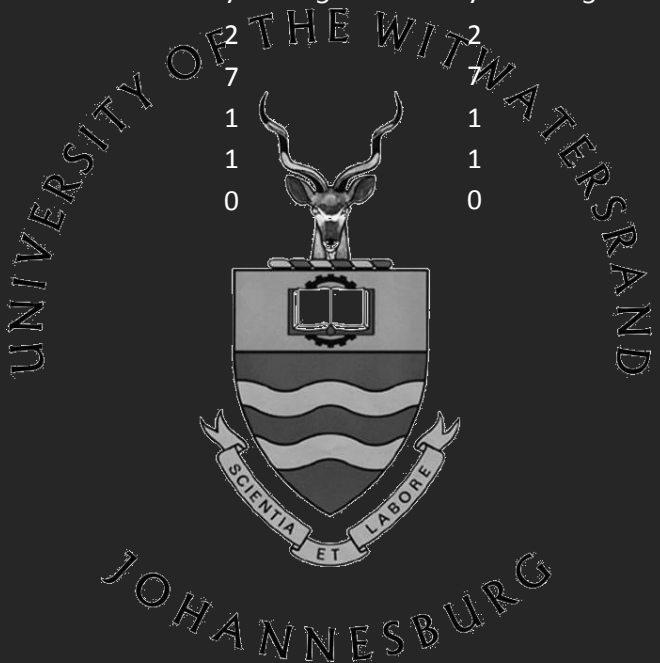


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Crisis Economics

Perilous Liquidity

**Thesis presented for the degree of
 Masters of Management in Finance
 and Investment**

9 February 2013

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Chapter One – Introduction

In what is widely regarded as the holy grail of macroeconomics, acquiring an intimate understanding of the causes and consequences of empirical financial crises remains at the epicentre of modern day macroeconomics. This paper intends to explore both the origins as well as the likely economic implications of numerous observed economic crises (with a particular emphasis on the on-going Global Financial Crisis which appears to have climaxed in 2008). Considerable research has been conducted to explore the effects of recently observed aggressive liquidity management undertaken by policy authorities (unprecedented expansion of money supply), along with various other reactive monetary tactics observed in both developed and emerging markets following the 2008 Global Financial Crisis. During the course of this research several economic theories are employed to explore the likely consequences of various central bank monetary policy responses to a contracting economic environment. The imminent task of deleveraging government (treasury as well as central bank) and private sector balance sheets is also scrutinised from the perspectives of both short-term regional specific economic growth, as well as the long-term sustainability of the global economy.

Next, this thesis will propose mechanisms available to manage the inherent risks of ‘artificially stimulated’ liquidity and will further explore the reliability of such recommendations. This research aims to gain an understanding of the inherent dangers of heightened market liquidity emanating from economic crisis responses, as well as the subsequent perils of artificially inflated asset prices. Given the often deferred effects of expansionary monetary policy, the importance of asset valuation measurement will provide an opportunity to isolate the risk of asset bubbles forming and the consequent risk of a renewed threat of economic contraction.

Various explanations such as the financial market prices framework described by Taylor (1995), can be cited concerning individual instances where the transmission of financial stress between regions has ensued following an economic crisis. Nevertheless, the fact remains that all regions do not participate equally in asset price recoveries following differing central bank interventions. The implications of conventional theories of monetary policy will be considered amid the backdrop of forthcoming geographic dynamics (more specifically the two-speed economic recoveries observed in both emerging and developed economies in the wake of the 2008 Global Financial Crisis), whilst remaining mindful of the effects of global monetary flows. Advocates of conventional monetary policy (along with their rigid belief in the necessity of overlooking asset prices when formulating monetary policy) are invalidated in this research, on the grounds of theoretical reasoning. Theoretical explanations derived from equity price correlation and US Treasury yield spreads have been utilised to objectively identify asset price bubbles.

Finally, looking beyond the 2008 Global Financial Crisis an assessment is conducted of Sub-Saharan Africa’s growth prospects. With the global economic recovery unique in its fragility, consideration of further down-side risk is warranted. Given the necessity of a bespoke risk management approach by potential investors in precarious emerging markets, a generic county specific stress-test is proposed as a practical means of quantifying potential investor pitfalls.

This thesis is structured as follows. Chapter 2 will commence by providing an exhaustive grounding regarding the roles and influences of monetary policy given an unfavourable macroeconomic climate. A comprehensive account of the causes and consequences of the 2008 Global Financial Crisis will then be presented. The chapter concludes by assimilating empirical findings with the now imminent

task of government balance sheet deleveraging. With government debt and central bank liabilities at unsustainably excessive levels, the process of deleveraging back to pre-crisis levels without disturbing an already fragile economic recovery is likely to prove an uncomfortable challenge. Chapter 3 adopts a proactive methodology (buy using forward looking indicators) which attempts to provide insight into the anticipated economic progress of the post 2008 economic recovery. Theoretical proposals are discussed on the likely economic implications for the Sub-Saharan Africa region, as well as how a potential investor in the region might embark on the prerequisite of risk management.

Chapter Two - Literature Review

Some of the most important and lasting questions faced by policymakers and central bankers in the wake of a significant economic contraction centre around the appropriateness of policies in accelerating economic growth and restoring gross domestic product to their natural levels. Broad consensus indicates that central banks have a mandated responsibility to stabilise and re-establish economic growth following an economic crisis (such as the US Humphrey-Hawkins Act passed in 1978). However the optimal strategy which should be undertaken to reinvent these favourable market conditions remains a controversial debate.

The intended consequence of this literature review, while not leading to any generic explanatory model with which central bankers can anticipate optimal monetary policy, rather aims to explore remedies to counter significant contractions in gross domestic product. The intention of this research is to identify a number of common structural characteristics which may be utilised as a framework for discussions and analyses in obtaining a tailored liquidity response to an economic crisis. Acquiring an understanding of the evolution of economic fundamentals as well as an account of our most recent economic experiences is an imperative prerequisite necessary to contextualise the finding of this research. In line with mainstream macroeconomic theory the principal response available to central bankers in the stabilization of a contracting economic environment remains a supportive thrust of accommodative monetary policy, and the subsequent increase of liquidity in financial markets to induce emergency market stabilisation.

I. Macroeconomic Policy

Whilst attempting to provide a foundation upon which one can analyse the various phases of the global economic cycle, particular emphasis has been placed on the 2008 Global Financial Crisis and the several years both preceding and succeeding the exceptional events which took place. The unprecedented scale of this most recent crisis provides an ideal opportunity to scrutinise our understanding of macroeconomics during periods of severe fiscal fragilities (large deficits) and extreme liquidity disruptions (plummeting asset prices). Of particular interest are the pragmatic synergies between our theoretical economic understanding and practical observations witnessed during this period of exception.

The dissection between conventional economics and the insurgence of heterogeneous schools of economic thought leaves much for economists to contemplate. As pointed out by Roche (2012),

given the events which followed the 2008 Global Financial Crisis, the notorious government bond vigilante myth has now been exposed. The government bond vigilante myth is an archaic theory that suggests bond investors will revolt against elevated levels of sovereign debt. The idea of an oversupply of sovereign debt issued diminishing investors desire to hold these government backed assets, has been proven largely mistaken. The widespread belief that the financial system has reached a point of self-sustainability, Geithner (2008), has similarly proven a premature supposition. And finally the disingenuous assurance by banks that financial innovation has made risk management omnipotent, confirmed equally erroneous.

Another fable which appears to have been dispelled is the flawed predictions of hyperinflation following the US Federal Reserve’s introduction of aggressive monetary policy. Closer scrutiny of the events preceding the 2008 Global Financial Crisis provide further insight into some of the challenges faced by policymakers as financial institution lending appears to have experienced persistent declines, despite ever increasing reserves. Conventional thinking might once have perceived financial institution activities peculiar as abundant liquidity supplied by the Federal Reserve to reduce the initial funding stresses of 2008 would have been expected to have been met by a willingness to lend and make markets (thus deploying available resource to potentially profitable transactions), however as we now know, this is not necessarily the case. Bernanke (2009|A) offers the explanation that concerns regarding capital, asset quality, and the risk of credit, limits the enthusiasm of many intermediaries to extending credit notwithstanding the abundance of liquidity.

Recent events have motivated the necessity to re-examine conventional economic ideologies. Roubini (2006) for example, argues for the inclusion of asset prices (along with traditional considerations such as inflation and economic output) as a necessary consideration in the determination of an optimal interest rate rule to be executed by global central banks. The debate surrounding whether central banks should target asset prices is on-going, with Roubini (2006) advocating the necessity of monetary policy responding to extreme changes in the market prices of assets. Bernanke and Gertler (2001) on the other hand support the view of limiting the influence of asset prices on monetary policy to the extent that changes in asset prices might have effects on inflationary expectations (and thus rather find favour with an inflation targeting policy).

Macroeconomic paradigms

Langdana (2002) provides a useful overview of the evolution of mainstream economic schools of thought, along with a well-articulated account of the events which appear to have motivated the observed paradigm shifts.

Preceding 1930s		Late 1930s until Late 1970s		Late 1970s to present
Classical Model	<i>Great depression</i>	Keynesian Model	<i>Oil-shock decade</i>	<u>Developed Economies</u> Supply-side (rational expectations) leading to the New Economy since the mid-1990s Or <u>Emerging Economies</u> New Keynesian

Under the Classical Model macroeconomic policies are reliant on assumptions pertaining to both price changes, as well as wages. Defects in the Classical Model quickly became apparent during the onset

of the 1929 Great Depression. During the period of the Great Depression classical economists remained dogmatic advocates of ‘natural’ levels of unemployment and output. Reliant on the belief that nothing could or should be done; classical theorists were not amiable to calls for discretionary macro-policy. It was Keynes (1937) who unsettled classical tradition by promulgating a mechanism by which fiscal and monetary policy may influence an economies long-term trajectory. Following the Great Depression a prevalent shift towards the Keynesian Model was witnessed. Under the newfound Keynesian framework proactive fiscal and monetary policies allowed for the incorporation of inflation and output growth, providing the opportunity for policy maker to tweak macroeconomic policy with superior precision. Widespread beliefs that unregulated financial markets were fundamentally unstable motivated the US government to introduce a comprehensive regulatory system, such as the Glass-Steagall Act. During the period of the Keynesian Model’s supremacy, strict government regulation appeared an effective deterrent to severe economic crises.

In the 1970s economic theorists promptly revisited the importance of the quantity of money, as inflation quickened in developed economies to the point where price stability was under threat. Oil shocks and the subsequent economic and financial instability during the 1970s led to further evolution in macroeconomic consensus. A noted divergence between developed and emerging market economies led to the departure of a common macroeconomic model. In the case of developed economies macroeconomists appeared to find favour with the view that ‘the roles of government spending and monetary policy in influencing employment and output (GDP) were minimal at best’ (see Friedman Doctrine below). It was this philosophy which would later become known as the rational expectations model, where the shifting emphasis became fixated on deregulation, tax cuts, and less government in general. Deep rooted regulation previously erected to safeguard economic stability was deconstructed through orchestrated stages of deregulation. Vocal activists of deregulation included financial institutions whose arguments relied heavily on the efficient financial market theory. The focus on tight financial market regulation shifted towards a new ‘globally-deregulated neoliberal capitalism’, Crotty (2009).

Gradually the focus on the supply of money became subservient, whereby by the end of the twentieth century policymaker found themselves focusing exclusively on the supervision of interest rates and its voluminous implications (see Taylor Rule below). Such implications include actual inflation, output, and employment. Economists and policymakers of late now face two vastly dissimilar models (namely the Rational Expectations and New Keynesian Model) which both compete for dominance in a globally-deregulated macroeconomic environment, and both of which boast forceful support from distinguished academics. Subsequent to the events which unfolded in the 2008 Global Financial Crisis the creditability of financial deregulation remains a contentious debate. Post crisis developments such as the Dodd-Frank Act and the progression of the Basel III global regulatory standards are testament to this regulatory evolution.

Whilst the theoretical structure above is worthy of note, dogmatic recognition of any specific implications dictated by any one unique model will not be necessary of the purposes of this research. An understanding of macroeconomic theoretical progression does however serve as an invaluable foundation upon which to contextualise the events which unfolded during the 2008 Global Financial Crisis. Perhaps more constructively this research will attempt to take a less rigid interpretation by electing to isolate and concentrate on the short-run effects of liquidity on asset prices, therefore diluting the significance of discrepancies present in the above mentioned macroeconomic philosophies.

The Friedman Doctrine

Prior to the new Keynesian and rational expectations model Friedman (1963,1968) outlined the role of monetary policy in developed economies by highlighting the inability of monetary policy to consistently ensure full employment and high GDP growth over extended periods of time.

Friedman established that whilst an increase in monetary supply (LM curve shift to the right) might achieve the short-term output and interest rate desired, long-term GDP levels and unemployment would return to their natural levels as price increases would prevail (LM curve would snap back to the original point). Real wages would maintain unchanged.

According to Friedman the only lasting effects of a developed economies increase in monetary supply would be an increase in inflation. This theory proposes that monetary policy cannot and should not be used to attain long-term output, interest rates, and employment targets.

Friedman advocated the ‘x percent money-growth rule’, which sees central banks of developed economies adhere rigidly to a fixed money growth rule, irrespective of demand-side stabilisation necessities.

In the US, Federal Reserve chairman Paul Volcker adopted this policy in the 1970s, where inflation finally declined from 10.5% in the 1970s to 3% by the 1980s. The legacy of this policy however soon came under immense scrutiny as the 1980-1981 recession ensued.

The effectiveness of the ‘x percent money-growth rule’ often comes under intense political pressure as government calls for measures to spur growth and employment.

The Taylor Rule

Formulated by John Taylor (1993,1998) the Taylor Rule provides a framework for policymakers to determine exactly how much interest rates should be adjusted in response to deviations of actual inflation, output, and employment from their specified targeted levels.

The theory dictates that adjustments in central bank interest rates are required to be disproportionately larger than changes to the inflation rate. According to the Taylor Rule this act will ensure the real interest rate (nominal rate minus inflation) increases. The rise in real interest rate, will in turn slow down the economy by reducing spending (AD curve will shift to the left). Consequentially inflation will decline downward towards its targeted range.

Whilst several versions have emerged, the simplified version of the Taylor Rule can be expressed as follows:

$$\text{Federal Funds Rate} = 2 + (\pi_t) + 0.5(\pi_t - \pi_t^*) + 0.5(Y_t - Y_t^*)$$

Where:

π_t = Prior four quarters inflation

π_t^* = Federal Open Market Committees inflation target

Y_t = Current GDP growth rate

Y_t^* = Trend rate of growth of real GDP potential

Accordingly if actual inflation exceeds its targeted level, or if real GDP growth exceeds the long-term trend rate, policymakers should avoid monetary growth and increase short-term interest rates.

Whilst recent economic developments and practical observations have rendered the coefficients provided above deficient, the intuition of the Taylor Rule model remains valid.

Source: Langdana (2002)

II. 2008 Global Financial Crisis

In a 2003 presidential address former Nobel Prize recipient Robert Lucas was noted as stating that macroeconomics had ‘solved, for all practical purposes the problem of economic depression’, Lucas (2003). Today, faced with an economic crisis so deeply rooted in the global economy that even unprecedented and coordinated interventions by various governments have thus far failed to quarantine the harmful contagion, there is an onus on economic scholars to scrutinise how our understanding of the financial system proved so conceited.

At the outbreak of the 2008 Global Financial Crisis the five largest independent US investment banks appeared at the epicentre. After sustaining considerable flash flood losses two such banks (Bear Stearns on the 16th of March 2008 and Lehman Brothers on the 15th of September 2008) failed, one was subject to an emergency take-over by a conglomerate (Merrill Lynch was sold to Bank of America on September 14th 2008), and two were transformed into bank holding companies (Goldman Sachs and Morgan Stanley) to qualify them for government financial support. The apparent origin of

this septicity has been identified as widespread and perverse incentives that encouraged excessive risk and exacerbated high-leverage strategies, amongst other contributing factors. More than four years after the Global Financial Crisis began policymakers need to revisit their understanding of the origin of this financial calamity. Whilst the focus on government deficits continues to dominate discussions, policymakers would be astute to acknowledge that these deficits are a necessary consequence of the crisis, and not as many may believe, the cause, Krugman and Layard (2012).

Perverse Incentives

Fees generated by excessively risky investment strategies during periods of financial market excess corrupted virtually all financial institutions during the run up to 2008. Financial innovation along with the widespread progression of derivative instruments appears largely responsible for the extensive utilisation of securitization by financial institutions. Through the usage of derivative type structures, financial institutions found themselves capable of redistributing risk through the process of securitization. In the case of securitization, claims to assets backed by a pool of loans or receivables were structured in tranches. These newly devised tranches boasted the ability to isolate and redistribute risk (as well as accompanying returns). Financial institution involvement in the practice of securitisation often extended beyond simply the origination of these asset backed securities, to include the secondary responsibility of distribution. Both functions were often seen as a principal source of financial institution profitability prior to the market collapse of 2008. Asset backed securities were not limited to the liability side of financial institutions, and were also frequently held as variable term assets.

Commercial and investment banks, private equity funds, hedge funds, pension funds, mutual funds, and insurance companies all appear guilty of generating short-term profits (and thus bonuses) by engaging in highly leveraged strategies and attempting to boost fee-based income by the innovative practise of securitization. High revenues generated from excessive risk taking translated into top investment bank traders and bank executives receiving hefty bonuses. To provide merely two examples, in 2006 Goldman Sachs' employees bonus's totalled \$16 billion, an average bonus of roughly \$650,000 for each of Goldman Sachs' 25,000 employees, Crotty (2009). Another fitting example is Merrill Lynch, where approximately 700 employees each received bonuses in excess of \$1 million in 2008 undeterred by the fact that the firm recorded a loss of \$27 billion in that same year, Crotty (2009). Evident is the fact that incentives intended to stimulate business volumes and thus risk taking, were not aligned to the accountability of the individuals tasked with such responsibilities.

Credit rating agencies appear also to have failed to align their profits with the general wellbeing of society, as corporate customer's desires for triple-A ratings corrupted their better judgement. Basel II guidelines required banks to only possess a modest sliver of capital against triple-A rated assets. High credit ratings of the institutions/assets translated into lower borrowing costs for a firm, which meant higher profits, higher potential leverage, and ultimately higher potential employee bonuses, Crotty (2009). Companies requesting to be rated were directly responsible for the costs payable to credit rating agencies for their services. Given the existence of several respected rating agencies the incentive to maintain client business by keeping their customers content (in terms of their perception of the institution that they were dealing with) was undeniably present.

According to Crotty (2009), perhaps even more alarming was that in 2005, more than 40% of Moody's revenues was attributable to the rating of securitized debt such as mortgage-backed securities (MBSs) and collateralised debt obligations (CDOs). A mortgage backed security is a type of asset backed security which is ultimately secured by an underlying mortgage loan or pool of

mortgage securities. A collateralised mortgage obligation on the other hand is a specific type of mortgage backed security which is characterised by differing pass-through rates separated into various tranches, each of which may also vary in terms of risk and maturity. Many of these illiquid, non-transparent, yet in retrospect absurdly highly rated instruments would later be observed defaulting in the years to follow.

Katz, Salinas, and Stephanou (2009) describe anecdotal evidence of credit rating agencies deviating from their conventional assumptions when rating asset backed securities, whilst failing to adequately disclose such abnormalities. Further their research adds support to the view that credit rating agencies were guilty of relaxing traditional credit rating criteria (which in part was a result of understaffing, inadequate databases, and deficient rating models) when considering the credit ratings of asset backed securities in the years preceding the 2008 Global Financial Crisis.

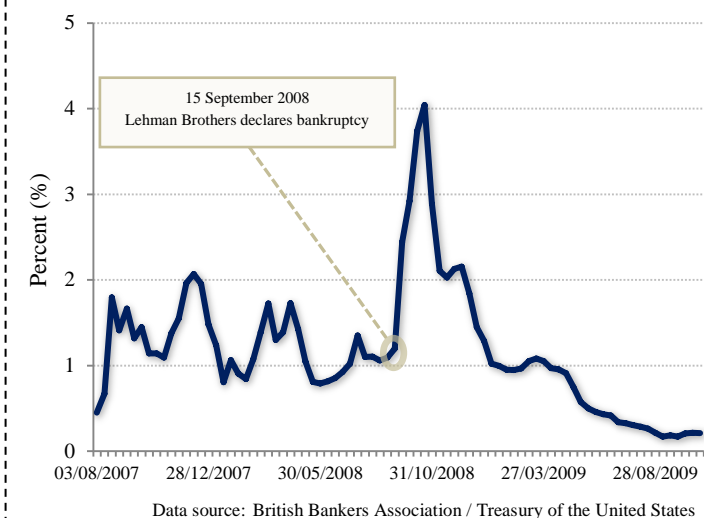
Despite the well documented failure of these rating agency organisations (Standard & Poor's, Moody's, and Fitch Ratings to name but a few) as custodians of debt market welfare, it seems peculiar that capital market stakeholders continue to look to rating agencies for guidance through trusting eyes.

Financial Products Transparency Compromised by Innovation

Innovation of financial products, for example mortgage backed securities (MBSs) and collateralised debt obligations (CDOs), extended to a point where such instruments had often been described as 'so complex they were inherently non-transparent', Crotty (2009, p.566). Hefty profits experienced by financial institutions motivated a substantial increase in the innovative construction of these products. The frequent compromising of the transparency of these intricate products weakened market efficiency (due to imperfect price information), adding to the challenge of pricing these instruments. The vast majority of these derivative products were traded over the counter (OTC) thus ultimately further weakening efficient price discovery (not traded on a regulated exchange). Valuations by investment banks and rating agencies were often derived from complex statistical simulation models prone to manipulation, and notorious for a lack of reliability. In the words of Roubini (2008) CDOs 'were new, exotic, complex, illiquid, market-to-model (prices influenced to a large extent by the type of valuation model being utilised) rather than market-to-market and misrated by rating agencies. Who could then ever be able to correctly price or value a CDO cubed?'

As observed by Blanchard (2011) the sheer complexity of these opaque financial instruments along with the existence of special purpose vehicles (described further in the reading) presented grave challenges when attempting to assess a financial institution's solvency. Testament to the inherent lack of transparency and inability to accurately value CDOs during the 2008 Global Financial Crisis, Merrill Lynch in July 2008 agreed to sell \$30.6 billion of CDO tranches (previously boasting Triple-A credit ratings) for 22 cents on the dollar, Hull (2010, p. 388).

Figure 1: Ted Spread 2007 - 2009

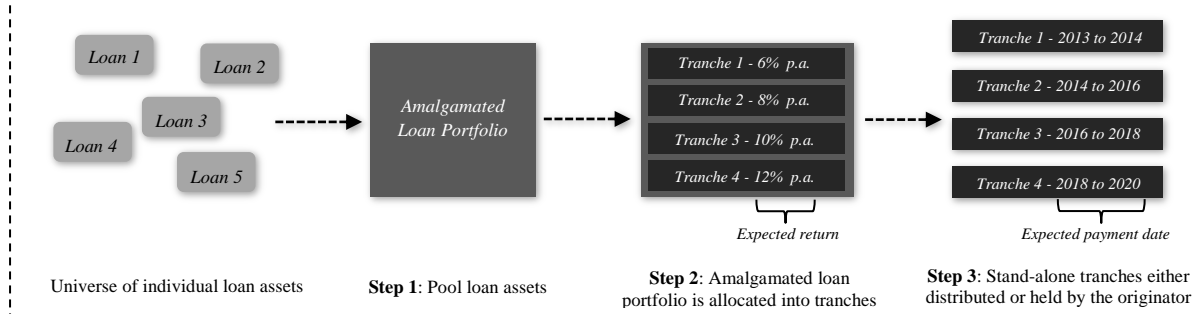


The adjacent Ted Spread (LIBOR minus the US 3-month Treasury bill rate) serves to capture the risks that banks perceive in lending to one another. Apparent is the dramatic increase in the perceived financial institution lending risk witnessed in September 2008, following the bankruptcy of US Lemman Brothers Bank.

By capturing the deviation in the US 3-month Treasury bill rate (risk-free rate) and the rate at which banks are willing to lend to each other (LIBOR rate). One is able to accurately gauge financial institutions reluctance to lend to one another.

