



end-game  
the denouement  
of exponentials

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# end-game

## the denouement of exponentials

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## about this report

With the Western economies mired in economic stagnation and burdened by unprecedented levels of debt, it is not at all surprising that the economic debate has become polarised between debt-cutters and fiscal stimulators. Fervent though this debate is, **it completely misses the point**. This report identifies fundamental issues that are neglected by Keynesians and free marketeers alike, and calls for a wholly new method of economic interpretation.

Intellectually, the high ground is up for grabs for only the second time since the Second World War. In the three decades after 1945, Keynesian orthodoxy ruled. From the mid-1970s, a free-market philosophy variously labelled 'monetarism', 'laissez-faire' and 'the Washington consensus'

became the new orthodoxy. Though its adherents have been fighting a valiant rearguard action, the reality is that the ultra-free-market system is dead in the water, discredited by the events of 2008-09. Keynesians are hoping that their paradigm will regain its former pre-eminence, but they are mistaken.

**Both approaches are outmoded.** Free market orthodoxy created profound weaknesses in the global economy, and took the financial system to the brink of collapse. The Keynesian solutions of the past are no answer to the challenges of the present and the future, not least because it is impossible to borrow one's way out of a debt problem. Something wholly new will emerge from the cauldron of the financial crisis.

**That new paradigm is very likely to be "exponential economics"**, our term for a new philosophy which takes account of the long-run trends that govern economic evolution. The first aim of this report is to explain what "exponential economics" is.

Exponential economics is a method of interpretation which uses long-run analysis to build upon an identification of the two key drivers of society and the economy.

The first of these key drivers is that **the economy is an energy equation**. Society as we know it today is a product of the use of extraneous energy to leverage the limited capabilities of human labour. The leveraging effect of abundant



extraneous energy alone permits the earth to support a population of almost seven billion people.

Ultimately, **money and debt are quantifications of the energy leveraging effect.** If one single equation matters most in understanding an energy-based economic system, it is Energy Returns On Energy Invested (EROEI), which compares energy outputs with energy consumed in the extraction process.

The second key driver has been the erection of **an ever more extended anticipatory financial superstructure on top of the fundamental surplus energy equation.** Since the advent of the free-market orthodoxy, this superstructure has become successively more exponential and

dangerous, to an extent that was not fully appreciated until the entire system teetered on the brink of collapse in 2008-09.

The problem now is that, even if supplies of extraneous energy remain comparatively abundant, energy *returns* – the critical surplus part of the energy equation – are weakening, particularly in the Western economies. This tendency suggests that the foundations of the elaborate financial superstructure are crumbling, and that this process renders unprecedented economic and social change inevitable.

Policymakers are singularly ill-equipped to understand, let alone to anticipate and to manage, the coming period of fundamental change. Their databases are far too short-term

for an appreciation of exponential change, and there exists no agreed calibration of the critical energy returns equation.

We hope that this report will provoke debate over these issues, and we welcome all contributions to the better understanding of exponential economics.



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“[W]ho profits from a low-growth U.S. economy hidden under statistical camouflage [?] Might it be Washington politicians and affluent elites, anxious to mislead voters, coddle the financial markets, and tamp down expensive cost-of-living increases for wages and pensions?”

Kevin Phillips<sup>1</sup>



# summaries

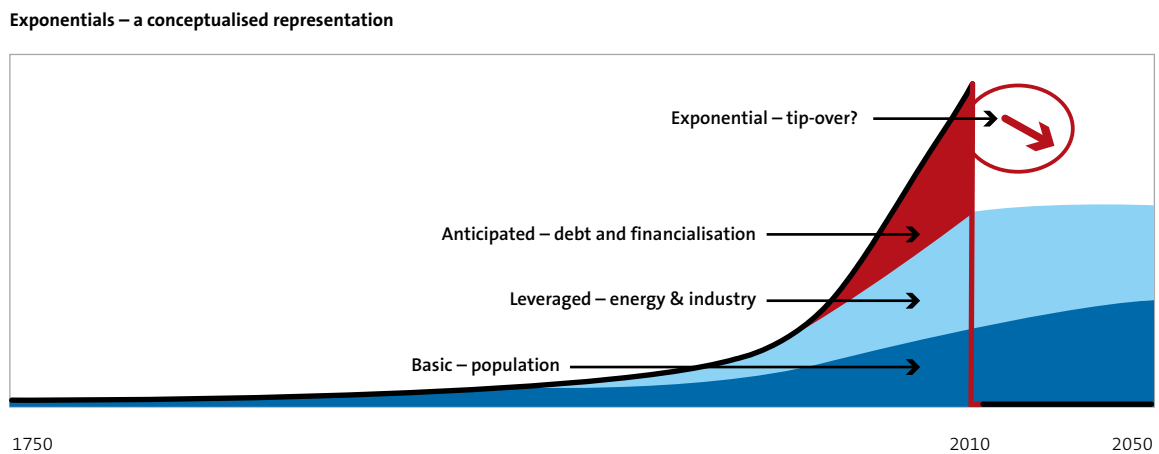
## i. overview – a system in crisis

- Though the global economy pulled back from the brink of catastrophe in 2008-09, OECD countries remain burdened by huge debts.
- Though some economic data suggests relative resilience, a deeper look at the global economy suggests that problems have been managed rather than resolved.
- Official data is at odds both with the reality of massive debts and with subjective interpretations on issues such as output, inflation and growth.
- The monetary ratchet – a process whereby low interest rates create bubbles, whose damaging bursts then provoke problems which are countered by yet lower rates – has reached its logical conclusion, neutralising rate policy and encouraging a resort to quantitative easing (QE), the contemporary euphemism for the printing of money.
- Can a wholly new approach to economic interpretation – **exponential economics** – provide better insights into the true condition of, and outlook for, the Western economic system?

## ii. fundamental drivers – the exponential economy

- A long-term assessment of the global economy reveals that it is governed by two categories of 'exponentials'.
- The first of these is the exponential expansion of physical metrics such as population and resource use.
- The second is an exponential financial system characterised by accelerating expansion in datasets such as debt and inflation.
- Ultimately, the economy is an energy surplus equation, and social sophistication is a product of the way in which exogenous energy has leveraged human efforts.
- The exponentials-based financial system faces two linked threats. The first of these is the potential for a collision between, on the one hand, an economic system which requires perpetual growth and, on the other, a finite resource set.
- The second, more imminent threat comes from the internal mathematical contradictions of an economic system which is increasingly turning to debt to sustain consumption in the face of static real output.

Fig. 1: The exponential economy – a conceptualised representation\*

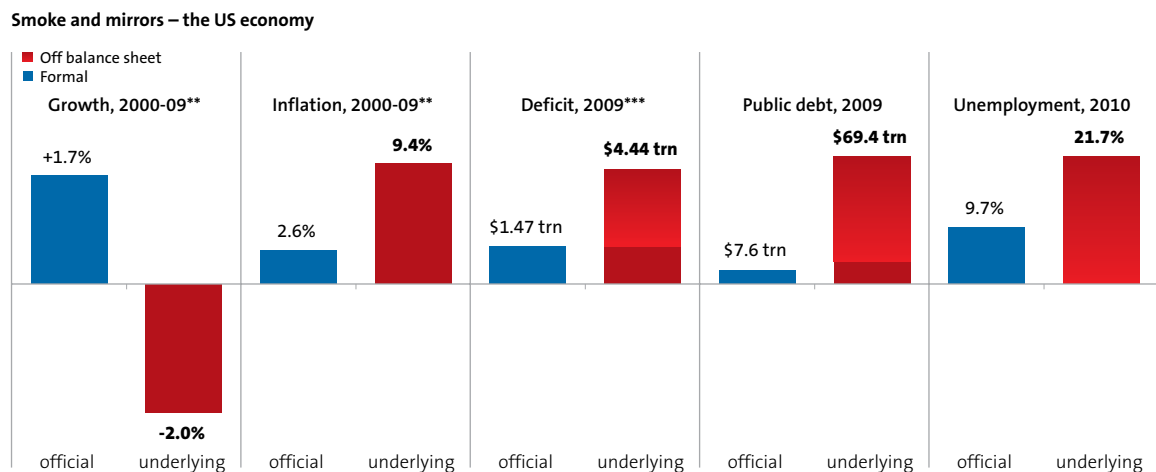


\*Sources: Tullett Prebon analysis

### iii. smoke and mirrors – a denouement disguised

- In most walks of life, deferential, unquestioning acceptance of government pronouncements is a thing of the past, and investors, in particular, usually exercise healthy scepticism. It is strikingly anomalous, therefore, that markets tend to accept government macroeconomic data at face value.
- The reality is that much government data is extremely unreliable. A history of incremental 'adjustment' has distorted many measures – such as unemployment, inflation, growth, deficits and debt – to the point where the statistical picture is drastically different from the underlying economic reality.
- Focusing on the US, we explain and strip away three decades of 'Pollyanna creep' to reveal an economy which is drastically weaker than is generally supposed.
- Unemployment, reported at 9.7%, actually exceeds 21%. Inflation, said to be at near-zero levels, is above 7%.
- Real GDP growth over the last decade, reported to have averaged 1.7%, has actually been negative.
- Public debt is out of control, exceeding \$69 trillion (or 540% of GDP) once off-balance-sheet obligations are included.
- The deficit for FY 2009 was reported at \$1.47 trillion, but this excludes increments to off-balance-sheet welfare obligations. The annual deficit inclusive of these incremental commitments totalled \$4.5 trillion last year.

Fig. 2: Smoke and mirrors – the US economy\*

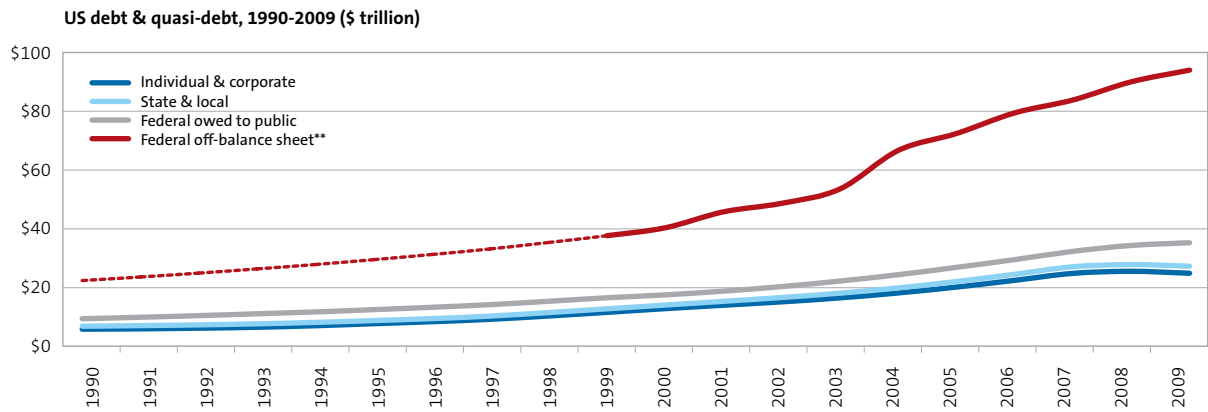


Sources: \* Official data and Tullett Prebon calculations based on data from Shadowstats.com, see text  
 \*\* Growth and CPI data show compound rates between 2000 and 2009  
 \*\*\* At end of fiscal year

## iv. the end-game

- The process of looking behind Pollyanna data reveals a US economy which is ex-growth, has strong inflationary tendencies, and is massively in debt. These characteristics seem to be shared by many other Western economies.
- In effect, **the Western economic system is being crippled by the unwinding of exponential debt-and-obligation finance as the core energy dynamic erodes.** It may be simply a matter of time before the system topples over, with ultra-high inflation seeming almost inevitable.
- Very little has been done to address (or even recognise) these intrinsic unsustainabilities. In the private sector, banks remain at liberty to inflate future sequential debt-driven asset bubbles, whilst governments' future welfare commitments cannot conceivably be delivered.
- In this situation, neither Keynesian stimulus nor *laissez-faire* market liberalism offers any answers. Between them, these ideologies are the causes of the departure from sound finance.
- The key issue for policymakers is damage-limiting management of the unwinding process, with conditions set to get tougher due to (a) demographic change, and (b) the weakening of the surplus energy equation.
- Formal debt will be destroyed via the 'soft default' route of inflation, since no other solution exists. At the same time, governments need to accept that most western welfare systems are becoming completely unaffordable.

Fig. 3: Deep in the hole: total US debt and quasi-debt\*



\$bn	2000	2003	2006	2009
Individual & corporate	\$14,480	\$18,063	\$23,910	<b>\$26,262</b>
State & local	\$1,198	\$1,568	\$2,008	<b>\$2,355</b>
Federal debt to the public	\$3,385	\$4,033	\$4,885	<b>\$7,805</b>
Federal off-balance-sheet	<u>\$21,780</u>	<u>\$29,608</u>	<u>\$47,808</u>	<b><u>\$56,536</u></b>
Total	\$40,843	\$53,273	\$78,611	<b>\$92,958</b>

Sources: \* Federal Reserve, [www.federalreserve.gov/releases/z1/current/z1.pdf](http://www.federalreserve.gov/releases/z1/current/z1.pdf). Latest data: 1Q 2010, and *Financial Report of the United States Government*, 2000 through 2009  
 \*\* NPV of future off-balance-sheet welfare obligations, sourced from *Financial Report of the United States Government*, 2000 through 2009

# sources and recommended reading

This research project has drawn upon data and interpretations from a very wide range of sources. Some of these are listed below, together with selected recommendations for further reading.

## three sources have been of huge importance to this project:

The first of these is **John Williams**, whose *Shadow Government Statistics* service looks behind the “Pollyanna Creep” in US official data, and publishes consistent long-run data, briefings and analyses. We believe that the SGS subscription service is an *imperative* source for *any* investor or policymaker who wishes to understand the economy and government of the United States. Many of the charts

and tables used in this report are based on data from this source, and are acknowledged as ‘Shadowstats’ throughout. *Shadow Government Statistics* can be contacted at [www.shadowstats.com](http://www.shadowstats.com)

**Chris Martenson** has set out a brilliant and persuasive analysis of the social and economic exponentials process. His *Crash Course* is available as a DVD, and can be accessed on line at [www.chrismartenson.com](http://www.chrismartenson.com)

Our third key source has been the works of **Kevin Phillips**, one of America’s leading political strategists. When working for the Nixon team, Mr Phillips published *The Emerging*

*Republican Consensus*, in which he correctly identified the likely swing in the centre of gravity of American politics from the industrial North East to the “Sun Belt” of the South and West. Latterly, Mr Phillips has become increasingly concerned about political and economic developments in the United States, and has published several superb analyses including *American Theocracy* and *Bad Money*.

These three sources have been indispensable (though we are of course responsible for all interpretations presented in this report).

## sources of information

1. Adam Smith Institute (UK)
2. Albert Bartlett, Professor Emeritus of Physics
3. Bank for International Settlements
4. Bank of England (UK)
5. BBC on line (UK)
6. *BP Statistical Review of World Energy*
7. Bureau of Economic Analysis (US)
8. Central Intelligence Agency (US)
9. Congressional Budget Office (US)
10. US Census Bureau
11. *The Daily Telegraph*
12. Debt Management Office (UK)
13. Department for Business Innovation and Skills (UK)
14. US Department of Agriculture
15. US Department of the Treasury
16. *The Economist*
17. Energy Information Administration (US)
18. European Commission
19. Eurostat (EU)
20. Federal Reserve Board (US)
21. Federal Reserve Bank of St. Louis (US)
22. *The Financial Times*
23. Government Printing Office (US)
24. International Energy Agency
25. International Labour Organisation
26. International Monetary Fund
27. John Mauldin's *Thoughts from the Front Line*
28. National Bureau of Statistics of China
29. The National Bureau of Economic Research (US)
30. *The New York Times*
31. Office of Management and Budget (US)
32. Office for National Statistics (UK)
33. Organisation for Economic Cooperation and Development (OECD)
34. Organisation of the Petroleum Exporting Countries (OPEC)
35. William H. Gross, *Investment Outlook*, PIMCO
36. Mohamed El-Erian, *Economic Outlook*, PIMCO
37. Statistisches Bundesamt Deutschland (Germany)
38. H.M.Treasury (UK)
39. United Nations
40. The White House, Council of Economic Advisers (US)
41. The World Bank

## recommended reading: a selected bibliography

1. Eamonn Butler, *The Rotten State of Britain: How Gordon Brown Lost a Decade and Cost a Fortune* (2009)
2. John Cassidy, *How Markets Fail: The Logic of Economic Calamities* (2010)
3. Niall Ferguson, *The Ascent of Money: A Financial History of the World* (2009)
4. John Gray, *False Dawn: The Delusions of Global Capitalism* (2009 edition)
5. Bill Houston and Robin Griffiths, *Future Storm: The Dynamics Unlocking the Future* (2006)
6. Paul Krugman, *The Return of Depression Economics* (2008)
7. Paul Mason, *Meltdown: The End of the Age of Greed* (2009)
8. Robert Peston, *Who Runs Britain? And Who's to Blame for the Economic Mess We're in* (2008)
9. Kevin Phillips, *American Theocracy: The Peril and Politics of Radical Religion, Oil, and Borrowed Money in the 21st Century* (2007)
10. Kevin Phillips, *Bad Money* (2009 edition)
11. Raghuram G. Rajan, *Fault Lines: How Hidden Fractures Still Threaten the World Economy* (2010)
12. Carmen M. Reinhart, Kenneth Rogoff, *This Time is Different: Eight Centuries of Financial Folly* (2009)
13. Nouriel Roubini, Stephen Mihm, *Crisis Economics: A Crash Course in the Future of Finance* (2010)
14. George Soros, *The Crash of 2008 And What It Means: The New Paradigm For Financial Markets* (2009)
15. Joseph E. Stiglitz, *The Stiglitz Report: Reforming the International Monetary and Financial Systems in the Wake of the Global Crisis* (2010)
16. Joseph E. Stiglitz, et al, *Mismeasuring Our Lives: Why GDP Doesn't Add Up* (2010)
17. Joseph Stiglitz, *Freefall: Free Markets and the Sinking of the Global Economy* (2010)
18. Gillian Tett, *Fool's Gold: How Unrestrained Greed Corrupted a Dream, Shattered Global Markets and Unleashed a Catastrophe* (2009)

“[M]ost economic theories have little practical use in the real world. Concepts such as free trade being a boon to the world’s economy, a weak currency helping turn a nation’s trade deficit, or personal income including what the average homeowner would receive from himself in rental income if he charged himself to live in his own house, fall in to the “not in the real world” category”.

John Williams<sup>2</sup>



“What we are describing is an economy that is essentially “running on empty” – moving money around, borrowing, expanding the money supply, incurring huge debt obligations and mortgaging the future in an ever more frenetic attempt to maintain at least the illusion of the status quo in the face of underlying economic deterioration”.



# part one:

## overview – a system in crisis

Have investors become schizophrenic, or are they just in two minds about it? If a single term can describe the tenor of investment market in recent months, ‘uncertain’ is surely that word. This uncertainty in turn reflects some remarkable divergences within the available information, combined with some serious disconnects between statistical data on the one hand and logical perceptions on the other.

