LINKS ANALYTICS

Global Systemic Risks

2013

GLOBAL SYSTEMIC RISKS

2013

a LINKS Analytics annual review

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EXECUTIVE SUMMARY

It appears that asset bubbles have become the most potent instrument in the hands of the governments in their efforts to generate the elusive growth rates, and not just in the developed economies. The overriding theme of this year's Global Systemic Risks review is the government policies that trigger, and in many cases foster, asset bubbles – self-perpetuating price or turnover increases in parts of the economy that create imbalances elsewhere.

Using a structured approach of sifting through hundreds of economic activities across three regions we identify sources of global systemic risk – asset bubbles that threaten to destabilize the financial markets. The knowledge about these sources of risk, including companies, financial institutions and government entities involved and linkages between them, should enable principal investors to implement strategic risk management process on the forward-looking basis.

The 2013 review includes two new sources of risk: the extraordinary rise in capital expenditure by global utility companies and the Japanese government debt, along with sources of risk that were covered last year: civil aerospace, the financial system in China and the U.S. farmland. Combined, these asset bubbles add over $ 4 trillion worth of "hot air" to the world economy. But above all, they create unsustainable imbalances in dozens of industries and are likely to cause significant wealth destruction if not timely deflated.

An early-stage asset bubble is developing in the electric utilities industry globally. U.S. shale gas revolution, which caused a collapse of regional natural gas prices, triggered an investment boom in gas-fired power stations. A large proportion of over $500 billion of committed investment hinges on the sustainability of low gas prices, despite the fact that at present level of pricing the U.S. shale gas industry continues to amass gigantic losses.

Japanese government debt market has always defied the gravity, with market turmoil predicted every year throughout the last decade. The country has managed to sail through the global financial crisis without any impact on its debt market largely because of the domestic funding of its debt. This year, however, the size of government liabilities is approaching the value of gross domestic financial assets, which can potentially destabilize the market. Japanese banks are highly integrated in the global financial system, not least via the project finance market dominated by them, which is the reason for us to pay special attention to Japan.

Needless to say, there are plenty of intricate linkages between all the risk sources that in combination serve as scaffolding for the world economy. The same industrial conglomerates supply capital equipment for the utilities, transport and infrastructure projects in China and aircraft engines for the aerospace industry. The same few banks that hold large part of the Japanese government debt or Farm Credit Funding bonds attempt to place parts of the project finance business in the market for the institutional investors. A clear view of these linkages and how they impact the true economic risks of institutional portfolios must be a key component of forward-looking strategic risk management efforts of principal investors.

INTRODUCTION

What a great difference a year makes. Since the publication of our last year's GSR report the equity markets have been up by 5-9%, and what is more reassuring, the S&P500 is now 45% higher compared to the low levels of 2010. Price levels that were perceived as asset bubbles and caused concern a year ago, are merely sources of strength now. Systemic risks that threatened economic stability are now the aspects of globalization that need to be embraced and profited from. The culmination of this process is the Fed Chairmen Ben Bernanke's dismissal of dangers posed by the existing asset bubbles in the U.S. economy in early February of 2013.

It is one thing to tolerate and monitor asset bubbles for the sake of long-term growth, an entirely different thing to dismiss them altogether. Unfortunately, our experience of the last few months proves the short memory of the regulators and institutional investors alike. History repeats itself. The 2013 review is marked by two underlying themes: the government and its role in asset bubbles and the strengths and weaknesses in the practice of identifying asset bubbles.

It appears that in order to generate the elusive growth rates in the global economy, we simply require asset bubbles. We are far from having a full understanding of the symbiotic relationship between the bubbles and economic growth. However, what we are comfortable with now is at least identifying, documenting and attempting to understand the intricate pathways that cause asset bubbles.

This year's effort, more than ever, sheds light on the importance of government policy in creating, expanding, perpetuating and eventually bursting an asset bubble. The emergence of all asset bubbles covered in this report without exception can be traced to government policy of a single or several governments sometime in the past. Whether the subsequent asset bubbles are intentional or unintentional consequences of the policies or whether the policies are still justified given the knowledge of asset bubbles is outside the scope of this report. What is certain is that the world economy would have had an entirely different structure and dynamics, if the scaffolding of market intervention was removed.

The degree of integration of these government policies and their impact on the economy are hard to underestimate. We are able to fly to more destinations than ever at a fraction of cost partly due to the government-subsidized export war between the two large aircraft manufacturers. We pay a lot more for groceries due to the U.S. government imposition of minimum ethanol content in petrol. China's centralized push towards increasing the share of natural gas in the energy mix irrespective of economics has added new jobs, incomes and spending in the U.S., Germany and France. The list goes on and on, until it is impossible to differentiate between genuine market-driven economy and intervention.

In the end, we are far from preferring market-driven outcomes from the ones created by intervention. These are normative and market-fundamentalist views that cannot be substantiated with any amount of data. Our main concern is sustainability of the outcomes and the stability of the regime. In this sense, we document the sources of risk that are inherently unstable and prone to explosion, causing ripple effects throughout the global capital markets.

It is this latter emphasis on sustainability that makes our research different from all academic efforts in devising asset bubble tests. We treat asset bubbles as complex social phenomena that require multiple angles to tackle. Academic literature concentrates either on price alone (attempting to come up with a statistical filter that separates asset bubbles from normal asset price appreciation) or a combination of the price and some hypothetical fundamental value.

In the end, our goal is not to devise a conclusive prove that a certain asset is in a bubble state. It is to draw the investors' attention to the dynamics of price appreciation and the underlying inconsistencies in the supply chain that such appreciation causes. These inconsistencies are factual and irrefutable, and we hope that armed with this knowledge a foresighted investor can take precautionary measures to avoid the pitfalls of investing in an asset bubble.

It is not accidental that governments feature prominently in this year's report. Due to the economic malaise, in many ways the governments have nationalized asset bubbles, or replaced industry-specific asset bubbles with government debt. And although most world governments have participated in this nationalization process, we have reasons to believe that in some instances, such as Japan, the issue of sustainability is more acute this year. Moreover, the degree of integration of the Japanese financial system into the global real economy is underreported and underappreciated. These two reasons have prompted us to focus on the government debt of Japan specifically.

A bubble of an entirely different nature and scale is developing in the gas-fired power station market. The roots of this bubble can be traced back to the shale gas revolution in the U.S., the environmental restrictions in Europe and China's push towards increasing the share of natural gas in the generation mix. The resulting imbalances in a number of industries have prompted early stages of a bubble in the industry that is very well connected through multiple supply chains with the rest of the economy.

The three asset bubbles featured in our 2012 report: China infrastructure and finance, U.S. farmland and global civil aerospace have been updated and revised, and although the size and scale of the first of the three sources of risk is somewhat diminished, the hyperactivity continues full speed ahead both in the U.S. agriculture and global civil aerospace industries.

Finally, we have decided to discontinue the coverage of the U.S. Social Media/User Generated Content asset bubble largely due to the gradual deflation of this source of risk post Facebook IPO. Many listed companies have performed poorly, but most importantly, the new VC investments in the sector have dried up abruptly. Nevertheless, the deflation process has made a sizable impact on the server and semiconductor markets – something we anticipated and flagged in our earlier report.

THE METHODOLOGY

Asset bubbles have been extensively covered in professional and popular media, in a wide variety of books covering disciplines as far apart as history, economics, agriculture and finance. All these sources have one thing in common – they attempt to describe asset bubbles years after they burst and the damage is done. So the question is, is it at all possible to identify asset bubbles before they burst?

Academic effort in this area is somewhat disturbing. Despite abundance of bubble reporting and evidence, mainstream orthodox economic thought did not even acknowledge the existence of asset bubbles until recently. Once the mounting evidence of built-in reflexivity in markets was hard to ignore, there were efforts to "explain away" these events as either temporary imbalances that correct very quickly or as fundamentally justified levels of pricing that simply reflect the market preferences. Often academic models require two distinct sets of investors: "rational" and "irrational", or differing knowledge levels. It appears that the greatest effort is directed towards reconciling facts with outdated theory.

The greatest fallacy of most of the academic research in this area is the most common definition for an asset bubble: an upward trajectory of asset prices beyond the fundamental value. Defined this way, the researcher is forced to chase the elusive "fundamental value".

Our definition and approach to identifying asset bubbles is based on the practical benefit. ***We define asset bubbles as abrupt asset price or trade turnover changes that have self-perpetuating nature and create unsustainable situations elsewhere in the supply chain or the economy.*** This definition allows us to ignore even the existence of the fundamental value and look for the key hallmarks of asset bubbles: high price appreciation and sustainability issues that are the potential triggers for the bubbles to burst.

Since asset bubbles are social phenomena, the approach to identifying them has to be multi-faceted. Over the years we have improved and added some standard tests that i) we believe are the most potent hallmarks of asset bubbles and ii) are corroborated by academic research to have predictive power. The five tests for asset bubbles are:

1. High pace of asset price or turnover volume growth
2. Sustainability constraints created by this growth
3. New entrants with cheap borrowed money
4. Poor corporate governance or lack of transparency
5. Government Intervention or technological change

THE PROCESS

We examine all major economic activities in North America, Europe and Asia and apply the five tests to the assets in each economic activity. Assets, in this context, are defined broadly as raw materials, finished products or fixed assets used in the economic activity. The first test of high pace of asset price growth applied to the utilities, for instance, would entail checking for evidence of price or volume increases of coal or natural gas (raw materials), power plant equipment (fixed assets) and the generated power (finished product).

All five tests are necessary conditions, in other words, we have to have evidence of all five standard tests in order to identify an asset bubble. We follow the NACE economic activity classification for Europe and NAICS for the U.S. Although there are hundreds (thousands at the lowest level) of economic activities in each classification system, most fail the first test, which narrows down our search at a very early stage.

The resulting short list is analyzed more thoroughly in terms of the linkages between various economic activities, enabling factors and involved parties. At the final stage only those asset bubbles that are large enough and sufficiently well connected with the global financial assets are included in the report. We have also included the shortlist of the new sources of risk that did not make it into the report for various reasons.

WHY NOT GAUGING THE UPSIDE?

Some of our clients and other institutional investors have enquired whether the same methodology could be used to identify potential "hyper-growth" areas, and if so, why we do not pursue this line of research.

There are two parts to the answer to this question. First, it is rightly remarked that if we are able to spot asset bubbles early enough, then there is a significant abnormal profit to be had from investing in the asset bubble. So in many ways, the list of global systemic risks could become a shopping list for institutional investors.

It is our belief that this is an extremely dangerous interpretation of the GSR research. Although we are able to identify the bubbles and assess the intensity, in terms of timing we always err on the conservative side, in other words, asset bubbles burst or deflate faster than we think. An investor attempting such an investment should be able to liquidate positions within days if not hours of the first signs of distress. In our opinion, institutional investors simply do not have the governance structure and flexibility in order to implement such an investment strategy.

The second part of the answer relates to whether it is possible to identify areas of growth that are implied by the bursting bubbles. This is indeed possible and can be carried out in a reasonably safe way. The resulting investment universe, however, would consist of a diverse set and a combination of large cap equities and often illiquid assets. Since the natural state of institutional investors, unlike many hedge funds or traders, is fully invested, they already have much of this exposure on their books. The minority of direct exposure could be an interesting complimentary investment for a niche asset manager, however, hardly a decisive part for the overall asset mix.

THE SHORTLIST

Several economic activities in various regions did not make it into our risk network. The shortlist contained areas that may resemble asset bubbles, but upon closer inspection fail one or more of our tests, or are not well enough linked with the rest of the economy and other asset classes to create large enough impact on institutional portfolios.

Four of these areas (Table 1), in our opinion, deserve a special mention largely because of the great interest from the investor base, and not least of them is, of course, gold.

Table 1: *Shortlist of global systemic risks that failed the GSR test*

Activity	Region
Manufacture of motor vehicles	Asia
Secondary and Tertiary education	U.S.
Precious Metals (Gold)	Global
Luxury goods	Global/Asia

THE CASE FOR GOLD PRICE BUBBLE

There is no better way to describe the rationale for the new gold rush other than in the words of A. Dumas' colorful character Porthos: "I fight because I fight", or paraphrasing it, "I buy because I buy". There are, of course, reasonable-sounding arguments along the lines of lack of trust in paper money, storage of value tried by time etc. However, all arguments and discussions in the end lead to the same conclusion: gold is perceived as good means of storage of value, because everyone perceives so.

Gold passes four of our five tests with flying colours, and an extra test that we created specifically for gold out of sheer curiosity – the "fundamentally justified" test, i.e. prices in orthodox theory should follow the demand, however irrational that demand is.

Gold price has appreciated faster than most asset classes in the past decade (Test 1). There is plenty of evidence that new and often leveraged money chases gold as a viable investment. According to the Gallup poll[1], 34% of Americans choose gold as the best long-term investment. Unsurprisingly, Gallup did not even consider including gold in the list of alternatives several years ago, so we have no reliable way to judge the change in attitudes over time. Temporary gold purchase/recycling kiosks have become ubiquitous in most large cities in Europe. So Test 3 is certainly passed.

A large part of new demand in gold comes in the form of financial investments in ETF structures (SPDR and others). The structures are often misunderstood and overly complex. Governance and transparency of particularly swap-based ETFs is certainly questionable (Test 4). Finally, the real swing factor in demand is the central banks' buying of gold, which is the most ultimate form of government involvement (Test 5).

[1] http://www.gallup.com/poll/149195/americans-choose-gold-best-long-term-investment.aspx

In terms of demand, despite what is often unsubstantiated claims of popular media, true end demand for gold for jewelry has been stagnant for many years, while industrial demand has been largely flat (Figures 1 & 2). So the only swing factor is investment demand for ETF and similar products and physical bar and coin demand.

