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Introduction

The events of 2007/8 pulled back the magician's curtains and revealed a rather shocking truth about the global financial system – markets can seize up and become completely illiquid. Although previous generations may have experienced similar episodes of systemic illiquidity, in the fall of 2008 the magnitude of the near meltdown came as a traumatic shock to most working in the financial world as well as those beyond. Even for assets such as short-term commercial paper and money market instruments, the liquidity which had been taken for granted completely evaporated. During Q4, 2008 the only asset class for which there was real liquidity was short-term government securities of very highly rated sovereigns. Banks did not want to deal with each other and most asset managers refused to purchase assets, where the risk of not knowing when they might be able to sell them again reflected a profound crisis in confidence regarding the efficacy of markets and the liquidity of market instruments.

At the limit there is ultimately a fundamental paradox regarding liquidity which is that when it is most required it is likely to be non-existent. John Maynard Keynes had a keen eye for noting paradoxes at the root of economic behavior, and made the following observation regarding what today would be called systemic liquidity. [1]

Of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity, the doctrine that it is a positive virtue on the part of investment institutions to concentrate their resources upon the holding of 'liquid' securities. *It forgets that there is no such thing as liquidity of investment for the community as a whole.*

To slightly paraphrase another of Keynes's classic observations about markets, one could sum up the worst case scenario for the demand for liquidity in the following aphorism "When average opinion comes to believe that average opinion will decide to turn assets into cash, then liquidity may be confidently expected to go to zero."

One of the central tasks of this book will be to explain [2] in as comprehensive and precise a fashion as possible the threat posed by critical financial episodes which can best be described as periods when there is a *disappearance of systemic liquidity*. As will become clearer, the notion of liquidity is one of the more elusive and poorly addressed concepts in the macro-economic and finance literature. Rather than assuming liquidity of markets as a given [3] a full blown account of systemic liquidity and the risks of its disappearance should be an indispensable component of any macro theory of financial economics. It is also imperative that there is recognition that we need to move beyond a view of the kind of liquidity crisis that may face an individual firm and realize that the much greater systemic threat is the kind of crisis – as seen in the second half of 2008 – where many if not most financial firms were, *at the same time*, confronting a liquidity crisis. One useful starting out definition for the risks posed by a systemic liquidity crisis is one proposed by the IMF in some useful analysis of the events of that troubled period. [4] "Systemic liquidity risk is the risk that multiple institutions may face simultaneous difficulties in rolling over their short-term debts or in obtaining new short-term funding through widespread dislocations of money and capital markets." We shall return to the IMF study on systemic liquidity risk and other related analysis in later chapters and in particular in regard to

the vital function of the money markets which is one of enabling maturity transformation. [5] If this ongoing facility is interrupted or breaks down there is a real risk of systemic meltdown and it will be suggested that rather than being complacent that the worst has already been seen with regard to the global financial crisis, there just might be an even bigger crisis on the horizon.

Although much of the focus in the literature on the global financial crisis is on the tumultuous events which took place in the second half of 2008 and especially in the wake of the collapse and bankruptcy of Lehman Brothers on September 15, 2008, the foreshocks of the crisis were being felt in 2007 especially during August of that year. August as a month has had a habit of producing nasty financial surprises – the LTCM crisis broke in August 1998 and it was a crisis in August 1971 that saw the US abandon gold convertibility for the US dollar [6] – and during August of 2007 there were some severe shocks to the financial system, the full implications of which would not be fully absorbed by the markets until one year later.

During August 2007, as the press release seen below indicates [7] even Goldman Sachs, which rarely acknowledges its own misfortunes, had to come to the rescue of one of its in-house hedge funds as a result of abnormal market conditions within the US markets during that time frame:

NEW YORK, August 13, 2007 – The Goldman Sachs Group, Inc. (NYSE: GS) today made the following statement: Many funds employing quantitative strategies are currently under pressure as recent conditions have resulted in significant market dislocation. **Across most sectors, there has been an increase in overlapping trades, a surge in volatility and an increase in correlations. These factors have combined to challenge many of the trading algorithms used in quantitative strategies.** We believe the current values that the market is assigning to the assets underlying various funds represent a discount that is not supported by the fundamentals.

The CFO of Goldman also made the comment that “Liquidity conditions were most extraordinary during early August (2007),” and then went on with the simple minded observation: “We were seeing things that were 25-standard deviation moves, several days in a row.” We shall return to this quotation again in what follows, but at this point we can just register the fact that invoking statistical assumptions based on a normal distribution to measure such disorderly behavior was to use a model that is not fit for purpose. [8]

Across the Atlantic during the same month another debacle was unfolding in what was yet another early warning of what was to come one year later. Although it was a relatively small mortgage lender the collapse of Northern Rock in the UK, with news footage of anxious depositors lined up outside the high street branches, is most definitely not the kind of image that bankers and policy makers like to see. The bank had to be taken over by the UK government due to its inability to fund itself in the money market. In a disingenuous comment, that would come to be echoed quite often since, the head of the British Bankers Association remarked to the media, while people were lining up outside the branches: [9]

“This isn’t about solvency, this is about a short-term problem that the Northern Rock has in getting liquidity – that is, getting some cash from the normal interbank lending market,” said Angela Knight, chief executive of the British Bankers’ Association.

“I think that anybody who is waking up this morning who is either a saver with Northern Rock or has got a mortgage . . . can be absolutely confident that they have got their money with or they have borrowed from a very sound financial institution,” she told the BBC.

Only the part in that statement that the depositors would be safe was accurate – the British government saw to that – but the institution was far from being sound or solvent as it soon

transpired. Although the spokeswoman for the BBA had her own reasons for downplaying the magnitude of the Northern Rock episode, it is also worth recalling that in the summer of 2007 there was still a large degree of complacency on the part of central bankers and many policy makers with respect to the seriousness of the unfolding crisis in the financial system. By way of illustration the Deputy Governor of the Bank of England is on record in an interview with the Financial Times expressing the view that many key policy makers failed to recognize the gravity of the situation at the onset of the crisis: [10]

“I think it’s fair to say that in the early stages of the financial crisis most of us expected this to be a relatively short-lived seize-up in the financial markets; it would be over by Christmas, if you like. Whereas it was only gradually, over time, that we appreciated the full severity of what was occurring.”

The effort to explain the existence of abnormal market conditions which can give rise to bouts of extreme illiquidity will be a central theme of this book. Some other signposts to guide the reader as to the way things will proceed are that we will also need to examine such issues as the increasing sovereign debt risk, the possibility of a disintegration (even partial) of the Eurozone and the single currency, severe stresses in the European banking system, and numerous other wild cards that can contribute to a general discomforting sense that uncertainty and potential systemic risk, which have been very much in evidence since 2007, are not going to be ameliorated any time soon. Further themes which will be examined are the notions that *price discovery*, the primary function of markets, is being increasingly hampered, even distorted, by central bankers’ efforts with QE, in Europe by LTRO and the Outright Monetary Transactions (OMT) program announced by the ECE in September 2012, in FX markets by the very large footprint of the People’s Bank of China (PBOC) with more than \$3 trillion of liquid reserves, and also by the aberrations which can and have arisen following the proliferation of algorithmic trading practices now omnipresent in many markets.

As the discussion proceeds it should become more apparent what the factors are, at the micro level of individual trades within a financial market, which are the principal determinants of liquidity and “price discovery.” In turn the dynamics and interplay of these various factors can then be used as heuristics for scaling up to a better understanding of the nature of systemic illiquidity events which are at the centre of the kinds of crisis episodes that have become more apparent since 2007/8.

Macro-economic theory is notoriously deficient in providing any real understanding of market liquidity, rather, as with so many other fundamental features of the contemporary financial economy, we are essentially told to take “liquidity” as a given. So one of the most crucial characteristics of the manner in which prices are determined, and the quality of trading activity which takes places in markets, as well as the nature of extreme price behavior which can arise from “an evaporation of liquidity” [11] remains as an unexplained article of faith. Surely one has grounds to be seriously troubled by the intellectual foundations for orthodox macro-economic theory which fails to account for liquidity, fails to explain how credit creation is a major dynamo for financial capitalism – a dynamo which has a proclivity for creating bubbles, and an absence of any tools which can anticipate when bubbles have gone too far and are about to burst.

What is the evidence of increasing abnormality in market prices over the past few years?

Figure 1.1, which comes from a presentation by the Bank of England’s Andrew Haldane who will appear again in this book, [12] is useful in illustrating the interdependency of market

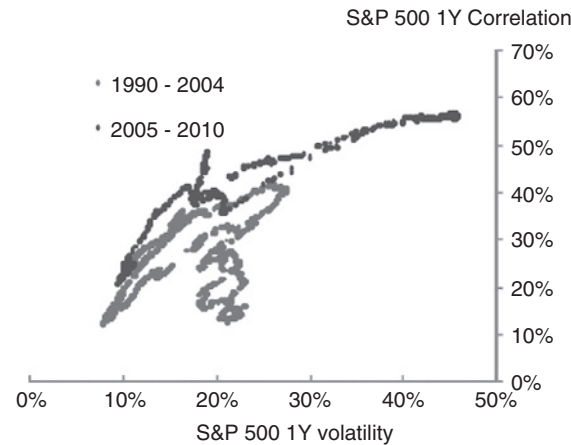


Figure 1.1 Volatility and correlation of S&P 500 1990–2010
 Source: Haldane, A G (2011), “The Race to Zero”.

volatility and correlation, which are two good measures that can throw light on the observed increase in the propensity towards abnormal episodes in the financial markets in recent years. The chart plots the volatility of, and correlation between, the individual constituents of the S&P 500 from 1990 to 2010. In general terms, as shown over the 20-year period the relationship between volatility and correlation is positive, which could suggest that higher volatility increases the degree of co-movement between stocks. But as Haldane points out, have we got the cause and effect the wrong way round?