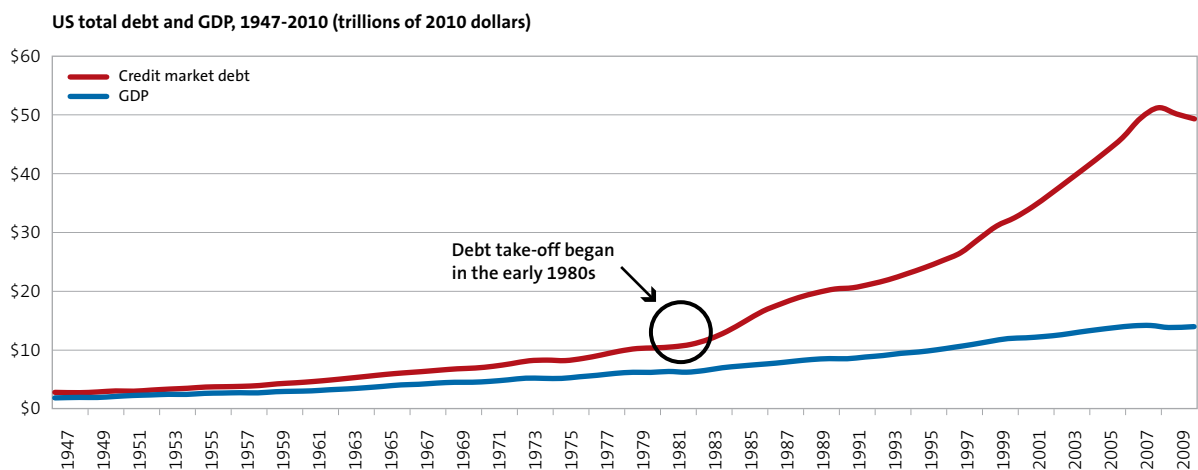
On the face of it, there seem to be substantial reasons for optimism. Looking at the US – which, despite globalisation and partial decoupling, remains the centre of gravity of the world economy – the good news

outweighs the bad, doesn’t it? To be sure, growth is weakening, and a double-dip recession cannot be ruled out. But, given the scale of the 2008-09 banking crisis and the subsequent economic down-turn, American output has held up pretty well. According both to official data and to consensus assessments, real GDP (gross domestic product) might have fallen by about 6% from peak to trough, but this pales into insignificance in comparison with the one-third fall in output experienced during the Great Depression.

Likewise, US unemployment, at 9.7%, is far below the scary 25% recorded in 1933. Inflation is low, and expectations

seem well anchored – indeed, deflation remains a possibility. Globally, interest rates are ultra-low and, with the obvious exceptions of certain fiscal miscreants, government bond markets are robust. Corporate earnings trends seem generally positive. A handful of maverick commentators aside, no-one seems to expect either inflation or interest rates to take off any time soon. Above all, the global financial system seems to have escaped from the melt-down which appeared a very real possibility in September and October 2008.

Fig. 4: Out of whack – US debt and GDP\*



\*Sources: US Bureau of Economic Analysis, US Federal Reserve, and Tullett Prebon calculations

And yet, and yet. For a start, some of the hard data must give investors nagging doubts. Take total (public, corporate and private) debt in the United States, for instance (see fig. 1). Since the early 1980s, aggregate American indebtedness has increased by roughly 4.7x, in real terms, which compares with a drastically smaller (2.25x) reported expansion in real GDP over the same period. At 350%, the debt-to-GDP ratio has reached levels for which there is no precedent, even in the crisis-hit 1930s (about 290%).

Federal debt, measured as a percentage of GDP, may not be all that large, but deficits are huge, and no-one expects them to decline any time soon. The Bank for International Settlements (BIS) has warned that public debt in most OECD economies threatens to take off exponentially<sup>3</sup>.

More subjectively – though surely just as importantly – *does published data agree with logical perceptions, with intuitive assessments, or with investors' everyday experience?* If we stand back and consider the promptings of what might be called common sense, certain things begin to jar.

Starting with debt, investors and policymakers must be uncomfortably aware that both government and the broader economy are piling colossal obligations onto future generations

(a process that we have described as “generational theft”<sup>4</sup>). Deficits seem intractable, and may well get worse as demographic changes – such as baby-boomer retirement, and the ageing of the population – kick in. If the need to finance deficits remains at anywhere near current levels, can interest rates *really* remain at rock-bottom levels? In the private sector, property prices continue to very look exposed in terms of historic earnings multiples. Even modest further falls in house prices could put millions of borrowers underwater<sup>5</sup>. What will happen to homeowner budgets if interest rates rise which, given persistent high structural deficits, they very well might?

And what about governments' *informal* liabilities? We have been warning for a long time about certain countries' off-balance-sheet obligations, which include future commitments such as public sector pensions and accumulated welfare entitlements.

Then let's consider inflation, both historically and in the future. According to official data, the average American consumer's cost of living has increased by 29% – an annual average of 2.6% – over the past decade<sup>6</sup>, but most people surely feel that inflation, as it applies to themselves, has been far, far higher than this.

Looking ahead, is the still-vaunted fear of deflation remotely realistic when governments can print money? To be sure, the US suffered crippling deflation in the 1930s, but the crucial difference was that the dollar was still gold-linked at that time. Now, government can simply create money (and, indeed, already has, on a huge scale). If the worst comes to the worst, Washington can mail cheques to individuals, or simply ask the chairman of the Fed to drop money from his helicopter. Doesn't the recent huge scale of quantitative easing (QE) – today's euphemistic term for the printing of money – suggest that those pesky Cassandras might have a point when they warn about future inflationary surges?

And then there's the banking system. Despite all of the political posturing, and the Basel recommendations notwithstanding, not much has really changed on the regulatory front. A restoration of Glass-Steagall separation seems as far away as ever, and the spirit of international co-operation forged in the heat of the banking crisis has melted away. As a result, the banking system is still at liberty to inflate more of the worryingly *sequential* bubbles which have plagued the global economy over the last decade or so<sup>7</sup>.

<sup>3</sup> See The Bank for International Settlements, *The future of public debt: prospects and implications*, BIS Working Papers No. 300, March 2010, and Tullett Prebon Strategy Notes, issue six, *Out of Control*, May 2010

<sup>4</sup> See Tullett Prebon Strategy Notes, issue one, *The Dick Turpin Generation*, March 2010

<sup>5</sup> In UK terms, 'in negative equity'

<sup>6</sup> CPI-U, 2009 compared with 1999

### a fundamental change?

Some of this may seem pretty subjective, but there's solid, tangible logic here, too. In a highly perceptive recent article, *The Economist* warned that a "monetary ratchet" has now reached "its logical conclusion"<sup>8</sup>. This process is pretty simple, at least in theory. Regulatory policy is relaxed, rates are low, borrowing expands, and an asset bubble is pumped up. After it bursts, fears of economic slowdown prompt the authorities to cut rates, credit becomes cheap and plentiful, another bubble emerges, then bursts... and so it goes on. Now, though, we seem to be reaching the end of this

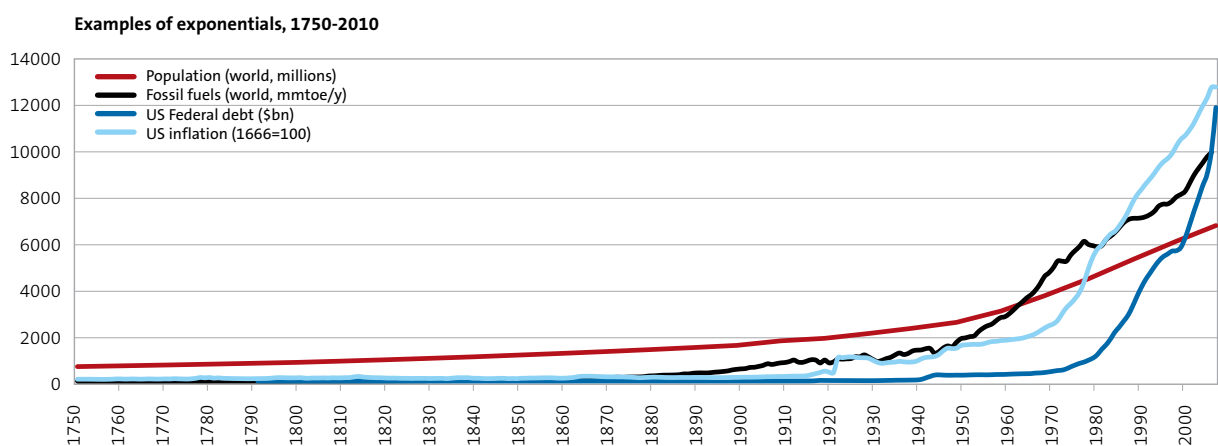
spiral. Rates are about as low as they can get, which essentially neutralises rate-setting as a policy tool. Instead, governments are printing money, which surely represents *the pre-inflationary end-game of the "monetary ratchet"*.

To us, and to those who share our core philosophy, there's another issue to be considered here, which is the process of 'dangerous exponentials'. "The farther back we look", as Winston Churchill said, "the farther forward we can see". Our research philosophy is that, to understand really important dynamic trends, investors need to

escape from the straitjacket of short-term analysis and look instead at ultra-long-term economic evolution.

Seen from this perspective, it becomes apparent that the economy is dominated by a series of exponential progressions which concern both financial indicators (such as inflation and debt) and a string of critical non-financials (including population growth, energy consumption and resource depletion). The exponential nature of just four of these data series is very evident in fig. 5.

Fig.5: Ever upwards? – 'dangerous exponentials'



\*Source: Tullett Prebon calculations from various sources

<sup>7</sup> We addressed the issue of sequential bubbles in Tullett Prebon Strategy Insights, issue three, *Forever Blowing Bubbles*, February 2010

<sup>8</sup> *The Economist*  
[www.economist.com/blogs/buttonwood/2010/06/economic\\_growth\\_money\\_supply\\_and\\_energy](http://www.economist.com/blogs/buttonwood/2010/06/economic_growth_money_supply_and_energy)

Our ‘dangerous exponentials’ thesis identifies two critical macroeconomic issues, both of which appear to be hidden from investors and policymakers by their own short-term time referencing. First, the financial system seems to be firmly in the grip of a series of exponential processes which are surely reaching their limits (an interpretation which exactly dovetails with the “monetary ratchet... logical conclusion” point made by *The Economist*).

Second, **the economy is essentially an energy construct**, with access to exogenous energy creating the economic surplus (a surplus, that is, over and above the requirement for bare survival) which is what the modern, specialised economy is really all about. Whilst we do not believe in a ‘Peak Oil’ doom thesis, we *do* believe that the critical equation, which is *the relationship between energy extracted and energy consumed in the extraction process*, is deteriorating markedly.

If a deterioration in the energy returns equation is clearly one of the two great threats facing the economy going forward, the other is the intrinsic contradiction implicit in exponentially-growing financial aggregates which, logically, cannot go on growing indefinitely. An economic system which, by its

nature, *must* grow, seems to be approaching a collision, not just with simple mathematics, but also with a finite resource set which can *not* grow.

This, we must emphasise, does *not* make us in any sense Malthusians. Far from believing that solutions cannot be found, we are confident that they can be. But what we *do* contend is that **we are entering a period of unprecedented change**, in which all prior assumptions, all structures and all political and social relationships will need to be reconfigured, rethought and, in many cases, completely replaced.

### smoke and mirrors

The exponentials process should be seen in the context of a point made earlier, which is that, even in the short term, there seems to be a huge disconnect between, on the one hand, generally positive official macroeconomic data (on output, growth, inflation and unemployment) and, on the other, both everyday experience and economic logic. How can we reconcile this apparent mismatch, what conclusions can we arrive at, and how might this relate to a possible ‘denouement of exponentials’?

As Sherlock Holmes famously said, “when you have eliminated the impossible, whatever remains,

*however improbable*, must be the truth”<sup>9</sup>. The seemingly improbable truth in the conundrum identified here is that *official data is by no means as reliable as investors generally assume*. Indeed, the widespread assumption that ‘this information must be accurate, because it comes from the government’ shows an almost childlike faith (indeed, surely a naïveté) that is alien to investors in every other facet of their activities.

Yet a detailed perusal of the evolution of US official data, summarised in part three of this report, shows that this data is not remotely as reliable as seems to be almost universally assumed. Through an accretion of incremental distortions, government statistics very materially flatter the underlying reality. Innovations such as hedonics, substitution and geometric weighting – each of which is explained later – have distorted reported inflation such that published numbers understate the real position by at least six percentage points (so yes, we can indeed dismiss any notion of deflation).

If inflation data is this heavily distorted, calculations of real GDP growth would be way off beam even if the GDP numerator itself did not include, as it does, its own hefty distortions. These, collectively, are termed ‘imputations’, and include

“owner equivalent rent”. If you own your property outright, and hence make no mortgage or rent payments, you might assume that nothing relating to your property appears in GDP. This isn’t the case, because the Bureau of Economic Analysis (BEA) calculates and includes the rent that you would have been paying (presumably to yourself) if you *didn’t* own the property. (Small wonder that the tax base, as recorded by the IRS<sup>10</sup>, bears ever less resemblance to output supposedly measured by GDP).

Debt is hugely understated in that it excludes enormous off-balance-sheet obligations, and the rate at which these obligations are being

accumulated dwarfs the published fiscal deficit. Unemployment has been routinely understated since the 1960s, not least because “discouraged workers” are excluded from the totals.

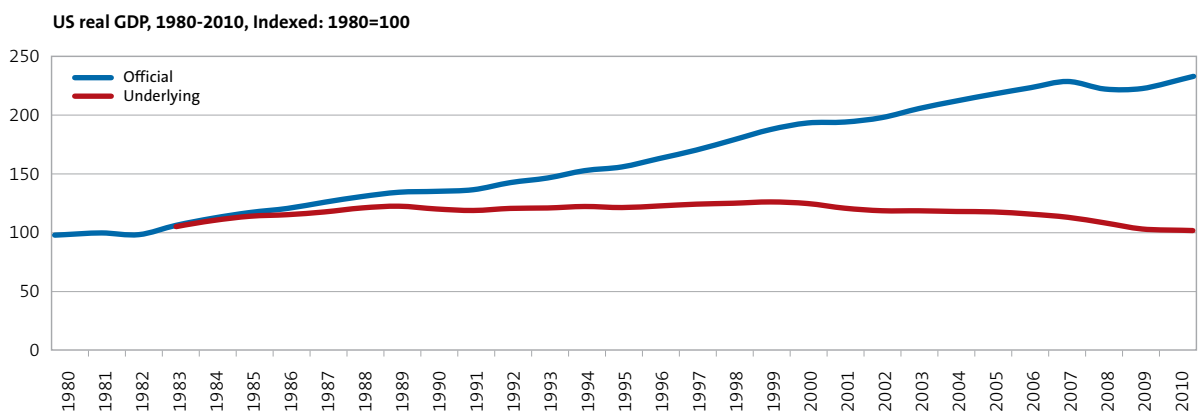
Stripped of these various distortions, the picture which emerges is extremely disconcerting. Indeed, *the underlying reality is barely recognisable to anyone who customarily bases his assessment of the American economy on official data.*

US unemployment, for example, though reported at 9.7%, actually exceeds 21% when we add back artificially-excluded categories such as “discouraged workers”. Inflation, despite trending lower, continues to

exceed 7%, making an inflationary take-off look very likely indeed. Real growth in the American economy was minimal in the 1990s, and *has been negative over the last decade.* According to some estimates, Federal obligations exceed \$69 trillion (5.4x GDP), and are rising by more than \$4 trillion annually.

Just one example of the extreme mismatch between official and underlying data is set out in fig. 6, which indexes real GDP from 1980. In stark contrast to published data, underlying calculations suggest that American economic growth was pretty minimal in the 1990s and has, since then, *gone into reverse.*

Fig. 6: Statistical distortion? US real GDP since 1980\*



\*Source: Tullett Prebon calculations based on data from Shadowstats.com

Lest it be thought that the US is in any way unique where these rather frightening numbers are concerned, we must emphasise that distortion of official data almost certainly occurs in many other countries.

Rather, we focus on the US in this study for two main reasons. The first of these is the **transparency** that some diligent, public-spirited analysts have managed to bring to the situation. The second is the sheer **importance** of the US which, quite apart from having the world's reserve currency and accounting for a quarter of global economic output, is the standard-bearer for the dominant *laissez-faire* economic orthodoxy.

Following a recapitulation of our exponentials thesis, and a detailed investigation of the reliability (or otherwise) of official economic data, part four of this report poses two questions which are a great deal easier to ask than they are to answer. First, *where are we now?* Second, *what comes next?*

### where are we now?

The answer to the 'where' question is pretty disconcerting, though we are convinced that there is nothing whatever to be gained by burying our heads in the sand and hoping that these issues will go away. They won't.

Essentially, we believe that the dangers intrinsic in the exponentials process, far from lying at some unspecified point in the future, *have already begun to kick in*. According to this interpretation, several Western economies have gone ex-growth, and may have reached this stage as much as ten years ago. Since then, these economies have been maintaining an illusion of continuing expansion, with 'real' productive growth increasingly supplanted by escalating indebtedness, supplemented in some cases by misleading presentation.

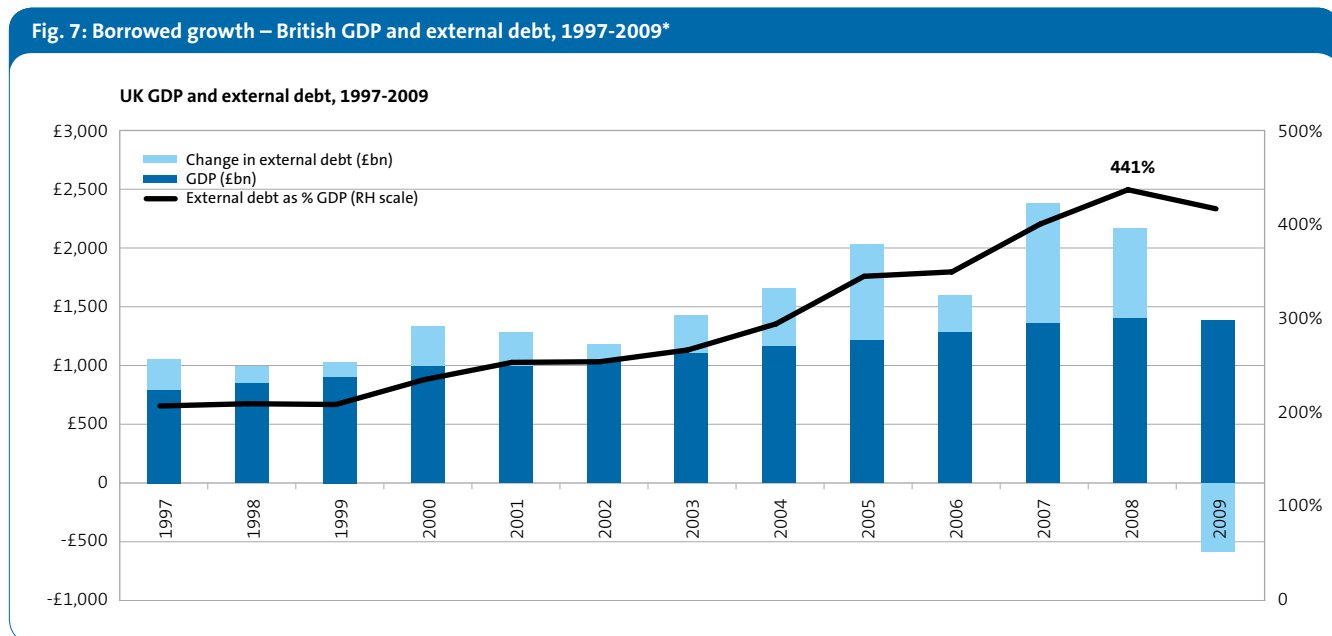
In underlying terms, what has been happening is that **the logical end-point of the exponentials process has been reached**, at least where the main economic aggregates are concerned. For a start, and by no means just in the US, official data has been understating inflation and, consequently, overstating growth. This distortion process would not, of itself, have been sufficient to maintain the illusion of continuity, because there are real, physical components to any economy – we cannot import, say, food or energy using misleading percentages. So, as a counterpart to illusory data, Western economies have been incurring two linked forms of debt escalation, each of which is fundamentally dishonest.