Whilst theoretically a problem, practically this lack of understanding regarding the valuation of various securitised assets was easily disguised during periods of market excess (liquid markets with an evident growth trajectory). In contrast, during periods of price contractions (specifically when defaults increased), this lack of understanding exacerbated panic, and the decline in both the demand and liquidity of these assets, causing asset backed securities prices to plummet. Ambiguity with regard to the solvability and liquidity of counterparties to asset backed security transactions contributed further to market participant’s anxiety. Prices of collateralised debt obligations (CDOs) were particularly vulnerable to the widespread panic selling. Collateralised debt obligations are a form of asset backed security whereby the underlying assets are characterised by debt obligations. Similar to collateralised mortgage obligations, originators of collateralised debt obligations redistribute risk (and return) by pooling assets and creating tranches prior to distribution. As observed by Crotty (2009), it was estimated that by February 2009, almost half of all the CDOs ever issued had defaulted. Defaults resulted in a 32% decline in the value of the super-safe senior tranches of triple-A rated CDOs, and a staggering 95% loss on mezzanine tranches of triple-A rated CDOs, Crotty (2009).

Figure 2: Example of a Collateralised Debt Obligation Origination



Throughout 2008 the derivative avalanche continued to gain traction, causing CDO prices across global markets (the majority of which were over-the-counter) to decline drastically. Global CDO issuance declined 84% from \$177 billion in the first quarter of 2007 to less than \$20 billion a year later, Crotty (2009). Large investment banks who had become accustomed to the lucrative fees flowing from originating CDOs began to witness significant holes in their balance sheets emerging. Balance sheet pressure was derived not only from plummeting fee based income as a result of the

demand for CDOs subsiding, but also from the decline in value of CDO assets present on investment banks balance sheets. According to Financial Crisis Inquiry Commission Report released in 2011, Merrill Lynch was found to have originated a total of \$38.9 billion in mortgage-related CDOs in 2006 (fetching fees in excess of \$1 billion between 2003 and 2006). The maintenance of these profitable CDO origination levels saw Merrill Lynch ‘pursue strategies which involved repackaging riskier mortgages more attractively, or begin buying its own products when no one else would’, FCIC (2011, p. 202).

The abrupt end to a decade long boom, fuelled largely by financial novelty, has led to widespread economic and financial ramifications. Posed with the question of how banks were permitted to tolerate this unbalanced risk on their balance sheets one is undoubtedly drawn to the regrets of insufficient regulation. As mentioned previously, the 1970s were characterised by a new found enthusiasm for deregulation in several developed economies (such as the United States of America). It is this very lack of regulation which provided the ideal environment within which financial innovation could flourish. Credit default swaps (a form of credit security which insures/guarantees the credit worthiness of the debt security) made it possible for originators of CDOs to transfer the risk of default to the issuer of the credit default swap instrument (for example insurance companies such as AIG). The advent of credit default swaps changed the structured finance market, and assisted banks in portraying that adequate risk management strategies were in place. Inspired interpretation of the terms of Basel I rules saw banks declaring CDO instruments on their balance sheets as held-for-trading. As accountants will attest, held-for-trading securities are traditionally presumed not to be present on a company’s books for extended period of time, and are often seen as short-term investments. This presumption fails to account for the innate characteristic of CDO instruments which commonly entail long-term investment horizons (especially higher yielding tranches), illiquidity (due to trading primarily taking place via over-the-counter markets), sluggish engineering time parameters (with the origination process often taking several weeks), and the characteristic of extreme price volatility in the event of a crisis.

Despite the widespread failure of financial regulation to adequately ring fence the risks posed by reckless and highly leveraged bank strategies, there appear rare instances of authorities sounding caution, such as the Bank for International Settlements and the Bank of England. The Bank of England in 2007 called attention to the lopsided growth on global banks’ on-balance-sheets assets (such as CDO assets being accumulated by banks themselves) which they claimed had augmented from \$10 trillion in 2000 to \$23 trillion in 2006, Crotty (2009). This observation unmistakably indicates an increase in assets, heightened levels of leverage, and ultimately higher levels of risk being adopted by financial institutions. According to a statement provided by Fitch in 2007, 58% of banks that buy and sell credit derivatives (such as credit default swaps) acknowledge that ‘trading’ or gambling was their ‘dominant’ motivation for engaging in those transactions, with less than 30% motivated by risk management of their own institutions lending, Fitch Ratings (2007). Few would argue that this did not epitomise moral hazard in its purest form (increasing systemic market risk).

Off-Balance-Sheet Assets of Banks

The usage of special purpose vehicles (SPV’s) is a popular mechanism utilised for the purpose of transferring assets from an institutions balance sheet onto the balance sheet of another independent legal structure. The special purpose vehicle (beneficiary of the transferred assets) is typically a separate legal entity and is often a subsidiary of the transferring institution. The development of SPV’s whereby independent holding companies were established to house certain bank assets became prevalent in the years preceding the 2008 Global Financial Crisis. In 2008 it was reported that

Citigroup had assets to the tune of \$1.1 trillion in off-balance-sheet entities such as SPV's (an amount equivalent to roughly fifty percent of the company's total assets), Keoun (2008, July 13).

The benefits of pursuing stand-alone institutions as holding companies for banks off-balance-sheet assets were twofold, firstly by transferring risky assets to these special purpose vehicles and off the banks' balance sheets meant banks were no longer constrained by the requirement to observe regulated capital provisions for these assets. A second noteworthy benefit entailed the ability to achieve a superior rating for the autonomous special purpose vehicle (as opposed to the whole company), this translated into a more efficient capital structure due to reduced lending costs (thus potentially amplified ability to leverage). Given the specific assets under consideration and more specifically their often risky nature, further benefit was at times sought by parent companies attempting to divorce themselves from any potential liabilities arising out of these assets in the event of losses materialising.

These special purpose vehicles were constructed to make periodic service fees to the originating banks, whilst sheltering the banks from any potential obligations or losses. Banks providing their special purposes vehicles with guaranteed lines of credit in order to secure a privileged credit rating did however prove a risk management oversight by these financial institutions during the 2008 Global Financial Crisis, with such contractual obligations requiring several banks to honour their subsidiary's losses. Preferential lending rates and reduced shareholder scrutiny provided ample motivation for excessive leverage of special purpose vehicles which were often comprised of already risky assets. During the 2008 Global Financial Crisis and the subsequent collapse of CDOs and MBSs markets, a wave of subprime mortgage defaults forced banks to move these contaminated assets from the balance sheets of SPV's back onto their own balance sheets, severely eroding their intentionally thin levels of capital. It was projected in 2008 that the seven largest US banks (including Citigroup) were likely to be liable for a aggregated \$300 billion in credit and liquidity guarantees, relating to their off-balance-sheet activities, Keoun (2008, July 13).

Bank Self-Regulation

Aligned with the theme of deregulation The Bank for International Settlements recommended that national regulators allow banks to assess their own risks due to the complexity of their businesses. This evaluation was conducted in the form of a statistical exercise called Value at Risk (VAR). VAR is an approximation of the maximum exposure to potential loss present within a portfolio of securities given a specified level of confidence and predefined time horizon. By vesting the responsibility of evaluating themselves banks were provided with the opportunity to ultimately determine their own capital requirements, an honour traditionally afforded to objective regulators. Statistical weaknesses inherent in the VAR calculation methodology proved bank self-assessments inaccurate and precautionary measures impotent when the 2008 Global Financial Crisis erupted. Statistical flaws were primarily a result of the heavy reliance of the VAR model on assets conforming to the normal distribution of return assumption. The normal distribution assumption is inappropriate for assets which are characterised by a negative skewness and large excess kurtosis/fat tails (such as many of the mortgage related assets which were present on bank balance sheets).

The Further Integrated the Global Financial System the Greater the Risk of Contagion

Supporters of global integration have often been quoted declaring victory over the prospect of financial crises, implying that widespread diversification has neutralised these 'primitive' risks. Timothy Geithner in 2006, then New York Fed Chairman (current Secretary of the US Treasury)

pronounced ‘in the financial system we have today, with less risk concentrated in banks, the probability of a systematic financial crisis may be lower than in traditional bank-centred financial systems’, Geithner (2008, p.2). This imprudent optimism was not unique to Mr. Geithner, in the same year the IMF has been quoted as stating that the distribution of credit risks ‘has helped to make the banking and overall financial system more resilient’, Tett (2009). The Bank for International Settlements as early as 2005 began to raise questions over the extent to which global credit management strategies incorporated the risks inherent to these new derivative instruments (MBS and CDOs), pointing to their ‘untested nature’ and a general lack of understanding of ‘how these new markets will function under stress’, Knight (2005, p.4).

Certainly economic logic broadly supports the globalisation of financial markets and their ability to, in part, cushion various economic shocks (i.e. not two sigma events). However this philosophy is only tolerable given shocks of controllable measure. In the event of irrepressible shocks, such as those witnessed during the 2008 Global Financial Crisis global integration provided a conduit for the transmission of financial stress. Such transmission was amplified by financial interlinkages and asymmetric information, namely the uncertainty surrounding counterparty creditworthiness. Danninger et al. (2009) found strong evidence suggesting a ‘co-movement’ of financial stresses between emerging and developed economies which were magnified by the intensity of financial linkages.

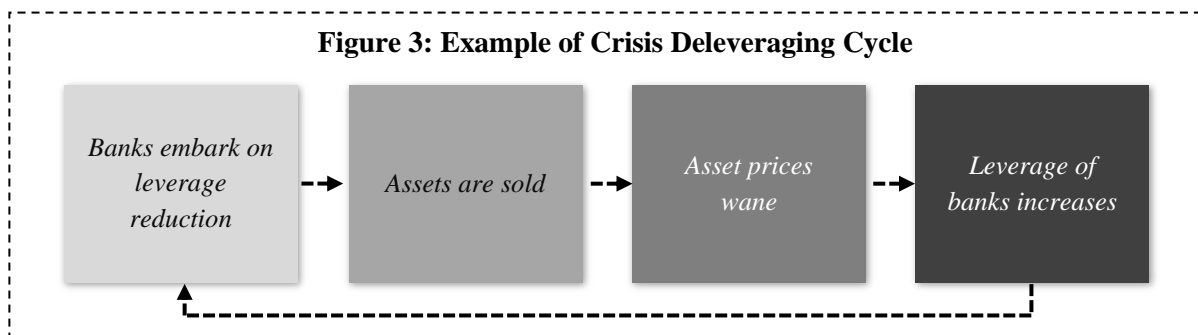
Risk Hedging Impediment

Risk hedging undertaken by financial institutions often utilise dynamic derivative trading strategies reliant on rational transaction costs and liquid markets to adequately offset any perceived unbalanced risks. A conventional hedge might for example involve the short selling of a risky asset whilst simultaneously acquiring a long position in a risk-free asset. As the strategy is dynamic, on-going rebalancing is required given perpetual changes in the asset price, risk-free rate, volatility, or time to expiration of the underlying derivative, Crotty (2009). Volatility intuitively increases when the asset price declines, resulting in the dynamic hedge necessitating the risky asset to be sold. The inherent problem with this process is the requirement to sell the risky asset in an environment of declining prices, as further pressure compounds the decline sending prices into free-fall. This theoretical shortcoming materialises into a severe problem when the underlying instrument being hedged fails to meet the liquidity assumptions upon which the hedging strategy relies. In the 2008 Global Financial Crisis this was indeed the case with the majority of CDOs and MBSs which banks sought to neutralise their risks through this fundamentally flawed strategy. Morgan Stanley reported an unprecedented mortgage related loss of \$2.6 billion in 2008, testimony to the shortcomings of the firms risk hedging strategies, Morgan Stanley (2008). Ultimately banks risk management strategies in this context did more to facilitate fragilities in bank balance sheets than alleviate risks.

Under the catastrophic risk management failures witnessed during the 2008 Global Financial Crisis globalisation was relied upon for its qualities of dispersing risk. The theoretical intuition was simple; less concentration of risk in isolated regions would improve the robustness of all industries now benefiting from diversification. However as previously cited the extent to which global capital markets were cohesive simultaneously provided the opportunity for contagion, upon which fractures in the US subprime mortgage market were able to rapidly spider throughout the globe. The speed with which shock waves transcended over-the-counter derivative markets into regulated equity markets took place on an unprecedented scale, creating substantial fragility in the global financial system.

Point of No Return

Given the banks ever increasing extent of financial leverage the pertinent danger then became how to control the tsunami of deleveraging by financial institutions once the fuse had been ignited (and the possibility of a fatal run on banks).



Wall Street Watch (2009) highlighted the magnitude of this task. During the period from 1975 to 2003, US investment banks leverage (debt to equity) regulated by the US Securities and Exchange Commission - was capped at a level of 12 times equity capital. In 2004, under pressure from Goldman Sachs chairman (and later Treasury Secretary) Henry Paulson, the acceptable leverage ratio was raised to 40 times capital. According to Blundell-Wignall (2009) US investment banks under the new Security and Exchange Commission requirements soon elevated their leverage levels to an average of approximately 34. US banks were not alone in this disingenuous behaviour as several of their European peers were also engaging in practices of excessive leverage which at times saw leverage ratios in excess of 50, Goodhart (2009). Astonishingly these ratios were exceeded by both Citibank and Bank of America, Ferguson (2008).

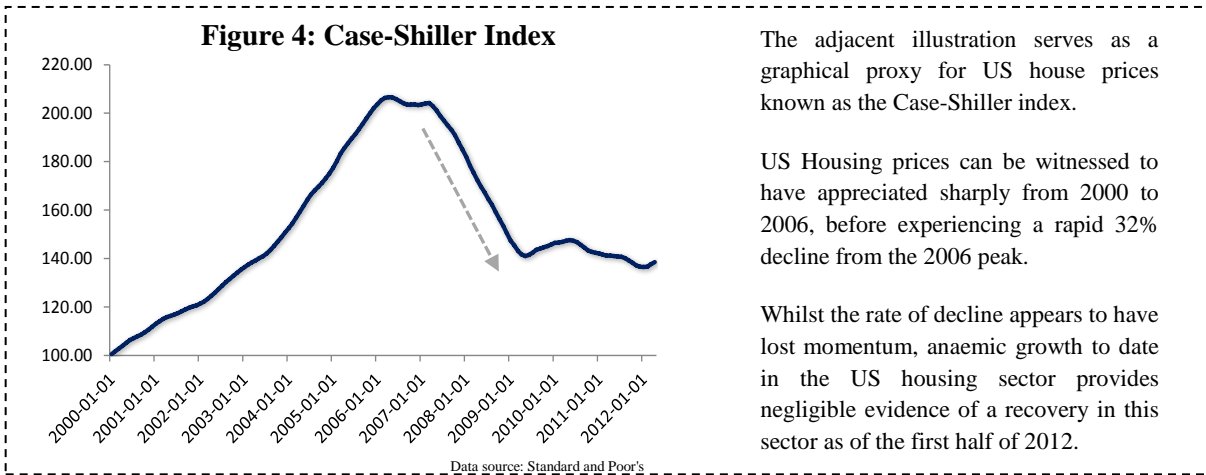
The intuition against levels of excessive leverage is simple, whilst not as profitable when banks have high levels of capital (low leverage) they are capable of absorbing potential losses resulting from financial shocks without the threat of bankruptcy. When highly leveraged however, even the slightest losses may induce a destabilising effect which ultimately may lead to bankruptcy. Given the abrupt demise of mortgage derivatives (marked to market), financial institutions found their capital depleted by losses and forced write-downs, and their balance sheets congested by complex credit products of uncertain value. Off-balance-sheet liabilities emanating from bankrupt special purpose vehicles augmented further downside pressure.

After having been exposed for their monumental failures in the run up to the 2008 Global Financial Crisis, rating agencies were quick at attempting to salvage credibility by revisiting unjustifiably optimistic credit ratings. Credit downgrades even by a modest degree, places large pressure on institutions to increase capital requirements. In an environment where banks faced unrelenting capital erosion on their balance sheets by the minute, financial institutions were left little choice but to commence liquidating assets in a draconic fashion. Credit markets quickly froze as the tidal wave of deleveraging (lead by distressed financial institutions) swept the global markets.

Unfolding of Events

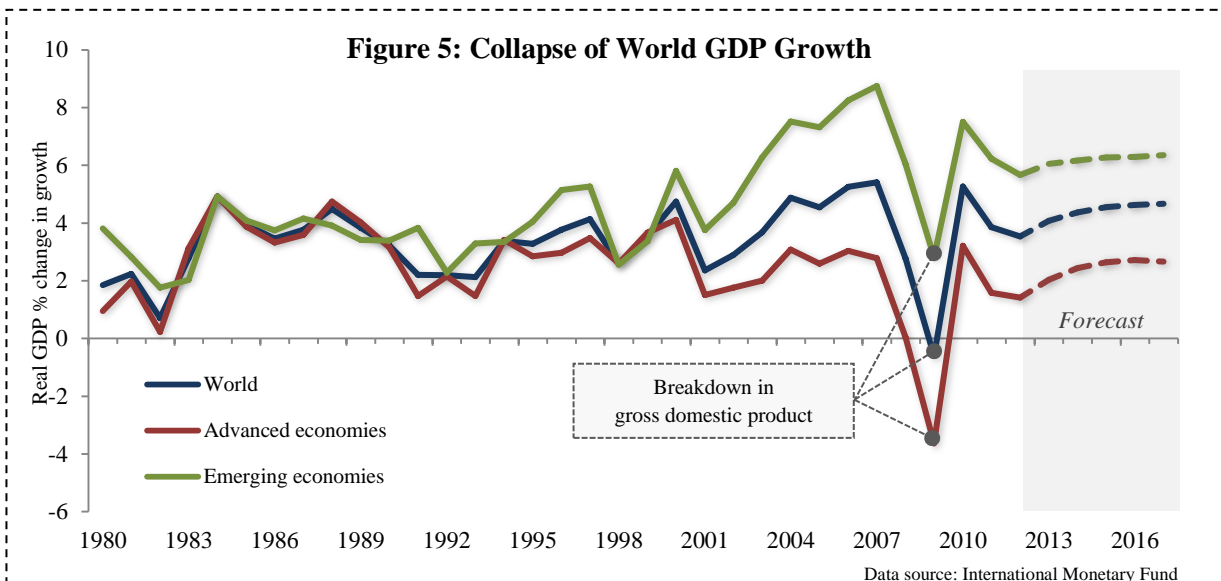
As the events of the 2008 Global Financial Crisis unfolded it appeared that even the most pessimistic of projections were to be confirmed overly optimistic. Faced with housing price declines in the US many dismissed the magnitude of the problem and found comfort in that any decline in output could

be offset by decreasing interest rates. Today there is little doubt that the trigger for the 2008 Global Financial Crisis was pulled as early as 2006.



The intuitive question then becomes what contributed to the significant appreciation of home prices prior to 2006. As previously described, mortgage lenders motivated by the potential for short-term profits found themselves extending loans to risky (sub-prime) borrowers (previously classified as unfit). Given the buoyant housing market and high loan-to-book values, even a modest erosion of house prices often found mortgages exceeding the marketable values of these assets. As described by Blanchard (2011, p.596) ‘the mortgages were in fact much riskier than either the lender pretended or the borrower understood’.

As borrowers began to accelerate defaults bank lenders found themselves exposed to large-scale asset write-downs. According to Blanchard (2011) by mid-2008 mortgage losses were estimated at \$300 million, roughly 2% of the US gross domestic product. From the beginning of 2007 world gross domestic product (GDP) growth began to wane until finally collapsing in 2008. Growth in the first quarter of 2008 was recorded as an annualised -5.7% before declining further to -6.3% in the first quarter of 2009. Emerging markets hoped to be spared from contagion through a regional decoupling between developed and emerging economies. However, as depicted in figure 5 this expectation proved little more than an overly optimistic supposition.



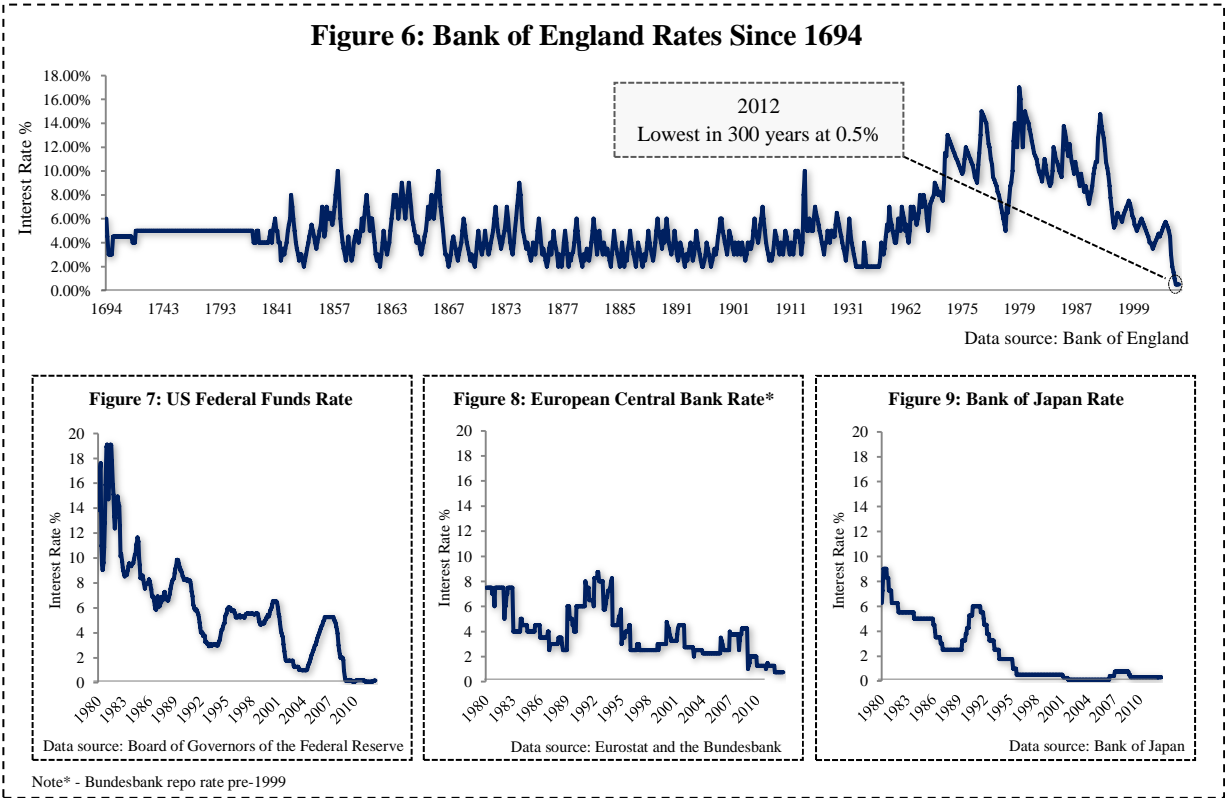
Evidently, transmission of financial stress globally occurred rapidly, and was similarly evidenced by the broad disruption of both developed and emerging market stock price indices. Transmission was primarily routed through the following channels:

- i. Decrease in import demand from the US, with demand largely limited to necessities (affecting exporting economies).
- ii. Decline in global capital flows, US investors and financial institutions became increasingly reluctant to invest abroad.
- iii. Widespread deterioration in confidence.
- iv. Global money markets experienced a sharp decline in flows (freezing).
- v. Economic distress (bank failures) necessitated large scale government intervention, thus placing further onus on future taxpayers (consumption declines).

Each of these consequences placed further downward pressure on global output, gross domestic product, and tax revenue. Blanchard (2011) goes further to highlight the point that less integrated economies such as India performed comparatively better than well-integrated peers. Africa however despite the coincidental absence of deep rooted financial linkages suffered a severe shock in the form of abating commodity prices.

Policy Intervention

Under circumstances of unremitting pressure, policymakers saw their hands forced to commit to extraordinary policy intervention, promptly and with imperfect information. In the middle of 2007 the US Federal Reserve took action by embarking on persistent decreases to the federal funds rate, from 5.25% to virtually zero two years later. This emergency measure was implemented in expectation of curtailing contractionary pressures, and was (as reinforced by the figures below) not a reactive measure unique to the United States. Testament to the far-reaching and aligned concerns in Europe is the Bank of England’s decision to institute its lowest interest rate in over 300 years.