That there is some circularity which needs explanation will be one of the tasks undertaken in what follows. It will also be shown that there is overwhelming evidence of increased cross correlations, not just within the major US equity indices, but across many asset classes in the wake of the global financial crisis. Examination of the inter-relationships between the correlations of asset returns, market volatility, and macro liquidity provides scope for a fascinating exercise in forensic analysis of markets. To the extent that it is possible to disentangle the underlying dynamics which account for these inter-connections it will be argued that this will enable one to be better equipped to navigate the choppy waters which are a feature of contemporary financial markets.

Figure 1.1 shows how the interconnection between volatility and correlation has changed over the 20-year period from 1990–2010. Two things are clearly noticeable in the latter period since 2005. First, both volatility, as indicated on the horizontal axis, and correlation, seen on the vertical axis, have been higher than during the earlier period. Volatility is more than 10 percentage points higher than in the earlier sample, while correlation is about 8 percentage points higher. Secondly, as Haldane observes “the slope of the volatility/correlation curve is steeper. Any rise in volatility now has a more pronounced cross-market effect than in the past.” It would be worth adding, once again, the comment that it may well be appropriate to think of the direction of influence as the other way around. In other words, it is just as feasible that it is the adoption of a more binary approach towards asset allocation – where the degree of cross-sectional correlations between both *risk on* assets and another set of *risk off* assets – is ultimately the determining factor in heightened volatility and the propensity for markets to experience bouts of illiquidity.

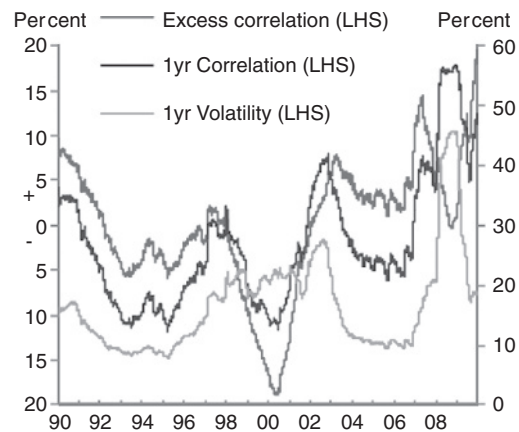


Figure 1.2 Excess volatility for S&P 500 1990–2010
Source: Haldane, A G (2011), “The Race to Zero”.

A simple way to demonstrate the trend towards increased cross-sectional correlations is to subtract the one-year volatility measures from the correlation values as displayed in Figure 1.1. The result of this can be seen in Figure 1.2 which is also taken from the BOE presentation. The measure of “excess correlation,” as used by Haldane, is simply the observed correlation minus the observed volatility. By referring to the right-hand axis, it can be seen that “excess correlation” in 2010 was at its highest level in the 20-year period under consideration. Further evidence which will be reviewed in Chapter 2 extends the historical back testing for comparison back even further and reveals that there is no comparable period of excess correlation in the post World War 2 period. [13] In summarizing the evidence from the two charts Haldane suggests that market volatility in the years since 2005 is both higher and propagates further than in the past. “Intraday evidence on volatilities and correlations appears to tell a broadly similar tale. Overnight and intraday correlations have risen in tandem.”

Financial markets are clearly reflecting a greater propensity for many asset returns to be more highly correlated and more volatile, and when pursuing a more in-depth analysis of market internals it becomes abundantly clear that a new kind of behavior on the part of traders and investors has emerged in the wake of the global financial crisis (which sometimes will be referred to simply by the convenient acronym of GFC), and this new binary mode of market behavior has come to be known as the “risk on/risk off” paradigm. I will argue quite tenaciously that this new binary pattern of trading is both a symptom of, and dominant contributory factor to, much increased cross asset correlations and that this results in a broad range of asset prices rising or falling in lockstep. These asset classes can almost be divided into two quite distinct camps and instruments within these classes will move with little regard for idiosyncratic fundamentals, generating further volatility and closer alignments along the frontier of the risk on/risk off demarcation. On the one hand the risk on assets will include, broadly, equities, emerging market instruments including their bonds and currencies, commodities, high yielding corporate bonds, and certain currency pairs especially those involving the Australian dollar. Within the other camp of risk off assets can be found US Treasuries, German bunds, the Japanese yen, previously the Swiss Franc (although this has lost some of its former status in this class since being pegged to the euro) [14] and in more general terms a tendency towards taking short positions in the other camp of risk on assets.

One of the many consequences of the global financial crisis has been that many traditionally active market participants have taken to the sidelines. There is mounting evidence of substantial declines in real institutional trading volume in US equity markets, [15] and despite the much increased presence of HFT and other algorithmic trading activity, which has boosted trading volumes without adding to the quality of liquidity in markets, [16] there have been momentary bouts of illiquidity, some of which have been severe. One of the most notorious occurred on May 6, 2010 and has come to be known as the Flash Crash (the term “flash” comes from the manner in which HFT algorithms can send rapid fire signals into electronic platforms and which customarily have mischievous motives). [17] The events of May 6, 2010 – which included the largest intraday points move ever seen in the trading of the Dow Jones Industrials – will be the focus of an entire chapter of this book and a forensic like examination of the trading patterns seen that day reveal some remarkable features of modern markets and their capability of producing extreme and highly abnormal conditions for traders and investors.

What evidence is there that contemporary markets are exhibiting more fat tail behavior?

In recent years, perhaps as a result of the proselytizing by financial pundits such as Nicholas Taleb, [18] there has been a widespread, but not ubiquitous, realization that financial asset prices exhibit an unconventional distribution pattern. By that is meant that the shape of the “bell curve” (actually it is not bell-like at all), and the lengths and size of the tails of the distribution for returns of financial instruments do not “fit” within a normal distribution model. There have been several attempts to find more applicable distributions but it will be argued later that this is most likely to prove fruitless. The peculiar shape of the distribution of asset returns can be quite convincingly illustrated by reference to Figure 1.3 which traces the distribution around the mean returns for the S&P 500 during the period from January 1985 until mid-May of 2012.

The period covered in Figure 1.3 includes almost 7000 separate data points which correspond to the daily percentage changes in the S&P 500. As can be seen if the shape could be described as bell-like at all, it is a very narrow bell. Also discernible is the fact that the tails are very elongated stretching to both \pm ten standard deviations on either side of the mean. This kind of pattern is called leptokurtic, and, in essence, reflects the fact that on a day to day basis there will be relatively small changes in the S&P 500, and therefore there will be a concentration of the distribution around the central tendency. More pertinent to the concerns of this book,

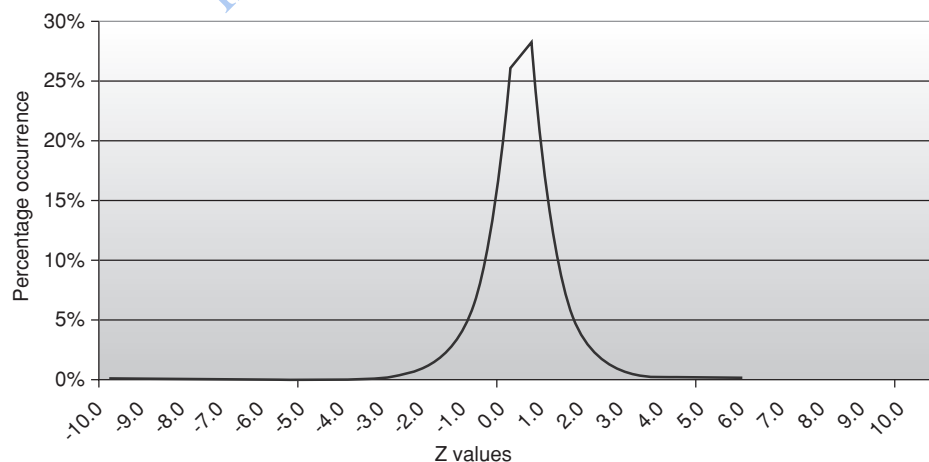


Figure 1.3 Normalized distribution of daily changes to S&P 500 1985–mid-2012

Table 1.1 Table of outlier values for daily changes to S&P 500 1985–mid-2012

TOTAL DATA POINTS	6899
LEFT TAIL OUTLIERS < -3 SD	51
RIGHT TAIL OUTLIERS > 3 SD	77
TOTAL OUTLIERS	128
PERCENTAGE OF OUTLIERS	1.9%
LEFT HAND CENTRAL TENDENCY WITHIN -2 SD	3170
RIGHT HAND CENTRAL TENDENCY WITHIN $+2$ SD	3410
TOTAL WITHIN ± 2 SIGMAS	6580
CENTRAL TENDENCY PERCENTAGE > -2 SD and < 2 SD	95.4%

the outliers of the distribution are far more severe and frequent than would be expected from the type of normal distribution which, for example, is a good representation of the distribution of heights of human beings (at least a specific category such as adult males). With respect to a normally distributed data series – such as heights – the likelihood of someone exceeding (or being less than) a height which is more than 3 sigmas from the mean is very small – approximately 0.15%.

