

# Quality Snags in the Mortgage-Finance Supply Chain

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“Nobody ever went broke underestimating the intelligence of the American public.” H. L. Mencken

## Abstract

This essay views the current financial crisis through the lens of quality management. The crisis represents a failure of quality, and solving it will require, among other things, careful management of quality in financial institutions and across financial supply chains. This will be difficult for several reasons, but not impossible. I offer several recommendations, partly inspired by successful quality practices in industry.

## Introduction

From the earliest days of the mortgage-backed securities market in the U.S. 30 years ago, sophisticated practitioners have recognized that it represents an industrial approach to financial products. It takes raw materials (mortgages), processes them in various ways, and sells the finished products (securities) to customers (investors). And, from the beginning, this financial supply chain employed various means to reduce the risks and thus enhance the quality of its products, to make them more attractive to customers. The guarantees provided by quasi-government agencies such as Fannie Mae and Freddie Mac fall into this category, as do bond insurance and grades from rating agencies.

The sub-prime mortgage crisis represents a system-wide failure of quality. Individual borrowers took on debt that they had no plausible hope of repaying, small lenders provided the financing, and then larger institutions cheerfully bought up those loans, processed and repackaged them, and sold them to each other. Now, some of those mortgages have defaulted, and there are predictions of more to come. Securities based on those mortgages have lost substantial value. Big banks have lost billions, and several have failed or been absorbed by bigger ones. (Is this a counterexample to Mencken’s famous dictum above?) The sub-prime crisis, bad enough in itself, has now exploded into a worldwide credit crisis. The entire financial system is paralyzed, and the dearth of credit has deeply damaged many other industries.<sup>1</sup>

How could this happen? Were people stupid or evil, or both or neither? Blame is flying. Home-buyers, brokers, appraisers, lenders, investors – just about everyone seems to have acted stupidly or greedily or both.<sup>2</sup> Now, various government officials are investigating,

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<sup>1</sup> As I write, there are some signs that the credit crisis is finally easing. See Worthen and Geressy (2009).

<sup>2</sup> See, e.g., Christie (2007).

and everyone is busy suing each other. All this furious activity actually impedes fixing the problem. Everyone must try above all to *appear* blameless, to avoid a fine or jail time or public disgrace. Smoke and noise erupt, and a thick layer of ash settles over what actually happened.

This is not the first time. The savings-and-loan crisis of the 1980s and 90s was partly a mortgage quality problem. Some S & L's bought large amounts of certain mortgage-backed securities that offered high yields but huge risks. (The risks were different from those of sub-prime mortgages, but real nonetheless.) Many S & L's failed, and taxpayers were left with the bills. Then too, there was lots of shouting and a few heads rolled, but otherwise not much changed. (To be fair, I should mention that ultimately taxpayers came out ok, but that was partly just good luck.) We seem collectively to have learned little from that fiasco.

It is instructive to view the current crisis and potential remedies from the viewpoint of quality management in general. We have learned a few things about the reasons for quality problems in large manufacturing enterprises and how to ameliorate them. Perhaps those lessons can be applied to the financial factory.

Much is being written about what the government should do. I have little to say here about bailouts and regulations. These policy issues are important, to be sure. But whatever institutions emerge from the wreckage will have to be managed, and much will depend on how well they are managed. That is the subject here. I do hope policy makers will pay attention, however. Their actions will determine the architectural structure within which managers will have to operate. That structure cannot ensure effective management, but it can encourage or discourage it. The framers of policy should pay careful attention to these impacts.

Unfortunately, we do not have a straightforward, reliable method to ensure quality in industry, and we shall not find there a complete solution for our financial woes. We know some things, but by no means everything. Still, even our limited understanding of industrial quality may offer some useful insights.

### **Is Financial Quality Really Quality?**

At first glance, financial quality may seem quite different from the quality of a physical product, like a car. However, in both cases, quality partly describes what will happen under adverse conditions. Will an automobile stay intact on a bumpy road as well as a smooth one? Is it capable of a sharp turn when necessary? Financial quality is similar. What will happen to the value of a mortgage-backed security, if interest rates rise, if housing prices decline, or if the borrower goes bankrupt?

One might object that financial quality is different in one respect from the quality of a physical product. Car designers have pretty solid knowledge of how alternative designs will lead to different performance levels. They can draw upon the laws of physics and

accumulated engineering know-how. So, managers can focus on how well the car meets its design specifications. This is often called “conformance quality”. The laws of the financial universe are far less well known. Nevertheless, we *do* have financial designs. One example is the set of criteria used to screen mortgage borrowers. True, we argue about those criteria. But car design principles are unsure as well. They are rough guides to success, not guarantees. (That’s why auto companies use test tracks.) A crucial part of quality assurance for a financial as well as a physical product, therefore, must be to check whether its design, imperfect as it may be, is indeed followed.