Figure 1: *Quarterly demand for gold from the jewellery industry, source: World Gold Council*

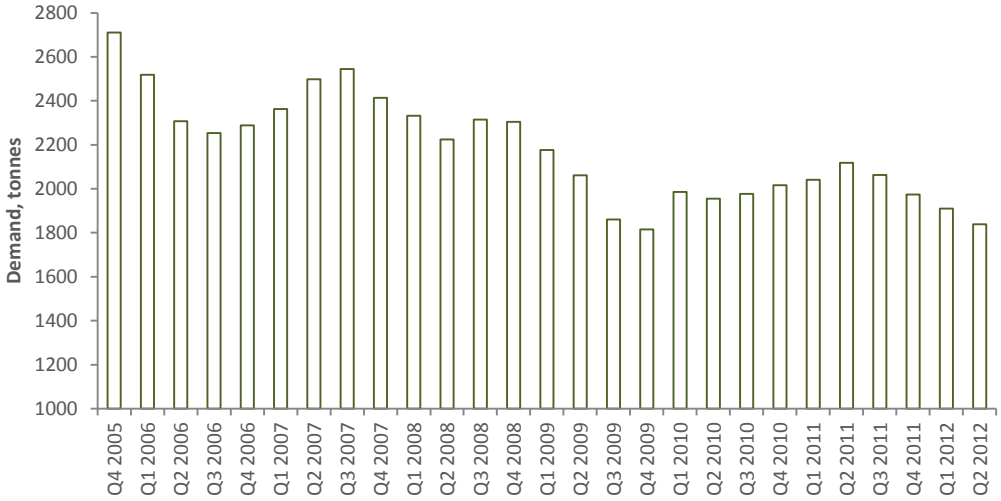
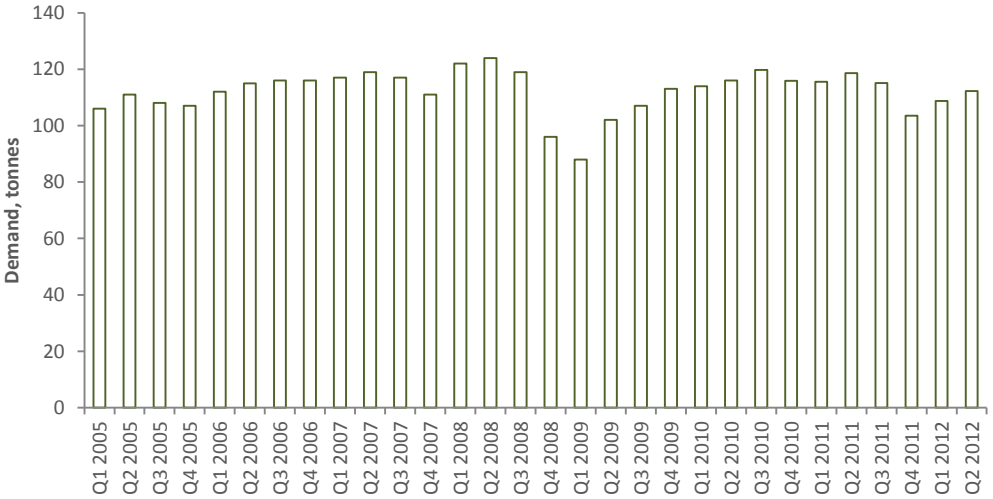
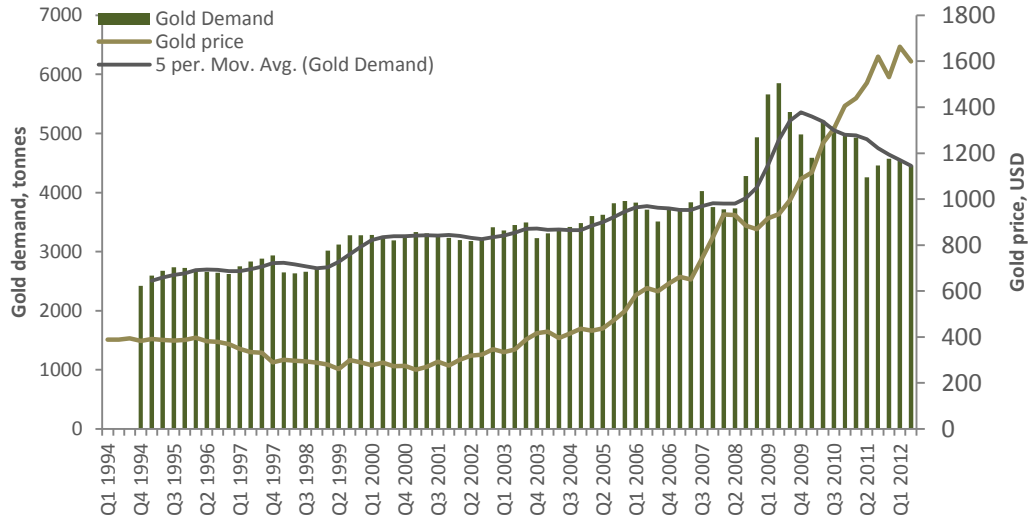


Figure 2: *Quarterly demand for gold from the manufacturing industry, source: World Gold Council*



What is more interesting, the total demand for gold, including demand for financial products and bullion, has also been falling in the past few years, while the price has been volatile or outright up (Figure 3).

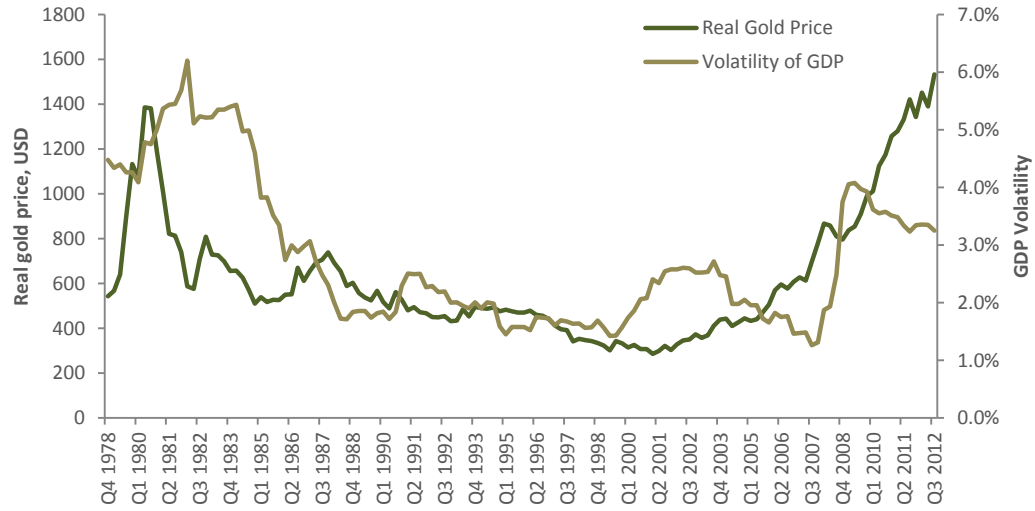
Figure 3: *Total demand for gold and gold prices, Source: World Gold Council*



So for once, even following the fundamentalist view of asset bubbles, we can recognize one. Of course, there is the argument of the uncertainty in the economy and gold's status as a hedge against such uncertainty. If we use the volatility of GDP as a proxy for this uncertainty, we can see some evidence of this argument, however, the most recent spike of gold price still remains unjustified (Figure 4).

Figure 4: *GDP volatility and deflated (real) gold price*

GDP volatility is calculated as the rolling standard deviation of quarterly GDP growth levels for four years. Price of gold has been deflated to 2005 price levels using GDP deflator.



But the reason we decided not to include gold in our list of Global Systemic Risks is twofold. First, as long as the "I fight because I fight" mentality dominates, gold will always fail our test number two: sustainability across the supply chain. Secondly, although falling gold prices will hurt many investors who have direct exposure to the metal, there is little real economy repercussions for large institutional investors.

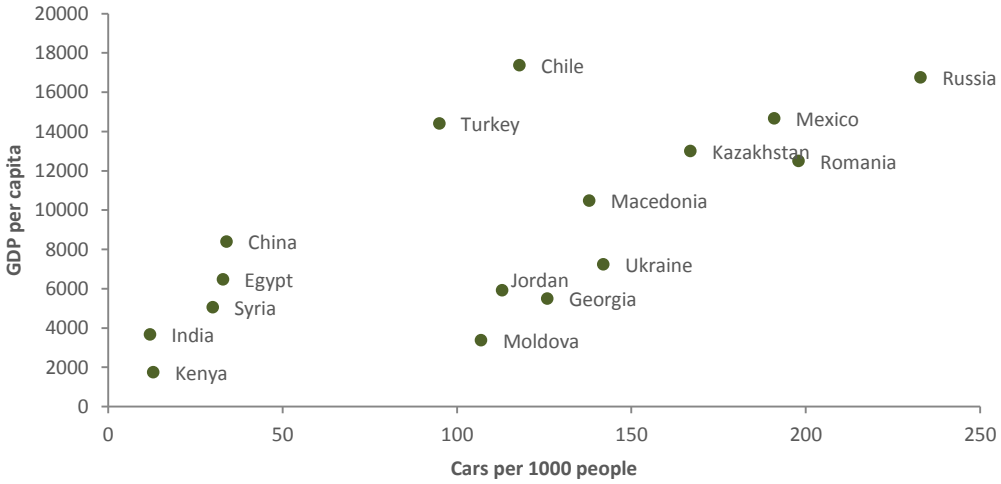
AUTOMOBILE INDUSTRY IN CHINA

Although China features in our GSR research for a number of years, the automotive industry has escaped our attention despite its very specific place in the economy. At first glance, the rapid capital expenditure in car factories in China, astonishing volume ramp up terms and demand expectations may point at a potential asset bubble. So our Test 1 is passed.

Upon closer inspection, however, there are fewer reasons to suspect an asset bubble in this industry. There is little government involvement or regulation beyond what is customary globally, disclosure about the plant output, sales and registration numbers are reasonably accurate, so we fail at least two tests. The domestic automobile industry is one of the few industries that generates sufficient return on capital to cover its true economic cost of capital.

But most importantly, there is little evidence that makes us doubt the sustainability of the market. Certainly, as in any other country, the market is and will be cyclical. However, the total volumes of car production are unlikely to fall to any pre-liberalization level, because there are no sustainability issues (Test 2). In terms of supply, the total volume growth, although impressive, is largely manageable for the supply chain. On the demand side, the most recent increase in car ownership still does not fully reflect the economic potential of the country. And although we doubt that the per capita car ownership will quickly catch up with even Turkey or Russia, the current levels of ownership can still grow at a remarkable pace without a disconnect with the rest of the economy (Figure 5).

Figure 5: *GDP and car ownership per capita, selected countries, Source: World Bank*



SMALLER "BUBBLETS"

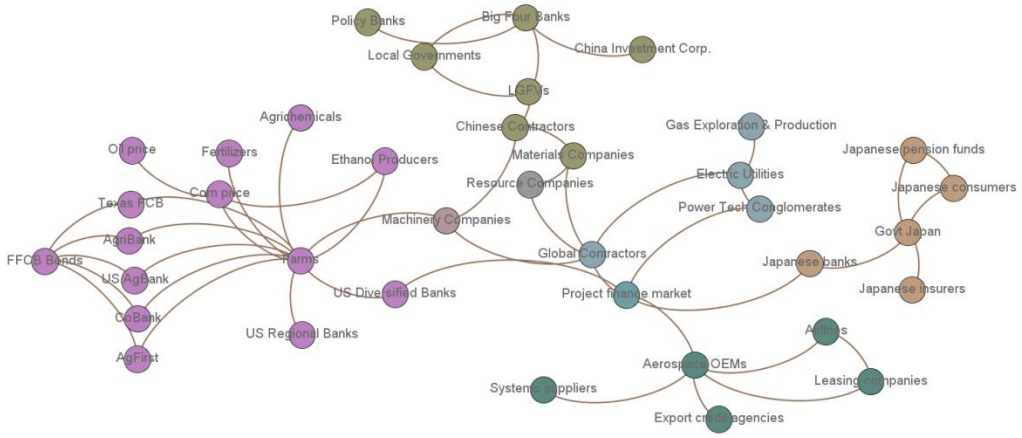
The asset "bubblets" – bubbles in economic activities that are small and not well-connected with the rest of the economy are interesting in terms of testing our methodology. However, by their nature they have little impact on institutional portfolios. U.S. education and the global luxury goods markets are examples of such bubblets. Pricing, volumes, sustainability and governance in both cases point at a likely collapse or deflation. The marginal impact on our global risk network means that these areas are excluded from the final report.

THE RISK NETWORK

Our updated risk network has five sources of economic risk and several global markets that are conduits for risk transmission (Figure 6).

Figure 6: *The Risk Network*

The risk network is a high-level visualization of the global systemic risks, participating companies, government entities, markets and their linkages. An interactive version of this network is available on LINKS Risk Portal.



The U.S. farmland and global aerospace markets feature in the network entirely unchanged from last years. Our emphasis in the Chinese infrastructure bubble is now on the financial system. The two new sources of risk: Japanese government debt and gas power are intricately linked with each other and the rest of the network through the global project finance market.

As always, it is the linkages between the agents that render each of the risk sources particularly damaging. A stress in the Japanese government bond market, for instance, will have an immediate impact on the global project finance market, the U.S. and European banks that in turn may trigger other sources of risk, such as the global aerospace or the U.S. farmland.

It is precisely the knowledge of linkages and ability to assess the intensity of these sources of risk that enable institutional investors to navigate the potential adverse market conditions.

THE JAPANESE GOVERNMENT DEBT

INTRODUCTION

For a number of reasons we have refrained from covering government debt in the Global Systemic Risks framework in the past. First, and foremost, apart from few exceptional cases (e.g. Greek bonds) cash flow generation of government debt obligations is by definition fully transparent and predictable. This means that LINKS Graham Risk framework is completely adequate for assessing asset price dislocations, without further need for microeconomic analysis. Secondly, it is the ambition and mission of LINKS to cover those sources of systemic risk that are not fully understood or actively covered by mainstream analyst and media community. Government debt of major issuers is far too broadly covered and well understood to qualify in this respect. And finally, the global systemic risk sources covered by LINKS are typically very specific in nature, with clearly defined and observable risk transmission pathways. Government debt, in this sense, is again far too broad, affecting the whole economy and all consumers in general, and as such, is more appropriate for macroeconomic analysis.

Despite these considerations, the present situation in the global government debt market in general, and of one issuer in particular, is so peculiar that in many ways it fits most of our requirements of the potential GSR risk source. Although the coupon payments are still predictable and transparent, the core LINKS risk scenario refers not to the cash flow, but merely to a small and quite plausible change in yield. Secondly, despite the abundance of analysis about the size and scale of the debt problem and the unsustainable nature of it, there has been little effort spent on explaining the potential triggers, likelihood and the knock-on effects that such an event may cause. And indeed, these transmission mechanisms, at least in case of Japan, are far too obvious and perilous to be ignored.

But before singling out Japan's case, it is worthwhile to reflect on the debt sustainability framework and the most recent sustainability statistics. The framework here is pretty standard: the discounted value of current and future income should be at least equal to the discounted value of all current and future non-interest expenditure[2]:

$$\sum_{i=1}^{\infty} \frac{g_i}{(1+r)^i} \leq -b_t + \sum_{i=1}^{\infty} \frac{t_i + s_i}{(1+r)^i},$$

where g is the government spending in period i, t is the tax collection, s is the benefit of seigniorage (money printing) and b is the accumulated debt. With a few adjustments it follows from here that debt is sustainable if[3]:

$$p_i - b_i\left(\frac{r-\gamma}{1+\gamma}\right) \geq 0,$$

[2] Wijnbergen, S. van and Budina, N, 2008, Quantitative approaches to fiscal sustainability analysis: a case study of Turkey since the crisis of 2001, The World Bank Economic Review 23(1), pp. 119-140.

