

## Kiyohiko G. Nishimura: Market intelligence, market information and statistics in central banking

Keynote Speech by Mr Kiyohiko G Nishimura, Deputy Governor of the Bank of Japan, to the 6th Irving Fisher Committee Conference, Bank for International Settlements, Basel, 29 August 2012.

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### 1. Introduction: statistics, market information and Irving Fisher

It is a privilege for me to address this keynote speech before the distinguished members of the Irving Fisher Committee. I am particularly thrilled, since the name *Irving Fisher* strikes a chord in my heart. Irving Fisher is an iconic figure at Yale University, where I earned my doctorate. In fact, he received the first Ph.D. in economics ever granted by Yale, in the year 1891. I vividly remember his life-size portrait hung above the mantelpiece of the 19th century mansion house, gazing solemnly at faculty members and graduate students.

No new words are needed to attest to his monumental contributions to microeconomics, macroeconomics and monetary theory. He was also influential in laying the foundations of economic statistics, as exemplified in his popular *The Making of Index Numbers*. In fact he was not content with just theory: he went on to found by himself the Index Number Institute that engaged in computing commodity price indices, and thus became one of the most popular providers of market information at the time.

Unfortunately, however, he failed to recognize the significance of the Stock Market Crash of 1929. Just three days before the crash, he wrote that stock prices were at a permanently high plateau. And even after the crash, he continued to assure investors that a recovery was just around the corner. This might testify to his failure in “market intelligence”, in detecting the signs of a fundamental change in the market place.

In his latter days, though not immediately appreciated by the public and the profession, he presented a remarkable theory of debt deflation as an explanation of the Great Depression. In fact, this masterful piece of work is the precursor of the vast literature concerning financial stability, which is especially relevant in economic policy making in the aftermath of the financial crisis of 2008.

What then can we central bank statisticians learn from these dramatic ups and downs in the life of Irving Fisher? In fact, this is the subject of this speech. In particular, I argue that, although reliable macroeconomic statistics are of course necessary for policy making, even good statistics are sometimes grossly insufficient to guide economic policy, especially when a seismic change occurs in the market and the economy. The recent financial crisis is an example of such change. Thus, central bankers should incorporate “market intelligence”, which I will explain later, and non-statistical market information, into their arsenal of statistics. So a central bank statistician should be more than simply a compiler of well-defined statistics: they should become a sort of sleuth or intelligence agent, detecting signs of future developments that may change the world.

I proceed as follows. Section 2 outlines the value of economic information from the perspective of policy decision making. A key theme here is “market intelligence”, which is the active gathering and analysis of market information through central banking activities. To understand the importance of market intelligence, I present three examples, with respect to the past, the present, and the future. Section 3 presents a lesson from the past. I examine the so-called Paribas Shock of 2007, and argue for the absolute necessity of “proactive” market intelligence to avoid this type of financial crisis. Section 4 describes the current achievements of market intelligence in an area of pressing importance: property price statistics. I show that it is possible to get reliable, unbiased information by combining various existing market information sources, even though individually they may have their

own biases. Section 5 concerns the future: detecting problems in shadow banking. Shadow banking involves a complicated structure, so it is necessary to grasp its “interconnectedness” to gauge the magnitude of potential problems. As an example, I explain the Bank of Japan’s attempt to reveal the interconnectedness of the Tokyo money markets. Section 6 contains some concluding remarks on market intelligence and central bank statistics.

## **2. Economic information and policy making**

Contemporary central banking faces two major challenges; one related to accountability, and the other to effective communication.

First, central banks should be accountable for their policies. This is all the more important for those central banks that have independence in determining their monetary policy. Accountability means policy should be evidence-based, that is, based on clear reasoning relying on substantiated data.

Second, central banks should be effective communicators. Markets and economies have become increasingly susceptible to changes in economic agents’ expectations. To ensure that policy is effective, central banks must communicate with the public in a persuasive manner. Here again, data supporting policy decisions become important. Thus, for accountability and effective communication, “numbers” or statistics become increasingly important. Moreover, data here means not only quantitative data; qualitative data are equally as important.

### ***Knowns and unknowns in Central Bank policy***

To understand the nature of the economic information central banks want to know, the following three-way classification may be helpful.

The first type of information concerns “known knowns”. Here “knowns” are whatever happened in the past. Thus, known knowns are information about what happened, and typical known knowns are contained in statistics. The second type is “known unknowns”. Here unknowns are those things that are happening at present or that will emerge in the future. They are known unknowns, since we already know that they are happening or will happen. You may have come across the word “now-cast”, which is an “estimate” of what is happening now, used in contrast with a “forecast” which predicts future events. A “now-cast” is a typical example of a “known unknown”. Finally, there is the third type, called “unknown unknowns”, things previously unknown but potentially having a significant effect on the economy. Here I quote Donald Rumsfeld, the former U.S. Secretary of Defense, whose enigmatic statement gives perhaps some indication of their nature:

*“But there are also unknown unknowns – the ones we don’t know we don’t know. And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones.”*

Keeping in mind this three-way categorization, let me ask the following question: What kind of information does a central bank policy maker want to know when he or she decides on policy? And, in what way is it related to the three-way categorization?

