

## **Kiyohiko G Nishimura: Macro-prudential policy framework from an Asian perspective**

Speech by Mr Kiyohiko G Nishimura, Deputy Governor of the Bank of Japan, at the ADBI FSA Conference, Tokyo, 30 September 2011.

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*Charts to the above speech can be found on the Bank of Japan website.*

### **Introduction**

In this presentation, I would like to take up several key issues relating to macroeconomic policy frameworks explicitly taking account of financial markets, or macro-prudential policies, especially from an Asian perspective. In particular, I ask following two questions: (1) What methods should we employ to detect intolerable accumulation of risks in the financial system? and, (2) How should we maintain financial stability in the short run, while improving efficiency in credit intermediation functions to support long-term economic growth?

I will be seeking practical “best practice” answers to these questions, rather than “optimum solutions” based on a particular theory.<sup>1</sup> This practical and somewhat atheoretical approach is warranted since we are still very much short of having a satisfactory macroeconomic theory that deals adequately with complex and sometimes violent financial markets, although there has emerged a sizable literature on the relationship between macroeconomic activity and financial markets.

Before trying to answer these inherently difficult questions, it is worth looking back to the evolution of the current financial crisis in the United States and Europe, and of that in Japan two decades ago. Although much attention has been focused on financial excess as typified by excessive leveraging in financial institutions, I would like to emphasize the importance of underlying changes in fundamentals, especially demographic factors such as population ageing. The latter has particularly important implications for the future in Asia. The basic message here is that many of Asia’s growing economies may face problems in the near future similar to those of developed countries, and it is thus of the utmost importance to implement appropriate macro-prudential policy now.

### **Section 1. Asia in perspective: financial crisis, its aftermath and fundamentals**

#### ***Financial crisis and fundamentals: demographic factors***

Although three years have passed since the so-called Lehman Shock, we are still in the process of soul-searching; pursuing a better understanding of its causes and the appropriate policy response to it. Since Japan and a number of Asian economies already experienced their own financial crises in the 1990s, we Asians may be in a slightly better position to compare them and draw the necessary lessons. Indeed, there are many similarities between the recent crisis in the United States and the eurozone on the one hand, and Japan’s financial crisis since the 1990s on the other. In the case of both the US-

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<sup>1</sup> Clark and Large (2011) present ten questions in framing appropriate macro-prudential policy, crystallizing its fundamental and practical problems. In this speech, I touch on only a few of them, which I think are most relevant from the Asian perspective.

eurozone and the “Bubble Era” in Japan, risks were accumulated during the period of high growth and low inflation.<sup>2</sup> Risks were accumulated particularly in real-estate related sectors.

The recent literature on financial crises has focused mostly on explaining how bubbles develop and influence economic activity through leveraging in financial markets.<sup>3</sup> Here the measures of economy-wide financial activity, such as deviation from the long-run trend of the credit-to-GDP ratio, are considered to be informative and possible guides for macro-prudential policy.

However, I would like to emphasize another important background factor, that is, demographic change in the form of population ageing. Indeed, the “bubble and burst” and subsequent financial crisis seemed to coincide roughly with the turning-point of population pyramids in Japan, the United States, and Europe. Let me show you some telling figures on the inverse dependency ratio, which indicates how many people of working age it takes to provide for one dependent person.<sup>4</sup> The Japanese ratio peaked around 1990, and it was in the very next year, 1991, that the Japanese Bubble peaked. The peak of the US ratio was between 2005 and 2010, and the peak of the US subprime bubble was 2007 (Fig. 1). The economically troubled countries of the eurozone have a similar pattern to Japan and the United States. The ratios for Ireland and Spain have almost the same time profile; they peaked around 2005, which corresponds to the peak of their property bubbles (Fig. 2). The ratio for Greece and Portugal peaked around 2000. The significant point for us here is that the financial crisis we have experienced has coincided closely with the turning point in these demographic dynamics.

