Informational Contagion and the Entrepreneurial Production of Informational Remedies

Mathieu Bédard*

March 10, 2013

CERGAM
Aix-Marseille Université
15–19 Allée Claude Forbin
13627 Aix-en-Provence Cedex 1
Tel: 00 33 4 42 96 12 31
Fax: 00 33 4 42 59 38 87

Abstract

This article reassess informational financial contagion theory relevant to systemic risk in banking in the light of a coordination problem approach to economics, and then proceed to analyze and comment some related types of systemic risk policies. Typically, policies to limit or contain informational contagion place too much emphasis on disclosed explicit information search and neglect the circumstantial, ecological knowledge surrogates, stemming from the actions taken by market participants during informational contagion crises.

Keywords: Financial Contagion; Bank runs; Information; Uncertainty

JEL codes: D82, G01, G14, G33

*PhD candidate in economics, CERGAM, Aix-Marseille Université. A previous version of this article was delivered at the AFEP/AHE/IPPE Conference (Paris, July 5-7, 2012). The author would like to thank Pierre Bentata, Peter Boettke, Pierre Garello, Antoine Gentier and Mario Rizzo for helpful comments and criticism on previous drafts. The usual caveat applies. mathieu.bedard@univ-amu.fr
1 Introduction

Financial contagion refers to the way the bankruptcy of a financial institution spills over to another one. It is the principal component of systemic risk, with the study of large financial institutions failures, and the macroeconomic study of financial crisis transmission to the real economy. It arises from the simple observation that financial institutions failures cluster during financial crises.

One such theory of financial contagion revolves around counterparty contagion, where direct links between financial institutions through counterparty risk are at the origin of contagion. The default of the first firm on its obligations would transmit financial distress to its creditors, who would forward it to their own creditors and so on until the crisis is widespread throughout the financial system. A variant of this theory is the ‘interconnection’ counterparty contagion, where counterparty losses are multi-directional and cumulative. This type of contagion however might not be significant in banking (Helwege, 2010; Kaufman and Scott, 2003), where the virtues of diversification are well understood and applied. A wide array of empirical literature (Jorion and Zhang, 2009; Furfine, 2003) tend to confirm that counterparty losses in banking originating from a large financial institution failure are unlikely to be important enough to create a crisis of systemic proportions.\footnote{Whether this direct knock-on contagion is a more likely scenario when triggered by a sovereign debt default remains to be researched.}

According to informational contagion theory, contagion spreads because the financial difficulties of the initial bankrupt firm reveals information on a risk
shared with other firms. Contagion occurs because the information needed to determine how similar firms, or securities, are affected by this third party risk is not immediately available, requires a costly analysis, and the creditors of these subsequent firms are risk averse. This type of contagion is manifested by bank runs, panics, and confidence crisis. It can lead to significant losses in the financial system without necessarily triggering bankruptcies, and affects solvent and insolvent institutions alike.

While this study concentrates on financial contagion within the financial system, systemic risk literature is also very much interested in the non-financial industry, where results largely differ.$^2$

Empirical literature remains uncertain about the status of informational contagion as a source of clustered bank bankruptcies. While it may not be the primary source, it would be hard to deny it is an aggravating effect. Other reasons bank bankruptcies cluster during financial crisis include common causes, encompassing anything from local shocks (sometimes referred to as an industry’s ‘fundamentals’), to systematic ‘macro’ shocks, to homogeneity. Homogeneity theory of systemic risk maintains that banks go bankrupt simultaneously not because failure spills-over to other banks, but because bank portfolios are relatively homogeneous. If banks invest in similar assets, then it is no wonder that they fail simultaneously, or at least it is no wonder that failure at a first bank triggers a reassessment crisis. Even if future research undoubtedly proves systemic risk to be homogeneity driven, informational spill-over will remain an important phenomenon as bad news at a first institution will signal trouble at other financial institutions of the same homogenous kind.

Additionally, readers should recognize that while phenomenons such as the

\footnote{Results differ in the sense that while counterparty contagion has somewhat been ruled out for financial institutions, it is still a likely scenario for non-financial large firms, especially in industries where firms are poorly diversified and where commercial credit can amount to a substantial portion of the counterparty’s annual turnover (see Boissay, 2006).}
liquidation of assets (through fire-sales or otherwise), liquidity problems and other sources of systemic risk may be exposed as different problems elsewhere, we strive to construct a broader, more general, theory of financial contagion that encompasses all contagion generally regarded as asymmetry of information driven. Therefore our definition of informational contagion is larger than what is generally found in the literature.

Our study not only expands on the definition of informational contagion, but also on its possible outcomes. The term “contagion” carries a negative connotation and implies that its outcome is necessarily inimical, a net welfare loss, and inefficient. Literature has narrowly concentrated on cases where investors are mistaken about their investment decisions. While it is certainly true that trains that arrive on time don’t deserve much discussion, we strive to underline the fact that reaction to bad news under uncertainty might be a positive, wealth increasing outcome. Informational “contagion,” like bank runs, can and do have positive benefits.