Financial products are indeed special in one obvious way – they essentially consist of information rather than matter. You can’t touch them or see them. But this is more an opportunity than a problem. Most of the relevant information exists, somewhere. The financial records of borrowers and lenders, the histories of bond insurers, the past and present prices of securities – they’re all stored in databases and in principle can be transmitted quickly and reliably.<sup>3</sup> Now, not everyone can access all those data. The question of just what should be visible to whom is a big one. And, it’s not always clear what to do with such data when you have them. These problems are not insoluble, however. The main thing lacking has been the will and the effort to utilize the data available.

### **Quality: How?**

How do successful industrial firms ensure quality? It should be said at the outset that the quality world is quite contentious. People debate fiercely over large matters and small, from overall philosophies to particular techniques. Nevertheless, there is a rough consensus on some central points.

The basic principles are pretty simple. Everyone needs to learn and apply certain elementary *problem-solving and communication skills*. These include 4- or 5-step outlines for conducting a project and reporting the results, as well as techniques for systematically tracing problems to their root causes.

Another main principle is to *measure and monitor*: An industrial process is a big, complicated undertaking, often spread over a wide area, involving many people and activities. No one can see everything going on. Therefore, it is essential to measure and record important things and to monitor the results over time. Don’t rely solely on peoples’ memories and impressions; people cannot reliably remember large numbers of events over long periods of time. Manage according to objectively measured facts, to the extent possible.

The other principles mostly have to do with making sure that this really happens. People need to learn how to solve problems, to measure and monitor, so they need training. There is noise in every measurement, and people need reliable ways to filter it out. (This

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<sup>3</sup> This is a slight exaggeration. We did not have until recently good data on the impacts of a sharp drop in house prices. Still, some observers had pretty good estimates. See Gerardi et al. (2008).

is where elaborate statistical techniques come into play; these are essentially noise filters.) You can't solve all problems nor measure and monitor everything, so you need ways to prioritize. Finally, all this needs to happen in an organization with thousands of people. The problem solvers and the measurers and monitors need to communicate their findings to many others, and this requires an elaborate but reliable communication system. In particular, senior executives need indicators of how well the organization is managing quality. They need to pay close attention to these metrics and to show everyone else that they are doing so.

For example, an auto company may take each finished car for a test drive. They carefully measure, among other things, whether the car turns properly. If there is a problem in one car, it can be fixed on the spot. But they also record the results and monitor them over time, to see whether a particular model seems especially prone to steering problems. In that case, the design must be changed. Executives get regular reports summarizing the results.

When the monitoring system detects a problem, a project is undertaken, usually by a team of people drawn from different parts of the organization. Their primary task is to *trace defects to their root causes*, employing the problem-solving skills mentioned earlier. A steering problem may result from a weakness in design, or a faulty part, or a flawed assembly technique. If the problem is due to bad parts, that in turn may result from defective raw materials, worn machines, etc. To sort out these possible causes requires a careful investigation, followed by actions to correct the problems. Once the root causes are identified and corrective actions taken, additional measure-monitor cycles are put into place, to make sure the problems stay fixed.

### **Quality: Who?**

Now, exactly who should do all this measuring and monitoring and all this root-cause analysis? Within a single organization, where should responsibility for quality be focused? And, in a system comprising several organizations, which ones should take the lead, and what should they do to bring the others along? Industry has cycled over the years through several answers to these questions, and we don't yet have a complete, final one.

From the 1930's to the 1970's, many firms established quality-control departments. These were collections of experts who employed advanced statistical techniques to design sophisticated inspection schemes. They were the owners of quality, and no one else was involved. Later (in the 1960's in Japan, in the 1980's in the U.S.) came a far more ambitious notion, total quality management, or TQM. The word "total" here partly describes who was involved – everyone. Quality is everybody's job. It was the TQM movement that insisted that everyone, factory workers as well as managers, learn problem-solving skills and basic statistics.

Neither approach worked very well. The quality-control departments were too isolated from the organization's other work. They were unable to determine why quality problems occurred and so unable to fix them at their sources. TQM, in contrast, was too diffuse. Everybody's job easily becomes nobody's job.

The latest approach is a compromise between these extremes. "Six sigma", pioneered by Motorola and GE, essentially proposes a matrix structure. There is a stable group of people with clear expertise and credentials (borrowed from martial arts – black belts, green belts). Most of these people, however, are embedded throughout the organization. They are directly involved in the organization's other activities and so can bring quality methods to bear on them. They serve as team leaders and teachers, instructing others in problem-solving and statistical techniques.

There remains the problem, inherent in every matrix structure, of allocating time and resources. How do you decide what to work on right now, when you have several responsibilities and several corresponding bosses? If you are an automotive designer who mainly designs new cars, but you are temporarily assigned to help solve a steering problem, should you first work on the steering problem or the new-car design? I know of no clear solution. For now, individuals are mostly left to answer such questions on their own. But at least this tension reflects the organization's real world.

