Economic Studies
at BROOKINGS

May 2014

Systemic Risk and the Asset Management Industry

Douglas J. Elliott, Fellow, The Brookings Institution

The author would like to acknowledge the excellent assistance of William Bekker, research assistant in Economic Studies at Brookings. He also wrote the first draft of Appendices A and B.

The recent devastating global financial crisis has focused policymakers on sources of risk to the financial system that could have spillover effects on the economy as a whole. This search for "systemic risk" has ranged widely, going well beyond the banks that are at the heart of the financial system to include, among others: finance companies and other near-banks; insurers; financial utilities, such as clearing houses; various financial instruments such as derivatives and securitizations; financial market practices such as the use of repurchase agreements; and the asset management industry and its practices.

This paper will explore systemic risk in the asset management industry and the appropriate response by U.S. regulators. This is a particularly important area, given the huge volume of assets under management, estimated at as much as $53 trillion.[1]

Reference will be made from time to time to a report by the Office of Financial Research of the US Treasury Department (OFR) that was issued in September 2013 entitled "Asset Management and Financial Stability". The Financial Stability Oversight Council (FSOC) had requested the OFR to study the asset management industry and its practices and their relationship to financial stability issues. The FSOC is a council of the top U.S. financial regulators and is charged with watching over the stability of the U.S. financial system. The Dodd-Frank Act that created the FSOC gave it, and the financial regulators that comprise it, very substantial authority to act to force changes that reduce systemic risk, if they believe it to be necessary. Choices made by the FSOC could have major effects on the asset management industry. Not surprisingly, the OFR report has gained considerable attention, despite its status as solely an initial background report for the FSOC's use.

This paper will tackle the questions surrounding the potential for systemic risk to arise from, or be amplified by, the asset management industry and its practices. It will focus on the following questions:

- What is systemic risk
- How is systemic risk measured?
- What are asset managers?
- What types of asset managers exist and how do they differ?
- How do asset managers touch systemic risk?
- In what ways do asset managers create or amplify systemic risk?
- How should the FSOC reach a decision about SIFI designation?
- Should the FSOC designate any asset managers as SIFIs?
- How could the Fed supervise asset managers designated as SIFIs?

This is a large and complex topic, so the paper will necessarily be an introduction to the key issues rather than providing detailed, definitive answers.

The Economic Studies Program at the Brookings Institution, of which I am a fellow, held a conference on December 16, 2013 in which we explored the OFR report and the larger questions of systemic risk in asset management. A number of leading thinkers gave their views, including Richard Berner, the Director of the OFR. I was both a moderator and a panelist and have drawn on my remarks in writing this paper. A transcript, and the PowerPoint slides from most of the presenters, are available at www.brookings.edu/events/2013/12/16-systemic-risk-asset-management-industry

Before addressing these questions, it is worth emphasizing a viewpoint of mine that is often ignored in previous analyses. It is important that the *net* systemic risk created by the asset managers be considered in SIFI designation. It would be inappropriate and ineffective for asset managers to be viewed as responsible for actions that are essentially just the passing through of end-investor decisions. However, if it is true that asset managers are increasing the systemic risks or creating new ones, then it would indeed be appropriate to consider that *net* increase in systemic risk in the designation decision.

It is important that the *net* systemic risk created by the asset managers be considered in SIFI designation. It would be inappropriate and ineffective for asset managers to be viewed as responsible for actions that are essentially just the passing through of end-investor decisions.

One might argue that it may be appropriate to regulate asset managers even if they simply transmit risk. One could create restrictions to reduce systemic risk, essentially using the convenience of asset managers as entities that can be regulated to deal with risks that arise from the underlying investors. For example, one might limit their ability to engage in fire sales in some manner. However, I believe this type of approach would be a mistake. It is likely to push investors' money into channels that are not restricted in this way, dampening socially useful asset management activities and creating new regulatory risks. Mutual funds, for example, have worked quite well over the years as part of the U.S. financial system and they operate under many constraints to protect investors. It would be a shame if a large part of their assets moved to channels with fewer regulatory constraints and less history by which to judge them.

What is systemic risk?

There is no single agreed definition of systemic risk, but it refers generally to the risk that the financial system as a whole, or important parts of it, seize up in a crisis and cease temporarily to perform effectively their key economic functions. The clearest manifestation of this risk is probably a credit crunch that results from the failure of one or more banks, reducing the ability and willingness of the banking system to supply needed loans to the economy at a reasonable price. However, systemic risks could arise outside of the banking system and then hit the wider economy through damage caused to the banks or by directly affecting financial markets or other non-bank credit providers.

There simply is no agreed definition of systemic risk and even less agreement about how to measure it. The disagreement stems at core from the lack of an agreed model of the financial system and its interlinkages with the wider economy.

While the FSOC acknowledged in its 2011 annual report that there is a lack of a commonly accepted definition, it also stated that "all definitions attempt to capture risks to the stability of the financial system as a whole, as opposed to the risk facing individual financial institutions or market participants."[2] This concept is apparent in the definition applied by Bisias et al (2012) in their survey of systemic risk analytics: "any set of circumstances that threatens the stability of or public confidence in the financial system."[3, 4] A similar, albeit slightly more expansive definition, is used by the European Central Bank in defining it as a risk of financial instability "so widespread that it impairs the functioning of a financial system to the point where economic growth and welfare suffer materially."[5]

Appendix A contains a fuller discussion of the varying definitions of systemic risk.

How is systemic risk measured?

Ideally, we would be able to measure the level of systemic risk at a given point in time and then determine what the level would be if certain policy changes were made. Further, it would be useful to allocate the total risk in the system to individual institutions or market functions. The latter would be particularly helpful for the FSOC in fulfilling its legal mandate to spot systemically important financial institutions that would then be subject to more supervision and regulation.

A number of researchers have attempted to quantify systemic risk. However, there is a great deal of controversy about the methodologies and results. In a methodological survey conducted by Bisias et al (2012) for the Office of Financial Research, no less than thirty-one different methods of measuring systemic risk are identified; yet even this extensive survey is caveated as not being "exhaustive in…breadth."[6] Indeed the diversity of sensitivities and aspects of financial stability being covered by each model lead the authors to raise the point that "a single consensus measure of systemic risk may neither be possible nor desirable."[7]

Appendix B contains a detailed discussion of the major approaches to measuring systemic risk. The key point for this paper is that there simply is no agreed definition of systemic risk and even less agreement about how to measure it. The disagreement stems at core from the lack of an agreed model of the financial system and its interlinkages with the wider economy. This leaves analysts with quite varying views of the core vulnerabilities of our financial system, which leads to differing measurement approaches focused on different types of risk.