Imperative to ensuring emergency fiscal and monetary measures were not immobilised, governments ceded to the importance of acting punctually. With the deficiencies of the handling of the Japanese Crisis in the 1990s and 2000s well documented, government authorities agreed on the hazard of a prospective liquidity trap neutralising their emergency measures, given a delay in implementation. A liquidity trap describes the condition when an increase in the supply of money fails to lower interest rates. This phenomenon occurs when members of the public, fearing further economic adversity, begin to stockpile cash (thus reducing the country's money multiplier).

The Federal Reserve and US Treasury immediately embarked on the following emergency measures:

- i. An increase in federal depositors insurance from \$100,000 to \$250,000 per account, to limit the risk of a run on banks.
- ii. An introduction of the Troubled Asset Relief Program (TARP) which aimed to cleanse banks of pockets of toxic assets.
- iii. Widespread measures intended to increase capital markets liquidity and to lubricate the financial system were implemented (such as direct government intervention).
- iv. The purchase of numerous 'unappealing' assets (such as CDOs, and MBS).

The universal goal of governments across the globe became to urgently increase the capital levels of financial institutions, in the hope that such efforts would succeed in averting a global economic meltdown.

Fiscal policy - aligned with emergency monetary measures in the US - took the form of tax alleviation and an increase in government spending. In February 2009 the American Recovery and Reinvestment Act was passed, which called for the provision of a further \$780 billion to boost crisis elevating efforts in 2009 and 2010. The programme made allowance for tax cuts of \$288 billion, increases in social expenditure, and the spending of \$170 billion on infrastructure investment to mention but a few measures, Blanchard (2011).

Whilst beneficial in the short-run, many countries have experienced surging levels of debt on account of the necessity to fund these stimulatory mechanisms. Several prominent economists have questioned whether this heritage of colossal fiscal deficits can persist, as the creditworthiness of governments begins to hamper governments' sustainability, particularly in regions lacking currency flexibility (i.e. European Union members).

Conclusion

The rapid globalisation of financial markets, along with widespread deregulation and financial innovation has cultivated a highly leveraged financial environment more suited for the purposes of serving individual self-interest than the general interest of society. The reintroduction of regulation alone however, will not provide the resolution to the risk of future economic crises, and will likely prove largely ineffective unless it proves capable of addressing the perverse incentives that have historically pervaded the financial system. Lessons learnt from the 2008 Global Financial Crisis should see active participation by governments in discouraging the moral hazard which has become synonymous with the past decade. In the future, financial institutions capable of posing a systematic risk should be obligated to accept especially close regulatory scrutiny of their risks, Bernanke (2009|A).

To date post-2008 economies which can be described as sluggish at best, appear attributable to pre-crisis excesses and the misshaped economies which they created. Over the past few decades financial

institutions have enjoyed growth far in excess of the environments within which they operate. With a focus on the US prior to 2008 growth relied too heavily on consumer spending and a surge in house-buying, both of which were financed largely by foreign savings channelled through an undercapitalised domestic financial system (for example the US multinational banks). A sobering observation by Crotty (2009) reveals US household debt was roughly 48% of GDP from 1965 to 1985. By 1998 debt had grown to an approximate of 66% of GDP, before accelerating to well in excess of 100% by late 2008. This untenable tread is unsustainable and inevitably must be reversed, however this may well prove as much a political challenge as it is economic, with credible long-term deficit plans which include both tax increases and cuts to public entitlement programmes a likely necessity. Further imminent consumer deleveraging may still sabotage the desired transmission mechanism of monetary policy.

III. Role of Central Banks and Government

Whilst the practical functionality and primary objectives of governments and central banks may differ materially, there are instances throughout this reading where both have been described interchangeably. This research serves to focus on the common objectives of government and central banks (namely fiscal and monetary policy construction and implementation), rather than their differentiating characteristics. The European Central Bank presents a germane example of the indistinct variances between the roles of government and central banks in implementing emergency fiscal policy. In the case of the European Central Bank, direct European sovereign bond market intervention was required in 2012 in order to ‘safeguard the monetary policy transmission mechanism in all countries of the euro area’, Draghi and Constâncio (2012, 6 September). In effect, this entailed government expenditure of several European Union members indirectly being financed through the central banks purchases of their peripheral euro zone debt. From this perspective the monetary policy considerations of the European Central Bank have to a large extent been dominated by the fiscal needs of its member countries.

Pertinent to this research will be the functionality of these policy institutions during periods of economic distress. It is under these testing circumstances that the prominence of economic policy becomes most apparent. Policymakers in responding to the 2008 Global Financial Crisis were presented with the daunting challenge of avoiding financial collapse in the short-run, while continuing to orchestrate the necessary structural financial market overhauls to ensure a sustainable economic recovery. During periods of financial distress policymakers are required to maintain a dual focus on both the cushioning of economic shocks on an already vulnerable economy, as well as containing the risk of an adverse ‘feedback loop’, in which economic ruptures and financial strains mutate to become mutually reinforcing, Bernanke (2009|A).

Redressing the economic repercussions of the 2008 Global Financial Crisis, policymakers around the world have been entrusted with a disconcerting task. First and foremost this entails limiting the effects of plummeting asset values, and averting a fatal credit crunch. Longer-term objectives extend to restoring both business and investor confidence, maintaining a tight grasp on inflation, and ensuring a sustainable level of economic activity. As accentuated by Bernanke (2009|A) government policy responses will be critical determinants of the speed and vigour of the post 2008 Global Financial Crisis recovery.

Contemporary explanation of central bank policy success would be deficient without brief mention of the victory over inflation witnessed in the United States as well as the United Kingdom during the 1980s and 1990s, a period which became affectionately known as the ‘Great Moderation’. During this time central banks found favour in monitoring money supply based on the theory of Friedman (1969) that ‘inflation is always and everywhere a monetary phenomenon’ for which the stability of money demand is an essential prerequisite. Empirical analysis supports the conclusion that the stable money demand assumption was habitually violated, this discovery was a primary contributor to the abandonment of money targeting in favour of the now popular inflationary focus. Years to follow saw several economists and policymakers gravitate towards a view that controlling inflation was sufficient to ensure the stability of economic activity, Jones, Atkins and Harding (2012). In practice the extent of this inflationary focus does however differ by region, for example the South African Reserve Bank has been noted as advocates of a flexible inflation strategy (where deviations of actual inflation from its predefined target are viewed as acceptable as a means of stabilising output). An interesting case can be observed in the legacy of the European Central Bank which to a large extent inherited its monetary policy strategy from the Bundesbank (which boasts a record of great antiquity in successfully managing inflation via money supply), Giese and Tuxen (2007). Accordingly the European Central Bank maintains a ‘two-pillar strategy’ which utilises economic indicators, as well as placing a ‘prominent role’ on monetary developments in the determination of its future policies. In the aftermath of the 2008 Global Financial Crisis the European Central Bank has been forced to endure the traumatic experience of acting as a fiscal agent for several of its severely indebted members.

The apparent oversight with an inflation-fixated policy (as evidenced by the heightened financial sector instability witnessed during the 2008 Global Financial Crisis), is the lack of consideration of how these interest rate policies inadvertently influence the behaviour of financial institutions. According to Mallaby (2012) the majority of developed economies’ central banks utilise interest rates as a measure of targeting inflation, leaving them unable to simultaneously use interest rates to prevent bank lending from getting out of hand.

During periods of economic distress fiscal and monetary mechanisms are tweaked to induce stability. Whilst practical challenges emerge when attempting to specify the implications of fiscal or monetary policy in isolation, an abridged explanation of these two economic tools will suffice for our purposes. Economic contraction is likely to motivate government intervention in the form of an increase in government spending, for example an increase in infrastructure spending (shifting the AD curve to the right, thus increasing short-term economic output). The economic intuition behind this act is based upon the expectation that the increase in government spending will counterbalance the crisis induced reduction in consumer spending and investment. The increase in government spending, without offsetting tax increases (balanced budget fiscal expansion), will predictably be accompanied by a proportional increase in government debt. As a primer to the detailed explanation provided below (see section IV deficit financing) we allow for the assumption that government debt is supported by exclusively by the sale of government bonds. Efforts by government spending to induce economic stability are often then reinforced by central bank activities to escalate levels of monetary supply (through the purchase of government bonds). Central banks as procurers of government debt inject profuse levels of liquidity into the financial system curtailing the risks of a monetary epidemic (shifting the LM curve to the right and lowering the short-term interest rate). Short-term in nature, both of these fiscal and monetary measures are subject to longer-term neutrality as the AS-LM curve ultimately returns to its natural level.

The role of central banks

The rationale and objectives of various central banks differ vastly, dependent largely on the wellbeing of the economic environment in which they operate. Common to central banks is the duty to act as custodian of a nation's money supply. The quantity of money supply is managed by central banks primarily through three direct control mechanisms, namely:

- i) Open markets operations
- ii) Discount rate policy
- iii) Fluctuating the reserve requirements

All three of these measures are highly integrated and amplified by the money multiplier. To provide an example of the level of cohesion amongst these mechanisms, consider the example of a central bank which has embarked on expansive monetary policy by purchasing government bonds in the open market. Government bond purchases results in financial institutions transforming fixed income assets into cash balances, thus increasing the banks cash reserves. The increase in national monetary supply circulating the country's financial system will be accompanied by a decline in short-term interest rates (such as the benchmark repurchase rate). Open market operations undertaken by the central bank to dispose of government bond will have the opposite monetary consequences.

In the case of the US, the Federal Reserve possesses the ability to dictate the short-term Federal funds rate. The Federal funds target rate is determined by a meeting of the members of the Federal Open Market Committee. Following which, the Federal Reserve embarks on open market operations to ensure that the Federal funds effective rate is aligned with the Federal funds target rate. The Federal funds rate is an overnight rate pertinent to banks and other depository institutions for the lending of non-interest bearing reserves. Institutions finding themselves in violation of legislated reserve requirements (due to inadequate reserves) are permitted to engage in short-term lending with peer institutions that may be in possession of excess reserves. Overnight lending under this practise will be at the expense of the levied Federal funds interest rate. In many countries a similar rate such as the LIBOR (London Inter-Bank Offered Rate) is determined by the device of supply and demand. It is this very open pricing mechanism which has exposed vulnerabilities to manipulation which are alleged to have taken place between 2005 and 2009. The LIBOR aims to represent the rate banks charge when lending to one another. This rate is captured through an auction like process whereby banks submit daily estimates of the rates which they would be willing to accept to borrow at that point in time. These private submissions are assembled by the British Bankers Association, and after excluding outlier bids, the average borrowing rate is declared as the LIBOR. In 2012 several submitting members were found guilty of aligning their borrowing estimates in an attempt to influence this final average. In the case of the Federal funds rate however, the Federal Reserve has authority to dictate this rate, making it an esteemed tool accessible for monetary policy administration.

For our purposes we are particularly interested in the functionality of central banks under circumstances of economic contraction, as well as the facilities available to these institutions to combat adverse economic conditions. In discussing the implications of the 2008 Global Financial Crisis, Bernanke (2009|A) specifies the Federal Reserves mandated duties under testing conditions as:

- i) First and foremost the Federal Reserve can be considered as the lender of last resort. Under this role market participants look to the Federal Reserve to make available to

- financial institutions adequate access to short-term liquidity in the hope of averting the freezing of money markets during times of extreme financial pressure.
- ii) Provision of liquidity directly to borrowers and various credit participants in key markets. Once again fulfilling the responsibility of liquidity provider of last resort, the Federal Reserve introduces facilities to purchase highly rated commercial paper, providing crucial liquidity to money market funds.
 - iii) Finally and perhaps most popular amongst market participants, the Federal Reserve purchases long-term securities, increasing the supply of money within an economy. Over time, this direct increase in market liquidity stimulates market activity and theoretically also assists in reviving private lending. As theoretically these elevated levels of business and household cash are put to use in economic transactions.

In response to the effects of the 2008 Global Financial Crisis the Federal Reserve demonstrated the ability to engineer innovative and creative facilities in order to ensure economic symptoms were not immune to the market anticipated central bank intervention.

In the context of this research seignorage will be viewed as the empirically preferred response undertaken by central banks around the globe to encourage economic growth following an economic crisis (however as previously noted policy elements are highly interrelated). The technicalities of central bank intervention often sees the open market purchasing of government bonds (debt) during times of extreme financial stress. Central banks purchasing of government debt, all else constant, causes government bond prices increase (increased demand), resulting in yields on these bonds to decrease (larger denominator). Investors selling these securities to central banks are expected to then deploy such proceeds on alternative assets, thus raising their prices. The countries prime lending rates will also be expected to decline proportionally to bond yield decreases. Lower bond yields encourage borrowing and thus higher equity prices (raising consumption), both contribute positively to investment and serve to boost aggregate demand. To the extent that investors diversify into foreign assets, portfolio rebalancing weakens the domestic currency, thus encouraging exports (this is assuming exports are invoiced in domestic currency i.e. producer currency pricing), Economist Newspaper Limited (2012|D).

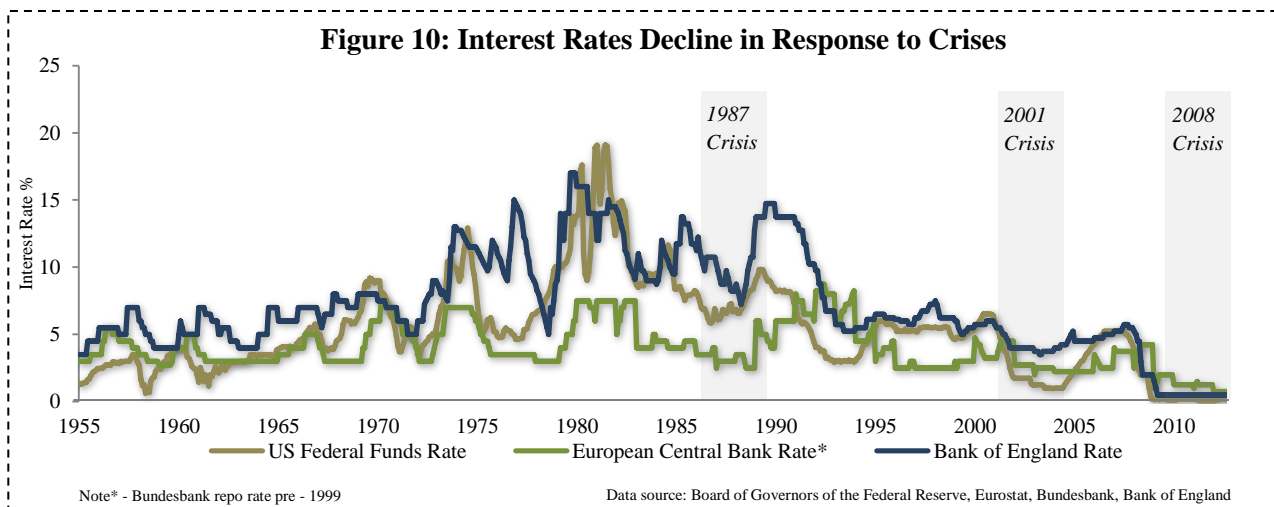
Weidmann (2012|A) does well to mention the duty of policymakers to uphold pressure on financial institutions in the wake of the 2008 Global Financial Crisis. This perpetual pressure should ensure that financial institutions proceed with their necessary restructuring, with the abolition of unviable banks and the retaining of earnings to build up much needed capital buffers.

As explained by Bernanke (2009|A) all three policy mechanisms mentioned above; provision of liquidity to credit markets, purchasing of securities, and lending to financial institutions are common in nature as they all utilise the asset side of the Federal Reserve's balance sheet. Of particular importance during the 2008 Global Financial Crisis was the fact that the Federal Reserve was able to utilise these tools to continue easing credit conditions regardless of the epic market conditions, and despite having already exhausted manoeuvrability of interest rates (federal funds rate was already virtually zero). In what has been commonly referred to as 'credit easing' the intention is to provide alleviation from economic pressures (emanating from clogged credit channels) through enhanced levels of liquidity, and thus to reduce long-term interest rates.

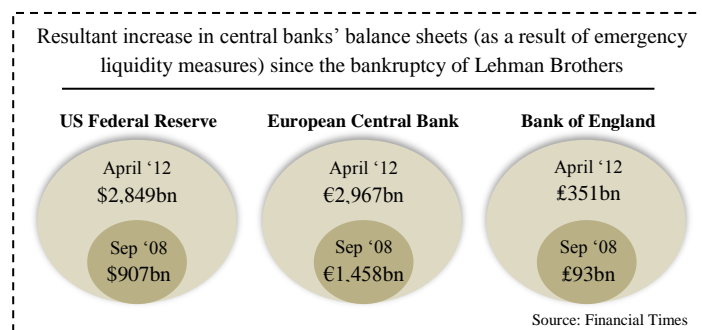
The liability side of the Federal Reserve's balance sheet is far simpler, consisting primarily of currency issued and banking deposits held (reserves). Central bank tools can often also be amplified by shifts in investor expectations. Take for example the expectation that a central bank is expected to

hold the government debt purchased for an extended period, such a perception is capable of supporting the economy by cutting government-borrowing costs and reducing the future burden of taxation. A reputable commitment to keep short-term interest rates suppressed (such as that made by the Federal Reserve to maintain depressed short-term rates well into 2015) may indeed gain credibility if accompanied by quantitative easing, since the central bank maintains personal interest through its holdings of government debt (of varying maturities) and thus is exposed to the risk of a rise in the interest rate.

Figure 10 below serves to highlight the interest rate trends observed during recent periods of significant economic contraction. Whilst perhaps opaque at times the underlying trend is that rates are witnessed declining during periods of economic crises, with the hope of economic pressures abating.



Economic intuition dictates that an interest rate decline be complemented by expansive monetary policy. By increasing the supply of money in an economy directly (through quantitative easing) central banks effectively expand their balance sheets to accommodate for both government bonds purchased in the secondary market (asset side of the balance sheet), as well as the further issuance of monetary obligations (liability side of the balance sheet). As illustrated below central banks commitment to suppressing interest rates following the 2008 Global Financial Crisis saw an unprecedented swelling of their balance sheets.



These sizable expansions in central bank balance sheets are thought by many to be harbingers of hyperinflation, an observation which Wolf (2012) has criticized as being 'idiotic'. Given the surrounding circumstances (the collapse of private financial sectors), central banks have honoured

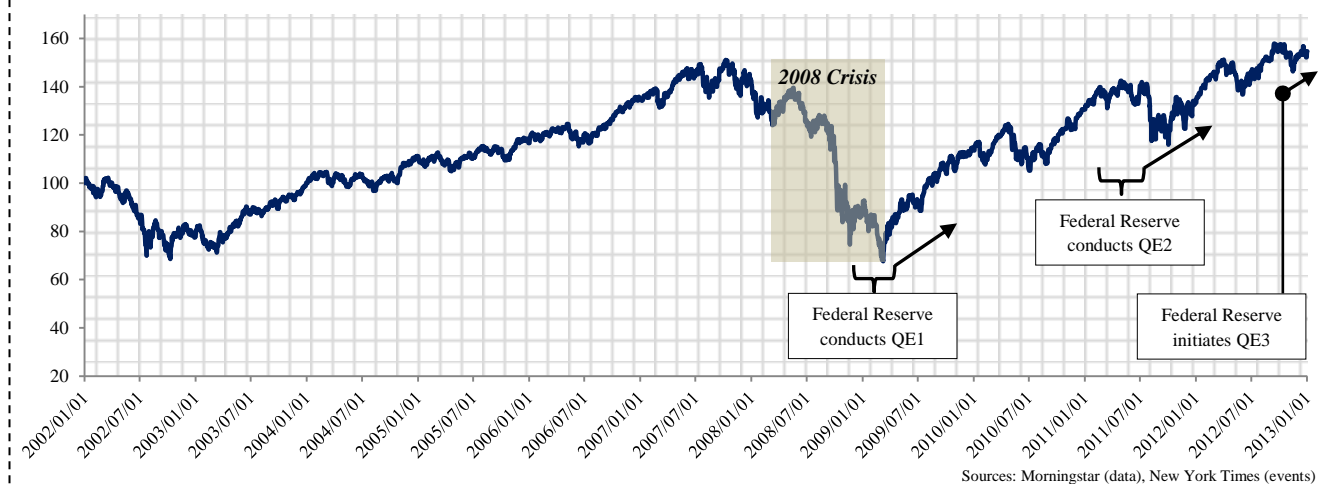
their governing mandate; they have acted as a lender of last resort during a period of flagrant panic. Wolf (2012) described the fact that central banks have saved the world from a second great depression as having been disregarded, with a focus instead on their incentives for coming to the aid of banks. It should be noted that ‘nobody gains credit for eliminating a hypothetical event’. Krugman and Layard (2012) do well to remind vocal market commentators of the sequence in which the event of the 2008 Global Financial Crisis unfolded. Given the widespread anxiety which ensued after asset prices plunged, private sector spending froze, whilst a logical action given these extreme circumstances, collectively this prudence becomes self-defeating as it motivates further asset price contraction. Government in turn embarked on measures to stabilize this spending deficiency, acting under the comprehension that ‘one person’s spending is another’s income’. Perhaps counterintuitive but a reduction in government deficit and/or an increase in taxation would have resulted in an undisputable consequence, to exacerbate the already daunting economic problem (conventional Keynesian multiplier argument).

Whilst the short-term merits of monetary stimulus in alleviating pressure during economic turmoil is undeniable, the cost of such mechanism sees a transfer of stress to the presumably more robust central bank balance sheet. Policymakers need to establish a balance between their pledge to ensure financial system welfare, whilst continuing to encourage economic efficiency and innovation.

Central banks are not only accountable for the degree of liquidity during times of financial distress, but need to be mindful of the potential dangers in delaying to provide distressed markets with liquidity following a crisis, more specifically the risk of economic stagnation. The Federal Reserve’s actions in the case of the 1929 crisis provide an example of the dangers of failing to increase liquidity following the initial signs of a crisis. By waiting too long to counter the banking credit crunch and economic repercussions of the crisis, the Federal Reserve neutralised their ability to influence subsequent calamities. Research by Friedman and Schwartz (1963) supports the view that a more accommodative monetary policy may well have reduced the severity of the 1929 Great Depression. A more recent example of a central bank diluting their monetary policy influence on crisis repercussions can be observed in the Bank of Japan’s actions in the 1980s. Failure to identify the bubble, along with the delay in deploying monetary policy tools (increasing liquidity through quantitative easing) following the initial shock of the bubble imploding rendered Japanese monetary and fiscal policy largely ineffective for a prolonged period. A phenomenon later termed a liquidity trap (economic stagnation).

Insight provided by Bernanke (2009|A) highlights the acknowledged importance of timely and aggressive action, ‘in historical comparison, this policy response {2008} stands out as exceptionally rapid and proactive’. The Federal Reserve’s attitude regarding their reaction to the 2008 Global Financial Crisis with the immediate and sizable monetary measures (increased liquidity) whilst an improvement on their empirical responses remains vulnerable by failing to acknowledge on-going dangers. Of particular concern are the resultant asset bubbles which stem from escalated levels of liquidity (accommodative monetary policy). Figure 11 below provides evidence of the post 2008 expansive monetary policy undertaken by the Federal Reserve (termed Quantitative Easing) and the subsequent increase in broad equity prices. Evident below is the encouraging trend of American equity prices reacting positively to the increased market liquidity.