During the 27-year period covered in Table 1.1 there were almost 7000 data points and 4.6% of those that exceeded the threshold of ± 2 sigmas. That this frequency of 4.6% also concurs with the expectation from statistical theory that ± 2 sigma events should occur with approximately 5% probability may be seen as validation of the theory that asset returns are normally distributed, *but* the problems arise when considering the frequency of the outliers and their distribution or tendency to cluster. There is a pronounced tendency for abnormal moves to cluster, and not be distributed haphazardly across the time line, as will be demonstrated in Chapter 4. This should not be surprising of course as prices are determined by human beings who have memories, fears, and emotions and, when they are stressed and anxious, their reactions to events are going to be more extreme and erratic.

Also evident from Table 1.1 is the fact that 1.9% of the daily returns for the S&P 500 lie outside the six sigma window which is often used as a simple metric for characterizing this fact about financial returns as having “fat tails.” According to a Gaussian model [19] the probability of an event falling outside the six sigma window is just shy of 0.3%. So the US benchmark index distribution has six times more outliers than would be expected by this model. Not shown on the table is the fact that since July 2007 the number events that lie outside the six sigma window is 58, which is almost one half of the total outlier events in the full 27-year period. The prevalence of these outliers, both during the GFC and in its aftermath, clearly demonstrates that there is a greater likelihood of “tail” events in recent financial history.

The following graphic, Figure 1.4, and the excerpted commentary, which comes from a Credit Suisse research note cited again in the discussion below, are also helpful in answering the question which began this section regarding evidence for increased “tail risk” events. [20]

... fat-tail events have occurred more frequently, and have been exacerbated by the 2008 credit crisis. For example, [Figure 1.4] shows that, for US equities and global fixed income, the number of three-sigma days per year has increased, reaching a peak of 46 and 15 days in 2008, respectively. As such, the probability of a fat-tail event occurring under a normal distribution is actually much higher—at 4.7%—just during the last decade.

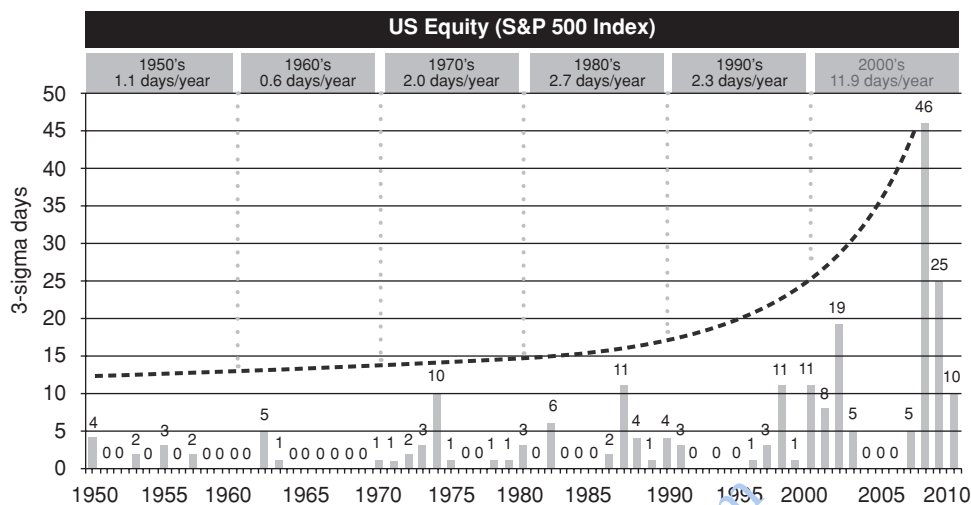


Figure 1.4 Extreme events for S&P 500 1950–2011

Source: Credit Suisse: Is the (Fat) Tail Wagging your Portfolio?

For the reader that notices a discrepancy between the incidence of three sigma days in my own table and that shown in the research note just cited, the simple explanation is that Figure 1.4 covers a different period back to 1950 but terminating in 2010, and this will affect the calculations of the mean and standard deviation and therefore the counting of six sigma events.

In the analysis which will follow it is suggested that, while looking at some of the extreme price activity which has been seen in markets since 2007, the nomenclature of fat tails and outlier events which exceed the six sigma boundaries, really doesn't do justice to the extraordinary severity and magnitude of drawdowns which can be inflicted on an investor. Furthermore by using the terminology of standard deviations (sigmas) and couching the analysis in terms of normal distributions, there can be a spurious sense of the reliability and accuracy of the methodology. *Markets are more badly behaved than statistically obsessed risk managers would like to believe!*

There is another potential danger when just focusing on statistical data such as increased volatility and the presence of fatter tails, of ignoring some facts about the financial environment which may be considered as part of the "new normal" but which are nonetheless quite extraordinary. For example, at the time of writing, the yields on both the 10-year US Treasury note and the 10-year German bund are hovering around 1.5%, short dated Swiss, German, and Finnish government securities have negative yields, the UK 10-year gilt is below 2%, and the Bank of England base rate has been at 0.5% for three years – its lowest level in the Bank's three-hundred-year history. Moreover the balance sheets of the ECB, the US Federal Reserve, and the Bank of Japan have expanded by several trillions of their respective currencies in just the last two years since 2010.

The remarkable paths taken by government bond yields in each of the US, UK, Germany, and Japan since 1990 are very well illustrated in Figure 1.5. [21]

What is perhaps even more remarkable about the steady decline in yields and their convergence towards levels seen in Japan for several years, [22] that is around 1% for a ten-year

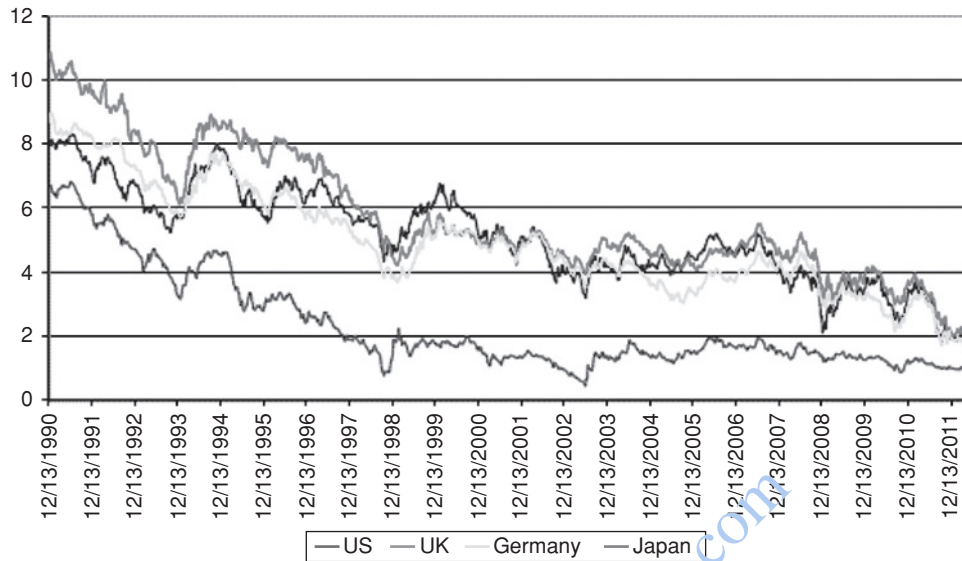


Figure 1.5 10-year government bond yields

maturity bond, is that these yields have been coming down steadily, especially in the period since the GFC, despite the fact that gross government debt in each sovereign has been climbing at an accelerating rate as can be seen in Figure 1.6.

The most notable feature of Figure 1.6 is the disproportionately large share that Japanese government debt has to its GDP, and if the IMF forecasts prove accurate this will have risen above 250% by 2017. Just how sustainable that level of public debt is remains to be seen, but there are a growing number of pessimists (realists) who believe that with adverse demographics

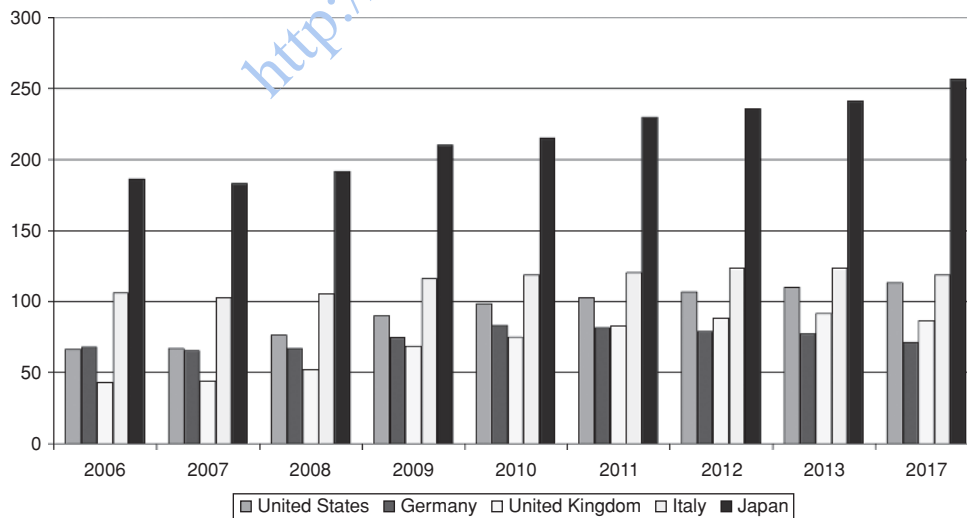


Figure 1.6 Government Gross Debt as percentage of GDP: data source IMF WEO April 2012

and increased competition from other Asian exporters the Japanese debt situation resembles a “fly looking for a windscreen.” By comparison the situation for the other territories looks less foreboding but to seek comfort from this would be a dangerous complacency. As can be seen the debt to GDP ratios for both the US and Italy are already above 100% and are expected to continue rising over the forecast period. Germany is the exception in that while there was a jump in 2009 and 2010 the projections going forward in the IMF data suggest that the rate will flatten out in the next several years. However IMF projections have often proved too optimistic in the past. Another wild card for Germany is the extent to which its public balance sheet will become burdened by efforts to keep the Eurozone afloat, a subject discussed further in Chapter 11.

