

China Development Research Foundation
Program on International Financial Systems
Symposium on Building the Financial System of the 21st Century:
An Agenda for China and the United States
Guangzhou, China, June 6-8, 2018

Keynote Address
June 6, 2018

Finance “without risk”

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If you would like to manage risk in the financial system more effectively, my advice is: do *not* use the word “risk”.

I use the word risk frequently. I find it hard to avoid. But I have come to recognize how ambiguous it is and how often I use it to create the illusion of understanding. When I say “risk” do I mean “danger” or “bad outcome”? Do I mean “probability” or “probability of a bad outcome”? Or do I mean “the necessary pre-condition for financial reward”?

We can think of the financial system as the way we match sources and uses of funds and the risks that lenders, borrowers and investors take in that process. But this is not very illuminating. Lenders, borrowers, and other providers and users of funds take on the “probability of bad outcomes” and also “the probability of good outcomes”. Is this all we mean by risk?

The Sami people, of the Nordic countries, apparently have more than 180 words for snow. I think that we who live in the world of finance should aspire to speak and think with equal clarity about something so central to our existence as risk.

So I will challenge myself for the next few minutes – and you for the next few days – to think and speak about the financial system without using the word risk. My modest proposal is that we try three other words as substitutes. Instead of risk I suggest we use probability, uncertainty and volatility.

If you can think about finance “without risk” I hope you will recognize that we expect the financial system *to allocate the costs of uncertainty*. Seen in this light, the essential challenge of designing, regulating and supervising an efficient and resilient financial system is to improve the quality of decision making in conditions of uncertainty.

How do you bet?

You can imagine yourself playing Liar's Dice or Mahjong or Poker. Let's imagine a game of Poker. Let's imagine that you have a good memory and are good with numbers.

Looking at your cards you will be able to calculate the probability that you hold a winning hand. If your hand has a high probability of winning this does not mean that you will win but, rather, it means that you are likely to win more often than you are likely to lose. You can bet accordingly. This is a matter of simple probability.

But if just before you place your bet you learn that the number of cards might change over the course of the game, and also that the rules of the game might change, how would you bet then?

Once you know that the distribution of outcomes and the rules are subject to change without notice, you would lower, or discount, the initial probability that you estimated and change your bet accordingly. And if you had to keep playing the game, you would try hard to learn how many cards are in play at any given time and continuously revise your probability estimates and bets.

You would be confronting a problem not of simple probability but of conditional probability. You would be facing conditions of uncertainty. You would take seriously the likelihood that your initial probability estimate was inaccurate and you would continuously revise and update your views based on new evidence.

Perhaps without knowing it, you would be following the advice of the 18th century English minister, Thomas Bayes, who first suggested a formula for how we should make decisions in conditions of uncertainty. As I hope to keep my remarks brief, I will pass over the finer points of Bayes' Rule.

But you should know that whenever your doctor ponders the diagnostic power of a medical test, and the probability of a false positive result, Bayes' Rule is being applied. And when Air France Flight 447 from Rio to Paris was lost over the South Atlantic in 2011, after two fruitless years of searching, the wreckage was located in just one week of further exploration once Bayes' Rule was applied to the problem.¹ And when you sat up late into the evening considering the probability that your teenage child would return home at the agreed-upon hour, if not Bayes' Rule, you were at least applying Bayes' insight: that we accumulate knowledge as we apply doubt, as we consider the likelihood that our initial estimate of the probability is wrong and as we continuously revise and update our estimates.

And so you would in playing an ever-changing game of Poker.

¹ McGrayne, S.B., *the theory that would not die* (2012), pages 252-6.

In finance today we have technical terms to describe what it means for the number of cards to change and for the rules to change. We call these circumstances “out of sample” and “out of model” and we know that when we are “out of sample” and “out of model” our predictions about the future are not very accurate.

Risk vs. uncertainty

In 1936 John Maynard Keynes described this when he wrote:

Business men play a mixed game of skill and chance, the average results of which to the players are not known by those who take a hand.²

If you cannot anticipate the average results then you cannot make a simple probabilistic prediction of the outcome. You face uncertainty. You can try to unpack this uncertainty with Bayes’ Rule – to turn your lack of knowledge into conditional probability. But that’s the best you can do.

Keynes emphasized that most business fixed investment is not the result of “cold calculation” but, rather, is a consequence of business confidence and animal spirits that overcome the inherent uncertainty about the prospective yield of any long-lived asset.

In 1937 Frank Knight drew the distinction between “risk”, which he defined to mean capable of probabilistic prediction, and “uncertainty” which is not.³ In conditions of uncertainty we are without a good sample or a good model to begin with.

Most observers and journalists continue to draw the *wrong* inference from Knight’s distinction, mistakenly repeating the adage that business leaders and investors “hate” uncertainty and prefer risk. This was not Knight’s point at all.