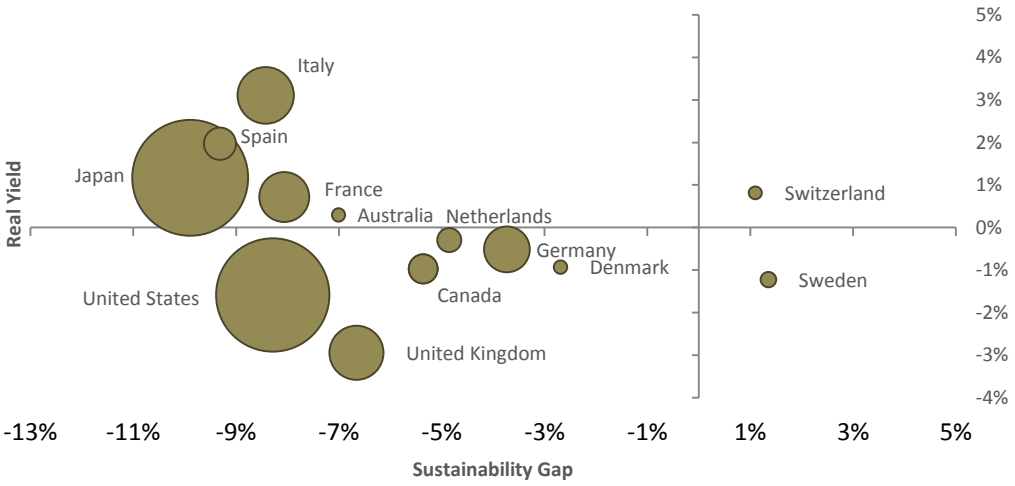
[3] Buiter, W.H., 2004, Joys and pains of public debt, in P. de Gijsel and H. Schenk (eds.) Multidisciplinary Economics: the Birth of a New Economics Faculty in the Netherlands, Springer, the Netherlands, 2005, pp. 209-224, http://www.nber.org/~wbuiter/joys.pdf.

where p is the primary balance as % of GDP, b is the level of debt as % of GDP, r is the real long-term yield and γ is the real GDP growth rate. Of course, it follows that GDP growth rates are as important as the level of debt and the primary balance, i.e. high debt levels can either be paid down by paying back or by outgrowing the debt burden. Our interest is in the levels of debt that are impossible or highly unrealistic to grow out of.

We will initially focus on the reported standard statistics both based on OECD actual and IMF forecasts. We will then delve into the complexities of data and definitions in order to cover the governance aspect of this risk source.

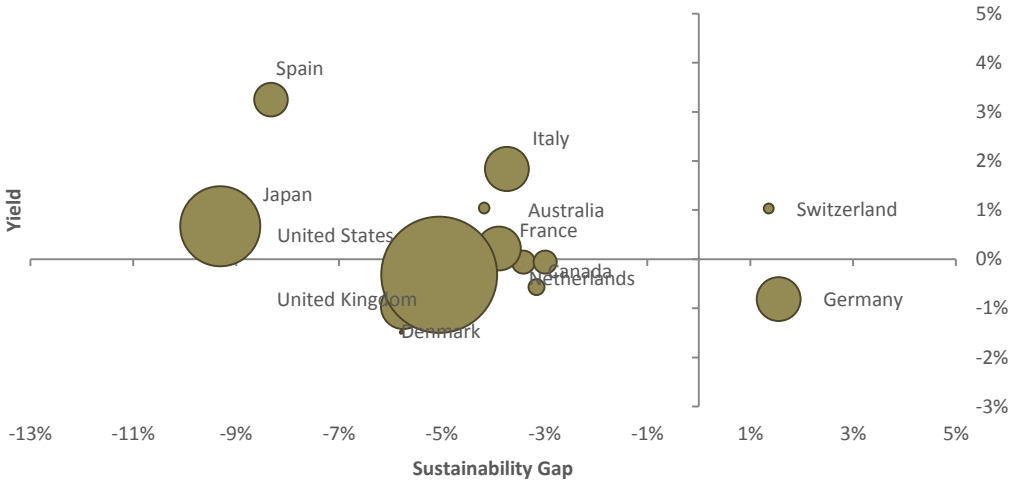
It is not surprising that in the present sluggish growth environment, most governments exhibit unsustainable growth levels (Fugure 7). This in itself is not a serious problem, since recovering growth rates will quickly remedy the situation and move the sustainability numbers to the positive territory. The size of the circle in the figure refers to the absolute value in USD of net debt. While most countries have clustered around the sustainability levels of -3% to -5%, Japan and Spain are notable exceptions.

Figure 7: *Debt sustainability, OECD numbers*



A convenient way to interpret this is to translate this gap into the required GDP growth rates in order to outgrow the debt burden. Although integrating the rosy expectations built into the IMF growth rates does help the situation for some countries (notably Germany), the United States and the UK would require growth rates of over 7% in order to balance the equation, while Japan's growth rate would need to be 15% or more (Figure 8).

Figure 8: *Debt sustainability, IMF forecast growth rates*



Clearly, judging the situation based only on an oversimplified macroeconomic model is not adequate. Governments have multiple resources at their disposal, including the existing stock of internal and external assets, and not least the ability to inflate the debt away. This is applicable to some extent to the United States and the UK. Japan, however, is a very special case and not only because of the exceptional size of the debt burden both in absolute terms and compared to own economy. It is a special case because of Japan-specific governance and sustainability issues.

The debt burden of Japan has been a subject for discussion throughout the past decade, with internal and external commentators generally agreeing that the absolute level of debt is unsustainable. This was not always the case though. As early as in 2005, Broda and Weinstein[4] calculated a constant tax rate that would be required to bring the net government debt (which is substantially lower than the gross debt) to more sustainable levels and since the tax levels required were broadly in-line with the U.S., they concluded that the debt levels in Japan were sustainable. These calculations have been re-run in later years, each year the results yielding a higher level of required tax, until finally the academics concluded that the level of taxes needed are politically infeasible[5].

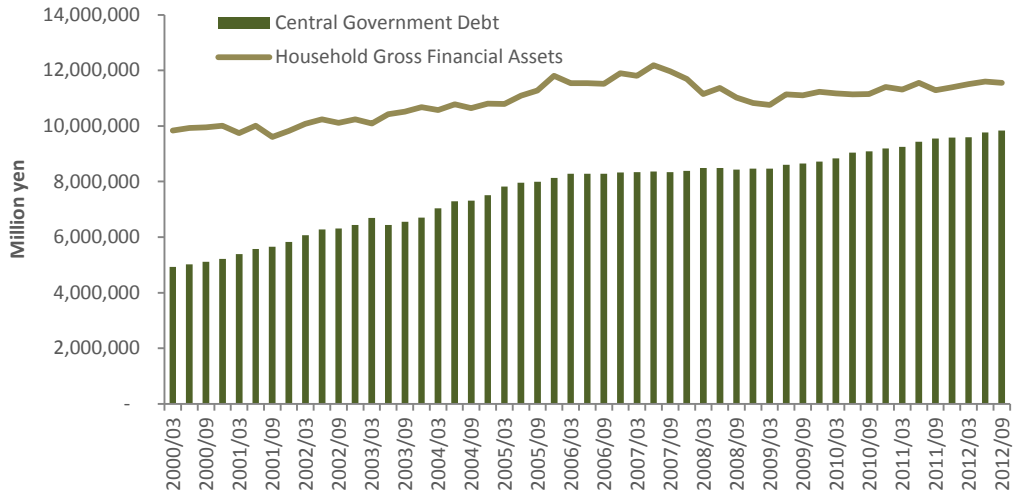
The second question that the academics pondered about was related to seeming defiance of deteriorating fundamentals by the Japanese bond market: the yields continue to remain exceptionally low. A number of reasons have been put forward to explain this fact. Chiefly among them is the internally funded debt. In various periods up to 95% of all outstanding Japanese government bonds were held by Japanese residents. Two complementary reasons are i) the continuously stagnant economy, which offers very few worthwhile alternatives to improve on the low JGB yields and ii) relatively low tax base in Japan, which gives investors comfort that the Japanese government will eventually kick start a form of a fiscal consolidation.

[4] Broda, Christian, and David E. Weinstein (2005). "Happy News from the Dismal Science: Reassessing Japanese Fiscal Policy and Sustainability," in Takatoshi Ito, Hugh Patrick, and David E. Weinstein (Eds.) Reviving Japan's Economy. Cambridge, MA: MIT Press, pp.40-78.
[5] Hoshi, Takeo and Ito, Takatoshi (2012). "Defying Gravity: How Long Will Japanese Government Bond Prices Remain High?"

Corrected for these factors, it has been shown that Japanese bond yields are in fact sensitive to the fundamental factors such as debt-to-GDP ratio and the primary fiscal balance. ***And here lies our key argument: there are strong reasons to believe that the factors enabling low JGB yields will not be sustained for much longer.***

To begin with, domestic savings are eventually depleted. When will this happen? Depending on how exactly debt and assets are defined, this may have already happened. Varying interpretations of debt may or may not include Government guarantees, local government long-term liabilities or even bonds issued under Fiscal Investment and Loan Program (FILP), which are in principle indistinguishable from other JGBs. Using the Treasury definition of debt and the BoJ statistics on household financial assets we can illustrate the less than comfortable state of affairs (Figure 9).

Figure 9: *Japanese Government liabilities and gross domestic financial assets, Source: BoJ and Treasury*



Since 2000, when the total debt stock was only 50% of household financial assets, the anemic growth rates and continuous borrowing has brought this ratio above 90% as of third quarter of 2012. Incidentally, third quarter 2012 was also marked by a noticeable increase in foreign ownership of JGB's of up to 9%. Although the 90% ratio is already a problem, the actual picture should be more alarming, since the household financial numbers used are gross numbers, without taking into account household debt, mortgages and other liabilities.

The fact that a certain hard barrier is approaching could not have escaped the attention of investors. All major Japanese banks have highlighted the risks relating to their JGB holdings and have started to cut the duration of their portfolios. In December 2, 2012 Nobuyuki Hirano, the CEO of Bank of Tokyo – Mitsubishi, admitted that the bank's holdings of $485 billion of JGBs were risky, however, what is more troubling, he then went on to say that the bank was powerless to do anything about it other than tweaking the duration.

And this brings us to the last and the most pervasive argument: poor governance and complacency. The two standard escape clauses used – internally held debt and Japanese government is unlikely to default, are the veil behind which hides the common consensus-based irresponsibility. The CEO that fully acknowledges the problem and admits that he is powerless to do anything about it is only the visible symptom of poor governance. The real problem lies

behind: at the treasury and layers of government agencies responsible for debt administration and repayment.

It is remarkable, that up until now it is not quite clear which agency holds the final authority over which part of Japanese government debt. The decision-making is consensual and often a result of inter-departmental negotiations. Funds are disbursed at lower levels of authority, however, with little ex-ante emphasis on which entity is in the end responsible for balancing the books and paying back the loan. As such, this structure is as close to collective irresponsibility as can be.

The debt management system is opaque enough without the co-mingling social benefit system. However, the government is free to finance its debt servicing with "surpluses" from the social benefit system, which gives rise to the large difference between net and gross debt. Although there is significant amount of reporting, particularly in the flow of funds report published by the BoJ, it is not possible to ascertain that these surpluses do actually exist.

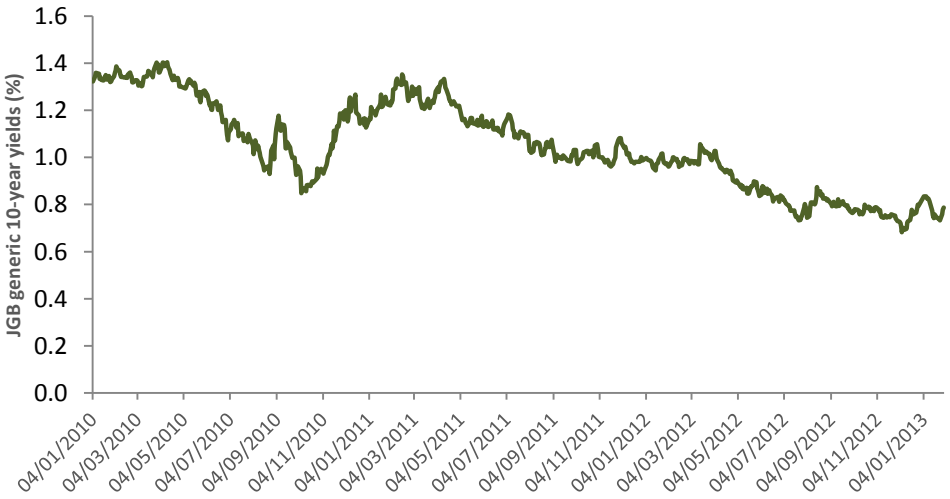
THE FIVE TESTS

Japanese government debt as a risk source comfortably passes our five tests. This is partly due to the fact that the government itself is the culprit, which makes it easier to justify government intervention. A more problematic question is the "why now?" In the end, if the situation can be sustained for the next two decades, as suggested by some academics, there is very little point in this knowledge. Our argumentation in the sustainability gap, therefore, is by far the most important part of our concern.

High pace of asset price growth

Despite the staggering level of both net- and gross debt as a proportion of GDP, the JGB prices have been stable and rising. The yields as of writing this paper are back to all-time lows (Figure 10).

Figure 10: *JGB 10-year yields*



One critical way, in which the JGB risk stands apart is the fact that both internally and externally the extent (if not the timing) of the problem is well accepted. This does translate into episodes

of confidence erosion, such as the one in the fall of 2010, when yields climbed by 50 basis points in two months. In the past decade there were two incidents of 100 bp upward moves in a month. Contrast this with the U.S. property prices pre-2007: the prices were up almost continuously, with almost no pull-backs in the housing market prior to the crush.

Sustainability

There are multiple issues with sustaining the current state of affairs. First, Japanese central government budget, quite expectedly, appears to be beyond repair (Table 2). The total expenditure, including earthquake recovery, is at 93.6 trillion yen, while tax revenues cover only 42.3 trillion of this. More than half of the tax revenues, or 22 trillion yen is spent on servicing the debt burden, and this level of spending is on the back of historically low cost of debt.

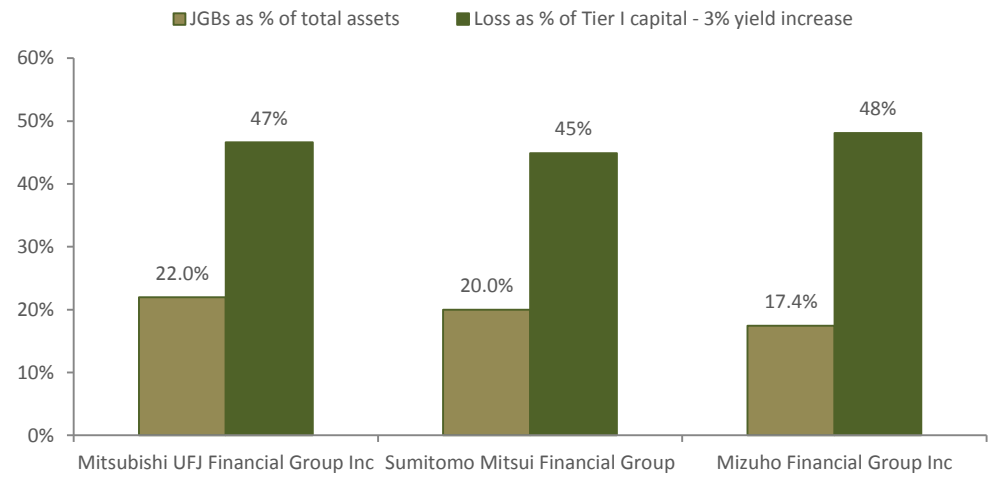
Table 2: *Japanese government budget (2012)*

Budget	billion yen
Tax revenues	42,346
Other revenues	3,743
Government bond issuance	44,244
Reconstruction taxes	531
Other revenues for reconstruction	12
Reconstruction bonds	2,682
Total income	**93,558**
National debt service	21,944
Primary balance expenses	68,390
Public works	9,876
Social security	26,390
Local allocation tax grants	16,594
Regional revitalization	910
Recovery from earthquake	3,250
Interest payments of recon. Bonds	125
Contingency reserve for recovery from earthquake	400
Other expense	23,945
Total expenditure	**93,558**

Secondly, although the debt burden is almost fully held by residents, the residents are quickly running out of financial assets. The stock of government liabilities is approaching the total size of gross household financial assets (Figure 9), and is now above net financial assets, which means households are funding JGB's by running debt.