So we are faced with an enigma which defies any straightforward explanation from classical demand/supply theory. If the supply of sovereign debt by these G10 states is increasing why, with the exception of Italy, are the yields on their sovereign bonds declining? (The prices of sovereign issues would have to be going up and/or bonds would have to be issued with lower coupons for this to happen.) The answer to this is both easy and hard. The easy answer is that there has been strong risk aversion on the part of many institutional investors since the GFC and the demand for safe sovereign issues (which can be claimed for four of the five countries shown in Figure 1.5) has replaced the “cult of equity” which prevailed through much of the 1990s and early years of the new millennium. If one couples risk aversion to equity with the fact that issues from many lesser rated sovereigns are definitely not on a buy list for most pension funds and insurance companies, and there is a satisfactory explanation for the paradox of increased supply but increased demand and therefore price. The harder explanation relates to a fuller analysis of risk on/risk off dynamics, the nature of a *balance sheet recession*, and the phenomenon of *vendor financing*, and discussions of each of those is still to come. [23]

There are two charts on the adjacent page which will be discussed in more detail later as we proceed, but both in their way are worthy of attention at this early stage in the discussion. The 20-year chart of the yield on the US 10-year note, Figure 1.7, shows a quite remarkable steady descent from a yield above 8% in 1991 to well below 2% in the late spring of 2012. The other long-term chart, Figure 1.8, shows the inexorable rise in the Japanese yen against the US dollar since 2007. It will turn out that there are some interesting dynamics connected with safe haven and risk off dynamics that need to be considered with regard to the cross-asset correlation of such apparently different instruments. These risk off dynamics need to be counterbalanced by considering the exceptional performance of other risk on assets such as equities where US equities almost doubled between 2009 and 2011 and Germany’s DAX to mention just another example, more than doubled from its low of 3588 in March 2009 up to a peak above 7600 in May of 2011.

1.1 HOW HELPFUL IS THE NOTION OF TAIL RISK?

The notion of tail risk has become *de rigueur* amongst financial analysts and is itself at risk of becoming overused. Although this was already touched on in the earlier part of this chapter, the key idea is to consider it in relation to the related notion of “fat tails” – a phenomenon which everyone in the financial world should be familiar with, if for no other reason than the meme planted by Nicholas Taleb in his best-selling book *The Black Swan: The Impact of the Highly Improbable*. [24] Based upon the normal distribution, an assumption which is highly questionable when trying to understand probability and risk in regard to financial markets, an event which falls outside ± 3 sigmas from the mean return could be said to be an outlier or



Figure 1.7 Yield on 10-year US Treasury note monthly 1990–mid-2012

tail event. It would then follow that such an event – such as a drop in an asset price of more than three standard deviations – has exposed the holder of such an asset to “tail risk.” But how relevant is that to an estimation of how probable such an event is?

According to a Gaussian normal distribution the likelihood of a data point that falls outside the six sigma window should only arise about 15 times in a series of 10 000 observations. Now this may be true with respect to the chances of meeting an adult male who is more than three standard deviations above the mean height for adult males – which is about 6ft 6inches or, for those more familiar with the metric system, approximately 199 cm. [25] However the data on S&P 500 returns, as illustrated earlier, shows that financial data does not fit a normal distribution, and that there is a chance of almost 100 observations out of 10 000 exceeding the six sigma window. So the frequency of outliers is much higher, and critically so too is the magnitude of the difference from the mean. Just for amusement if we consider the remark made by the CFO of Goldman Sachs, and noted earlier, regarding 25 standard deviation moves “that happened several days in a row,” we would have to subtract 25 times 8 centimeters (the sigma for heights of adult males) from the mean height of 176 cm and that would give us an individual with a height of about minus 20 cm.

When we talk about tail risk the thesis developed here is that we might be misleading ourselves into thinking that this is just an extreme form of lesser risk. The implication when using terms like *extreme* is that there is a scale of reference, but the question that really needs to be addressed is – what is the proper scale for comparison of different degrees of risk? In finance there are many kinds of risk – credit/default risk, inflation risk, counter-party risk



Figure 1.8 Japanese yen/US dollar monthly 1990–mid-2012

and so on – but in much of the theoretical side of financial economics, risk is taken as being synonymous with volatility. The tendency of prices or asset values to fluctuate is something that can be measured, and, from this simple method of calculating the degree of fluctuation and the application of statistical and probability axioms, many kinds of extrapolations and forecasts can be made. But just how valid are such extrapolations and forecasts? This is a crucial question for wealth protection and risk management.

So does it follow that since we can measure degrees of volatility, and therefore risk in the narrow sense favored by financial economists, and make sense of them in relation to textbook statistics, that we can simply scale this understanding up to provide a theoretical framework for comprehending financial crashes or episodes of extreme volatility? I take this to be a hard question to answer, and also one that is both fascinating and extremely pertinent to a better understanding of today's financial markets. Moving away from statistics for a moment, the question might be framed along slightly different lines as follows – is the difference, from a psychological and emotional point of view, between anxiety and outright panic just a matter of degree or is there such a difference in the order of magnitude of each that categorically different explanations are required?

Not to confuse the reader too much at the beginning of this journey, there are echoes from the question just posed to a similar one which can be posed in what may seem to be the totally unrelated field of geophysics. This question can be framed along the following lines: Are extreme earthquakes, which are mercifully quite rare, simply to be understood as smaller earthquakes that didn't stop or failed to attenuate? The reason for asking this question will become clearer when examining the concept of power laws for which there is evidence

certainly in the case of earthquakes and also in terms of the magnitude of movements in financial markets. In simple terms, an event is said to behave in accordance with a power law if the frequency of the event is inversely proportional to its magnitude. The dimension of the magnitude or scaling variable could be the amount of energy released (or ground motion) in the case of an earthquake or, in the case of the financial markets, it could be the magnitude of price discontinuities. [26] Even if we are able to discern a power law relationship in regard to financial dynamics (which we can) does this enrich our understanding of these dynamics, and more pertinently does it provide us with any means of anticipating when financial crashes may occur? Or are we in the same position as geo-scientists in having no real means of predicting when and where (exactly) a mega quake is likely to occur?

The reason for posing these questions in an introductory chapter is to alert the reader to the possibility that for those who have a fetish for quantification of all things in the realm of finance, they may end up being frustrated by our inability to arrive at the proper scalar for understanding risk. In turn it may be that the notion of tail risk – which has a pseudo scientific flavor to the term, suggesting that there is some robust theoretical framework which can be referenced – is actually not a quantitatively determinable concept. Instead it may turn out that by thinking about financial crashes, market panics, and extreme risk in a fresh manner we will be better armed to understand the origins of such phenomena and from an investment management perspective better able to deal with them.

Although we shall return in Chapter 13 to the manner in which an investor can alleviate the dramatic drawdowns [27] that arose during the 2008 crisis, and which will arise again during future bouts of systemic illiquidity, it is very useful to make reference to a key limitation of some of the tail risk protection strategies that are now being offered by various providers such as PIMCO and large investment banks. [28] Many of the world's leading hedge fund managers attend the GAIM conferences each year, and at the June 2012 meeting in Monaco a number of managers made the excellent point that some of these tail risk protection products may not perform as required (and promised by the providers) when markets experience systemic illiquidity. An article from Reuters entitled "Investors Cast Doubt on 'End of World' Hedge Strategies" [29] reports on doubts expressed at the GAIM conference "whether such funds can perform as they are expected to, leaving investors dangerously exposed to a deepening global debt crisis."

Pension funds and family offices, still smarting from the huge losses they suffered in the 2008–2009 financial crisis and fearing another blow-up is just around the corner, are handing over billions of dollars to bank and fund providers promising protection – many without really knowing if the funds will pay out when they need them to.

The fallacy inherent in the design of some of the products on offer is that *they assume market liquidity* in the instruments that will purportedly be providing the protection. This is a dangerous assumption as will become more evident in what follows but it was also brought out at the conference by one of the delegates who is quoted as follows:

"You guys better figure out how, while hedging tail risk, you're not letting liquidity risk sneak in the back door . . . you don't know how to get out and we've just had a liquidity event not so long ago," one investor told a panel of managers discussing their funds on Wednesday.

He accused firms who offer the strategies of not knowing how to exit their positions, particularly if markets seize up and liquidity in the derivatives markets these funds trade evaporates.