To understand how this works, we must draw a distinction between *formal* borrowing (instruments, like bonds, which specify precise monetary debts with defined contractual terms for repayment) and *informal* borrowing (typified by future pension and welfare commitments). A further important distinction needs to be drawn between internal and external debt, with the latter posing far more of a problem than the former.

First, Western countries have been increasing their formal indebtedness, borrowing the surpluses of emerging nations (most notably China and other Asian countries). This borrowing has been used to sustain levels of consumption which have become increasingly disconnected from productive output. (We could put this much more simply by saying that Western consumers have been living far beyond their means). When American politicians bemoan – as Mr Obama did during his campaign – the ultimately futile practice of borrowing from Asia to buy oil from the Middle East, what they are identifying, and quite rightly, is *borrowed consumption*.



Fig. 7: Borrowed growth – British GDP and external debt, 1997-2009\*



\* Sources: Office for National Statistics and HM Treasury

This form of borrowing is palpably dishonest, because it is based on an implied willingness and ability to repay these debts at some future stage, even though it is surely pretty obvious that full repayment is almost certainly impossible, meaning that *soft default* (through inflation) is the *overwhelmingly likely outcome*.

Second, and just as insidiously, Western economies are piling informal borrowings onto future generations, promising future welfare and pension benefits that cannot conceivably be delivered without massive tax

increases. This is a *double-con of future generations*, who will be expected to shoulder their predecessors' debt burdens whilst at the same time discovering that they cannot conceivably expect the same standards of living that those predecessors enjoyed.

According to economics conventions, gross domestic product consists of the sum of private consumption, government consumption, investment and net exports ( $GDP = C + G + I + E$ ), but this equation leaves out borrowings, which have massively

supplemented consumption over the last decade. Even if all other things were to remain equal – which, of course, they have not – then a simple reduction in the *rate* at which debts are being accumulated will reduce consumption and hence economic output, with any movement towards net debt *reduction* obviously having an even more marked impact. A **fundamental difference between the latest recession and all of its post-War predecessors is the deleveraging nature of the most recent downturn.**

All previous recessions since 1945 have been de-stocking events, in which businesses cut back their inventories and their capacity in response to (or in anticipation of) lower demand. In this situation, Keynesian demand stimulus can indeed smooth the performance of the economy. But when the issue is deleveraging – consumption weakening as individuals and businesses retreat from over-borrowed positions – the traditional Keynesian stimulus approach will not work, and could exacerbate the situation, since one obviously cannot borrow one’s way out of excessive debt.

Though this report looks most closely at the US, the British experience has been a striking example of the ‘borrowed growth’ process (see fig. 7). Between 1997 and 2008, the UK borrowed almost £4 trillion from overseas, equivalent to 29% of nominal GDP over the same period. At its peak in 2007, the increase in external borrowings equated to 70% of GDP during the same year. Reflecting this process, gross external debt increased from 181% of GDP to 441% in the space of ten years.

What was happening here was that, from the turn of the century, the UK operated an excessively relaxed financial regulatory regime whilst at the same time maintaining irresponsibly low interest rates.

Given minimal incentives to save – not just because of low rates, but also because of punitive imbecilities in the fiscal regime<sup>11</sup> – Britain naturally sucked in huge quantities of overseas borrowings.

Much of this was in turn channelled into irresponsible mortgage lending, which fed through into *apparent* GDP in two main ways. First, it gave a huge (though, of course, an unsustainable) boost to a gamut of property-related trades, including building, furnishing, real estate agency and legal services. Second, it fed through into consumption via equity release, with homeowners increasingly using their properties as cash-card machines (ATMs). In 2007, for instance, only 35% of new mortgage issuance was actually being used for the purchase of homes<sup>12</sup>.

For those prepared to look at the appropriate data, all of this was clear enough all along, because *each year’s nominal increase in sterling GDP was exceeded by the same year’s increase in overseas indebtedness*. At the same time, the then government seems to have believed that this borrowed growth was genuine and sustainable – that “boom and bust” had been abolished – since this rationale seems to have underpinned the reckless increase in public expenditure over the same period.

When this unsustainable process unravelled – which it would in due course have done, by the way, even *without* the catalyst of the global banking crisis – the British government found itself in a cleft stick. Reductions in rates seemed imperative, in order to try to keep a credit-and-consumption economy going. Public spending, meanwhile, could not be cut, because the automatic stabilisers would have driven it upwards even if Keynesian calculation had not.

This process has necessarily reached its denouement, with the new coalition government confronting an unsustainable deficit via spending cuts in the knowledge that the alternatives would undoubtedly be even worse. There have been victims all along, of course, including savers, but *the main effect has been to burden future generations with huge levels of formal and informal debt*. The ultra-short-term, ideological and incompetent management of the British economy between 2000 and 2008 was a deeply unedifying spectacle, but one for which consumers were nearly as much to blame as the then government.

<sup>11</sup> Such as the long-established practice of taxing interest as “income”, exacerbated by the notorious 1997 tax “raid” on pension funds

<sup>12</sup> Of the remainder, 39% went into equity release and 26% was invested in buy-to-let. Source: Financial Services Authority (FSA), Address by Adair Turner – *The Mortgage Market: Issues for Debate*, 12th May 2009

Of course, the UK was by no means alone in this process, and the quantitatively largest foul-ups have been made in the US. Like London, Washington seems to have exhibited total economic myopia in the 2000-08 period, believing, again on the basis of illusory economic strength, that it could combine tax cutting with the hugely expensive conduct of two essentially unwinnable wars. Mistakes of the magnitude of those which have occurred in the US, the UK, Ireland, Iceland and elsewhere don't 'just happen', by the way – bringing this sort of situation into being requires almost surreal levels of incompetence and myopia.

Another process has been disturbingly evident in the US, the UK and several other Western economies, a process which has been termed "financialization". Looking back at past 'end-of-Empire' examples – such as Spain in the sixteenth century, Holland in the late seventeenth and Britain in the early twentieth – highly regarded political analyst Kevin Phillips has identified, in each instance, a consistent pattern in which productive activities are displaced, within the economic mix, by various forms of moving money around. In the case of Spain, the vast influx of bullion from

the New World was largely responsible, but much the same thing happened both in the Netherlands and in Britain at similar developmental stages.

A similar process, Mr Phillips explains, has now happened in the US, where the proportionate importance of industry has declined just as the role of finance has expanded. In 1950, manufacturing accounted for almost 30% of American GDP, and finance for less than 11%. This has completely reversed, such that finance now provides a fifth, and manufacturing less than 12%, of US economic output<sup>13</sup>.

This trend presents another dimension of the uneasy relationship between Wall Street and Main Street. More importantly, it tells us a great deal about the nature of the American economy just as the exponentials process starts to unwind.

### what happens next?

This report sets out the findings of what has been, by a very wide margin, the most challenging strategy research project that we have thus far undertaken. In *Dangerous Exponentials*, we set out to explore the core dynamics driving the global economy, explaining that **the economy comprises an exponential progression founded upon what is essentially an energy**

**dynamic**. In that report, we concluded that these exponentials were indeed dangerous, first because *the energy foundation is weakening* (as energy returns deteriorate), and, second, because of *the intrinsic mathematical impossibility* of extending financial exponentials indefinitely. We concluded, somewhat tentatively, that, at some indeterminate point in the not-too-distant future, the exponentials process could go into reverse, fracturing the fragile economic and social construct.

Here, we go a great deal further, explaining our belief that **the denouement of exponentials has already begun**, at least in many leading Western economies. The fact that most investors and policymakers are blissfully unaware of this situation can be explained in terms of the ultra-short-term basis on which they assess situations and plan future strategies, combined with the weaknesses of the data upon which their assessments are founded. Provided only that the much-vaunted spectre of 'Peak Oil' isn't an imminent threat – which, *expressed simply as a reserves equation*, it isn't – then policymakers look no further where fundamental dynamics are concerned. To be sure, they are aware of escalating debt, but believe that this

<sup>13</sup> Financialization\* – percentage contributions to US GDP, 1950-2008\*

	1950	1960	1970	1980	1990	2000	2005	2008
Manufacturing	29.3%	26.9%	23.8%	20.0%	16.3%	14.5%	11.9%	11.5%
Finance	10.9%	13.6%	14.0%	15.9%	18.0%	19.7%	20.4%	20.0%

\*Sources: *Economic Report of the President, 2010*, table B-12, and Kevin Phillips, *Bad Money*, 2009 edition, page 31

can be managed or, at the very least, can be put on the back-burner whilst there are more immediately-pressing issues to be tackled.

As a result, stop-gap expedients – such as unsustainable (and fundamentally dishonest) borrowing both from foreigners and from posterity, have enabled the illusion of normality to be sustained even though **the exponentials process has already begun toppling over**. Stripped both of distortion and of borrowing, real economic output in many Western economies has been either flat or in decline for at least a decade. Continuing increases in consumption have been simply **the greatest-ever example of entire societies living beyond their means**.

The ‘normality delusion’ does not prevent some, at least, of the unpleasant realities filtering through into the Western consciousness. Most of us are uneasily aware of several siren factors. One of these is that the real living standards of the majority of Western consumers are declining, whatever the published statistics may say.

Another is that Western economic influence is in steep decline, something which it is all too easy to attribute

simply to growth in emerging countries. **The West’s commercial, political and even militarily superiority seems to be ebbing away**. When Barack Obama notes the absurdity of the US borrowing from China to buy Middle Eastern oil, or when David Cameron goes to India as a supplicant for a ‘special relationship’, we are seeing evidence not just of under-performance but of absolute decline.

Yet delusions still abound. Most Western citizens, like the White Queen in *Through The Looking Glass*, continue to “believe in six impossible things before breakfast”<sup>14</sup>. Amongst these ‘believed impossibilities’ are the mistaken beliefs that:

1. **Western economies are getting richer**, when in reality they are not.
2. **Western welfare systems can continue indefinitely in their present form**, which is not remotely feasible.
3. **The escalation of public and private debt can continue indefinitely**, which obviously it can not.
4. **Each successive generation will enjoy higher living standards than their forebears**, which has already ceased to be the case.

5. **Western countries’ elected leaders have a long-term plan** founded on realistic data and expectations, whereas *we see no evidence of any such fundamental preparedness*.
6. **Technology will ride to the rescue**, which cannot happen without major structural change. (It is even believed, by many, that technology will somehow overcome global pressures on food supplies, on energy availability and on the environment).

There is a surfeit of economic theories and prescriptions, but most seem to assume essentially static fundamentals – in other words, that what is required is better management of the same structure, not fundamental changes to basic assumptions.

If, as we argue here, **each of the above assumptions is profoundly mistaken**, we need to look towards a future economic structure which is static rather than growing, where neither Keynesian demand management nor *laissez-faire* economic liberalism works as theory says that it should, and where *deleveraging becomes debt destruction*.

<sup>14</sup> Lewis Carroll, *Through The Looking Glass* (1871), chapter five

“Nos numeros sumus et fruges consumere nati”.  
(We are just statistics, born to consume resources)

Horace<sup>15</sup>



# part two:

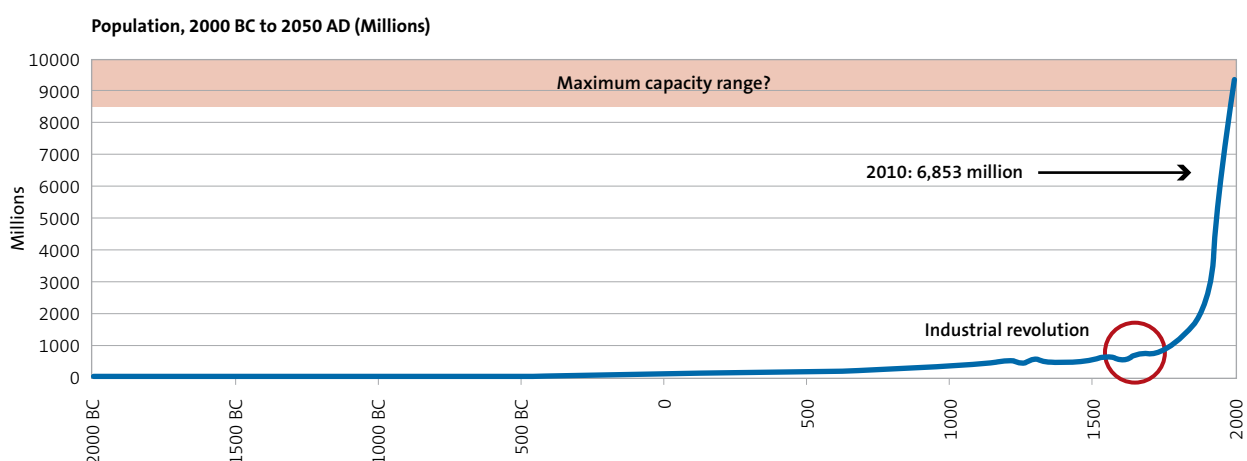
## fundamental dynamics, exponential drivers

- A fundamental assessment of the global economy reveals that it is governed by two categories of 'exponentials' – the exponential expansion of physical metrics (such as population and resource use), and an exponential financial system characterised by accelerating expansion in datasets such as debt and inflation.
- Ultimately, *the economy is an energy surplus equation*, and social sophistication is a product of the way in which exogenous energy has leveraged human efforts.
- The exponentials-based economic system faces two linked threats. The first of these is the potential for a collision between, on the one hand, an economic system which requires perpetual growth and, on the other, a finite resource set.
- The second (and more imminent) threat comes from the internal mathematical contradictions of a system which is increasingly turning to debt to sustain consumption in the face of static real output.

At its very simplest, the exponential function states that any chart of a linear percentage progression eventually turns into an exponential, 'hockey-stick' or 'J' curve.

One of the best examples of an exponential progression is the global population (fig. 8). Historians estimate that the world population was about 170 million in 2000 BC, and that this number increased only very gradually thereafter, reaching 254 million by 1000 AD. By the late eighteenth century, the global population was approaching 700 million, but did not reach the first billion until the 1830s<sup>16</sup>.

Fig. 8: Going exponential – world population



\*Source of population data: US Census Bureau

Thereafter, population growth really took off. Whilst it had taken thousands of years to reach the first billion, the second billion was achieved in the 1920s – that is, adding the second billion took about ninety years. The third billion was added in thirty years, the fourth in less than twenty years, and so on. From the mid-nineteenth century, the population growth chart turns into a characteristic exponential ‘hockey-stick’ shape. The current population total is about 6.85bn, and this is expected to increase to 7.6bn by 2020, and 9.3bn by 2050, the latter representing an increase of more than one third from a current number which has itself doubled since the late 1960s.

Since the earth’s resources – such as land, food production capacity, energy and, perhaps most important of all, fresh water – are *not* infinite, it is logical to wonder whether the population trajectory might at some

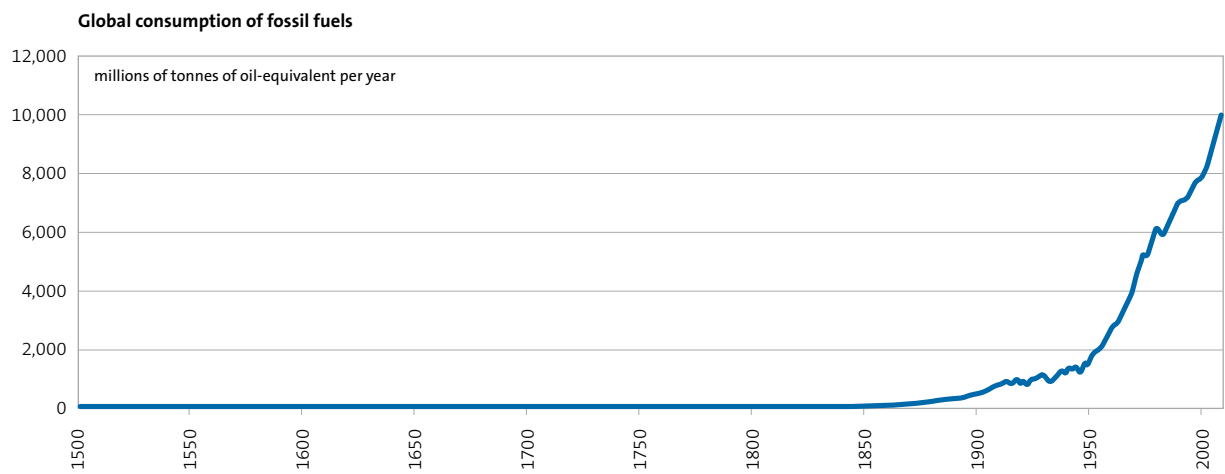
point collide with a physical constraint, and some specialists believe that the earth’s ‘carrying capacity’ may be limited, with estimates varying between perhaps 8.5 bn and 11 bn. This range is superimposed on fig. 8.

Of course, such concerns are by no means new, and experience over the last two centuries has been that food production capacity has expanded even more rapidly than the global population. Optimists would therefore maintain that the rapid expansion of the population need not pose a problem, even if the absolute rate of growth (about 70 million annually) seems daunting. Moreover, optimists contend, fertility rates are dropping as living standards and levels of education improve, such that the global population may top out at somewhere between nine and ten billion somewhere in the middle of this century.

### exponential energy use, finite resources

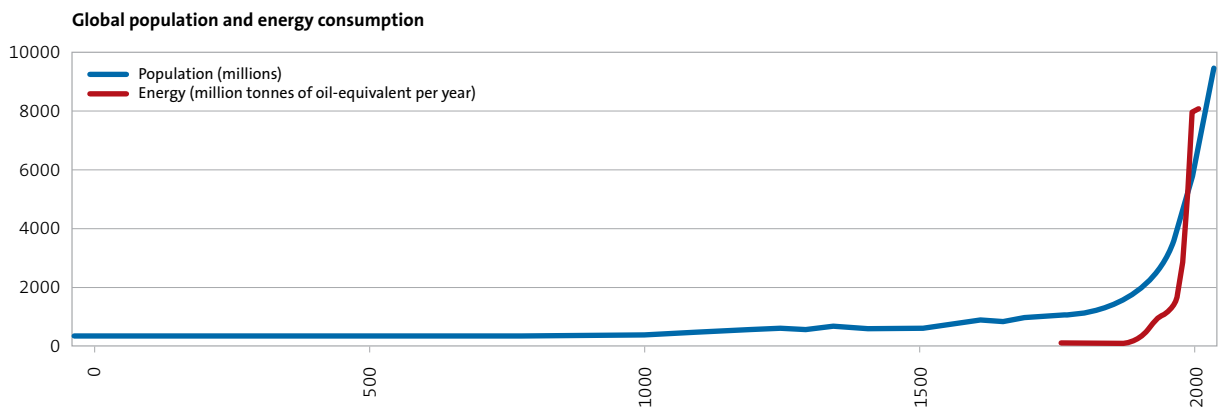
Unfortunately, this interpretation may be at odds with another, potentially unsustainable exponential, which is the rapid expansion in the global consumption of fossil fuels, as summarised in fig. 9. Though shown on a much shorter time-scale than the chart of population, **energy usage nevertheless displays a distinctive ‘J-curve’ exponential trajectory.** Fig. 10 makes the relationship between the two curves explicit, showing how both global population and the consumption of fossil fuels have risen, in tandem and exponentially. In fact, energy consumption has increased *more rapidly* than the population, reflecting a rising energy intensity which parallels – again, quite un-coincidentally – increasing living standards, albeit very unevenly distributed.