First of all, in contemplating appropriate aggregate demand management policy, the central bank policy maker wants to know the momentum of activity in the economy and financial markets. However, this is not in itself sufficient. The experience of the recent financial crisis has shown that the central bank policy maker should also be aware of the signs of previously unknown factors, unknown but potentially significant changes in the economy and financial markets.

In fact, with respect to the former, i.e. macroeconomic momentum, we have made significant progress. There have been improvements in the comprehensiveness, accuracy and timeliness of macroeconomic statistics related to aggregate demand management.

We now have a rich array of data, both quantitative as in GDP and CPI figures, and qualitative as in business surveys. Not only public but also private institutions produce and disseminate their own data. These are either known knowns (type 1), or known unknowns (type 2).

Statistics provide valuable information about known knowns, and they become the foundation for estimating known unknowns. However, statistics are grossly insufficient when it comes to detecting unknown unknowns (type 3). Central-bank policy makers are frequently frustrated by deficiencies in the statistics available, which they find inadequate in helping them detect potential problems in the economy.

Perceived deficiency is especially keen in financial information. It should be noted that financial stability is now seen as a prerequisite for economic stability. Moreover, policy makers are alarmed by the increasingly strong negative feedback seen in recent years between financial malaise and economic stagnation. The rapid development of financial factors confounds the problem of detecting malign symptoms. Thus, guarding against previously unknown but potentially devastating factors has become one of the most important issues for policy makers.

Thus, in November 2009, the G20 Finance Ministers and Central Bank Governors requested statisticians to fill the so-called data gaps. Twenty recommendations were submitted in the G20 Data Gaps Initiative (DGI) in order to establish timely reporting schemes for detecting both known unknowns (type 2), and unknown unknowns (type 3) .

### ***The key to guarding against unknown unknowns***

A central bank's intelligence activities are the key to guarding against unknown unknowns. These consist of two parts. The first is so-called "market intelligence": the central bank's daily transactions with financial institutions, which provide various kinds of information about market participants, developments in financial products, as well as other "news". These pieces of market information are valuable in creating a timely and accurate view of particular institutions and the market as a whole. The gathering and analyzing of this information is the core of "market intelligence".

The second part of the central bank's intelligence activities is monitoring and feedback. Qualitative or supervisory information can be obtained from regular supervisory dialogue with regulated entities. They have valuable information, and by analyzing it thoroughly we get a grasp of the details of market information, which is then fed back to these institutions if necessary.

It should be noted here that information coming from individual financial institutions may include subjective or in some cases biased content, regardless of whether it is market information or information acquired through regulatory monitoring. We should be aware of these biases, and good market intelligence is needed to gauge the extent of such bias and to compensate for it.

### **3. Lessons from the past: necessity of proactive market intelligence**

Let me now turn to three examples of central bank intelligence. The first example is its failure in the past. This is the so-called Paribas Shock of August 9, 2007, the precursor of the global financial crisis of 2008.

On July 10, 2007, S&P and Moody's announced that they would be reviewing the ratings of several residential mortgage-backed securities (RMBS) backed by subprime housing loan assets. As a consequence, the AAA ratings of asset-backed commercial paper (ABCP) backed by these RMBS would also be downgraded accordingly. This looked like a minor change in a marginal market of the US financial system. Unfortunately however, within just one year, it became the epicenter of a global financial crisis.

To understand the problem, we should be aware of the special role of money market funds (MMFs) in the United States. US MMFs were considered to be extremely safe financial assets. One of the primary reasons for this was that MMFs were only allowed to invest in AAA-rated assets. Therefore, when ratings were downgraded for ABCP, MMFs did not reinvest in ABCP. Then, funds that originated ABCP and used it to raise money found themselves in fund-raising difficulties: funds under the Bear Stearns umbrella went bankrupt; BNP Paribas moved to freeze its affiliated funds' new applications and redemptions. These funds were the structured investment vehicles (SIV) created by banks to issue ABCP. When these SIVs were unable to find funding sources, their parent banks were forced to provide liquidity enhancement instead. At that time, nobody knew for certain which banks' SIVs were on the brink of extinction, and which banks had serious liquidity problems. Banks, which frequently lend each other money, suddenly became aware of counterparty risk, the risk that the other party in a transaction might suddenly go belly up. They began to worry that some bank somewhere might suddenly be unable to secure liquidity and fail.

Indeed, on August 9, a liquidity crisis actually occurred, with liquidity drying up quickly in the interbank market. Many European banks were among those facing liquidity difficulties. Chart 1 shows an unprecedented spike in the three month LIBOR-OIS spread, showing the heightened risk premium in the European interbank market. A liquidity crunch in interbank markets started, and it spread immediately to the United States (Chart 2). Confronted with this situation, the European Central Bank (ECB) promptly announced that it was prepared to supply massive amounts of liquidity into the short-term money market. This was the event that came to be known as the Paribas Shock.