Figure 11: S&P 500 Index's Reaction to Expansive Monetary Policy



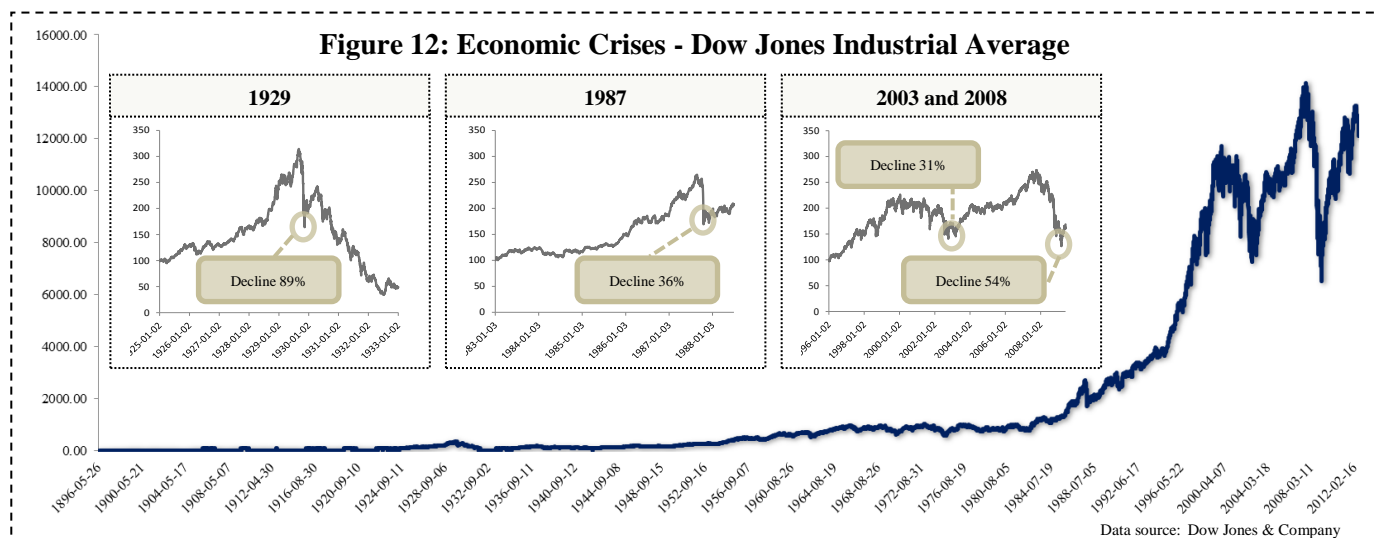
Closer scrutiny of equity price levels following these abnormal echelons of liquidity warrant caution. Economic intuition repudiates the possibility of sound fundamentals underpinning the post-2008 equity price rebound. A more sound reasoning would attribute such equity advances as a direct repercussion of the short-term elevations in liquidity. Given the necessity of consumer deleveraging, excess liquidity surges into global equity markets (as opposed to further bank lending). This explanation of price behaviour raises several similarities with our current understanding of asset bubbles. Failure to recognise these repercussions resulting from short-term crisis response measures by the Federal Reserve consequently appear somewhat disingenuous. According to Weidmann (2012|A) 'delivering on its primary goal to maintain price stability is the prerequisite for safeguarding the most precious resource a central bank can command: credibility'.

Definition of an Asset Bubble

According to the broadest definition an asset bubble appears to be present when asset prices demonstrate a provisional unhinging from their true worth. Most economists would describe an asset bubble as the phenomenon where an asset price significantly exceeds the fundamentally justified value of the asset. Formally, the fundamental value of an asset would entail the discounted present value of all cash flows expected to be derived over the life of the asset. To this end the value of an asset can be thought of as the claim to a stream of future payments, in the case of equities such payments take the form of dividends. Intuitively, if the observed market price exceeds this fundamental value such asset should be construed as overvalued. However projecting future cash flows with any degree of certainty is a notoriously difficult task. In the event of the market price exceeding its 'objective' fundamental value this suggests the asset possesses an intensified vulnerability to a price collapse. According to research by Barlevy (2007) there is always an equilibrium in which the asset price declines towards its fundamental value.

Despite the rather simplistic definition, the task of appropriately identifying an asset bubble in practice remains challenging. The reason for this is the pre-emptive payoff of asset bubbles, as the economic value assigned to the task of identifying asset bubbles is derived not by what actually transpires, but rather what could potentially happen.

Kindleberger (1996) is documented having defined an asset bubble as ‘an upward price movement over an extended range that then implodes’. The aggressive rise and fall of the Dow Jones Industrial Average index presented in figure 12 below, provides several backward looking specimens of such price behaviour.



Perhaps a more abstract documented example of an asset bubble can be dated back to the seventeenth-century, where the price of tulip bulbs in the Netherlands (Tulipmania) became arguably the most primitive exhibit of an asset bubble recorded. Most economists at this point will argue that the definition provided is flawed by ambiguity. Economists do however concede that dramatic increases in asset prices serve as a dependable cause for concern, Barlevy (2007). This is largely due to the rapid pace in which asset prices are often observed to have advanced, which of course confines the explanation that such fluctuations could be exclusively a result of changes in the underlying assets fundamental characteristics. Swift advancements in the prices of assets over these condensed periods of time fuel the notion that assets are overvalued and an impending ‘correction’ in price is imminent.

In 2005 The Economist stressed the inflationary risks of surging asset prices, which may distort price signals and thus encourage the misallocation of resources within an economy. The examples provided entail the encouragement of too little savings, or too much investment in housing, Economist Newspaper Limited (2005). With the advantage of hindsight this was a remarkably accurate assessment of the US economy which at the time was guilty of diverting disproportionate resources from their productive uses towards domestic real estate.

Further, there are a vast number of empirical studies which indicate a correlation between asset bubbles and the introduction of less-seasoned market participants, one such study was that conducted by White (1990). The underlying premise of these studies alludes to widespread euphoria amongst both professional market participant and less experienced participants. The apparent ‘easy profits’ motivate otherwise impartial parties to undertake the ‘lucrative’ practice of purchasing equities, thus further fuelling asset price advances. Several simulated academic experiments confirm this behaviour. Smith, Suchanek, and Williams (1988) conducted an experiment in which subjects were permitted to trade simulated assets. Unambiguous data was provided regarding the respective assets dividends, and subjects (who were not necessarily professional investors) were provided individual motivation in the form of prospective profits to ensure their active participation. Given that the information communicated to all participants relating to the assets was identical, logic dictates that no

asset price bubble should have occurred. Surprisingly the results of this study however depicted a typical asset bubble scenario, whereby prices rapidly elevated beyond objective fundamental levels, followed by a rapid price reversal. This result serves to highlight the inherent danger of dislodged (from fundamental justification) and synchronised asset price valuations amongst unaccustomed market participants, effectively further contributing to the inflating of asset bubbles. In contemplation of the study conducted by Smith, Suchanek and Williams (1988), Barlevy (2007) provides an insightful observation. Given the susceptibility of market participants to incorrectly determine an equities fundamental value, could the same potential vulnerability be present amongst policymakers? Certainly if this were to be the case, attempts to discourage asset prices inflating may run the risk of proving misguided and perhaps even counterproductive. Assuming policymakers do possess a superior understanding of fundamental asset prices when compared to the average market participant, Barlevy (2007) highlights yet another potential hazard. Supposing early signs of an asset bubble is confirmed by policymakers, who undertake the proactive measure of decreasing its market price. Surely under these circumstances market participants will simply accelerate their purchases, inevitably bidding the price up under speculative euphoria. Perhaps one solution to this phenomenon might lie in the nature of the policyholders' intervention. By controlling the level of market liquidity (limiting the availability of credit) perhaps this unfavourable development can be restrained, a topic certainly deserving of further study. Barlevy (2007) provides the more palatable solution of simply educating market participant as to the nature of an equities fundamental value, and their inherent nature to mean revert. If deemed the most effective elucidation, it will be imperative that such education is conducted proactively.

Liquidity and Asset Bubbles

The possibility that asset prices may deviate from their intrinsic value based on market fundamentals has long intrigued economists. If equity prices were relentlessly consistent with rational expectations of future dividends discounted by a constant rate, then prices could be expected to change only in the event of new information entering the market. The arrival of this information would obviously be unpredictable, Samuelson (1965). Rationality of prices would therefore imply equity price changes which take place in an unpredictable fashion, Camerer (1989). Unpredictability however does not necessarily imply the presence of rationality. Equity prices may indeed be unpredictable given the incorporation of all available information, however may also be subject to the influence of an unpredictable bubble component, Friedman (1984).

The concept that asset prices may drift from intrinsic value and demonstrate bubble like tendencies has a long oral account among financial practitioners, especially non-economists. Macroeconomic theorists appear to have been the first to formalise the possibility of asset bubbles, sighting 'dynamic models of the price level could have indeterminate explosive solutions even if agents have rational expectations', Camerer (1989, p.4). Theoretical considerations by Giese and Tuxen (2007) go further to identify the relationship between liquidity and asset prices on a global scale, namely:

- i) Liquidity may cause inflation if demand increases, given a static supply of assets
- ii) An economy experiencing growth may lead to both amplified liquidity and to a upswing in asset prices
- iii) Lower interest rates (due to increased liquidity) may result in equity price gains, due to the reduction in the discount factor

Allen and Gale (2000) provide a differing explanation regarding asset bubbles, noting three distinct phases. The first phase is described as financial liberalisation, whereby a conscious decision by a domestic central bank is made to increase lending. This expansion of credit is closely followed by an advance in asset prices (such as equities) as further demand filters into the economy and the bubble begins to inflate. The second stage has been described as the precipitant mean reversion of asset prices i.e. the bubble bursts. And finally the third phase is characterised by subsequent defaults by the institutions which participated in the purchasing of assets at inflated values, by abandoning prudent financial management.

Broad evidence supports the existence of asset bubbles along with accompanying economic distortions, financial and real economic instability, Roubini (2006). The germane question becomes whether monetary policy authorities in contemplation of policy should incorporate the effects of liquidity on asset price bubbles (i.e. target the bubble directly) beyond the influence that such bubbles may have on ancillary considerations, such as current output growth, inflation expectations, and aggregate spending. As described by Roubini (2006), many including the Federal Reserve believe monetary policy should refrain from reacting to asset prices and potential bubbles beyond its direct effects on inflation, aggregate spending and economic growth. Much like Roubini (2006) this thesis refutes the arguments against consideration of asset prices in the formulation of monetary policy to address potential bubbles.

In the fall of 1996, Federal Reserve Chairman Alan Greenspan cautioned of the ‘irrational exuberance’ clearly evidenced by the stock market valuations at the time, Greenspan (1996, Dec 5). Reviewing empirical actions undertaken by the Federal Reserve in reply to the surge in stock prices beyond that which was allegedly warranted by economic fundamentals during the 1990s provides support to this argument. With the exception of a 25 basis point increase in the Federal funds rate in 1997, the Federal Reserve remained committed to their policy of refraining from decreasing market liquidity despite evidence that an asset price bubble may be forming. Similarly the Federal Reserve can be seen resisting the pre-emptive adjustment to monetary policy (thus market liquidity) during the years preceding the 2008 Global Financial Crisis.

Roubini (2006, p. 95) argues the necessity of a monetary policy which ‘should try to prick or burst asset bubbles’ by incorporating the monitoring of asset prices on a continuous basis. Asset price bubbles permitted to evolve unchecked empirically have demonstrated the potential to grow large, leading to investment and economic distortions which pose a grave risk to financial stability once they become inevitably unsustainable. ‘Thus, optimal monetary policy should pre-emptively deal with asset bubbles rather than just mop up the mess that they have caused after they burst’, Roubini (2006, p. 89).

In contemplating practically how asset prices bubbles can be incorporated into monetary policy formulation mechanisms, the logical question then becomes how one could identify whether advancements in asset prices are justified by fluctuating economic fundamentals. Tirole (1982, 1985) provided insight as to which specific asset classes might be prone to price bubbles. Given the necessity of resale, assets would need to be durable in the sense that they are capable of maintaining value beyond a one owner. Scarcity or short-run supply inelasticity is also important as the alternative would be an increase in supply in response to more favourable asset prices, introducing an early limit on price advances. Assets require an active secondary market, and perhaps more ambiguously a mechanism for coordinating the belief that asset prices will continue to advance. Upon inspection global equity markets appeared to satisfy each of these requirements (ignoring comparatively trivial initial public offerings) during the year preceding the 2008 Global Financial Crisis.

Admittedly it is difficult to identify a non-fundamental asset price bubble with any degree of confidence. It is this challenge which motivates advocates of monetary policy formulation which disregards asset price incorporation as superior such as Bernanke and Gertler (2001). The inherent flaw in this argument is that ‘all economic policy decisions are based on some degree of uncertainty’, Roubini (2006, p.92). Expanding on this observation the conceptual flaw of failing to recognise asset prices when formulating monetary policy due to the presence of uncertain characteristics implies that monetary policy is always implemented under conditions of certainty (such as data reliability), this however we know to be inaccurate.

Once a degree of uncertainty regarding the identification and measurement of an asset bubble has been acknowledged the superior approach to asset price incorporation might perhaps be diluting the effects of its incorporation by a quantified level of uncertainty. Perhaps given the uncertainty faced by policymakers in the practical implementation of monetary policy, effectiveness can be enhanced by introducing a coefficient to account for the presence of imperfect information, Brainard (1967). Filardo (2004) rationalises that the greater the uncertainty regarding the presence of an asset bubble the lower the coefficient will be on the asset price in the optimal monetary reaction function. Therefore the greater the uncertainty regarding the size of the asset bubble, the more muted the monetary policy response. Another alternative could perhaps be for policymakers to follow a strategy of robust control, whereby relatively more attention is paid to the potential for downside risks (policy taking account of two sigma events). However, to rigidly ignore the influence of asset price fluctuations altogether is neither optimal nor rational, Roubini (2006). Caution however is warranted as the emergence of an asset bubble is likely to evidence structural delinquencies within an economy, grave foresight as to whether proposed actions will mitigate or exacerbate economic imperfections will be required.

Numerous empirical observations that the majority of instances of increased liquidity resulting from the sustained increase in monetary supply fail to have led to equity booms does not invalidate the possibility of bubbles occurring. Rather, what is relevant is the potential for post monetary accommodation bubbles, and how monetary policy authorities should react to them, Roubini (2006).

Relationship between liquidity and asset prices

The hallmark of an asset bubble appears to be when market participants acknowledge that prices are much higher than their intrinsic worth but continue to purchase the assets never the less undeterred, with their rationale dominated by the expectation that asset prices will continue to progress. The provision of liquidity during periods of market distress assists in the alleviation of systematic risk by assuring market participants that, in the event of a loss of investor confidence, financial institutions are able to honour their obligations to creditors without relying on the sale of potentially destabilizing assets in a fire sale fashion, Bernanke (2009 |A).

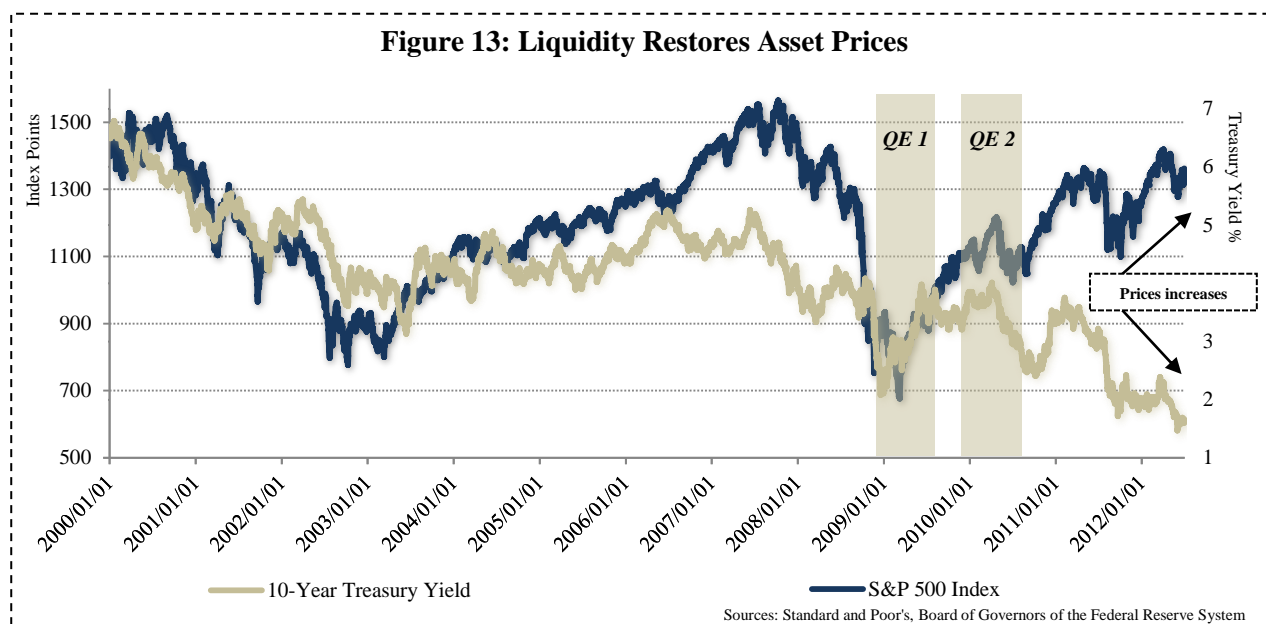
While in many cases financial crises appear to have been precipitated by a shock (originating from the real economy) of some sort, there are however numerous documented instances whereby a financial crisis appears to have been triggered by an event in the financial sector. Allen and Gale (2000) provide the example of financial liberalisation (of the capital account) and the associated expansion of credit being correlated to the surge in equity prices of emerging markets (increased capital inflows and credit feeding the bubble). The then bloated asset prices are in turn supported by further anticipation of credit (more liquidity) and thus even grander prices. The inevitable deviation from this cumulative progression ultimately may initiate a crisis. Testament to this theory is the Japanese Crisis in the early 1990s. Japan’s withdrawal of liquidity in 1990 through channels of credit tightening

precipitated the collapse of asset prices, marking the commencement of a prolonged real economic crisis (following an initial financial shock).

Motives to participate in the inflation of an asset bubble are of particular concern amongst mutual funds. Investors often judge the competence of professional money managers relative to the returns of competing professionals, this comparison more often than not places the bulk of the emphasis on returns. During periods of rapidly advancing prices (bubbles) money managers are often left with little choice other than to obtain exposure to the booming asset(s), dampening the individual asset valuations required to ensure an efficient market. If risk-averse money managers succeed in minimising the variance of their relative performance by conforming to broader market, holdings coordination will assist in sustaining the persistence of the ‘mispricing’. Acquiring an investment allocation which varies from competing professionals under these conditions will likely increase relative performance risk, Camerer (1989).

Policymakers have been slow to acknowledge a relationship between the management of liquidity and its undeniable influence on the price of assets. At the heart of this intellectual struggle are attempts to overlook asset bubbles due to the fact that empirical research has found them to be arbitrary, as well as the academic challenge to rationalise the clearly evident possibility of their existence during times of economic distress. Despite the absence of a uniform explanation of how expansive monetary policy (thus a surge in liquidity) will affect asset prices, the correlation is undisputed. From a theoretical perspective consider central bank dictated declines in interest rates. The central bank makes lending more affordable for financial institutions; therefore base rate declines will irrefutably be accompanied by a uniform decline in depositor interest rates. Subsequent liquidity excess circulating the market will find little incentive to commit to this new uninspiring depositor rate. With expansive monetary policy fuelling inflationary concerns, investors seeking real wealth preservation may be enticed to invest in overly speculative equities or perhaps the bond market. Negative real returns on money market investments offered by financial institutions therefore provide an undesirable investment prospect. The uncertainty surrounding the sustainability of financial institutions in the event of a financially rooted crisis (such as the 2008 Global Financial Crisis) can be seen to exacerbate the lack of desire of market participants to hold their wealth in riskier institutions offering parsimonious returns.

Figure 13 below provides graphical evidence of the observed correlation between increased liquidity and asset price recoveries following the 2008 Global Financial Crisis. With the Federal Reserve committing to a policy of prolonged depressed interest rates, excess market liquidity (resulting from the first two Quantitative Easing programmes) can be perceived as the primary contributor to asset price recoveries. For purposes of objectivity the safe haven status of US Treasury bonds during periods of economic distress should however also be noted.



Empirical observations prior to the 2008 Global Financial Crisis provides abundant evidence of several crises preceded by asset bubbles. Giese and Tuxen (2007) provided evidence of ‘unusually loose’ monetary policy in the years preceding the 2008 Global Financial Crisis, culminating into a global liquidity surplus - defined as money in excess of Gross Domestic Product - and ultimately inflated asset prices. Principal concern in the years to follow 2008 should remain focused on the perils of liquidity in equity and bond markets, and more particularly the resultant bubble like characteristics evident in global equity and bond markets resulting from an accommodative monetary policy which fails to make provisions for the non-fundamental renewed equity and bond price highs.

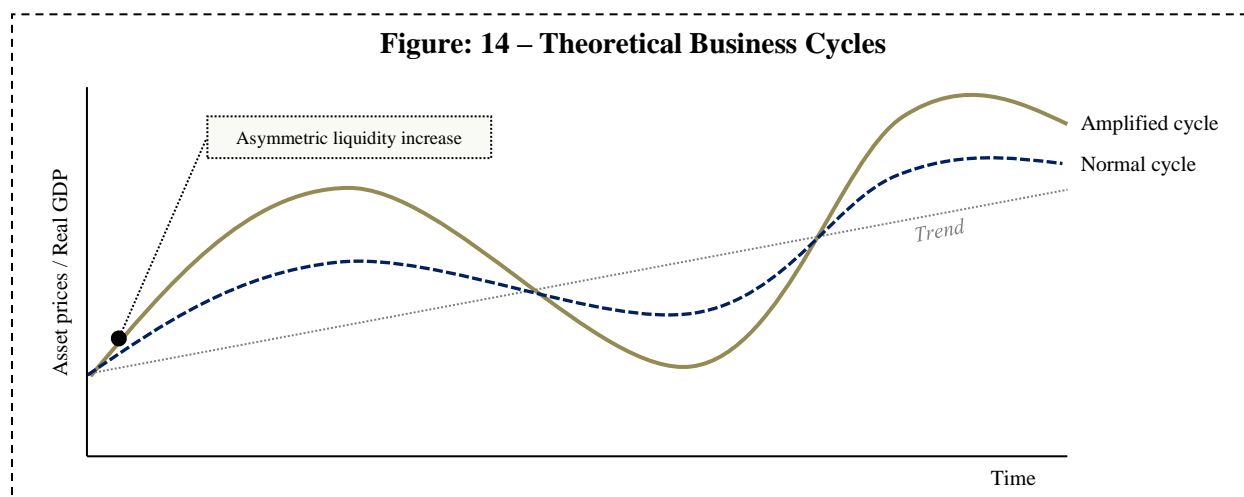
Monetary policy whilst not a silver bullet which may be used as a customary measure to address asset bubbles may however possess an authoritative influence which may be used to avoid a prolonged economic crisis. Roubini (2006) stopped short of advocating an aggressive monetary policy approach to asset bubbles, suggesting rather monetary policy respond to bubbles in a cautious and moderate manner, an insightful recommendation certainly worthy of further deliberation.

Limitations of liquidity

Acknowledging the effectiveness of liquidity as a remedial measure to remedy an economic contraction, our interest shifts to whether this liquidity response may possess limitations. That is, is an increase in liquidity (resultant from Quantitative Easing) destined to be succeeded by superficially inflated asset prices posing the risk of a renewed recession? Central bankers are in need of an inventive approach to gauge the perils of excessive liquidity, which leverages off public financial market observations to gauge acceptable levels of asset valuation. Adding to the already problematic challenge of gauging the relationship between liquidity and asset prices is the observation that the financing of purchases (and thus demand) in many instances is not directly derived from the availability of liquidity. Asset purchases such as equities may and often are funded through a myriad of financial products (for example leverage type contracts).

Acknowledging the correlation between liquidity and asset prices, what becomes imperative is the resolve to predefine a limitation to the artificially inflated levels of liquidity. In this case we are less concerned with the merits of increasing money supply (and liquidity) succeeding a crisis, but rather argue for a more symmetric response to rising and deflating asset prices to encourage the appropriate

balanced risk recognition by investors. According to Roubini (2006) there may indeed be circumstantial evidence that dealing asymmetrically with bubbles causes more bubbles to emerge, as witnessed in equity valuations subsequent to the 2008 Global Financial Crisis (see figure 13 above). An asymmetric response serves only to further inflate asset bubbles and deepen cycles. Studies conducted by the Bank for International Settlements accentuate the need for further symmetry over the business cycle; alternatively a building up of financial imbalances may pose a threat to future price stability, Borio (2012).