**Fig. 9: The energy exponential\***



\*Source: Tullett Prebon calculation from a variety of sources

**Fig. 10: No coincidence – the population and energy exponentials\***



\*Sources: See preceding charts

There are two wholly valid explanations – a simple one, and a more fundamental version – which explain the relationship between population numbers and the consumption of fossil fuels. The simple explanation is that **the ‘green revolution’** – the dramatic expansion in food production over the last two centuries – **has been almost wholly energy-driven**. Across the gamut of its activities, modern agriculture is massively (and increasingly) energy-intensive, relying hugely on mechanised planting, cultivation, processing and distribution, and on extraneous inputs such as fertilisers and pesticides. All of these inputs are energy-dependent (through extraction and delivery) even when they are not sourced directly from hydrocarbons. The ability of the earth to feed 6,900 million people, where two hundred years ago it fed less than 900 million, is a direct function of the availability of energy-derived inputs.

But the energy-population nexus goes much deeper than the simple energy dependency of modern agriculture. Essentially, **the entire economy is an energy equation**.

To understand this concept, we need to go back to the most primitive form of human existence, which was

the hunter-gatherer system prior to the invention of agriculture. All of the energy derived from food was consumed in catching and finding that food. There was no energy surplus at an individual level and, since every single individual (or family unit) was fully engaged in the obtaining of food, there was no specialisation, and no society.

The development of agriculture, which probably began in the ‘fertile crescent’ in about 9,500 BC, was one of the two greatest steps forward in human existence. In addition to allowing population densities to increase from the maximum of about one person per km<sup>2</sup> under the hunter-gatherer system, agriculture liberated surplus energy. Though nearly as energy-intensive as the hunter-gatherer form of existence, agriculture delivered proportionately major improvements in energy efficiency by (a) utilising the energy of animals, and (b) harnessing economies of scale.

Essentially, because the labour of four individuals or families could now support five individuals or families, agriculture created the first ‘energy surplus’. This in turn made possible some very modest forms of specialisation, which included rudimentary structures of government

and law together with a limited number of specialist trades such as miller, smith and shoemaker.

Progress over the subsequent millennia was evolutionary rather than revolutionary, with a gradual enhancement of agricultural efficiency driving slow increases in social specialisation and complexity. Society was still overwhelmingly agrarian, and boasted very little specialisation, in the late eighteenth century, when the second great step forward occurred – the discovery of the heat engine, initially in the form of steam-power derived from coal. The crucial point to note about the harnessing of coal – and latterly of other fossil fuels such as oil and natural gas – was that **the energy equation altered drastically from the agricultural model**.

Agriculture itself was made vastly more efficient, initially through the use of motive power and latterly through the introduction of hydrocarbon-based fertilisers and pesticides. Within a hundred years of the first commercial use of steam-power, the proportion of the populations of most developed countries engaged in farming had fallen to less than ten percent. Specialisation had arrived, courtesy of the harnessing of the energy contained in fossil fuels.

The overwhelmingly important point to grasp from this lightning tour of social and economic evolution is that **there is an essential connection between all forms of energy**, which include food and human labour as well as exogenous forms of energy such as fossil fuels. There is, as we shall see, a further direct linkage between energy and the monetary economy. Before that, however, we need to look a little further into the energy dynamic, bearing in mind that **social specialisation and complexity are direct functions of surplus energy**.

What would happen, then, if the exponential progression of energy consumption ceased to function? Might specialisation and social complexity – and therefore the economy as a whole – unravel and start going backwards if the exponential energy equation were to go into reverse? After all, and as we shall see later, we have now built a towering *financial* superstructure on top of an essentially energy-based social and *economic* dynamic.

Some analysts believe that this unravelling is exactly what is in store for the economy if – or rather, in their analysis, *when* – we hit ‘Peak Oil’. This concept, pioneered by American geologist M. King Hubbert, contends that, at some time in the relatively near future, we will have consumed half

of all originally-available reserves of oil. At that point, Hubbertians argue, the supply of oil will decline, in pretty much a mirror-image of the increase in consumption which has taken place since the 1850s. Much the same, they argue, will eventually happen to supplies of natural gas and of coal, with depletion of these resources accelerating as a result of substitution from oil.

Advocates of the Peak Oil thesis argue that there is a direct time-linkage between rates of discovery and subsequent trends in production. For example, petroleum discovery rates in America’s lower forty-eight states peaked in 1930, and peak production occurred forty years later, in 1970, since when output has declined relentlessly. Since the global peak discovery rate occurred in the mid-1960s, it is argued, a similar time-lag implies that global Peak Oil is now imminent.

Whether or not one agrees with the Hubbertian thesis, we are in no doubt that the future outlook for fossil fuel availability is critical, because the economy is, ultimately, an energy-driven construct. Are the ‘Peakniks’ right to argue that when, in the very near future, we reach the point at which half of oil originally-recoverable oil has been produced, production must go into inevitable decline?

The first flaw in the ‘half-way’ argument is that it is simply not true. The application of the Hubbert thesis at this time implies that the original reserves base was of the order of 2.2 tn bbls (trillion barrels), whereas ample evidence exists to suggest that the originally-recoverable reserves base was of the order of 3.0 to 3.5 tn bbls, and possibly much larger. Whilst the Hubbertian case has merit if it is applied to conventional oil – light, sweet crudes which can be extracted relatively easily – its adherents tend to overlook the seemingly incontrovertible evidence that huge quantities of *unconventional* oils remain to be extracted.

These include tar sands in Canada, which are estimated at not less than 170 bn bbls (billion barrels), shales in the US (perhaps 800 bn bbls), and perhaps 350 bn bbls of ultra-heavy crudes in Venezuela. There may indeed be significant *overstatements* of reserves in other countries (and most notably amongst OPEC nations, the legacy of a period in which production quotas were allocated pro-rata to claimed reserves), but the overall picture, *when non-conventionals are included*, is one of a comparative abundance of recoverable reserves.

If the reserves numbers are one weakness in the Peak Oil argument, the other is the inevitability that a supply squeeze would, via the price mechanism, prompt very major changes in consumer behaviour. In a government-sponsored analysis that essentially leans towards the concept of an oil production peak, Robert Hirsch argued that there is a great deal that can be done to mitigate the economic impact of oil shortages, *always presupposing that action is taken at least ten years ahead of the event*.<sup>17</sup> Oil scarcity would trigger fundamental social and economic changes, which include the reversal of a trend towards suburbanisation and a reversion to denser forms of habitation. The thirstiest vehicles would rapidly be consigned to the scrap-heap, and the transport balance would swing decisively from private car ownership towards greater use of public transport.

Peak Oil is not, we believe, a near- or medium-term threat, but **no-one should be lulled into complacency by seemingly-abundant oil reserves**. Rather, the issue is one of *resource constraint*, which is likely to be reflected in deliverability and cost rather than in the absolute availability of producible reserves.

A comparison between conventional oil production in Saudi Arabia and tar sands in Canada illustrates this

point. Given that Saudi production capacity is about 12 mmb/d (million barrels per day) from reserves of some 270 bn bbls, one might, on a simple pro-rata basis, expect 170 bn bbls of Canadian oil sands reserves to produce perhaps 7 mmb/d. But the reality is that output is most unlikely to reach even 3.5 mmb/d. Deliverability from the Canadian resource, will, then, be less than half of that attained from conventional reserves in Saudi Arabia.

Essentially, oil reserves have been cherry-picked, with the cheapest, highest-quality and most accessible resources exploited first. This means that production levels might hit a ceiling in the relatively near future even if reserves remain substantial. It also needs to be remembered that net changes in output represent a two-piece equation – substantial new sources are needed each year simply to replace natural declines from already-producing fields. As the industry moves from higher- to lower-deliverability fields, maintenance of existing production levels, let alone growth, becomes ever more difficult. Further implications naturally include higher costs and greater risks, as the exploration and development focus swings towards reserves in ever more technically-challenging locations.

According to OPEC, global consumption of oil is likely to rise to 108 mmb/d by 2030, a 27% increase from the

output in 2009 (84 mmb/d)<sup>18</sup>. We are by no means convinced that this is achievable, with our research inclining us to agree with M. Christophe de Margerie, CEO of Total, who has questioned the ability of the industry to exceed 100 mmb/d<sup>19</sup>. Within a projected 24 mmb/d increase in supply, it is assumed that no less than 16.9 mmb/d will come from OPEC countries, but a net increase of this magnitude might be difficult to achieve given that Saudi Aramco now admits that it is injecting 13 mmb/d of treated seawater, most of it to sustain production at its giant (but ageing) Al Ghawar field, historically the source of about half of the kingdom's production.<sup>20</sup>

Another way to look at the deliverability issue is that reserves need to be quality-weighted. We may have used up much less than half of the world's originally-recoverable reserves of oil, but we have, necessarily, resorted first to those reserves which are most readily and cheaply recovered. The reserves that remain are certain to be more difficult and costlier to extract.

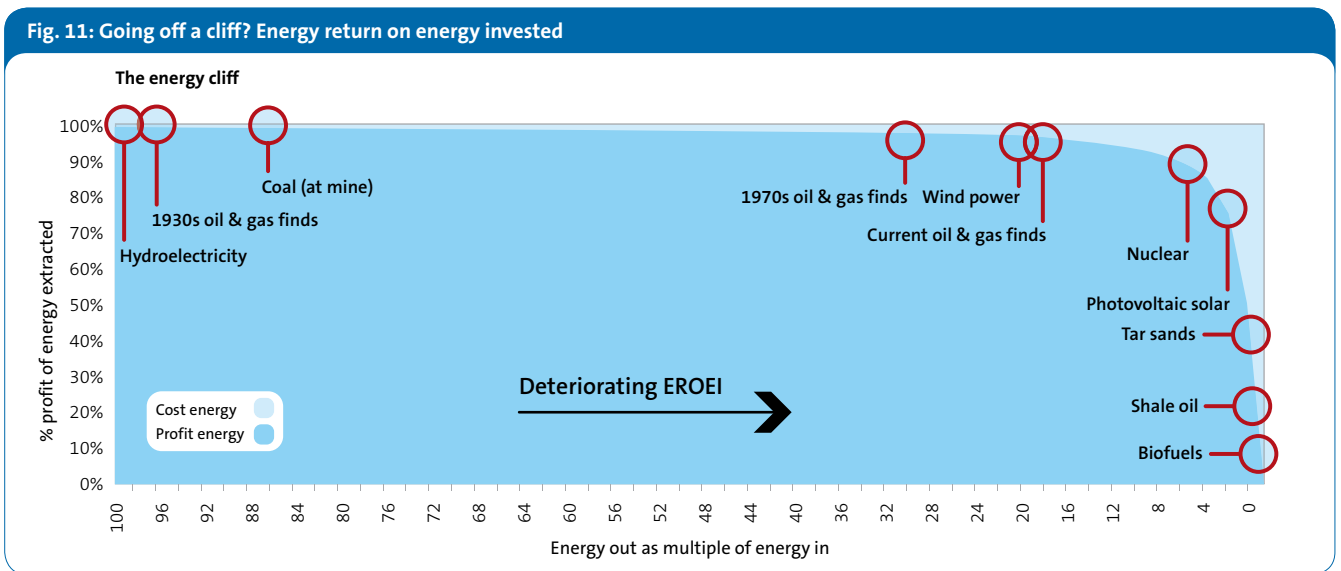
And this issue of quality weighting links directly to the key determinant, which is not volume in the absolute but, rather, **the relationship between energy produced and energy consumed in the production process**. Although the emergence of resource scarcity is likely to trigger big increases

<sup>17</sup> See Robert Hirsch et al, *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*

<sup>18</sup> [www.opec.org/home/](http://www.opec.org/home/)

All figures used here exclude processing effects

Fig. 11: Going off a cliff? Energy return on energy invested



in dollar oil prices, price-based analysis is inadequate in this context – we can always print dollars, but the real issues here are hard physical constraints. The same is true of supposed substitutes for oil, such as biofuels. An effective assessment of the future outlook for energy inputs needs to be calibrated in terms of an energy rather than a monetary equation.

It is evident that we need a new paradigm if we are to interpret energy constraint in an economy of exponentials. The appropriate energy-based equation already exists, and is known as EROEI (energy return on energy invested). The theory of

EROEI is extremely simple, but its application is complicated. The basic requirement is that the amount of energy extracted should be divided by the amount of energy involved in extracting it. The problem here is how far the calculation should be carried back up the supply chain.

Our belief is that **the lack of a consistent basis of EROEI calculation is a huge flaw in our understanding of economics.** Indeed, we think that the lack of a definitive and standardised EROEI methodology is **the greatest single shortcoming** in the way in which economic trends are interpreted.

Notwithstanding the lack of accurate calibration, we can develop an approximation of the EROEI landscape, and this can best be depicted in the form of a 'cliff chart' (fig. 11). The horizontal and vertical axes are linked – the horizontal axis is calibrated to EROEI as a multiple, whilst the vertical axis expresses the same calculation by dividing energy output into percentages of 'cost' (energy in) and 'profit' (the surplus of energy out minus energy in).

<sup>19</sup> As reported in the Financial Times, [www.ft.com/cms/s/0/1d725e64-c8d2-11de-8f9d-00144feabdc0.html](http://www.ft.com/cms/s/0/1d725e64-c8d2-11de-8f9d-00144feabdc0.html)

<sup>20</sup> See [www.saudiaramco.com/irj/portal/anonymouse?favlnk=%2FSaudiAramcoPublic%2Fdocs%2FOur+Business%2FOil+Operations%2FProduction+Facilities%2FWater+Injection&ln=en](http://www.saudiaramco.com/irj/portal/anonymouse?favlnk=%2FSaudiAramcoPublic%2Fdocs%2FOur+Business%2FOil+Operations%2FProduction+Facilities%2FWater+Injection&ln=en)  
Until quite recently, the figure cited was only 7 mmb/d

The general pattern which emerges from this approach is highly instructive. Within the oil industry itself, EROEIs are deteriorating as easy-access sources deplete and are replaced by ever more challenging alternatives. Although the cliff chart is not time-linear, the broader energy picture shows steady movement from left to right along the EROEI curve, **with newer sources of energy delivering ever lower returns.** At EROEIs of less than about 15, the energy returns equation drops off a cliff, and the overall average is clearly worsening as traditional high-returns sources are displaced by resources which offer successively lower EROEIs. Tar sands, oil shales and biofuels are on the low-returns end of the equation. An economy characterised by ever-worsening EROEIs is certain to be a vastly weaker generator of value, and its ability to sustain current social complexity would be, at best, debateable.

Slippage along the EROEI curve – and *not* the simple issue of ‘running out of oil’, as some fear – is the clear and present threat to an economy based on dangerously energy-dependent exponentials. To understand how this process might manifest itself, we need to examine the second category of exponential progressions, which is the towering superstructure of financial systems which has been constructed on top of an essentially energy-driven economic equation.

### **exponential money, escalating debt**

In *Dangerous Exponentials*, we explained the exponential nature of the financial system in considerable depth. In the context of this report, there are two key points which need to be appreciated. The first of these is that the financial system is a superstructure built upon an energy equation, and that the development of financial exponentials has developed in tandem with exponential exploitation of exogenous energy. The second is that **the financial system itself has developed exponential characteristics which look increasingly unsustainable.**

The history of money – as a medium of exchange and a store of value – begins millennia before the Industrial Revolution, and money in pre-industrial times was in essence a claim on human labour. Money was, of course, used in payment for work, and those things which could be purchased with it were all the products of human labour either in the past, the present or the future. The fundamental nature of money as a claim on labour remained true after the harnessing of exogenous energy, the big difference being that **energy drastically leveraged the quantum of labour.**

To appreciate this point, the reader need only put one gallon of fuel in his or her car, drive it until the fuel runs out, and then pay someone to push the car back to the start-point. Chris Martenson has calculated that, at

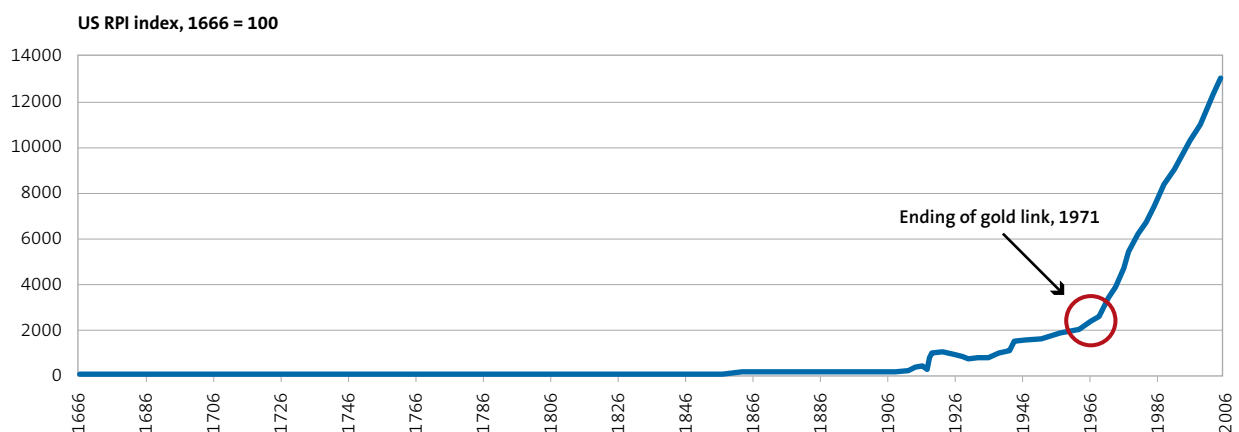
the far-from-generous rate of \$15 per hour, this would cost \$7,500<sup>21</sup>. Since a gallon of gasoline can be purchased for about \$3, it is clear that the abundance of exogenous energy has massively leveraged the economy in relation to human labour. As a further example, one can envisage trying to power domestic appliances using dynamos linked to exercise bicycles propelled by employees. **The energy used in a typical modern home equates to the full-time labour of perhaps a hundred people.** So our economic system is massively leveraged by exogenous energy, the key part of the whole equation being the relationship between energy extracted and the energy consumed in the extraction process.

In other words, **the economy is a function of surplus energy, and money is the medium with which this energy surplus is quantified.** From its origins as a claim on human energy (in the form of labour), **money has become a claim on energy**, past, present or future. At the same time, debt is by definition *a claim on future money*. *So the ultimate nature of debt is that it is a claim on future energy.* A debt-driven system is thus viable if – and *only* if – the energy of the future is sufficient to meet the claims that exist on it. And the payment of interest in turn requires that the money (that is, the energy-claim) of the future has to be greater than it is today. The big nuance to this equation is inflation, a

process by which the real value of money – and hence the value of debt as a claim on future energy – is diminished.

As fig. 12 shows, inflation has taken on its own exponential trajectory. Through much of American history, inflation was minimal, with inflationary spikes (caused by conflicts such as the War of Independence, the War of 1812 and the Civil War) reversed during years of peace. In periods of war, the government tended to print money to meet costs which far exceeded available budgets, but the gold linkage always caused a post-war reversion to something close to pre-war values.