### ***Lesson: necessity of proactive market intelligence***

The circumstances surrounding the Paribas Shock naturally beg the question: Was this event avoidable? Or at least, was there any telling sign that this type of event was just around the corner?

As the description of the event shows, there are four important pieces of information that the policy makers should have known and which would have helped prevent this event. The first is the asset position of the MMFs: their composition and quality. MMFs held a large amount of AAA-rated ABCPs of SIVs whose parents were European as well as US banks. These ABCPs were backed by US subprime loans, so that if the subprime loans were downgraded then these ABCPs would also be downgraded. The second vital information is possible side effects of the legal constraints upon the MMFs. MMFs could hold only AAA-rated assets so that, if US subprime loans were downgraded, MMFs could not reinvest in ABCPs of the SIVs. The third and most crucial information policy makers should have had is knowledge of banks' involvement in their SIVs. To what extent were those banks obliged to support their SIVs with liquidity injections? Here it was not only a question of contractual arrangements, but reputations were also at stake. The fourth piece of vital information is knowledge about the inter-connectedness among banks in the interbank market.

It is clear that existing statistics and routine market intelligence were grossly insufficient to gather the above four pieces of vital information. To my knowledge, few, if any, market participants flagged the alarms that should have been raised by any of these four points. No statistics ever pointed out the danger.

However, there were several, though obscure, signs flagging a possible problem, so that a market intelligence unit alarmed by these signs might have detected the problem and could have helped policy makers avoid the disaster. In particular, there was a telling sign in the statistics about US MMFs. Chart 3 shows an upward trend in the total assets of the US MMFs in the first half of 2007. The growth rate of MMFs was fast, though it did not look extraordinary. However, if you look at the share of "safe assets", it actually *declined* from the start of the year. So, this chart shows that by looking into these figures, one might

have found some sign of abnormal risk taking in non-safe assets, including ABCP. Thus, if in addition, the market intelligence unit had detected the heavy involvement of banks in their SIVs issuing these ABCP, the unit might have sensed a possible danger of liquidity crisis in the interbank market, and might have been able to help the authorities prevent the crisis. In fact, after the Paribas Shock, the safe asset share jumped considerably and the total assets also skyrocketed, showing the strong flight to safety that devastated the ABCP market, and the ABS market in general.

To sum up, it is not clear whether the liquidity crisis in the summer of 2007 could have been avoided. However, proactive market intelligence, that is, detection of possible problems in the market based on careful monitoring of market developments and thorough analysis of market statistics, might have helped contain if not avoid the turmoil in the interbank market, and thus might have ultimately lessened if not negated the severity of the financial crisis of the following year.

Bearing this in mind, the Fed and other central banks, as well as private institutions, have begun to collect and compile a wide range of statistics that capture securitization. In particular, Chart 4 shows details of the asset composition of US MMFs. The chart indicates that MMFs may have already increased investment in commercial papers in 2006, the year before the Paribas Shock.

#### **4. Present achievement: best use of existing market information**

Let me now turn to the second example, which is the present achievement of market intelligence. This is about property prices, and the issue is the timing of the availability of market information.

The financial crisis of 2008 was triggered by the bubble and subsequent bust in US house prices. There is a wealth of evidence detailing the close relationship between property price bubbles and financial crises. International panel studies show more than two-thirds of 46 systemic banking crises were preceded by house price boom-bust patterns, while 35 out of 51 house price-bust episodes were followed by a crisis.<sup>1</sup> However, we have not had access to good property price indexes, based on sound economic foundations and comparable between countries and jurisdictions. Frustrated by this deficiency, in November 2009, the G20 Ministers and Central Governors designated property price indexes as one of the most important data gaps to be filled.

To rectify the problem, several conferences were held under the leadership of Eurostat, which gathered a wide range of experts on property prices from theory to data compilation. Based on these conferences and public comments, the *Handbook on Residential Property Price Indices* has been drafted, and the finalized version of the Handbook will be published very soon. Moreover, many countries and jurisdictions are now preparing their own property price indexes in accordance with the recommendations of the Handbook. In fact, I have learned that Japan's Ministry of Land, Infrastructure, Transport and Tourism has almost completed the development of a new series of residential property price indexes using the procedure recommended in the Handbook, and the Ministry is about to start publishing new statistics just this morning.

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<sup>1</sup> Claessens, Stijn, M. Ayhan Kose, and Marco E. Terrones, (2008), "What Happens During Recessions, Crunches and Busts?" IMF Working Paper 08/274 (Washington: International Monetary Fund) and Claessens, Stijn, Giovanni Dell'Ariccia, Deniz Igan, and Luc Laeven, (2010), "Cross-Country Experiences and Policy Implications from the Global Financial Crisis", *Economic Policy*, Volume 25, pp. 267–293.

### ***Issue of timeliness***

This is a great leap forward indeed towards having reliable and accurate property price information. However, from the policy maker's viewpoint, the situation is still far from satisfactory. It should be emphasized that, for a policy maker, timely information is as important as, or in some cases more important than, reliable and accurate information. According to this criterion, many property price indexes are not helpful in immediate policy making, since they inevitably lag behind market movements.