The difficulties in agreeing on a definition and measurement approaches for systemic risk make it considerably harder to find common ground on the question of how to measure and regulate systemic risk in the asset management industry.

What are Asset Managers?

Asset managers, broadly defined, provide investment management services as fiduciary agents for clients. Asset managers generally do not invest on their own account. This distinguishes the business model of asset management from those of other financial institutions. Commercial banks, investment banks, insurers, and government-sponsored credit providers all engage in activities that involve substantial balance sheet risk. Most notably, financial intermediaries, such as banks, fund themselves with deposits and borrowings in the market and then make loans or buy investments where the risk and reward accrue to the intermediary. As another example, investment banks serve as principals in their trading and market-making activities, risking their own capital in financial transactions.[8] In contrast, as agents, asset managers invest on behalf of their clients; that is, the losses and gains from their investments accrue to the clients as opposed to the firms.[9]

In fulfilling the core function of investing cash for clients, asset management firms engage in a variety of activities, which can be categorized into two groups: those that occur at the fund level and those that occur at the management company level. Fund level activities include overall asset allocation, selection of specific securities, and liquidity management. Fund shareholders receive any profits or losses. Management company activities include administration, centralized execution of trades,

risk management, and market research. There are interconnections between the two levels. For example, management companies may provide their funds with lines of credit in order to cover investor redemptions; such lines may allow the funds flexibility to keep less cash on hand.

Another notable feature of asset management is the revenue structure. Unlike banks, asset managers receive little or no income from investments. Their primary revenue source is from fees for services, particularly the core fee for managing assets.[10] This not only creates a relatively stable income stream, but also leads to smaller balance sheets at the management company level, with relatively little debt on them.[11] Private funds, such as hedge funds, are a partial exception to this rule, as they are not subject to restrictions on receiving performance fees, which gives the management company a direct stake in the performance of the funds.

Another critical difference between asset management and commercial banking is that asset management firms do not rely on government support in the same way that commercial banks do. In the United States, bank deposits are guaranteed by the Federal Deposit Insurance Corporation, which has a credit line with the US Treasury and a strong implicit government guarantee. Asset managers however, must explicitly disclose to clients that investment performance, and the original principal invested, are not guaranteed by any entity.[12]

What Types of Asset Managers Exist and How Do They Differ?

Some asset managers exist within independent investment companies while others may be divisions of insurers, banks, or other entities. Asset managers may operate mutual funds or other types of co-mingled funds or they may operate separately managed accounts for individuals and institutional investors. There are a wide variety of specific asset management models. In this section, five specific types of funds will be highlighted and discussed: Mutual Funds, Exchange-Traded Funds, Collective Investment Trusts, Separate Accounts, and Hedge Funds.

The Securities and Exchange Commission (SEC) offers the following definition of mutual funds: "a type of investment company that pools money from many investors and invests the money in stocks, bonds, money-market instruments, other securities, or even cash."[13] Investors, or their brokers, purchase shares in mutual funds directly from a fund, but may not purchase shares on secondary markets, such as the New York Stock Exchange. A mutual fund's share price is equal to the fund's approximate net asset value (NAV) – the value of an investment company's total assets less its total liabilities[14] divided by the number of outstanding shares. Each fund must re-calculate its NAV at the end of each trading day, though some funds do so more frequently. Mutual funds are considered "open-end" investments, meaning that shareholders are free to buy or redeem shares on any day. While mutual funds come in a wide variety depending on, among other things, risk profile, asset class focus, and investment strategy, some common types include: money market funds, which are legally required to invest in short-term, low-risk securities; equity funds, which invest principally in stocks; and fixed income funds, which invest primarily in bonds and other types of debt securities.

Like mutual funds, exchange-traded funds (ETFs) enable investors to pool their money in a fund that invests in stocks, bonds, or other assets, and earn a corresponding return. Unlike mutual funds however, ETF shares are traded on national stock exchanges at market prices that may not necessarily reflect the NAV of the fund. While ETFs were initially designed to track the performance of specific U.S. equity indexes, such as the S&P 500, newer funds may track indexes for other financial securities or may be actively managed and based on complex investment strategies.[15]

Collective Investment Trusts (CITs) are similar to mutual funds in that they enable investors to combine their assets in order to achieve a larger and more diversified portfolio. But unlike mutual funds, CITs are only eligible for qualified retirement plans, such as 401(k) plans and government plans.[16] Furthermore, CITs are not regulated by the SEC. Instead, CITs are managed by banks or trust companies and subject to regulations enforced by the Office of the Comptroller of the Currency. In practice, CITs face less stringent reporting standards and have lower costs.[17]

A Separately Managed Account (SMA) is a portfolio of assets under the management of a professional investment firm. SMAs have higher investment minimums than mutual funds and are targeted at wealthier investors. In contrast to mutual funds, each account has a customized investment portfolio to fit the client's unique investment objectives. Thus the primary difference between SMAs and other pooled investment vehicles, such as mutual funds, is that decisions are made at the account level and will not affect all fund investors in the same way.[18] That said, smaller separate accounts are often managed with a set of common approaches, in order to gain some economies of scale.

There is no universally accepted definition of hedge funds. In general, hedge funds are a type of private fund that have few restrictions on the types of investment activities that they engage in.[19] Private funds are excluded from registration requirements under the Investment Company Act of 1940, and differ from registered funds in a variety of ways, such as in their freedom to use leverage without limit and impose

restrictions on investor redemptions.[20, 21] Investors in hedge funds must be accredited, meaning that they fit certain minimum wealth standards, and typically include institutional investors, such as pension funds and insurers, and high net worth individuals.[22, 23] Hedge funds tend to be less liquid than other types of funds such as ETFs or mutual funds.

How do asset managers touch systemic risk?

Asset managers control the investment decisions for a substantial percentage of the total assets invested in financial markets. This particularly matters in the U.S. because of the relative importance of financial markets, as compared with more bank-centric financial systems in most of the rest of the world, including Europe, Japan, and China. A crisis in the financial markets can harm the real economy through multiple channels:

Credit supply. Crises cause a substantial contraction of the supply of credit and equity funding, reducing economic growth.

Wealth effects. Crises also create a significant decline in household wealth with the attendant reduction in spending and slowdown in the economy.

Confidence effects. Crises damage consumer and business confidence, leading to lessened business activity and employment.

Links to the bank sector. Problems in the financial markets can be transmitted to the banks with which markets are interlinked in a number of different ways, including by reducing the value of bank assets and capital and by tightening bank liquidity conditions by making it difficult to sell certain assets at a reasonable price.

