We anticipate that experiments and measures like these can play an important role in the evaluation of the stability of economic systems.

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