### ***Asset price bubbles: dancing over the tide of fundamentals***

The “life-cycle” theory, or more precisely speaking, overlapping generation models suggest that demographic change is one of the most forceful drivers of asset prices. After all, assets are a means of saving for the young and dissaving for the old, and thus the numbers of the young and the old determine the demand and supply for these assets.<sup>5</sup>

The recent history of crisis seems to confirm this line of reasoning. In Figure 3, the real land price in Japan (national average, for all purposes) is juxtaposed with the country’s inverse dependency ratio from 1955 to date. This figure shows, firstly, that the relative abundance of young people coincided with sharply higher property prices. Secondly, in contrast, the relative abundance of old people seems to be leading to lower property prices. In the United States also, an increasing reverse dependency ratio coincided with the property bubble (Fig. 4). After the bubble burst in 2007, property prices seem to have followed the long run movement of the inverse dependency ratio, although it would be premature to draw any conclusions from this at the moment. We see a similar pattern in the Irish and Spanish experience (Figs. 5 and 6).

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<sup>2</sup> The period is known as the “Great Moderation” in the US case.

<sup>3</sup> European Central Bank (2010) and Basel Committee on Banking Supervision (2011) provide a concise survey of models with macro-financial linkage proliferating recently in this literature. Bianchi (2010), Jeanne and Korinek (2010a, 2010b), and Stein (2011) focus on the credit externalities and pave the way for exploring the effects of macro-prudential measures. In particular, Bianchi (2010) and Jeanne and Korinek (2010b) study financial crises in open economies, aiming to provide macro-prudential remedial measures. However, there is unfortunately relatively little from an Asian perspective. Exceptions include Hattori et al (2010), and Hahm et al (2011).

<sup>4</sup> I take these figures from Nishimura (2011b), which contains more figures about other European countries, both core and periphery.

<sup>5</sup> Empirical evidence suggests strongly that this is the case. See Takáts (2010) for property prices, and Liu and Spiegel (2011) for equity prices. The Economist (2011) carries a readable account of this issue.

I am not suggesting that this demographic factor is the sole cause of the asset bubbles that led to the crisis. There may be other factors, as for example in the case of Greece and Portugal, who experienced “bubbles” in their public sectors rather than in asset prices, but still faced the crisis. Likewise, there are other countries that underwent similar demographic changes, and yet did not fall into crisis. I only want to point out that a favorable demographic background (increasing inverse dependency ratio) might be fertile ground for the excessive optimism<sup>6</sup> that led economic agents in many countries to take a highly leveraged position to boost their returns. In other words, asset bubbles might dance over the long-run tide of demographic change.<sup>7</sup> By the same token, the eventual sharp reversal of the ratio made resolution of accumulated financial excesses particularly difficult, resulting in the prolonged, severe balance-sheet adjustment that followed the crisis, and which is still under way.

### ***Aftermath: severe balance sheet adjustment under population ageing***

In order to determine the effect of balance sheet adjustments after the bursting of a bubble, let me first clarify who leveraged during the bubble periods. In Japan, it was the corporate sector, whose loans-to-GDP ratio increased by 29 percentage points in the ten years before the bubble burst in 1991. In the United States, it was the household sector, whose housing loans-to-disposable income ratio jumped by 39 percentage points in the ten years before the bubble burst in 2007. These sectors were interest-sensitive, and thus constituted the “transmission gears” of the ordinary monetary transmission mechanism in the periods before the bubbles burst. However, after the bubbles burst, these leveraged sectors became insensitive to policy rate reduction, because of the acute balance sheet adjustments. This led to a breakdown in the ordinary monetary transmission mechanism. It should be noted here that declining property prices greatly aggravated the balance sheet adjustments of Japanese corporations and US households.<sup>8</sup>

In looking to the future, I would like to emphasize that the balance sheet adjustments after the bubbles burst in Japan, the U.S. and the eurozone, whether private or public, must be carried out, *at a time when the population is ageing*. This acute balance sheet adjustment is unprecedented in our modern history of economic growth.