To see why, let me give you the example of a typical Japanese property transaction. Property transactions follow a series of stages several weeks apart from each other, and each stage usually entails different prices, namely: the initial asking price, P1; the offered price, P2; the contract price, P3; and the price that is filed with the land registry office, P4. My collaborators and I have been able to get a unique data set of a large number of property transactions in Greater Tokyo which illustrates these four stages. Here I will present the results based on this data set.<sup>2</sup>

Chart 5 depicts the timeline graphically. From P1 to P2 takes on average ten weeks, from P2 to P3 five and a half weeks, and finally from P3 to P4 fifteen and a half weeks. Thus, from P1 to P4 takes almost thirty one weeks, more than a half year. We should also take into account the time taken to collect and compile the information, which is itself likely to be substantial, as in the case of GDP and CPI data. Thus, if the authorities use the most reliable transaction price data of P4, it will probably take almost a year. From the policy maker's viewpoint, this is often too late.

To get the timeliest information about property market conditions, earlier reporting of P1, the initial asking price, is preferable. However, this is the asking price, not the transaction price. There might be a substantial bias in this asking price data because a seller wants to sell at a higher price, even though it may take much longer to strike a deal or he is never able to sell. In fact, Chart 6 shows the price distribution of P1, P2, P3 and P4. As expected, the initial asking price P1 has a higher average than the price P4 at the registry office (though there is the caveat that the sample population of P1 is not exactly the same as that of P4). Thus, we face an apparent trade-off: if you want timely information then you use P1, but it has non-negligible bias. If you want accurate information, then you use P4, but it has already become somewhat stale information by the time it is available.

### ***Best use of market information***

There is, however, an important way around this dilemma. It should be noted that the Handbook recommends hedonic quality adjustment in property price indexes based on detailed micro and macro market information. There are various ways to conduct hedonic quality adjustment, among which a hedonic quantile regression approach is one of the most sophisticated and robust. Remarkably, after applying this quality adjustment to both P1 and P4 of our data set, we find the quality-adjusted price distribution based on P1 is very close to, and almost indistinguishable from, the quality-adjusted price distribution based on P4.

Let us look at Chart 7, the quantile-quantile plots of two distributions. In the quantile-quantile graph, if two distributions are identical then the plotted line is on the 45 degree line. The upper chart illustrates the result of raw or unadjusted data of P1 (initial asking price) and P4 (registered transaction price). This chart clearly shows the upward bias in the initial asking price relative to the registered transaction price. However, when quality is adjusted using a hedonic quantile regression method, the bias seems almost to have vanished, as shown in the lower chart.

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<sup>2</sup> Shimizu, C., K. G. Nishimura, and T. Watanabe (2011) "House Prices at Different Stages of the Buying/Selling Process", Working Paper no. 69, Research Center for Price Dynamics, Institute of Economic Research, Hitotsubashi University.

In a nut-shell, the result of this study shows that the initial asking price data, the timeliest of all price information, can be used as reliable information about property prices, so long as quality is appropriately adjusted using a hedonic quantile regression method. So we can benefit from the best use of market information, with respect to both reliability and timeliness.

## **5. Guarding against future problems: shadow banking and basic information**

### ***Gathering***

So far, we have examined the importance of market intelligence and the best use of market information in the past and the present. I am now looking towards the future, and considering what is needed to guard against future problems. The pressing problem that comes first to mind is that of shadow banking, a problem in the past, but still a potential problem in the future. Since regulations on banks are to be tightened further, new types of shadow banking may appear, little known at present but potentially threatening to financial stability in the future.

Modern shadow banking activities are largely based on financial markets, and hence are likely to create innovation there. They change themselves rapidly in response to changes in market conditions and regulations. Moreover, they have broad interconnectedness with banks and other financial institutions. Given this situation, in what way should central banks gather valid and vital information about them? Here again, I believe that the key is to utilize various sources of market intelligence alongside other sources of information. Furthermore, I would like to stress that the intelligence work should be properly followed by the establishment of new statistics about shadow banking.

### ***Various approaches of market intelligence***

Let me explain the efforts of the Bank of Japan in this respect. The Bank monitors shadow banking entities and activities through various channels. The nature and scope of the Bank's monitoring are depicted in Chart 8. Amongst these channels, direct monitoring of major shadow banking entities is of course the most significant. Thus, the bank has increased the number of staff directly monitoring major securities companies. However, it is practically impossible to conduct dialogues with all financial institutions of a shadow banking nature, and moreover, shadow banking activities tend to change rapidly with developments in financial markets. It should be noted that shadow banking entities are deeply involved in funding and investment with various financial institutions. So indirect monitoring through banks, monitoring through the payments and settlements system, and market intelligence through market participants all become important. The Bank also closely watches shadow banking activities in securitization, securities lending and repos.

For instance, we have started direct monitoring of hedge funds and investment trusts as well using market intelligence through market participants much more than before. Furthermore, although we do not directly monitor finance companies, since large finance companies are owned by banks, we monitor them by monitoring the banks.