As for relations between organizations, the earliest approach focused on inspection. When a shipment arrives from a supplier, inspect a sample of the goods, and, based on the results, either accept or reject the shipment. The information passed between organizations is in principle limited to these yes-no signals. The TQM approach, in contrast, emphasized long-term relationships rather than individual shipments. Insist that your suppliers implement solid quality programs. Work with them, if necessary, to establish such programs. Buy only from those who can demonstrate that they reliably produce quality goods. Work closely also with the suppliers' suppliers, and their suppliers too. Some radical TQM leaders went so far as to argue that, with proper relationships in place, inspection could be eliminated.

Currently, most firms use a hybrid approach. As in TQM, they buy only from certified suppliers, with whom they maintain long-term relationships, and they require their suppliers to do the same. However, they still inspect incoming goods, to keep those suppliers honest and alert. It's not foolproof. Things can go wrong even at a time-tested supplier, and any inspection scheme can miss defects. (Mattel's problem with lead paint is one highly visible example.<sup>4</sup>) Still, it works most of the time.

In some cases, one firm plays the role of regulator, ensuring quality throughout the supply chain. This notion is sometimes called *network orchestration*. An example is Li and Fung, which creates and manages supply chains throughout the world in the clothing industry.<sup>5</sup> Li and Fung maintain a large network of suppliers, but it could be larger. They are quite selective and keep out firms whose quality is unsure. Furthermore, their people

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<sup>4</sup> See, e.g., Stanford University (2008).

<sup>5</sup> See Fung et al. (2008).

spend huge amounts of time with suppliers, inspecting quality and guiding improvements.

Government agencies also play roles in ensuring quality. The Food and Drug Administration (FDA) and the Consumer Product Safety Commission (CPSC) are concerned with product safety in the U.S., and safety is a prime dimension of quality. The EU and Japan have similar bodies. There are also voluntary groups, such as Consumers Union, which collect and disseminate information about the safety and general quality of various products.

Another feature of the quality landscape needs mention: ISO 9000. ISO is an independent, global standards organization based in Geneva. Most of its work concerns mundane physical standards, such as the sizes of cables, but it also maintains a few “managerial” standards, and ISO 9000 is one of them. The content of the standard mostly concerns documentation. To meet the standard, a company must keep careful records of what is supposed to happen and what actually did happen. (Thus, the standard does *not* require that quality be good, only that the firm systematically measure it. Not all observers are thrilled by this neutral stance.)

ISO also maintains an elaborate hierarchy of inspectors, who decide which firms can claim to be “certified”, that is, to have met the standard. So far, about a million enterprises worldwide have been certified. Many require a potential supplier to be certified as a first step towards qualification for business dealings. A study found that certification has a positive impact on financial performance.<sup>6</sup>

The notion of management “by the book” is hardly new. Certain military organizations are famous for documenting every minute rule. Some companies, including financial institutions, maintain equally voluminous codes. How well does this approach work? Does it really lead to improved quality? The actual evidence is slim.<sup>7</sup>

In sum, the answer to the “who” question is mixed, at least for now. There is no clean, clear answer. This is sometimes described as a *layered approach*, which is a fancy way of saying that no one single remedy will surely work, so we need to do lots of things. Quality is like health in this sense. Exercise is good for you, but you also need to eat well, get enough rest, regularly visit the doctor, etc.

Finally, it should be noted that structure is not everything. For instance, Toyota is a classic hierarchical organization, and the levels of the hierarchy are supported by traditional Japanese habits of deference. However, anyone can say anything. Even the lowest factory workers are in fact encouraged to question the ideas of their superiors – politely, of course, but still firmly – and expect sensible answers, with no fear of reprisal. One of Toyota’s favorite problem-solving techniques is called “5 whys”. Whenever you see something puzzling, don’t be satisfied with the first explanation. Ask “why” 5 times.

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<sup>6</sup> See Corbett et al. (2002).

<sup>7</sup> There is indeed some evidence suggesting otherwise. See, e.g., Gray et al. (2008)

Such cultural norms operate across the grain of the organization's structure and help keep it from rigidity.<sup>8</sup>

This is partly why *every* quality approach emphasizes the need for senior leadership. Repeated exhortation remains a powerful shaper of people's thoughts and actions.

Even with all these layers, industrial companies are by no means universally successful in managing quality. Even Toyota still encounters problems from time to time, sometimes big ones.<sup>9</sup> There remain some fundamental gaps in both theory and practice. How do you balance stability and energy? How do you keep attention focused on the possibilities of events that don't occur very often?

### **Measurement in the Financial Supply Chain**

How well do financial institutions manage quality? Not very well, in my view. The industry has paid little attention to the principles sketched above. Their methods of measuring the quality of securities are primitive, and their arrangements for assessing and controlling quality internally and over their supply chains are flawed. Some at least of the sub-prime mortgage problems can be traced to these weaknesses.