The novelty of this research is to set those reactions to bad news in a genuine uncertainty framework. That is to say, that uncertainty is not an asymmetry of information, not a probability-weighted arrangement of already known alternatives, and in some aspect it might be impossible to overcome. Asymmetry of information generally means that an agent possess information but is unwilling, or unable, to disclose or signal it. Genuine uncertainty implies that not only the relevant information is unknown to market participants, but also the inability of discerning wrongs from rights before the market process has gone through. It cannot be modeled stochastically because its set of possibilities are open-ended. Finally, some aspects of uncertainty are impossible to overcome because under real-time market conditions are ever changing, and equilibrium might be better thought of as a tendency rather than a static instantaneous outcome (O’Driscoll
Thinking of informational contagion under genuine uncertainty allows us to challenge “beauty contest” theories, self-fulfilling prophecy theories, and herd-behavior theories. Our contribution to this literature is both substantive; we endogenize information production, and qualitative; these episodes provoke a shift in the nature of relevant information, as demonstrated and circumstantial (instead of technical) information comes to hold more re-equilibrating power.

Moreover, this research underlines the role and nature of noisy prices and non-price signals for disequilibrium readjustment.

We review informational contagion theory in the light of a market process approach to economics, and then proceed to analyze and comment some related types of systemic risk policies. Typically, policies to limit or contain informational contagion place too much emphasis on disclosed ‘explicit’ information search, and neglect implicit, circumstantial and ecological knowledge discovered by the actions taken by managers and investors in face of the bank’s adverse situation. Then, it is likely that the policies intended to remedy these reassessment crises might not address the problem, or even worsen the uncertainty.

2 A Critical Review of Literature

Informational contagion is triggered when a shock prompts creditors of financial institutions with imperfect knowledge to review their expectations. At that time, information on the intensity of the initial shock (value uncertainty), as information on each firm and securities’ exposure (event uncertainty), is not known very precisely. Risk-averse agents will then try to reduce their stakes until they learn more about their debtor’s exposure. These episodes are to be characterized as plagued by volatility, with noisy prices, flights-to-security and market freezes.
Theories of informational contagion generally assumes that agents can identify the banks that will survive the shock on the basis of information, but it is expensive or sometimes simply unavailable timely.

During this period of reassessment, creditors and shareholders of firms with portfolios similar to that of the firm in difficulty will question the soundness of the institution. In a manner reminiscent of bank runs, counterparties will try to reduce their exposure to the institution they interpret as dubious. The contagion will affect firms that are actually affected by the initial shock, but also other firms that will in due time prove they were not in danger.

A wide range of models seeks to recreate these events.

2.1 Beauty Contests

In King and Wadhwani (1990) economic agents transmit the shock because they infer incorrect information from price movements and cannot distinguish between idiosyncratic shocks and systematic shocks. In Gennotte and Leland (1990), it is because some investors cannot tell apart sales to liquidate hedging securities and sales resulting from adverse information on the concerned securities. We find here the idea of Keynes’ beauty contest, in which investors do not act because they believe the value or performance of the title dropped, but because they believe that others believe that the value or performance of the title dropped.

In a somewhat similar manner, Calvo and Mendoza (2000) describes a scenario where an investor liquidates some securities after a margin call. Other uninformed investors interpret these liquidations as a signal that adverse information has appeared on the market in question, and trigger a wave of contagion. In Barlevy and Veronesi (2003), a simple price drop misinterpreted by investors triggers a similar mechanism.
Kodres and Pritsker (2002) build a model where the readjustment of optimal portfolios after an idiosyncratic shock in one region exports the crisis to other regions, as investors in other areas have had no information about the idiosyncratic nature of the shock abroad. Seeing prices adjusting downward, they infer that these fluctuations reflect bad news for these securities, and sell too.

In the same vein, in Pasquariello (2007) it is the heterogeneity of information (measured by the dummy variable in the dispersion of analysts’ forecasts), combined with investment strategies seeking to hide “good tips” from other investors and a “beauty contest” behavior where everyone tries to guess which behavior is actually hiding the proper strategy, which causes the infection.

In these rational expectation models, crises are the result of a wrong interpretation of the world (Azariadis, 1981). Because some agents hold wrong beliefs about the state of the world, and act accordingly, they ultimately create crises that would otherwise not have existed. These crises are essentially self-fulfilling prophecies. Treating informational contagion as a rational expectations phenomenon has a built-in problem, as the important problem is precisely that we cannot know beforehand what are the right beliefs about the state of the world.

And indeed, in the case of informational contagion there are no way of knowing whether banks will survive the crisis or not before events unfold. In that sense, informational contagion might very well turn out to have been salutary, as it can play an important role in sorting out financially unsustainable firms and have them close before shareholders and management can enlarge losses in a bet to make the bank solvent again, or simply bleed liquidities until they’re in a much worse situation. A positive Pareto increasing externality as it were.

Underlining this indeterminacy of beauty contests, O’Driscoll et al. (1996, p. 72) comments that there is no logical ending to the outguessing of market
prices characteristic of a beauty contest. Guesses enter an unending cumulative deviation, as each party tries to guess the subjective valuation of the other. And indeed, these models could conceptually be extended so that the first group (the one rightfully reacting to real shock) could also wrongfully infer information from the “mistaken” action of the second group, and so on. Stopping at any level has to come from a convention or, as in informational contagion literature, from exogenous new information.

While we may seem critical of these models, we do think of them as the foundation to our theory spelled out in section 3, and aim to directly build, expand, and generalize them.

2.2 Bank Runs

A parallel is often drawn with the phenomenon of bank runs. Aside from their very different institutional context, they are a more particular case of a larger, more abstract theory of informational contagion. As such, it should be recognized that bank runs are special cases of informational contagion, and not the other way around. Banking is a market of higher transaction costs, while financial markets are by nature less institutionally intensive. In both cases, an event triggering such contagion could be any type of adverse news, including news about a class of assets, the failure of a similar bank or its fall in credit ratings.