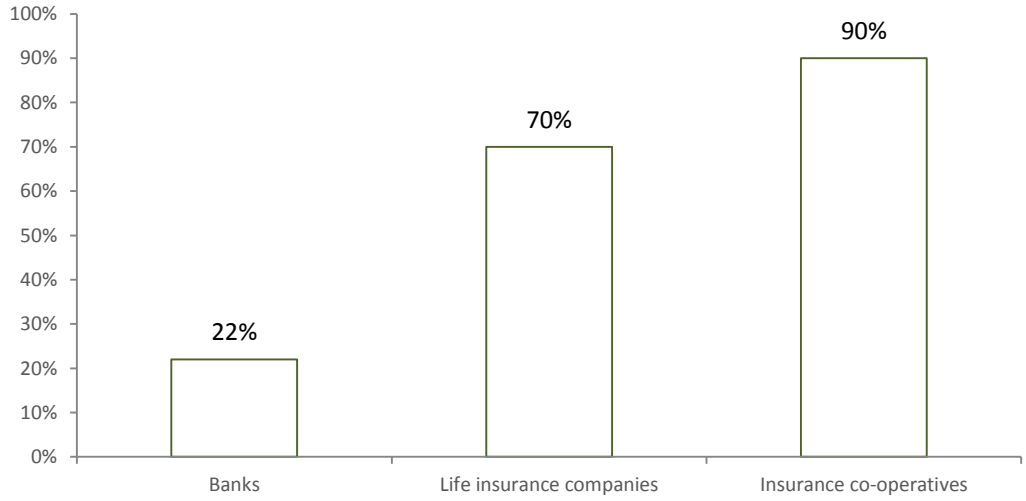
Finally, the fragility of the system is not so much in the likelihood of the government debt default, but the degree of exposure of the domestic financial system to minor shifts in the yield curve (Figure 11). JGB holdings for top three banks in Japan constitute close to 20% of their total assets, or 4-5 times their Tier I ratio. A three hundred basis point shift in the yield curve (which would bring the yields to 4%), would wipe out half of the banks' capital.

Figure 11: *Exposure of banks to JGBs and potential loss*



The portfolios of regional banks, insurance companies and the pension funds have an even greater exposure (Figure 12).

Figure 12: *JGBs as % of assets at financial institutions*



New entrants with cheap borrowed money

Third quarter of 2012 saw a marked increase in foreign ownership of the Japanese government bonds. According to the BoJ data, foreign residents owned 9.1% of outstanding JGBs, with bulk of it coming from China and rest of Asia. The new entrants with cheap borrowed money, in this case, is the Chinese government, with its capital based on highly leveraged domestic economy.

Poor Corporate Governance

The quality of corporate governance in Japan has been well documented. In the private sector, it is sufficient to recall the most recent case of Olympus. On a broader basis, of over 1600 companies listed on the TSE, only 100 have independent directors, while over 1000 do not have even one independent member.

Public debt-related governance, in particular, has been reported to be inefficient and opaque[6]. There is little accountability; decision-making is based on inter-departmental negotiations, with no ultimate responsible body for the various cost centers and corresponding solvency efforts.

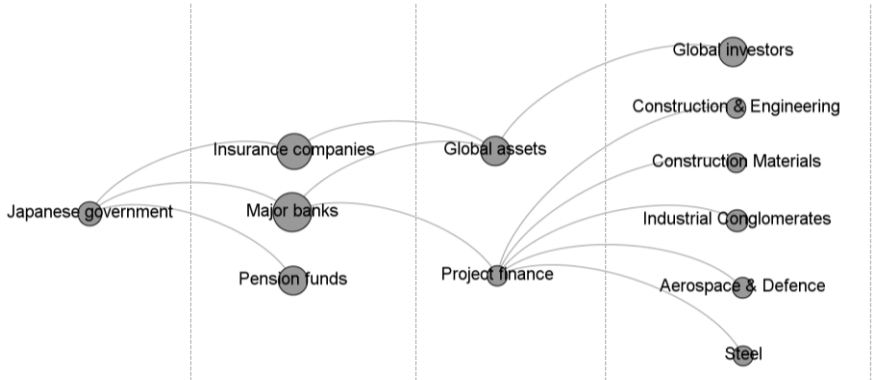
Government intervention or technological change

The source of this particular systemic risk is, of course, government intervention: the successive Japanese governments have tried to resuscitate the stagnant economy with monetary means rather than undertaking serious structural reforms to boost the competitiveness and bring dynamism to the economy.

THE TRANSMISSION MECHANISM

The combination of its potential size, vulnerability to minor pricing shocks and the intricate transmission mechanism, in our opinion, makes the Japanese government debt market one of the core sources of global systemic risk.

Figure 13: *Japanese government debt risk source - the transmission mechanism*



Source	Transmission	Primary effect	Secondary effect	Sum Impact
$ 125	$1,160	$280->	$ 110*	$ 1,675

In many ways, the perfect storm does not need to involve a full-blown default. In case of adverse developments in the JGB market, which we define as 3% shift in the yield curve, the immediate cost for the Japanese government is minimal – about $ 55 billion refinancing cost due to the higher yield. Such a rise in yield is a lot likelier going forward, as the foreign participation in the JGB market is increasing, while domestic financial assets are largely fully utilized. The cost of shoring up the banks, which will be insolvent, will add an extra $ 50-75 billion in the first stage at least. This puts the total bill at the source of the crisis at $ 125 billion.

The key transmission mechanism for such an event lies through the Japanese banks, insurance and trading/trade finance companies. Due to the continued domestic low yielding environment, Japanese financial institutions have gone farther afield to generate yields, most importantly in the global project finance business and physical assets at large. These assets include aircraft

[6] Goto, Y "Governance of the Management of Public Debt in Japan", Policy Research Institute, Ministry of Finance, Japan, Public Policy Review, Vol.4, No.1, December 2008

leasing companies, oil pipelines and refineries, chemical plants, construction projects and all other capital-intensive areas of the global economy. Faced with a drastic impact on their Tier I capital (up to 50% drop), Japanese banks will be forced to liquidate their global assets, possibly in fire sale. The initial impact on the balance sheets purely due to the principal loss of the JGBs will be $ 1.1 trillion. The fire sale then is likely to increase these costs further.

The primary effect of such an event will be acutely felt in the global project finance market and generally asset pricing. Total revenue declines and re-pricing of assets globally will cause another $ 390 billion loss. The combined effect of a 3% increase in Japanese yields (even without a default) is likely to be to the tune of $1.7 trillion.

INTENSITY

The depth and liquidity of the JGB market mean that the ultimate test for the crisis intensity is actually the bond market itself. The purpose of gauging the intensity is not an attempt to predict a slump in the JGB market, rather it is to forewarn the institutional investors against a meltdown in the project finance and fixed asset markets globally. Therefore, the long end of the yield curve and the steepness feature in the calculations of intensity. The levels considered critical here are 4% yield for the 10-year bonds and a 1-5 year spread of 100 bp.

A key uncertainty is also connected with the size of household financial assets. The total volume of financial assets has changed its trend growth level several times over the course of last decade and may do so again. The critical level for the household financial assets is the size of government liabilities. The intensity gauge thus constructed currently hovers around 0.5 (Figure 14).

Figure 14: *Japanese government debt risk intensity*

GAS POWER

INTRODUCTION

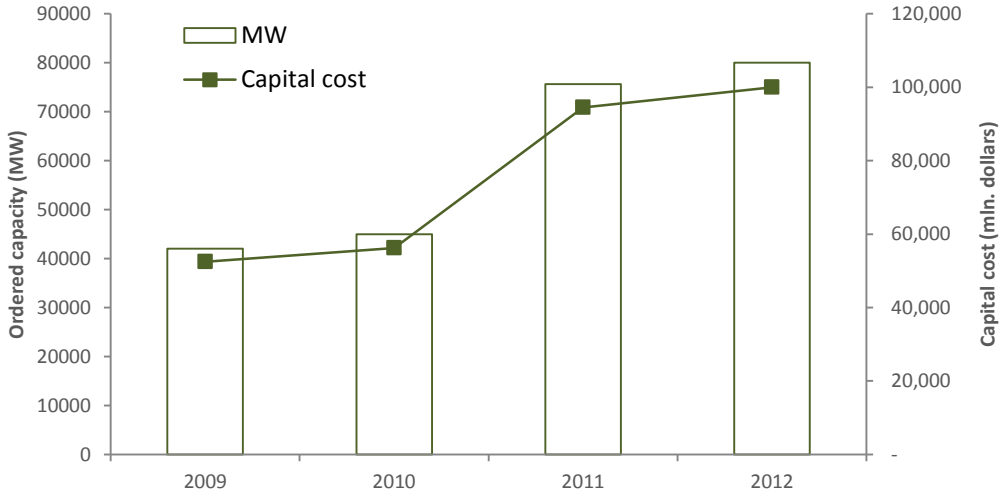
No source of risk covered in this year's GSR report is as "perfect" as the gas power. It is perfect in the sense of its history, development, emergence and likely bust following all typical boom-bust patterns without exception. All the required preconditions are in place, from the government's intervention to technological innovation and masses of new investors expecting quick bonanza to media proclaiming the dawn of a new era. And although the greatest impact and source of this risk lies firmly in the story of the U.S. shale gas, the true magnitude of the risk is fully understood only by looking at the global gas and power markets simultaneously.

As late as in 2008 most experts held an opinion that world natural gas reserves would run out sooner than oil reserves. The "peak gas" theory, in a way, was always more potent than the "peak oil" theory, although both were around for as long as the resources were used on an industrial scale. Contrast this with the most recent statements of "abundant" gas reserves and resources heralding a new industrial age in the U.S., and it becomes clear how large a leap has been made by the media in the period of less than five years.

The gas power source of risk, however, does not refer to the "bubble" in the U.S. shale gas industry, which in itself is not hugely damaging for the broader investor base, but rather to the overinvestment in and overreliance on CCGT, or combined cycle gas turbine-driven power plants by the global power generation industry. The wave of overinvestment in CCGT plants has been driven by a confluence of several global events: i) the U.S. shale gas revolution, ii) large-scale deployment of renewable energy in Europe and iii) mandated increase of gas-fired power station investments in China.

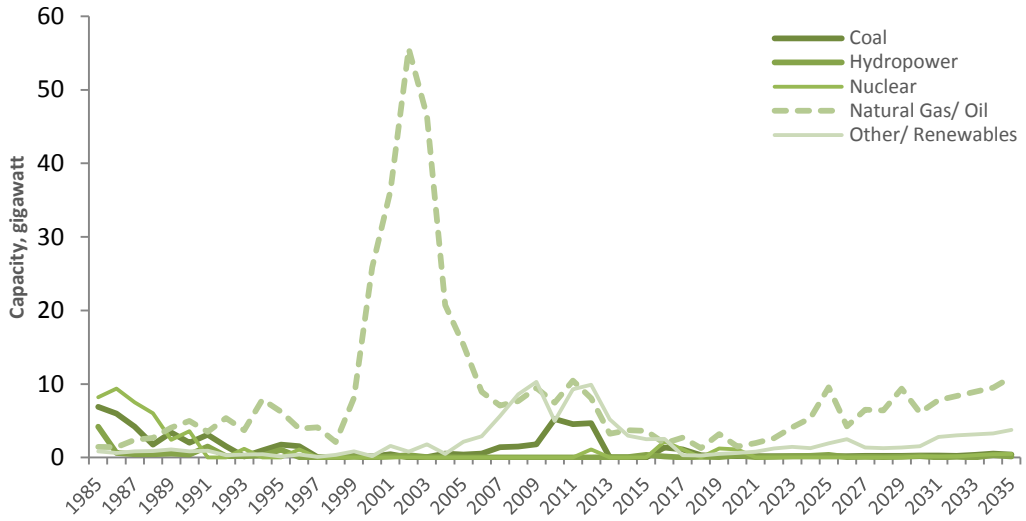
The orders of new CCGT capacity and the capital cost associated with them have caught many analysts by surprise (Figure). To be sure, such an increase of gas-fired power generation capacity has happened before (figure).

Figure 15: *CCGT orders and associated capital cost*



The boom-bust cycle in the early 2000s lasted 5 years, with 200 gigawatts of capacity added at a total cost of approximately $ 220 billion to be operated subsequently at capacity levels below 30%. The current acceleration in orders is likely to cause an even stronger uptake in orders. Unfortunately, the fundamentals following the commissioning and construction of this new capacity are unlikely to be any better than before.

Figure 16: *U.S. power plant capacity addition by fuel, Source: Energy Information Agency*



The gas-fired power generation risk source is also very complex. In order to clearly understand the inconsistencies along the supply chain in gas power generation, we have to cover the dynamics and rationale for decision-making in multiple industries in three regions: gas exploration and production, electric utilities and the power generation capital equipment industry in the U.S., Europe and China.

The supply chain inconsistencies in power generation play out over a relatively long period. There are plenty of uncertainties along the way, and the biggest uncertainty is the price of the fuel. The surge in demand for CCGT capacity is broadly explained by:

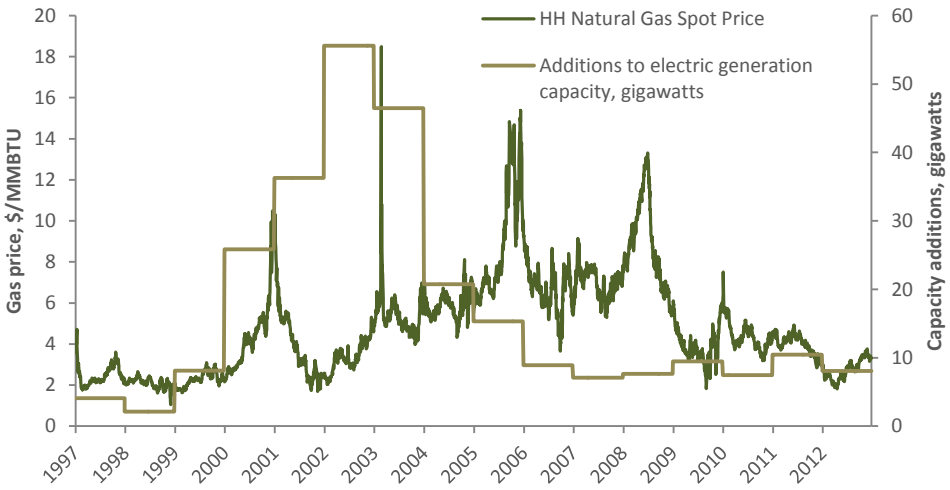
i. expectation of much lower gas prices globally, following the shale gas revolution
ii. pressure to move away from coal due to the large gap in carbon emission between gas- and coal-fired plants, even assuming carbon capture and storage (CCS)
iii. a mandate by the Chinese government to introduce a subsidy scheme for CCGT
iv. wholesale move to renewable capacity in Europe, which creates a serious off-peak power supply/demand balancing issue, which gas-fired plants are expected to remedy.