Liquidity effects. Money market funds have been a partial substitute for bank deposits and a "run" on such funds could have effects on the economy similar to a bank run, forcing fire sales, blocking credit channels, and harming confidence. Some analysts are concerned that other asset management activities could have similar attributes.

> The relative importance of financial markets in the United States compared to the bank-centric financial systems of the rest of the world means asset managers play a critical position in managing systemic risk.

Decisions by asset managers affect, or are affected by, these systemic risks principally through two related channels: asset prices and liquidity conditions in financial markets. Asset managers decide what volumes of specific assets they are willing to buy or sell and at what prices. These decisions are partly a result of analysis by the managers and partly a response to financial market conditions and, importantly, inflows and outflows of funds from their investor clients.

One risk related to asset management is the potential for large-scale redemptions from funds during times of market stress. Unwinding positions during turbulent periods may require conducting costly and unprofitable trades. This risk would be exacerbated if investors believe that they will gain an economic advantage by being the first to redeem.[24] There has been such an advantage to some extent for money market funds because of the artificial use of a Net Asset Value of $1.00 per share even when the actual NAV is slightly above or below that amount. In such a situation, the costs of trades in troubled markets could primarily be borne by the remaining investors, creating a "first-mover advantage" to withdrawing funds.[25] The presence of a "first-mover advantage" may distort investor expectations and serve as a source of risk to a fund.[26]

In general, redemptions on a scale that threatens financial stability or that triggers heavy selling and price declines in markets have not been observed. According to analysis conducted by the Investment Company Institute, "investors do not redeem heavily from stock and bond funds during periods of market stress and fund portfolio managers are not heavy sellers of portfolio securities in down markets."[27] Nevertheless, redemption risk remains a concern for asset managers and regulatory authorities insofar as it is presents a legitimate channel through which funds may be exposed to financial shocks.

Securities lending programs serve as another channel through which asset managers may touch systemic risk. During the financial crisis, some asset managers that were involved in securities lending programs bore significant losses on cash collateral that had been invested in assets that were severely impacted by the crisis, such as structured investment vehicles and Lehman Brothers notes.[28] Moreover, securities lending programs create another source of redemption risk. Borrowers may seek to return securities if they are concerned about the safety of their collateral in stressful market periods. Since asset managers typically reinvest cash collateral in money markets, in the event that markets have seized up and borrowers demand the return of their collateral, lenders may be forced to sell at a loss assets that have become illiquid in order to return the cash collateral.[29]

Asset managers may also touch systemic risk through interconnections with other financial institutions or business lines. According to the OFR, the complex network of interconnections among asset managers and other financial services firms may expose asset managers to risks that arise in other market sectors.[30,

[31] Likewise, asset managers may be exposed to risks through interconnections within their own firm or fund complexes. Asset managers that work in a division of a bank or insurance company or that work in an asset management company that offers ancillary services, such as in-house broker-dealers, commodity pool operators, trust companies, or consulting services, may be exposed to risks in other market segments.

Asset managers act autonomously in many ways and in others act solely as agents passing through the decisions of their investors. Therefore, it is important in considering systemic risk to separate out the impacts on risk arising from the structure of asset managers and their decision-making processes from those that merely represent the pass-through of decisions by their customers. It will generally be ineffective to try to reduce systemic risk at the asset manager level in those cases where the real determinants are decisions by end-investors. That is, the distinction must be made between *exposure* to systemic risk, as has been discussed in this section, and *creation or amplification* of systemic risk.

It will generally be ineffective to try to reduce systemic risk at the asset manager level in those cases where the real determinants are decisions by end-investors. That is, the distinction must be made between *exposure* to systemic risk and *creation* or *amplification* of systemic risk.

In what ways do asset managers create or amplify systemic risk?

It is critical to determine whether the existence of an asset manager causes the total level of systemic risk to be significantly higher than it otherwise would be. This should exclude the effects of simply pooling together systemic risks that would otherwise exist, unless there is an amplification effect caused by the act of pooling.

Some read the OFR report to imply that asset managers can create systemic risk by entering into fire sales of troubled asset categories in a time of crisis. A "fire sale" is the sale of an asset at a price below its value that takes place because it is forced in some manner, rather than as the result of a discretionary investment decision that happens to undervalue the asset.

It is not clear that this implication was intended by the OFR, but if it was, the key question is whether such fire sales are simply a straight pass-through reflecting choices by end-investors. For example, if mutual funds dumped tech shares during the Tech Crash of 2001, but did so simply by proportionally lowering the size of their holdings in response to investor redemptions from the mutual funds, then it does not seem meaningful to view the asset managers running those funds as having created the fire sales.

Thus, asset managers do not bring a fire sale risk unless their mode of operation makes such risks higher than would exist simply due to the changing preferences of their end-investors. This would hold even if the end-investor choices are themselves the result of fire sale conditions. That is, if end-investors want or need to dispose of assets quickly, for whatever reason, this would be reflected in overall financial market conditions whether those investors owned the assets directly or did so through an asset manager.

It is theoretically possible that having large amounts of assets pooled together under one asset manager could raise the risk of fire sales, because of an amplification effect. For example, if millions of end-investors entrust their funds to the management of a single asset manager, it is possible that the manager would concentrate their investments in a few assets and create fire sale risks for those assets that would be more severe than would have existed if the end-investors had acted independently or had spread their money across more managers. Of course, higher concentration in an asset at a given manager might be offset by lesser holdings at another manager. For this theoretical risk to exist in reality, it would have to be true that asset managers, as a class, "herd," or create greater concentration in specific assets, or that asset managers with high concentrations in specific assets are more prone to forced sales.

There is an extensive body of theoretical and empirical literature on institutional herding. Institutional investors may exhibit herding behavior for a number of reasons, some of which do not apply to retail investors, including information cascades – that is, inferring information from one another's trades,[32] relying on similar information or market signals to make investment decisions,[33] the possibility of reputational costs to investing against the crowd,[34] or the presence of competitive pressures.[35] While there is empirical evidence suggesting that institutional investors broadly may exhibit herding behavior, thereby increasing market concentration in specific assets or asset classes, such is not necessarily the case for every type of institutional investor. Mutual funds as a class, for example, tend to exhibit less herding behavior.[36, 37]

As to whether asset managers with high concentrations in specific assets are more prone to fire sales, the OFR argues that if asset managers assume large or concentrated market positions, the "likelihood and severity" of fire sales could increase. The OFR explains that this risk is particularly pronounced in markets that have high barriers to entry or that tend to be populated by specialized funds, since such markets have a "lack of substitute investors" and are thus less liquid. In the event that a fund with a concentrated position in

such a market needed to raise cash – to, for instance, cover redemptions – they would be vulnerable to high liquidity premiums and more likely to have a large price impact from selling.[38] The extent to which there might be negative externalities from such a situation would be determined by various other factors, such as the firm's degree of leverage and linkages to other financial institutions.[39] Again, it will be critical to judge the extent to which this excessive concentration is the result of the existence of the asset managers as opposed to end-investor behavior that flows through the funds. If one type of asset becomes the flavor of the month for end-investors, this will be reflected in asset manager choices.