However, one must be careful with comparisons to bank runs, as there are two competing explanations, the random withdrawals of Diamond and Dybvig (1983) and the asymmetry of information of Gorton (1985). The triggering event in Diamond and Dybvig is a sunspot, in the context of a fragile, chimerical

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3Self-fulfilling prophecies based on rational expectations are often referenced to as ‘sunspot’ theories. In these models agents believe, like Jevons did, that economic fluctuations are caused by the effect of sunspots on human activity. In the closed world of rational expectation models, they would end up causing the very effects they were anticipating. It should also be emphasized that ‘sunspot’ here does not refer to an exogenous variable affecting the economy, but a belief
bank with no equity, no banknotes, no other banks to lean on, and no possible suspension of convertibility\(^4\) (White, 1999, p. 123).

Another problem with the random withdrawal theory of bank runs is that these beliefs are generally modeled as being insensitive to new information. Diamond and Dybvig bank runs cannot be stopped once in motion, and depositors cannot revise their beliefs even if they were shown that the bank can, indeed, withstand the shock.\(^5\)

On the other hand, Gorton (1985) bank runs result from an asymmetry of information between depositors and their banks. Future returns on investments are opaque, but banks can submit themselves to external scrutiny, rigorous monitoring and reveal more information about its investment that would prove their resilience to depositor, and stop the run. In the particular case modeled by Gorton, the bank precisely suspends convertibility to submit to a verification of its books. This kind of bank run can be thought of as a partial verification run, where relatively uninformed and analytically disadvantaged depositors review their expectations before driving the bank to insolvency. Our research takes this idea of “partial run” and applies it informational contagion.

Gorton (1985) also offers an example of an incentive-compatible contract for disclosures. The suspension of convertibility, accompanied by an inextricable verification, signals that the bank is solvent. It does so because the bank has incentives not to abuse this mechanism, as if it was not solvent the bank would ultimately have to pay both depositor and verification costs. This exem-

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\(^4\)There is no possible suspension of convertibility because the primary role of the Diamond and Dybvig bank is to act as an insurance against liquidity needs in the first place.

\(^5\)Recent developments in this literature, such as Nikitin and Smith (2008), do feature partial runs. But they are deterministically driven optimums rather than the result of learning. Moreover, they separate information search from the run. This research seeks to emphasize that the bank run, or informational contagion, is the actual information search. Such isolation of both phenomena might put too much importance on one type of information (explicit, technical, disclosure based information) and rule out other kinds (circumstantial, demonstrated information).
plifies the emphasis given on technical disclosure information, rather than tacit demonstrated knowledge generated by the market process.\textsuperscript{6}

\section*{2.3 Herd-behavior}

Informational contagion is sometimes also thought of in terms of herd-behavior. While in Keynes herding was the result of ‘animal spirits’,\textsuperscript{7} making man collectively act like lemmings, we will only consider herding resulting from rational behavior. According to Drehmann et al. (2005):

\begin{quote}
An informational cascade is said to occur when it becomes rational to ignore one’s own private information and instead follow one’s predecessor’s decisions. Since no further information is revealed once an information cascade has started, inefficiencies occur even though each individual is behaving rationally.
\end{quote}

For Bikhchandani et al. (1992), informational cascades are a shift from decisions taken on the basis of “previous-signal-observable” to decisions being taken on the basis of “previous-actions-observable” that occur when agents are uncertain of the accuracy of their private information. For such phenomenon to take place, necessary conditions are:

1. Decisions are taken sequentially by agents;

2. Decisions are taken rationally on the basis of the private information agents possess, and the actions of other agents;

3. Information cannot be communicated from agent to agent, only actions can be witnessed (at no cost);

\textsuperscript{6}Additionally, this example might be made irrelevant by the existence of a manager other than the equity holders, as managers can and often do engage in delaying tactics, shifting this kind of costs on the equity holders in a bet to make the bank solvent again.

\textsuperscript{7}Or ‘the spirits of animals’ as Don Boudreaux would put it.
4. Sanctions and externalities that might otherwise enforce uniformity are absent or negligible;

5. Agent’s decision spectrum is binary (i.e. buy or sell).

As Avery and Zemsky (1998) point out, herd behavior in most of the early models resulted from sticky prices, or prices that adjust too slowly. Indeed, herd-behavior cannot survive basic price system where prices reflect all publicly known information. In such context of efficient market, or pure and perfect competition, prices rise simultaneously as copycat preferences are adopted, and neuters herd-behavior before it even appears. They conclude that whether or not asset prices are affected by herd-behavior, herd-behavior is affected by asset prices; it eliminates it. In fact, to reproduce herd behavior under freely adjusting prices, Avery and Zemsky have to rely on multiple “dimensions” of asymmetry of information following a credit event, similar to those we have spelled out at the beginning of section 2. In this world of asymmetrically informed agents, public and private information is the only force that can ultimately overcome the informational cascade, is exogenous, remains unexplained, and fully available to the market maker.

The theory of informational contagion we formulate in section 3 is not a theory of herding, as agents can communicate, decisions are not necessarily taken sequentially, and observation of other actors’ behavior is not central. However, it does carry implications for the processes that might shatter informational cascades.

2.4 Economics of Information

While literature on informational contagion has been prolific with regards to new sources of financial contagion, little attention has been given to the processes of information acquisition and discovery going on during those episodes. In this
sense, information still “occupies a slum dwelling in the town of economics,” to use the words of Stigler (1961). Surely, financial market participants are capable of acquiring new information, other than price movements, and adjust their behavior accordingly. If we are to study the informational phenomenons through which systemic risk manifests itself, surely our agents must be responsive to information, or we would have written the problem out of the equation from the start.