The Shale gas revolution

First, the shale gas bubble in the U.S. helped perpetuate the myth that gas prices globally will fall and stay very low for a very long period of time. Technically, there has been little technological news in the industry in the past 20 years. What is broadly referred to as fracking technology consists of a number of existing enabling technologies: computer-aided seismic exploration, horizontal drilling and fracturing (or "fracking"). The real breakthrough came in 1990s, when the combination of these technologies was used to target natural gas in deep shales.

Fields that were previously assumed to be uneconomical, had begun to produce gas at rates greater than previously estimated by experts. The first such shales - Bernett and Marcellus, started to produce meaningful quantities of gas in the mid-2000s. At the time gas prices in the U.S. were in the range of 12 – 13 $/MMBTU (figure). Development of shale gas and production of gas at this price level was economical and profitable. There is, of course, a good fundamental reason for gas prices this high: the first CCGT bubble brought a huge gas generation capacity that required adequate supply, which created strong demand for gas. Almost 60% of natural gas production is used in power generation either by the electric utilities or by the industry.

Figure 17: *Additions to generation capacity and gas prices, Source: Energy Information Agency*



Consequently, shale gas exploration was triggered by high natural gas prices. However, the new technology combined with high gas prices created both real, and to some extent, imaginary excess supply of gas in the U.S. The rush to explore shale gas assets created a real boom, often on the back of 5-year lease agreements and "all now or nothing" attitude. But the the largest impact was felt on the natural gas price. Early estimates of Marcellus shale (2007), for instance, indicated gas resource of about 50 Tcf, which in itself is a large number. In 2011 some estimates of the same shale neared 516 Tcf, worth potentially $ 2 trillion. Such statements, of course, do not usually provide a side-remark about the economic feasibility or the price at which $2 trillion is calculated.

It is then unsurprising that awash with real gas and the prospect of glut of gas supply, market prices plummeted. From the highs of $12-13 / mmbtu by 2012 gas prices in the U.S. fell to below $2. In a capital intensive industry declines in output price of only 10-20% may be the difference between profit and loss. A six-fold decline meant irreparable damage to the industry. Table illustrates the realities of the industry. At $8 the industry breaks even, if we take into the account the capital cost (assuming a certain depreciation schedule). The current gas price assumes industry losses to the tune of $60 billion.

Table 3: *Gas exploration business model*

Item		Value	Unit
Break-even gas price including capex		8	$
Break-even gas price excluding capex		6	$
Total produced		36,273	MMCF/d
Total produced		13,239,645	MMCF
Total produced		13,597,000,000	MBTU
Total revenues		44,870,000,000	$
Costs		108,776,000,000	$
Loss	-	63,906,000,000	$

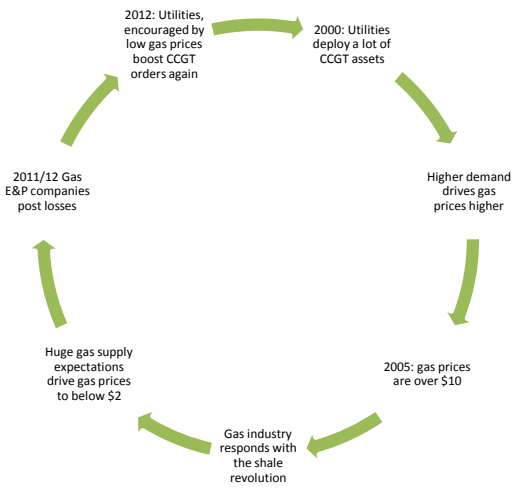
Ironically, the shale gas industry itself is to be blamed for the price drop. Although decent level of gas production from the first shales is a fact, the actual size of the reserves is disputable. The costs of technology and capital outlays are large, and therefore, the industry had all the incentives to overplay the size of potential reserves in order to raise the required capital. Studies by A. Berman and L. Pittinger[7], for instance, have concluded that per well reserves are at least half of what the operators claim, while the break-even prices are much higher than the $3-4 range of the current prices (Table 4).

Table 4: *Ultimate recovery per well, Source: Berman, A., Pittinger, F.*

Ultimate recovery per well estimates (Bcf)		
Shale	Berman/Pittinger Studies	Operator Presentations
Bernett	1.3	2-2.65
Fayetteville	1.1	2-3.0
Haynesville	3	6-10
Marcellus	No public data	4-10

Although it has been broadly recognized that the shale gas industry may be in a bubble, the utilities have been aggressive in their commissioning and deployment of gas-fired power stations. This, of course, is partly due to plenty of industry-commissioned detailed studies claiming the significant size of resources, and partly due to the regulatory and environmental difficulties connected with commissioning a new coal power plant, but mostly it is due to the short-term price behavior of natural gas. The ironical "reflexivity" of the industry is hard to miss (Figure 18)

Figure 18: *The utility capex boom-bust cycle*

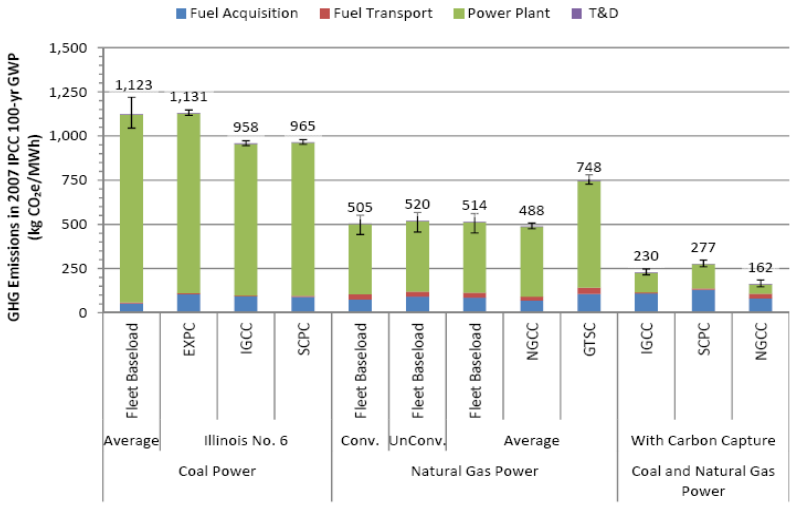


[7] Berman, A., Pittinger, F. "U.S. Shale Gas: Less Abundance, Higher Cost" August 5, 2011

The environmental argument

One of the most potent arguments in favour of gas-fired power stations is that non-shale gas powered plants have the lowest emissions among the conventional power plants. The level of emissions of a CCGT plant is estimated to be lower than that of the most modern coal-based technology combined with carbon capture and storage (CCS) (Figure).

Figure 19: *Comparison of emissions by fuel, Source: US DoE / NETL*



Clearly, as far as fossil fuels and conventional technologies are concerned, the CCGT has a clear advantage. When CCS is taken into account, a technology that is both very expensive and underdeveloped, gas still leads, albeit with a smaller margin. Encouraged by the maturity of technology and the relatively benign environmental impact, governments from the U.S. to China have been eager to build a regulatory framework conducive to commissioning of CCGT power plants.

CCGT orders in 2011 were up 315% in China. This number could be a testament to the decisiveness with which the Chinese authorities select a direction to move and carry out their plans and many observers would find that admirable. There is, however, a second side to the pace of decision making – the market realities that are often ignored. According to Mark Axford[8], a veteran of gas turbine industry, the "torrid order rate of gas turbines is unsustainable without major new supplies of natural gas".

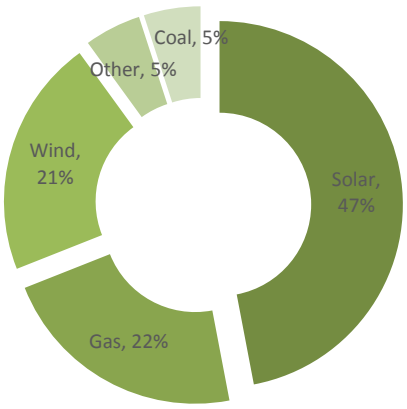
Unfortunately, Axford may actually be wrong in one thing. The order rates from China are sustainable even without new gas reserves, since the reason for strong pick up of gas power in China is not (however temporary) the economics of price, but government directed funding made available for building CCGT plants. This means that provincial state enterprises that were facing funding shortages due to the curb on infrastructure finance by the central government, have now access to another source of business activity – power plants.

[8] "Axford on gas-turbine orders: 2011 better than predicted, 2012 better still", http://www.ccj-online.com/axford-on-gas-turbine-orders-2011-better-than-predicted-2012-better-still/

It is, of course, possible that China's shale gas efforts will pay off as planned and the plants currently being built will have sufficient gas supply. However, most industry observers are skeptical about China's shale gas target. It is in fact very likely that the actual gas production will fall short of the plans, which will either drive gas prices high enough for imports to make sense, or what is likelier, will result in permanently redundant CCGT capacity in China – much like the ghost cities.

But there is a second more pressing and indirect reason for strong CCGT market related to the environment. In the past decade, the European governments have been favoring sources of renewable energy such as wind and solar (Figure 20). Since power production volumes from wind and solar are unstable and depend on the weather, a greater proportion of these renewable sources requires a greater installed reserve power generation capacity. Since gas power plants have traditionally been used for peak load levelling, they are best suited for this purpose. The practical consequence of this is that as Europe's power generation mix shifts towards renewables, the need for gas power increases.

Figure 20: *New capacity addition by source of fuel, Europe 2011*



The implied increase in gas demand, however, is not reconcilable with the realities of the global natural gas market. For one, there is no such a thing; there are only regional natural gas markets with regionally determined prices.

Gas prices

Gas prices deserve separate coverage, since there are often misguided references made to global gas prices. Figure 21 illustrates the fact that there is no genuinely global gas market in the same way as there is an oil market.

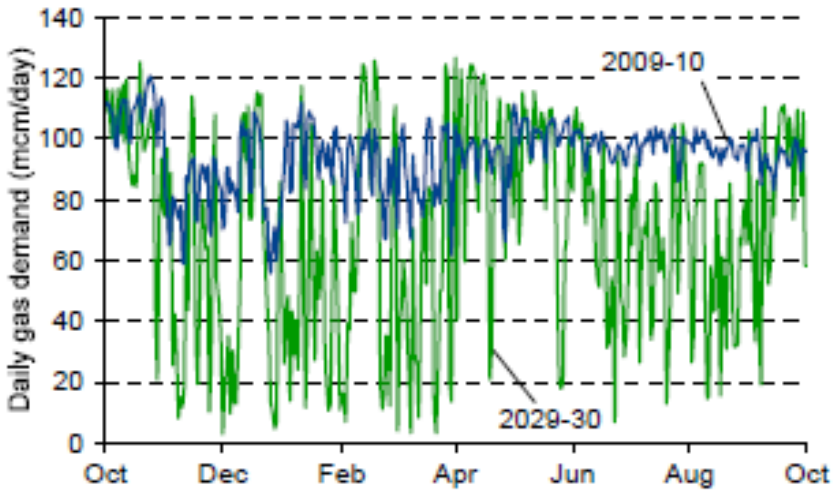
Figure 21: *Regional LNG prices*

Pricing in Europe is largely linked to oil price and driven by relatively long-term negotiations with Gazprom – the dominant supplier. The US prices are driven more by fluctuating demand and differ greatly by the region. This is of course largely driven by the fact that natural gas does not travel well. Transportation costs of gas are significantly higher than that of oil. In a recent interview to Bloomberg, Peter Vosser, the CEO of Shell, mentioned that the cost of the currently cheap U.S. shale gas after transporting to Japan will be roughly the same as the current LNG prices in Japan.

The first consequence is that even if shale gas is successfully produced in China and the U.S. in quantities projected, it is unlikely to drive European gas prices lower. But just in case, Gazprom has drummed up support for an OPEC-like natural gas cartel, with Saudi Arabia becoming a proud member of it only recently.

A more damaging, in our view, feature of gas prices is its volatility. By default, natural gas spot prices are more volatile than oil prices. But given the huge planned CCGT capacity, the volatility of gas price is expected to increase. The impact of intermittent renewable energy on European mix is that the monthly swings in gas demand are going to increase by a factor of 3-4 (Figure 22). Assuming gas indeed becomes the load balancer and the market pricing mechanism does not change, this will cause major fluctuations in gas prices.

Figure 22: *UK model daily gas demand, Source: Eurelectric*



THE FIVE TESTS

Testing gas power as a risk source is somewhat more complex, since the ultimate test – price appreciation is almost impossible to gauge due to the private and discrete nature of the gas turbine market. Having said this, the price appreciation test, as mentioned earlier, does not only apply to the product, but also to the prices of inputs, companies, assets used in the process or any other price series available throughout the supply chain. Furthermore, volume changes, which are observable in this case, are equally relevant and telling.

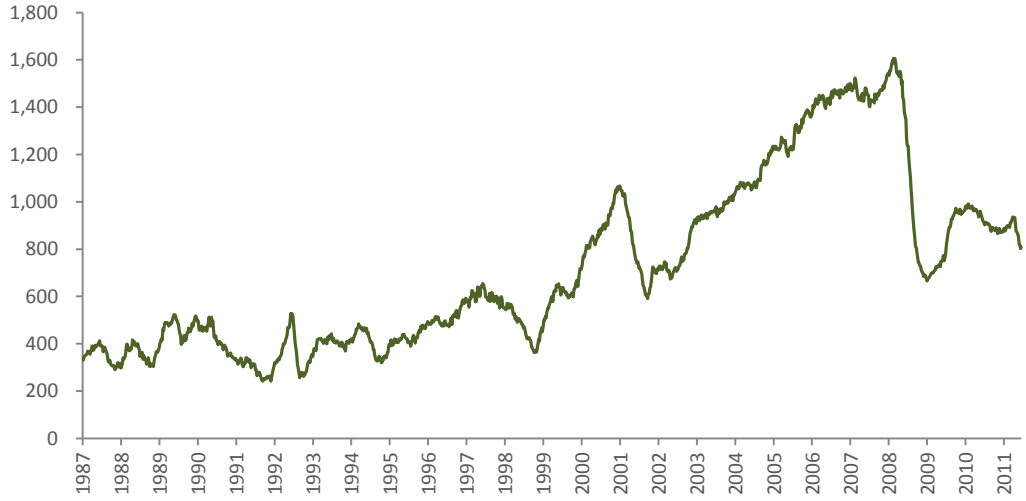
High pace of asset price growth

Here the relevant metric is the combination of significant growth in CCGT order volumes and the downward trajectory of natural gas prices in the U.S. The combination of these two factors gives rise to a potential asset bubble in the gas-fired power generation market.