### ***Where does Asia stand?***

Asian economies and financial systems weathered the recent financial crisis relatively well. Their recovery since 2009 has been markedly rapid, and emerging Asia is now a growth engine of the global economy. The fiscal situation of emerging Asia is also far more favorable than that of many developed countries. Furthermore, with the exception of Japan, Asian economies have not yet faced serious problems with population ageing.

Nonetheless, I would like to point out future potential issues and the absolute necessity of a prudent approach now. Let me draw your attention to the inverse dependency ratio figures for China (Fig. 7) juxtaposed with those for Japan and the United States. The Chinese ratio seems still to be rising rapidly, but will peak a bit later than in Euro-American countries. The peak will be around 2010–15, after which it will decline as rapidly as it is now

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<sup>6</sup> Nishimura and Ozaki (2006, 2011) provide decision-theoretic foundation of excessive optimism and pessimism, showing that seemingly-irrational excessive optimism and pessimism can be analyzed in the framework of rationality. See also Bracha and Brown (2010).

<sup>7</sup> One possibility is to incorporate the “bubble”, as formulated in Martin and Ventura (2010), into the detailed overlapping generation framework of Braun et al (2009) extended to the multi-country framework, to calibrate the bubble-bust and subsequent balance sheet problems both national and international perspective. See also, Aoki and Nikolov (2011).

<sup>8</sup> See Nishimura (2011a) for more detail of this balance sheet adjustment.

rising. The inverse dependency ratios of many other Asian countries have a quite similar time profile to that of China, and some are even more pronounced (Fig. 8).

## **Section 2. Macro-prudential policy – two “dos” and one “don’t”**

The recent financial crisis, as well as the Great Moderation leading up to the crisis, brought to bitter recognition the gap between our macroeconomic and micro-prudential policies. Thus, macro-prudential policy has come into the spotlight as something that would fill this gap. However, we are still very much short of having a satisfactory macroeconomic theory that deals adequately with complex and sometimes violent financial markets. Consequently, the very definition of macro-prudential policy remains elusive, even three years after the crisis. How are we to draw the lines between macroeconomic, macro-prudential and micro-prudential policies? What indicators are useful in detecting risks? What should be the tools of macro-prudential policy? Should capital controls also be considered as a part of macro-prudential policy tools? How are we to achieve the appropriate burden-sharing among monetary, macro-prudential and micro-prudential policies in order to maintain financial stability? Since we do not yet have a satisfactory theory to give clear-cut answers to these questions, I will take a more pragmatic approach and propose two “dos” and one “don’t” for prospective macro-prudential policies.

### **2.1. “Do” detect risks in advance – information and intelligence**

In order to avoid another crisis and subsequent stagnation, it is critically important for policymakers to detect undue risk accumulation. It should be noted that information propagation always plays a critical role in the inception and transmission of systemic crisis. Thus, “information” and “intelligence”, or more precisely speaking, market intelligence, is of the utmost importance both for risk detection and for crisis management. Here both bottom-up and top-down approaches are absolutely necessary.

#### ***Bottom-up information: market intelligence***

The history of financial crises provides clear evidence that systemic crisis is often ignited by the bankruptcy not of large firms, but of relatively small firms such as Sanyo Securities in Japan (1997) and Northern Rock in the United Kingdom (2007) (Fig. 9). This reveals one crucial aspect of financial intermediation, that is, information. Since financial transactions are a collection of information flows, the failure of a small financial institution may cause an immediate market-wide liquidity crisis or a “run”, if the failure gives rise to widespread fear or uncertainty in the market.