It is then crucial to cross-check the information gathered. Chart 9 illustrates the point. In this regard, it is important to monitor banks as counterparties of shadow banking entities. This is because bank activities are interconnected with shadow banking activities. Market information in the financial markets is also particularly valuable. Central banks are especially well-positioned to collect valuable information on the activities of participants in financial markets, since they not only gather information relevant to monetary policy, but they also operate payment and settlement systems. Information on market practices and financial innovations can often provide early warning of risks, and hence are especially important among the various kinds of market intelligence.

The case in point is found in the subprime mortgage crisis in the United States. Securitized products were originated with financial engineering and distributed without appropriate risk assessment. This was partly due to an overly optimistic assessment of risk diversification. However, this risk became increasingly visible in the market as the market evolved into a new phase.

### ***Feedback of market intelligence***

Another important role of market intelligence is to feed information back to the market, and thus to find potential information gaps to be filled. For example, based on market intelligence, the Bank of Japan designs and compiles the “Tokyo Money Market Survey”, which provides an overall quantitative assessment of the money markets.<sup>3</sup>

The survey depicts, among other things, the current interconnectedness among financial institutions through repo transactions, as is shown in Chart 10. This chart shows that securities companies borrow specific JGBs through SC repos mainly to cover their short position in bond trading. Most of their short-term money is funded through GC repos from trust banks, while some funds come from banks and money market dealers.

This kind of quantitative understanding provides both new perspectives for central bank business and wider grounds for dialogue with financial institutions and market participants. In fact, the result of these dialogues will be examined and used by financial institutions to develop more sound business practices. Also, the feedback of any relevant information will be reflected in the next survey data. Starting this year, we will begin to conduct this survey regularly.

Overall, market intelligence is absolutely crucial for central banks in maintaining the stability of the financial system. I believe that this flexible system of monitoring shadow banking entities and activities, based on market intelligence, can provide a good pilot study for other central banks to consider when they want to identify emerging risks and vulnerabilities in their own countries and jurisdictions.

## **6. Concluding remarks**

Let me now come to my conclusion. As we all know and feel, central banks around the world have faced serious challenges, especially since the financial crisis of 2008. Financial stability is now clearly marked as an essential prerequisite for economic stability, and it is thus the responsibility of central banks to maintain this stability. Moreover, the financial turmoil following the collapse of Lehman Brothers, and still lingering somewhat in the global market, has clearly proved that existing statistics are not sufficient for policy making, in particular policy making involving financial markets. Financial markets are fast moving and “mutate” in many ways in a relatively short period of time. Therefore, I have argued in this speech that gathering and thoroughly analyzing market information, which is often described as market intelligence, is of the utmost importance and should be utilized proactively alongside conventional economic statistics.

The reason I have stressed market intelligence, or more specifically, central bank intelligence, is that central banks have a clear comparative advantage in extracting valuable and vital information, especially from financial markets. Central banks are the unique organization that transacts with the widest range of financial market participants.

I have explained how this market intelligence works in the case of shadow banking in Japan. The most important point is to extend these intelligence activities to new financial institutions and products to detect possible problems. The existing framework at the

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<sup>3</sup> Bank of Japan, Financial Markets Department (2009, 2010), “The Development and Challenges of Japan’s Money Markets: Tokyo Money Market Survey” (available only in Japanese).

Bank of Japan is versatile and can incorporate new elements relatively easily. However, problems remain about the depth or intensity of these intelligence activities: that is, the quantity and quality of information currently available may not be sufficient for detecting possible risks. Thus, we are only at the starting line, and there is still a long way to go.

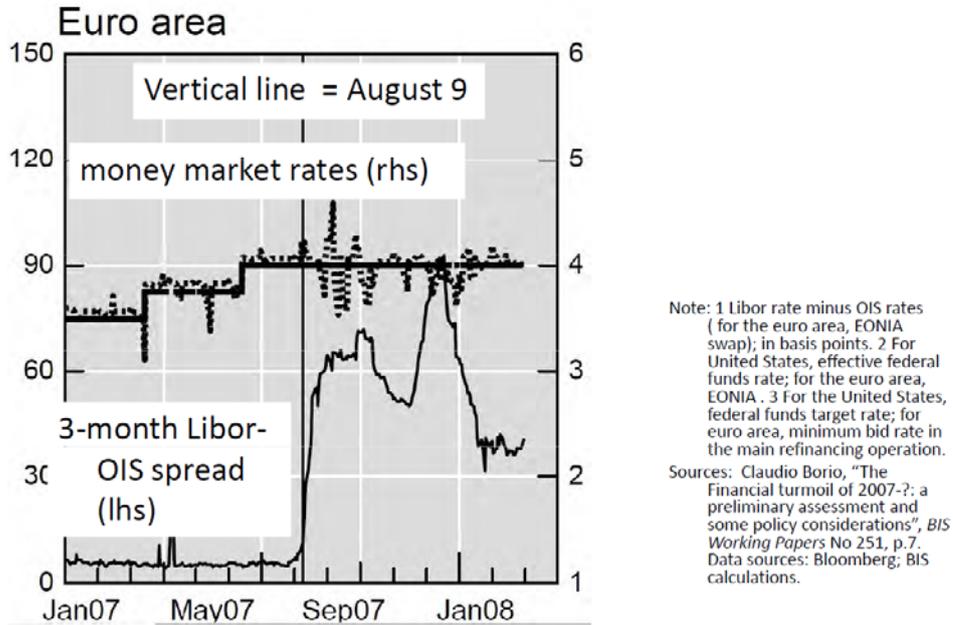
Finally, I should emphasize that market intelligence has significantly improved central banks' economic statistics, and will continue to do so in the future. We have learned from the failures in the summer of 2007, that we must extend the coverage and improve the quality of statistics concerning non-depository financial institutions. We can also take advantage of new methods and new information sources to get the best use of market information in constructing timely statistics, as shown in the case of property prices.