The quality of a financial instrument or institution depends largely upon its sensitivity to the various risks the world presents. To measure and monitor quality in this context, therefore, means to measure and monitor risks and sensitivities to them. How well do the actors in the financial drama do this? To answer this question requires a brief excursion into the strange world of financial mathematics and the financial supply chain it supports.

Figure 1 provides a rough picture of the mortgage-finance supply chain in the U.S. Money flows from right to left, from investors through various financial institutions to borrowers. What moves from left to right are promises to pay back the money in the future.

[Figure 1 about here.]

A mortgage is a kind of debt, and so it is natural to measure its performance and risks similarly to other debt instruments, specifically, to bonds. A simple bond has (virtually) certain cash flows in the future. A standard measure of the performance of a bond is its *yield*, a straightforward function of its current price and future cash flows, all known parameters. To measure risk, the bond world employs other standard measures, such as *duration*, also simple functions of known quantities. These measures provide a reasonably complete account of the bond's primary risk sensitivity, that is, to the risk of interest-rate changes. From the beginning until this day, people have assessed mortgage-backed securities using the same measures.

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<sup>8</sup> Osono et al. (2008) argue that Toyota's success is largely due to several such fruitful "contradictions".

<sup>9</sup> See Rowley (2007).

Of course, a mortgage is not a bond, not even the simplest fixed-rate mortgage. Two types of events can make it more risky, prepayment and default. A prepayment typically happens when the borrower sells the house or refinances the mortgage. To reduce the exposure to default, it is customary to obtain a guarantee from a larger institution, such as Fannie Mae. If the borrower defaults, then Fannie Mae promises to pay the remaining principal to the lender. In this way, an actual default is converted into a prepayment. Before making such a promise, Fannie Mae is supposed to carefully screen borrowers, to limit its own risks. (More precisely, it establishes methods according to which lenders are supposed to screen borrowers. This screening is analogous to quality inspection in the world of physical products.) This is one reason its promises are considered valuable. With such a guarantee, the mortgage becomes a much more liquid entity.

The prepayment risk remains, however. To mitigate it, an institution can *pool* several similar mortgages into a bundle and then issue a security backed by those mortgages. This is the simplest kind of mortgage-backed security. Although one of the borrowers may prepay, it is unlikely they all will do so at the same time.

There remains the question of the yield and duration of such a security. To compute them, one needs to know the cash flows it will produce. This requires an *estimate* of the prepayments over time, and this in turn requires a *model* of them. A range of models has been developed and used in the industry, with varying degrees of success. Some of these models make simple point estimates of future prepayments, treating them as certain from then on, while others include numerous scenarios with different probabilities. The primary point is, we have now left the comfortable world of standard, universally understood measures of performance and risk. Even so, investors came to trust these models as well as the default guarantees, and so the mortgage-backed securities market thrived.

More complex mortgages, such as those with adjustable interest rates, pose even greater risks, and so are even harder to evaluate. When the borrower has a less-than-stellar credit rating, the loan becomes a sub-prime mortgage. The screening process and the assessment of guarantees on the loan become more delicate. Recently, some mortgages have been issued without guarantees. These are sometimes called “private-label” mortgages.

Furthermore, there are fancier ways to construct securities based on pools of mortgages, such as collateralized mortgage obligations (CMOs). Again, people have developed models to evaluate these securities. But each added layer of complexity makes such evaluation trickier and more error-prone. The technical literature amply documents these dangers<sup>10</sup>, but for a long time, many investors appeared to ignore them.

Even some bonds are not so simple. A corporate or municipal bond too can default. This is where the rating agencies come in. (S&P, Moody’s, and Fitch are the main ones.) The agency assesses the specific terms of a bond and the overall financial health of the enterprise issuing it, comparing it with others and using various rules of thumb, and then

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<sup>10</sup> See, e.g., Fabozzi (2005).

gives it a grade, a place on a single uniform scale. For example, S&P's highest rating is AAA, AA is a shade less good, BB means somewhat speculative, and CCC means low grade with default possible. For this service, the issuers of securities pay the agencies; the actual ratings are freely available.

What can a small town or company do if it believes it will receive a low rating? It can simply pay the higher interest rates that investors will demand. Or, it can obtain insurance. This is a guarantee against default, much like that offered by Fannie Mae for mortgages. The insurer, however, is typically a private company. With such insurance in place, the rating agency may give the bond a higher rating. The insurance costs money, but the resulting savings in interest expenses may make it worthwhile. Again, the insurer is presumed to screen applicants, to limit its own risks.

The rating agencies started about a century ago, evaluating fairly standard securities issued by normal industrial companies and municipalities. In recent years, however, they have expanded to less familiar territory, including mortgage-backed securities, even complicated ones. The creators of these securities, especially securities based on private-label mortgages, have sometimes enhanced their ratings with insurance, just like ordinary bond issuers. The insurers too had little experience with such intricate securities.