With respect to the issue of whether large asset management firms create a discrete risk by nature of their size, the OFR does take the position that the distress or failure of an asset management firm "could be a source of a risk, depending on its size," in addition to other factors.[40] If a large firm were forced to sell assets, the report explains, asset valuations could be depressed or market volatility could increase, creating the potential for spillover effects. The OFR further argues that "material distress" at the management company level could threaten "a broader loss of confidence" in financial markets.[41]

Funds that employ financial leverage could also create or magnify systemic risks. Levered entities are subject to margin calls and haircuts from creditors, exposing them to the risk of fire sales during episodes of market stress. Moreover, leverage serves to magnify any losses that occur on bad investments. Asset managers can obtain leverage through traditional bank loans or other borrowings or can create similar exposures through derivatives or securities lending or repurchase agreements. There are a number of regulatory limitations on the extent to which registered funds can obtain leverage,[42] and, the "typical mutual fund" has been used as an example "of a nonbank financial company with a low degree of leverage."[43]

Two types of funds have been highlighted in the systemic risk discussion: hedge funds and exchange-traded funds.

Beyond industry-level risks related to herding, redemptions, fire sales, and leverage, two types of funds have been highlighted in the systemic risk discussion: hedge funds and ETFs.

With respect to the former, hedge funds face fewer regulatory restrictions on their activities than registered funds, such as mutual funds. As a result, they may use leverage without limit, impose restrictions on investor redemptions, face no restrictions on investment strategies, and are exempt from many regulatory oversight and reporting requirements.[44] Nevertheless, according to Dixon, Clancy, and Kumar (2013), hedge funds did not play a "pivotal role" in the recent financial crisis, and while they may "contribute to systemic risk" and ought to be closely monitored, in the authors' estimation they "need not be the primary concern of regulators as they work to improve the stability of the world's financial system."[45] The OFR report touches on the issue of private funds and systemic risk, but does not go in detail, as further analysis on the topic will be conducted by regulators in conjunction with information currently being gathered in the newly instituted Form PF (Private Funds).

ETFs, like other closed-end funds, offer intraday trading of shares. Although the majority of ETF assets are invested in highly liquid equity markets, investors also use ETFs to gain exposure to less liquid market segments, such as fixed income and emerging market securities.[46] Intra-day trading, and the inability for investors to redeem at NAV, raises some issues that concerned the OFR.

The OFR has stated that ETFs "may transmit or amplify financial shocks" that have originated elsewhere in the system. While trading in ETF shares may offer the benefit of improving price discovery by providing a market price for a portfolio of investments in thinly traded markets, the report goes on, it could also "amplify … price movements … during market turbulence."[47] However, beyond raising these concerns and discussing the behavior of ETFs in two notable cases –the Flash Crash and the market turbulence of June 20, 2013, the OFR does not cite any empirical research showing that ETFs may amplify financial shocks, exacerbate adverse price movements, or lead to market volatility.

A key question in regard to this argument is whether ETFs "transmit" financial shocks or "amplify" them. The OFR report does not specify an answer to this key distinction. There is a reasonable argument that fire sales related to ETFs would have occurred directly through the mechanism of sales of the underlying assets, if ETFs did not exist. It is even possible that by placing liquidity risk on those who are buying or selling the ETFs, rather than pooling it across all participants in the fund, there is a reduction in the systemic risk that some argue comes from incentives for fundholders to exit first in the event of a panic.

At this point, it is not clear whether ETFs amplify financial shocks. This is likely to depend to a significant extent on whether ETF holders understand the actual degree of liquidity available to them to the same extent that holders of the underlying assets do. (This could be a weak understanding in either case, of course.) One concern is that it is possible that holders of ETFs take too

much comfort from the ability to trade easily over the course of the day in normal times.

How should the FSOC reach a decision about SIFI designation?

The Financial Stability Board (a global coordinating body for financial stability issues) and the International Organization of Securities Commissions (IOSCO) have proposed the following indicators of systemic risk for asset managers. (The short descriptions are my own summaries.)

Size. All else equal, a larger firm or fund will have more potential impact on the financial system than a smaller one.

Interconnectedness. The more connections a firm has with others, the more channels there are to transmit problems.

Substitutability. If a firm provides an important service that is difficult or impossible to replace then problems at that firm can have wider repercussions.

Complexity. Complexity and the related opacity can breed panic in a financial crisis.

Cross-jurisdictional activities. Activities that cross boundaries can be harder to track and more difficult to clean up if problems develop.

There are good reasons to consider these factors, but it is impossible to know how to calibrate these measures without an analysis of the business models of the firms and their relationship to systemic risk. It is for this reason, presumably, that the FSOC asked the OFR to analyze the asset management industry. The OFR focused on "four key factors that make the industry vulnerable to financial shocks." These are, in the OFR's words:

- "reaching for yield" and herding behaviors
- redemption risk in collective investment vehicles
- leverage, which can amplify asset price movements and increase the potential for fire sales
- firms as sources of risk

The OFR stated that there were two key channels by which these vulnerabilities could be transmitted to the wider financial system: "disruptions in markets caused by fire sales, and exposures of creditors, counterparties, and investors."

These are reasonable starting points for an analysis of asset managers and systemic risk, *if properly evaluated*. Assuming the FSOC accepts this view of the asset management business model and the risks it presents to the financial system, it will be important that the *net* systemic risk created by the asset managers be considered. As noted earlier, it would be inappropriate and ineffective for asset managers to be viewed as responsible for actions that are essentially just the passing through of end-investor decisions. However, if it is true that asset managers are increasing the systemic risks or creating new ones, then it would indeed be appropriate to consider that net increase in systemic risk.

One might argue that it may be appropriate to regulate asset managers even if they simply transmit risk. One could create restrictions to reduce systemic risk, essentially using the convenience of asset managers as entities that can be regulated to deal with risks that arise from the underlying investors. For example, one might limit their ability to engage in fire sales in some manner. However, I believe this type of approach would be a mistake. It is likely to push investors' money into channels that are not restricted in this way, dampening socially useful asset management activities and creating new regulatory risks. Mutual funds, for example, have worked quite well over the years as part of the US financial system and they operate under many constraints to protect investors. It would be a shame if a large part of their assets moved to channels with fewer regulatory constraints and less history by which to judge them.