Fig. 12: The destruction of value – the history of US inflation



<sup>21</sup> See Chris Martenson, *Crash Course*

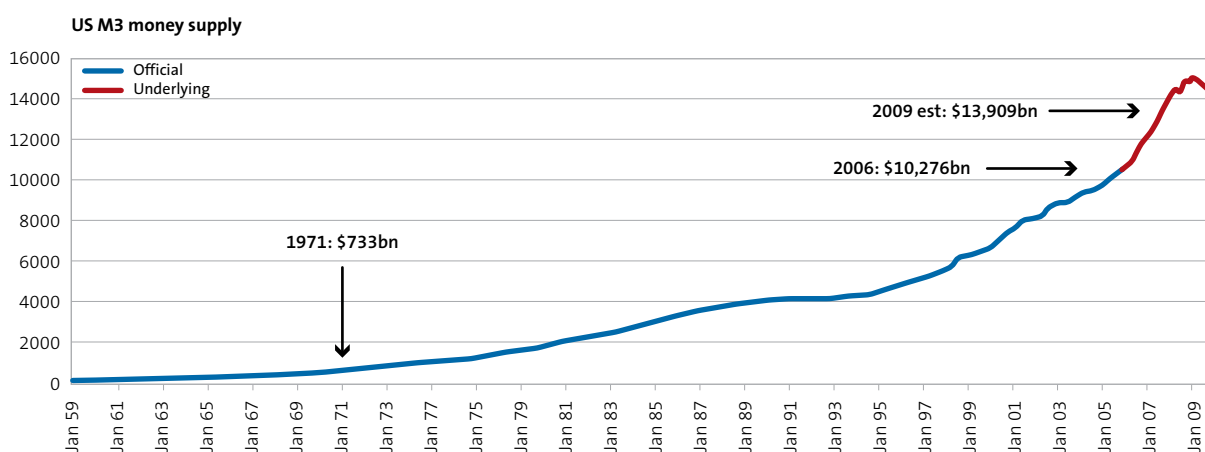
The first big break from reliable gold linkage occurred in 1933, when President Roosevelt confiscated all privately-owned gold in the United States. Americans could buy their gold back, but at a price of \$35/oz, significantly higher than the \$21/oz paid to them in compensation. This amounted to a one-off inflationary burst and, although its immediate inflationary effect was cancelled out by the general deflationary conditions of the period, it is nevertheless a **striking example of the use of inflation to devalue outstanding debts**. At the same time, Mr Roosevelt also unilaterally cancelled all government

obligations payable in gold. Though arguably necessary, these moves showed a preparedness to place expediency firmly ahead of principle.

This was followed, in the post-war years, by the removal of the gold standard by Richard Nixon in 1971. As fig. 12 shows, this opened the floodgates for a massive depreciation in the purchasing power of the dollar, which has lost more than 80% of its value over the intervening four decades. For our purposes, however, the key point to note is that **inflation has taken on unmistakably exponential characteristics**.

Inflation is by no means the only financial example of exponential progressions. Indeed, the entire financial system has exponential characteristics, as can be seen from the charts of American M3 money supply (fig. 13) and Federal debt (fig. 14). The authorities ceased publishing M3 data in 2006 – just when it might have alerted investors to the sheer scale of the financial bubble which was then developing – but John Williams of Shadowstats has continued to calculate and publish it. Though now in retreat (because America is gripped by an essentially deleveraging recession), the chart of

Fig. 13: Exponential money – US M3 since 1959\*



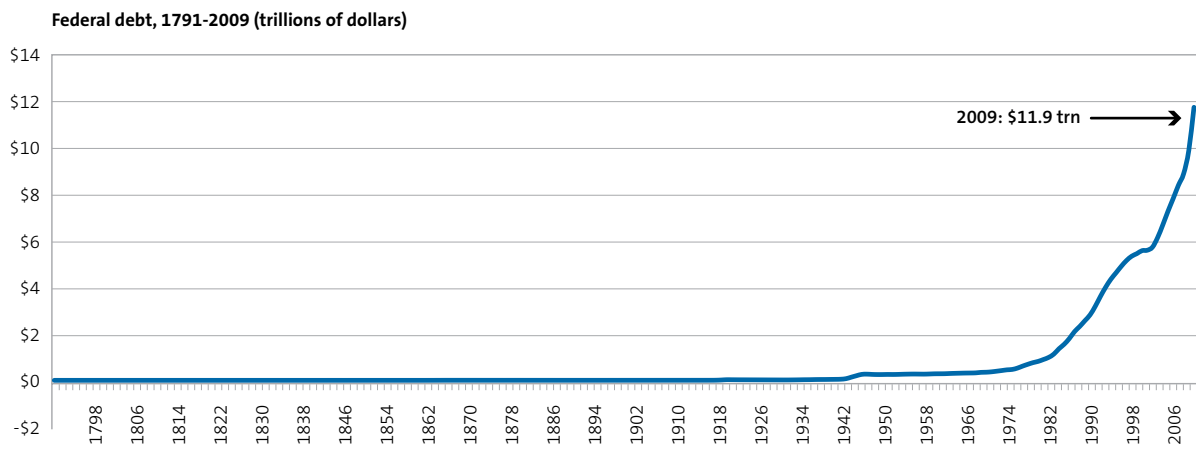
\*Sources: 1959-2006 – Federal Reserve Bank of St Louis. Since 2006 – Tullett Prebon estimates based on Shadowstats.com data

M3 nevertheless reveals a distinctively exponential progression, albeit one that now seems to have hit the buffers.

Expansions in the money supply are, clearly, part of the exponentials equation, and monetarist theory, as championed by Milton Friedman, argues that, if the rate of expansion in the money supply becomes excessive, the *inevitable* result is inflation. Of the 3,800 or so paper currencies which have gone into the dustbin of financial history, almost all have been destroyed by hyperinflation which was itself triggered by excessive growth in the supply of money.

“The economy is a function of surplus energy, and money is the medium with which this energy surplus is quantified”.

Fig. 14: Exponential government – US Federal debt since 1791\*



\*Sources: [www.treasurydirect.gov/govt/reports/pd/histdebt/histdebt.htm](http://www.treasurydirect.gov/govt/reports/pd/histdebt/histdebt.htm)

Historically, destructive inflation has been accomplished by the ‘printing’ of money, a process of which Weimar Germany and modern-day Zimbabwe are just two examples among very many. Since the financial crisis of 2008-09, the printing of money has returned in the form of ‘quantitative easing’ (QE). In the US, QE has boosted the money supply by some \$1.2 trillion, whilst the Bank of England has injected £200bn through QE. More QE can be expected, at least in the US.

Will printing money – for which QE is a euphemism – lead to a take-off in inflation? According to classical monetarist theory, this is *exactly* what should happen, because an increase in the money supply, if it occurs without a corresponding increase in the output of goods and services, necessarily creates inflation.

Fortunately, conventional monetarist theories are somewhat oversimplified, because they leave an important item out of the equation. This omitted item is the velocity of money – in other words, the rapidity with which money is spent. Where inflationary pressures are concerned, the ‘effective money supply’ can be defined not simply as

the stock of money but, rather, as the combination of the quantity of money and *the velocity with which it circulates*.

In the immediate aftermath of the crisis of 2008, the velocity of money dropped dramatically. Not surprisingly, fear and uncertainty prompted banks, businesses and individuals to hoard their cash holdings. At the same time, the usual process of credit creation reversed, and became a process of credit destruction. Optimistically, therefore, QE can be regarded as an appropriate expansion of the *quantity* of money in order to offset a rapid deterioration in its *velocity*.

However, the quantity-velocity interpretation of the money supply can provide only short-term reassurance where QE is concerned because, as soon as the economy begins to recover, it will become *imperative* that the earlier process of QE is reversed. Otherwise, a recovery in velocity will combine with an expanded stock of money to boost the ‘effective money supply’, and this truly *would* lead to high inflation. Given that inflation really amounts to a devaluation of money, an inflationary process prompted by a failure to

reverse QE would raise legitimate investor concerns about the future value of sterling and the dollar, the currencies most affected by QE.

So QE only represents an inflationary threat if it is not reversed. But *is the reversal of QE a realistic possibility?* We very much doubt it, not least because it would greatly exacerbate budgetary strains. The temptation, surely, will be to leave the QE expansion in place, or even to add to it, in the knowledge that inflation is probably the only way out of the debt bind in which most western economies now find themselves. So, in answer to the question ‘will QE spark very high inflation?’, the short answer is ‘almost certainly yes’.

For heavily indebted governments, as we shall see, there now exists an almost irresistible temptation to destroy outstanding debt through inflation, though this is likely to be pursued in a fairly covert way. The imperative can be seen in the sheer scale of government debt.

Whilst there have been significant contractions in private indebtedness, there has been no similar reversals in public debt. As fig. 14 shows, US Federal debt is another extremely distinctive exponential. When considering the exponential trajectories of inflation, the money supply and debt, we need to bear in mind that these are all aspects of a single exponential, and show **an out-of-control propensity for living on printed money and accumulated debt.**

Where government indebtedness is concerned, the US is by no means alone, either in the exponential trend of borrowings or in the existence of disguised as well as disclosed indebtedness. As the Bank for International Settlements (BIS) explained in a recent report, the sovereign debts of most OECD countries are in danger of turning into exponential trajectories, because of a combination of structural deficits and demographic change<sup>22</sup>.

Where the exponential expansion of public debt is concerned, two processes have accelerated debt accumulation since 2008. The first of these is 'toxic asset transference', a process whereby the state, in an effort to stave off a systemic collapse of the banking

system, takes over the burden of debts irresponsibly created during the bubble-building phase. This is by no means a new phenomenon – it happened, for example, during the Savings and Loan (S&L) crisis of the 1980s and 1990s – but the transference which has occurred in recent years dwarfs all previous such episodes.

Later in this report, we shall look at how a debt-expanding, sequential bubble process has come into existence, how very little has been done about it, and how dire the consequences could be if this structural weakness is not addressed. For our purpose in this chapter – which is to review the essentially exponential nature of the economy – it is sufficient to note that all forms of debt are expanding exponentially. This is as true of aggregate American indebtedness (fig. 17) as it is of Federal debt, with similar exponential phenomena evident across the OECD economies.

With the concept of exponential economics now understood, we can move on to look at when the unsustainable nature of this might impact the system, and how we might recognise it when it happens.

<sup>22</sup>See The Bank for International Settlements, *The future of public debt: prospects and implications*, BIS Working Papers No. 300, March 2010, and Tullett Prebon Strategy Notes, issue six, *Out of Control*, May 2010

Fig. 15: Exponential debt risk – the US\*

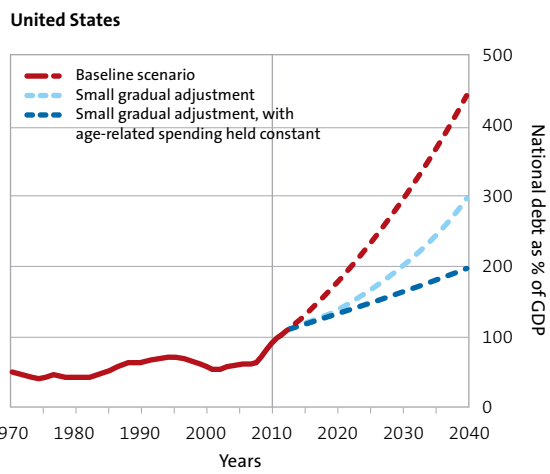
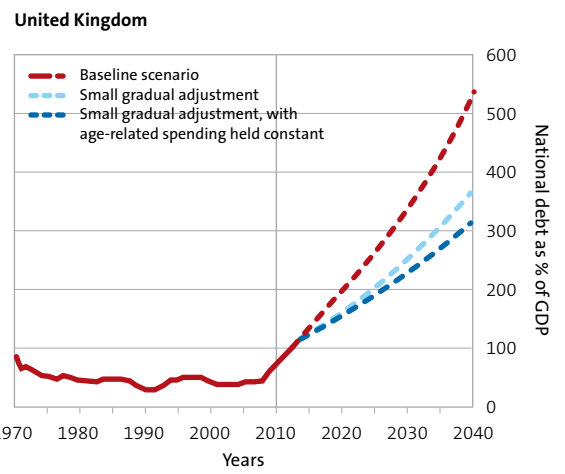
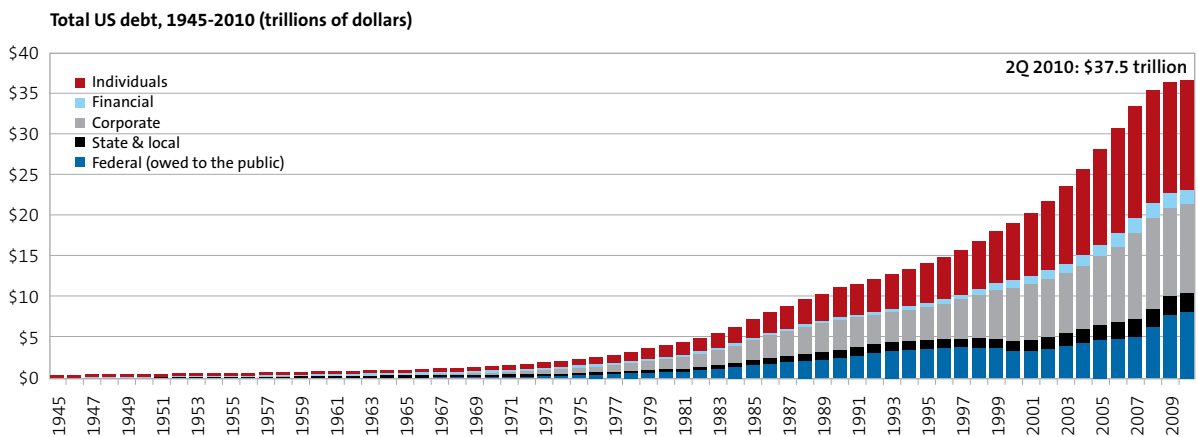


Fig. 16: Exponential debt risk – the UK\*



\*Source for figs. 15 and 16: *The future of public debt: prospects and implications*, BIS Working Papers No. 300, March 2010

Fig. 17: Deep in the hole – US debt, 1945-2010\*



\*Source: Federal Reserve, [www.federalreserve.gov/releases/z1/current/z1.pdf](http://www.federalreserve.gov/releases/z1/current/z1.pdf). Latest data: 2Q 2010

“There are three kinds of lies:  
lies, damned lies and statistics”.

Benjamin Disraeli



# part three:

## smoke and mirrors

### a denouement disguised

- In most walks of life, deferential, unquestioning acceptance of government pronouncements is a thing of the past, and investors, in particular, customarily exercise healthy scepticism. It is strikingly anomalous, therefore, that investors tend to accept government macroeconomic data at face value.
- The reality is that much government data is extremely unreliable. A history of incremental ‘adjustment’ has distorted many measures – such as unemployment, inflation, growth, deficits and debt – to the point where the statistical picture is drastically different from the underlying economic reality.
- Focusing on the US, we explain and strip away three decades of ‘Pollyanna creep’ to reveal an economy which is very much weaker than is generally supposed. Unemployment, reported at 9.7%, may actually exceed 21%. Inflation, said to be at near-zero levels, is above 7%. Growth over the last decade has been negative. Debt is out of control.

As outlined earlier, we believe that the global economy is firmly in the talons of an exponential process which will, in due course, put the current economic system in jeopardy. Essentially, exponential-based

analysis shows that the economy faces two distinct threats – a threat from internal contradictions (because exponential financial progressions may become unsustainable), and a threat from a worsening in the energy equation (as an economic model which relies upon growth collides with the realities of a finite resource set).

A question which naturally arises at this point is this – ‘how will we recognise the denouement process when it begins to happen?’ The naive answer to this question would be that the unravelling of the system will become apparent in headline macroeconomic numbers. But this answer would be correct if – and *only* if – two essential pre-conditions both applied. The first of these vital pre-conditions is that investors are watching the right headline numbers. The second (and even more imperative) pre-condition is that the data that investors are watching is accurate.

In fact, **neither pre-condition applies.** Though habitually sceptical in most other areas of their activities, investors display an almost childlike trust and naiveté where official data is concerned. They place implicit faith in the validity of official statistics. The almost universal assumption – which is that ‘these figures must be accurate, because they come from

the government’ – reveals a hugely misplaced faith in the quality of official data.

Given that – as we shall see – **public faith in the accuracy of official data is very seriously misplaced**, two courses of action are essential. First, we should look at the ‘structural context’ – in general terms, what is the economic environment telling us, and does it accord with official data? Second, and more obviously, can we access and interpret a more accurate statistical picture of what is really happening to the economy?

The ‘structural context’ is surely extremely cautionary. For a start, the macro environment is characterised by a very obvious “monetary ratchet”. As remarked earlier, this has been described by *The Economist* as a process in which “lower interest rates leads to more debt, which leads to asset bubbles, which then pop; when they pop, authorities cut rates again and the whole cycle starts again. This process has reached its logical conclusion with rates at zero. The authorities have responded by resorting to QE, money printing. This has not resulted in high inflation (yet) because the velocity of money has collapsed (if you like, the money has been hoarded)”<sup>23</sup>.

<sup>23</sup> ‘Energy In, Energy Out’, *The Economist*, 9th June 2010  
[www.economist.com/blogs/buttonwood/2010/06/economic\\_growth\\_money\\_supply\\_and\\_energy](http://www.economist.com/blogs/buttonwood/2010/06/economic_growth_money_supply_and_energy)

When a process as fundamental as a “monetary ratchet” reaches “its logical conclusion”, investors need to pose two questions – ‘*why has this happened?*’ and ‘*what comes next?*’. Our answer to the ‘why’ question about the monetary ratchet is that the ‘implicit growth’ system has collided with its intrinsic contradictions. As to ‘what comes next?’, our belief is that, at least where the Western economies are concerned, **an exponentials-based economic system is unravelling**. Moreover, we believe that the system has been unravelling for at least a decade.

### misplaced faith

Despite the financial crisis of 2008-09, the widespread perception seems to be one of ‘business as usual’ – that catastrophe has either been averted or at least delayed, and that the resilience of the system has been proven under extreme stress. The banking system did not, after all, collapse in the autumn of 2008. Although economic output has fallen, the decline has been by no means as severe as it was during the Great Depression. Neither employment nor living standards have cratered as they did in the 1930s. Whilst many investors accept the possibility either of a ‘double-dip’ recession or of an extended period of flat-lining, the overwhelming perception is that the

fall-out from the banking crisis has been comparatively modest, and that economic growth has resumed, albeit at a subdued rate.

Even before we go into the reliability (or otherwise) of the data upon which such comforting conclusions are based, there are surely at least two highly cautionary indicators. First, debt – both formal and informal – has escalated, and continues to do so, in manner which looks very like a vortex process, and from which there is no obvious exit route in sight. The implication, therefore, is that the economy is proceeding on the assumption that we can continue to pile additional obligations onto future generations *ad infinitum*. Any such assumption is illogical, as a limit must be reached (indeed, we believe that it has been reached already). Second, it is surely obvious that continuous progression is surely impossible if the monetary ratchet has indeed already reached “its logical conclusion”. *At that point, something new has to happen.*

The conclusions suggested here are as follows:

- If we look behind the official data, we can perceive a reality-set which accords much more closely with the subjective indicators provided by the

out-of-control accumulation of forward obligations and by the completion of the monetary ratchet process.

- Though the exact timing of the process is neither possible nor essential, the probability is that the Western economic system collided with its internal contradictions no later than the end of the 1990s.
- What has been happening since then is the increasingly unsustainable continuation of the system through intrinsically time-limited expedients, of which by far the most important, unsustainable and dangerous is the accumulation of ever greater formal and informal indebtedness.