Asymmetry of information literature generally relies on optimal contracts that align the incentives of the managers toward full disclosure to reduce the gap between the knowledge of the investor and the knowledge of the manager, or regulation that force managers to disclose relevant information. However, this approach assumes that bank managers not only have perfect knowledge regarding the content of their portfolios and perfect expectations of their associated risks, but that this information somehow objectively exists in the first place, as a stock, waiting to be communicated to investors. In light of the growing critique of risk-based management, it is reasonable to think that information relevant to firms with exposures to troubled institutions is not only difficult to transmit through risk-taking disclosures (Woods et al., 2008), but that it has to be discovered through the market process before it even exists.

This literature also emphasizes the role of third party intermediaries, such as rating agencies, which might both produce additional information and increase the credibility of information available through other channels. Likewise, the bank runs and banking panics literature identified that, in the absence of deposit insurance, the sequential service constraint (clients are serviced on a first-come-first-served basis) creates incentives to produce the costly analysis of disclosed and signaled information, because the first served will have their deposits returned in full (Calomiris and Kahn, 1991). Likely, in an informational
contagion setting thought of as broader than simply depositors to include other kinds of creditors and shareholders, better informed agents can reap a premium by acting early, facing a smaller haircut, or by not reducing their exposure when their analysis suggests that the bank is not at risk.

‘Search’ models, such as Stigler (1961) then come into action. However, these models concentrate on the optimal amount of search required. In these models, search ends when its marginal cost equals its expected benefits. It not only assumes that agents already know what they need to know in advance (known-unknowns) (Evans and Friedman, 2011), but it evades the question of how the search is ultimately carried out. It seeks to answer the question of what decisions are made with regards to the search, rather than how decisions are made.

Moreover, it is important to recognize that this view of the market, in which equilibrium is an initial state and where an unforeseen change triggers a re-equilibrating process, might deeply skew the re-equilibrating power we attribute to technical disclosure information. In reality, the market process might better be described as a constant chain of disruptive changes, with economic agents constantly reviewing their expectations. The informational shock of systemic risk is merely unique by its atypical strength and the fact that we can ex post identify its origin. In this sense, the re-equilibrating process itself is made of unexpected disruptive changes in market value. The idea that a sequence consisting of (1) a state of equilibrium, (2) an unexpected change, (3) a search for information and (4) a state of equilibrium, likely gives too much importance to information search in the re-equilibration process, and downplays the role of the market process as a discovery procedure (O’Driscoll et al., 1996). The return to a state of coordination might be better thought of as a constant process of re-equilibrating adjustments that are also unexpected changes.
To further understand the dynamics of informational contagion and the endogenous production of informational remedies, we will reconstruct it within the confines of genuine uncertainty and a process of market discovery.

3 Reaction to Bad News Under Uncertainty

3.1 Information, Knowledge, and Market Value

While the valuation of firms and securities is an inscrutable phenomenon, due to the subjectivity of preferences and radical uncertainty over future market conditions, the value of the firm derives essentially from the subjective assessment of its capabilities. That is to say, the firm’s value is a path dependent function of its signaled resources. Some of these resources are tangible capital goods, and others are intangible, human or not, capital goods. For the study of economics, however, the palpable nature of the physical capital goods is incidental; what matters to the subjective valuation process is the capabilities embodied by the resources and their alternative uses (Langlois, 2007; Penrose, 1995).

Some of the information relevant for the subjective valuation of the firm is of an explicit nature. Disclosures and announcements, mandatory or otherwise, are one example of such explicit knowledge. It is explicit because the firm is aware and capable of communicating this knowledge. However, much knowledge about the firm is of a tacit nature, in the sense that often market participants, both inside and outside the firm, know more than they can tell.

There are many reasons that not all knowledge is explicit. Sometimes the flow of information that would be needed to be ingested is just too fast for human cognitive capabilities. Sometimes it is the other way around, and knowledge simply cannot be articulated fast enough. Or it could be that effectively transmitting this knowledge requires a full understanding of its complex causal
depths and their interwoven relations. Often, market participants might not even be fully aware that they possess such knowledge. That means that in many case we might have a good appreciation of a given firm’s capabilities, but might not be able to communicate it explicitly to the world. How it will be communicated, with regards to the market process, is through market participants’ actions. Their actions signals their knowledge without the need for them to articulate it intelligibly.

Of course, not all individuals dealing on the market have knowledge about said firm, or are able to witness and analyze the informational content of their actions. But neither do they need to, as the fluctuation of relative prices provides sufficient information for a lot of important decisions.

The role of the price system, in this regard, is to provide a surrogate for this underlying knowledge. Because we see relative prices fluctuate on the market, making good decisions about firms and securities (mostly those about relative scarcities) requires us to acquire and interpret much less information than would otherwise be the case. The price system economizes on our informational needs. This does not mean that this process is perfect or complete, or that it completely rules out the need to acquire non-price information.