Thus, both in terms of risk detection and crisis prevention, market intelligence obtained through face-to-face contacts and dialogue with market participants is critically important. In this regard, most Asian central banks can boast of their grip on individual institutions’ activities and micro information in the market. Nonetheless, the increased sophistication and innovation of financial services makes risk detection increasingly difficult. In some cases, financial institutions themselves do not seem fully aware of the risks associated with their investments and transactions, especially those related to structured products and derivatives. Any complacency in terms of risk detection could itself be another source of risk, and authorities should encourage market participants to continuously improve their risk management skills. Painstaking information gathering, continuous updating and open-minded risk assessment are all about market intelligence.

In this regard, macro-prudential measures such as information exchange through the publication of the Financial System [Stability] Report (FSR) have the potential to provide new ways of utilizing information and market intelligence. Macro-prudential policies can be effective only if they facilitate dialogue and coordination between market participants and authorities, and also between macro- and micro-policies.

### ***Top-down information: indicators for detecting macro risks and excesses***

I would therefore like to turn now to macro risks and excesses and the indicators used to detect them. In most cases of “bubble and burst”, the large gyrations of financial markets and the economy are driven by psychological swings: Economic entities are likely to become excessively optimistic in bubble periods, and excessively pessimistic when those bubbles burst. In economic boom periods, such as Japan’s “Bubble Era” and during the “Great Moderation”, the co-existence of high growth and low inflation may lead to the illusion of productivity growth and an expectation of continued low interest rates. Such optimism is likely to induce a euphoric view of asset prices and an under-estimation of risks. On the other hand, in a prolonged downturn, economic entities become excessively pessimistic, leading to further deterioration of the economy, and thus their pessimism turns to be self-fulfilling. In order to avoid excessive accumulation of these risks, it is critically important to detect any such extreme optimism or pessimism behind the developments indicated by various financial data.

For such purposes, we should carefully avoid becoming a hostage to any particular form of reasoning or theory. Although some indicators such as credit-to-GDP ratio and the deviation of real estate prices from the trends may provide useful information, we do not have any decisive indicators in this respect. The theory I have perused earlier is valuable in explaining what has happened before, but is not so helpful in providing an indication of what will happen in the future. Every crisis may take a different form. Excessive reliance on specific indicators might cause us to miss important risks or misidentify nonexistent risks. Moreover, we should take into account a variant of Goodhart’s law:<sup>9</sup> If a central bank announces its intention to focus on specific indicators in order to take action to discourage risk-taking, market participants might try to take risks without influencing these indicators, and these indicators might eventually lose their information value. This problem would be further intensified if we focused on a narrower range of indicators.

Thus, it would be wise for policymakers to monitor impartially a variety of indicators. Moreover, we need to make full use of market intelligence in order to interpret various data comprehensively, since price data themselves may not indicate whether they are in line with fundamentals or driven by euphoria.

### ***Bank of Japan’s framework for detecting risks***

Let me now explain the various efforts made by the Bank of Japan in this field. The Bank executes both on-site examinations and off-site daily monitoring of a wide range of financial institutions, including securities firms. Through such activities, the Bank, making full use of market intelligence, tries to identify any signs of risk accumulation. The Bank also maintains close dialogue with market participants such as the counterparties of market operations.

Moreover, the Bank of Japan makes a regular comprehensive risk assessment of the overall financial system, analyzing both macro data and micro information, and publishes its assessment on financial stability in its semi-annual “Financial System Report”. Moreover, the Bank’s assessments of the risks in the financial system are useful inputs to the decision-making of monetary policy in the “Two Perspectives Framework” (discussed later).

The Bank of Japan is making efforts also in terms of exploiting wide-ranging data, macro stress-testing and establishing econometric models incorporating the financial sector, which is in line with the efforts of other central banks. In addition, two Bank of Japan economists, Koichiro Kamada and Kentaro Nasu, have recently devised an innovative

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<sup>9</sup> See Goodhart (1975) for the original account, and also Goodhart and Tsomocos (2011) for its most recent application.

system of Financial Cycle Indexes (FCIXs), which are designed to be early warning indicators.<sup>10</sup> These FCIXs are not based on a particular theory, but on the age-old analytic tradition of economic trends and cycles. Although the jury is still out, the performance of FCIXs seems to be promising: they predicted Japan's financial crisis, and warned of the recent financial crisis about a year in advance (Fig. 10).