Further, it will be critical to choose the right units of analysis, in particular to decide when an asset management company should be the entity evaluated and when it should be the group of funds managed by that manager or each individual fund. This is not straightforward. For many purposes it may be most appropriate to look at each fund within a fund family separately, since they are usually legally separate from their sister funds and cannot provide financial assistance across the funds. This is the preliminary choice made by the FSB/IOSCO. But, for potential fire sale effects, it may be relevant that an asset manager's research is used by multiple funds within the group, depending on the extent to which analysis at the manager level causes very similar actions to be taken by multiple funds.

We could create restrictions on systemic risk created by end-investor decisions, but I believe this type of approach is likely to push investors' money into channels that are not restricted in this way, dampening socially useful asset management activities and creating new regulatory risks.

Another important judgment call is on the degree of probability necessary to take a theoretically possible risk into account. To take an extreme, it is theoretically possible that the CEO of a large fund complex would find a way to embezzle all the funds managed by the asset manager. There are multitudes of safeguards to keep this from happening, but one could conceivably hypothesize a scenario in which this happens. Yet no one would suggest that SIFI designation should be affected by this truly remote possibility. On the other hand, something which is unlikely, but which has occurred in

the past and could plausibly occur again, might well be appropriate to consider. For example, it would have been appropriate pre-crisis to consider a scenario in which house prices fell nationwide, affecting many securities simultaneously, even though such a thing had not occurred since the Great Depression.

It is also worth emphasizing the importance of leverage as a systemic risk factor in the context of "shadow banking". Authorities around the world are worried that the increased burden of regulation on banks and other highly regulated financial intermediaries will cause substantial amounts of business to move to less regulated entities while retaining their essential characteristics. The exact nature of these characteristics is subject to debate, but certainly center around credit intermediation performed with high levels of leverage. (Many banks and insurers have ratios of assets to capital of 10:1 or more, making them much more levered than non-financial firms and than the large majority of funds managed by asset managers.)

Asset managers will certainly undertake activities that substitute for traditional credit intermediation, such as managing the many funds that already exist that invest in bank loans. (More basically, the bond markets can be viewed as a form of disintermediation and asset managers are major investors in bonds.) Some of the asset managers, particularly in the hedge fund world, will take on leverage to raise their returns from credit intermediation. High levels of leverage combined with credit intermediation, particularly if coupled with maturity transformation (borrowing short-term and investing long-term) are potential indicators of substantial systemic risk. (Note that the OFR report includes "redemption risk" as a key variable. This is essentially the fund management version of the risk from maturity mismatches.)

It should be noted that there is no decision factor here for whether SIFI designation would be the best regulatory approach. Dodd-Frank essentially assumes that any financial firm that presents a sufficiently high level of systemic risk should be designated as such and that the Federal Reserve will make appropriate choices about supervisory actions, if any, afterwards. Some argue that designation, of itself, can be harmful, such as by implying government support or by creating regulatory uncertainty about the firms. Whatever the validity of these arguments, Dodd-Frank did not give weight to them.

Should the FSOC designate any asset managers as SIFIs?

With the possible exception of money market funds, which are a complex topic, it seems unlikely to me that any US asset managers currently deserve to be designated by FSOC as SIFIs. To be fair, it is impossible to be completely certain of this without more information than is publicly available now. However, even the largest asset managers do not appear to cross the threshold of systemic significance, given that the bulk of their activities are undertaken as agents. As a preliminary overview, here are some thoughts on the key factors raised by the FSB/IOSCO and by the OFR.

Size. Some fund families in the US are very large, with as much as $2.5 trillion in assets in the largest funds management group, which is probably the principal reason that they might be considered formally for SIFI designation. However, if the correct unit of analysis is the individual fund, as would primarily be the case and as is preliminarily recommended by FSB/IOSCO, we see much smaller figures, with the Vanguard Total Stock Market Index Fund the largest, at a bit over $300 billion.[48]

Interconnectedness. Funds managed by the asset managers are at least loosely connected with many firms by owning their securities. They also have tighter connections with a smaller number of major financial institutions through securities lending, repurchase agreements, and derivatives exposures and similar counterparty relationships. They may also be affiliated with or owned by other financial firms. The interconnections with financial institutions bring the potential for transmitting systemic risk from asset managers, if significant risk does reside with the managers.

Substitutability. The great bulk of asset management activities could easily be moved to another firm. There are doubtless some specialized niches where this is not true, but even in the aggregate they are unlikely to be large at any particular firm. On the whole, ready substitutability in the industry argues against SIFI designation.

Complexity. Most asset management is performed in a straightforward manner and mutual funds and other registered investment companies provide a great deal of information about their activities. There will be exceptions to the complexity point, particularly at some hedge funds, but complexity is not a major issue overall in asset management.

Cross-jurisdictional activity. Some US asset managers do invest significant amounts overseas on behalf of their clients, but the great bulk of money is still invested in the US. Further, the types of activity are quite straightforward, such as buying foreign securities, and do not raise the concerns that caused this category to be included when considering financial intermediaries.

Moving on to the OFR vulnerabilities list:

Reaching for yield and herding behaviors. There is considerable evidence that asset managers exhibit herding behavior, including reaching for yield.[49] It is much less clear that this occurs to a greater extent than

would have been done by the end-investors themselves. In my view, it is easy to overstate the systemic risk from this aspect of asset management behavior and the total *net* risk from this is likely small compared to the size of assets invested.

Redemption risks in collective investment trusts. This depends heavily on the entity under consideration. In no case is the underlying systemic risk in asset management from redemption risk nearly as bad as the underlying run risk at financial intermediaries. Traditional bank runs are a particular problem because deposits that can be withdrawn on demand are used to fund multi-year, illiquid loans. The closest that asset management comes is with money market funds, which can normally be withdrawn on a day's notice and which some customers view as essentially the same as bank deposits, therefore effectively riskless. As a result, many of them appear to rely on the ability to withdraw funds quickly and without loss, in the same manner as a bank account, creating the possibility of runs if these expectations seem at risk of being thwarted. However, the maturity mismatch is far less severe than with traditional banking, as the average maturity of the investments of money market funds is measured in days, not years, and the average credit quality and liquidity are considerably higher than for loans. This means that the losses from a run on money market funds would be much less.

Beyond money market funds, there is also the saving grace that investors who use asset managers know that they can lose money, unlike with bank deposits where there is an expectation of safety. To the extent that investors fully recognize the liquidity risks, it is not clear that collective investment vehicles create any significant new systemic risk that would not have existed for the end investors if they had invested directly. It is true that there is an incentive to exit early in a crisis, in order to avoid the full impact of fire sales and overall worsening liquidity. However, this is just as true for those investing directly. Further, this assumes that investors recognize that things will keep getting worse, rather than choosing to hold out until potentially temporary problems reverse, as they often do.