To invest prudently in mortgage-backed securities, then, investors must process a good deal of information. How do they use the information that the mortgage guarantors and ratings agencies provide? One might expect, given the difficulties of evaluating such complex entities, that investors would take the guarantees and ratings with grains of salt. Many, however, do not. A common approach is to impose certain limits on investments in lower-rated securities (e.g., no more than 20% of a portfolio in securities rated BB or below) but otherwise to select those with the highest yields.

I recall being surprised by such practices when I first encountered them in the 1980's. What exactly does a 20% limit mean in terms of the overall risks of the investment? What does a AAA rating mean when applied to an intricately structured investment vehicle? What does yield mean, when it is based on statistical estimates? Nobody knew nor seemed to care. Those practices have continued to this day. There are more sophisticated evaluation methods available (involving multiple future scenarios, as mentioned above), but many investors cannot or will not use them.

As it happened, some bond insurers accumulated large exposures to sub-prime mortgages. As those weakened, so did the insurers' credit ratings<sup>11</sup>, and that in turn broke confidence in the securities they insured. Fannie Mae and Freddie Mac, the two primary guarantors in the last decade, also expanded into the roles of issuers of securities and investors. They were thus heavily exposed to the risks of price declines. This is why the government had to absorb them.

## **Weaknesses**

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<sup>11</sup> See, e.g., Rappaport and Ng (2008).

That, in a nutshell, is how mortgage-backed securities are created and evaluated. The process has several weaknesses.

Guarantees and insurance play huge roles in converting mortgages into marketable securities. The origination side of the supply chain is fragmented, with huge numbers of brokers, small lenders and resellers. The guarantors and insurers absorb some of the risks that the bond market prefers to avoid. One might expect that they would be *very* careful, to ensure that sound screening procedures are reliably followed. But it seems they were not. They did *not* require lenders to establish solid internal quality-management programs. They did *not* send out teams of inspectors nor check the data on samples of applications.<sup>12</sup> They relied instead on the legal sanctions against outright fraud. But the law is a blunt instrument. There are gray areas between fraud and honesty, which they seem to have underestimated. The evidence is anecdotal, but it appears that the screening criteria were stretched if not ignored in many cases.

Several observers<sup>13</sup> have pointed out that the incentives for many actors on the origination side are very different from those of borrowers and investors. These brokers and small lenders receive fees at the beginning and have no stakes in the long term. It would not be hard to change the compensation structure by spreading the fees over time and making them contingent on the loan's performance. This seems like a good idea. It is unlikely, however, that the incentives can be perfectly aligned, and so some direct inspection will still be necessary.

The ratings agencies too play major roles in the market. The investing community has essentially outsourced quality inspection to them. The agencies perform valuable services, but those services are not well suited to the evaluation of complex asset-based securities. The agencies report their findings on simple, one-dimensional scales. This is just not enough to capture the risks involved in such products. An automobile part must have the right special dimensions, weight, hardness, etc. to have adequate quality. One single dimension alone cannot suffice.

In the event, some mortgage-backed securities which had enjoyed the agencies' highest ratings declined in value. Some investors began to suspect their soundness, despite those high ratings. That made the securities' yields higher, which made them more attractive to less skeptical investors. When the declines continued, those latter investors lost money. Some blamed the agencies. The agencies correctly pointed out that they do not claim to predict market values. Even so, the agencies began to receive considerable unwelcome scrutiny.

Many observers have questioned the agencies' business models. They are paid by the issuers of securities, not customers. They thus have incentives to provide results that please the issuers. (I know of no cases where they actually twisted results in this way.

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<sup>12</sup> The FHA, one of the major mortgage guarantors, at one recent point had only five quality-assurance positions, of which several were unfilled. See Terhune and Berner (2008).

<sup>13</sup> E.g., Quigley (2008).

Anyway, after months of discussion, the SEC recently acted to reduce such conflicts of interest.<sup>14</sup> The new rules forbid certain people from talking to certain other people about certain things. Will they help? We shall see.) Also, like mortgage guarantors, the agencies are not accustomed nor equipped to conduct inspections, i.e., independent investigations of the accuracy of the information that issuers provide. I know of no systematic study of the performance of the agencies over time.

In retrospect, the agencies should probably have declined to issue ratings on complex securities they didn't fully understand. It's hard to turn down business, but when your reputation is a major asset, you really should do so on occasion. Or, perhaps they should have created new, multi-dimensional scales for such securities.

Many of the institutions that lost money did and do have systems in place to manage company-wide risks. Those systems include scenario-based models, which measure risk much more completely than the rating agencies' scales. But the systems were mostly adopted at the insistence of bank regulators. Unfortunately, they have often been buried in obscure parts of the organizations, tended by quantitative experts – “quants”. In this way, they are like the original quality-control departments in manufacturing companies. It has been easy for the real decision makers to ignore them.<sup>15</sup>

One might expect that senior bankers would be eager to measure and control their risks. But many investment banks operate more like mall operators than integrated businesses. Individual employees or small departments are treated like independent merchants, subject only to occasional reviews of profits and losses. They often compete fiercely with each other as well as with the outside world. Cooperative problem solving is rare. It is a harsh culture, with great rewards for success and good luck, and severe penalties for failure or bad luck.<sup>16</sup> People cultivate an air of frantic busy-ness; no one can afford time for reflection. The notion of measuring and controlling the overall institution's risk profile thus goes against the cultural grains of these organizations as well as their compensation schemes. This is one explanation of the bizarre, repeated scandals, where one individual or a small group establishes a huge, risky position, without the knowledge of the firm's leaders.