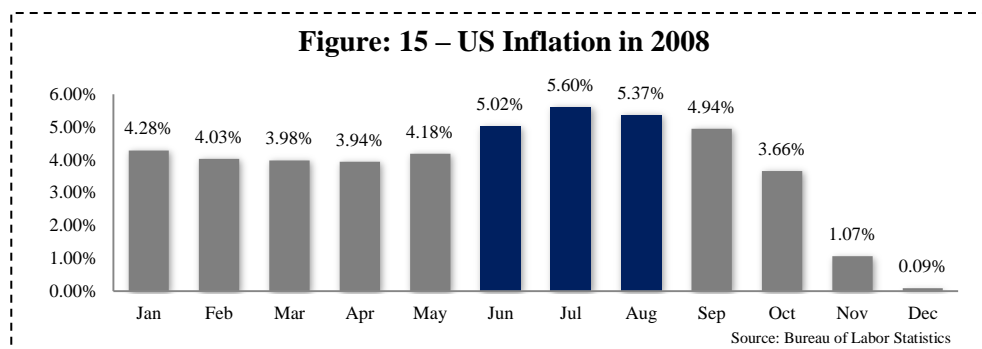


The primary objective of demand-side stabilization is to flatten the business cycle depicted in figure 14 above. Less volatile periods of recession and recovery are characteristic of projected gyrations proving less vigorous. Given a flatter business cycle the planning horizon for the private sector becomes more stable, long-term capital investments (and thus economic growth) theoretically flourishes under such circumstances.

A further limitation to crisis liquidity committed responses is the effect of monetary policy incorporating asset prices on investor psychology, which by nature is notoriously unpredictable. Investor psychology in response to monetary policy however appears deserving of further independent research. Nobel Laureate Paul Krugman provided valuable insight into the limitations of liquidity as a homogeneous remedy for the 2008 Global Financial Crisis; ‘many believe that all that we have is a liquidity crisis that can be undone with a bit of financial engineering. This is a bad analysis, bad policy, and terrible politics’, Krugman (2009).

Research suggests the asymmetric response of increasing liquidity (money supply), to offset the correction of asset price excess, serves to encourage financial institution risk taking. As seen in the repercussion of the 2008 Global Financial Crisis banks becoming overly dependent on central bank funding, often exhibit reduced incentives for business model reform. By maintaining pressure on financial institutions to address their structural faults, there should be no ambiguity about the short-term nature of emergency liquidity. According to Weidmann (2012|A), ‘to overcome the 2008 crisis, short-term measures have to be consistent with long-term stability’.

Conventional economics dictates that aggressive monetary policy runs the risk of stoking inflation. Observing the events which preceded the 2008 Global Financial Crisis these concerns intensified as inflation reached alarmingly high levels in mid-2008.



Fortunately this appears merely a reflection of a surge in the price of oil and other commodities which soon after reversed. Prudent monetary policy and fiscal alignment remains essential to the alleviation of upside risks to inflation. Unstable inflation as a result of excessive money supply (liquidity) creates uncertainties that inhibit economic decision making and thus investment, which ultimately encourages social dissatisfaction. The excessive erosion of purchasing power of nominal income serves to negatively impact citizen's general standard of living, and further stands to dilute citizens' sustainability in retirement (adversely affecting the real value of pension income). Inflation exceeding a certain level will surely be accompanied by calls for stabilization. This may entail large costs in lost output, as the priority of economic policy shifts towards an inflation appeasing effort.

IV. Deficit Financing

With the exception of a few limited scenarios, a country which incurs a current account deficit will simultaneously experience an offsetting capital account surplus. Assuming a static official settlements account, the linear function of the current and capital account will equal zero.

According to Balance-of-payments accounting this relationship can be depicted by the following equation:

$$\text{current account} + \text{capital account} + \text{official settlements account} = 0$$

Faced with the necessity of funding a current account deficit (through the capital account) three options are available to a government:

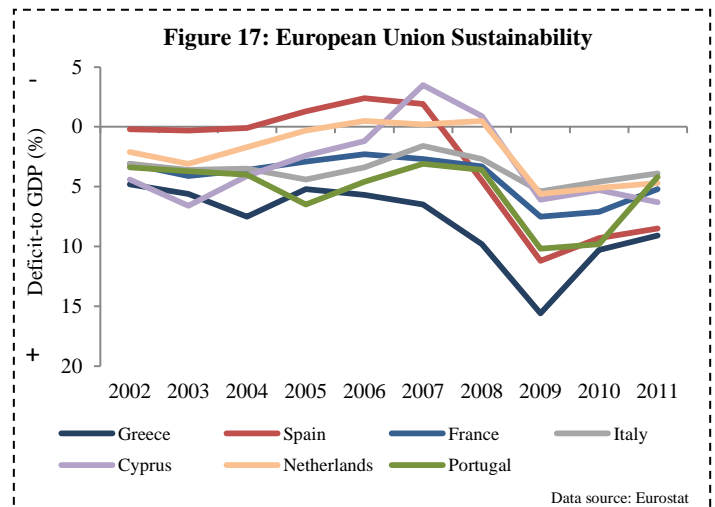
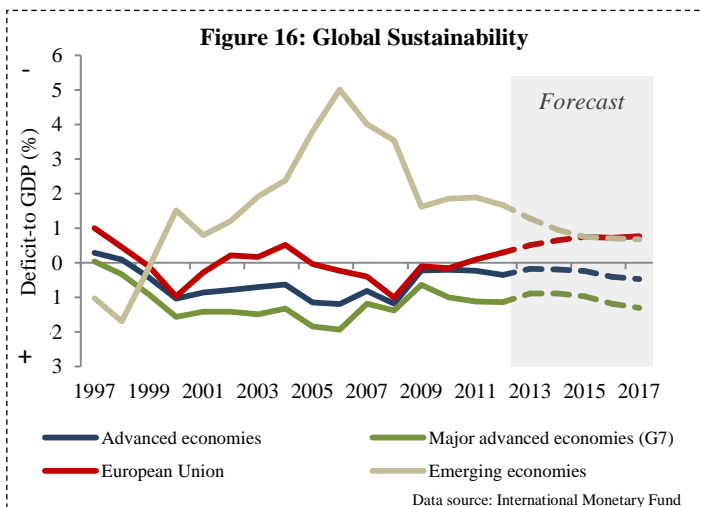
- i. Foreign and domestic borrowing
- ii. Debt repudiation (default)
- iii. Monetization

Upon first observation, the possibility of foreign borrowing to fund a current account deficit appears extremely convenient. Not only does a country benefit from the funding of its current account deficit, but capital inflows from foreign investment serve to suppress domestic interest rates (long-term interest rates/bond yields). The logical question then becomes: how is this practise sustainable? Theoretically this practice is viable; however there are definite limitations to this form of deficit funding mechanism. Langdana (2002) describes a sustainable bond-financed deficit as one which is capable of being rolled over indefinitely. Under this explanation when government bonds mature, new bonds are simply issued to refinance existing debts. So long as the inflationary adjusted yield of these bonds is less than the growth rate of the economy, the deficit is theoretically sustainable.

The inferences of limitations now become apparent, when the current account deficit (assuming it is government budget deficit driven) is observed as exceeding investors demand for government debt, the deficit becomes unsustainable. Causes for the diminishing investor demand may be numerous, including rampant inflation, economic crisis, a lack of faith in government, etc. Current observations of Greece’s economic woes provide a meaningful example of investors diminishing desire to hold Greek sovereign debt, primarily as a result of a lack of faith in the Greek government as well as repercussions of the 2008 Global Financial Crisis. Beneath this undesirable dynamic a country experiencing an unfunded current account deficit may (where possible) find it necessary to embark on the practise of monetisation. Intuitively the interest on government debt at this point will likely exceed the growth rate of the country’s economy. In the event where monetization is not possible, such as within the European Union, alternative measures may include various degrees of austerity (reduced government spending and increased burden of taxation).

Under monetization central banks increase the supply of money and intensify purchases of outstanding government debt, this is termed the monetizing of government deficit. Whilst the attractiveness of this practice is apparent, inflation and hyperinflation bear testament to the limitations of rampant monetization. According to Langdana (2002) a loose rule for G7 economies is that sustainability implies a budget deficit-to-GDP ratio of no greater than 5%. Thus ensuring that deficits are funded by economic growth rather than monetization. Perhaps even more stringent is the criterion of the 1991 Maastricht Treaty which defined the qualifying criteria for admission into the European Monetary Union. Under this accord countries applying for admission were required to observe a budget deficit-to-GDP ratio of no greater than 3% (and a public debt cap limited to 60%).

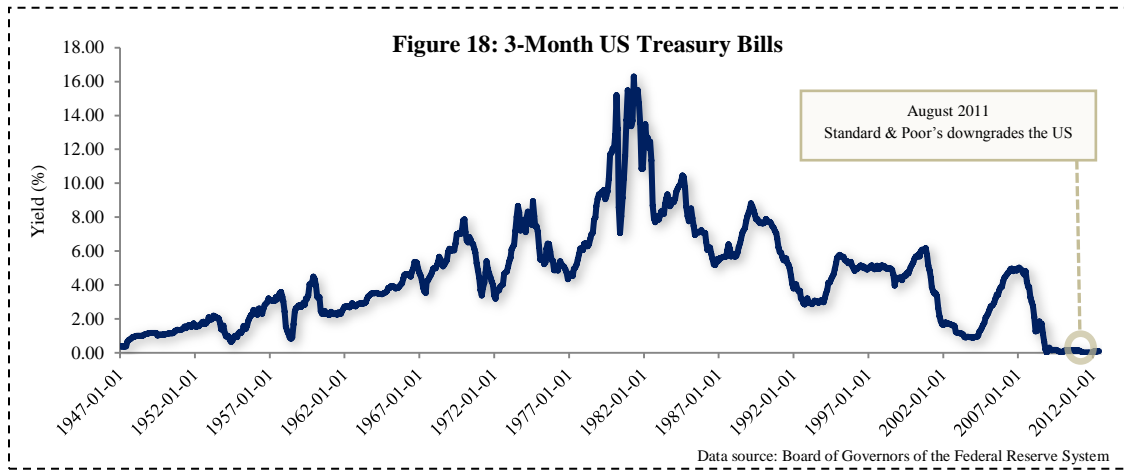
Given the events which followed the 2008 Global Financial Crisis these benchmarks appear to have been largely neglected, especially given our new-found knowledge of the various fiscal fractures amongst European Monetary Union members. Figure 16 depicts the broad based (with the exception of emerging economies) increase in global debt-to-GDP following the 2008 Global Financial Crisis, however these regionally aggregated totals provide little insight into the immense challenges faced particularly by several sub-set members of the European Union. Scrutiny of the sustainability of the European Monetary Union soon becomes apparent by isolating troubled members debt-to-GDP levels (see figure 17). The combined average debt-to-GDP level for these seven troubled European states in 2009 was an alarming 8.8%, nearly three times the accepted maximum for admission into the European Monetary Union.



Perhaps even more distressing than these European Union member's escalating debt-to-GDP levels, is their inability to monetise government debt to alleviate short-term economic pressures. European Union members are characterised in part by a common currency, the Euro, which exists under the restrained mandate of the European Central Bank, annulling any possibility of monetizing debt on an individual country basis. As an observed repercussion to the 2008 Global Financial Crisis these severely indebted countries have little choice but to commit to measures of austerity. Whilst gradually introduced austerity measures are imperative for most countries experiencing unsustainable account deficits, the timing of these judicious efforts should be coordinated with the recommencing of a robust economic growth trend. Attempts to reign in government spending during period of economic distress will do little other than to sabotage already fragile recovery efforts (the debt overhang effect).

European Union construction appears to have succeeded admirably in integrating monetary policy by assimilating differentiated monetary practices towards the shared vision of a cohesive European Union, and common currency. As revealed by the most recent euro-zone crisis however, fiscal actions are so closely aligned with monetary implications that problems affecting the one will undeniably be transmitted promptly to the other. Intentional monetary parallels have nevertheless been eclipsed by the apparent absence of fiscal coordination (failure of member countries to abide by the terms of the Stability and Growth Pact), a defect which now threatens the fate of a united Europe.

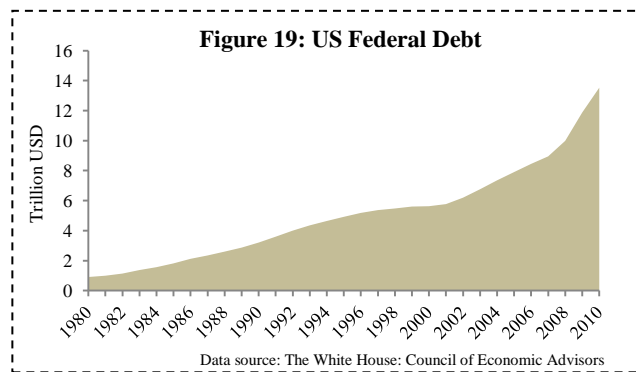
Debts of emerging market economies have in contrast traditionally enjoyed sustainable demand from investors despite higher budget deficit-to-GDP ratios. With global bond markets having recently endured the severe stresses stemming from the 2008 Global Financial Crisis, financial theorists now have practical evidence refuting their antiquated believe that demand for sovereign debt is privy only to low deficit-to-GDP regions. America in 2012 was noted as having borrowed from bond markets at a cheaper rate than at any time in the history of the republic, Economist Newspaper Limited (2012|A). Investor's evident credibility concerns following the 2008 Global Financial Crisis appear to have motivated an investment temperament which prioritises the 'return of capital, not necessarily the return on capital'. The overwhelming desire of investors for safety tends to have inundated their concerns over the long-term health of the US economy. The US therefore in many ways has become the beneficiary of disastrous global economic conditions, possessing the unique ability to purchase real goods and services from abroad in exchange for extremely low yielding debt obligations. Boasting the desirable quality of being the most liquid asset in the world, US Treasury bills (as well as bonds) have exhibited an unrivalled acceptance amid dire economic news. Remarkably, this is true notwithstanding the bad news related to US government finances. According to an article featured in The Economist, US Treasury bond yields were witnessed to have declined (rather than increased) following the once inconceivable downgrading of the US credit rating by Standard & Poor's in August 2011, Economist Newspaper Limited (2012|A).



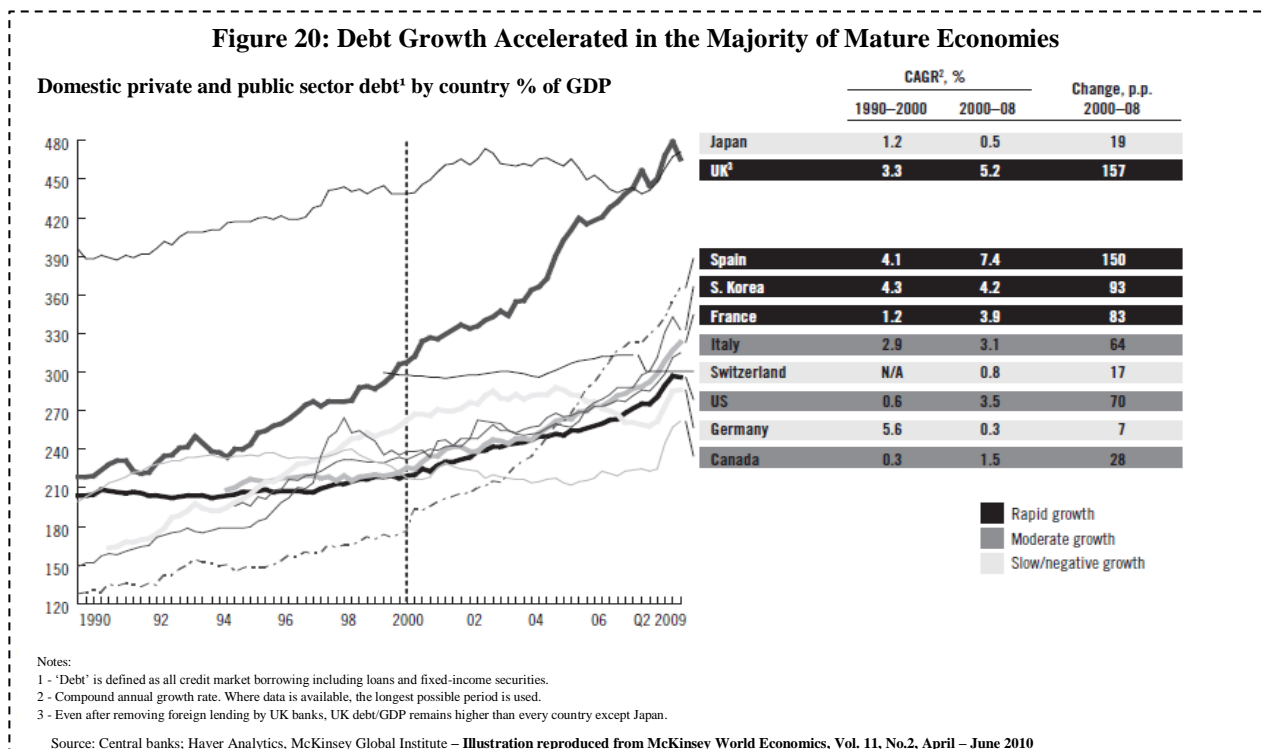
v. Deleveraging

Following the 2008 Global Financial Crisis many countries have been left with an enormous burden of debt, threatening the already strained prospect of a sustainable economic recovery.

After having provided a comprehensive account of the actions undertaken by global central banks to alleviate both financial and economic pressures from the beginning of the 2008 Global Financial Crisis to the time of writing, mounting pressures to deleverage government balance sheets should be intuitive. The neighbouring illustration demonstrates the perpetual US Federal debt accumulation witnessed over the past 30 years.



After having come to terms with the initial shocks of the economic crisis, the pertinent question then becomes one of the optimal deleveraging of government and central banks' balance sheets. In addressing this widespread challenge it is preferential to assess the sustainability of leverage and the process of deleveraging beyond the implications derived simply by the, at times misleading, debt-to-GDP ratios of an economy. These debt-to-GDP ratios - when considered in isolation - fail to concede contrasting vulnerabilities of fundamentally different regions. Accepting the strategic contribution that bank lending to residential mortgages played in setting the scene for the 2008 Global Financial Crisis, economists may ask questions of region-specific levels of debt in this sector prior to the recent economic fallout. Work by Lund and Roxburgh (2010) reveals that by 2007 UK bank lending for residential mortgages was equivalent to 81% of the country's annual GDP, with the US similarly exposed at 73%. Figure 20 below assists in accentuating the extensive increases in both private and public domestic debt over the past twenty years.



A study of the above illustration, whilst admittedly limited to only a few developed economies, provides little perspective on the intrinsic dangers of escalating levels of debt within an economy. Empirical observations dating back to the Second World War do however produce evidence of lengthy and often painful periods of deleveraging following economic crises. In the context of current global governments' debt levels the daunting challenge of deleveraging, as well as the mechanisms available to do so, remain authoritative in acquiring a sustainable economic solution. Swelling real estate prices along with increasing equity markets (which are regularly marked-to-market) assisted in concealing steep upsurges in leverage, as household debt-to-assets ratios remained stable in the years preceding the crisis, Lund and Roxburgh (2010). Relatively low levels of interest (bank lending rates) in developed markets further contributed to the masking of increasing unsustainable levels of household debt. The trend evident in the illustration above does well to summarise an imperative point; advanced economies have demonstrated a clear tendency to increasing leverage relative to GDP over the past decade.

In contrast to households, government debt relative to GDP remained stable in the decade preceding the 2008 Global Financial Crisis. In the US, for example, the ratio of government debt to GDP was witnessed to have declined by an annual rate of roughly 2%, this despite having subsidised wars in both Iraq and Afghanistan. Similar trends were observed in Italy, Spain, and Switzerland, however the ratio of government debt to GDP rose slightly in Germany, Canada, France, and the UK, Lund and Roxburgh (2010).

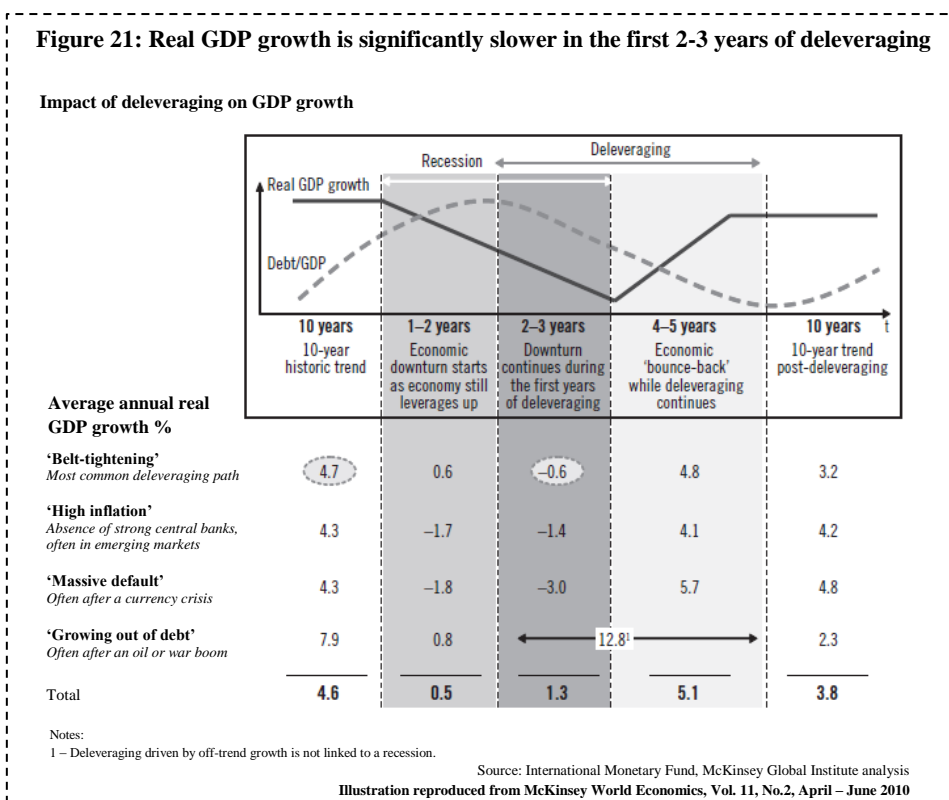
This disciplined government budget was later to prove a defining factor in recessionary response flexibility following the outbreak of the impending crisis. Unprecedented action following the 2008 Global Financial Crisis has seen a dramatic transferring of this debt onto the balance sheets of governments and central banks around the globe.

Economic consequences of deleveraging

Following the outbreak of the 2008 Global Financial Crisis, government borrowing surged in many countries to finance unprecedented recession-related stimulus programmes and financial sector bailouts. Whilst a return to nominal growth in GDP in many developed regions is currently underway, evidence of the sustainability of this trend remains questionable. Stubborn aftershocks following the 2008 Global Financial Crisis appear persistent at the time of writing; leaving calls for government debt reduction disregarded as premature.

Returning to the comprehensive work of Lund and Roxburgh (2010), abundant empirical evidence suggests that the deleveraging of government balance sheets is imminent. Defining significant deleveraging as where debt-to-GDP declines for at least three consecutive years and falls by 10% or more, Lund and Roxburgh (2010) identify 45 such episodes since the 1930s through to June 2010. Having cross-referenced these periods of deleveraging with the documented work of Reinhart and Rogoff (2009), every significant financial crisis during the period under study has been followed by a period of deleveraging (with the exception of Japan). The undeniable significance of this observation allows us to analyse the prospects of an impending deleveraging with a great degree of empirical support.

According to research conducted by Lund and Roxburgh (2010), empirical post-crisis evidence suggests that the process of deleveraging tends to last an average of six to seven years and produce a debt-to-GDP median reduction of roughly 25%. Fascinatingly, they found that deleveraging typically commenced two years after the inception of the financial crisis and economic recession. Lund and Roxburgh (2010) noted that in the vast majority of cases GDP growth declined in the early years of the deleveraging, only to rebound in the next four to five years while deleveraging persevered. Early evidence suggests the post 2008 Global Financial Crisis deleveraging will be unique in this regard, given the vast scale of deleveraging which is required.