Normal functioning of markets depends upon adversarial views on the appropriateness of the current valuation of assets. Depending on one's economic circumstances, orientation, and cognitive frames of reference, some will want to be buyers at current prices and others would prefer to sell to the former. The fractious dimension to market participants is the driver towards *price discovery* which is the primary purpose of markets. (The more cynical view is that markets have become the playground for hedge funds and HFT algorithms, but we shall not go down that path at this juncture.) The adversarial or fractious quality of market dynamics will be enhanced by asymmetry of information and knowledge (or ignorance), enabling those with insight into "real" or "true" information to exploit those with "mistaken" knowledge. It is also true that, as a result of many within markets wearing several hats as both principals and agents, the asymmetry of information can in a real sense be one that crosses the borderline between information that is in the public domain and that which is not.

If a vital prerequisite for the existence and functioning of proper markets is information asymmetry, in light of the events of 2007/8, a strong argument could be made that markets will be more dangerous when there is essentially symmetry of ignorance, i.e. where no one knows what is going on. That is where no one has an information advantage. In such a case markets lose their liquidity, disagreement over the appropriateness of valuations is suspended, and a lot of wealth destruction can and will take place.

1.2 DICHOTOMIES AND AMBIGUITIES

Epistemologists, concerned with the theory of knowledge, have sometimes pointed to the role of metaphor in our language and underlying cognitive framework. We know about many abstractions by being able to use analogy and metaphors to translate a complex idea into simpler and more intuitive notions. Such metaphorical devices could be as simple as the difference between being inside a container of some sort or outside it, being above or below some reference point and in general terms being able to imagine a simple schema which then allows us to add on further layers of abstraction – themselves aided by metaphorical heuristics. Another key strand of thought is that some of our knowledge derives from the mind's facility with contemplating opposites or being able to polarize qualities. Good and bad, tall and short, volatile and calm are just a few of thousands of dichotomies that the mind is capable of laying out at each end of a spectrum of dichotomies.

Most dichotomies are susceptible to what can be called *semantic shading*, in other words they can be thought of as black and white extremes at the end of a spectrum, but with many shades of gray in between.

Most dichotomies are tolerant of ambiguity . . . they are susceptible to semantic shading without posing truly uncomfortable choices and cognitive dissonance. The capacity of human beings to entertain a disparate variety of dichotomies as foundations to a set of beliefs is testimony to this tolerance. But there are certain kinds of dichotomies which cannot be nuanced and where cognitive anxieties will demand disambiguation.

1.3 TRUST AND SOLVENCY ARE ALL OR NOTHING DICHOTOMIES

In the realm of finance and economics two such dichotomies, which are not so readily susceptible to shading, are solvency and trust. This is not to suggest that for many people they cannot be smudged at times – as attested to by the saying that you can fool some of the people all of the time. Under normal circumstances we are not faced with having to make a vital decision

on whether or not it is wise to place trust in another or whether a prospective counter-party may be solvent.

When circumstances become critical there is no longer a continuum for trust -> distrust or solvency -> insolvency. After a certain tipping point there is a dramatic discontinuity in the willingness to consider mitigating factors or compromises in the judgments we make. We may start out, if transactions are small and inconsequential, in overriding any discomfort that we may be experiencing about having to make a critical decision as to whether to trust the solvency or ability of counter-parties to honor their obligations. However once we move beyond a certain threshold of inconsequentiality, when more critical circumstances (perhaps life threatening) present themselves to us there is absolutely no propensity to tolerate doubts or mistrust. To the extent that we have a choice we will refuse to engage with that counter-party. The discontinuity is not just a jump from a linear to a nonlinear method of weighing up the risks/benefits, but rather our decision about the uncertainty of the outcomes is best thought of as totally unacceptable. Beyond a certain threshold the decision making and willingness to accept a certain degree of “fuzziness” and to fudge the issue becomes an *all or nothing proposition*.

As an example, in September 2008 counter-parties that were dealing with Lehman Brothers *completely lost trust* in the company, refused to fund it in the money markets, and quite rapidly the overall market realized that the company was insolvent. Traders and investors were no longer prepared to tolerate self-serving statements from the company’s CEO and its management team that its balance sheet was sound and that it could fund itself. There was a total breakdown in trust of the company’s declarations regarding its financial position. In such circumstances, there are no degrees of solvency – a company, especially a bank, either is solvent or it is not – there is no halfway house. It is this unwillingness to tolerate any ambiguity regarding solvency that explains why companies can be full of employees in opulent offices one day and then bankrupt the next, with the employees walking out of those same opulent offices with cardboard boxes containing their hastily packed personal possessions.

The switch from all or nothing in decision making with respect to whom we can trust, or what kinds of intermediation (also intervals) we can have faith in, is precisely the explanation for the dramatic and non-quantifiable element of systemic risk. As human agents with survival instincts (to call these emotions is to understate their visceral quality) there is no longer a calculus of probabilistic reasoning but rather a gut level response to danger. Failure to account for this very abrupt switching rather than a gradualist change of mind, it will be suggested, is one of the principal shortcomings of the theoretical framework which underpins financial economics. It will be argued that the bias in our theories of economics and finance towards gradualism and uniformitarianism – which have occupied a powerful position in the history of ideas including the vital work of Charles Darwin [30] – has inhibited us from confronting true dichotomies in a robust manner, and thus to fudge a lot of hard questions. Just one further thought in this regard is the fallacy of believing that all large effects – such as the collapse of a bank for example – has to have a large cause. But there are several insights from complexity theory which suggests that this is not the case. [31]

One influential insight which is related to the gradualist fallacy is found in the work of Per Bak, a physicist and computer scientist, and this was developed in a fascinating book entitled *How Nature Works*. [32] It will not be necessary to go into depth on this work but in essence Bak showed that under controlled experimental conditions very large effects, specifically massively disruptive avalanches in sand piles, could result from just adding one more grain of sand to the pile. Over time the sand piles have taken on the condition of *self-organized criticality* [33] in which, although they have preserved their state of being in the form of a heap

or pile, they are also highly unstable; the incremental addition of just one more grain causes a collapse. Bak found that there is no linear relationship between the cause (the addition of one tiny grain of sand) and the disproportionately large effects, i.e. a massive avalanche.

With regard to our understanding of extreme events in markets, such as have been seen since 2007, there is a parallel in that they had by 2007 reached a position of criticality and the ensuing collapse does not require a single big cause as the explanation. It may also help to account for why not many macro economists had an answer to the question famously asked by Queen Elizabeth II on a visit to the London School of Economics soon after the events of late 2008 – “Why didn’t anybody see this coming?”

Just as the grains incrementally falling on to the sand-piles which haphazardly will produce avalanches, or small earthquakes that just don’t stop, the rupturing or abrupt discontinuity which takes place with regard to systemic risk is not susceptible to easy quantification. How else can one account for the manner in which assets are disgorged with no regard to price or favorable arbitrage opportunities. To have confidence to conduct arbitrage one needs to have confidence in spanning a time interval and that will be lacking when the total aversion to trusting counter-parties prevails.

Imagining circumstances at the individual or microcosmic level which could cause an individual to suddenly lose trust or faith in another is not too difficult to contrive. Most of us will have had experiences with others where the desire to rid oneself of any engagement with that other person is total and uncompromising.

It is also possible to reflect that this is scalable and can be extended to circumstances where there is a sudden collective suspension of belief in the value of intermediation, i.e. relying on another person to perform. To the extent that most market participants become unwilling to rely upon the promises and solvency of others, there is a systemic breakdown.

How could the value of one of the world’s largest banks – Citigroup – be marked down by 95% within a little more than a year? Or to put in a slightly different fashion: What rationalization could be made for an investor suffering a 95% drawdown in one of the world’s most highly capitalized companies, to want to continue to own that asset? Even more acutely, after the fact when surely trust in that institution’s solvency must be at rock bottom, how can someone be enticed to invest in that same company? Later in the book, the suggestion will be made that it is necessary to radically amend our framework for understanding and evaluating financial risk in order to understand why such “abnormal” events have occurred, will occur again, and what strategies one can adopt to assist in alleviating the wealth destruction that can arise in their wake.

Bubbles will keep inflating until they don’t – is that the best that can be said? To express the same question in terms of the analogy with the difficulty in knowing when the avalanches in Bak’s sand-piles will occur, or when a large earthquake might happen, it may be that we can have a good sense that the financial system has reached a point of critical instability, but, much more pointedly, what is the triggering event – the extra grain of sand or the additional foreshock – which will cause the system or financial markets to crash? The difficulty in identifying the exact triggers – especially at the time – captures the difficulty which prevents the “rationalizing” mind from having great specificity about outcomes in the highly uncertain world of economics and finance. Notwithstanding our inability to understand the precise interplay of the highly complex dynamics that are present in a sophisticated financial economy, there is quite a bit more that could be done to avoid crashes. Most pertinently central bankers should expand their mandates from monitoring inflation at the level of the price of bananas and haircuts to monitoring asset inflation.

Although this is a contentious issue it would seem to be self-evident in the aftermath of the GFC that central bankers should have the macro-prudential task of ensuring that bubbles do not become as crisis prone as they were in 2006/7. The chairman of the Federal Reserve Ben Bernanke has famously said that it is not desirable for central banks to become “bubble poppers,” and his predecessor, Alan Greenspan, has often been accused of allowing the US real estate market to become overly frothy by keeping interest rates at extremely low levels for too long after the Nasdaq crash and the events of 9/11. [34]

I think for the Fed to be an “arbiter of security speculation or values” is neither desirable nor feasible . . . Aggressive bubble-poppers would like to see the Fed raise interest rates vigorously and proactively to eliminate potential bubbles in asset prices. To be frank, this recommendation concerns me greatly, and I hope to persuade you that it is antithetical to time-tested principles and sound practices of central banking.