It is especially surprising that professional investors were so gullible. They collectively showed little interest in the complex supply chains underlying the products they were buying and the corresponding quality risks.

It will not help to complain about derivatives and quants. The business press has largely blamed the crisis on them. Financial journalists tend to be people who dislike the mathematical side of finance, and they talk mainly to those in the business who feel the same. They cry to each other when things get too arcane for them. Folks, finance is

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<sup>14</sup> See Westbrook (2008).

<sup>15</sup> This was a cause of Merrill-Lynch's problems, for example. See Cassidy (2008).

<sup>16</sup> Cappelli (2008).

complicated. It always was and always will be.<sup>17</sup> Anyone who thinks that even a nice, normal bond is simple, not to mention an intricate mortgage-backed security, is deluded. Careful analysis is needed to understand any security.

The quants have their own cultural limitations. They speak in weird technical languages. The real problem lies in a communications gap between the quants and the “jocks” (as the mathematically challenged are called). The jocks need to learn more mathematics, and the quants need to learn to communicate better. Some anecdotes describe models that systematically underestimated risks.<sup>18</sup> Others describe quants whose models did reveal alarming risks, but who were summarily overruled by jocks who didn’t understand them.

Finally, the huge number of borrowers who took on debt they had little chance of repaying is appalling. This is a problem on the demand side (for money), in addition to the supply side. Many sub-prime mortgages included “teaser rates”, low interest rates for the first couple of years, followed by higher rates later on, usually to be set according to market conditions, and so unpredictable at the time of origination. Did all those people really believe they could afford those higher, unpredictable rates? Did their brokers hide the risks?<sup>19</sup> These are the mortgages that have defaulted in large numbers, thus sinking insurers, guarantors, banks, investors, and the rest of us.

Only Mencken could do justice to such widespread, systematic foolishness:

“The men the American public admire most extravagantly are the most daring liars; the men they detest most violently are those who try to tell them the truth.” H. L. Mencken

## **Recommendations**

The problems exposed by the sub-prime mortgage crisis are many. There are weaknesses in many parts of the system. Accordingly, we should not expect a simple, clean solution. As with quality in general, a layered approach is likely the best way to improve financial quality.

I have already suggested a few specific remedies above. The organizations which guarantee or insure mortgages should aggressively and persistently manage quality over their supply chains.<sup>20</sup> The incentives of mortgage originators should be better aligned with the long-term interests of borrowers and investors. The ratings agencies should clean up their acts in various ways. Here are a few more ideas:

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<sup>17</sup> Since the Renaissance at the latest, the development of mathematics has been spurred in part by financial problems. This story is well told, in mostly non-technical language, by Pesic (2003).

<sup>18</sup> See, e.g., Hansell (2008).

<sup>19</sup> It seems that some borrowers counted on a continuing bubble in house prices, which would have enabled them to refinance in a few years. But this was a highly risky bet. See Shiller (2008).

<sup>20</sup> Alternatively, private firms paid by investors could play the roles of network orchestrators.

Let's begin with the demand side. There should be a broad effort to better educate the public about financial decisions and their risks. I call upon religious leaders to exhort their congregations, media outlets to exhort their audiences, teachers to exhort their students, and politicians to exhort their constituencies to avoid excessive debt.

Before you conclude that I have lost my mind, let me explain: Public exhortation of this sort was widely practiced a hundred years ago. Its great success and its great failure was Prohibition. It has now largely disappeared, and that is largely a good thing, but not entirely. In fact, we all need reminders of how to live sensibly. Proverbs are rarely news to anyone, but rather reminders. We are constantly subject to various messages, tempting us to cast aside common sense. We need countervailing messages. We do some of this, but only in certain areas. Unprotected sex is only a bit more dangerous than unprotected debt. We teach driver training, and that helps keep our roads safer. Financial safety is important too, for our children and for the rest of us too.

Anyone who takes such a leadership role risks appearing ridiculous, like Petronius in Hamlet, or your grandmother. Well, I'm sorry, we need a few more ridiculous nags. Surely our clever marketing people can think of ways to make these messages sound less foolish.