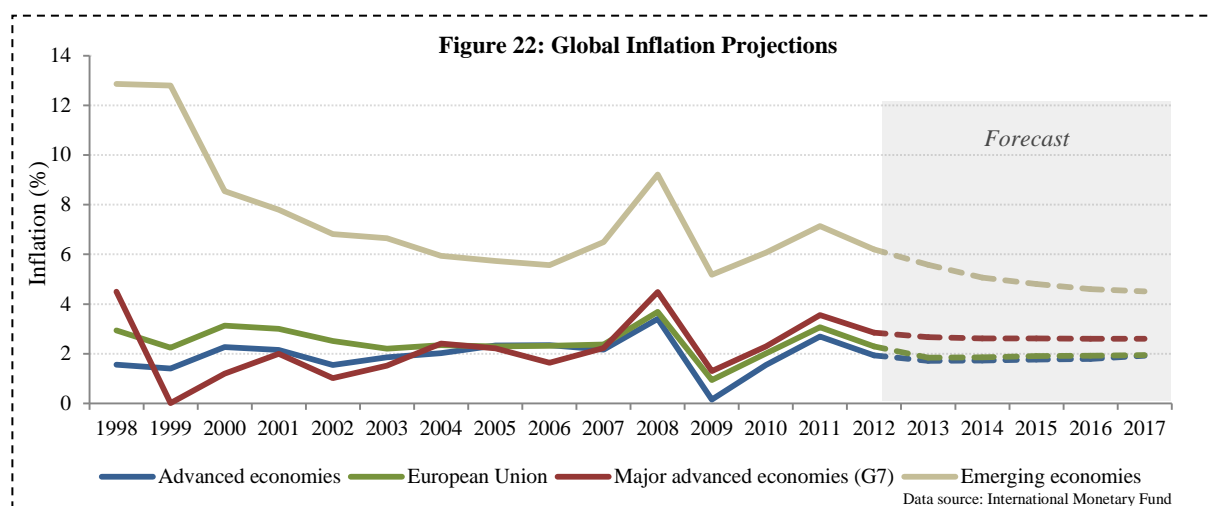


Whilst the study above provides a valuable framework within which to contemplate the implications of government deleveraging following the initial outbreak of the 2008 Global Financial Crisis, the differing rudiments of modern day influences need to be taken into consideration. The majority of crises witnessed in Lund and Roxburgh's (2010) empirical study were incidents isolated by geographical region, therefore reliant on the supposition that countries could deleverage whilst simultaneously boosting exports. In the case of the current crisis few countries have been spared from the extreme repercussions. Given the increasing degree of global integration witnessed over the past decade, the 2008 Global Financial Crisis is distinctive in its ability to transcend borders. Adding to the challenge of a sustainable recovery is the fact that contagion has not been limited to smaller global economies, but rather has been characterised by an indiscriminate transmission to large and smaller economies alike.

Post-2008 Global Financial Crisis developments in advanced economies are of particular concern, as several governments (particularly in Europe) are experiencing ever increasing political pressure for a rapid deleveraging of government debt. Given the anaemic growth (at best) in these regions economic recoveries have reached the point of being derailed. Whilst the task of deleveraging governments' balance sheets remains irrefutable, Krugman and Layard (2012) accuse advocates of hasty deleveraging policies as having misconstrued the purpose of fiscal policy during depressed economic conditions. Justly argued is that fiscal policy should play a stabilising role until such time as economic normality resumes, and should not 'reinforce the dampening effects of private-sector spending cuts'.

Whilst the future of an integrated Europe remains uncertain, palatable arguments for a sustainable recovery appear to advocate governments refraining from deleveraging until the recovery is confirmed to have taken hold. This view is in line with traditional Keynesian advocates. Despite the maintenance of higher government debt-to-GDP ratios amplifying a countries vulnerability to further economic shocks (for example higher interest rates), the prospect of impulsive deleverage poses even greater risks. A number of empirical examples, from the US in 1938 to Japan in 1997, confirm the perils of a premature withdrawal of fiscal and monetary support from a fragile economy. However, given the alternate prospect of compounding already excessive government levels of debt leaves little political flexibility in many euro-zone member countries other than government spending discipline.

Bernanke (2009|A) argues against the necessity of hastily deleveraging the Federal Reserve's balance sheet. Theoretically many acknowledge that by expanding the Federal Reserve's balance sheet (i.e. Quantitative Easing) one effectively undertakes the practice of printing money, and thus provoking inflation. Bernanke point out that much of the Federal Reserve's lending activities to financial institutions can be accounted for by a substantial increase in the excess reserves held by banks. Given the noted preference of banks in holding these bulk reserves idle (in most cases on deposit with the Federal Reserve), the rate of broader monetary aggregate growth is diluted. The risk of rampant inflation is further relaxed as weak global economic activity and the suppression of commodity prices remains persistent in the wake of the 2008 Global Financial Crisis.



Another theoretical interpretation which may warrant reinvestigation is whether a rise in inflation will in fact derail an economic recovery at all. Shifting away from conventional inflationary fears leads us to question whether a temporarily higher-than-normal level of inflation could perhaps assist in facilitating wage and price adjustments as well as erode the real value of household debt? Further when nominal interest rates have reached zero, a higher inflation rate corresponds directly to a lower (and even further stimulating) real interest rate. In stark contrast to this reasoning, the Deutsche Bundesbank argues against higher inflation proving beneficial, and instead advocating a strong preference for stability-orientated monetary policy, Weidmann (2012|B).

Faced with widespread taxpayer apprehension of the measures executed in response to the 2008 Global Financial Crisis, Bernanke (2009|B) adamantly defends the actions undertaken by the Federal Reserve as being in the best interests of all stakeholders. The transactions undertaken by the Federal Reserve to prevent the systematically destabilizing failures of Bear Stearns and AIG admittedly carry more risk than the Federal Reserve's traditional activities. However it is anticipated by the Federal Reserve that upon the sale of these assets taxpayers returns will be maximised, and any credit extended will be recovered. Bernanke goes on to emphasise that the assets under scrutiny are interest bearing and thus the implied increase in interest can be viewed as beneficial to the Federal budget. According to Bernanke 'from the point of view of the Federal government, the Federal Reserve's activities do not imply greater expenditure or indebtedness'. Whilst factually correct, the intention distorts policymaker credibility.

Whilst the innate characteristics of the 2008 Global Financial Crisis may have alleviated the need for a rapid deleveraging of the Federal Reserve balance sheet, at some point the numerous and unnatural (emergency) lending programmes will have to be unwound. Expectations of the events that will eventually trigger this policy transformation are likely to be evidence of a sustainable and robust recovery in both credit markets and the economy at large, with actions undertaken by the Federal Reserve to unwind its balance sheet closely resembling monetary and fiscal tightening. Bernanke (2009|A) describes the process under which normality will be restored at the Federal Reserve, upon which time it will resume its traditional considerations in making monetary policy, identifying a target for the Federal funds rate. Accordingly it is expected that a significant shrinking of the Federal Reserve's balance sheet can be accomplished rapidly as it commences the scaling back of assets which it holds. Given the short-term nature of many of these assets, for instance loans to financial institutions, currency swaps, and purchases of commercial paper, the Federal Reserve will simply be able to allow these asset to 'run off' their balance sheet as they mature. Longer term investments are expected to be disposed of gradually as confirmation of the economic recovery and renewed investor

demand takes hold. The vast majority of mortgage backed securities acquired by the Federal Reserve under the third round of Quantitative Easing are likely to constitute longer term investments.

Upon reestablishment of financial normality central banks will likely find favour in their lacklustre duty of setting reserve requirements (in conjunction with the setting the Federal funds rate) given the on-going pursuit of economic stability. Reserve requirements as well as the quality of assets acceptable to be used as reserves, have an augmentative effect on the level of liquidity available in an economy.

Regardless of which points find favour with the reader one thing appears undeniable, deleveraging once commenced will likely dampen GDP growth, decelerating an already uninspiring recovery. According to a study conducted by the International Monetary Fund where 173 cases of government budget cuts were analysed, the consistent result was an economic contraction, Krugman and Layard (2012). This result comes as no surprise when observing copious examples of contracting European countries following crisis-induced austerity measures. It is therefore vital that policies remain aligned and avoid the risk of a tightened economic cycle. Policymakers if to be successful will find it imperative to exploit policy synergies (allied monetary and fiscal policies) in returning to growth, and face grave challenges in placing economic priorities above politics.

VI. Geographic Considerations

Economic fundamentals differ vastly by geographic region; failure to acknowledge these contrasts renders our perception of global economic dynamics deficient. Differences vary immensely dependent not only on geographic location, but also on less tangible considerations such as exchange controls, perceived credibility amongst investors, the political environment, professed risk, and the sophistication of a country's financial system to name but a few. Whilst the discretion of each of these differences is redundant for the purposes of this research, there is merit in accentuating a few differences so far as their potential influence on asset bubbles.

Asymmetric Information

A noteworthy consideration when investing in emerging markets is the disreputable lack of uniformity of information. Weaker market efficiency even in the absence of internal optimism may be capable of stimulating asset bubbles. Elaborating on this concept, let us assume market participants are in agreement that asset prices are far in excess of that implied by intrinsic justification. Under such conditions all market participants will anticipate a future price decline; however each participant is unaware of whether other market participants have identified the same outcome. Market participants continue to partake in the generous returns exacerbating the price bubble. Intuitively this unsustainable approach will conclude with one inauspicious market participant being the owner of the asset when the bubble bursts, Camerer (1989). Assuming a limited number of market participants willing to participate in this practice, the 'last person in line' will decline to purchase the distended asset, forcing the holder of the asset to endure significant losses.

Central Bank Transparency

The extent of central bank transparency (and to similar measure credibility) may prove detrimental to market participants managing investment strategies 'vigilant' of asset price bubbles. Uncertainty surrounding central bank policies on credit expansion and liquidity, as well as a lack of independence

may lead to substantial deviations in asset prices from their fundamental values. These adverse characteristics, often synonymous with emerging markets have empirically been concluded as the root cause of severe financial crises.

Population Growth

A consideration perhaps somewhat peculiar upon first glance; however a country's population growth is irrefutably interrelated with a country's fiscal rigidity. Consider two countries both characterised by an alarming obligation of debt. Further let us assume that while both economies are similar in every respect with one prominent contrast; the one country possesses on average a young population with high fertility rates, whilst the second an older average population with less vigorous levels of fertility. Whilst perhaps overly simplified, the economic consequence is ostensible, the higher the projected population growth the greater the number of future tax payers (*ceteris paribus*). A favourite amongst emerging market prejudiced investment strategists is the argument of the generational effect. Theoretically under the generational effect competitive countries characterised by the prospect of a rapidly expanding workforce (admirable population growth) are capable of maintaining much higher levels of government debt (as opposed to their stagnant peers) due to their superior future taxation revenues. There is certainly a necessity for further future studies based on empirical observations of emerging Asian economies during the late 1990s which are likely to add credibility to this theory.

A less controversial secondary effect of excessive population growth is the strain placed on resource accessibility. Thriving future populations will undoubtedly be accompanied by increased demand for agriculture, energy, metals, and other minerals. Investment strategists have been quick to note the imminent shifting of capital to resource blessed regions. With Africa a unique natural resource net producer already having been labelled as a 'new frontier' for investors. Whether emerging markets such as Africa can transform these capital inflows into longer term wealth remains a controversial debate. This debate to a large extent highlights the economic deficiencies which often characterised emerging markets, for example; corruption, suboptimal allocation of resources, inadequate infrastructure, scarcity of skilled labour, and capital markets which are often difficult to access.

With a global population now in excess of seven billion and growing by approximately 76 million people per year, a discussion of geographic dynamics would be incomplete without the consideration of the economic consequences of this population trajectory. Adopting a scientific approach (and intentionally avoiding apocalyptic predictions) it took human history from first record up until the 20th century to reach a population of two billion; however it is now projected that the achievement of the next two billion will take little more than the next forty years, Fortune Magazine (2011).

The relevance of emerging markets in this observation relates to the phenomena of regionally segregated fertility levels. According to Cookson (2011), emerging markets such as Africa and the Middle East demonstrate fertility levels far in excess of their developed market counterparts. According to the UN population division this trend will likely persist as low-fertility countries which at present account for roughly 42% of the world population are failing to be succeeded by children who will survive to child bearing age. In contrast high fertility countries are on average producing in excess of two children per household, with a particular concentration in Africa. There appears to be a strong correlation between high fertility rates and poverty (attributable in large to a lack of female education), Cookson (2011).

The above findings are echoed by recent research conducted by the Economist Newspaper Limited (2012|B). This research finds a clear correlation between post crisis European countries and the decline in family formation (and thus reproduction). Another identified trend focuses on the postponement of childbirth as a result of external influences, known by demographers as the “tempo” effect. According to this study in 1970 the age at which most Western European woman desired to have their first child was between 22 and 25. In 2008 it was between 27 and 29. If this observation is considered to hold merit it would appear that European fertility is far more susceptible to government policy than their emerging neighbours. In 2006 woman surveyed in Niger were confirmed to desire an average of 9.1 children each, undeterred by external influences.

Two actualities remain irrefutable, firstly emerging markets population growth will continue to progress in excess of their developed peers, and with an ever increasing global population demand for raw-materials can be anticipated to follow suit. Whilst admittedly ignorant to global sustainability projections, emerging markets if able to advance the level of their populations’ education, stand to benefit the most from global rebalancing and monetary policy flexibility.

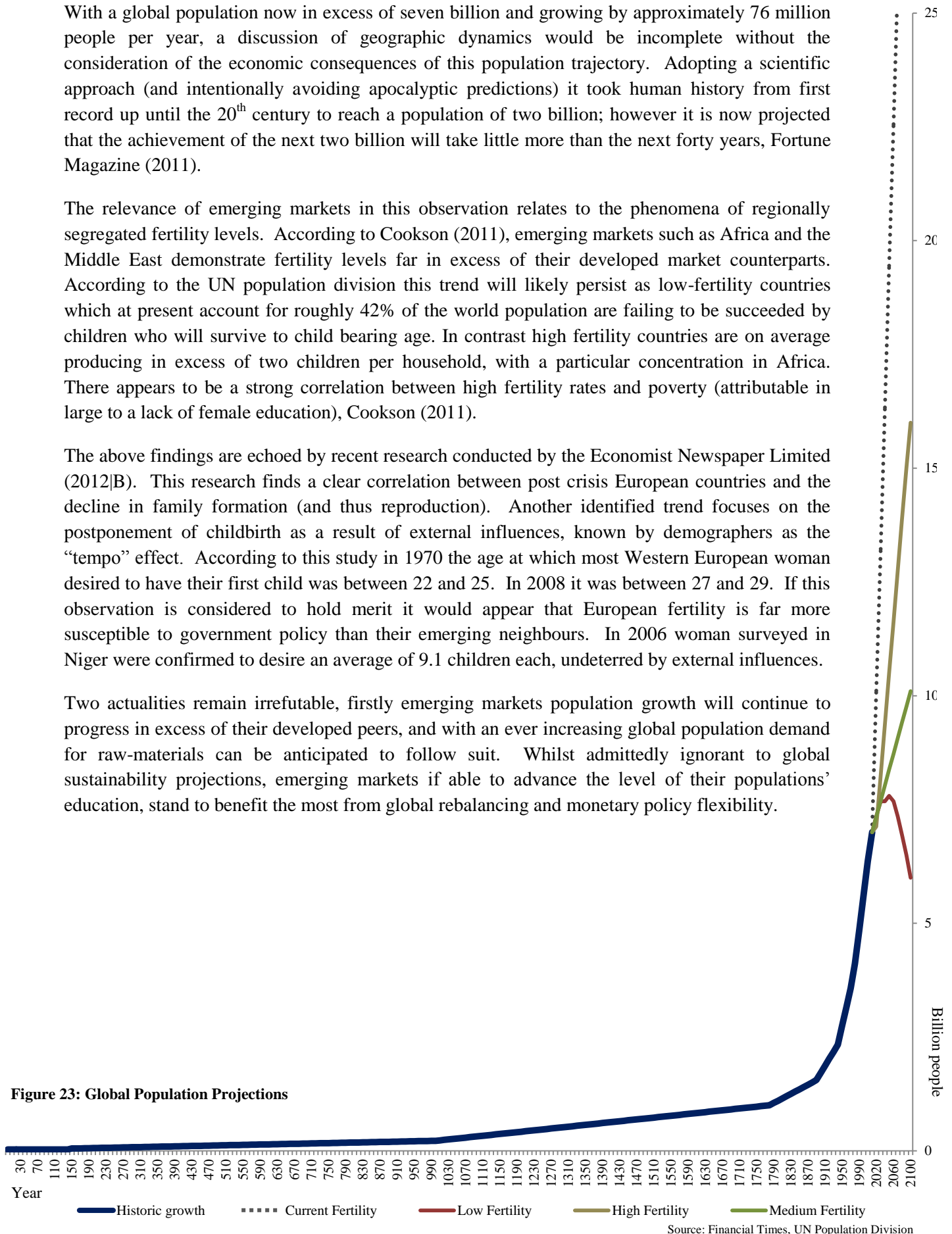
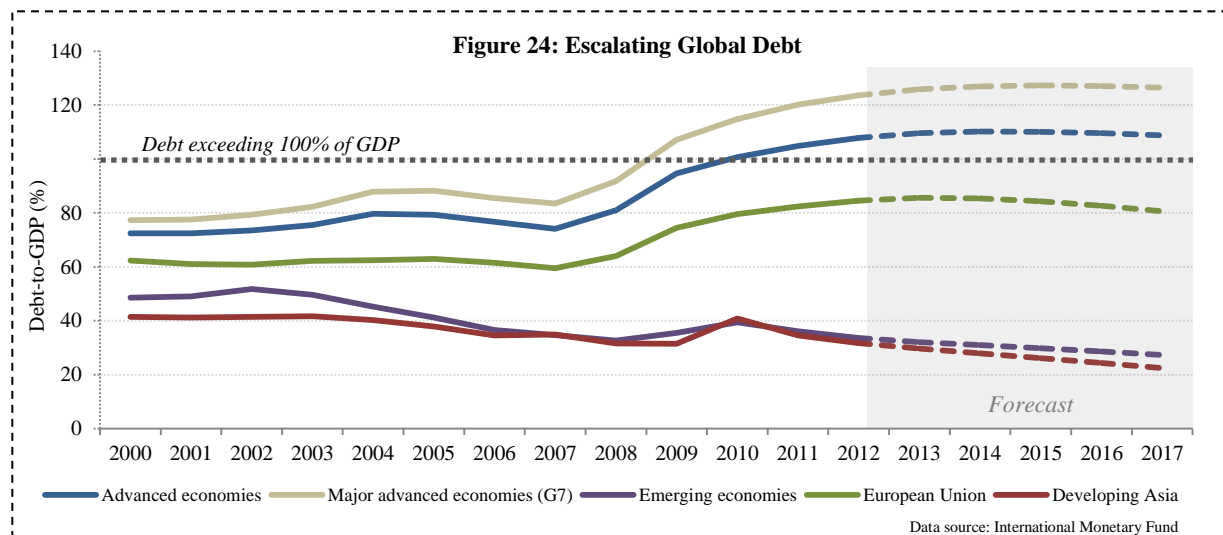


Figure 23: Global Population Projections

Even under the most optimistic projections the 2008 Global Financial Crisis is sure to leave a costly legacy. As depicted in figure 24 below average debt-to-GDP ratios remains a vital area of concern. In the absence of growth it would appear reasonable to anticipate these ratios continue to exacerbate. Perhaps this provides an opaque depiction of the comparative fate of developed economies to their growing emerging peers.



These immense levels of debt will unavoidably call for vast deviation between emerging and advanced economies in interest payments and tax revenue collection, with signs of such burdens already taking their toll on several European economies. Perhaps the largest challenge once global output levels have stabilised, will be how to return government debt back to acceptable levels. This is unlikely to be a painless and politically unproblematic progression.

Global Capital Flows

In the context of this research, of particular concern is the shifting of short-term global flows of funds witnessed during periods of significant financial distress, and perhaps most importantly the ability of these flows to exacerbate the financial pressure exerted on an emerging market economy.

Typically a hot capital flow has been designated as capital with origin in an advanced economy, which has been invested in an emerging economy with the primary motive of speculation (portfolio flows). Unfortunately given the often short-term nature of these investment flows, hot capital can at times most accurately be classified as a macroeconomic liability. Whilst many would argue that given periods of current account deficits, a country should welcome this much needed capital inflow, it rarely arrives on the shores of economies upon their instruction. Consider the events which unfolded during the 1990s in Southern Asia, all recipients of these hot capital flows demonstrated current account surpluses (with the exception of Indonesia). Not only did this region enjoy the absence of a deficit to finance, the region further boasted a low unemployment rate and an oversupply of manufacturing goods and capital investments (automobiles, electronics, etc).

Despite the apparent self-sustaining characteristics in Southern Asia during the 1990s, market participants looking to participate in the inspiring growth in the region injected significant speculative investment into the region. Financial markets in the region began to overheat with prices of equities and real-estate climbing to astronomical levels. In the midst of an evident bubble inflating in the

region, Western Europe began to show promising signs conducive for investment. The sudden and fatal exodus of capital towards restored European investment prospects left Southern Asian economies financially traumatised.

The abrupt flight of hot capital causes long-term interest rates to increase sharply, resulting in borrowing costs becoming prohibitive. Furthermore, as foreign speculators raced to discharge speculative investments the domestic currencies collapsed. Imports became unaffordable as the currency got progressively weaker, fuelling increases in inflation. Finally the economic symptoms culminated with a terminal weakening of confidence, Langdana (2002). Worthy of mention is the remarkably prudent monetary policy of Singapore during this period, which contributed largely to the avoidance of the Singaporean currency meltdown. Singaporean policymakers pegged their domestic dollar to a basket of currencies (with the US dollar a major component) as a defensive precaution during this period. Under this currency structure the Singaporean economy demonstrated admirable resilience to temperamental outflows.

Emerging markets quick to learn from the disruptions of Southern Asia designed mechanisms to discourage such hot capital inflows and the destabilising volatility which accompanies it. China for example has restricted the purchasing of its A-type equities by foreign investors. Whilst the intolerance of foreign speculative investment in China is evident, long-term inflows aimed at capital and infrastructure spending continue to be encouraged.

Superior growth prospects in many emerging economies along with the low interest rate environments in developed regions appear to be a primary contributor to the resurgence of capital flows to emerging economies. It is this very portfolio flow which warrants close scrutiny given the ever present risk of inflationary pressures and asset bubbles.

Chapter Three – Insights of Research

The intention of this research is to elaborate on the economic intuition behind technical theory and elusive empirical observations. The objectives can be listed as follows:

- i) To formulate a conceptual framework to assist in the identification of asset price bubbles.
- ii) Conduct a post-crisis economic assessment of Sub-Saharan Africa, along with a multiple regression gross domestic product forecast for the region.
- iii) Hypothesise a generic stress test methodology which can be utilised to ascertain individual country risk.

Purpose of Study

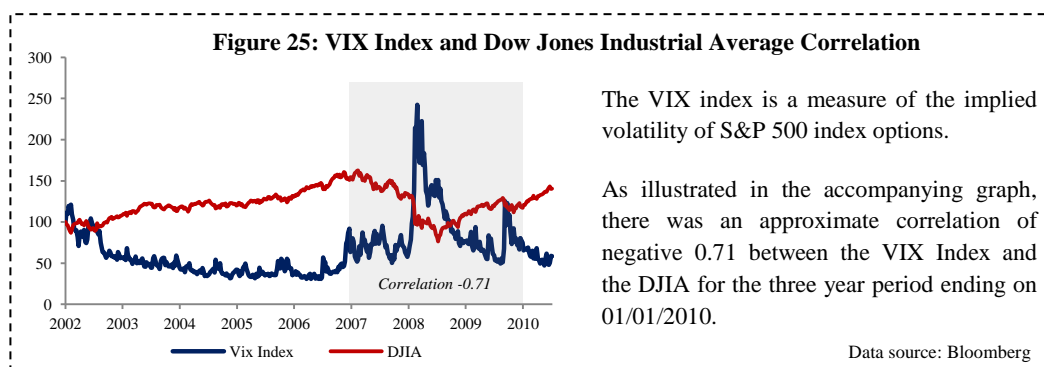
To date there have been a number of studies which are complementary to that contained in this research. However there are three main theoretical innovations which have been explored in this paper, namely:

I. Identification of Asset Bubbles

The theory of asset bubbles and the prerequisite conditions under which such bubbles might occur appear at present fairly conclusive. However this is less true for empirical tests which continue to produce discrepancies when verified under practical experiences. This research attempts to explore means of identifying prospective asset bubbles.