In closing, I would like to emphasize again the point I stated in the Introduction, the point that I would most like to convey to you. Central bank statisticians should be more than good statisticians, simply maintaining the quality of existing statistics. They should also be good sleuths or intelligence agents, detecting signs of future developments that may change those statistics, and thus may change our world.

Thank you for your kind attention.

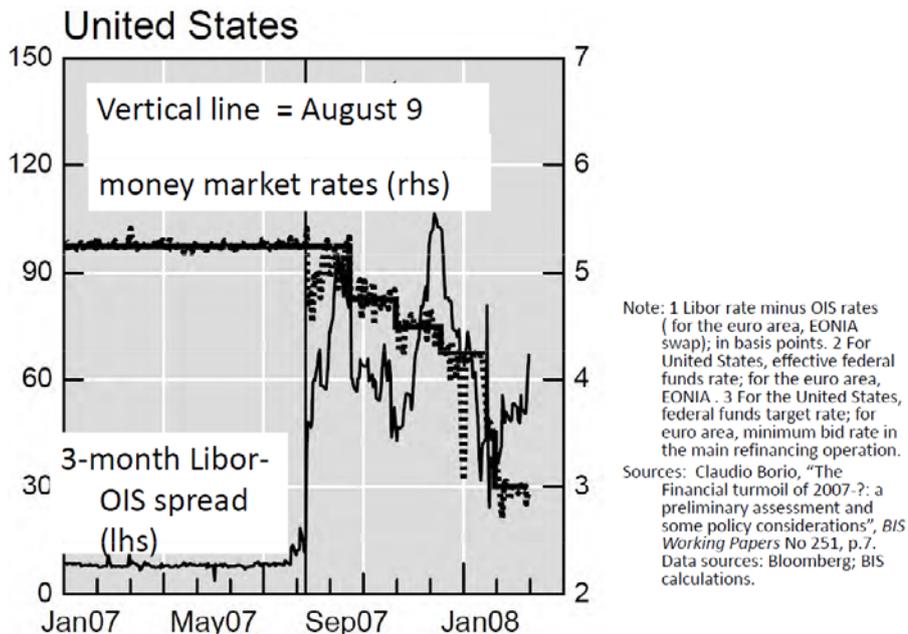
3. Lessons from the Past: Necessity of Proactive Market Intelligence

### Chart 1: Interbank Markets Seize Up



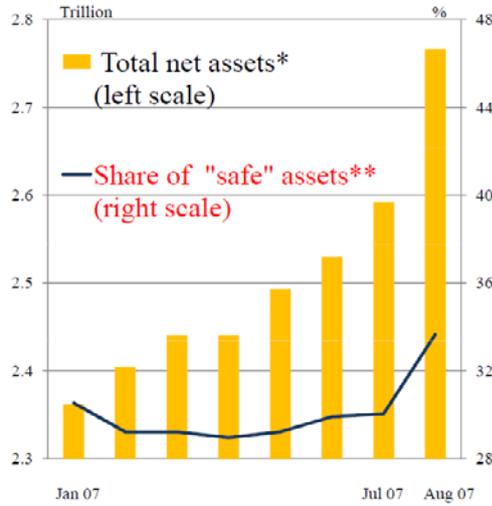
3. Lessons from the Past: Necessity of Proactive Market Intelligence