Sustainability

Our thesis on inconsistency of the current status quo is based on the very real likelihood of a strong reversal in gas price trends, particularly in the U.S., where the lowest natural prices in two decades were triggered by production of shale gas. Since the break-even price of shale gas production is much higher than the current price, the industry is making losses and capital is being withdrawn. This has already resulted in falling gas drilling in the U.S. (Figure 23).

Figure 23: *North America gas rig counts, Source: Baker Hughes*



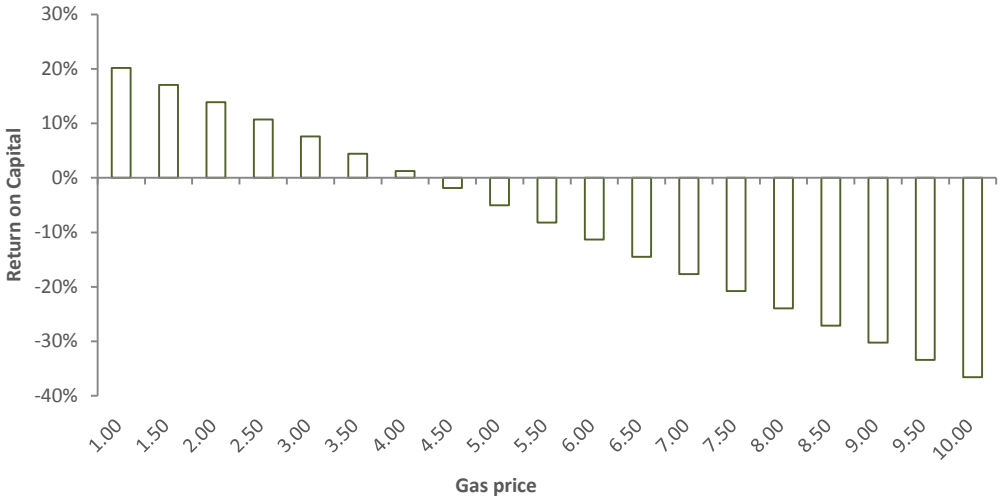
The result of this squeeze in the U.S. is likely to be an increase in gas prices. On the other hand, the economics of the power plants currently under construction is sensitive to gas price changes. Assuming no obvious long-term gas supply agreements, the current high-level business model generates a modest return. Table XX shows the economics of commissioning the 36 GW planned CCGT capacity in the U.S.

Table 5: CCGT Power plants economics, U.S.

Item	Unit	Current gas price
Plant Efficiency		55%
Capital cost	$/Mwe	750000
Capacity factor		87%
Useful life	year	25
Planned addition in capacity	GW	36.05
Energy content of fuel	MJ/cm	37
Opex	$/MWh	5
Current Gas Price	$/MMBTU	3.3
Available hours/year	hours	8760
Actual hours	hours	7621.2
Planned power produced	MWh	274,723,248
Price per MWh	$	35
Total revenues added		9,615,313,692
Gas used	MMBTU	1,704,354,287
Opex	$	1,373,616,242
Cost of fuel	$	5,624,369,146
Depreciation	$	1,081,417,290
Profit	$	1,535,911,014
ROC		5.7%
Gas used	MMCF/d	4,546.70
Total gas produced in the U.S.		36273
% of total produced		12.5%

Addition of this capacity alone will result in 12% higher demand for gas. Combined with likely stagnant production volumes, this will trigger higher gas prices. Our modest assumptions are U.S. spot gas prices of $4.9. Surprisingly, this level already makes CCGT projects loss-making at least in the U.S. The sensitivity of the plant-level return on capital to the gas price is captured in Figure

Figure 24: Sensitivity of a U.S. CCGT project profitability to gas price



A natural question crops up: if such a simple model suggests high likelihood of a loss, surely, the electric utilities that commission these plants on the back of far more comprehensive analyses should realize the fact. Indeed, public utilities use models that look at the whole generation portfolio, including their peak power demands and the need to quickly and flexibly respond to temporary demand spikes. Although an individual CCGT project may be loss-making, the plant's overall contribution is to balance the peak demand – the peak load.

And here lies the inconsistency. Buoyed by rosy expectations of shale gas and to some extent the lack of alternatives, some quarters of global power energy industry envisage CCGT as base load plant. But as we demonstrated, in this case the simplistic business model becomes the core model, with its impact on the overall return on capital as a downside.

New entrants with cheap money

The element of new entrants with cheap money is present in a number of segments of the supply chain. First, there is of course the "gold rush" or shale gas, with plenty of new capacity added in the last few years by a range of firms. Secondly, there is the CCGT rush in China, which has not had natural gas experience to this extent in the past. Finally, there is a substantial increase in project finance by the Japanese banks, who indeed have access to cheap money of Japanese households and form another pillar of our 2013 GSR report.

New entries into the CCGT market itself are not quite possible, at least in the short term. Production of CCGT is highly capital- and R&D-intensive and is concentrated in the hands of the largest industrial conglomerates: Siemens, GE, Mitsubishi Heavy Industries and Alstom. However, the top producers are adding capacity at a rapid pace, based on very optimistic expectations. Part of this addition is financed by cheap debt available through the buoyant corporate credit markets.

Poor corporate governance

Poor corporate governance and reporting is evident in the shale gas industry, where as we have already mentioned earlier, there is a tendency of overestimating the size of reserves. In the CCGT industry, while there is usually headline data about the specific projects, the economics of the projects, specific funding terms and assumed gas prices are not reported.

Government intervention and technological change

Government intervention in this source of risk is most notable in China, where the government's centrally directed mandate to invest both in shale gas and in CCGT capacity has caused a three-fold increase in orders in one year. The opaqueness of central and particularly provincial finances, the layers of cross-guarantees and mutual loans mean that it is nearly impossible to judge the leverage behind such projects.

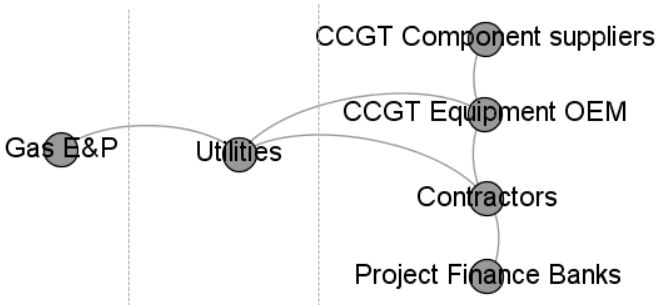
But the real culprit of this source of risk, is of course, the technological change, i.e. the successful exploration and production of shale gas.

THE TRANSMISSION MECHANISM

The potential of gas-fired power stations as base-load generation capacity in the portfolio of the electric utilities has caused a major re-evaluation of long-term cost of electric energy at least in the U.S., if not globally. There have already been claims of a likely rebirth of heavy industry in the U.S. driven by significantly cheaper energy. Whether these expectations have already been a factor in new capital investment in the energy-intensive industries such as steel or bulk chemicals is too early to tell. Consequently our estimate of transmission effects may err on the downside.

The primary trigger for the source of risk is gas prices. Lower capital expenditure and permanent capital withdrawals will cause lower production volumes in the U.S., followed by a permanent price rebound to over $5. This price level, although conducive to profitability in the gas exploration industry, will render the existing CCGT capacity on order to generate a potential of $27 billion of losses. Cancellation of half of this capacity (the remainder being sufficient for capacity replacement for peak load plants) will mean cancellations of over $400 billion.

Figure 25: *Risk transmission mechanism, gas power*



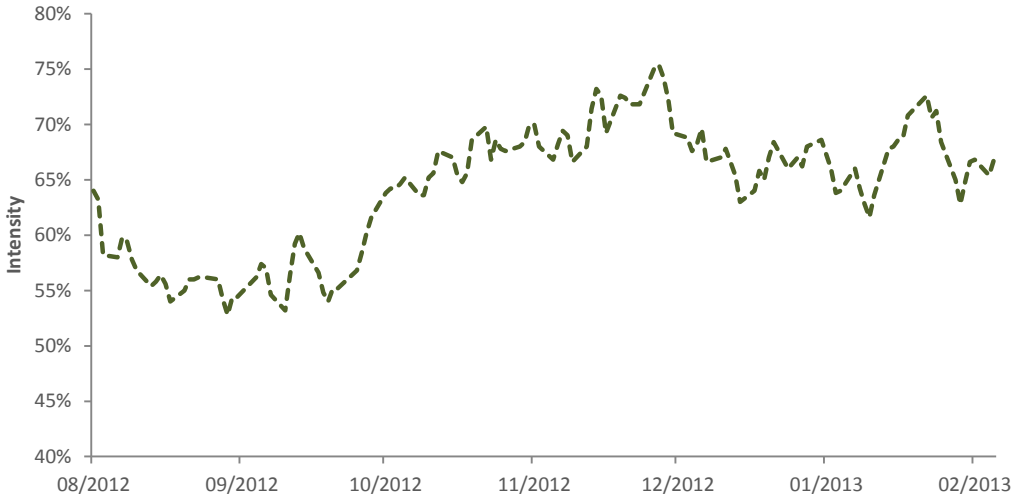
Source	Transmission	Secondary effect	Sum Impact
$ 64	$27	$ 420	$ 511

INTENSITY

Our effort to gauge the intensity of gas power risk will be focused on spot gas prices in the U.S. The perception that gas prices may stay low for a very long period is based on the performance of Henry Hub Gulf Coast Natural Gas spot price. Any significant shift in gas price in the U.S. is likely to shift the expectations globally.

Once again, our effort is not aimed at attempting to predict gas prices. Instead, we claim that higher gas prices, when they occur, will cause large-scale cancellations of gas power projects and result in significant revenue losses for the companies involved in the market. The critical price level is near $5/MMBTU, which renders most projects loss-making. Natural gas price is scaled to this level in order to be comparable with intensity measures of other risk sources.

Figure 26: *Gas power risk source intensity*



CHINA: THE FINANCIAL SYSTEM

Since our 2012 report, where we attempted to estimate the total scale of the problem at the local government finance vehicle (LGFV)-funded infrastructure projects and their impact on the banks, many exhaustive and thorough research reports have come out covering the exact same problem. Hardly anyone doubted the soundness of the balance sheets of top Chinese banks at the time we were writing the 2012 report.

Since then both Fitch and Moody's raised alarms regarding the quality of reporting. Moody's have stated that "the NPL ratios the banks report to the regulator and the public might not be accurate. Compared with last year, overdue loans and 'special-mention' loans have been increasing very noticeably, especially among some small and medium-sized lenders, but the increases were not reflected in their NPL ratio". Fitch was more severe in its assessment: "China's problematic loans are vastly understated and banks' cushions are thinning as deposit growth slows and forbearance reduces loan repayments".

Year 2012 was marked not so much by an exploding asset bubble in China, as by slow deflation and "evergreening" – an attempt to i) hide the staggering size of non-performing assets off-balance-sheet, ii) refinance the debt with new debt and iii) create new pathways to generate the required growth rate. It is our opinion that the Chinese authorities unfortunately missed the opportunity to deflate the bubble and reset the economy to lower and more efficient growth rate. And here lies the core misunderstanding: unless this "resetting" is achieved, the financial system will continue to be bound by the necessity to cover the existing dead weight and any real growth will be extremely challenging.

THE FIVE TESTS

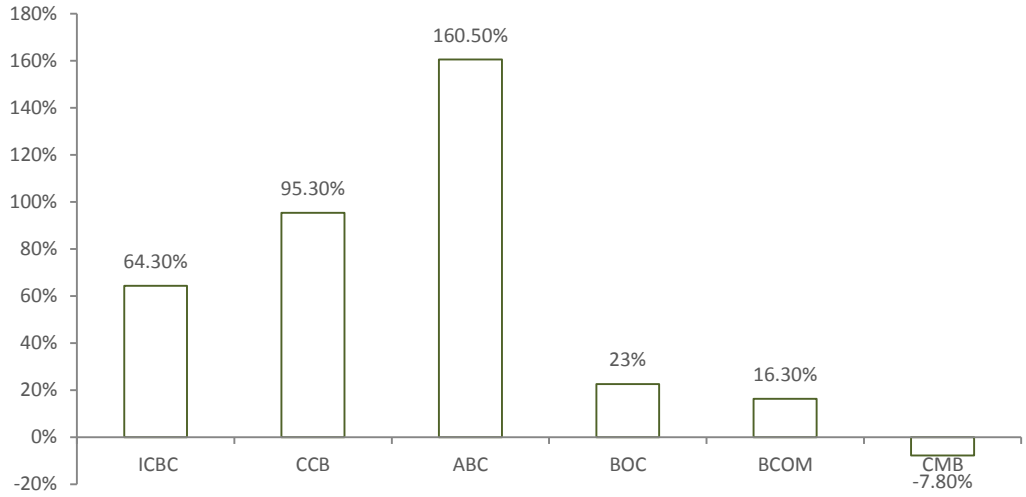
We will focus on the sustainability of the existing status quo in China. The other four tests: high pace of asset value growth, poor governance, new entrants with borrowed money and the government intervention are all too well documented to cover in this report in any length. The key question remains: how sustainable is the current state?

The major banks in China have used several different instruments to refinance their exposure without an impact on NPLs:

- fair value through P&L accounting in combination with bond issuance
- inter-bank loans
- wealth management products
- off-balance-sheet loan guarantees

Hiding a significant proportion of the balance sheet using one or more of the methods is not straightforward. According to the published reports, some line items on the balance sheet more than doubled year-over-year. Of course, such growth had to be explained. In the most recent quarter, it was inter-bank loans that grew the most on the balance sheet (Figure 27). Banks that had lower additions to their inter-bank loan portfolio had already over 8-10% of their assets in this category.

Figure 27: *Year-on-year increase of inter-bank loans, Q3 2012, Source: annual reports*



The banks explained such high pace of growth in inter-bank assets by vague references to efficiency improvements:

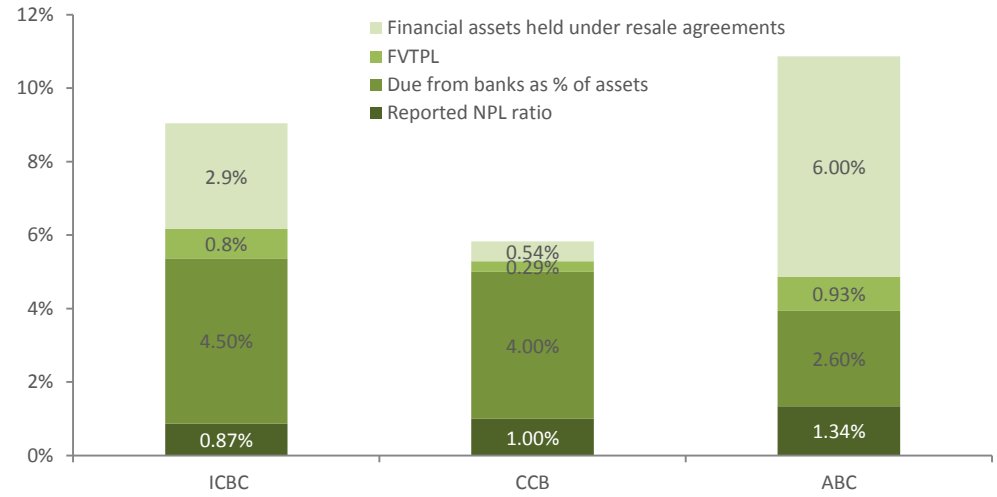
ICBC: "Due from banks and other financial institutions increased as the Bank strengthened fund operation and improved fund utilization efficiency"; by pointing at cross-guarantees of loans:

CCB: "Deposits with banks and non-bank financial institutions increased as a result of the increase in funds raised from principal-guaranteed wealth management products"; or just:

ABC: "The increase in the credit lending as the Bank had relatively adequate funds".