There have already been some beginnings. The Federal Reserve Board offers all sorts of consumer information on their web site, including some useful guidance about mortgages.<sup>21</sup> If every borrower had read their fine *Consumer Handbook on Adjustable-Rate Mortgages*, I doubt we would find ourselves in the mess we are currently in. (I'm not sure the Fed is the right organization to undertake such things, but for now, no one else is doing it.)<sup>22</sup>

Private organizations may find opportunities here. I am a great fan of Suze Orman. Consumer Reports provides a valuable service, funded by subscribers. Although they generally warn readers against complicated financial deals, and urge them to shop, compare and read carefully, they were not particularly noisy about sub-prime offerings with teaser rates. On the other hand, they were quick to recognize the crisis once it broke and to offer reasonable advice for coping with it.<sup>23</sup>

I believe it is quite proper for the government to set limits to the kinds of loans offered and the ways they are sold. A few states like North Carolina have pioneered such rules, forbidding negative amortization, balloon payments, and other dangerous practices. These laws have indeed served to dampen turmoil in the housing markets there.<sup>24</sup> I also like the idea of a federal financial product safety commission.<sup>25</sup> Constraints always have

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<sup>21</sup> See the web addresses in the reference list.

<sup>22</sup> There has been a sharp increase in savings in the U.S. in recent months, but this appears to be a panic reaction to economic turmoil, not a fundamental change in attitudes.

<sup>23</sup> See ConsumerReports.org (2007).

<sup>24</sup> See Quercia et al. (2004), Byrnes (2007) and Berner and Grow (2008).

<sup>25</sup> See Warren (2007).

costs, but I am not persuaded by arguments<sup>26</sup> that teaser rates add substantial value to the market.

Now let us consider the supply side. Risk management should be a carefully documented process of the highest priority in every financial institution.<sup>27</sup> Boards of directors should insist on it, and senior executives should energetically promote and guide it. It should not be difficult to devise incentives to ensure compliance without entirely squelching entrepreneurial spirits. The six-sigma matrix structure appears to work well in industry, and it should be seriously considered for financial risk-management.

Also, I strongly support recent accounting rule changes to make credit-default swaps more transparent.<sup>28</sup> It is hard to manage risk seriously when you take positions in instruments that few can see or understand. Whatever else quality means in banking, it certainly includes nice, clean books.

Beyond that, do we need extensive additional regulations on banks? I would proceed with caution. I don't mind adding burdens to financiers, when they accomplish something. (I was and am unsympathetic to complaints that the Sarbanes-Oxley bill imposes costs. Sure, the rules could be streamlined, but they do serve a purpose.) But, if you establish a new rule, you have to verify that people follow it, and that can be tricky. ("Measure and monitor.") Moreover, when there are too many rules with unclear purposes, people just forget them. Some years ago, I attended an orientation session for new employees at one of the major investment banks. The instructor held up a thick binder of rules and regulations and said, "Don't bother reading this. If you're unsure what to do, ask your boss."

If the ratings agencies continue to provide very limited information to investors, then there are opportunities for entrepreneurs to provide more. Something like Consumer Reports for investors might sell well.

Investors too need exhortation. It should go without saying that you should not buy something you don't understand. Well, lots of people failed to heed that rule. No one likes to appear stupid, and so we all pretend to understand things we don't. Senior financial managers should be the primary exhorters here. Business-school professors too ought to pitch in. Something like "5 whys" should be part of every investor's routine discipline.

I shall not express an opinion about whether the government should step in and save small householders and large hedge funds from their follies. There are decent arguments pro and con. We should recognize, however, that the various possible remedies along

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<sup>26</sup> See, e.g., Hahn and Passel (2008).

<sup>27</sup> There has been much talk about getting the risk-management *model* right, but not enough about getting the *process* right. By that I mean the entire flow of information to and from the model, including who must sign off on its results and who is permitted to alter it, and when.

<sup>28</sup> See Morgenson (2008).

these lines are short-term emergency measures. They do not address the basic, long-term issues.

Furthermore, government action is a large, blunt instrument. Well-intentioned rules can have perverse unintended consequences. We should reflect carefully on any such proposals. Frantic weekends determining the fates of financial empires make good drama but rarely good decisions. People who must often make quick decisions, such as boxers and musicians, practice incessantly. Bankers and economists don't. I don't know whether the government should have saved Lehman Brothers, or whether Bank of America should have bought Merrill Lynch. But I do know that these decisions were made in haste. That spectacle spooked everybody and thus likely worsened the credit crisis. Wiser heads should in the future refuse to be rushed in these matters.

## The Future

Is there a serious chance that the financial world will embrace quality? It is hard to imagine. The cultures of quality and finance will not mesh easily. The discourse of quality in industry tends to be relentlessly earnest. Educated people often find it tedious and trivial, even insulting. It has made an easy target for humorists from *Dilbert* to *30 Rock*. Financial types, in contrast, incline to the sophomoric. Humorists have not neglected them either<sup>29</sup>. To my knowledge, the only serious attempts to adopt quality programs on Wall Street have been in operations, that is, the unglamorous back office.<sup>30</sup> But cultures change, especially in times of calamity. A more sober, mature financial system might serve society well.