### Chart 2: US Interbank Markets Seize Up



3. Lessons from the Past: Necessity of Proactive Market Intelligence

Chart 3: US MMFs in the 1st Half of 2007



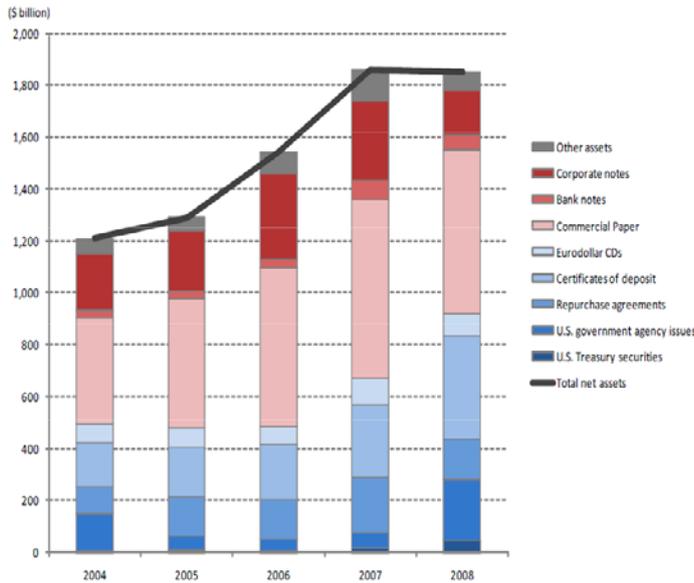
Note: \* In trillions of US dollars. \*\* Share of taxable money market mutual funds held as treasury securities, government agencies and repurchase agreements; as a percentage of total assets.

Sources: Ingo Fender and Peter Hordahl, "Overview: a cautious return of risk tolerance", BIS Quarterly Review June 2008, p.15. Data sources: Investment Company Institute.

3. Lessons from the Past: Necessity of Proactive Market Intelligence

Chart 4: Detailed Data of MMFs

Assets Composition of Taxable Prime Money Funds

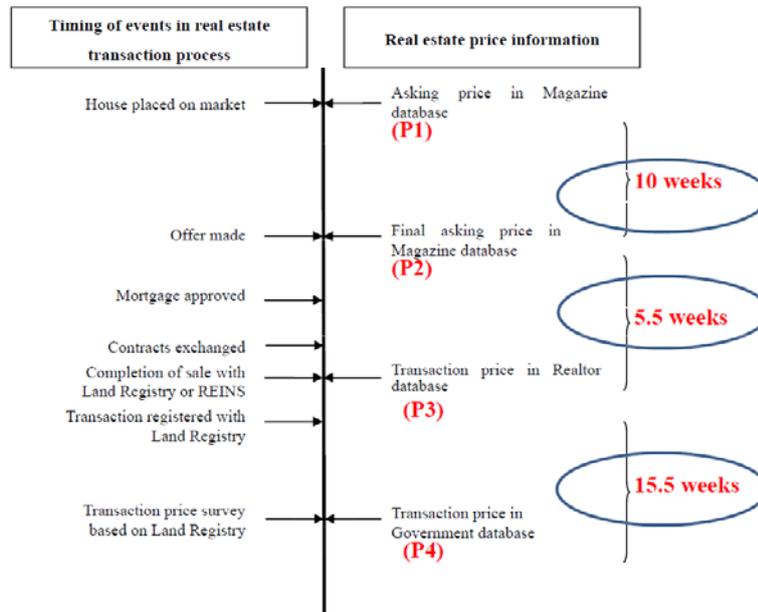


Notes: "Other assets" includes banker's acceptances, municipal securities, and cash reserves. "U.S. Treasury securities" includes U.S. Treasury bills and Other Treasury securities. Data for funds that invest primarily in other mutual funds were excluded from the series. BOJ compiles the graph from original data.

Source: Investment Company Institute, 2012 *Investment Company fact book*, p177

4. Present Achievement: Best Use of Existing Market Information

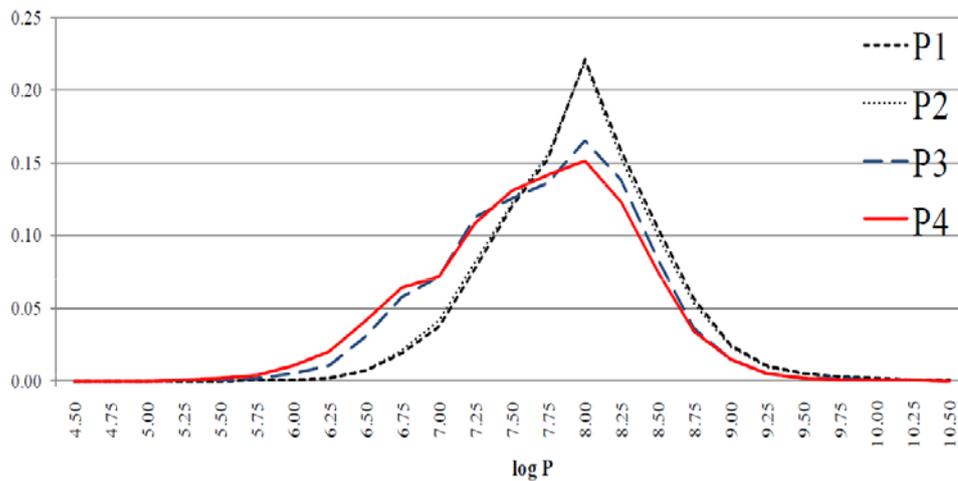
### Chart 5: Timeline of Transactions and Prices