From my viewpoint, FCIXs would be useful tools for macro-prudential policies, since they could provide early warning signals of excessive optimism or pessimism. Indeed, one of the most difficult challenges for macro-prudential policy is how to spot excessive optimism or pessimism, especially because we do not yet have a credible theoretical framework that can be applied for such purposes. In this regard, the FCIX approach may be atheoretical in the sense that it does not depend on a particular economic theory, but this is an advantage in light of the unsatisfactory state of theory. Owing to such strengths as indicators, FCIXs would contribute to effective monitoring of the financial system as a whole from the macro-prudential perspective.

## **2.2. "Do" avoid pro-cyclicality**

### ***Lean against the wind of financial risks: coordination of monetary and macro-prudential policy***

I would now like to refer to another aspect of macro-prudential policy; that is, macro-prudential policy as a means to counter procyclicality.

After detecting undue risk accumulation, policymakers would be required to check further accumulation of risks and to discourage risk-taking. On the other hand, if policymakers find that market participants have become excessively risk-averse, they would be called upon to restore confidence in the market. The basic principles are simple: Don't be so lenient when things are booming, and don't be so restrictive when things turn sour. Here, coordination of monetary and macro-prudential policy is necessary, and very effective.

In this regard, the Bank of Japan is making use of a "Two Perspectives Framework" in its conduct of monetary policy. The framework involves a two-step policy consideration: policy should be guided by the most probable scenario for the future course of the economy (first perspective), but at the same time it should incorporate "remote risk factors" that might affect the economy adversely if they happen to materialize, even though they may not be in the main scenario (second perspective).<sup>11</sup> The latter clearly includes systemic financial risks. Thus, when it contemplates monetary policy, the Bank examines a broad range of information, not only conventional indicators such as inflation, but also financial information and market intelligence about risk accumulation. The Bank assesses such information in a comprehensive manner, and communicates to the public its assessment of these tail risks.

Needless to say, there can be other styles of communication, such as conveying central banks' risk assessment in terms of changes in their inflation forecasts over a long horizon within their inflation-targeting frameworks. There is no clear-cut answer as to the most suitable communication strategy, since the appropriate style of communication depends upon the economic and financial structure of the particular jurisdiction. However, there is an apparent need for financial risk assessment and its communication to the general public, beyond conventional inflation assessment.

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<sup>10</sup> See the Appendix for a detailed explanation of FCIXs.

<sup>11</sup> See Nishimura (2007) for clarification.

## ***New regulatory framework and pro-cyclicality issues***

Let me now take up the issue of the new regulatory framework and pro-cyclicality. Indeed, one of the regular agenda items of recent international debates is how to address pro-cyclicality in financial regulation. The Basel Committee has tried to address this issue in Basel III, which incorporates a “capital conservation buffer” and “counter-cyclical buffer”.

Here implementation is the key. Should banks conceive of the capital conservation buffer as a part of the minimum capital requirement and maintain the buffer regardless of the phase of the cycle, the introduction of the buffer might result in the banking sector holding more capital than is optimal from the inter-temporal viewpoint.<sup>12</sup> In order for Basel III to be an optimal regulatory framework, not only from a static but also a dynamic perspective, it should be implemented appropriately and accompanied by adequate supervision. This is all the more true for the counter-cyclical capital buffer.