Knight’s book was titled *Risk, Uncertainty and Profit*, and one of his major points was that uncertainty is the domain of the entrepreneur and also the domain of super-normal profits (and losses). Profits that derive from merely probabilistic insights can readily be arbitrated away by competitors whereas the profits from uncertainty cannot.⁴

With what data set, with what model, would we have predicted the success of Henry Ford? Or Bill Gates? Or Jack Ma? I’m open minded but none that I can think of.

² Keynes, J. M., *The General Theory* (1973), p. 150.

³ Knight, F., *Risk, Uncertainty and Profit* (1964), Chapter VIII.

Allocating the costs of uncertainty

We also strongly encourage *uncertainty taking* by entrepreneurs in the way that we have organized our capital markets. We invented equity.

Equity – as we think of it today – provides for limited and single liability. This gives the equity holder an unlimited upside and a downside that is limited and bounded at zero. In contrast, traditional partnerships provide the symmetric outcomes of unlimited upside and downside.

With modern equity, uncertainty-taking entrepreneurs have the opportunity for boundless riches and cannot lose more than their initial investment. But who absorbs the costs of uncertainty taking – the losses from uncertainty below zero equity?

That would be the financial system and, more specifically, creditors.

Of course, the financial system gets to share in the gains of uncertainty taking from the equity market. And once entrepreneurs have achieved some success they can lose their accumulated equity gains. The financial system also does more than allocate the costs of uncertainty: it allocates the gains and losses from accurately estimated probabilities, of likely and unlikely outcomes.

But creditors are left to absorb the costs of uncertainty taking – when changes in the expected value of an asset cause equity to be less than zero.

Volatility and the volatility mismatches of credit intermediaries

Volatility is the likelihood of a change in the price of a financial claim over a given period of time. We can describe financial intermediaries (without using the word “risk”) as incurring “balance sheet mismatches” between the likely value of their assets and the likely value of their liabilities. The nature or character of these *volatility mismatches* can be described by words like maturity, duration, liquidity, credit or equity.

The bank or credit intermediary that lends money to an entrepreneur hopes and intends that the “asset” of that loan will generate a positive return: meaning that the future value of the asset will exceed the future value of the corresponding liability. But in saying this we are making a prediction, exposing ourselves to problems of probability and uncertainty.

It is possible that what is uncertainty for the entrepreneur could be capable of probabilistic prediction for the intermediary *if* the intermediary has a bigger, better data set (a good sample) and also keener insights about the likelihood of entrepreneurial success or failure (a good model).

The credit rating agencies in the United States had bigger, better data sets for American mortgages than homeowners, mortgage originators and many investors. Unfortunately, their models assumed that mortgage defaults in different cities and towns would be independent events. As things turned out, we could and did experience a nation-wide decline in home values and mortgage defaults in different cities and towns were not independent events. As a consequence, mortgage-backed securities and our financial intermediaries held concentrated not diversified exposures. We misestimated the probabilities; we ended up out of sample and out of model.⁵

My insistence that we dwell on the role of uncertainty may seem abstract to you, perhaps even tedious. But if you do not recognize that, among its duties, we expect the financial system to allocate the costs of uncertainty taking then you will not understand how it is that we experience what we perceive to be the equivalent of a one-hundred year flood every ten years or so. You will be naively surprised by our inability to predict the future.

We flatter ourselves with overconfidence when we think that our estimates of probability do not themselves confront the problem of uncertainty. Whether our estimates are, in fact, accurate, or whether we misestimate the probability, or whether we face genuine uncertainty, is itself a problem of conditional probability.

All investors and intermediaries confront the challenge of drifting out of sample and out of model. But the business model of banks and credit intermediaries involve three particular, acute and related challenges.

First, they are in the business of concentrating the potential losses of uncertainty taking. They may try to hold diversified, rather than concentrated, portfolios but this, itself, is a mere prediction – subject to uncertainty.

Second, they are often highly leveraged – meaning they incur big maturity, liquidity and credit mismatches of their own.

And third, the equity that they issue is the same kind of equity that we permit entrepreneurs to issue: upside unlimited, downside bounded at zero, with the same incentive effects that encourage uncertainty-taking behavior by the intermediaries themselves.

And yet, we want financial intermediaries to fail less often than other types of firms.

⁵ Silver, N., *The Signal and the Noise* (2012), pages 19-46.

The importance of supervision in conditions of uncertainty

Thirty years ago we thought we could address this unstable foundation for banks by writing rules that would require banks to hold “risk-based” capital. But what did we mean by “risk”? Did we mean “probability-based capital”? “Probability-of-bad-outcome-based capital”? Sadly, I think we meant “capital sufficient to absorb the losses of some but not all bad outcomes.” Which are those?

The failure of risk-based capital is reflected – but not yet acknowledged – in the current practice of “stress-test” based capital, in which capital adequacy for banks is based upon stress tests that are grounded in unlikely scenarios. This is deeply frustrating for the bankers who complain that these scenarios are unlikely.

But even unlikely scenarios will not solve the problem of genuine uncertainty.