4. Present Achievement: Best Use of Existing Market Information

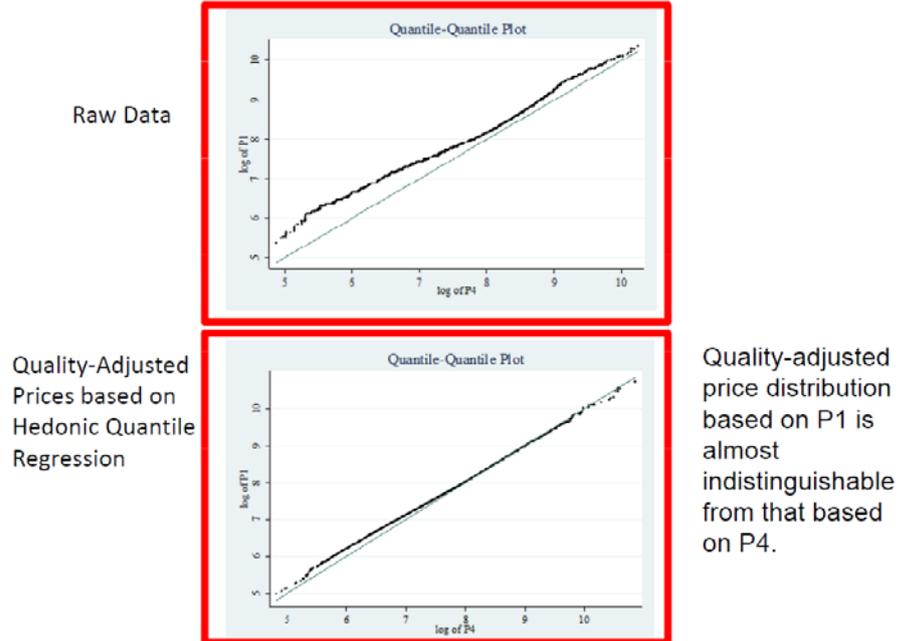
### Chart 6: Price Distributions

Price densities for P1, P2, P3 and P4



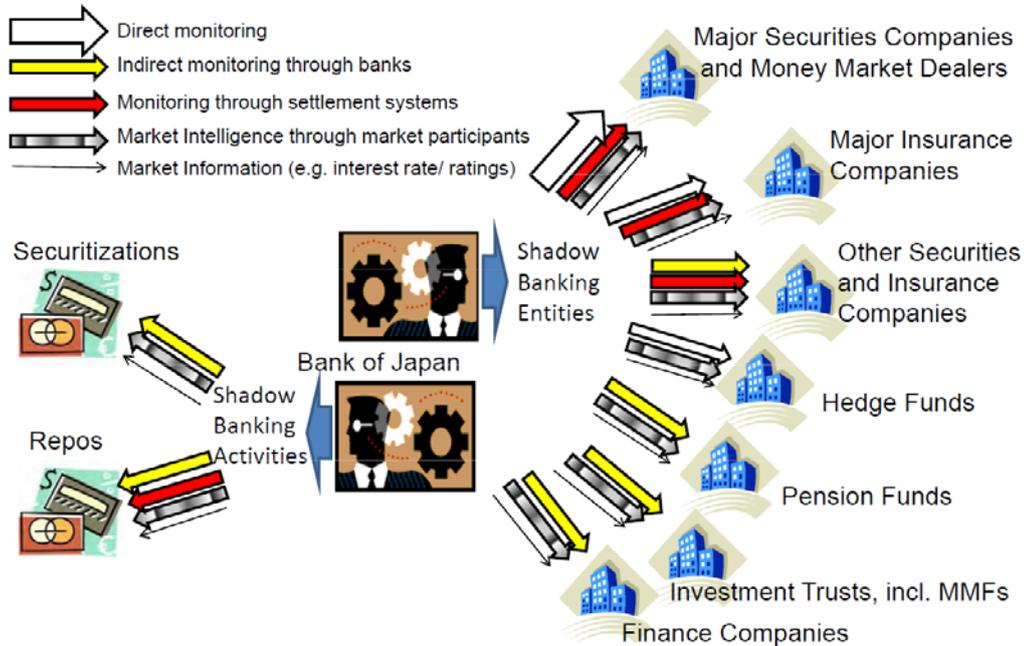
4. Present Achievement: Best Use of Existing Market Information

Chart 7: Quantile-Quantile Plot



5. Guarding against Future Problems: Shadow Banking and Basic Information Gathering

Chart 8: Various Approaches of Market Intelligence



5. Guarding against Future Problems: Shadow Banking and Basic Information Gathering

Chart 9: Cross-Checking of Information Gathered

Source of Information	Information through Banks	Market Intelligence through market participants	Market Information (e.g. interest rate/ ratings)	Settlement systems
SB Entries				
Major Securities Companies and Money Market Dealers	→	→	→	→
Major Insurance Companies	→	→	→	→
Other Securities and Insurance Companies	→	→	→	→
Hedge Funds	→	→	→	→
Pension Funds	→	→	→	→
Investment Trusts incl. MMFs	→	→	→	→
Finance Companies	→	→	→	→

5. Guarding against Future Problems: Shadow Banking and Basic Information Gathering

Chart 10: Feedback of Market Intelligence

Result of "Tokyo Money Market Survey"