The quality movement too could use a cultural makeover. A livelier, less tedious style would be welcome.<sup>31</sup> (Has there ever been a less attractive name for a good idea than “six sigma”?) Some of those penetrating financial eyes might be able to peer through the fog and resolve some of the movement's persistent dilemmas.

I greatly admire the gift of prophecy, but alas I do not possess it. I can only hope that, at the ground level, people will persistently work against the obstacles to make financial quality more reliable.

## References

Benner, M. and M. Tushman 2002. Process management and technological innovation: A longitudinal study of the photography and paint industries. *Administrative Science Quarterly* **47**, 676-706.

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<sup>29</sup> See Wolfe (1987) and Lewis (1989).

<sup>30</sup> There is some evidence, in fact, that quality and other process-improvement programs can stifle creativity; see Benner and Tushman (2002). On the other hand, the firms best known for quality, such as GE and Toyota, also usually score highly on innovation.

<sup>31</sup> ISO recently revised the information on its web site, [www.iso.org](http://www.iso.org). It is now much clearer and friendlier.

- Berner, R. and B. Grow 2008. They warned us about the mortgage crisis. *Business Week*, October 9.
- Byrnes, N. 2007. Those tough lending laws could travel. *Business Week*, November 7, pp. 70-71.
- Cappelli, P. 2008. HR lessons from investment banking. *Human Resources Executive Online*, September 15.
- Cassidy, J. 2008. Subprime suspect. *The New Yorker*, March 31, pp. 78-91.
- Christie, L. 2007. Subprime blame game. CNNMoney.com
- ConsumerReports.org 2007. Subprime mortgage meltdown: What it means to you. March.
- Corbett, C., M. Montes, D. Kirsch, and M. Alvarez-Gil 2002. Does ISO 9000 certification pay? *ISO Management Systems*, July-August, pp. 31-40.
- Fabozzi, F. 2005. *The Handbook of Mortgage-Backed Securities* (6<sup>th</sup> edition). McGraw-Hill.
- Federal Reserve, <http://www.federalreserve.gov/consumerinfo/default.htm>
- Federal Reserve, [http://www.federalreserve.gov/pubs/arms/arms\\_english.htm](http://www.federalreserve.gov/pubs/arms/arms_english.htm)
- Fung, V., W. Fung and Y. Wind. *Competing in a Flat World*. Wharton School Publishing, Pearson Education, Upper Saddle River, NJ, 2008.
- Gerardi, K., A. Lehnert, S. Sherlund and P. Willen (2008) Making sense of the subprime crisis. *Brookings Papers on Economic Activity*. Brookings Institution, Washington, DC.
- Gray, J., A. Roth and B. Tomlin (2008). Quality risk in contract manufacturing: Evidence from the U.S. drug industry. Working paper, Ohio State University.
- Hahn, R. and P. Passel 2008. Better that the Fed regulates subprime mortgages. *Economists' Voice*, February, Berkeley Electronic Press.
- Hansell, S. 2008. Bits: How Wall Street lied to its computers. *New York Times*, September 18.
- Lewis, M. 1989. *Liar's Poker*. W. W. Norton, New York, NY.
- Morgenson, G. 2008. A window in a smoky market. *New York Times*, July 6.

- Osono, E., N. Shimizu and H. Takeuchi 2008. *Extreme Toyota*. Wiley, Hoboken, NJ.
- Pesic, P. 2003. *Abel's Proof*. MIT Press, Cambridge, MA.
- Quercia, R. M. Stegman and W. Davis 2004. Assessing the impact of North Carolina's predatory lending law. *Housing Policy Debate* **15**, 573-601.
- Quigley, J. 2008. Compensation and incentives in the mortgage business. *Economists' Voice*, October, Berkeley Electronic Press.
- Rappaport, L. and S. Ng 2008. Bond insurers inflict further pain on the market. *Wall Street Journal*, June 21-22, pp. B1-B2.
- Rowley, I. 2007. Even Toyota isn't perfect. *Business Week*, January 22, p. 54.
- Shiller, R. 2008. *Subprime Solution*. Princeton University Press, Princeton, NJ.
- Stanford University 2008. *Unsafe for children: Mattel's toy recall and supply chain management*. Graduate School of Business, Case GS-63.
- Terhune, C. and R. Berner (2008). The subprime wolves are back. *Business Week*, December 1.
- Warren, E. 2007. Unsafe at any rate. *Democracy: A Journal of Ideas*, Summer.
- Westbrook, J. 2008. SEC curtails conflicts of interest at Moody's, S&P. *Bloomberg.com*, December 3.
- Wolfe, T. 1987. *Bonfire of the Vanities*. Farrar, Straus and Giroux, New York, NY.
- Worthen, B. and K. Geressy (2009). Bond market in winter thaw. *Wall Street Journal*, February 10.

# Figure 1: U.S. Mortgage-Finance Supply Chain