And indeed, better informed agents can reap a premium by acting early upon this non-price information. It is the opportunity cost of this early bird premium that creates incentives to monitor firms and gives rise to a wealth of third party institutions analyzing, auditing and publishing financial institutions. In turn, this heterogeneity in investors’ knowledge will create profit opportunities that steer the security’s value towards equilibrium. The existence of this particular re-equilibrating use of information through the price mechanism rest on the opportunity cost of such premiums. In fact, the very driving force behind financial markets is best thought of by a constant outguessing of market prices.
3.2 Reassessment Crises

The reassessment crisis results from the revision of expectations following bad news, where information about the shock is scarce and noisy. Market participants not only ignore the strength of the ongoing shock, but they ignore whether their debtor’s portfolio is concerned or not. The bad news need not concern the firm or securities directly, but can be a proxy for an underlying risk shared with the bad indicator.\(^8\)

During this reassessment and sorting out process counterparties will reduce their exposure through various means. It is a shift from mostly ‘divergent’ expectations to mostly ‘convergent’ expectations about future firm and securities value. Creditor and shareholder flights, may they be toward liquidity, quality, or otherwise, are an example of such. They will do so as protection from uncertainty, up and until they’ve gained more information about the initial shock and the new relative price structure of the market. This process will entail a wide variety of strategies, as information regarding the shock is difficult to find, not perfectly transmissible, market stakeholders are not perfectly vigilant, and the information not perfect.

The ignorance of economic agents entails disequilibrium prices, that is to say noisy signals that do not play their role as knowledge surrogates into coordinating individual plans. The ties between relevant, individually possessed tacit knowledge are temporarily severed. It is important to recognize, however, that even incorrect prices convey knowledge by pointing to inconsistencies in market valuations, and possible arbitrage opportunities. Some of this arbitrage is going to be based on relative price inconsistencies, other based on inconsistencies with non-price information. During these crises, both kind require information, and

\(^8\)E.g. Bear Stearns’ financial distress revealing that subprime mortgage-backed securities might turn out to be a bad investment, independently of whether or not you’ve invested in Bear Stearns.
entrepreneurs perceptive to its existence, to act as equilibrating mechanisms.

The explicit, disclosed information channel can be a source of clues about possible arbitrages. Moreover, the firm might now consider explicitly articulating knowledge that used too costly to do so because of the urgency of the crisis. Also consider the fact that banks do not operate in a vacuum, but are part of a network. What this mean is that investors using noisy monitoring signals shift the monitoring responsibility upon other banks with much greater analysis capabilities to assess their financial situation, and who can benefit from this situation. However, treating information of a new kind involves costs in terms of expertise and research. Information must be crossed, processed, made into projection and other complex steps to ensure that we understand its importance. It is likely to make such type of information irrelevant in a context of rapidly evolving crisis situation. Following the failure of Lehman in Fall of 2008, for example, banks were seemingly incapable of evaluating and pricing each other’s solidity as the interbank market froze.

The implicit assumption that explicit data analysis applies uniformly to all situations is problematic. This source of knowledge may be the most reliable in the case of routinely repetitive decisions (Winston, 1989), but a characteristic of contagion is that expectations about the world, our reference points so to speak, have been upset. Analyzing and treating information requires an investment, not necessarily in the sense of infrastructure, but in terms of time and effort to be able to distinguish relevant signals. Because of these costs, not all sources of information are investigated all the time. Choices have to be made. Explicit information, even if it was readily available, would likely fall within an under-analyzed, unmonitored channel and be unheard and otherwise useless (Arrow, 1974). Indeed, when the speed of the process evolve and the nature of informational needs changes, explicit information becomes less helpful. It is an artifact
of equilibrium theorizing and maximization to assume that we need to work out a perfect solution to problems of market expectations, and that the explicit information channel will always going to be the source of such knowledge.

Some information acquisition might however take place, and originate in other activities than intentional collection of technical information. There are some tasks, seemingly remote, where a perceptive and alert market participant might serendipitously acquire information.

A way to discover the needed information, specific to informational contagion, is a by-product of creditor and shareholder flights. During these flights, investors run on short term claims or sell their shares or bonds. On the derivative market, counterparties may do so by borrowing to offset exposure, by entering new derivative contracts, or through novation requests by which they transfer their claims on a third party (Duffie, 2010). These flights can be interpreted as a means of controlling the banks; the stress on the bank’s liquidity forces them to take the actions that ultimately create information about their exposure and resilience to the initial shock through price and non-price signals.

Firms or securities dealers might make announcements or release information, but much more valuable information might come from actions taken to ease their liquidity management, or simply from withstanding the test of time. Banks that are actually at risk, or with structurally unsustainable balance sheets or liquidity management, might reveal their situation by, for example, refusing to provide two-sided market quotations, offering unattractive quotations or refusing novation requests in an attempt to stop the outflow of liquidities. Ultimately, they might do so through default and bankruptcy.

This process is more than a screening process, in the sense that the vocable of ‘screening’ implies that managers possess the information, but do not want to disclose it, or might not be able to do so credibly. But had there not been
informational contagion, this circumstantial knowledge would not have existed in the first place.

Relevant information that would not have existed save for the circumstances include non-price signals such as the actions taken by the affected firm’s management, but also the market and client’s reaction to the unfolding of events. Relevant price signals might be the variation of CDS, its spreads, the volatility of stock prices, or any other relative price movement that might suggest to an attentive investor positive or negative news about the distressed firm.

Relevant knowledge that is more costly (and often impossible) to communicate includes tacit knowledge. Some of this tacit knowledge might have otherwise have been obtained through audit, such as qualitative human resources information, the state of client relations, etc. Other types of relevant tacit knowledge might be non-verifiable, such as management’s resourcefulness, its appreciation of relevant changing market condition or of competitor’s strategy. Other types of information impossible to disclose might relate to intelligence the firm does not want to publish for a variety of reasons, such as their internal strategy, information protected by non-disclosure agreements or information acquired through illegal channels. Ultimately, the meaningfulness of disclosed information itself, especially in the case of firms with complex contractual arrangements and complex internal structures, and how different sources of information fit together, might be tacit knowledge.