In macro-economics the problem goes even deeper than that expressed in the comments above by Bernanke. It is not only that central bankers may not think it feasible to become “bubble poppers” but more alarmingly they seem not to have an adequate framework for understanding the dynamics behind the creation of bubbles, much less how to arrest their development.

As the discussion proceeds it will be useful to look at good and bad theories in macro-economics which either have, or do not have, any explanatory force as to why bubbles and booms arise and also why they will inevitably, to mix metaphors, crash and burn. The mainstream economic orthodoxy as taught within many universities and business schools which is often referred to as neoclassical economics, really suffers from an inadequate framework for explaining bubbles because it fails to account for, even acknowledge, the manner in which the banking system via its ability to create credit, fuels bubbles and provides the lubrication to the dynamo which helps to motivate investments – the Keynesian “animal spirits” – to excess and over-exuberance. The superior theories of the modern monetarist school (inspired in large part by the work of Hyman Minsky) provide a much better explanatory framework for understanding bubbles in terms of Minsky’s notion of ponzi financing and other insights about the role of credit and money within a sophisticated economy. [35] Even with this better framework there is still a deficiency in that we are not adequately prepared to know when bubbles have been inflated to their maximum extent, and when financial crashes and instability will emerge.

Attempts at specificity with respect to “tail risk,” when they become preoccupied with trying to measure it precisely, are spurious as they will fail to reflect the astounding magnitudes of total asset price collapses that are evident in recent economic history. These collapses range from outright bankruptcies of companies ranging in recent times from corporate giants such as Enron, Worldcom, General Motors, Lehman Brothers and many others, to the reorganizations/rescues of others such as AIG, Citigroup, Merrill Lynch, Fannie Mae, Freddie Mac, Bear Stearns, Royal Bank of Scotland and too many others to mention.

When a bubble bursts, all confidence in the immediate basis for normal financial intermediation disappears. Admittedly over time some semblance of trust can be restored but only after some form of re-structuring. No one is going to lend money to a person who is on the verge of bankruptcy. After a bankruptcy re-organization, when the slate has been wiped clean, there will be a different perspective on the riskiness of making such a loan. But what if there is a cultural taboo about wiping the slate clean for certain kinds of debt?

1.4 THE ASYMMETRY OF PRIVATE GAIN AND PUBLIC LOSSES

At present central bankers and policy makers do not have to make a choice between preserving or abandoning the asymmetry of the private gain/public pain dichotomy. Although there has been growing hostility to continuing bailouts, until there is a radical change in the political climate (which just might come within struggling European states), there is still acquiescence in the status quo whereby institutions that are deemed Too Big To Fail *have to be rescued by taxpayers*. Even when assisted back to robust health there is often no gratitude from some institutions for the public assistance that was provided during the GFC.

In fact it has become part of the revisionist rhetoric since 2008 that certain financial institutions, particularly in the US, were actually forced into accepting TARP assistance and could have withstood the systemic liquidity crisis without such aid. It is always difficult to adjudicate on a counter-factual but there is understandably some public distaste with the bold assertion that these reluctant recipients of taxpayer assistance received no benefit from the massive government programs that were put in place to counter the tumultuous conditions in financial markets in the second half of 2008. When bubbles burst and crashes occur there are very substantial external costs involved in cleaning up the messes. It will be argued later that for an individual bank to turn a blind eye to these externalities is akin to a chemical company failing to pay for the environmental damage caused by dumping pollutants into its nearby rivers.

Preservation of the private gain/socialized losses asymmetry ultimately hinges on the notion of protecting creditors – the *stickiness of debt*. The entire financial system revolves around the notion that while all other variables, especially equity, should be encouraged to vary – with or without the efficacy of price discovery and market clearing forces – there should be constancy and certainty with respect to most debt financing – including mortgage debt and, to a large extent, sovereign and corporate IOUs. In a financial system where uncertainty is omnipresent it is remarkable that there is almost total deference to creditors and bond-holders in preserving the fixed value of their claims, and an unwillingness to allow it to fluctuate as does the value of almost all other financial instruments.

The calculation seems to be that whereas the public may well be very critical and opposed to transferring private liabilities to the public balance sheet, the financial establishment would be even more hostile to a collapse in the banking system and the interlocking contractual claims that underlie indentures, loan agreements (mortgages), and swap arrangements. The reasoning seems to proceed along the following lines. It might be argued that there is no obvious sense in which bailouts violate statutory cornerstones – raising the debt ceiling has resulted in Congressional gridlock in the US but there is no constitutional transgression *per se* in expanding the balance sheet of the public authorities – however to unpick indentures, swaps, mortgage agreements etc. would undermine the very fabric which binds a society/economy together by undermining the rule of law.

Why did the US government pay out 100% on AIG's contractual promises? The answer is probably not one for which it would be easy to find a consensus view. The argument has been made that it was important for the US government to honor the promises and commitments made by AIG to its counter-parties in order that the integrity of the legal and contractual framework at the heart of financial transactions is fully maintained.

An alternative, and some might say, more cynical viewpoint is that Henry Paulson, the Treasury Secretary at the time when a negotiated settlement reducing the payout by the government that had taken over AIG could have been reached, had a conflict of interest with respect to his former employer Goldman Sachs who was one of the main beneficiaries of the 100% payout. [36]

The main thrust of this book is not polemical but sometimes it is good to give an airing to alternative and radical viewpoints as they help in clarifying what is often seen as beyond discussion. Following the calamities of 2008 it would seem that the “official” view and the revisionist rhetoric alluded to just now, should be subjected to very critical scrutiny so that we might learn worthwhile lessons from mistakes made in the past. When one is increasingly required to think the unthinkable with regard to the way that the rolling financial crisis has evolved since 2008, the foundations of financial capitalism should be open to honest debate.

One of the deeply held foundations that has been challenged, but still by a small minority of economists, relates to the almost sacrosanct manner in which providers of debt financing must have their financial claims protected at almost any cost. Apart from the manner in which the AIG payout was conducted as exemplifying this predilection, there is the more general point that unlike most players in the financial markets who win sometimes and lose sometimes, it seems to be accepted that debt holders should never be on the losing side.

Another way of expressing this asymmetry between providers of equity financing and those investors that buy bonds or banks that lend money so that people can buy houses or companies can buy capital assets, is to consider what can be called the “stickiness” of debt.

Macro-economic theory is quite preoccupied with the stickiness of wages and other rigidities which inhibit the ability of markets to *clear*, but the rigid and unbending liabilities of the borrower (or the assets for the debt holder) are an all pervasive stickiness to the macro economy and financial system. Some would argue that this stickiness is the single most important obstacle to a clearing, in the market sense of that term, of the detritus left over from the GFC.

As an example of the attempt to put the issue of the stickiness of debt into the realm of economic discourse the following comes from one of the more outspoken and articulate critics of economic orthodoxy. [37] Steve Waldman raises the following question in regard to this issue:

Here’s my question. Looking forward to the next thirty years, after we have decisively defeated wage rigidity by ensuring that the unemployed are numerous and miserable, don’t you think we should devote just a bit of our attention to tackling that other sticky price? . . . perhaps we should think about the bargaining power of creditors as well, so that if we get ourselves into a pickle where the “cost structure” of honoring debts is high, we have technocratic and politically acceptable means of managing the burden of loan contracts just as we’ve developed mechanisms to control wages.

To “unstick” the price of debt really means to resolve a mismatch between the asset and liability side of the swap. If assets values have depreciated, you can do that two ways:

1. you can write down the debt;
2. you can somehow cause the asset values to reflate.

Waldman makes the point that bailouts are often intended to reflate asset values and rejuvenate the “animal spirits.” At least at the time of writing they seem not to have been too successful in regard to the latter. Moreover, “bailouts tend to unstick some peoples’ debt and not others: the government picks winners and losers. Bailouts destroy incentives to choose assets well and maintain or improve their value. This raises the classical question posed by Walter Bagehot, Keynes and others regarding moral hazard – why should one be financially prudent, as long as one holds assets that will be bailed out?” Once again the matter of the external costs of financial crashes raises its head. As Waldman also observes this is particularly

pointed as “focused bailouts are often targeted towards those ‘in the most pain’ — exactly the people who were the worst choosers and stewards of assets *ex ante*.”

Waldman’s questions are well put, and there are echoes of exactly the same desire to encourage an open dialogue about the stickiness of debt in the writing of Steve Keen, professor of Economics at the University of Western Sydney, who engaged in a lively war of words in the blogosphere with Nobel prize winner Paul Krugman in the spring of 2012 and who has made a personal campaign of calling for a “debt jubilee.” [38]

However the calls for debt write-downs and the “unsticking” of debt values have fallen on deaf ears amongst policy makers. Rather the tacit assumption by central bankers and policy makers is that there is a systemically vital need to prolong the Minskyesque ponzi financing of the debt overhang from the GFC, via continuing enlargement of the public sector balance sheet. The unspoken and somewhat hidden agenda (it is getting much harder to keep agendas hidden in the age of ubiquitous blogs and Twitter) behind ongoing bailouts and rescue programs is that if the can is kicked down the road for long enough then reflation will ultimately kick in and the animal spirits will be rejuvenated. For now, at least in mid-2012, policy makers have to hope that we are still in the convalescence phase of a burst debt bubble, and programs such as QE, LTRO, and ZIRP for as far as the eye can see should ultimately mitigate deflation and restore asset valuations towards their former elevated values. One of the critical questions remains: Even when (if) such valuations are restored will these values have been restored on a nominal or a real basis? In other words might real estate prices return to their previously lofty values but homeowners are confronted with \$10 per gallon for gasoline and £10 for a bar of chocolate?