### official data, underlying reality

To relate this interpretation to seemingly-comforting official data, we need to look at how reliable that data is. We conclude that, since this data is *not* reliable, any comfort which investors or policymakers derive from it is dangerously misplaced. Once we have exposed the structural inaccuracies of official macroeconomic numbers, we then need, as a matter of urgency, to access an alternative dataset which shows us the true picture.

<sup>24</sup> Total credit market debt

<sup>25</sup> Kevin Phillips is one of America’s most respected political analysts. As a young strategist working for Richard Nixon, he published *The Emerging Republican Consensus*, which correctly predicted the benefits which the party could reap from the swing in America’s centre of economic gravity away from the industrial north-east towards the “Sun Belt” States of the south and west. Recent seminal works by Mr Phillips include *American Theocracy and Bad Money*

This exercise, summarised here, reveals some extraordinarily stark and worrying conclusions. For a start, the US economy, far from having grown by two-thirds in real terms since 1990, has actually been flat, at best, over that period, with the trend in real output worsening since 2000 (see fig. 6 in part one of this report). Second, American inflation has, for more than a decade, been understated in the headline numbers by at least six percentage points, which supports our conclusion that, in contrast to the largely delusional threat of deflation, the real forward risk lies in very much higher *inflation*.

Third, and in stark contrast to the officially-reported \$7.8 trillion, the true scale of Federal obligations stands at an eye-watering \$69 trillion. Likewise, the fiscal deficit, at \$1,417 billion, dramatically understates the real rate at which formal and informal obligations are accumulating. Fourth, US unemployment, currently quoted at 9.7% (on the U-3 definition), may actually exceed 21% of the workforce.

All of this, of course, is *in addition* to known aggregate formal American indebtedness<sup>24</sup> which, at 350% of GDP, is completely without precedent.

In this section of our report, the emphasis is placed overwhelmingly on the statistical distortion of a dire economic status and outlook in the United States. This being the case, we cannot emphasise too strongly that the US is not the worst (and is most certainly not the only) example of underlying weaknesses being masked by unreliable official data.

The focus is placed on the US here for two reasons. First, American figures can be unmasked because of the sheer quality of the economic debate in the US, in which the unreliability of official data has been unmasked by the efforts of analysts such as Kevin Phillips<sup>25</sup>, Chris Martenson<sup>26</sup> and, above all, John Williams<sup>27</sup>.

<sup>26</sup> Chris Martenson is the author of the eye-opening *Crash Course*, which was mentioned extensively in Tullett Prebon Strategy Insights, issue five, *Dangerous Exponentials*, May 2010

<sup>27</sup> John Williams' *Shadow Government Statistics* (Shadowstats.com) is the source for data which looks beyond the distorted data supplied by American government agencies. We regard Mr Williams' subscription service as the imperative source for anyone wishing to understand the real state of the American economy



<sup>28</sup> As measured by 2009 GDP. Source: *CIA World Factbook*

<sup>29</sup> The term 'Pollyanna', meaning resolute optimism in the face of the facts, derives from *Pollyanna: The First Glad Book*, by Eleanor H. Porter (1868-1920)

<sup>30</sup> Kevin Phillips, *Harper's Magazine*, 1st May 2008

Second, and whilst America is by no means the only Western country in which a ‘denouement crisis’ is masked by unreliable data, it is by far the most important, in terms both of sheer scale (the US accounts for 25% of the global economy<sup>28</sup>) and as the standard-bearer for the dominant ‘Anglo-American economic model’, a *laissez-faire* system which is also known as ‘The Washington Consensus’. Clearly, **any emergence of an ‘exponentials denouement’ in the United States would have hugely far-reaching implications for the global economy.**

#### ‘Pollyanna creep’<sup>29</sup>

As we explain here, the investor can no longer rely on the accuracy of a broad swathe of American official economic data. Here, we examine this process, looking in turn at inflation, growth, gross domestic product (GDP), debt and the deficit. But it is important to emphasise from the outset that the revelation of the distortion process does **not** unmask any kind of grand conspiracy. Rather, the distortion of US official data has been a piecemeal,

incremental and bipartisan process. As Kevin Phillips has put it, “the deception arose gradually, at no stage stemming from any concerted or cynical scheme. There was no grand conspiracy, just accumulating opportunisms”<sup>30</sup>.

The first set of figures to fall victim to the distortion process was unemployment, which, early in the presidency of John F. Kennedy, was inconveniently high, and marred the “Camelot-on-the-Potomac”<sup>31</sup> image that the Kennedy team wished to portray. Henceforward, unemployed Americans who had given up looking for work would be classified as “discouraged workers” and excluded from the unemployment statistics. Kennedy’s successor, Lyndon Johnson, may have supervised and ‘fine-tuned’ GNP<sup>32</sup> numbers before their publication, and he certainly introduced the “unified budget”, which combined Social Security<sup>33</sup> data with broader Federal numbers. The latter move was significant, because the inclusion of the Social Security surplus has, since 1969, improved the apparent standing of the overall budget.

As might be expected, Richard ‘Tricky Dickey’ Nixon was not above tinkering with economic data. He proposed that government should choose between seasonally-adjusted and non-adjusted unemployment numbers on a month-by-month basis, publishing whichever happened to be the lower at the time. Although this blatant piece of finagling was opposed successfully, Mr Nixon did succeed in creating the concept of “core inflation”, from which the fastest-rising price categories of the period – energy and food – were excluded to create a number which has been described as “inflation ex-inflation”. By using this core number, governments have at various times been able to claim that inflation is low even when consumers are experiencing very rapid increases in the cost of living.

<sup>31</sup> Kevin Phillips, *Harper’s Magazine*, op cit

<sup>32</sup> Gross National Product, a measure of output which was used until 1991, when government opted for the more flattering GDP measure instead

<sup>33</sup> In the United States, Social Security refers to the Federal Old-Age, Survivors, and Disability Insurance (OASDI) program

Under Ronald Reagan, the process of “Pollyanna creep” continued when the government decided that, like energy and food, the rising cost of housing, too, was biasing inflation upwards. Consequently, from 1983, “owner-equivalent rent” was introduced instead of the actual cost of housing. Essentially, the Bureau of Labor Statistics (BLS) would henceforth calculate, instead of actual housing costs, the rent that a homeowner might pay if he or she rented a property which they actually owned. As we shall see, this dubious methodology is still used today, and impacts GDP (as an “imputation”) as well as distorting the measurement of CPI. Because low reported inflation helps influence interest rate policies, it can be argued that the under-reporting of CPI contributed to a low interest rate environment which in turn fostered an artificial property price boom which contributed very significantly to the savings-and-loan (S&L)<sup>34</sup> and junk bond scandals of the era.

Under George H.W. Bush, it was decided that economic data should be redesigned to shift reporting away from old industrial-era methodologies towards a more modern, service-based economic pattern. Whatever the real motivation, the result, when implemented by the Clinton

administration, was a further reduction in reported CPI inflation, one effect of which was a reduction in the annual increases received by recipients of Social Security. Clinton’s government also further undermined the reliability of unemployment data, as “discouraged workers” – of whom there were about four million – would henceforth be removed entirely from the larger workforce. Sampling sizes were reduced from 60,000 households to 50,000. Since a disproportionate number of the dropped households were located in inner cities, this change may have resulted in the under-reporting of unemployment amongst black Americans.

Few further changes were introduced by under George W. Bush (who was perhaps too busy fighting unwinnable wars). In the economic sphere, policy bungling in this period was largely left to the Federal Reserve, whose interest rate policies contributed to the spectacular boom-bust rollercoaster in real estate markets. A new “experimental” CPI calculation (C-CPI-U) was introduced, which further reduced reported inflation. From 2006, the government ceased publication of M3 money supply data, which was beginning to reveal the dangerous nature of the bank lending bubble.

As a result of this convoluted and incremental process, inflation, unemployment, deficits and debt are routinely under-reported, whilst both growth and absolute GDP are over-stated. Before considering the real nature of an American economy masked by misleading data, we need to look more closely at reporting distortion, starting with inflation.

### **inflation – the cost of living, or the price of survival?**

With the possible exception of debt, no other macroeconomic indicator is as important as inflation. In everyday life, inflation determines how well a person’s income keeps up with the cost of living. The calculation of real economic growth is a function of the reverse inflator<sup>35</sup> applied to measures of national output such as GDP. Inflation determines growth not just in national output but in the real profitability of companies, and is thus of great importance to investors. The relationship between interest rates and inflation determines the real return on savings. Inflation measures are in general use in the calculation of wage settlements in government and industry. Inflation calculations inform rate of returns assessments on major capital projects. And the payments made under welfare programmes (such

<sup>34</sup> S&Ls are the American name for institutions also known as ‘thrifts’ and, in the UK, ‘Building Societies’

<sup>35</sup> The GDP deflator

as Social Security in the US) are set in relation to official statements of inflation.

The inflation measure most commonly used in America is the Consumer Price Index (CPI), which is calculated and published by the BLS. The BLS actually publishes three principal CPI measures, but the most commonly used is CPI-U (the consumer price index for urban consumers). CPI has a long history – but whether its more recent history is also an honourable one is open to very significant doubt.

The origins of CPI can be traced back to the 1880s, when the Bureau of Labour – the predecessor of the BLS – used it to calculate the effects of tariffs. During the First World War, it was used to determine wage rates in shipyards. Though published regularly from 1921, CPI did not become a widespread tool of measurement until after the Second World War, when it became an integral part of wage settlements between employers and unions. Its use has long since spread into a gamut of commercial contracts as well as into such mainstream economic indicators as growth in real GDP.

At various times, inflation has destroyed paper currencies such as the Weimar mark and the Zimbabwean

dollar. In fact, more than 3,800 different paper currencies have been destroyed by hyperinflation, affected countries having included Argentina, Austria, Brazil, China, Greece, Hungary, Japan, Poland, Russia and Yugoslavia as well as inter-war Germany and modern-day Zimbabwe. If we go back far enough into history, even the United States has not been immune, as rapid inflation (exacerbated by British counterfeiting) destroyed America's first paper currency, the "continental", during the War of Independence, whilst much the same thing happened to the currency of the Confederacy during the Civil War. Economists may dispute Milton Friedman's famous observation that "inflation is always and everywhere a monetary phenomenon"<sup>36</sup>, but there can be no doubt that a currency can be destroyed if hyperinflation is let loose by the excessive creation of money.

The last time that major Western economies were threatened by rapid inflation was in the 1970s, when two successive oil crises drove annual inflation well into double digits. The high inflation of the 1970s was driven out of the system, successfully but at huge cost, by resolute action by central bankers, and most notably by then Fed chairman Paul Volcker. Ironically,

the debauching of the American CPI measure seems to have begun just as Mr Volcker's efforts were bearing fruit.

Amongst the first of the measures which undermined CPI was the adoption of "owner equivalent rent" (OER) instead of the actual cost of housing. OER is calculated by substituting the notional rent that a homeowner would have to pay him- or herself if they did not own the property for the actual mortgage costs that he or she pays. In addition to its direct distortion effects, OER is significant in two other respects. First, **it introduced a notional element into an equation that had previously been based on strictly cash-based computations.** Second, and as well shall see, OER is also used as an "imputation" in calculating nominal GDP.

In the early 1990s, some financial luminaries (including George H.W. Bush's chief economist Michael Boskin, and Fed chairman Alan Greenspan) began to argue that CPI actually overstated inflation and, as a result, artificially increased the cost to government of programmes such as Social Security. Although planned changes to the system failed to get through Congress, they were implemented anyway under Bill Clinton.

<sup>36</sup> Milton Friedman, *The Counter Revolution in Monetary Theory*, 1970

These changes included the effective abandonment of a tried-and-tested system whereby CPI was measured by calculating the prices of a defined “basket” of goods. Two of the principal assumptions introduced into the system were “substitution” and “hedonics”. “Substitution” means that, when the price of one item rises, consumers might not go on buying it, but might switch to something else instead. “Hedonics”, derived from the Greek word for “enjoyment”, endeavours to adjust prices for the increased benefit to consumers which may arise if the quality of an item improves. (It is, as Kevin Phillips has remarked<sup>37</sup>, richly ironic that the use of hedonics should have begun whilst the Oval Office was occupied by its ultimate hedonist, William Jefferson Clinton).

Chris Martenson illustrates the insidious use of hedonics by citing the example of a television which, both in 2003 and in 2004, sold for \$329.99. But the 2004 version had a better screen. Because of this, the BLS estimated that the equivalent cost of the TV had fallen by 29%, even though the price in the shop was still \$329.99. (This anomaly has led Mr Martenson to wonder whether Americans might be able to buy their televisions at the BLS, since they are cheaper there than anywhere else).

There are many problems with the use of hedonics. For a start, hedonics calculations are not back-dated – what would happen if hedonics were applied retroactively, such that the benefits of, say, air conditioning and automatic transmissions were inserted at the appropriate moments in history? Second, and more seriously, hedonics only seem to be applied when they *reduce* the CPI calculation, the assumption being that *all* changes are improvements. In reality, this is by no means necessarily the case. A new telephone or washing machine may have more features than the old one – a beneficial hedonic which the BLS calculation would capture – but what if the new product lasts for far less time than the old one did, which also tends to be the case? The continuing process of improvement may actually *accelerate* rates of obsolescence. A third problem with hedonics, critics argue, is that is applied in *reverse* in the calculation of GDP. Improvements might reduce the equivalent price of, say, a computer when CPI is being calculated, but the same hedonic improvement might actually *increase* the contribution that the same computer is supposed to have made to national income.

The application of hedonics can certainly appear highly subjective. When the introduction of a Federally-

mandated fuel additive increased gasoline prices by 10 cents per gallon, this increase was deemed to represent a hedonic improvement, and hence was not reflected in the CPI statistics. (This move led John Williams to ponder quite how much of a hedonic thrill motorists actually derived from having this additive in their vehicles).

Critics allege that the use of substitution enables the BLS to take steak out of the basket and replace it with hamburger – will dog food be next?, muses John Williams – whilst official sources dispute this, arguing that substitution is limited to more closely-comparable categories, one example that has been given being a switch from steak to chicken. Chris Martenson has pointed out that, through the use of substitution, **CPI has changed from a measure of the cost of living to one of the price of survival**<sup>38</sup>.

The fourth change which has undermined the accuracy of CPI is the use of geometric weighting instead of the earlier arithmetic calculation. Under geometric weighting, those items whose price has increased by the most automatically become a smaller component of the overall basket, a method of calculation which necessarily serves to reduce recorded inflation.

<sup>37</sup> Kevin Phillips, *Harper's Magazine*, op cit

<sup>38</sup> Chris Martenson, *Crash Course*, chapter 16

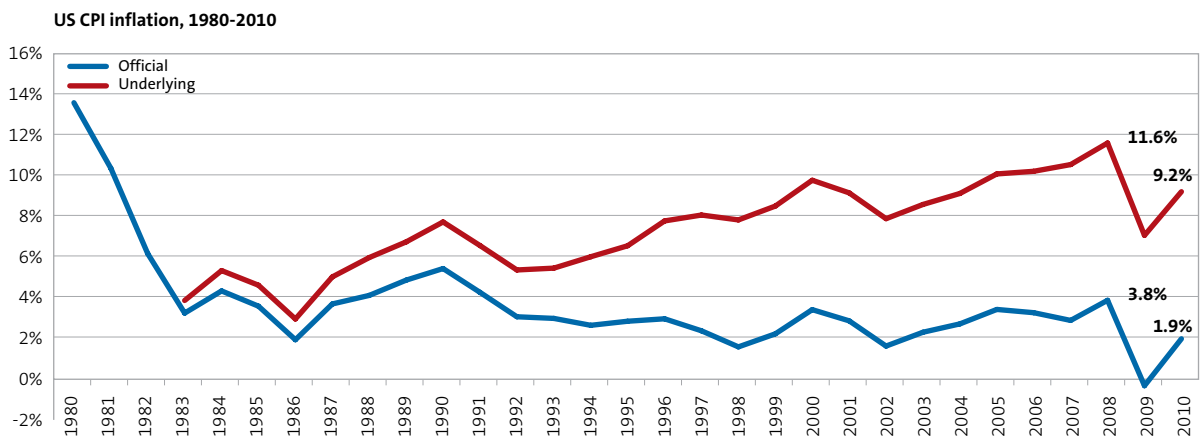
The overall result of these various adjustments, critics rightly claim, has been to understate CPI to the point at which it has become grossly inaccurate, quite apart from being transformed from a realistic measure of the cost of living into a descending barometer of the price of survival. Fig. 18 compares the official and underlying rates for US inflation since 1980, showing that the spread between the official and the underlying number has widened with each successive methodological change, and now exceeds seven percentage points.

Over the last decade, underlying CPI inflation has averaged 9.4%, compared with an official figure of just 2.6%. This is pretty tough on many people, particularly those Social Security recipients who, if the methods of calculating CPI had remained unchanged since the 1980s, would now be receiving about twice as much today as they actually do.

Most importantly, of course, the undermining of the calculation of inflation means that those analysts, investors and policymakers who base their decisions on official inflation data

are living in a through-the-looking-glass country which bears little or no resemblance to the United States as it really is. Fears of deflation – which are, of course, rather implausible anyway in any country which can simply print money – look particularly improbable when, as fig. 18 shows, underlying inflation remains at seven percent. Of even greater significance, where this analysis is concerned, is a further implication which flows from massively understated inflation, which is that reported GDP “growth” is clearly a wholly unreliable number. How strong *is* today’s American economy?

Fig. 18: Smoke & mirrors #1 – unmasking American inflation\*



\*Source: Tullett Prebon calculations, based on data sourced from Shadowstats.com

### economic output – a Grossly Distorted Picture

Gross domestic product (GDP) – or rather, the quarterly or annual rate of change in this number – is one of the most important indicators studied by analysts, investors and policymakers. After all, GDP is supposed to quantify a country’s total economic output, and the change in this number – adjusted, of course, for inflationary effects – should tell us whether the economy is growing and, if so, how rapidly. Indeed, a recession is customarily defined as ‘two consecutive quarters of negative growth’.

Theoretically, at least, this rate of growth also determines the scope for expansion in business profitability. The welfare of millions of individuals and families is determined by GDP growth. A growing economy boosts government tax revenues, reduces welfare costs (the so-called ‘automatic

stabilisers’), and determines the affordability of debt. Levels of GDP, whether in absolute or in per-capita terms, are routinely used to compare the wealth of nations. And robust growth is certainly good for governments seeking re-election.

Though the rate of growth in a mature economy clearly cannot rival that of an emerging country which starts from a low base, the American economy continues to grow at a respectable rate – if government numbers are to be believed. According to official data, US output expanded by 38% (a compound average of 3.25% per year) during the 1980s, by 40% (3.4% annually) during the 1990s, and by about 18% (0.3% per year) in the decade since 2000.

But **these seemingly-comfortable numbers might be wildly inaccurate**. Alternative calculations, summarised in fig. 19, suggest that American real


GDP growth might have averaged 2.1% during the 1980s and 0.3% during the 1990s, and that US output might actually have *fallen* (by about 2% annually) since the turn of the century. If true, this kind of calculation would put a wholly new complexion on the performance of the American economy. Does such an interpretation accord with the facts?

There are two reasons for supposing that this gloomy picture might indeed be accurate. For a start, GDP does *not* – as most Americans probably assume that it does – represent a monetary quantification of national output measured in ‘actual’ dollars. Rather, it includes substantial “imputations”. Second, the way in which inflation is deducted to arrive at “real” growth – that is, the GDP deflator – might be contaminated by the same distortions which afflict the measurement of consumer (CPI) inflation.