The assessment of absolute level of non-performing loans, given the degree of disclosure, is hard, not least because lack of disclosure and obvious inconsistencies cause natural suspicions about every line item on the balance sheet. Of course, the nature and state of off-balance-sheet obligations, such as wealth management products without the principal guarantee, are entirely obscured from us. As an illustration, figure XX shows the items most likely to be linked with non-performing loans along with the formally reported NPLs.

Figure 28: *Formally disclosed and potential NPLs*



If we assume that another 5%-10% is tucked away off balance sheet, the total NPL's at present are likely to be around 13%-20% of assets, in-line with our earlier assessment of the likely exposure to problematic infrastructure loans.

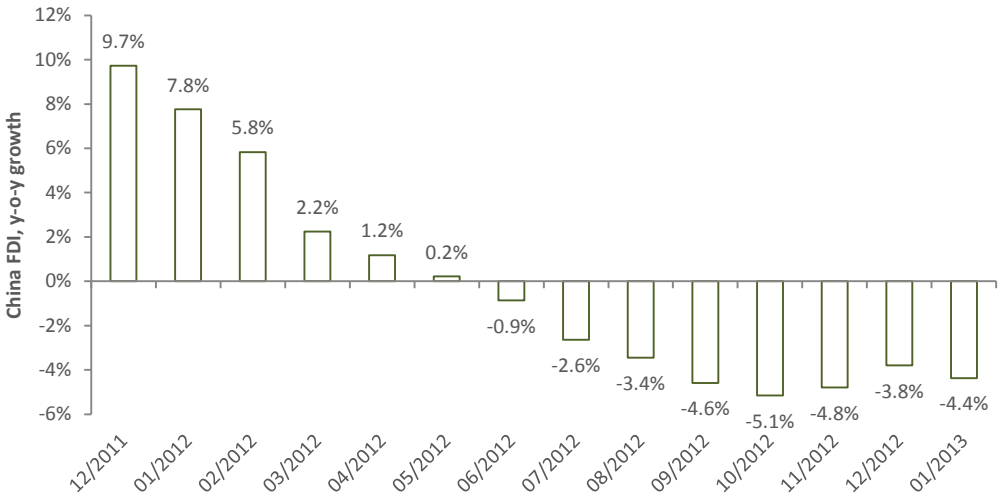
The ultimate sustainability test is the amount and pace of real money flow into the economy. Although in the 2012 GSR report we treated all foreign direct investments as such, many observers have claimed since that bulk of those FDIs are internal investments that are channeled through offshore zones such as Gibraltar for tax and ownership concealment purposes. We find these claims plausible. However, we still use the FDIs as a major gauge for risk intensity, since even internally sourced funding is an indication of the level of business activity.

INTENSITY

Money outflow and squeeze in China started in early 2012 and continued until now. Foreign direct investments have been falling continuously throughout the year, however, the pace of fall slowed down somewhat in December, pointing at some stabilization. January FDIs numbers are very poor again (figure).

On the positive side, the performance of the equity market has lagged significantly both U.S. and European equities, which suggests that a certain degree of gradual deflation has taken place. However, the true capitulation should come with the banks' admittance of the true scale of NPLs and full-blown bank rescues and restructuring efforts. The mountain of debt prior to these events still poses a significant risk for the global asset markets.

Figure 29: *China Foreign Direct Investments, year-on-year change, Source: National Bureau of Statistics*



AEROSPACE

LINKS has had a focuse on the extraordinary demand for aircraft from the often subsidized and loss-making or state-run airlines of Asia and Middle East for a while now. The issue of the sustainability of new orders was assessed in the context of the required traffic growth for the existing order book placed by these airlines. A more complete picture of this source of risk included the government intervention on both sides of the Atlantic, in the form of export credit guarantees and outright industrial subsidies.

The scale of this intervention has increased over the last twelve months and is now firmly at the heart of the asset bubble. The U.S. Senate reauthorized the mandate of Ex-Im Bank in May and increased its approved budget from $ 100 billion to $150 billion. Half of the portfolio of Ex-Im Bank is directed to aircraft acquisition finance.

Although there were several order cancellations throughout 2012, the pace of the aircraft asset bubble formation accelerated during the year, with more evidence of “all or nothing” behavior by the airlines. The pace of new asset deployment causes intensification of competition, which in turn creates incentives for the airlines to deploy even more assets in order to hang on to the existing market shares. Only a few days before this report’s publication Lufthansa announced in the same report that they were cutting their dividend and adding an order worth Eur 9 billion in order to compete with more fuel-efficient aircraft. One would assume that greater capital expenditure would be a sign of confidence in business, if it were not for scrapping dividends.

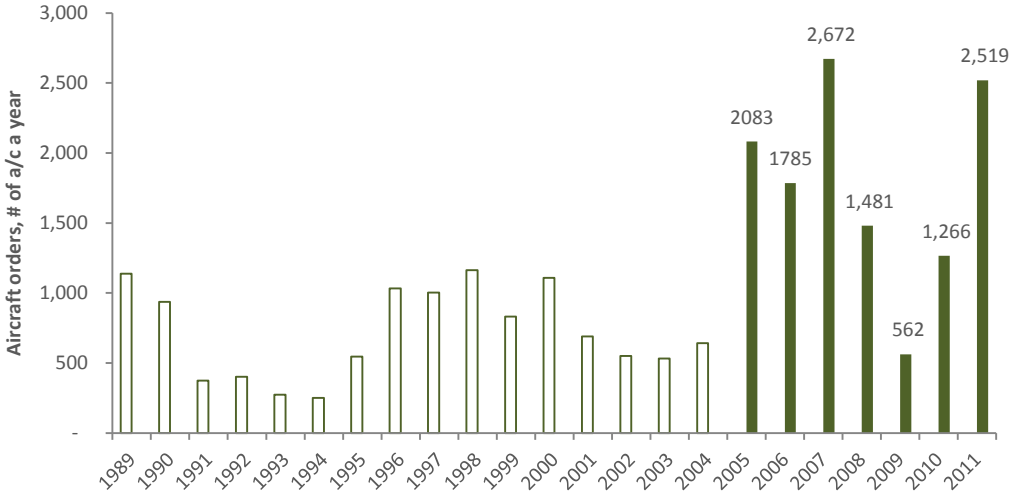
Of course, in different quarters of the industry there are warnings of a bubble, but Airbus head of sales John Leahy dismissed talk of a production bubble and defended the industry's demand projections: "I have been selling commercial airliners for 28 years. Approximately every five years we go through the cycle of industry gurus predicting asset bubbles, shortage of financing and imminent collapse. It hasn't happened yet, and it won't," Leahy told Reuters.

There are a number of factual errors in this statement. The first part: “it hasn’t happened yet” is not quite true, since the industry has always been very cyclical. But a more worrying factor is the second part of the statement, in which it is claimed that “it won’t” happen, because it has never happened before.

THE FIVE TESTS

The key test – the pace of asset price or volume growth is relatively easy to confirm. A simple observation of order volumes by year indicates a significant shift in "base" level, up from about 600 aircraft a year to 1100 aircraft (Figure).

Figure 30: *Aircraft order rates, Boeing and Airbus*



There has always been a degree of cyclicality in the industry. Even in the most recent years, order volumes were down in 2009 to the levels seen in the downturn of 2002-2003. However, it is the excess demand in peak years that is going to cause bulk of the problems for the aerospace industry.

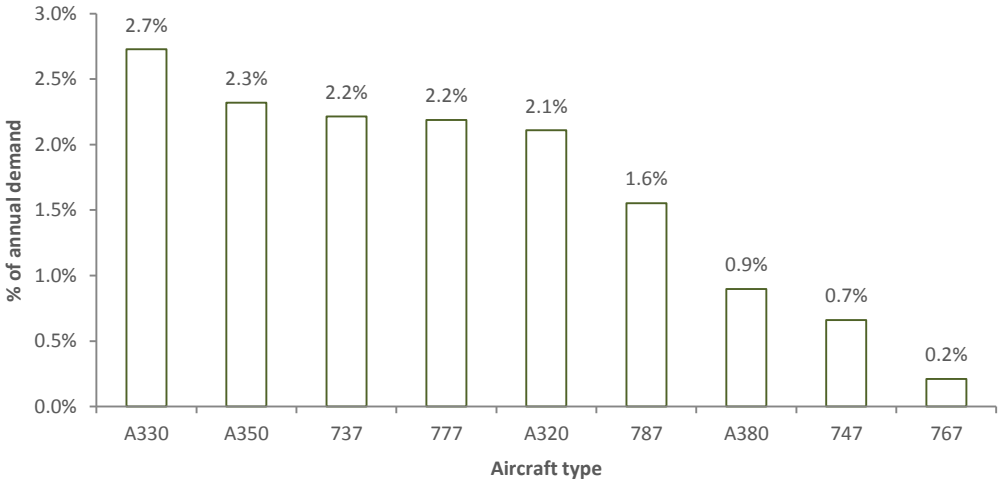
Abundance of all types of data with respect to civil aerospace makes it hard to focus on the few critical parameters that matter. The data items that do make the biggest difference, however, are not readily available. The industry body, IATA, for instance, makes volumes and load factors public on the monthly basis, however, there is no mentioning of the development of yields – a reflection of prices that the airlines are able to charge paying customers.

We will attempt to highlight the key troubling factor without resorting to greater complexity of detailed data. In our 2012 report we had shown that from the airlines perspective, placed orders translate into growth rates of 15-20%, although markets in their recovery mood are increasing by 4-5% at best. Airlines, however, may delay deployment of aircraft, while in some instances individual airlines may launch pricing war, squeeze out the competition and manage to sustain temporarily growth rates of 15-20% (e.g. Middle Eastern airlines).

From the industry point of view, however, the net impact is greater number of aircraft (capital asset) deployed over time, with greater competition and what's most important, shorter asset life. To illustrate this, we state the current **production rates** of aircraft by Boeing and Airbus (figure). The rates by model are in percentage of current Revenue Passenger Kilometers of 460 billion per month[9].

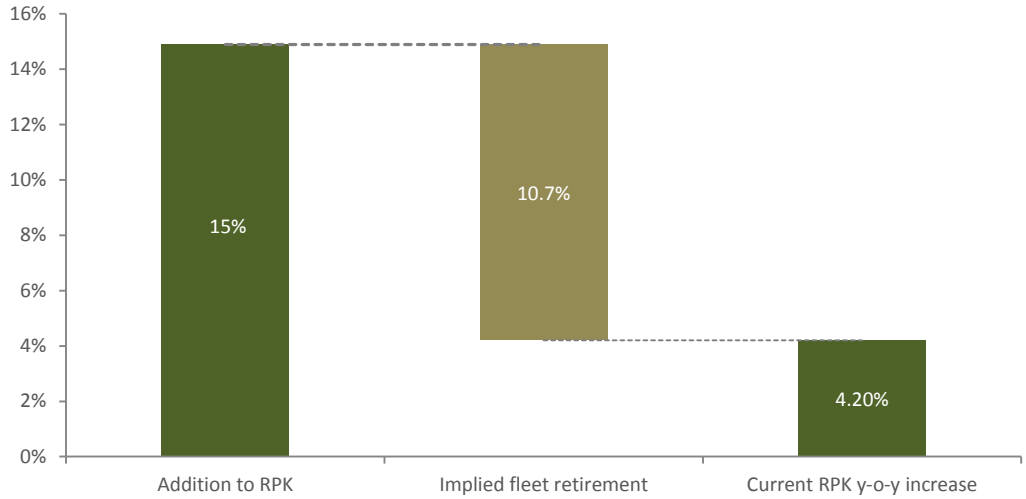
[9] Revenue Passenger Kilometers are number of paid seats times the kilometers travelled - an industry metric for demand.

Figure 31: *Current aircraft production rates*



Assuming the current production rates continue, the total addition of capacity is roughly 15% to the existing RPKs. Since the market currently grows at a rate of 4.2%, the difference in added capacity should be compensated by retiring the fleet (figure). And it really does not matter whether the airlines that order aircraft have older fleet or not, since the equation should work for the industry as a whole.

Figure 32: *Aircraft supply and demand imbalance*



A 10.7% retirement rate in itself is extremely troubling, since it implies asset useful life of slightly over 9 years. What this means is that although historically airlines could use aircraft for up to 25-30 years, right now they retire or even scrap aircraft that is merely 10 years-old. The consequence for the airline profitability is that the notoriously unprofitable industry faces further return-on-invested capital (ROIC) falls of 2.5-3 times.

There is plenty of evidence on the ground that corroborates this analysis. Scrapping occurs already after 7-8 years of plane's operation: "A 10-year-old Boeing 737-700, previously owned by Saudi Aramco and later purchased by AAR is demolished at the Indianapolis International

Airport. The plane would normally have a 30-year lifespan, but the owner wanted a newer model and decided the parts of its 737 had more value than an intact plane.[10]"

The back-end of the market – values and lease rates for aircraft formerly in their early life, continue to fall. According to Dr. Stuart Hatcher, head of valuations and risk at IBA Group, the trend of lower lease rates and values has spread to the new generation of the narrow body aircraft, formerly assumed to be immune.

Of course, it is entirely possible that more aircraft is placed in the market without retiring the existing fleet. Needless to say, this will have a significant pricing impact, driving yields down. The net effect on the civil aerospace industry will be the same.

INTENSITY

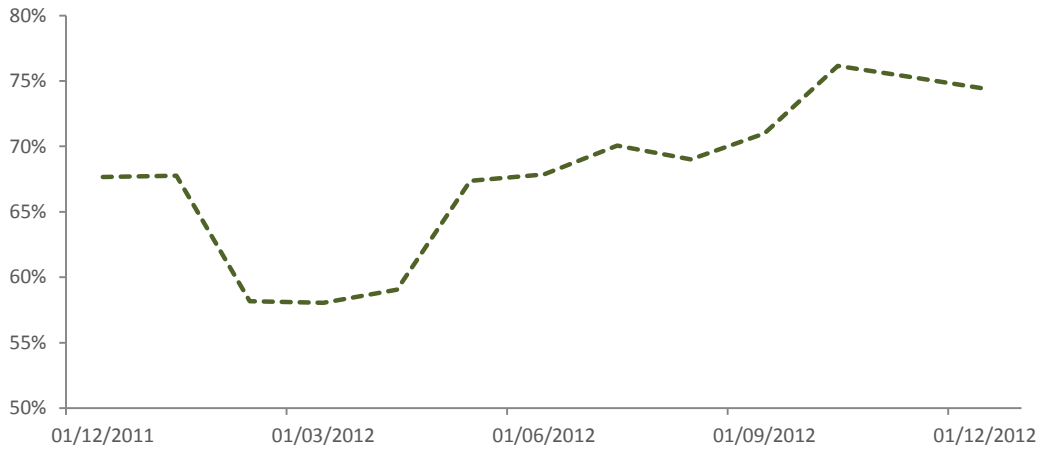
We monitor the intensity of civil aerospace risk source with a combination of two observable variables: crude oil prices and growth rate of demand in terms of Revenue Passenger Kilometers (RPK).