If we recognize that the financial system – specifically, the credit system – is how we allocate the costs of uncertainty taking, capital that will be sufficient to absorb the losses from uncertainty will likely, over time, need to be greater than “probability-based” capital. But we should also recognize that there will be no useful point estimates of the “correct” amount of capital that can absorb the costs of uncertainty.

Uncertainty-based capital can only be approximated by a process – the process of decision-making in conditions of uncertainty – where the best we can do is apply doubt and update our views continuously.

In my experience, this is how the wisest investors and the most enduring financial firms make decisions. They do not sit comfortably relying on the accuracy of their own predictions and decisions. They apply doubt. They take seriously the likelihood that their own predictions are wrong. They continuously revise and update their views. They also limit the size and longevity of the volatility mismatches that they incur so as to reduce the likelihood that they are exposed to drifting out of sample and out of model. And if they cannot keep their bets small and short-lived they apply doubt, update and revise their views all the faster.

These are the behaviors that we label good “risk” management. They reflect the quality of a firm’s decision making in conditions of uncertainty. These behaviors are also what we need to look for when we practice the art of financial supervision.

We have fallen into a bad habit of thinking that “regulation” is the important business of writing rules and that “supervision” is merely the process of checking to see whether firms comply with the rules.

Of course we need to have rules and we need to set minimum capital requirements. But if this is all we do, we will miss the importance of assessing the quality of financial firms’ decision making in conditions of uncertainty.

Where is the “risk” in China’s financial system?

Vast wealth has been created in China in recent decades. But it is likely that there is somewhat less wealth, than is now apparent, if we could find more accurate estimates of the value of the debt that has accumulated.

China is not the first country to find it easier to recognize the gains from entrepreneurial uncertainty taking than it is to recognize the costs of uncertainty for creditors. Nor is China the first country to respond to this problem initially by the application of “extend and pretend” – by which on, a de facto basis, we extend the maturity of debt and we pretend that its value is unchanged.

In the 1980s it was official US policy to encourage US banks to extend and pretend the values of Latin American sovereign debt. In the 1990s Japanese banks were permitted to extend and pretend the values of commercial real estate debt accumulated in the Bubble Era.

From experience we learned that extend can work, in a limited way, but pretend does not work. Why do I say this?

If by fiat we can extend the maturity of debt we can, for a time, avoid realizing the balance sheet mismatch between the likely values of the intermediaries’ assets and liabilities. In this way, we may be able to avoid the destabilizing consequences of the liquidity and maturity mismatches that we recognize as bank runs and financial crises. This is what we mean when we say that “leverage doesn’t kill you but the term-structure of leverage can kill you.”

While these destabilizing consequences can be avoided by “extend”, the depressing consequences of “pretend” cannot. The liquidity mismatch is avoided but the credit mismatch that creates an ultimate solvency problem is not avoided, it is merely postponed and likely compounded.

When we pretend that the values of loans are unchanged, we are failing to allocate the costs of likely, unlikely and uncertain outcomes. The financial system is failing at one of its essential missions.

Locating this credit quality and valuation mismatch on the balance sheets of the special-purpose vehicles called “wealth management products” can shift it from the banks but cannot make it go away. We only make matters worse when we fatalistically refer to these as “bad loans” of “zombie companies”, suggesting an impossible, intractable problem.

Instead, why not simply call them “mispriced assets”? What are they really worth? We don’t know. They are likely to be less valuable than initially estimated but their ultimate values are uncertain.

We need to apply doubt and revise and update the valuations of these mispriced assets. Regulations will not be much help. Qualitative financial supervision is required.

In my view, the essential reform of China's financial system will require empowering bank examiners to apply doubt to current asset values and to revise and update the recorded values of those assets based on new evidence.

Further desirable reform would include financial supervisors directly assessing the quality of financial firms decision making in conditions of uncertainty.

Indeed, for the market to play a "decisive role" in resource allocation, or even just a useful role, China needs to establish such a process for finding less inaccurate estimates of the value of the many mispriced assets. Only when this happens will the Chinese financial system be able to carry out the function of allocating the costs of uncertainty and, thereby, help allocate resources for society.

How to be a good Bayesian

Despite Keynes' insight about the role of uncertainty in investment, and Knight's careful distinction between risk and uncertainty, today we seem to use the word risk to avoid the distinction between *probability* and *uncertainty*. We speak of "risk" when we want to invoke the idea of a range of possible outcomes without acknowledging the limits of our ability to anticipate accurately the distribution of those outcomes.

We also seem to use the word risk to avoid being clear about "compared to what?" The concept of balance sheet and volatility mismatches is a useful way to make "compared to what" explicit.

You may not agree with my description of the financial system as the means by which we allocate the costs of uncertainty, nor with my suggestion that we consider "uncertainty-based" capital as a process of doubt and updating, nor with my brief description of debt in China's financial system and how it could be addressed.

But I do hope you accept my challenge to think and speak about the financial system without using the word risk.

If we can do this, if we can apply *doubt* to our own use of the word risk and, also, *revise and update* our thinking by using words like probability, uncertainty and volatility, I think it likely that we will achieve a deeper understanding of how to build a financial system worthy of the 21st century.