



Portfolio manager behavior and global financial crises

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ARTICLE INFO

Article history:

Received 10 February 2009
 Received in revised form 9 March 2010
 Accepted 13 March 2010
 Available online 23 March 2010

Keywords:

Behavioral finance
 Agent-based models
 Financial crises

ABSTRACT

I develop a two market agent-based model to study how global portfolio managers affect global financial crises and stability. First, I create an agent-based model where fund managers make their allocation decisions between two markets and a risk-free asset based on the mean variance framework. Simulation results reveal that global managers do not create global financial crises. Second, I extend the base model by incorporating insights from behavioral finance where risk is instead determined by fund manager losses. Simulation results reveal that slight global manager losses can trigger a widening of both markets' risk premium, accelerating the decline in asset prices worldwide. Statistical analysis reveals that global managers are a stabilizing force in smaller numbers; however, they become destabilizing in larger numbers. The ability to reduce risk by diversifying across markets results in excessive risk taking. If global managers exist in larger numbers, systematic over leverage may result such that a deleveraging process can lead to the spreading of financial crises.

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1. Introduction

Since the mid-1980s, financial markets have suffered from global financial crises; episodes in which two markets or more fall into crisis simultaneously. Recent examples include the 1997 Asian financial market crisis and today's global financial crisis. These episodes have received great interest, however, there is no widely accepted theoretical explanation. One possible reason is that fundamentals and common shocks do not fully explain the relationship among countries. In these cases, spillover effects are attributed to investor behavior which is difficult to understand from the data. A second reason is that even though standard equilibrium models do well in explaining long term behavior, they have difficulty explaining short term behavior, especially during financial crises. Flood and Rose. (2008) show the random walk beats all stock market models in the short to medium run.

The purpose of this paper is to answer how fund managers who diversify across markets affect global financial crises and stability. Do global managers cause more frequent and severe global crises because they are the linkage between these unrelated markets? Or do they cause less because they reduce market risk by diversifying? I explore this question by integrating ideas from the traditional, agent-based modeling, and behavioral finance literature. I use an agent-based framework because it allows more flexibility in modeling four realistic characteristics of a stock market environment. First, the agents are individual fund managers. Most of the tradeable assets are professionally managed through pension funds, insurance companies, mutual funds, hedge funds, and private equity firms. Second, fund managers can use leverage as in actual markets. Third, all fund managers have their own alpha. At any point in time a fund manager can outperform or under perform the market. Fourth, stock prices are affected by aggregate price pressure. If aggregate demand increases, the market price

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increases. I incorporate insights from behavioral finance within a realistic stock market framework to better understand how investor behavior can affect global price dynamics.

Section 2 discusses some of the relevant literature. I mention earlier papers, some of them quite influential, that develop single market agent-based models.

Section 3 presents the base model. The base model is a two-market agent-based model where simulated fund managers make investment decisions based on the mean variance framework, Markowitz world (1952).

Section 4 presents the extended model where risk is determined by fund manager losses instead of solely variance and covariance, the Friedman and Abraham world (2009). Both the base and extended models are agent-based and share common characteristics such as price pressure, the use of leverage, and a mean-reverting alpha. The underlying difference is the measurement of risk.

Section 5 explains the simulation setup. I simulate the Markowitz and the Friedman and Abraham (FA) world in two phases, autarky and globalization. In the autarky phase there exist two markets and two populations of 'local managers'. Local managers are confined to investing in their local market. For example, there exists a set of local managers purely investing in the Brazilian market and another set investing in the Indian market. In the globalization phase, I add a population of 'global managers' who invest in both markets. A realistic analogy would include Brazil and India opening up their financial markets to investors in New York. In both the Markowitz and FA worlds I study how the global managers affect price dynamics relative to the autarky case.

Section 6 presents the results. Fig. 2 displays the price plots for the autarky and globalization phase of the Markowitz model. The difference between the three plots is the percentage of global managers who make up the market.¹ Relative to the autarky case, global managers increase volatility and correlation but also return. None of the price plots reveal frequent global financial crises. Fig. 3 shows the price plots for both the autarky and globalization phase of the FA model. It can be seen that global managers are a stabilizing force in smaller numbers, but destabilizing in larger numbers. In a world where risk is based on losses the ability to diversify leads global managers to become less risk averse and thus take on excessive leverage. In markets where global managers exist in smaller numbers, the additional leverage global managers add to the system is minimal and the effect of spreading risk over two markets dominates, thereby stabilizing both markets. However, global managers in larger numbers can lead to excessive overexposure resulting in too much leverage in the system. Therefore, as losses mount, which they always do, global managers need to sell fast. They can only deleverage so much in one market and end up selling in both markets, increasing the price of risk in both markets, and accelerating the decline in asset prices even further, creating global financial crises.

The implication of these results are first, that policy makers should be cognizant of any widespread risk reducing strategy because it will create more risk in the future. In addition, capital control policy should be formed based on this optimal number of global managers relative to local managers.

Concluding remarks are collected in Section 7. Appendix A gathers details about implementations and presents supplementary data analysis.

2. Existing literature

2.1. Traditional literature

The ultimate cause of global financial market crises is difficult to identify. Many authors instead explain how crises can spread from one market to another. Forbes and Chinn (2004) estimate a factor model to decompose the cross-country factor loadings into direct trade, bank lending, and foreign direct investment. They find direct trade flows are the most important factor, with bank lending and trade competition in third markets also playing a role. Others argue that investor behavior is the key element to understand the recent contagious episodes, which includes ideas such as herding, margin calls, use of leverage, asymmetric information, and diversification strategies. Calvo (2004) develops a model where informed investors receive signals about the fundamentals of a country and are hit by margin calls. These force the informed investor to sell, and as a result uninformed investors also sell since they cannot distinguish between liquidity shock and a bad signal. Kodres and Pritsker (2002) model investors who respond to shocks in one market by optimally readjusting their portfolios in other markets, thus transmitting their shocks.²

2.2. Agent-based modeling and behavioral finance

Given all of these theories consensus is still elusive on whether and how fund managers contribute to global crises and financial market stability. Therefore, I explore an alternative framework by using agent-based modeling and behavioral finance.

¹ Five global managers are equivalent to 15% of the population in each market. Twenty global managers is equivalent to 40% of the population in each market.

² Empirical papers also confirm herding type behavior. Kaminsky et al. (2004) use mutual fund data from Latin America to support what they call "contagion trading" where investors sell (buy) assets from one country when asset prices fall (rise) in another.

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