Oil prices of as low as $50 per barrel will change drastically the economics of owning new aircraft. Older generation aircraft will be significantly more competitive even in a low interest rate environment. Another impact pathway is the impact on Gulf airlines that are subsidized by their governments that in turn depend on oil revenues – a strong fall in oil price will put pressure on capital expenditure budgets of these airlines.

Although we have used RPK as a gauge of demand in the industry, it is important to note that strictly speaking RPK is volume demanded, and as such, does not include the prices paid for travel. Lower RPK numbers would indicate greater need for retiring old fleet, which would put even greater pressure on used aircraft prices, the business model of leasing companies and airlines.

The combined indicator has had an upward trajectory for the most part of 2012 (Figure 33).

Figure 33: *Civil aerospace risk intensity*



[10] Read more: http://www.smh.com.au/travel/travel-news/planes-booming-but-will-they-crash-20120524-1z6ks.html#ixzz2LvDG9VXb

U.S. FARMLAND

In early February of 2013, the U.S. Federal Reserve Chairman Ben Bernanke was reportedly[11] present at a meeting, where concerns were presented over the formation of potentially dangerous asset bubbles, particularly in the farmland and mortgage REIT industries. Bernanke, according to people present at the Treasury Borrowing Advisory Committee meeting, brushed off these concerns.

The U.S. Farmland asset bubble is by far the most evident and well documented source of risk covered by LINKS. Of course, there is no consensus about whether this is a bubble and if so, whether it will ever burst. But the super cycle, once-in-a-lifetime investment opportunity, a whole new era for farming and other similar phrases can hardly be missed even during a cursory review of the state of the industry.

We have covered this source of risk extensively throughout 2012 and many of the reasons and arguments for the formation of the asset bubble and potential triggers for its demise are still valid[12]. In this report we will focus on the asset bubble tests and give an updated view of intensity of the bubble. But before that we will attempt to answer the question why the U.S. Federal Reserve does not perceive the farmland asset prices as a threat to the economy.

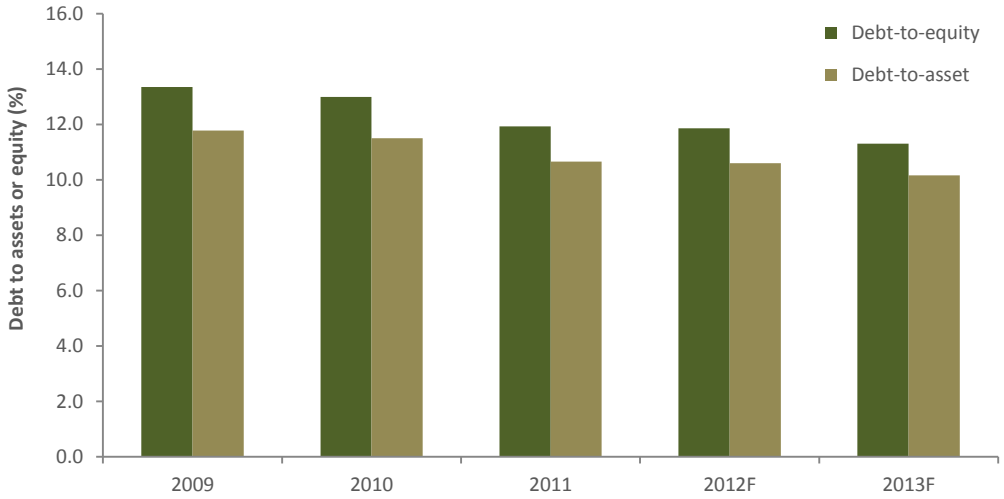
Indeed, the Federal Reserve have paid due attention to the farmland prices and commissioned a comprehensive report about the state of the industry as early as in 2011. The report concluded that although there had been steep price appreciation of farmland, particularly cropland assets, there was very little likelihood of defaults among the farmers because of the very low leverage in the system. Unlike in the residential property market, farmers typically have significant equity in the land and rising prices of land have rendered their equity even more valuable compared to debt.

Indeed, if we look at the debt ratios of the U.S. farms (Figure 34), the debt-to-equity and –asset ratios are stable if not falling to the low levels of 10-11%. The Fed concludes that such low level of debt cannot possibly pose economic risks.

[11] http://www.bloomberg.com/news/2013-02-22/bernanke-said-to-minimize-asset-bubble-concern-at-meeting.html

[12] See Global Systemic Risks 2012 report and subsequent updates on LINKS Risk Portal

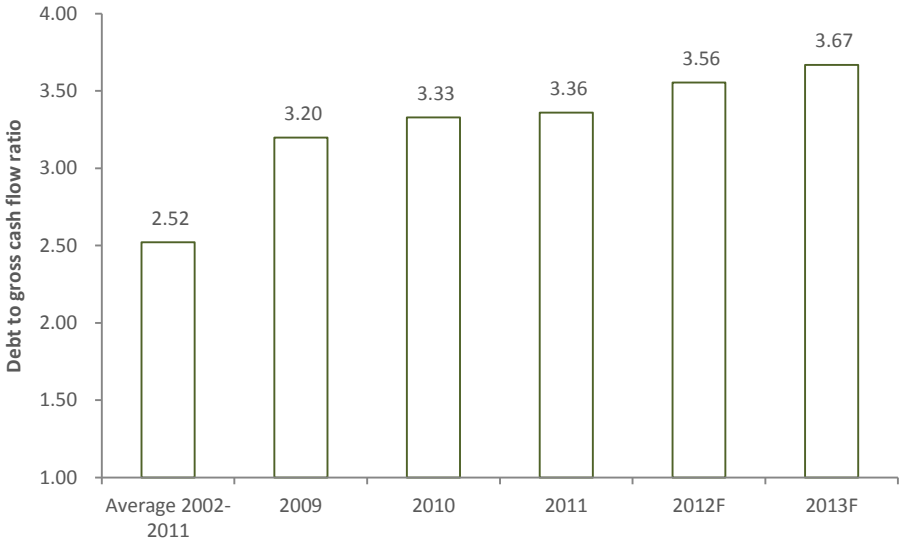
Figure 34: *US Farmer Balance Sheets, Debt Ratios, Source: U.S. DoA*



This type of analysis, in our opinion, underpins lack of understanding of the mechanisms of asset bubble formation and the subsequent bust. First, it is not the average or the whole market that is often unsustainable, but small parts of it at the fringe – such as sub-prime borrowers in case of the property market or new financial investors in the farmland. Both categories are proportionately small in the market and highly leveraged. Secondly, the debt-to-equity analysis based on the current equity values is based on the "wealth" created by the bubble. In a similar analysis, U.S. core mortgage market would have been if not healthy then at least sustainable in 2007, albeit not as healthy or sustainable as the farmland market.

If we ignore the irrelevant "wealth" metrics and concentrate on cash generation vs. debt, the picture is somewhat different (Figure 35). Total debt to net cash flow ratio has increased steadily over the past years and reached a level of over 3.5 times. To put it another way, assuming business activity in farmland goes back to average of the last decade and interest rates climb back to what is perceived as normal levels, farms will end up paying 25% of their cash flows as interest payments. It is this equation that makes or breaks industries and not the wealth effect.

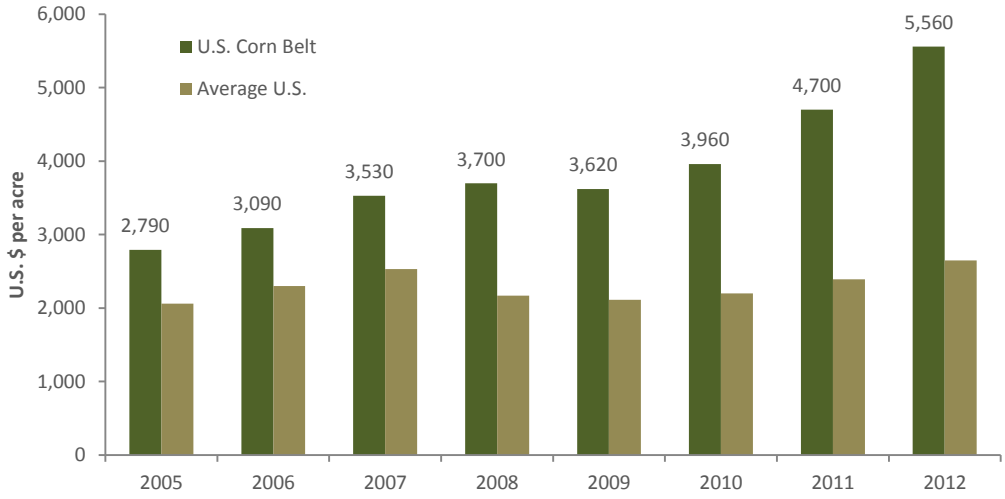
Figure 35: *Total debt to cash flow ratio development, Source: LINKS, US DoA*



TESTS

Price hikes of cropland alone are staggering compared to the nature and status of the industry. Most recent price data show no sign of moderation (Figure 36), particularly in the Corn Belt. Of course, there is always a justification for such strong price appreciation. In this instance, it is the structurally higher global demand for food due to the changing wealth and habits in the emerging markets. We have covered this issue extensively last year: briefly, we found no evidence of "the emerging markets" theory. The present asset price bubble is caused, instead, by a combination of low interest rates, U.S. government intervention in the ethanol market and temporary weather-related shortfalls of production.

Figure 36: *Farmland prices per acre, Source: U.S. DoA*

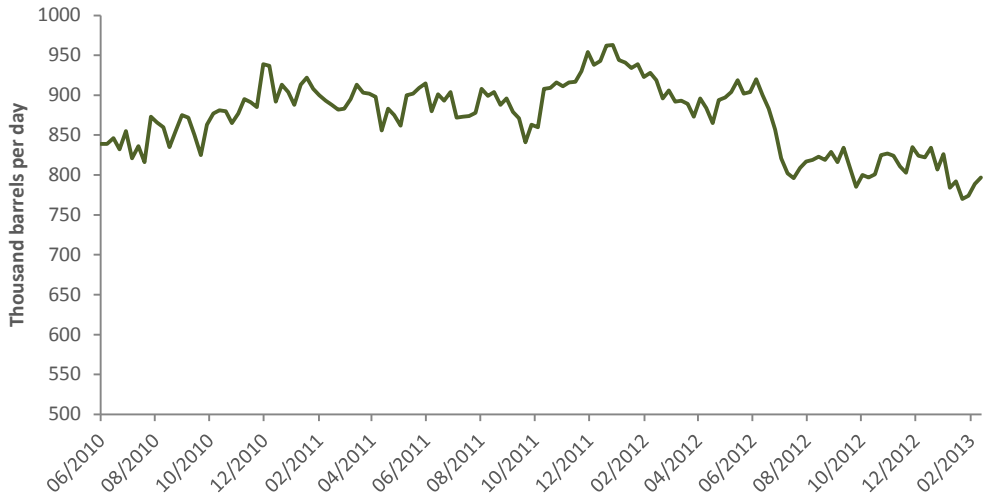


The sustainability test is twofold. The microeconomic driver of higher cropland values is the ethanol industry, which increased its share of corn demand from 5% to over 40% of the total

U.S. corn production in just a few years. As we have noted in the past, the ethanol industry now faces a number of hurdles, chiefly among them the exceptionally high corn price and simultaneous phasing out of the ethanol-related tax rebate. In response, the industry has been cutting capacity – as of January 2013, 20 out of 211 U.S. ethanol distilleries are out of operation and "they are not coming back on stream any time soon". The total ethanol production has begun to fall already at the end of 2011, with a sharper drop in August (Figure 37). But the ultimate impact on corn demand will be felt if and when the U.S. minimum ethanol content mandate is reversed, i.e. the government intervention is withdrawn altogether.

The more general macroeconomic risk factor here is the interest rates. Higher interest rates and healthier economy will drive financial investors away from the asset class and increase the interest payments of the farmers.

Figure 37: *Weekly U.S. Oxygenate Plant Production of Fuel Ethanol, Source: U.S. EIA*



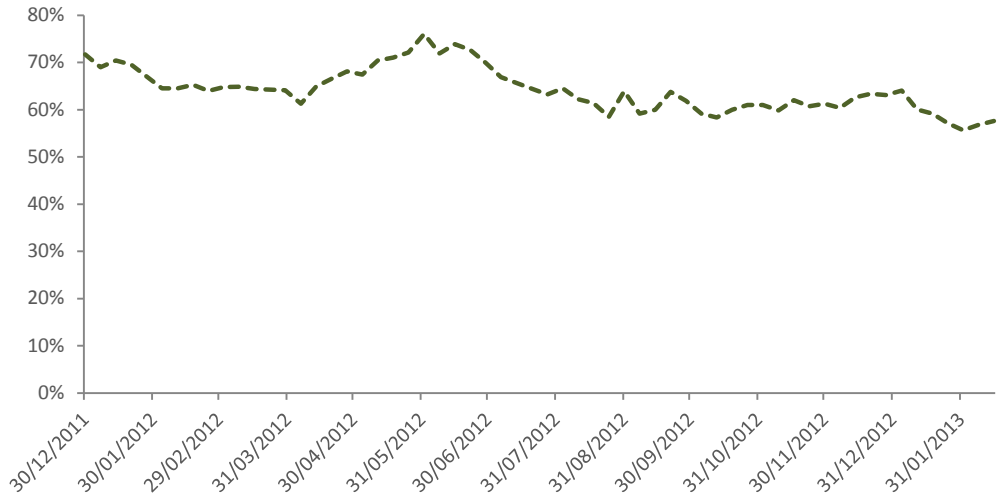
INTENSITY

We monitor a number of observable price series to gauge the intensity of the U.S. farmland risk source. As the ethanol industry is strategically placed in this supply chain, we monitor the economics of ethanol distillery by focusing on corn and distilled ethanol prices. Furthermore, a large part of the farmland acquisitions is financed by the Federal Fund Credit system by issuing Federal Fund Credit Banks (FFCB) agency bonds. The spread of these bonds versus the U.S. Treasuries is an indication of near-term perceived risk in the farm industry. At present this spread is near its all-time lows of 15-20 basis points. We are not aiming to forecast expansion of the spread; rather we use the spread as a gauge of potential distress in the system.

Finally, ethanol imports from Brazil have become a viable alternative due to the weakness in BRL-USD exchange rate. We incorporate the exchange rate in the intensity analysis to take into account the threat of cheap imports from Brazil.

The combined indicator has had a downward trend through the second half of 2012 following the corn price spike due to the drought in the U.S. (Figure 38). We expect the intensity to increase with the normalizing weather patterns.

Figure 38: *U.S. Farmland risk intensity*



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