Equity Correlation

With equity prices becoming increasingly susceptible to the ebb and flow of market participants' expectations of the economic environment, one can't help but wonder why so little research has been conducted regarding whether market fear can be gauged by the observed correlation among equities.



Whilst the concept of investor herding during times of both extreme market fear and abundant exuberance is broadly accepted, the ability to credibly gauge the effect of irrational market sentiment on price behaviour would provide a superior understanding of how to gauge market excess. Equities in theory should experience random price fluctuations based on ever changing company fundamentals (Random Walk Hypothesis). Practically however, we know this assumption to fail dramatically during periods of market crises. Massive investor deleveraging motivated by panic selling followed by alternating waves of purchase by investors anticipating a trough has been reached, results in heightened volatility and high levels of correlation between individual equities. According to Demos (2011) the correlation between the largest 250 equities in the S&P 500 during the market correction of 2011 demonstrated similar levels of correlation as those observed in the equity market crash of 1987. In 1987 correlation on the S&P 500 (largest 250 companies) was seen to have peaked at 88 per cent. The historical average is roughly 30 per cent. This raises questions of the ability of equity correlation to predict investor herding behaviour at the expense of overlooking equity fundamentals. It stands oddly coincidental that the build-up finally culminated on the notorious black Monday of 1987 where a 22 per cent decline in the Dow Jones Industrial average was observed remains the highest daily correlation on record. Questions must also be asked of whether this explanatory tool is capable of gauging both irrational exuberance as well as apocalyptic fear.

Interestingly Demos (2011) found similar spikes in correlation during the “flash crash” of May 2010 as well as immediately succeeding the Japanese earth quake in 2011, where peaks in correlation demonstrated a reliable proactive indicator of further equity price declines.

There is however one very pertinent explanation for this correlation during the current derivative influenced equity exchanges. According to Demos (2011) many traders, by mandate, are forced to pare back their market positions (long and short) in the event of significant levels of volatility

exceeding their value-at-risk limits. This ultimately results in equity correlation being pushed to even higher levels. Attested by Crotty (2009, p.571) ‘Most prices fall together as investors run for liquidity and safety, and correlations invariably head toward one, as they did in the recent crises’, namely 2001 and 2008.

The bias towards equities as a measure of asset bubble identification has a foundation in the research conducted by Camerer (1989). Broadly considering all asset classes we must acknowledge that the most likely argument against asset bubbles existing is the potential restrictions on the scope of the market. An example of such a restriction could be considered a finite lifetime of T periods for the asset (let us assume a five year US government note). Backward induction dictates that under this restriction price bubbles should theoretically not occur. Suffice to say that upon time period T no logical market participant will pay more than the terminal value of the asset for its ownership. Therefore we can reasonably deduce that any market participant acting under rational expectations will be willing to purchase this asset for more than the discounted terminal value at period T – 1 (or a close approximate amount incorporating for risk differentials). On this basis we can dismiss the likelihood of an asset price bubble based on the restriction of all market participants’ ability to anticipate an ending.

According to Camerer (1989), many empirical studies which have been conducted to provide evidence of the growth of an asset bubble are flawed in construction. The identified problem with many of these studies is the assumption that the money supply is exogenous, i.e. market fundamentals, controlled by government policy, are assumed to be independent of a bubble.

Given the fact that bubbles are likely to cause aberrantly large positive price changes as they inflate (particularly in the final growth stages), followed by extreme negative price changes upon bursting, the distribution of price changes will have negative skewness and large kurtosis if the presence of a bubble is confirmed, Camerer (1989). Following this logic Blanchard and Watson (1982) were able to confirm this pattern for gold prices, and Fama (1976) was able to identify a similar pattern for stock prices. Using stock prices, West (1987) found sturdy evidence of the existence of a bubble that is correlated with dividends. Meese (1986) utilising the same test to foreign exchange rates identified confirmation of bubbles in dollar-mark and dollar-pound exchange rates.

The dotcom bubble witnessed during the turn of the millennium saw the rapid increase of internet company stock prices as investors confused scientific breakthroughs with financial breakthroughs.

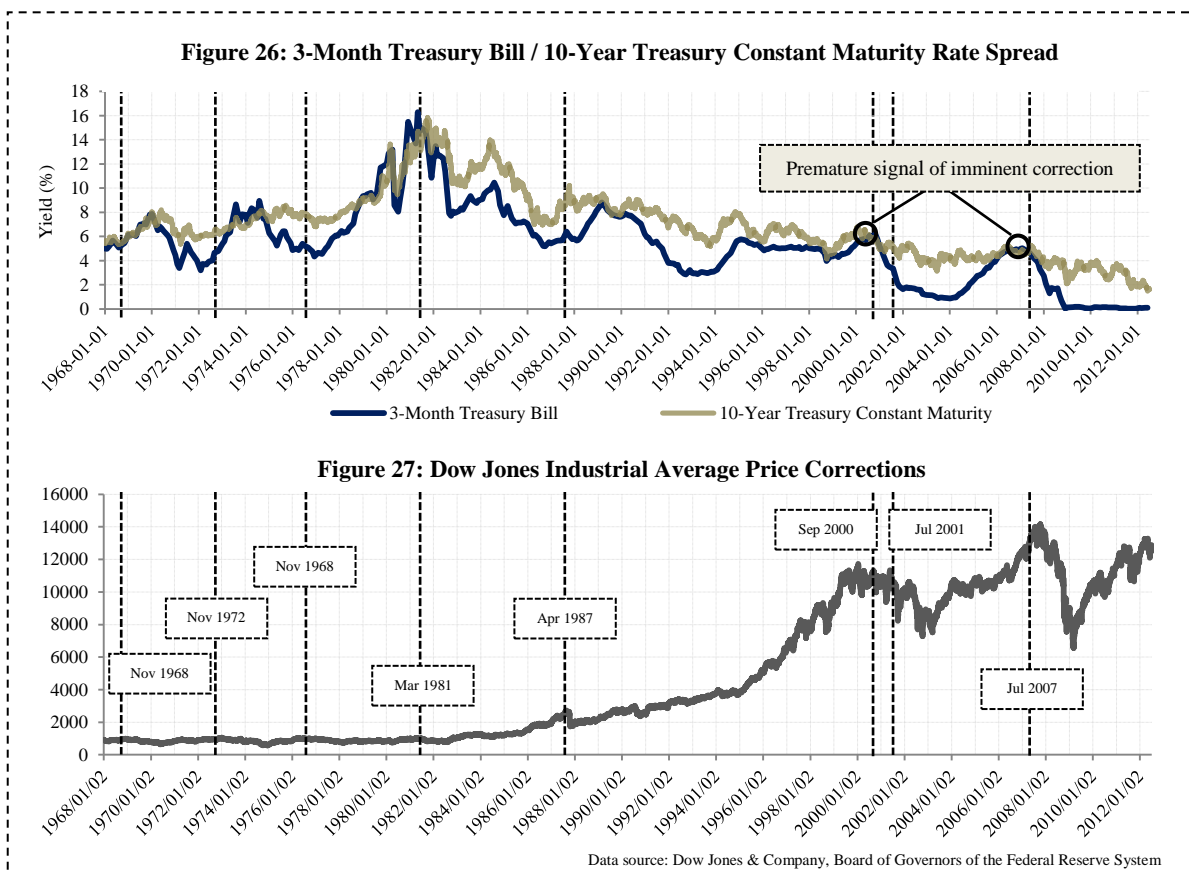
If equity prices are indeed based upon rational cash flow forecasts, price changes should possess a constant conditional mean (implying independence), and prices should conform to a martingale. For example all equity valuations are conducted independently by numerous market participants, thus price movements are derived from independent valuations (and immune to contagious market bias). If however equity price changes are not independent, a bubble like influence lacking fundamental evidence is clearly present, Camerer (1989). An extended and forceful market movement either positive or negative places a severe test on price trend sustainability.

US Treasury Spreads

A simplistic observation made by Graham, Dodd, and Cottle (1962) was that ‘empirical evidence suggests that a drop in stock [current] yields below that of bond [current] yields, caused by rising stock prices has proven a sure indication that the market has entered a dangerously high level’. To the extent of the return on risky assets being less than that of risk-free assets, clearly this serves as

evidence market irregularity. Whilst this insight perhaps held merit during earlier decades modern evidence fails to confirm the explanatory power of this methodology in recent decades to any acceptable degree of significance.

Common to Graham’s method - in terms of simplicity - there appears to be a renewed binary type of observation, which may provide a signal of market participant’s behaviour, namely the spread between the 3-month current US Treasury Bill yields and the 10-year current Treasury Constant Maturity Rate. Intimate inspection of the deviations between these two instruments provides a surprising result when referencing the observations to the returns of the Dow Jones Industrial Average Index. Whilst evident inaccuracies are present (fails as an exact measure), one cannot dismiss the apparent predictive qualities of this unconventional theoretical screen. As evidenced in the graphs below, it appears that confirmation that a Treasury Bill current yield exceeding current yields of the competing Treasury Note (a contradiction to the popular liquidity preference theory) indicates the increased likelihood of stock market excess (perhaps as investors satisfy their growing appetite for equities at the expense of investing in Treasury Notes), and thus an impending price correction. In the context of this research a correction has been defined as an index price decline exceeding not less than 20% over a rolling (moving average) annual period. For the purposes of objectivity should a stock price correction be confirmed, the earliest date of the rolling annual period is termed the initiation of the stock price correction, as illustrated in the graph below.



Visibly evident in the graphical illustration above, recognition of the observed relationship whereby 3-Month Treasury Bills current yields exceed the 10-Year Treasury Constant Maturity Rate would have provided predictive insight into six of the seven crises observed of this period of study. Of particular apprehension is the superior ability to anticipate the two most recent crises, namely the ‘dot

com' crisis of 2001 and the more recent Global Financial Crisis which by this definition commenced as early as 2007. Observing our formerly prudent definition of a price correction, the earliest commencement of the 2001 price correction can be observed as the 13th of July 2001. As illustrated in figure 26 this correction comes several months after the initial 3-month Treasury Bill rate was recorded as having breached the respective 10-Year Treasury Constant Maturity Rate, which took place on the 1st of September 2000. Similarly a breach on the 1st of September 2006 provided a remarkably accurate cautionary to market participants of the heightened risk of a price collapse. By the third quarter of 2007 equity prices collapsed. The challenge of identifying an asset bubble, according to Camerer (1989), can perhaps be circumvented if equity bubbles boast common statistical properties which do not depend on the specification of market fundamentals that underlie an assets' intrinsic value, such as that provided by observing Treasury yield spreads (the difference between 3-month and 10 year Treasuries). Whilst admittedly this observation would gain credibility from further statistical testing, nonetheless this observation may provide a premature substitute for Graham's antiquated screen for assets price irregularity.

II. Post-Recession Recovery Prospects (Sub-Saharan Africa)

In the context of this research practical validity has been enhanced by providing a framework projection of the post 2008 Global Financial Crisis Gross Domestic Product (GDP) expectations for the Sub-Saharan African region. By utilising multiple regression analysis we are not only able to augment our understanding of the post crisis implications in an emerging market context, but further we also provide the insight into the degree of global integration present in the traditionally segmented Sub-Saharan Africa region.

Through multiple regression analysis the projected annual percentage change in GDP for the Sub-Saharan African region has been forecast and presented in figure 28 below. Beginning with this regional forecast one can begin to systematically analyse prospects for regions, culminating with a country specific stress test. Given recent global economic turmoil, the ability to accurately isolate risk on a country specific basis proves market participant with an invaluable intuition for purposes of regional investability.

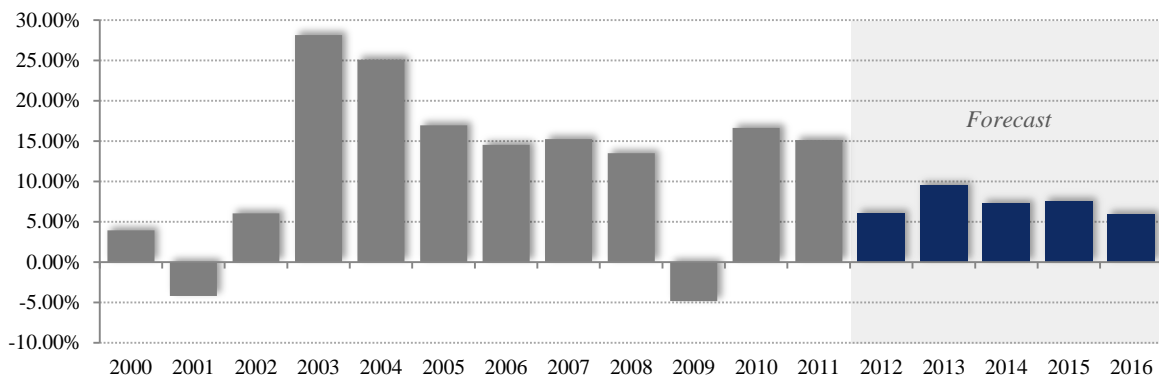
Multiple regression input variables derived from the International Monetary Fund data base:

	GDP (constant prices)	Gross National Savings	Current Account Balance	External Debt	Percentage Change in GDP
1980	277.545	61.32356775	0.519	65.465	
1981	274.109	46.53274384	-17.542	76.631	-1.24%
1982	271.411	36.0433808	-16.363	88.634	-0.98%
1983	234.304	39.16625664	-8.736	97.334	-13.67%
1984	202.647	35.4834897	-4.45	100.084	-13.51%
1985	187.634	33.98802276	-0.078	107.112	-7.41%
1986	205.397	33.01756775	-4.937	123.267	9.47%
1987	230.61	38.788602	-1.887	137.079	12.28%
1988	250.251	42.41253948	-6.794	142.561	8.52%
1989	252.42	44.2593228	-4.028	143.09	0.87%
1990	290.592	51.9287904	-2.352	167.196	15.12%
1991	295.706	46.72746212	-4.956	177.976	1.76%
1992	303.192	45.03310776	-6.461	174.546	2.53%
1993	282.119	39.93394445	-5.839	181.415	-6.95%
1994	267.435	41.1422004	-5.987	189.882	-5.20%
1995	319.616	46.46897024	-9.898	206.838	19.51%
1996	334.672	53.8319912	-4.718	212.056	4.71%
1997	333.881	52.79660253	-6.835	209.537	-0.24%
1998	315.277	44.50450132	-15.532	205.275	-5.57%
1999	317.415	44.818998	-10.352	206.642	0.68%
2000	329.84	60.4860592	2.209	208.539	3.91%
2001	315.988	53.50940792	-4.609	201.968	-4.20%
2002	335.08	53.7233764	-12.258	203.151	6.04%
2003	429.365	71.10713765	-11.808	221.227	28.14%
2004	537.028	96.7724456	-7.885	233.368	25.07%
2005	627.923	121.8421789	-0.731	215.005	16.93%
2006	719.16	180.9190812	30.58	183.95	14.53%
2007	828.738	196.236871	12.458	203.718	15.24%
2008	940.379	210.3063596	1.219	211.424	13.47%
2009	894.81	175.114317	-27.845	222.11	-4.85%
2010	1043.624	206.5123171	-24.562	246.384	16.63%
2011	1201.285	236.9895048	-21.104	266.672	15.11%
2012	1274.055563	254.331974	-25.575	298.27	6.06%
2013	1394.100725	271.0668783	-36.257	326.057	9.42%
2014	1494.62818	286.1706691	-46.959	326.057	7.21%
2015	1606.356458	303.5004414	-58.235	326.057	7.48%
2016	1701.393032	317.8463913	-68.276	326.057	5.92%
2017	1970.77631	371.9122774	-81.477	326.057	15.83%

Forecast

Despite the uncertainty which is inherent to forecasting, this research uses the statistical technique of multiple regression to establish the quantitative relationships between gross domestic product in Southern Africa, and the above mentioned independent variables.

Figure 28: Annual Percentage Change in GDP for Sub-Saharan Africa



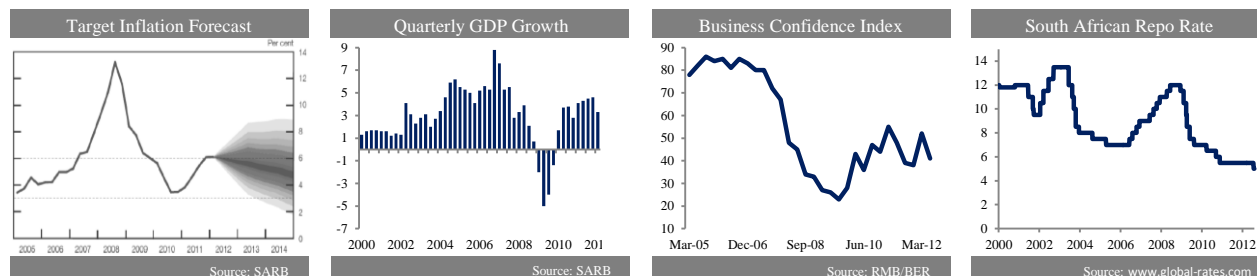
Regression Statistics	
Multiple R	0.998742545
R Square	0.997486671
Adjusted R Square	0.997217386
Standard Error	14.38874822
Observations	32

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	-3.691969504	9.22673057	-0.40014	0.692091	-22.5920703	15.20813129	-22.5920703	15.20813129
Gross National Savings	4.102748273	0.050188251	81.74719	7.26E-35	3.999942301	4.205554245	3.999942301	4.205554245
Current Account Balance	-3.603102566	0.250484643	-14.3845	1.85E-14	-4.116197098	-3.090008035	-4.116197098	-3.090008035
External Debt	0.464163838	0.060468893	7.676076	2.32E-08	0.340298925	0.588028751	0.340298925	0.588028751

Testament to the explanatory power of the inputs of this analysis in capturing the behaviour of the historic GDP trajectory is the admirable R square along with the statistical significance of the explanatory variables (however the intercept is found to be insignificant) as determined by robust t Stats and P-values. Whilst admittedly only a modest number of explanatory variables have been utilised to construct this projection (and a degree of variable overlap), the output approximation provides valuable insight into expected GDP growth in the region. Forecast GDP growth varying between five and ten percent appears both logical and favourable when viewed in a globalized context. Whilst this projection provides a ‘best guess’ of future anticipations for the region, such a one-dimensional view remains vulnerable to overlooking the deficiency of emerging market symmetry (high correlation between emerging markets) and normality of returns, Estrada (2002).

Given the innate nature of this research and a theme biased strongly towards understand economic consequences in a post recessionary context, the prospect of hypothesising an effective means to conduct an isolated country specific stress test becomes invaluable. In pursuit of such a theory South Africa shall serve as our proxy for a vulnerable emerging market in the post 2008 global economic recovery. The desire behind the successful construction of such a country specific stress test is that it might serve as a generic methodology capable of regional specific adjustments to be made useful in a universal risk management context. Following our broad projections regarding Sub-Saharan Africa we narrow our study down to a single country within the region, namely South Africa.

Figure 29: Snapshot of South African Economy



Inflation is expected to remain within the targeted band of 3% - 6%. Inflation has been derived from CPI as opposed to its oil shock benign GDP deflator counterpart. Inflationary declines provide valuable flexibility to contraction remedying monetary policy efforts.

GDP growth which experienced a sharp decline in 2008 has since returned to positive growth. Whilst less desirable than many emerging market peers, GDP growth levels appear largely hostage to the economic health of broader Europe (the countries primary export market).

In line with global trends South African business confidence waned sharply during the 2008 Crisis from its 2006 pre-recession highs. Despite the modest recovery to date business confidence remains fragile and thus a likely hurdle to the efficient allocation of capital in the private sector.

Consistent with the global trend of accommodative monetary policy, South Africa remains representative of emerging markets in its more modest policy execution. With inflationary pressures easing further rate cuts remain a possibility should economic growth appear to stagnate.

The intention of this admittedly shallow economic overview of the post 2008 Global Financial Crisis South African economy is to provide a rudimentary foundation upon which one is able to expand. Following the above economic introduction our attention now shifts to the task of attempting to gauge the country specific risk applicable to an investor in this country's sovereign debt issue. In this research sovereign debt has been used as a proxy for general country risk.

III. Country Specific Stress Test (South Africa)

Radical work by Taylor (1995) utilised a financial market prices framework to explain the impact of a change in monetary policy on real gross domestic product and inflation. In researching this relationship his measurement of financial market prices focused primarily on three types of prices: exchange rates, long-term interest rate yields, and short-term interest rate yields (federal funds rate) without a distinction between developed and emerging economies. With the objective of establishing a uniform means of stress-testing a country, this research draws significantly on the findings of Ruggerone (2004). Following the 2008 Global Financial Crisis the application of country stress-testing is increasingly observed to have undertaken a macroeconomic focus. By providing regulators and policymakers with the ability to analyse latent risks unique to a country's economy by hypothesizing grave market price variations (exchange rates, interest rates, asset prices, etc.) country specific stress-testing is becoming an increasingly valuable tool in the framework of policy making. Well-constructed stress tests provide anticipatory insight into the potential vulnerabilities of domestic and international financial systems to unforeseen macroeconomic considerations. The primary objective of this research is to provide a practical explanation of the post 2008 methodical evolution of country stress-testing with a specific focus on one emerging market, namely South Africa. Following the explanation of how such a stress-test can be constructed, a discussion of the various input variables to be shocked will be proposed, thereby providing a generic framework amiable to customisation.

In order to make the stress test meaningful, country risk shall be defined from the perspective of market participants holding government issued debt. Under this definition the intention of the stress test can be expanded to incorporate various scenarios which strain a country's ability to withstand post-recession macroeconomic shocks, as well as monetary and fiscal measures initially implemented as a remedy for the economic contraction. By describing country risk in terms of a demarcated monetary value (potential investor losses) from the perspective of a market participant, stress-testing provides an objective means to analyse the effects of potentially materialising of vulnerabilities that would effect a country's dynamics. An extreme example would be a holder of government debt forced to endure substantial write-downs on the face value of their government issued assets, following the crisis induced restructuring of government debt (a good example comes in the form of Greece following the 2008 Global Financial Crisis).

Materials & Statistical Methodology

Conventional analysis of a countries creditworthiness hinges on macroeconomic variables such as a countries aggregate income and expenditure flows. Under these parameters, a country's financial soundness is a consequence of forecasts of its ability to generate income (primarily through taxes and exports), as well as the extent this income exceeds public expenditure, interest and principal debt repayments. Whilst the importance of macroeconomic considerations remain irrefutable, in the case

of emerging markets it is essential to extend this analysis in order to improve on the quality of a country’s risk assessment. Observations made in the wake of the 2008 Global Financial Crisis, where government guarantees - whether explicit or implicit - were extended to the banking and financial sector, add credibility to this progression. Governments and central banks were often observed alleviating the probability of default of domestic banks and financial institutions at the expense of burdening state accounts, which may in extreme circumstances threaten the country’s economic and financial stability.

Assessing Down-Side Risk

A simplistic process, constructed first by Ruggerone (2004), by which a countries default credit VAR can be computed, along with how such estimate of the countries credit VAR can be expected to react to changes in the country risk assessment is presented below.

From the perspective of a market participant invested in government issued debt the computation of the expected loss (EL) and the unexpected loss (UL) can be deduced algebraically, Ruggerone (2004).

$$EL = p \times LGD \times Exposure$$

$$UL = \sqrt{p(1 - p)} \times LGD \times Exposure$$

Where:

LGD = loss given default

p = probability of default

$\sqrt{p(1 - p)}$ = degree of unexpected loss as found by Ruggerone (2004)

A prerequisite for the computation of this credit VAR are the following simplifying assumptions:

- i. The default probability is distributed as a binomial, default and no-default. For example either South Africa will default on its sovereign debt, or it will not.
- ii. The recovery rate in the event of default is 40 per cent, therefore the expected write-down is (1 - 40%) which we have termed the loss given default. Degrees of potential loss are flexible to analyst prudence. This 40 per cent recovery rate assumption is customisable, and has been randomly generated in this example for purposes of illustration.
- iii. The probability of default (p) can simply be extracted from the respective sovereign rating, denoting the relative peer default probability. The investment term within which the default probability will be contextualised may be subject to analyst judgement. For the purposes of illustration consider a five year BB rated sovereign bond with 1.08% default probability.