In a similar vein, we should be aware of the possible side-effects of a newly-introduced Systemically Important Financial Institutions (SIFI) framework. Capital surcharges for “additional loss absorbency” in the SIFI framework may lead to the risk that SIFIs keep more capital than optimal on an inter-temporal basis, which may cause more acute credit contraction in the midst of a recession. Moreover, there is the confounding factor of possible deposit concentration in SIFIs. In the midst of Japan’s financial crisis, we experienced a substantial shift of deposits from small banks to money center banks. If a SIFI framework and the capital surcharge make people believe that SIFIs are much safer than non-SIFIs, a SIFI framework might even accelerate the shift of deposits in a stressed situation, but the surcharge might discourage SIFIs from fully implementing the credit intermediation functions formerly performed by non-SIFIs. Thus, we should carefully examine whether or not newly-introduced regulatory frameworks will actually counter procyclicality as expected.

### ***2.3. “Don’t” harm long-term efficiency***

#### ***A new excuse for an old addiction?***

That having been said, let me elaborate one “don’t” of macro-prudential policy, especially from a long-term perspective.

Since there is no clear definition of macro-prudential policies or of their policy tools, any policy tool could be justified as a part of that policy. Thus, we have to be careful of the danger of making macro-prudential policy “a new excuse for an old addiction”, which often leads to long-term inefficiency. Indeed, most of the tools often referred to as “macro-prudential policy tools”, such as ceilings on loan-to-value (LTV) and debt-to-income (DTI) ratios in property markets and capital controls in foreign exchange markets, cannot be free from the risk of distorting asset allocation that leads to inefficiency in the long run. Thus, policymakers should be required to examine carefully the consequences of each macro-prudential policy action from the long-run perspective. Long run consequences often develop in a relatively short period of time, when addiction continues.

#### ***SIFI framework and long-term efficiency***

It is important to design the SIFI framework in a manner compatible with incentives. One of the root causes of the recent crisis was excessive risk-taking. If the SIFI framework encourages SIFIs to pursue further the yield-searching originate-to-distribute model due to

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<sup>12</sup> This is exactly the reason Basel III differentiates the capital conservation buffer from the minimum capital requirement. The capital conservation buffer and accompanying regulations such as restraining dividends are designed to be utilized in a counter-cyclical way. Otherwise, there is no rationale to distinguish between the capital conservation buffer and the minimum capital requirement.

the need to downsize balance sheets while maintaining their return on equity, the effect might rather be to destabilize the financial system. In this regard, I would like to reiterate that the SIFI framework should be a comprehensive package of effective regulation and supervision sustainable in the long run.

Furthermore, the SIFI regulation will be counter-productive if it hinders SIFIs' core financial intermediation. Since the demand for financial services is largely determined by the needs of the real economy, any additional regulation imposed on SIFIs will reduce their financial functions to some extent, or the financial intermediation performed by SIFIs will be replaced by similar services offered by other entities. Thus, should there be a significant difference between the regulatory burden imposed on SIFIs and that on non-SIFIs, financial transactions might shift to less regulated entities and the risk underlying the financial system as a whole might heighten. "Shadow banking" is a typical problem of this kind.

Asia should be well aware of these problems. First, emerging Asia is now at the center of global economic growth. To sustain such growth, the need for fund intermediation is also likely to increase. Hence, should new financial regulations hinder the core financial function at a global level, the negative impact on the real economy could be all the more serious. Second, some emerging Asian economies, where asset price hikes threaten to create bubbles, have already adopted macro-prudential tools such as lowering the LTV and DTI ratios of real estate-related loans. Accordingly, these countries should examine the costs and benefits of their macro-prudential policy actions, and devise appropriate and timely exit policies to avoid long-term inefficiency.

### **Section 3. Tail risks and false sense of security of macro-prudential measures**

The recent financial crisis (the "financial tsunami"), and the tragic great earthquake in Northern Japan (with its gigantic real tsunami), showed vividly that tail risks may materialize in our life time, and thus they are not really tail risks anymore. Policy frameworks anticipating only "ordinary" shocks within usual economic cycles may not be very effective in mitigating the impact of such tail events when they actually materialize. The recent financial crisis in particular has forced policymakers to review their own policy frameworks and to examine how they could identify tail risks and deal with tail events.