The real systemic risk to the ponzi financing programs being undertaken by all G10 economies is what might happen with the apparently endless saga of Eurozone bailouts. At present the ECB remains transparent about the nature of its financing of Member States, but such transparency could ultimately become the weak link in the global daisy chain. The reason to presume that this weak link could eventually snap is that the underlying framework of the EZ is one of *several but not joint responsibility*. This characteristic of the legal framework of the EZ will be the subject of Chapter 11 so will not be elaborated further at this stage.

In a truly federal system such as that in the USA or for an economy which is autonomous (i.e. it can print its own currency) such as the non EZ European economies and Japan, there will, during critical episodes, when the economy is highly stressed and in risk of systemic crisis, be a “circling of the wagons” to obfuscate the fact that the emperor might not have a full set of clothes. However in the case of a looser structure such as that of the EZ where the separate members of the currency union want to preserve *pro rata* obligations towards the liabilities incurred by other members, the audit trails for a disentanglement of collective liabilities will have to be preserved. In such circumstances the wagons won’t be able to complete a full circle and the emperor’s humble wardrobe is in danger of coming into full view. Without joint responsibility for all EZ liabilities, which Germany seems desperately keen to preserve, the Bundesbank and Bundestag will also be very keen to ensure that all of the financing operations conducted on behalf of the EZ Member States remain fully transparent – how else would it be possible to continue to insist that they are only liable for their pro-rated share? Full transparency is often to be admired, but as the opening sentence to this chapter suggested there are reasons why diversionary tactics have been employed to keep unsettling and untidy facts from public attention.

So the really crucial question becomes who might be willing to carry out a full blown bail-out of the EZ, one that could see Spain and Italy needing to be rescued? Will it be Germany?

If not then who else will be the counter-party of last resort? Would not a cascading of debt dominoes as numerous contractual claims burst asunder wreak systemic breakdown? The risks of the Eurozone disintegrating are likely to remain long-lived and the system threatening risks are likely to see a prolongation of the kind of post-GFC investor demeanor which is well characterized as the *bipolar switching between behavior which is either risk on or risk off*. In a nutshell the thesis of this book is that the post-traumatic stress of the GFC, and the ongoing threats of an even larger systemic liquidity breakdown looming on the horizon, are the background conditions which have led to a mode of investor behavior which can be characterized, at one level, as risk on/risk off, and at another level, in a theme which is to be developed, as bipolar.

At the time of writing the deteriorating situation with regard to Spain's financial position prompted a remarkably candid outburst from Spain's finance minister in which he likened Europe to the Titanic and Spain to a seriously ill patient undergoing critical surgery. [39] Although events are moving fast in the Eurozone crisis, and there is a risk in dwelling too much on the day-to-day news flow, that quotations could easily be outmoded by the time this book is published and read, the following comments from the Spanish finance minister are well worth repeating for their poignancy:

"This is like the Titanic," he told state radio. "If there's a sinking here, even the first-class passengers drown."

"If the banks are loaded down with doubtful assets on their balance sheets, and if the only safe thing they can do is buy sovereign bonds, then there is virtually no new credit for the private sector. Then the economy's seized up and that strangles the banks again, because the people becoming unemployed don't pay their debts."

Financial contagion brings with it nonlinear dynamics which is why, beyond a certain tipping point, the deterioration in the Spanish economy (and other countries not yet acknowledged to be distressed), coupled with accelerating increases in Spanish bond yields could quickly start to resemble those of previously distressed borrowers ranging from Lehman Bros to Argentina. The above remarks underscore the increasing fragility of the great European project, and, prompt the statement that – to provide the flavor to another major theme of what lies ahead, dilemmas which pessimists claim are irresolvable and I believe are going to be quite threatening – *if one wants to save the single currency and the Eurozone one wouldn't start from where we are now*.

ENDNOTES

1. J. M. Keynes, *The General Theory of Employment, Interest and Money* (BN Publishing 2008) ch 12.
2. *Risk versus Uncertainty: Frank Knight's 'Brute' Facts of Economic Life*, by William Janeway. Social Science Research Council (19 October 2005).
3. An example of the assumption that low-cost liquidity can be considered as a "given" in financial markets can be found in Standard & Poor's, *The Leveraging Of America: Corporate Financial Policies Evolve Toward The More Aggressive Standard & Poor's*, October 2007. The report is available at: http://mountainmentorsassociates.com/files/Aggressive_Corporate_Finance_Policies_S_P_Nov07.pdf.

4. International Monetary Fund, *Global Financial Stability Report: Durable Financial Stability: Getting There from Here*, April 2011, <http://www.imf.org/external/pubs/ft/gfstr/2011/01/index.htm>.
5. Maturity transformation is discussed at length in Chapter 14. *Leverage, maturity transformation and financial stability: challenges beyond Basel III*, a presentation at the London Cass Business School by Adair Turner, March 16, 2011:

Maturity transformation is a key function of the financial system, enabling non-financial agents – corporates and households – to hold longer-term financial liabilities than assets.

http://www.fsa.gov.uk/pubs/speeches/031611_at.pdf.

6. The following extracts are from Lewis E. Lehrman, *The Nixon Shock Heard 'Round the World*, *Wall Street Journal*, August 15, 2011:

On the afternoon of Friday, Aug. 13, 1971, high-ranking White House and Treasury Department officials gathered secretly in President Richard Nixon's lodge at Camp David . . . Nixon and Safire put together a speech to be televised Sunday night. It had taken only a few hours during that August 1971 weekend for Nixon to decide to sever the nation's last tenuous link to the historic American gold standard, a monetary standard that had been the constitutional bedrock (Article I, Sections 8 and 10) of the American dollar and of America's economic prosperity for much of the previous two centuries.

At least one Camp David participant, Paul Volcker, regretted what transpired that weekend. The "Nixon Shock" was followed by a decade of one of the worst inflations of American history and the most stagnant economy since the Great Depression. The price of gold rose to \$800 from \$35.

<http://online.wsj.com/article/SB10001424053111904007304576494073418802358.html>.

7. Press release from Goldman Sachs, August 13, 2007, <http://www.goldmansachs.com/media-relations/press-releases/archived/2007/2007-08-13.html>
8. More scathing criticism of the mistaken use of the normal distribution in the analysis of asset returns is found in many places and especially in the work of Nicholas Taleb. See for example the following: Nassim Nicholas Taleb, *The Black Swan: Second Edition: The Impact of the Highly Improbable: With a new section "On Robustness and Fragility"* (Random House Paperbacks, 2nd edn, May 2010); *Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets* (Random House; 2nd updated edn, October, 2008).
9. Bank of England tries to stop a run on mortgage bank, ABC News, <http://abcnews.go.com/Business/story?id=3609705&page=2>.
10. The court of King Mervyn, *Financial Times*, May 5, 2012, <http://www.ft.com/cms/s/2/f853d068-94b7-11e1-bb0d-00144feab49a.html#axzz1udaalwlu>.
11. Findings regarding the market events of May 6, 2010
Report of the staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory issues, September 30, 2010. Available at: <http://www.cftc.gov/ucm/groups/public/@otherif/documents/ifdocs/staff-findings050610.pdf>.
12. Andrew G. Haldane, *Financial arms races*, April 14, 2012. Speech by Mr Andrew G. Haldane, Executive Director, Financial Stability, Bank of England, at the Institute for New Economic Thinking, Berlin, 14 April 2012, <http://www.bis.org/review/r120426a.pdf>.
13. Barclays Capital Equity Research, *U.S. Equity Quantitative Strategies*, August 4, 2010. This report is no longer available online.
14. Grahame Wearden, Swiss bid to peg "safe haven" franc to the euro stuns currency traders, *The Guardian*, September 6, 2011:

The Swiss National Bank in effect devalued the franc, pledging to buy "unlimited quantities" of foreign currencies to force down its value. The SNB warned that it would no longer allow one Swiss franc to be

worth more than €0.83 – equivalent to SFr1.20 to the euro – having watched the two currencies move closer to parity as Switzerland became a “safe haven” from the ravages of the eurozone crisis.

15. *Dark Pools Win Record Stock Volume As NYSE Trading Slows To 1990s Levels*, Bloomberg, March 1, 2012:

Dark pools got a larger piece of a shrinking pie. Trading at the New York Stock Exchange has declined to the lowest level since 1999, with the average volume over the 50 days ended Feb. 28 slowing to 789.5 million shares, according to data compiled by Bloomberg. The 50-day average for all exchange-listed securities, including transactions on dark pools, fell to 6.62 billion shares on Feb. 28, the lowest in Bloomberg data going back to June 2008.

<http://www.bloomberg.com/news/2012-03-01/dark-pools-capture-record-share-of-declining-u-s-equity-volume.html>.

16. The following reference to comments from CFTC Commissioner on the contribution to liquidity appears at the website for Themis Trading:

CFTC commissioner Bart Chilton is not usually shy about telling the investment world his opinions about high frequency trading. He has coined the term “cheetah” traders when referring to HFT. In this must watch Bloomberg television interview, Chilton holds nothing back:

“Technology in markets isn’t always what it’s cracked up to be. As regulators, we need to take a step back and say “Is there more that we need to be doing?”