An alert market participant might be able to interpret these demonstrations of knowledge, and act upon these interpretations for his benefits. These arbitrage constitute the market process that ultimately, upon a succession of cumulative readjustments, make market prices less noisy. This process will take place up until more traditional analysis, such as explicit information processing, again becomes the dominant source of information.
Also, the equilibrating arbitrages does not necessarily need to extremely precise and accurate in its valuation at first. During informational contagion speed in decisions becomes more important than accuracy in decisions. The urgency of the process makes it so that the farther from a state of plan coordination, the bigger error margins can be with regards to the ultimate state of ‘equilibrium.’ As per Kirzner (1973):

In this struggle to keep ahead of one’s competitors (but at the same time to avoid creating opportunities more attractive than necessary), market participants are thus forced by the competitive market process to gravitate closer and closer to the limits of their ability to participate gainfully in the market.

This process should not be characterized as one depending upon contrarian trading, but as one of alert trading. Contrarian traders can be characterized as going against conventional wisdom, in the blind hope that the market is lead by herd behavior rather than real insight. Our alert traders, rather, are making educated (through alternative price and non-price channels) guesses about the firms and their securities future value.

Whereas standard informational contagion literature might portray the market as ‘overcoming’ informational contagion, our depiction of reaction to news under genuine uncertainty portrays the market process as using informational contagion to overcome disequilibrium. The reason a market process is decisive for producing information, and much more so than analysis of disclosed information, is the same as the reason that we need the market in the first place; our radical ignorance of future market conditions. If it were possible to know beforehand the future prices of securities and which bank will fail, if any, indeed the market process would be unnecessary and wasteful in the first place. We need the market process to discover relevant knowledge that is the product
of the circumstances (circumstantial) and the reflect of the complex context (ecological), for economic adjustments to take place.

To summarize our reconstruction of informational contagion:

1. Informational contagion appears when stakeholders of financial institutions review their expectations *en masse*;

2. Until a better appreciation of the future value of their assets can be formulated, stakeholders resort to flights to reduce their exposure;

3. The circumstances will produce alternative-price and non-price information that can act as knowledge surrogates;

4. Attentive investors will use this information to act upon it, both reaping entrepreneurial profits and bringing about a better state of coordination.

   As this knowledge is taken into account by the price system, prices will be less noisy and volatile.

An implicit condition for this theory is that not all markets effectively dry up and freeze. Some trade and some interaction, however remote, must still be going on for the market process to generate circumstantial information.

### 3.3 Spillover Effects

The interesting policy question, of course, is if informational contagion entails spillover effects. It should be recognized that the spillover effects concerned here are of a particular kind. When we think about negatives externalities, we generally have in mind the extra-contractual effects of one’s action. And in a sense, the failure of a financial institution that would be due to contagion would be a negative externality to the owners and creditors of that firm. The clients could also be added to this list, as building relationship, and credit, at another bank might be costly. But these are the effect of deliberate, direct and voluntary
market transactions rather than technical effects due to a nonexistent market. Pecuniary externalities, when they exist, are the result of ‘correct’ equilibrium prices, and generally don’t involve resource misallocation.

However, Greenwald and Stiglitz (1986) have argued that under asymmetry of information pecuniary externalities might not be Pareto optimal, as prices play not only a role in allocating resources, but also in conveying information. Since the welfare effects of all parties don’t net out, these externalities would result in a deadweight welfare loss.\(^9\) While this might be relevant in some particular cases of asymmetry of information, it does not translate to situations of radical uncertainty, as there are no way to know whether the individuals engaging in this behavior are right or wrong in their beliefs. As argued earlier in section 2.1, informational contagion can also be a positive externality and act as a sorting out process, preventing managers from making additional losses.

There is at least another way in which the agitation characteristic of informational contagion can be a positive vertical spillover; it can attract the attention of creditors who neglect monitoring their investments. The overreaction characteristic of uncertainty can make news obvious to everyone with no investment in monitoring, and at virtually no cost.

If what characterizes the contagion is rationality, economic agents should be able to not only revise their expectations when new information appears, but also to learn from past crises. If the contagion is repeated several times in a system that is beset by crises, for example, agents can learn from the past and already have some appreciation of the institutions that are well managed, and of management’s cover-up tactics. This learning can limit spillover.

While agents do learn and revise their expectations, there are no \textit{a priori} reasons to think that this process will be fast enough, that interpretation of

\(^9\)This view might be completed by Grossman and Stiglitz (1980), where the non-excludability of information leads agents to acquire insufficient information.
price and non-price signals will be effective enough or for that matter of fact, emphasizing our point on circumstantial knowledge, that convincing explicit information will necessarily emerge on time. Still, we can characterize what might influence the reassessment process.

3.3.1 Horizontal Spillover

There are essentially two dimensions to these spillover effects, which for the sake of simplicity we will label horizontal spillover, and vertical spillover. The first, horizontal spillover, concerns the spillover to firms that are not concerned by the bad news. It is about creditors’ ability to discriminate between firms. E.g., whether bad news on mortgage-backed securities affected financial institutions that had not invested in these securities in the Fall of 2008.