Nonetheless, at this juncture we do not have fully reliable indicators for detecting tail risks nor panaceas against the maladies that accompany these tail events. We have to bear in mind that, no matter how intellectually-inspiring policy makers may find this new tool, macro-prudential policy can never be a substitute for appropriate macroeconomic policy or for effective financial supervision. Japan's experience of its bubble economy is a good example. Japan learned just how difficult it is to control asset prices solely with macro-prudential tools such as an administrative ceiling on bank loans to the real estate sector.<sup>13</sup>

Thus, in detecting tail risks and tackling tail events, we have to avoid any complacency or false sense of security in our macro-prudential policy framework. If we mistakenly believe that we could discover excessive risk accumulation through observing specific indicators, or that macro-prudential policies could be mightily effective in achieving financial stability, such complacency could itself become another source of instability.

Let me illustrate the importance of avoiding a false sense of security, by telling you the story of the world's deepest tsunami breakwater at Kamaishi port in northern Japan (Fig. 11). At 1,960 meters long and 63 meters deep, it was celebrated as the deepest breakwater in the world by Guinness World Records when it was completed in March 2009. Exactly

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<sup>13</sup> I explained the inadequacy of macro-prudential policy in Japan in Nishimura (2011c).

two years later, it was shattered by the force of a tsunami equivalent to the impact of 250 Jumbo jets flying at 1,000km/h; the very apotheosis of a real tail event.

With hindsight, we cannot deny that this seemingly indestructible tsunami breakwater, and other facilities to ward off possible tsunami threats, gave us a sense of security. It might lead us to underestimate the magnitude of the tail risk event of tsunamis and thus to ignore the antique stone inscriptions warning of the devastation of tsunamis (Fig. 12). Hundreds of these so-called tsunami stones, some more than six centuries old, dot the coast of Japan. We now know the true cost of relying on this false sense of security.

Thank you for your attention.

## Appendix: the financial cycle indexes

The Financial Cycle Indexes (FCIXs) developed by Kamada and Nasu (2011), are used to monitor financial stability from the macro-prudential perspective. They are designed specifically as an alternative to the early warning indicator introduced by Kaminsky and Reinhart (1999).

Kamada and Nasu focus on the Juglar cycle – a cycle with a duration of 7 to 11 years – included in financial time series, according to the result of analyzing the data compiled by Laeven and Valencia (2010). The Juglar cycle is extracted from the original time series by the HP-filter-based band pass filter,<sup>14</sup> which consists of two HP filters with different smoothness parameters, specifically  $\underline{\lambda}$  and  $\bar{\lambda}$  as defined below:

$$\underline{\lambda} = \left\{ 2 \sin \left( \frac{\pi}{7f} \right) \right\}^{-4} \quad \text{to extract cycles lasting longer than 7 years;}$$

$$\bar{\lambda} = \left\{ 2 \sin \left( \frac{\pi}{11f} \right) \right\}^{-4} \quad \text{to extract cycles lasting longer than 11 years.}$$

In both of the above,  $f$  is the parameter used to adjust the formulae for the frequency of an original time series. The Juglar cycle lasting 7 to 11 years is given by the difference between the two HP trends obtained above.

The two financial crises are used to categorize data into leading and lagging indicators.

- (a) January 1990: the triple sell-off in the yen, equity, and bond markets, which is considered the beginning of the bursting of the asset-price bubble; and
- (b) November 1997: the bankruptcy of Sanyo Securities, which is considered the start of a series of financial institution bankruptcies

Data is called a leading indicator if the Juglar cycle extracted turns down before the above two crises, or a lagging indicator if the extracted Juglar cycle turns down after the two crises.