Therefore, the place to focus on redemption risks is with those vehicles where there may be a substantial difference between investors' perceptions of liquidity and the reality. This is one of the main concerns with ETF's, since it may be the case that some investors are lulled into an assumption of permanent liquidity availability just because it is readily available, at low cost, in normal times. This is an area where more study is warranted.

Leverage. There is little leverage employed in most of the asset management industry, particularly registered investment companies, such as mutual funds. Statutory and regulatory limits provide assurance that this will remain true. Hedge funds, on the other hand, range in their approaches from ones with little or no leverage to others with much more. As a general matter, higher leverage is associated with lower risk in the underlying assets, since someone has to be persuaded to loan the fund money or to take the credit risk in some other way and they are understandably leery of multiplying the risks of leverage and high risk investments. Also, high-risk investments tend to provide a large enough absolute return to reduce the temptation to lever up excessively. Leverage is certainly an area to be considered closely when evaluating individual firms for potential SIFI designation, but it does not appear to be a huge factor for the industry as a whole.

Firms as sources of risk. It is true that one can imagine problems with an asset management company that would create contagion across all of the funds managed by that firm. However, it is not clear whether this is a realistic fear, at least on a scale that would cause systemic problems. Fund investors appear to be stickier than one might intuitively assume. Further, the ability to switch funds to another investment manager with ease greatly mitigates the potential damage. Thus, the firm risk is unlikely to surface unless the other elements that create systemic risk, such as high leverage, are already present. In sum, FSOC should consider this risk, but should be careful not to overweight it, as it is unlikely to be a major factor.

How could the Fed supervise asset managers designated as SIFIs?

If an asset manager were to be formally designated as a SIFI, there would then be a difficult question as to how the Fed ought to exercise its supervisory responsibility that would arise from the designation. Dodd-Frank was written with a strong emphasis on classic financial intermediaries such as banks and therefore focused on issues such as capital requirements that may be less relevant for asset managers.

The Fed would certainly want substantial amounts of information about the situation and activities of the designated entities and, to a lesser extent, related parties. It is unclear what additional information would be desired beyond what may already be reported publicly. It would likely encompass information about investment procedures and might go on to more detailed information about investment positions and trades.

This would serve both to give the Fed, and potentially other relevant authorities, the ability to monitor the risks within the overall financial system and would also increase the probability of spotting dangerous practices that might arise over time. It is difficult for an analyst such as myself to argue against additional information, but it must be borne in mind that there are costs as well as benefits to data collection, therefore a balance must be found. Gathering, and then interpreting, the data does

have a cost even in our more technological age. Further, investors do have a right to confidentiality in their transactions unless there is a strong enough reason to gather the data.

Based on this information, the Fed might, over time, begin to place restrictions on certain activities by asset manager SIFIs. It is impossible to say at this point what restrictions might be instituted, because it would depend on conclusions reached by the Fed about dangers to the system, which might themselves change as the state of the financial system and larger economy evolves.

A crucial question is whether the Fed would institute capital requirements. Dodd-Frank effectively mandates capital requirements for non-bank SIFIs, as already exist for bank SIFIs. However, there may be room for the Fed to apply this loosely in cases where it did not actually make sense. For example, if a fund is designated as a SIFI, it would be possible to view all of the funds invested by shareholders into the fund as capital.

It would be worrisome if the Fed imposed broad capital requirements on SIFI asset managers, unless there was an interpretation that rendered it easy for typical asset managers to meet. Capital is largely inappropriate as a concept for asset managers, since they act as agents and not financial intermediaries in their own right. For example, an equity mutual fund that is part of a large mutual fund family could suffer very significant losses, especially if it is concentrated in particular sector. However, there is no expectation by the investors or anyone else that the fund management company would step in to absorb some of the losses. Nor would other funds in the same family do so, as they are forbidden by law from mingling their profits and losses across the funds in this manner. Absent such an expectation of loss-sharing, it is difficult to see why capital would be needed. Further, holding such capital would require an increased return for the fund manager sufficient to compensate its own equity investors who supplied the capital. This return would have to be extracted from the investors in the funds under management through higher fees. Thus, investors in the individual mutual funds would suffer higher costs with no particular benefit.

There is potentially more of a case for an adequate capital cushion for those asset management vehicles that use debt leverage. For example, if a hedge fund chooses to use high levels of debt in order to magnify its gains and losses, then whoever is supplying the credit should impose a limit on leverage in order to protect its own position, effectively requiring a certain portion of the assets in the fund to be available as capital. However, there does not appear to be a need for regulators to require such capital in order to protect the creditors, unless the creditor is a regulated financial institution in its own right, in which case such rules can be laid down for regulated lenders, without establishing regulations binding on the asset manager.

One could, though, argue that the end-investors in a fund ought to be protected from excessive leverage, which could be done with capital requirements. This does not seem necessary in the hedge fund example, because a hedge fund's investors are supposed to be limited to sophisticated investors who can analyze the risks and rewards and have the resources to bear any losses. (Concerns exist about whether these rules do a good job of weeding out unsuitable investors, especially now that hedge funds are being marketed to smaller investors than was historically the case. However, any such issues should be resolved by fixing those rules, rather than through excessive intervention in the activities of hedge funds.) Nor is there a good argument for the manager of the hedge fund to have substantial capital requirements, since they are not called upon to subsidize losses, except through forgoing incentive based fees.

Registered investment companies in the US, such as mutual funds, already have quite strict limits on their debt leverage, and strong disclosure requirements, in order to protect the less sophisticated investors who may choose to invest in these funds. Thus, here too it seems unnecessary to require that capital be held at the level of the fund manager. End-investors should be in a position to bear any losses, even when magnified relatively modestly by the allowable debt leverage at the fund level.

All in all, there does not seem to be a good case for capital requirements on asset managers, or their funds.

All in all, there does not seem to be a good case for capital requirements on asset managers, or their funds. The one exception would be if a hedge fund chose to operate as a near-bank, conducting traditional credit intermediation activities with high leverage and especially if substantial levels of maturity transformation are involved as well. If a fund is operating in largely the same manner as a bank or other financial intermediary, then it may be necessary to impose capital requirements to protect the financial system from potential shocks if a large asset manager performing these operations were to become insolvent or at serious risk of insolvency.