Kaufman (1994) reviews the empirical literature on the ability and effectiveness of investors to discriminate between institutions that are similar to the distressed institutions and those that are not. He finds that contagion, in financial institutions just like in the industry, is firm-specific as opposed to industry-wide. Subsequent studies (Aharony and Swary, 1996; Jordan et al., 2000) confirm these findings. Likewise, Dumontaux and Pop (2012) find that the firms that were affected by the Lehman bankruptcy of 2008 shared comparable characteristics to failed firm; there were no horizontal spillover. Investors direct their doubts quite effectively toward the institutions that have links, seem to have links, with the informational shock.

In cases where banks subject to contagion turn out to have been capable of sustaining the shock, the result of this reaction to news under uncertainty is that investors have acquired more knowledge about the exposure of their debtors. When prices become less noisy and reflect tacit knowledge, some of the bank runs and hedging over banks that have turned out to be solvent will be “rolled back” and business will resume. Markets that had frozen will see trade
renew. According to Lang and Stulz (1992) bankruptcies might even often have a positive effect on competitors, as they inherit new market shares. Jorion and Zhang (2007) call this “good contagion.”

Market characteristics that might affect the effectiveness of the re-equilibrating process includes the quantity and diversity of sources of alternative signals available (more on this in section 4), and the homogeneity of actors mentioned in the introduction.

### 3.3.2 Vertical Spillover

Vertical spillover is an overshooting effect. It is whether informational contagion is sufficiently acute to push otherwise solvent firms into bankruptcy. In the context of the 2008 crisis, a vertical spillover question would be: did news on mortgage-backed securities affect financial institutions disproportionately, so as to turn insolvent firms that had only tangentially invested in them? In other words, do agents revise their expectations before they push solvent institutions to insolvency?

Many empirical studies have tried to answer this question. According to Calomiris and Mason (1997) and contrary to popular belief, the banking panic at Chicago in June 1932 did not turn otherwise solvent banks insolvent. Quite the contrary, “failures of banks during the panic reflected the continuation of the same process that produced failures before the panic. The special attributes of failing banks are distinguishable months before the panic.” Results are similar, with varying degree of confidence, for nearly all studies.\(^{10}\)

It should be recognized that in most cases bank runs and flights do not cause insolvency, but rather result from insolvency. According to Kaufman and Scott (2003), since the introduction of the FDIC, banks that go bankrupt are generally insolvent for as long as months before the resolution is declared and

\(^{10}\)See Kaufman and Scott (2003) for a review of literature.
initiated. This is in part due to the regulatory forbearance of the FDIC, but also because the existence of deposit insurance and lenders of last resort has eliminated the need for depositors to resort to bank runs and timely discover insolvent banks. It can sometimes make sense for deposit insurance funds to turn a blind eye to insolvency in the hope that the bank’s investment will pay off in the end. Especially when the crisis is so important that capital is insufficient to cover all insured claims and there’s a political unwillingness to address the problem. Absent the forces of bank runs and informational contagion, this little game can last quite a long time. An extreme example is the 1980’s Savings & Loans crisis, where a state of insolvency was tolerated for thrifts for years prior to initiating resolution procedures, even up to a decade in a few cases (Gupta and Misra, 1999).

4 Systemic Risk Policies

Recently, authorities in Europe and in the United States have resorted to stress tests, in which they submit bank statistics to adverse scenarios in an attempt to predict how they would react in those conditions. Results have been, at best, mixed considering anecdotes like Dexia bank going bankrupt just a few weeks after passing the test with flying colors. But more generally, it is safe to say that stress tests merely are exercises in persuasion that lack credibility. Our approach to financial contagion renders questions over whether tests should be less or more charitable with banks, or which variable they do or do not take into account, a vain exercise. Stress tests are merely based on disclosed technical information, while relevant information regarding tacit properties of firms and their securities might better be exploited by circumstantial information. In other words, the only stress tests that use both disclosed information and circumstantial information are live informational contagion episodes. We are
very skeptic as to whether traditional stress test will ever be of actual help to informational contagion.

The breadth of policies aimed intentional or not at circumventing informational contagion goes largely beyond stress tests however. Financial contagion containment policies directly addressing informational contagion are mostly those that involve increased transparency and centralization. They will be reviewed under the light of our theory of informational contagion and information discovery.

Calls for greater transparency through mandatory disclosure are widespread in informational contagion literature. Yeh (2010) goes further and imagines a dystopian financial system where every finance professional must extensively describe their risk-taking activity on video, and have it posted on their firm’s website.

Without denying the costs of mandatory disclosure requirements, more transparency and disclosure might very well decrease contagion. However, treating this information involves costs in terms of expertise and research that are likely to make such laws have little effect on financial contagion. Indeed, information must be crossed, processed, made into projection and other complex steps to ensure that we understand the importance of this information, and that it has an effect on the decision of the creditors.

Moreover, thinking in terms of optimum level of information shrouds the fact that different investors have different informational needs in terms of urgency, coverage, required precision and heterogeneity of sources. Some investors, playing big, may want raw information in large quantities, while small investors can be satisfied with very brief information, but heavily processed. And when the information isn’t sufficient, contagion and bank runs are market phenomena that forces banks to reveal more information, either explicitly through signaling
or implicitly by their actions.

It also assumes that more information always leads to an improvement, but this is not always the case. If agents already have access to good but imperfect information, public provision of more good but imperfect information may amplify some of the noise in information (Morris and Shin, 2002; Morris et al., 2006). Even if all information is objectively correct and noiseless, new information can mistakenly change our outlook on old knowledge. More information is not necessarily always better, as the context of learning is also important.