FCIXs comprise leading and lagging indexes. Kamada and Nasu propose three different types of index: type D, C, and B. Here, we explain the type-D leading FCIX, which is a diffusion index and constructed as follows:

$$D_t = \frac{1}{N} \sum_{i=1}^N i(\Delta b_{it})$$

where  $b$  denotes the Juglar cycle extracted from a leading indicator;  $\Delta b$  its first difference;  $N$  the number of leading indicators; and  $i(X)$  the index function, which takes on +1 if  $X$  is positive and -1 if  $X$  is negative. The type-D lagging FCIX is obtained in a similar fashion.

<sup>14</sup> The OECD (2008) has recently adopted the HP-based band pass filter in place of the phase average trend (PAT) method to construct its composite leading indicators. The PAT is a traditional method of trend detection originally developed by the NBER and is calculated as follows: Deviations from a 75-month centered moving average are first calculated; then, the obtained series is divided into expansion and contraction phases and the average is calculated for each phase; a three-phase centered moving average is calculated and these averages are interpolated.

FCIXs may not be very sensitive to a revival of financial activity, because they are designed to detect signs of financial crisis. As the father of business cycle analysis, Arthur Spiethoff, pointed out, the timing of recoveries is often ambiguous, compared with that of crises.

The Japanese FCIXs are constructed only from monthly, quarterly, and semi-annual financial data that can be traced back at least to the mid-1980s. Kamada and Nasu have found 8 leading indicators: stock prices of the banking, real estate, and construction sectors; the lending attitude of financial institutions; the financial positions of firms; current profit levels of firms; housing loans; and commodity prices. Some of the leading indicators are affected by global shocks and enable the leading FCIX to detect financial crises prevailing in overseas economies.

In contrast, Kamada and Nasu have found 11 lagging indicators: corporate debt; household debt; lending interest rates; changes in interest rates on loans; the two monetary aggregates, M2 and M3; deposits; land prices nationwide and in large urban areas; as well as 3 and 9 year government bond yields. The leading indicators cover mainly balance-sheet information, so that the lagging FCIX reflects domestic financial conditions.

In the scheme of Kamada and Nasu, a possible financial crisis is warned of when the leading FCIX falls to the zero point. This simple scheme successfully forecast the BNP Paribas shock about one year ahead of its occurrence in August 2007. However, this result should be interpreted with caution, since the index fails to take into consideration the uncertainty caused by real-time estimation problems.<sup>15</sup>

Fig. 10 plots the predicted type-D leading FCIX. It forecasts three financial crises successfully, falling to zero in May 1988 (19 months before the triple sell-off), in February 1997 (8 months before the bankruptcy of Sanyo Securities), and in June 2006 (14 months before the BNP Paribas shock).

In Fig.10, the predicted leading FCIX takes positive values during November 1999–December 2001, reflecting the IT bubble. However, no crisis was observed in Japan during this period. To avoid a potential false alert, we have to be able to discern such an “economic lull”. The lagging index is useful for this purpose. The lagging index (not shown here) indicates that Japan remained in a contraction phase during November 1999–April 2004, suggesting that the revival of the leading index during November 1999–December 2001 might be indicative of an economic lull.

Some caveats are in order here. First, although FCIXs make it possible to detect signs of impending financial crises, they do not enable one to identify the source, type, or size of the crisis. Second, FCIXs do not make obvious the optimal policy measures that should be undertaken. With the help of FCIXs, policymakers must monitor financial institutions carefully and devise policy measures appropriate for the economic and financial conditions.

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<sup>15</sup> FCIXs are not immune to real-time estimation problems, such as the end-of-sample and lagged-data-publication problems, which may cause serious delay in warning signals. As a solution, Kamada and Nasu propose to predict the Juglar cycle’s turning point, where the growth rate falls to zero, by an inflection point, where acceleration falls to zero in real time data. This is an application of the well-known rule of thumb: acceleration drops before velocity does.

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