1123-91-146 **Mark D Flood** and **Jonathan Simon*** (jonathan-simon@uiowa.edu), Department of Mathematics, University of Iowa, Iowa City, IA 52240, and **Mathew Timm**. *Topological measures of financial network complexity.* Preliminary report.

Imagine a network of financial institutions trading some stock, or currency, or more elaborate derivatives. How complicated is the network? How much would it "cost" in time, effort, money, phone calls, anguish – to determine, at a given moment, who owns what, and who owes what to whom? We want to quantify this kind of complexity.

We work in the framework of finite graphs: models are simple graphs or allow orientations, edge weights, multiple edges or loops, as dictated by the application. We define several topologically based metrics, using the dealer network and its line graph. We start with network size and move on to: homology and simple cycles in the graphs; homology of a 2-complex defined by nettable cycles of obligations; and a mild form of persistent homology to visualize how edge weights and vertex degrees interact.

We have experiments showing our measures are sensitive to financially complicating behaviors such as collateral commingling and interdependent chains of obligations. Our measures, and correlations between them, can distinguish graph topologies, e.g. between random G(n,p) graphs and core-periphery graphs of the same size.

Our metrics give a new way to visualize the dynamics of the 2012 credit-default-swap event known as the "London Whale". (Received August 23, 2016)