Fig. 19: Divergent numbers – US economic growth, 1980-2010e\*

	1980-90		1990-2000		2000-2010e		Since 1980
	Aggregate	Annual	Aggregate	Annual	Aggregate	Annual	Aggregate
<b>Official</b>	38%	3.3%	40%	3.4%	18%	1.7%	127%
<b>Alternate</b>	<b>23%</b>	<b>2.1%</b>	<b>3%</b>	<b>0.3%</b>	<b>-18%</b>	<b>-2.0%</b>	<b>4.1%</b>

\*Source: Tullett Prebon estimates based on official and Shadowstats.com data, see text



“Exponential economics can provide investors and corporate managers with a competitive edge because it offers a basis for interpretation and prediction which is far superior to anything else available. As the process of change accelerates, policymakers have an imperative need to access the insights that exponential economics can provide”.

One of the distorting “imputations”, described earlier when we looked at inflation, is “owner-equivalent rent”. If you own your house outright, you naturally make no mortgage or rent payments, so you would assume that no figure could possibly show up in the national output accounts in respect of your property. But this is not the case as far as the Bureau of Economic Analysis (BEA) is concerned when GDP is being calculated. Rather, the BEA calculates the rent that you would otherwise be paying (to yourself, presumably) if you did *not* own the property.

Likewise, your bank might provide a free banking service. Being free, obviously no money changes hands in respect of this service, but the BEA calculates what you would have to pay if your bank *did* charge you for it. These and other imputations stack up to at least 15% of ‘nominal’ GDP, meaning that this figure is *not* – as most people probably assume that it is – an actual counted number of ‘real’ dollars.

Imputations (and the dubious nature of inflation reporting) should of themselves prompt analysts to look closely at the validity of GDP data,

which John Williams describes as being both “the most widely followed business indicator reported by the US government” and “nearly worthless as an indicator of economic activity”<sup>39</sup>.

GDP is a large component of the National Income and Product Accounts (NIPA), developed by the National Bureau of Economic Research (NBER), a private organisation established in 1920. Today, GDP reporting is undertaken by the BEA.

For a start, investors should note that GDP is not as broad a measure of national economic output as GNP (gross national product), the historic benchmark used for decades in calculating American economic data. However, the broader GNP measure includes international flows of interest and dividends, which are a negative item in America since the US is a major debtor nation. Consequently, reporting switched from GNP to the more flattering GDP in 1991. Since then, and reflecting a relentless increase in American overseas indebtedness, there has been ever greater divergence between output and growth as measured on a GDP or a GNP basis.

Most users of national output data, be it GNP or GDP, probably assume that it is a predominantly cash-based number, which counts transactions in much the same way as, say, the trade deficit is computed. But this is not the case. For a start, and as mentioned earlier, it includes very large imputations (such as owner-equivalent rent and free banking, of which the latter is treated as “imputed interest income”). Critics allege that free banking accounts for more than half of aggregate personal interest income, and that owner-equivalent rent represents well over half of all rental flows.

Defenders of GDP calculations draw comfort from the observation that the GDP deflator is applied in reverse through a chain-weighted volumetric measure, and is therefore distinct from potentially-understated consumer inflation measures such as the CPI.

But a moment’s reflection will indicate that **the change in GDP between one period and the next cannot, in fact, conceivably be measured volumetrically** – that is, in a non-financial way – in order to back out the effects of price changes. Even if the numbers of paper-clips and cars produced in the US in two comparative

periods could be counted, the nature, quality and longevity of the cars, if not of the paperclips, are certain to have evolved. And then, of course, there is the huge volume of purely financial transactions – involved in financial services activities such as insurance, banking real estate and so on – that cannot possibly be measured in a non-financial and purely volumetric way. So it is self-evident that the distorted measurement of consumer inflation necessarily impacts the calculation of ‘real’ economic growth.

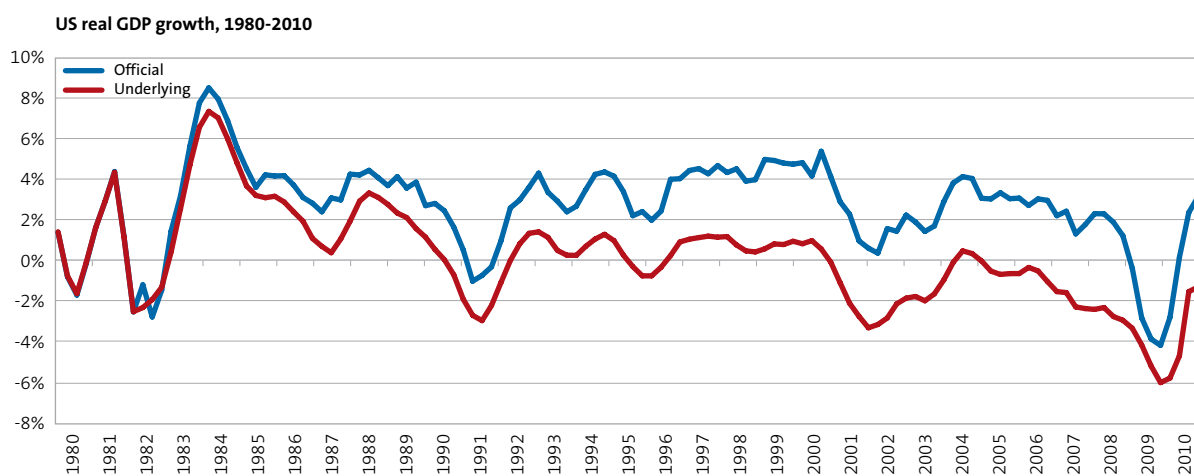
Quite apart from these theoretical weaknesses, GDP data is often starkly at odds both with logic and with alternative data reference points. Where alternate data is concerned, there is a persistent and widening mismatch between solid data (such as that published by the tax authorities) and reported economic activity. The rent paid to a non-existent landlord for the “rent” of a wholly-owned property does not actually exist in dollar form, of course, which means that the Internal Revenue Service (IRS) obviously cannot tax it.

As a result, income trends reported by the IRS are often starkly at odds with apparent changes in GDP. But few

analysts seem to ask themselves why the efficiency of the IRS – measured, that is, against changes in reported GDP – seems to deteriorate over time. The answer to this conundrum lies to a significant extent within imputations which, since they do not actually exist in real terms, obviously cannot be taxed.

Of course, any computation of national output requires a judgement about the “production boundary”, because some services naturally lie outside the formal economy. A good example of this is childcare carried out by parents – this service is of undoubted value, but no dollar sum is attached to it. The production boundary necessarily complicates the assessment process. Even so, the steadily increasing scale of imputations does seem to have boosted nominal GDP pretty appreciably, and in a manner starkly and increasingly at odds with national income as measured for tax purposes. These variations are most stark in areas such as rental and interest income, *the same categories in which imputations are most extensive*.

Fig. 20: Smoke &amp; mirrors #2 – unmasking American economic growth\*



\*Source: Tullett Prebon calculations, based on data sourced from Shadowstats.com

Even if we could somehow square GDP and IRS reporting (which we can not), subjective assessment would surely conform that official data overstates output and growth. On several occasions, official GDP data has produced a so-called “jobless recovery”, which many critics regard as a contradiction in terms. Even assuming the most benign computation procedures, GDP is, amongst all of the front-line macroeconomic measures, the one most dependent upon economic theory rather than the simple counting of monetary sums. On balance, we lean heavily towards

the view that GDP significantly (and increasingly) overstates output both in the United States and elsewhere.

Fig. 20 shows a reconstruction of how extensively official GDP data may have overstated American economic growth since the 1980s.

#### debt and the deficit

According to official data from the *Financial Report of the United States Government* for the 2009 fiscal year (FRUSG 09), the Federal government incurred a deficit of \$1,417 billion in that year, and owed debt of \$7.58

trillion at 30<sup>th</sup> September. Critics allege that these figures are drastic understatements of the government’s financial obligations and of the rate at which these obligations are accruing. Significantly, in the accompanying letter to the President and the leaders of both houses of Congress, the Office of the Comptroller General reported that the report contained some “major impediments” which “continued to prevent us from rendering an opinion on the Federal government’s accrual-based consolidated financial statements”<sup>40</sup>. In the terms in which such matters are expressed in the corporate sector,

*the government's own auditor again refused to sign off the accounts.* Critics of government reporting certainly seem to have a point.

To understand the accuracy or otherwise of the reported Federal debt and deficit numbers, investors need to appreciate that the American government – like many others, amongst them that of the UK – does not account for forward commitments (sometimes known as ‘off-balance-sheet’ obligations) in the way that corporations are routinely required to do. These obligations are typically huge, and can include undertakings to pay pensions to its employees and to provide more general pensions and other benefits to members of the public. The US government is by no means alone where these off-balance-sheet obligations are concerned. Indeed, we explained in an April 2010 report<sup>41</sup> that British public sector pension commitments *alone* constituted a £1,000 billion undisclosed obligation.

The numbers in the United States are much larger than those of the UK, by orders of magnitude greater than the simple comparisons of population or economic scale. Taking off-balance-sheet US obligations into the equation, critics have argued that the true federal deficit in the 2009 fiscal year was \$4.4 trillion, or 35% of national income,

and that outstanding liabilities at the year-end exceeded a terrifying \$69 trillion, which is about 5.4x American GDP. **If these figures are even remotely accurate, the US government is in very, very deep trouble.**

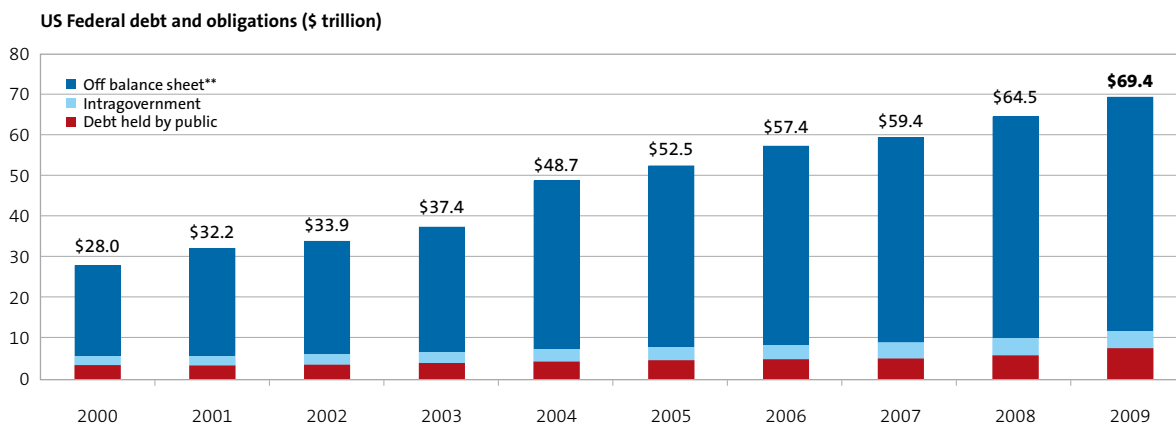
Though we believe – for reasons to be explained shortly – that outside critics’ terrifying numbers may be somewhat exaggerated, we concur in their belief that **the revenue and capital accounts of the American government are drastically worse than official numbers imply.** Moreover, senior officials not only know this but periodically do their very best to warn their elected masters (and the American public) about the implications of undisclosed and escalating indebtedness. What, then, is the real situation regarding debt and the deficit?

The debt and deficit story really begins in the 1960s, when the Johnson administration began the obfuscation process by combining net Social Security payments with other government accounts in the “unified budget”. Because in Mr Johnson’s day (and since), Social Security receipts have exceeded payments, this process has flattered the reported deficit, but is now poised to reverse as ‘baby boomer’ retirement begins to exert significant upwards pressure on net payments by government.

In the early 1970s – at about the same time that Richard Nixon detached the dollar from gold, thereby enabling the US, at least in theory, to print as many greenbacks as it could get away with – the ten then-largest American accountancy firms proposed that the government should report its financial performance under US generally accepted accounting principles (US GAAP), the same benchmark used by corporations. Such accounts, which began to be published from 1974, showed the government’s off-balance-sheet obligations as well as its formal indebtedness. But the Reagan administration disliked (and therefore ceased) the practice of disclosing these accrued amounts. To his credit, George W. Bush reinserted these sums in the FRUSG from 2002, in that off-balance-sheet obligations are disclosed in a note to the accounts (though they do not appear in the government’s balance sheet or cash flow statement).

Critics argue that, if these sums were fully incorporated into GAAP accounts, reported deficits would be very much larger, whilst the American public would become conscious of the huge scale of underlying Federal debt and quasi-debt.

Fig. 21: Smoke & mirrors #3 – hidden Federal debt\*



Sources: \* *Financial Report of the United States Government (FRUSG)*, 2000 through 2009. Data is at end-September  
 \*\* Future net present value of welfare and pension programmes

Published numbers certainly appear to bear this out. At the end of the 2009 fiscal year, the net present value of future Social Security and Medicare commitments exceeded scheme assets by \$52.1 trillion. Moreover, reported Federal debt (of \$7.6 trillion) excludes \$4.4 trillion of intra-governmental debts which, since they are owed to the welfare funds, have *already* been excluded from the net present value calculation which results in the \$52 trillion outstanding welfare computation. Finally, obligations to

pay pensions to federal employees should be included, too. Together, these sums total \$69,403 billion, equivalent to 540% of GDP (see fig. 21). Both the aggregate sum and the GDP measure have expanded dramatically in recent years, with **total obligations rising from 248% to 540% of GDP between fiscal years 2000 and 2009.**

Similar calculations, critics contend, have implications for the deficit which are every bit as gruesome as they are for the debt calculation. During 2009, the deficit was reported at

\$1.47 trillion, inclusive of an unusual (but highly significant) reversal of the Social Security balance from credit to debit (see fig. 22). But off-balance-sheet liabilities increased by almost \$3 trillion during the year, and critics contend that the underlying Federal deficit was actually close to \$4.5 trillion, within a whisker of 35% of GDP (even if the analyst accepts a GDP denominator swelled by imputations). In short, some argue, **both Federal debt and the deficit are completely unaffordable and out of control, a**

**Fig. 22: Smoke and mirrors #4 – the hidden Federal deficit\***

Fiscal year	2002	2003	2004	2005	2006	2007	2008	2009
<b>\$ billions:</b>								
Basic deficit	\$365	\$668	\$616	\$760	\$450	\$276	\$1,009	<b>\$1,254</b>
Social Security	<u>-\$207</u>	<u>-\$293</u>	<u>-\$203</u>	<u>-\$442</u>	<u>-\$202</u>	<u>-\$113</u>	<u>-\$554</u>	<b>\$217</b>
Reported deficit	\$158	\$375	\$412	\$319	\$248	\$163	\$455	<b>\$1,471</b>
Welfare & Pension obligations	<u>\$1,316</u>	<u>\$2,929</u>	<u>\$10,711</u>	<u>\$3,191</u>	<u>\$4,293</u>	<u>\$1,547</u>	<u>\$4,083</u>	<b>\$2,975</b>
Total deficit	\$1,473	\$3,303	\$11,123	\$3,509	\$4,541	\$1,710	\$4,538	<b>\$4,446</b>
<b>As % GDP:</b>								
Reported deficit	1.4%	3.1%	3.4%	2.5%	1.9%	1.2%	3.4%	<b>11.4%</b>
Welfare & Pension obligations	11.3%	24.5%	87.1%	25.2%	33.1%	11.7%	30.9%	<b>23.1%</b>
Total deficit	12.7%	27.7%	90.4%	27.7%	35.0%	12.9%	34.3%	<b>34.6%</b>

\*Sources: Tullett Prebon estimates based on official data

grim reality that is being hidden from the American people by distorted accounting.

And there is one further, even more frightening calculation which can be made here. The aggregate indebtedness figure (which totalled \$69.4 trillion at the end of the 2009 fiscal year) is growing at a compound annual rate of almost 11%. Since these obligations also equate to 5.4x GDP, the rate of nominal national income growth required *even to maintain*

*the multiple at this frightening level* is a ludicrous 58%. Therefore, **the underlying indebtedness ratio must continue to grow under any realistic economic scenario.**

Finally, inflation can (and doubtless will) destroy conventional debt over time, but it cannot work the same magic where off-balance-sheet obligations are concerned, because these commitments tend to expand at least as rapidly as the cost of living. Concluding that the Federal

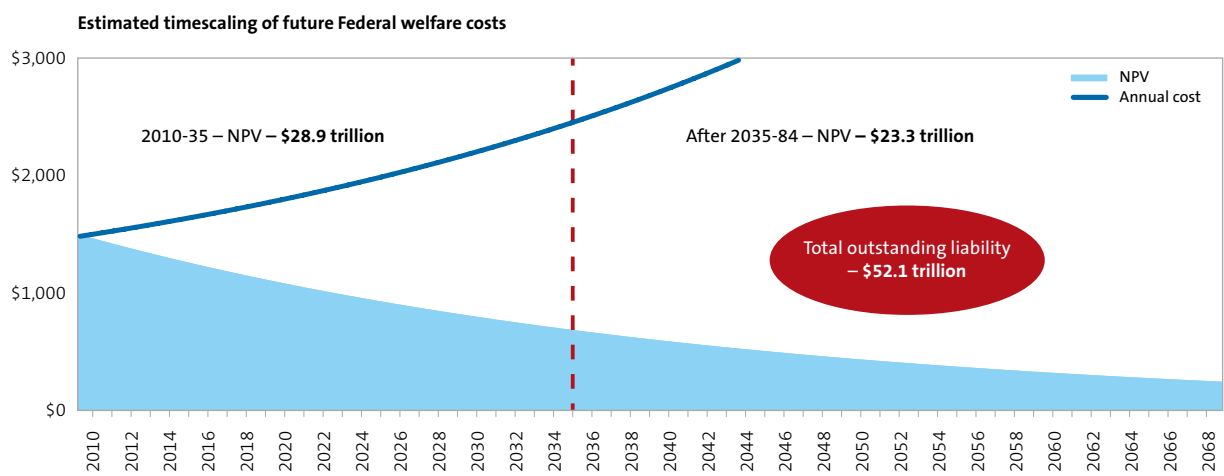
government is bankrupt in all but name, critics call in aid former Fed boss Alan Greenspan, who warned almost ten years ago that Washington ought to come clean about its inability to deliver on current Social Security and Medicare commitments, adding that there is no possibility whatsoever of these commitments being rendered affordable by economic or productivity growth. Perhaps unsurprisingly, analyst John Williams warns of an **“unfolding fiscal disaster”**<sup>42</sup>.

<sup>42</sup> *Federal Deficit Reality* briefing paper, and *Commentary Number 282*, by John Williams, Shadowstats.com

At this point, we need to stand back and remember four very significant ameliorating factors. First, the off-balance-sheet debts reported in the FRUSG represent the difference between the assets of the various schemes and the net present value (NPV) of their obligations over a 75-year period. This, we think, pulls too much of the future commitment into the present-day balance sheet. Using parameters published in the FRUSG, we have calculated the outstanding net liability based on a more reasonable 25-year horizon (see fig. 23).

This suggests that the outstanding obligation is of the order of \$46 trillion – comprising debt of \$12 trillion, employee benefits of \$5.3 trillion and future welfare commitments of \$28.9 trillion – whilst the underlying deficit in fiscal year 2009 was of the order of \$3.5 trillion. Since the underlying obligations and deficit equate to 359% and 27.4% of GDP respectively, these numbers are only marginally less appalling than the full-inclusion calculations. These numbers are summarised in fig. 24.