It should also be noted that SIFI designation might lead to additional fees or premiums that would be charged to these asset managers and ultimately their customers. For example, the FDIC's SIFI resolution fund may put a charge on the assets of all SIFIs, even those for whom it is hard to see a resolution occurring, such as asset managers. There are also proposals in Congress to place an excise tax on all SIFIs, although this could easily end up excluding certain types of SIFIs, if it ever made it through into legislation.

Appendix A: Definitions of Systemic Risk

Kaufman and Scott (2003) identify three major concepts that pervade the literature on systemic risk, and thus they offer three definitions.[50] The first definition hinges on the concept of "macroshocks" that produce simultaneous, widespread, adverse effects on the broader economy or system. In this concept, the focus is on an *event* that affects "the entire banking, financial, or economic system."[51] Systemic risk is specifically the "likelihood" of an "event that disrupts information in financial markets, making them unable to effectively channel funds."[52]

The second definition relates to the mechanism through which local financial problems are transmitted to the broader system; specifically, in this definition systemic risk is the "probability that cumulative losses…from an event…sets in motion a series of successive losses along a chain of institutions or markets."[53] This concept is drawn on by the Bank of International Settlements in their definition of systemic risk: "The risk that the failure of a participant to meet its contractual obligations may in turn cause other participants to default with a chain reaction leading to broader financial difficulties."[54] Kaufman and Scott (2003) distinguish this concept from that of macroshocks, noting that "unlike in the… macroshock definition, only one bank need be exposed in direct causation to the initial shock."[55]

The concept underlying the third definition offered by Kaufman and Scott (2003) is similar to that in the second insofar is it concerns transmission mechanisms but is different in that it "does not involve direct causation and depends on weaker and more indirect connections."[56] Under adverse market conditions, such as in the case of the failure of a large financial firm, uncertainty about the values and levels of risk exposure of other market participants is raised. In such situations, information on the levels of risk exposure may be unavailable, imperfect, or costly. As a result, a flight to safety may occur in which risk-averse market participants immediately transfer funds to safer units without conducting a complete analysis; that is, funds are transferred without properly differentiating between solvent institutions and insolvent ones, making the situation dangerous and difficult to contain.[57] Moreover, such runs may exert downward pressure on prices of securities in the affected markets, potentially creating liquidity problems and a channel for further spillover effects into banks and markets not directly affected by the initial shock.

In DeYoung's (2012) characterization and discussion of systemic risk, the concepts of macroshocks, credit crunches, and interbank connections interact with one another. In DeYoung's explanation, if banks are exposed to a common macro-economic shock, the collective weight of the damage to the banking system can cause a reduction in the aggregate supply of loans, creating a credit crunch. In turn, a feedback loop between the credit crunch and poor economic performance may arise. Furthermore, some banks may act as counterparties in money markets, derivatives contracts, and other financial arrangements, creating a source of contagion within the banking system.

Finally, in Hansen's (2012) chapter on issues of measuring and identifying systemic risk, he describes three generally recognized notions of systemic risk. First, systemic risk is often interpreted as a "modern-day counterpart to a bank run triggered by liquidity concerns." Second, systemic risk is often used to describe the "vulnerability of a financial network in which adverse consequences of internal shocks can spread and even magnify within the network." And third, systemic risk commonly refers to the possibility of "insolvency of a major player in or component of the financial system."[58]

Appendix B: Measurements of Systemic Risk

The following is an incomplete survey of the various measures of systemic risk.

The tail measurement approach involves measuring "co-dependence in the tails of equity returns to financial institutions."[59] Co-dependence is the operative concept in this approach as the measurement must "distinguish the impact of disturbances to the entire financial sector from" those that are "firm-specific."[60] A form of the tail measurement approach is applied by Adrian and Brunnermeier (2011) in their measure of systemic risk, which they call *CoVar* – the value at risk (*VaR*) of the financial *system* conditional on institutions being under distress.[61]

Contingent claims analysis is another approach. It builds on option pricing theory for firm financing – that is, equity is treated as a call and debt as a put – and estimates risk-adjusted sectoral balance sheets. In the International Monetary Fund's *2009 Global Financial Stability Review*, the contingent claims approach model is highlighted as a way of obtaining "useful and timely indicators of default probability and credit risk."[62] Jobst and Gray (2013) apply an advanced version of the contingent claims approach in order to generate aggregate estimates of the joint default risk of multiple institutions conditional on tail risk expectations in a forward-looking framework that they call Systemic Contingent Claims Analysis ("Systemic CCA").[63]

Network models focus on complex interconnections within the financial system and shed light on the "systemic implications" of those connections.[64] In the IMF's *2009 Global Financial Stability Review*, four general and complementary approaches to assessing systemic linkages are presented:

- The Network Approach tracks the reverberation of a credit event or liquidity squeeze throughout the banking system via direct linkages in the interbank market
- The Co-Risk Model assesses systemic linkages among financial institutions under extreme events
- The Distress Dependence Matrix examines pairs of institutions' probabilities of distress, taking into account a given set of other institutions
- The Default Intensity Model measures the probability of failures of a large fraction of financial institutions due to both direct and indirect systemic linkages

Notably, the relationship between network structure and systemic risk is ambiguous a priori. In a model developed by Allen and Gale (2000), complete networks, in which all banks lend to and borrow from one another, fare better than incomplete networks, in which each bank can only borrow from one neighbor and lend to only one other neighbor, in handling liquidity shocks.[65] Yet in a recent lecture given before the American Economic Association and the American Finance Association, Janet Yellen called this result "incomplete" and raised the issue that more complex networks tend to be more opaque than less complex ones, possibly lending to information problems.[66]

Other measures may be more microprudential in nature, focusing on specific financial sectors or institutional varieties.[67] Chan et al (2006a, 2006b), for instance, focus their analysis on hedge funds. Looking at the industry from both an individual and an aggregate level, the authors develop several risk measures, such as on illiquidity risk exposure, hedge fund liquidation probabilities, and aggregate volatility. In general, the authors focus on two themes in their work: illiquidity exposure – since illiquid portfolios are prone to larger price impacts from forced liquidations of positions – and time-varying hedge fund correlations.[68, 69]

Endnotes and References

1. This estimate, from the Office of Financial Research report described in the next paragraph, includes double counting, as that report acknowledges. The true figure is likely substantially lower.

2. Financial Stability Oversight Council, *Annual Report*, Washington, DC, July 26, 2011.

3. Billio, M., M. Getmansky, A. W. Lo, and L. Pelizzon, 2010, "Econometric measures of systemic risk in the finance and insurance sectors," NBER Working Paper 16223, NBER.

4. Bisias, Dimitrios, Mark Flood, Andrew W. Lo, and Stavros Valavanis, 2012, "A Survey of Systemic Risk Analytics," Working Paper 0001, Office of Financial Research.