Estimation of the VAR^{99.9%} comparable to normal distribution can be done by simply multiplying the UL by 3.08. By multiplying the unexpected loss by 3.08 we are simulating the probability of an unexpected loss materialising and assessing the estimated loss (following a normal distribution) within a 99.9 per cent level of confidence. The exposure to country risk can then be summarised in the table below.

Country	Exposure (R million)	Rating	LGD	p	EL	UL	VAR ^{99.9%} (R million)
South Africa	100	BB	0.6	1.08%	● 0.648	● 6.20	19.1

= 1.08 X 0.6

= $\sqrt{1.08(1 - 1.08)} \times 0.6$

In light of the assumptions, the current risk applicable to a portfolio of R100 million of South African government bonds is R19.1 million. This represents a current maximum of 19.1% down-side risk on the portfolio given a high degree of statistical probability. Whilst this simplistic example proves valuable in demonstrating the construction of country risk it remains vulnerable to several assumptions. Analysts may consider adjusting recovery rates (likely to be derived from global rating agencies) which differ by not only financial robustness of the country, but also by government attitude towards the honouring of debt. Admittedly the effectiveness of the above analysis remains significantly influenced by the opinion of rating agencies (their credibility questioned in the prior reading), and remains hostage to the approximation of a probability of default. In the above example reliance on rating agencies and their internally computed credit rating for countries provides the basis for this analysis (both probability of default and the likely loss given default are derived directly from rating agencies).

Importance of Stress-Testing in Emerging Economies

Abundant empirical evidence identifies the higher levels of volatility experienced in emerging markets. It is widely believed that additional volatility in emerging markets can be attributed to characteristics unique to countries experiencing capital account liberalisation. The vast variations in the credit ratings of emerging economies and their developed peers appears largely testament to the risks of unstable capital flows resulting from political, structural, or economic developments.

Investors in these volatility-prone countries run the risk of substantial losses in the event of a credit downgrade, and the subsequent waning of investor's sentiment towards the country's government issued debt. As described previously, the deterioration of an emerging country's credit rating is often accompanied by a significant and abrupt outflow of capital, causing asset values to decline and / or the domestic currency to plummet. The wellbeing of an investor's stake in an emerging markets debt is thus intrinsically tied to the opinion of global rating giants.

A second reason why investors might be concerned about emerging markets risk extends to its ability to deteriorate the credit ratings of banks, other financial institutions, and the domestic corporate sector. That is, sovereign debt is regarded as the closest to risk-free investment within a country, as such sovereign debt forms a floor upon which alternative ratings of institutions within the respective country are based. Should this risk materialise there will be an increasing cost for these institutions to obtain necessary capital from international capital markets. The subsequent cost of capital in this emerging country will likely retard future productivity. The importance of assessing the financial consequences stemming from a country's specific vulnerabilities becomes obvious. A country stress test provides a superior insight into the financial costs that an emerging market based a company might be subjected to, should a deterioration in country risk materialise.

A final vulnerability to an emerging market country's risk rating is applicable primarily to institutions such as banks and insurance companies, who maintain substantial regulated collateral in the form of government bonds. Legislation/regulation in many regions restricts risk management diversification by demonstrating a bias for domestic bond requirements. Therefore, these institutions are often found to have an unbalanced exposure to excessively volatile emerging economies. Therefore, an on-going construction of a stress-test scenario which provides the opportunity to objectively anticipate upcoming sovereign creditworthiness provides an essential consideration upon which institutions can enhance their strategic decisions.

Contingent Claims Analysis

Ruggerone (2004) provides a framework from which we are able to extend the Merton-based methodology by applying concepts borrowed from his contingent claims analysis (CCA) for the purposes of analysing sovereign and country risk. The Merton-based methodology assesses the credit risk of a company by characterising the company's equity as a call option on its assets. Following which put-call parity is then used to identify the firm's implied credit risk.

Building on the conventional application in private firms, CCA can be adapted to value countries, Ruggerone (2004). The underlying assumption of CCA is that assets issued by a financial entity are subject to volatility, and that the value of such volatile assets is dependent on the seniority or priority of the owners claim. The inherent value of an entity which is financed through debt and equity $V(t)$ is the sum of equity $E(t)$ and debt $D(t)$ and is similarly equal to total assets $A(t)$ plus reserves $R(t)$. Given that asset/bond prices are stochastic the possibility exists for their prices to decline below the face value of the debt plus accrued interest, we term this the default barrier (DB) [the sum of the face value of the debt and accrued interest], as under these circumstances a financial entity is assumed to default/partially default. Owners of junior claims (such as equity holders) possess at maturity (T) a contingent claim on the residual assets, once all debt has been taken into consideration. In other words equity holders will either receive the difference between $A(t)$ and DB , or nothing at all. Moreover, the value of risky debt at maturity (T), i.e. $D(T)$, will equal DB less the maximum between the difference of DB and $A(T)$, or once again nothing at all. Therefore:

$$\begin{aligned} V(T) &= A(T) + R(T) = E(T) + D(T) \\ &= \max[A(T) - DB, 0] + DB - \max[DB - A(T), 0] \end{aligned}$$

Recognisable is the interpretation of both a call and put option in the equation above. Therefore we can state that the value of a country at maturity (T) is simply the sum of a call option plus the default free value of the debt issued DB , less a put option, Ruggerone (2004). Now with the assistance of the Black-Scholes formula we are able to calculate a value of both call and put options. The latter, for example can be deduced by:

$$P = DB e^{-rT} N(-d_2) - AN(-d_1)$$

Where:

N = cumulative distribution function for a standard normal variable

R = risk-free rate

$$d_1 = \frac{1n\left(\frac{A}{DB}\right) + \left(r + \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}}$$

$$d_2 = d_1 - \sigma_A\sqrt{T}$$

Note that d_2 is defined as the risk-neutral distance to default and its cumulative distribution is the risk-neutral probability to default.

Substitution of the applicable country elements into the equation presented above provides an opportunity to find the 'value' of the country under scrutiny. Ruggerone (2004) goes further to describe the assets to be considered when the entity under assessment is a country:

- Currency reserves
- Equity held in public assets
- The right to issue money (seigniorage)
- Fiscal revenues (adjusted for time value of money)

Liabilities include:

- Currency debt (local and foreign)
- Present discounted value of public expenditures
- Financial guarantees
- Money in circulation

According to Ruggerone (2004) variations to the assets and / or liabilities mentioned above will result in a non-linear impact on the value of the value of the options (and *DB*), and ultimately the country. For instance a government who issued financial guarantees to financial institutions following the initial outbreak of the 2008 Global Financial Crisis, would have increased their liabilities (and *DB*) thus deteriorating the country's credit merit and increasing the country's risk. The down-side resulting from a lack of government intervention is not considered under this framework.

Stress-testing of a country by extension of the CCA is conducted by manipulating a countries assets and liabilities in accordance with the analysts' views on:

- Future fiscal position
- Vulnerability to finance a decline in confidence
- Probability of a rapid depreciation in the foreign exchange rate
- Exploitation of quantitative easing
- Governments standpoint toward the private sector

Under the proposed framework it becomes possible to conduct a stress-test scrutinising the robustness of a country's economic and financial prospects, and ultimately gauge the vulnerability of a country's creditworthiness.

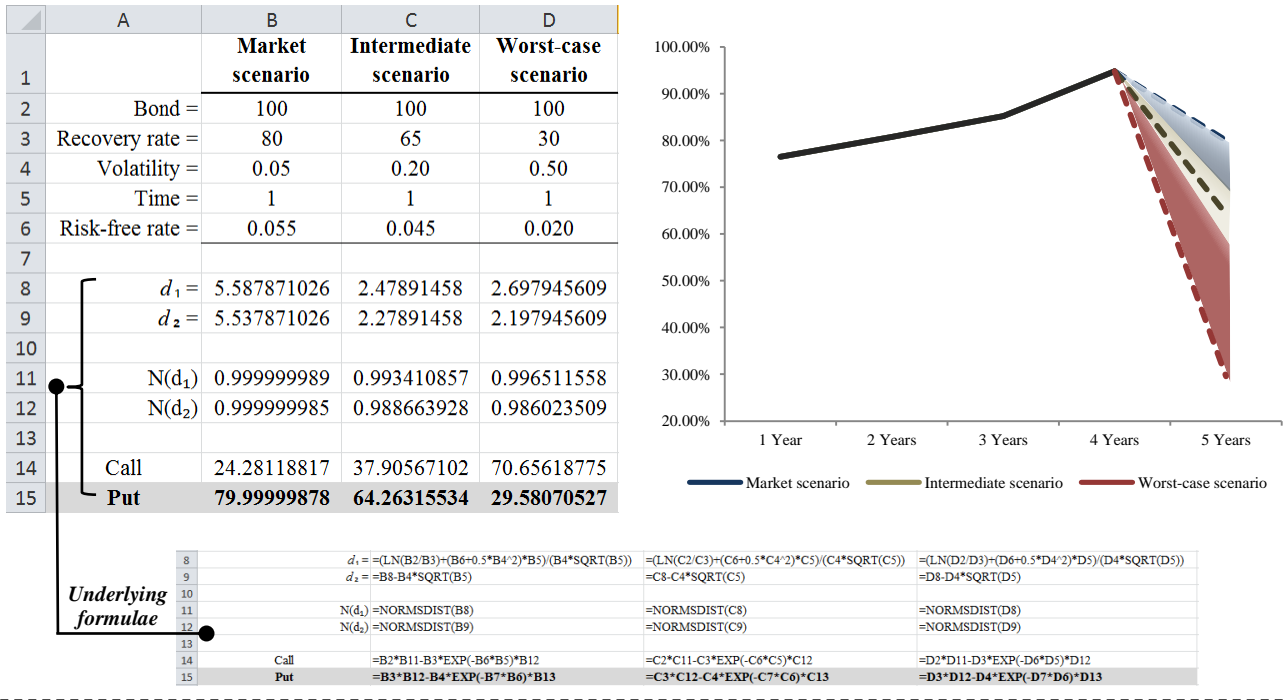
Practical Stress Test of South Africa

For the purpose of demonstration the hypothetical stress test below employs the triangular approach of expected market default scenario, intermediate default scenario, and worst-case default scenario. In line with the previous explanation, the stress test contained in figure 30 has been taken from the perspective of a market participant holding South African government issued debt, with the put option presented below as the capital recovered in the event of a default materialising. Whilst susceptible to criticism of over simplification the simulation below has been constructed to provide practical example of how to utilise the Black-Scholes formula in assessing a country's risk. Admittedly, the results of the stress test below are primarily reliant on vague assumptions used, however as previously discussed a more coherent stress test may be conducted by detailed computation of the various inputs.

In the case of the stress test below we begin by specifying a time horizon of twelve months, and perhaps more specifically the graph on the right hand side has depicted a five year bond with twelve

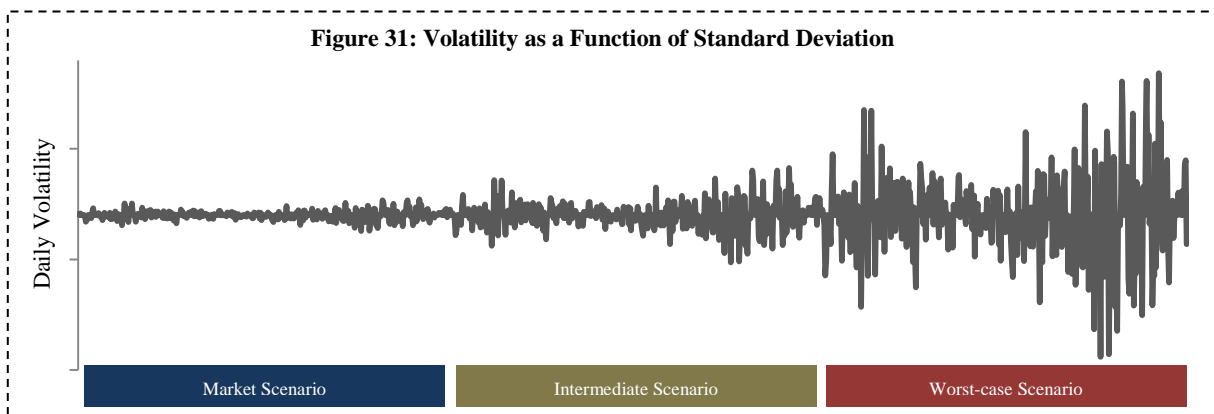
months outstanding to maturity. Given the priority of accuracy as well as the complexity of conducting a country stress test it is advisable to limit distant estimations of the vast number of variables, as this tend to dilute credibility. Once an acceptable time horizon has been defined, we begin to postulate the country’s value in accordance with the considerations mentioned above. By identifying the variables which need to be shocked we can then begin to construct the proposed degrees of stress placed on the country given varying degrees of crisis with the intention of establishing a meaningful perspective on how the country’s risk responds under differing environments. For simplicity the example below has made use of several assumptions.

Figure 30: Simulated Stress Test of Hypothetical South African Treasury Bonds

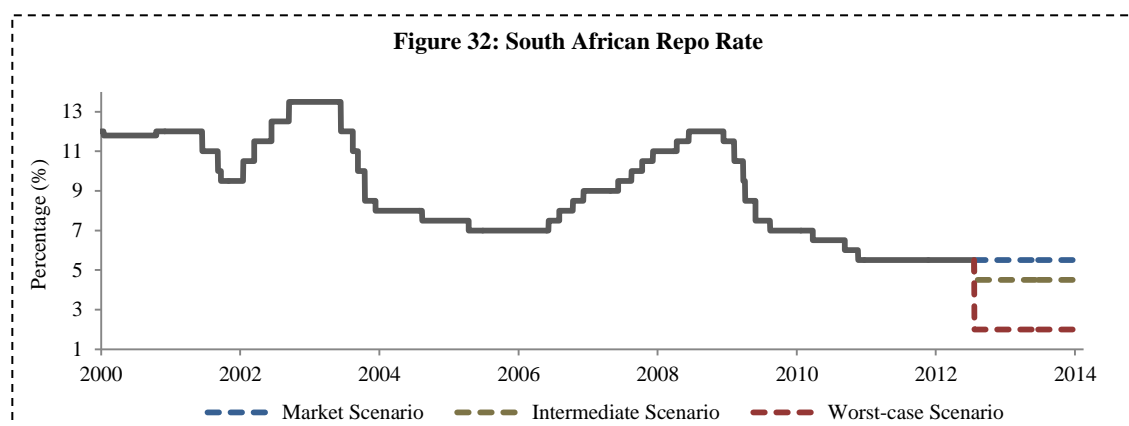


In the example above recovery rates have been assumed to decline in line with the severity of the stresses placed on the debt issuing government. Practically their ability to honour their debt and subsequently avoid forcing losses onto the beneficiaries of such obligations will be a function of a detailed analysis of a country’s assets and liabilities. The assumed volatility would be an estimate directly derived from empirical market observations. Logic dictates that with the increased severity of the crisis, the larger the fluctuations in the assets price. Below is a graphical depiction of the randomly generated volatilities (as measured by standard deviation) used in the construction of the stress test in figure 30.

Figure 31: Volatility as a Function of Standard Deviation



The final assumption which is evident in figure 32 is the proposed fluctuations in the risk-free rate. Whilst conventional practice favours the US Treasury Bills rate as the proxy for this hypothetical rate, given our geographical focus in conducting this analysis, we have made the bold supposition that the domestic South African repo rate will be fitting for a risk-free alternative. Further in light of the theme of this paper, the assumption is also made that the repo rate will decline proportionately in line with the severity of the crisis, and as such will be utilised as a stabilisation focused monetary tool sensitive to economic contractions.



According to Ruggerone (2004), in addition to the above mentioned standard macroeconomic variables, it is often necessary to consider other transmission channels through which a crisis instigating shocks might feed and influence the creditworthiness of a country. Given the regional specific nature of these stress transfer mechanisms, a deep and comprehensive knowledge of the country under study is a prerequisite for reliable country risk projections. For instance, whilst the role of government guarantees extended are a pivotal consideration when assessing a country's risk, a more intimate knowledge of the country's unique dynamics are likely to reveal further important sources of financial instability.

Another conduit through which a country's creditworthiness remains susceptible is the exchange rate. This is particularly prevalent in emerging markets where there is a heightened sensitivity to increases (or decreases) in capital flows. In these instants negative fluctuations in the local currency are capable of enhancing the credit risk of such a country to the extent that the country is exposed to debt denominated in foreign currency. A pertinent example of such a risk could be found in South Africa and Brazil, where debt is largely denominated in foreign currency. In January 2012 alone the South African National Treasury issued \$1.5 billion worth of US dollar denominated debt, National Treasury (2012). Thus, an intimate understanding of the structure of a country's debt can prove invaluable when building a country stress test, as it provides valuable intuition of how fluctuations in the country's exchange rate may affect the financial position of a country, not to mention exchange rate implications beyond the nature of a country's debt organisation.

Another consideration particularly prevalent when considering the construction of an emerging market country stress test is the duration of the domestic-currency-denominated debt. Ruggerone (2004) points out that in numerous emerging markets local currency debt is characterised by short durations, where service costs react almost instantaneously to monetary policy induced deviations in domestic rates. Thus in periods of heightened uncertainty regarding currency depreciation, any

reaction by the central bank to protect the currency (from depreciation) by raising short-term rates may come at the expense of domestic debt, thus placing the country's stability at further risk.

As a meaningful stress test should be intended to depict the impact of extreme yet plausible circumstances, Ruggerone (2004) advises utilising empirical observations when constructing a vector of shocks with which to subject the variables considered relevant for the country whose credit merit is under scrutiny. Intuitively the on-going Global Financial Crisis remains unique in both scope and severity. Therefore more will be demanded of an analyst's imagination when producing a stress test which leaves room to encompass a worst case scenario, whilst remaining plausible to a broad audience.

Results

The analysis of country stress testing using the Black-Scholes Merton methodology provides a practical study of theoretically based monetary and fiscal hypotheses. From a practical point of view the primary concern remains the operational importance of designing an appropriate stress test to gauge country risk with the possibility of customisation and application within a risk management context. This development entails the valuable evolution of risk management in the hands of insurance companies, financial institutions, investors, and pension funds, to name a few. In the event of sovereign spread corrosion, an analyst will use a higher discount rate implying a decline in the actual value of the sovereign bond portfolio under scrutiny, Ruggerone (2004).

Whilst the framework of this stress test remains generic by nature, several considerations previously mentioned serve testament to an analyst's ability to enhance the statistical accuracy of the forecasted scenarios. A further consideration which comes to light upon practical implication is the presence of correlation amongst countries and their input variables. Given our knowledge of inter country transmission mechanisms the assumption that one can focus exclusively on an isolated country's risks appears naive. As evidenced by the events which followed the 2008 Global Financial Crisis, it is imperative that we acknowledge and account for spill-over effects and contagion as a menace to an otherwise healthy county risk level.

The final warning is a reminder of the ever present detachment from theory to practical implementation. Risk perceptions adopted by market participants have empirically not always proven logical nor predictable. Financial theorists may be found describing this lack of conformity as "animal spits" of international markets. Whilst easy enough to dismiss as anomalous market behaviour, this in fact poses the largest threat to the proposed country stress testing's credibility. Empirically, the most aggressive corrosion of a country's risk has been accompanied by irrational self-fulfilling investor expectations. This often results in an economic and financial system reasoning which is susceptible to asset bubbles and beyond the default barrier.

Chapter Four - Significance of the Research

Despite the inherently unreliable nature of speculating on projected economic consequences, perhaps there is a benefit to taking stock of current US economic characteristics when investigating the merits of aggressive policy responses to a significant economic contraction. It is true that at the time of

writing the US overall growth rate remains uninspiring, however dissection of the various elements evidence some intriguing shifts. Consumer spending and housing appear to have declined in dominance, now accounting for just 65% of domestic growth. Exports on the other hand have risen to 43%, one of the strongest showings in any recent economic recovery, Economist Newspaper Limited (2012|C).

Whilst it is easy to attribute short-term US economic progress to forcefully accommodative monetary policy, credit is similarly warranted to enhanced regulation. One of the first discrepancies to be corrected was the inadequate capital ratios of banks at the time of the outbreak of the crisis. As a condition of Federal assistance at the time, the US Treasury forced banks to raise adequate capital to be able to endure exceptionally dire scenarios of recession and loan write-offs. It has been approximated that five of America's largest banks have to date written off roughly \$500 billion since 2008, and have raised \$318 billion in new capital. As a result, many of their equity ratios (common stockholder's equity / balance sheet assets) at present stand in excess of 10% exceeding both their pre-2008 crisis levels, as well as many of their embattled European peers, Economist Newspaper Limited (2012|C).

Following the peak of the 2008 Global Financial Crisis accommodative monetary policy and the subsequent increase in market liquidity (whilst overlooking the pertinent benefits for a moment) adds to stock prices with a destabilizing effect. Empirically, investors motivated by artificial levels of liquidity are likely to demonstrate irrationally exuberant behaviour placing little emphasis on market fundamentals. Testament to this short-term motivated portfolio flow is the broad based stock market highs (fourth quarter of 2012) observed around the globe, while the logic of the fragile state of the present economic environment dictates that stock price valuation is not driven by fundamentals, but rather a function of aggressive monetary accommodation. Initial periods of increasing the supply of money will almost surely result in increased government revenues (as central banks increase their exposure to government issued debt). However, persistent monetary accommodation practices have empirically been observed as a root cause of excessive levels of revenue-eroding inflation. Recalling that tax revenue is collected retrospectively (for example budget deficits expected to be offset by future tax revenue) it remains sensitive to hyper-inflationary environments. In this context the proposed ability to actively manage levels of seignorage/quantitative easing cannot be overstated. Ben Bernanke in his research on the great depression found strong evidence that declines in output and employment demonstrated a strong correlation with both money and price declines. Recent research taking a comparative perspective has greatly strengthened the empirical case for the money supply as a major driving force of economic recoveries, Bernanke (1995). At present there appears to be consensus that forcing countries to avoid deflation neutralises one imperative response tool available to global central banks.

Given the severity and scope of the 2008 Global Financial Crisis along with the fractured foundation upon which growth has as of late been achieved, it should come as no surprise that the findings of this research shows that the expected global growth trajectory in decades to come will be far less generous than those which we have become so accustomed to.

Kaminsky and Reinhart (1996, 1999) conducted a conclusive study of various crises observed across 20 countries, including 5 developed and 15 emerging economies. Interestingly, financial liberalisation and significant credit expansions were found to be reliable precursors/predictors to the crises under review. These measures appeared to be succeeded by an average excess rise of roughly 40% per year in equity prices, in addition to that experienced during periods of normality. Upon the imminent

collapsing of equity prices, banks as well as other financial intermediaries were often found to have been harbouring excessive naked/unhedged exposure to these ‘desirable’ equities. They observed that under these conditions roughly a year later a banking crisis ensues. This was often accompanied by an exchange rate crisis as government found themselves having to choose between sacrificing interest rates (increasing interest rates at the expense of continued economic growth) and defending their currencies. Inevitably, a contraction in output is witnessed and a recession is affirmed.

Work by Taylor (1995) provides a valuable foundation in describing the linkages between monetary policy, real GDP and inflation. Important distinctions need to be made between the short-term and long-term implications of monetary policy actions. This research will concede that monetary policy implications for long-term gross national product levels remain resistant to short-term monetary policy actions (that is, long-term neutrality of monetary policy). The focus therefore will be limited to short-term remedies to stimulating gross national product growth following a significant economic contraction.

The pertinent empirical concern which requires thorough scrutiny, after the incorporation of asset prices into monetary policy has been accepted as a valid suggestion, is to what extent will a monetary policy response be justified? Reactive interest rate increases along with the extracting of market liquidity needs to be considered in the context of the potential that a resultant economic contraction may well ensue. Work by Roubini (2006) suggests both analytical arguments and empirical evidence that monetary policy is capable of pre-empting asset bubbles in much the same way as it does inflationary pressures. Thus the argument of unavoidable economic contraction or severe financial distress may indeed be inconsistent with logical judgment. Roubini goes further to highlight pre-2008 observations in the United Kingdom, Australia and New Zealand where moderate and gradual monetary policy tightening reacting to asset bubbles proved effective by avoiding triggering an economic crash.

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