“There are 160 million financial transactions per day around the globe. And its these traders, that I call “cheetah traders”, that are just trying to scoop up dollars in milliseconds. I’m not saying they’re bad, but they’re new to the market and there are bound to be problems. They are not even required to be registered at the SEC and CFTC.”

“The claim from these cheetah traders, the high frequency traders, is they add liquidity and of course, they do because somebody is on the other side of those trades. But it is fleeting liquidity.”

“Are they adding long term liquidity, deep liquidity, that helps markets? I question it.”

<http://blog.themistrading.com/page/3/>.

17. An interesting and readable account regarding the nature of HFT activity and also its contributions to the Flash Crash can be found in Michael Pelz, *Inside the Machine: A Journey into the World of High-Frequency Trading*, *Institutional Investor*, May 5, 2012:

Under Reg NMS, exchange were given the ability to “flash” marketable orders electronically for a split second to some professional traders before they are displayed to the broad public.

<http://www.institutionalinvestor.com/Popups/PrintArticle.aspx?ArticleID=2593339>.

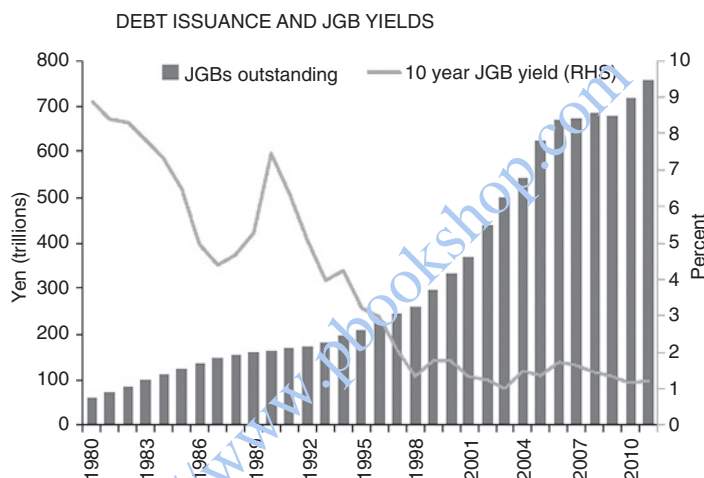
Themis Trading have been frequent critics of HFT algorithms and have the following quotation at their website from Berkshire Hathaway’s Charlie Munger:

Take the rapid fire trading by the computer geniuses . . . those people have all the social utility of a bunch of rats admitted to the granary. I never would have allowed the rats to get in the granary. I don’t want the brilliant young men of America being rats in someone else’s granary. That’s not the right way to run the Republic, and if you let me write the law, that wouldn’t happen. If we changed the incentives, a lot of this regrettable behavior would go away.

There would be less gambling and productive investment and more long term thinking and less of short-term trading frenzy. We do a lot of things that are literally insane. Once you allow this wrong culture to be entrenched and be remunerative, you create political power that protects activities that are regrettable. *What good is it doing civilization to have people “clipping” money through computer algorithms that work a lot like legalized front-running of orders? Why has the situation gone on as long as it has? Both parties are getting a lot of donations from these people.*

<http://blog.themistrading.com/munger-strong-leadership/>.

18. See endnote 8 above for references to the work of Nicholas Taleb.
19. The Gaussian distribution model, named after the German mathematician, Friedrich Gauss, is just another term for the normal distribution which is typified by the bell shaped curve which represents a probability density function. Many variables in the natural world can be modeled using the normal distribution but asset returns are not normally distributed. Also see endnote 8.
20. *New Normal Investing: Is the (Fat) Tail Wagging Your Portfolio?* Credit Suisse Asset Management White Paper, April 2012, https://www.credit-suisse.com/asset_management/downloads/marketing/new_normal_investing_white_paper_042012.pdf.
21. Martin Wolf, The journey towards becoming Japan, *Financial Times*, May 12, 2012, <http://blogs.ft.com/martin-wolf-exchange/2012/05/12/the-journey-towards-becoming-japan/>.
22. The following chart showing Debt Issuance by the Japanese government and JGB yields comes from a JP Morgan report entitled *Japan's Debt Trap: Who's in the Trap?*



Japanese government debt issuance and JGB yields

Source: JP Morgan Research Report – Japan's Debt Trap: Who's in the Trap?

Notes: The data for JGBs outstanding is as of March (i.e. the fiscal year-end) while that for JGB yield is the yearly average of each month-end value except the figure for the year 2011, which uses the average through April.

<http://www.jpmorgan.com/cm/BlobServer?blobkey=id&blobwhere=1158636672388&blobheader=application%2Fpdf&blobcol=urldata&blobtable=MungoBlobs>.

23. See the discussion of vendor financing in Chapter 10.
24. See endnote 8.
25. According to Wikipedia "the average height for adult men in the United States is about 70", with a standard deviation of around 3". This means that most men (about 68%, assuming a normal distribution) have a height within 3" of the mean (67"-73") – one standard deviation – and almost all men (about 95%) have a height within 6" of the mean (64"-76") – two standard deviations." http://en.wikipedia.org/wiki/Standard_deviation.
26. Price discontinuities or gaps are discussed in Clive Corcoran, *Long/Short Market Dynamics* (John Wiley & Sons, 2007) ch 7.

27. Portfolio drawdowns are a far better reflection of the investment risks encountered during a systemic liquidity crisis than the notion of a tail risk loss. A drawdown measures the extent to which the portfolio has declined from a previous “high water mark” for the portfolio, i.e. when the account equity had reached a maximum. The maximum drawdown is a measure of the largest drop from the highest water mark to the deepest trough experienced by an investor.
28. PIMCO offers a variety of “off the shelf” products to provide tail risk protection. An insight into these products and the rationale behind them is provided in the following article from the *Economist*: Fat-tail Attraction: Investors’ interest in hedging tail risk is growing, March 24, 2011, <http://www.economist.com/node/18443412>.
29. Investors cast doubt on “end of world” hedge strategies, Reuters, June 22, 2012, <http://uk.reuters.com/article/2012/06/22/uk-hedgefunds-gaim-tail-idUKLNE85L00920120622>.
30. The influence of uniformitarianism in intellectual history is discussed in *Long/Short Market Dynamics* – see endnote 26:

There have been several advocates of gradualism amongst the more prominent are two seminal writers and thinkers of the 19th century, Darwin and Lyell. The views of Charles Darwin are too widely known for there to be much discussion except to note the very general point that, in his view, the evolution of life forms took place gradually in conjunction with the logic of ecological adaptation. Less well known is the influence that the principal work of Charles Lyell, *The Principles of Geology*, had on his friend Charles Darwin.

The proposal that a giant asteroid impact in the Yucatan peninsula was responsible for the extinction of the dinosaurs, and Wegener’s theories regarding continental drift and tectonic plates were initially shunned, as they conflicted with the broad prejudice of gradual uniformitarianism.

31. Per Bak, *How Nature Works: The science of self-organized criticality* (Copernicus Books, Springer, 1999). Also a popularized treatment of the issue that large effects do not require large causes can be found in Malcolm Gladwell, *The Tipping Point* (Little, Brown and Co, 1st edn, March 2000).
32. See Bak’s book in endnote 31.
33. Bak’s book (cited in endnote 31) has a good discussion of this concept but in general terms the following brief definition is taken from a clearly written article in Wikipedia: “In physics, self-organized criticality is a property of dynamical systems which have a critical point as an attractor.” http://en.wikipedia.org/wiki/Self_organized_criticality.
34. Remarks by Governor Ben S. Bernanke before the New York Chapter of the National Association for Business Economics, New York, October 15, 2002, <http://www.federalreserve.gov/boarddocs/speeches/2002/20021015/default.htm>.
35. The key work of Minsky and many of his disciples is Hyman Minsky, *Stabilizing an Unstable Economy* (McGraw-Hill, 2008).
36. Goldman Sachs defends \$13-billion payment from AIG, *Los Angeles Times*, March 21, 2009.

The Wall Street powerhouse says money it received from the bailed-out insurer was fully justified. Critics say Goldman should have agreed to take less than it was owed.

WASHINGTON — Beleaguered Wall Street powerhouse Goldman Sachs Group switched to offense Friday, contending that the \$13 billion the firm received from bailed-out American International Group Inc. was fully justified and in fact was good for taxpayers.

But that did little to quell the criticism that Goldman and other financial institutions should have taken less than they were owed on insurance for their risky bets on the subprime housing market.

37. *The stickiest price* from the Interfluidity blog of Steve Randy Waldman:

“Sticky prices” are the foundation of “Great Moderation” monetary policy, the core justification for why we have inflation stabilizing central banks. As the bedtime story (or DSGE model) goes, if *only* prices

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were perfectly flexible, markets would always clear and the great equilibrium in the sky would prevail and all would be right and well in the world. Hooray!

<http://www.interfluidity.com/v2/910.html>.

38. The Keen/Krugman Debate: A Summary, *Unlearning Economics*, April 3, 2012, <http://unlearningeconomics.wordpress.com/2012/04/03/the-keenkrugman-debate-a-summary/>.
39. Vulnerable banks under the spotlight, *Financial Times*, April 27, 2012, <http://www.ft.com/cms/s/0/1a10b2ac-9080-11e1-9e2e-00144feab49a.html>.

<http://www.pbookshop.com>