5. European Central Bank (ECB), 2010, "Financial networks and financial stability," Financial Stability Review, 2010, 155-160.

6. Bisias et al, pp. 4

7. Ibid, pp. 2.

8. *BlackRock Viewpoint*. Aug. 2013. Web. (Hereafter, BlackRock Viewpoint)

9. Department of the Treasury. Office of Financial Research. "Asset Management and Systemic Risk." Sep 2013. pp. 1 (Hereafter, OFR, "Asset Management and Systemic Risk")

10. *BlackRock Viewpoint*

11. Ibid.

12. Ibid.

13. "Mutual Funds." *SEC Website*. U.S. Securities and Exchange Commission, Dec. 2010. Web.

14. "Net Asset Value." *SEC Website*. U.S. Securities and Exchange Commission, Dec. 2010. Web.

15. "Investor Bulletin: Exchange-Traded Funds (ETFs)." *SEC Office of Investor Education and Advocacy Website*. U.S. Securities and Exchange Commission, Aug. 2012. Web.

16. *SEI Global Asset Management Product Guide - Collective Investment Trust (CIT)*. 2012. Web.

17. Holspopple, Scott. "Collective Investment Trusts: To Trust or Not to Trust?" U.S. News & World Report. Jan. 2012. Web.

18. Lamb, Katrina. "Separately Managed Accounts: A Mutual Fund Alternative." *Investopedia*. June 2012. Web.

19. Fabozzi, Modigliani, Jones (2010)

20. OFR, "Asset Management and Systemic Risk," pp. 28.

21. RAND Report, "Hedge Funds and Systemic Risk," pp. xiv

22. "Investor Bulletin: Exchange-Traded Funds (ETFs)." *SEC Office of Investor Education and Advocacy Website*. U.S. Securities and Exchange Commission, Aug. 2012. Web. (Hereafter, SEC Investor Bulletin – ETFs)

23. Collins, Margaret, and Devin Banerjee. "Would You Like Some Private Equity in Your 401(k)?" *Bloomberg Businessweek*. Apr. 2013. Web.

24. OFR, "Asset Management and Financial Stability," pp. 12

25. Chen, Goldstein, Jiang (2010)

26. Feroli, Michael, Anil K. Kashyap, Kermit Schoenholtz, and Hyun Song Shin (2014), "Market Tantrums and Monetary Policy," presented to the Federal Reserve of Atlanta February 2014 conference

27. Investment Company Institute, Comment Letter, pp. 6

28. OFR, "Asset Management and Financial Stability," pp. 15

29. OFR, "Asset Management and Financial Stability," pp. 15

30. OFR, "Asset Management and Financial Stability," pp. 15

31. OFR, "Asset Management and Financial Stability," pp. 21

32. Banerjee (1992), Bikhchandani, Hirshleifer, and Welch (1992)

33. Froot, Scharfstein, and Stein (1992), Hirshleifer, Subrahmanyam, and Titam (1994)

34. Scharfstein and Stein (1990), Trueman (1994)

35. OFR, "Asset Management and Systemic Risk," pp. 9

36. Sias (2004)

37. Wermers (1999)

38. OFR, "Asset Management and Systemic Risk," pp. 22

39. Duarte and Eisenbach (2013), "Fire-Sale Spillovers and Systemic Risk,"

40. OFR, "Asset Management and Systemic Risk," pp. 18

41. OFR, "Asset Management and Financial Stability," pp. 19

42. ICI Comment Letter

43. Senate Banking Committee Proceedings

44. Rand, "Hedge Funds and Systemic Risk," pp. xiv

45. Rand, "Hedge Funds and Systemic Risk," pp. xxvi

46. OFR, "Asset Management and Financial Stability," pp. 11

47. OFR, "Asset Management and Financial Stability," pp. 11

48. Comment letter to the FSB from the Investment Company Institute, April 7, 2014, page B2.

49. See Feroli et. al. (2014) and Stein (2014), which comments on it, for an interesting recent argument as to how relative performance benchmarks could encourage fire sales, even in the absence of leverage.

50. George G. Kaufman and Kenneth Scott. What Is Systemic Risk, and Do Bank Regulators Retard or Contribute to It?. The Independent Review, vol. 7, no. 3 (2003): 371-391.

51. Bartholomew, Philip, and Gary Whalen. 1995. Fundamentals of Systemic Risk. In Research in Financial Services: Banking, Financial Markets, and Systemic Risk, vol. 7, edited by George G. Kaufman, 3–17. Greenwich, Conn.: JAI.

52. Mishkin, Frederic. 1991. Asymmetric Information and Financial Crises: A Historical Perspective. In Financial Markets and Financial Crises, edited by R. Glenn Hubbard, 69–108. Chicago: University of Chicago Press.

53. Kaufman, George G. 1994. Bank Contagion: A Review of the Theory and Evidence. Journal of Financial Services Research (April): 123-50.

54. Bank for International Settlements (BIS). 1994. 64th Annual Report. Basel, Switzerland: BIS.

55. Kaufman and Scott, What is Systemic Risk, pp. 373.

56. Ibid.

57. Ibid.

58. Hansen, 4-5.

59. Hansen, pp. 10.

60. Ibid.

61. Adrian, T., and M. Brunnermeier, 2010, "CoVar," Staff Report 348, Federal Reserve Bank of New York.

62. International Monetary Fund, 2009, "Global Financial Stability Report: Responding to the Financial Crisis and Measuring Systemic Risks," Working Paper, IMF. (Hereafter, "IMF 2009 Global Financial Stability Report")

63. Jobst A., and D. Gray, 2013, "Systemic Contingent Claims Analysis – Estimating Market-Implied Systemic Risk," Working Paper, IMF.

64. IMF 2009 Global Financial Stability Report, pp. 73.

65. Allen F., and D. Gale, 2000, "Financial Contagion," The Journal of Political Economy, Vol. 108, No. 1: 1-33.

66. J. Yellen, "Interconnectedness and Systemic Risk: Lessons from the Financial Crisis and Policy Implications," Speech to American Economic Association (AEA) and American Finance Association (AFA). San Diego, CA. Jan. 4, 2013.

67. Bisias et al

68. Chan, N., M. Getmansky, S. M. Haas, and A.W. Lo, 2006a, "Do Hedge Funds Increase Systemic Risk?," Federal Reserve Bank of Atlanta Economic Review, 91 (4), 49-80.

69. Chan, N., M. Getmansky, S. M. Haas, and A.W. Lo, 2006b, "Systemic Risk and Hedge Funds," The Risks of Financial Institutions, ed. by M. Carey, and R. Stulz. University of Chicago Press, Chicago, IL, pp. 235-330.