A policy that has been much discussed in the context of the Dodd-Frank act is the centralization of risk within government-mandated financial clearing houses. Financial clearing houses centralizes collateral, and thus act as a form of insurance. In doing so it mutualizes the losses of its members and assumes a portion of the credit risk. In return, they centralize technical information about the claims of every party, in an easily available form.\footnote{Another benefit is that their netting function increases liquidities on financial markets.} They effectively become a counterparty in all trades, updating collateral requirements based on their assessment of risk. The monitoring of credit risk over the mutualized part of risk then rests on the clearing house, as it makes margin calls when its management perceives an increase in member bank’s credit risk. Other functions can include acting as a market-maker in matching purchases and sales, but not all financial clearing houses operate on such a captive basis. Matching supply and demand like this requires a harmonization of financial products. A system inspired by these clearing houses might soon see the day for the secondary mortgage market, through the Federal Housing Finance Agency’s project of a ‘Common Securitization Platform.’

Rochet and Tirole (1996) model interbank relations as such that centralization of credit risk does not improve the incentive structure. In the absence of such firewall to losses, banks monitor and discipline themselves. This can
be done by demanding better collateral at higher rates for example. Moving from a multitude of bilateral relations to a central multilateral management of risk generates a deadweight loss. Our theory of informational contagion, however, deals with unpredictable events, in a setting where agents’ rationality is bounded. Preventing informational contagion is not a simple issue of stewardship and monitoring, but one of dealing with ignorance and uncertainty through market discovery under stress.

Clearing houses, albeit in a different form focused on clearing payment claims, are institutions present in such context as free banking (White, 1984; Selgin, 1988), where comparisons to central planning would be ludicrous. However, they evolved gradually from exchange agreements, do not rule out innovation and competing clearing houses from appearing, and are complementary to other interbank contractual relations.\footnote{An example often cited is the Suffolk Bank of Boston, that became a clearing house for most of New England from the 1820s to 1858. It did not rule out bilateral compensation, as banks generally accepted notes of other local banks at par value. The market for clearings remained contestable, as in 1858 the Bank of Mutual Redemption drove the Suffolk Bank out of business over a period of only 6 months. The BMR and authorities even had to ask the Suffolk Bank to continue its clearing operations until the BMR could expand its processing capabilities. See Rolnick et al. (1998, 2000).}

In the present context, however, a parallel with central planning might be drawn. Indeed, cooperation through the price system dynamically discovers local knowledge that would not exist when coordination is mandated by a central body (Hayek, 1945). In this context of disequilibrium prices, relevant information for prices to reach equilibrium through arbitrage are signals that would be less accurate and rich without the complex web of contractual interactions investors have daily on the bilateral market.

Additionally, mandatory clearing houses entail an institutional rigidity that might be counterproductive to the production of information, in the sense that markets are constantly coming up with new financial products, with an ever increasing level of division of labor and risks among the parties involved, based
on their needs. A financial clearing house necessarily has to investigate and approve new products, or new variations of traditional contracts. The fact that risk is already insured also neutralizes the need to resort to novations, and with it all the signals that can be perceived by the reluctance to accept them. Another way to look at it is to say that the netting of claims by the clearing house undermines the circumstantial non-price information channel of innovative problem solving. It seems then that clearing houses crowds out the production of circumstantial information in favor of its in-house production of technical disclosure information.

On the other hand, it is true that the increasing level of complexity in financial contracts shrouds important information regarding who bears the final risk (Gorton, 2009). Clearing houses might very well make this issue clearer, as it is centralizing risks in-house and knows and can instantly tell who owes what to whom, the history of trades, etc. In other words, they might very well lead to the production of more and better technical information. But it should be recognized that this is done at the expense of the depth and context-dependent character of the circumstantial information that arises on the bilateral market.

A completely different, and perhaps surprising, policy that has a great effect informational contagion is the prohibition of insider trading. Employees and other stakeholders using non-proprietary information for their own gain could be said to blow a metaphorical whistle on the tacit knowledge noisy prices ignore and, as we have seen, might not be communicated by technical disclosure information. Indeed, one of the primary problem of systemic risk is the correct pricing of firms and securities, allowing the people that have this knowledge, and are aware of possessing it, to act upon prices themselves might be an ef-

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13While we certainly do not wish to brush aside all objections that have been formulated to insider trading as though they were unworthy of being addressed, this is not the place to review them. For an expansive review of literature and a similar point being made see Manne (2005).
fective systemic risk containment policy. In a nutshell, instead of trying to recreate information through stress test, let those who already have this knowledge demonstrate it.

5 Conclusion

Informational contagion crises are episodes in which risk-averse investors sell their stakes because they are afraid of credit and market risk. As a result, arbitrage opportunities will appear and incentivize investors to seek to acquire information about their counterparties. The information they need to do so is of course a costly analysis of disclosed information, but also, and perhaps more importantly, the price and non-price signals sent by management to limit these flight’s impact on their firm. Indeed, during these episodes tacit knowledge that couldn’t possibly have been disclosed is demonstrated.

While this phenomenon has been mostly seen as a negative, leading to losses, it should be recognized that these crises also have benefits. Indeed, sometimes a reassessment process is necessary for prices to reflect bad news. And it is stressed that bad news are not always mistaken news.

Policies to counter the adverse effects of these crises, mainly those that seek to limit their intensity so as to prevent solvent firms from being pushed into insolvency, have mostly concentrated around the production of disclosed information. However, a greater concern for circumstantial information, information created by the crises and impossible to disclose, is warranted.

References


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