**Fig. 23: Still daunting – the time-scaling of unfunded US welfare commitments\***



\*Source: Tullett Prebon calculations based on the *Financial Report of the United States Government (FRUSG)*, 2000 through 2009

**Fig. 24: Smoke and mirrors #5 – the hidden federal obligations\***

Fiscal year in \$ trillion	2002	2003	2004	2005	2006	2007	2008	2009
Federal debt (gross)	\$6.2	\$6.8	\$7.4	\$8.0	\$8.5	\$9.0	\$10.1	<b>\$12.0</b>
Federal employee benefits	\$3.6	\$3.9	\$4.1	\$4.5	\$4.7	\$4.8	\$5.3	<b>\$5.3</b>
Welfare commitments**	\$13.4	\$14.8	\$20.6	\$22.2	\$24.4	\$25.2	\$27.2	<b>\$28.9</b>
Aggregate indebtedness	<u>\$23.2</u>	<u>\$25.5</u>	<u>\$32.1</u>	<u>\$34.6</u>	<u>\$37.7</u>	<u>\$39.1</u>	<u>\$42.6</u>	<b>\$46.1</b>
As % GDP	200%	214%	261%	273%	290%	294%	322%	<b>359%</b>
Effective deficit	\$1.3	\$2.3	\$6.6	\$2.5	\$3.0	\$1.4	\$3.6	<b>\$3.5</b>
As % GDP	10.8%	19.3%	53.7%	19.9%	23.3%	10.6%	26.9%	<b>27.4%</b>

Sources: \* *Financial Report of the United States Government (FRUSG)*, 2000 through 2009. Data is at end-September

\*\* Based on estimated NPV of 25 – rather than 75 year forward commitments



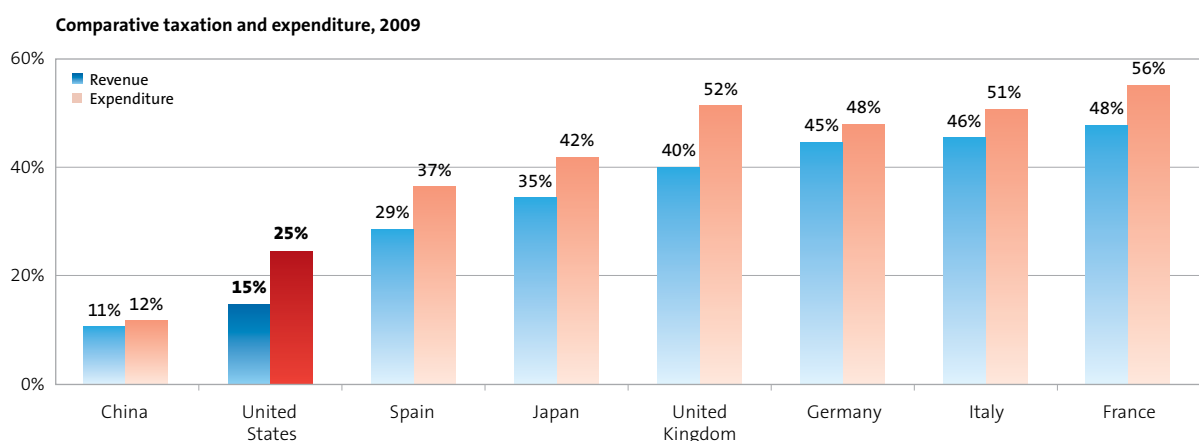
Second, America has significant leeway where taxation is concerned. According to data sourced from the *CIA World FactBook*, government revenues equated to just 15% of American GDP last year, far lower than competitors such as Japan (35%), Britain (40%), Germany (45%) or France (48%) (fig. 25). One possibility, therefore, is that the US could raise taxes very materially. This solution would be hugely unpopular – as, indeed, would any cutbacks in forward welfare obligations – but it does give America more room for manoeuvre than many other heavily-indebted countries.

Third, the vast bulk of these debts are internal – that is to say, they are obligations which some Americans owe to other Americans. As we have explained in several previous research reports, internal debts matter far less than external obligations. By this criterion, America, with gross external debts of \$44,000 per capita, is in far better shape than Germany (\$63,000), France (\$78,000) or the UK (\$149,000).

Finally, and perhaps most pivotally, the American dollar is the world’s reserve currency. This has enabled the US to enjoy international (though often grudging) acceptance for expansions

of debt and the money supply. Whether the American dollar can retain its reserve status in the future, however, has to be open to question – a subject to which we shall return in part four of this study, when we look at the implications of an American (and Western) economic system in the grip of unwinding exponentials.

Fig. 25: Room for manoeuvre? – the US as a low-tax economy\*



\*Source: *CIA World FactBook*

“America has indulged in a debt binge which, whilst adding hugely to the burdens of median earners whose real earnings have been declining anyway, has benefited only a tiny minority of the very rich”.



# part four:

## end-game – the denouement of exponentials

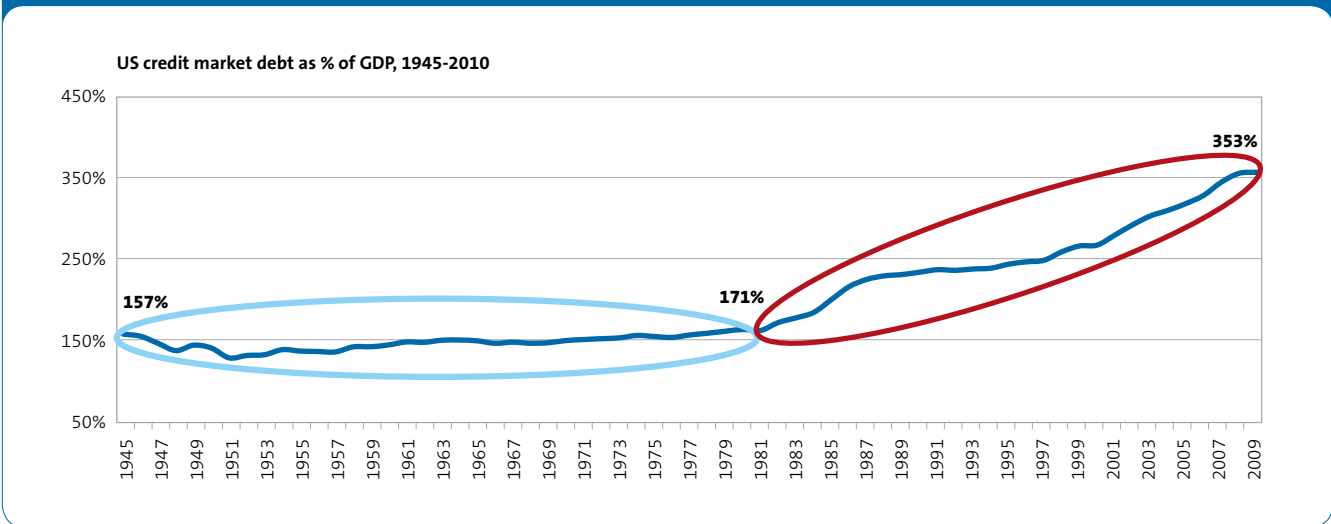
- All available evidence suggests that the Western economies are *already* in the talons of an exponentials denouement process. The critical energy equation is weakening, and an exponential financial system has created unsustainable debt burdens.
- If we are to understand and manage this process, we need to realise that neither Keynesian nor free-market economics can provide the necessary policy tools. Investors and policymakers alike need to embrace the new paradigm of **exponential economics**.
- There is an *imperative* need for a standardised calibration of the energy surplus equation (EROEI), and for a consistent, accurate and long-term economic database, which can facilitate a breakaway from faulty and short-term interpretation and planning.

- Specifically, investors and policymakers alike need to prepare themselves for higher inflation, and for a growing recognition that the current basis of globalised free-trade is extremely detrimental to the Western economies.

Before looking at the implications of the exponentials end-game, let's review where this research project has led us thus far. First, we've reviewed the two-part exponentials equation, comprising a surplus-energy economy driven by fossil fuels, on top of which has been constructed an increasingly exponential financial superstructure. And we have explained that reported macroeconomic data presents a hugely distorted picture, certainly in the United States and very probably elsewhere in OECD.

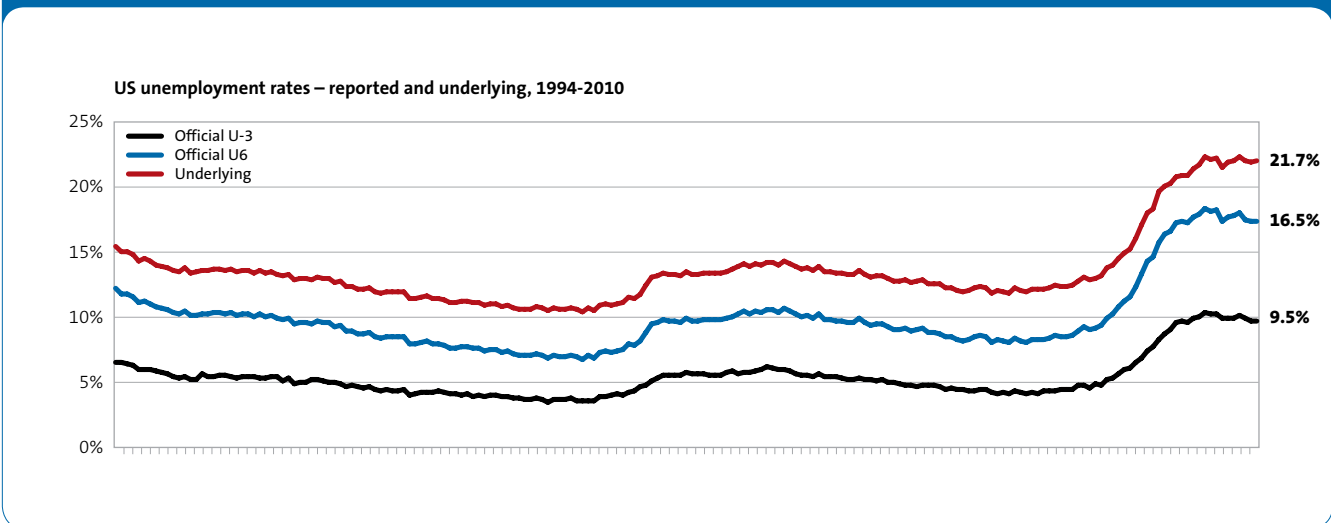
Concentrating on the US, we have seen that the economy appears to be essentially ex-growth, a situation disguised by understated inflation and overstated GDP. Meanwhile, and in addition to huge disclosed formal debts, the Federal government has accumulated truly enormous forward obligations, principally in the form of welfare commitments. Inclusion of the annual increment to these 'informal' debts presents a far worse ongoing picture than can be appreciated by the reported fiscal deficit, with the American government incurring welfare obligations which cannot conceivably be met without truly massive increases in taxation. Total credit market debt, which includes individuals and the corporate sector as well as State and Federal government, stands at an unprecedented 350% of GDP (see fig. 26).

Fig. 26: Uncharted waters – US debt as a percentage of GDP\*



\*Source: Official data

Fig. 27: Smoke and mirrors #6 – America's hidden jobless\*



\*Source: Official data and Shadowstats.com

Moreover, unemployment is extremely high, and has risen sharply in recent years, with the reported (U3) figure (9.7%) disguising a far worse underlying situation (see fig. 27). There seems every likelihood that the underlying economic weakness and the excessive indebtedness of the US is replicated throughout the OECD economies.

Does this disturbing state of affairs tie back to an unravelling of exponentials? In order to relate the situation to these two factors – an unsustainable exponential dynamic, and a weaker-than-reported, massively indebted economy – we need to consider *what we would expect to see* if either the resource or the financial dimension of the exponentials process were to reach end-game.

Essentially, we would expect to see an economy that is increasingly monetary rather than productive. This means, first, that the currency loses its value as the money supply expands much more rapidly than real productive capacity (by which we mean the aggregate of manufacturing, agriculture, the extractive industries and genuinely value-adding services such as retailing and distribution). Second, it means that the centre of gravity of the economy swings successively away from productive activities, with an ever-larger proportion of GDP being accounted for by the ultimately unproductive activity of simply moving money around.

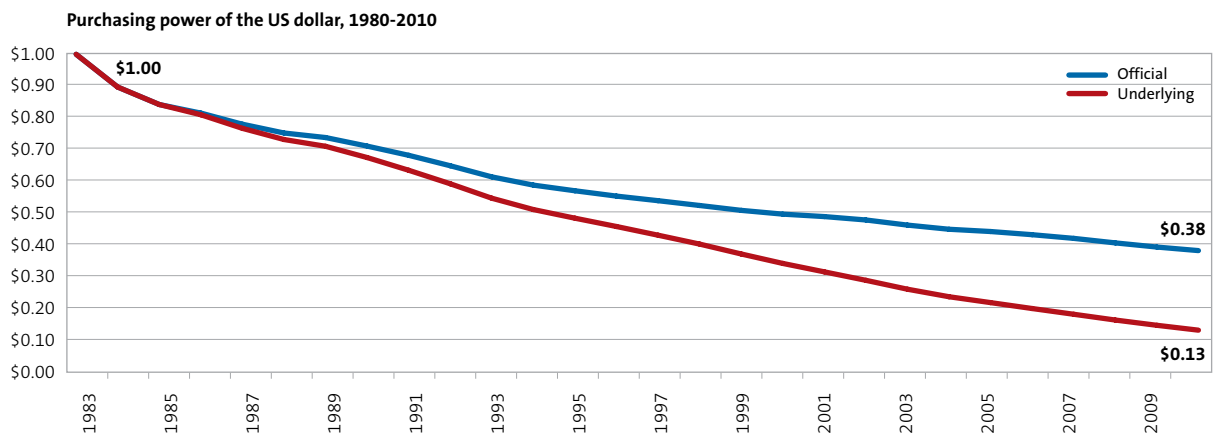


Third, we would expect to see debt of all types rise to ever-higher and ultimately untenable levels. In addition, we would expect unemployment to rise, reflecting the declining role of productive activities. Next, we would expect policymakers and institutions to resort to ever more desperate expedients in an endeavour to prevent the system from toppling over. These efforts could be expected to include the creation of successive asset bubbles, and an extensive resort to QE. Lastly, we would expect these efforts to prove futile, resulting in some kind of default on unsustainable forward obligations. Along the way, we would expect most people to become poorer well before the ultimate denouement.

This, we believe, is **exactly the process that we are witnessing both in the United States and in a number of other OECD economies**. Even if we base our calculations on official (and very understated) inflation data, the US dollar has lost 92% of its purchasing power since 1945. If we take 1980 as our base year, the purchasing power of the dollar has declined by 63% on the basis of official data, or by 89% on the more realistic inflation calculations supplied by Shadowstats (fig. 28).

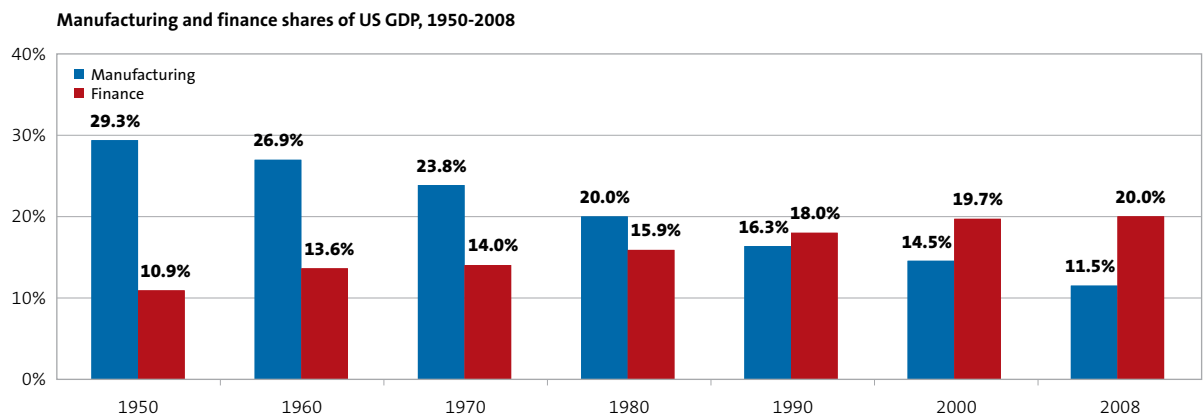
The tilt away from productive activities towards profiting from the process of simply moving money around continues apace. In 1950, America was an economy dominated by manufacturing, which accounted for almost 30% of economic output. Now, this share is just 11.5%, whilst the proportion of GDP attributable to finance has risen from 10.9% to 20% over the same period (see fig. 29). This year, we believe that financial services – including banking, investment, insurance and real estate – are likely to account for about \$3 trillion within a probable American GDP total of some \$14.3 trillion. This process has been called “financialization”, and it has an historical significance (as a marker of decline) which is highly pertinent today – exactly the same phenomenon occurred in other instances of great power decline, in sixteenth century Spain, eighteenth century Holland and early twentieth century Britain. **Now it seems to be happening to the economies of the United States and other Western countries.**

**Fig. 28: Crumbling? – the purchasing power of the dollar\***



\*Source: Tullett Prebon calculations based on official CPI-U and Shadowstats alternate CPI data

**Fig. 29: 'Financialization' – America swings from making to moving\***



\*Source: *Economic Report of the President, 2010*, table B-12, and Kevin Phillips, *Bad Money*, 2009 edition, page 31

Another ‘denouement marker’ – an escalation in all forms of debt – is extremely visible, again in the US and in other OECD countries. So what we are describing is **an economy that is essentially “running on empty” – moving money around, borrowing, expanding the money supply, incurring huge debt obligations and mortgaging the future in an ever more frenetic attempt to maintain at least the illusion of the *status quo* in the face of underlying economic deterioration.**

### the first linkage – a weakening energy equation

In the autumn of 1941, when the Roosevelt administration finally lost patience with Japanese incursions into Indo-China, the US imposed an oil export embargo on Japan. This presented the Tokyo government with two unpalatable alternatives – lose face by backing down in the face of pressure from Westerners widely regarded in Japan as racists<sup>43</sup>, or start a war that many in the Imperial high command knew to be unwinnable. In the end, Japan gambled, creating the ultimate euphemism – the “Greater East Asian Co-Prosperty Sphere” – as part of a dash to secure access to oil supplies from the Dutch East Indies. To give the project even the faintest chance of success, the US battlefleet at

Pearl Harbor (and especially its aircraft carriers<sup>44</sup>, though the Japanese failed to appreciate this) needed to be taken out. The carriers were missed (they were at sea), a mighty industrial power had been provoked to anger, and the end result was never in much doubt.

Though the sailors, soldiers and airmen of the US and her allies defeated the Japanese, the war was really won by industrial might. Oil was the basis of America’s industrial muscle – an army might have marched on its stomach in Napoleon’s day, but the mechanised forces of the mid-twentieth century were powered by oil, not just at sea and in the air but in the factories and the shipyards that made victory possible.

Changes in the energy balance create shifts in global power. As energy pre-eminence shifted from coal to oil, the United States, with her then-huge petroleum supplies, overtook Britain as the major industrial power, a displacement that Britain tried unsuccessfully to forestall by trying to parcel out the Middle East between herself and France in the immediate aftermath of the First World War. Oil powered American industrial, economic, political and military superiority for much of the twentieth century.

But domestic oil production in the United States has been in decline since the early 1970s, and now meets barely 40% of American requirements (see fig. 30). Since 1970, US consumption of oil has increased by 62%, whilst production has fallen steadily despite major exploration and development investment in Alaska and the offshore Gulf of Mexico.

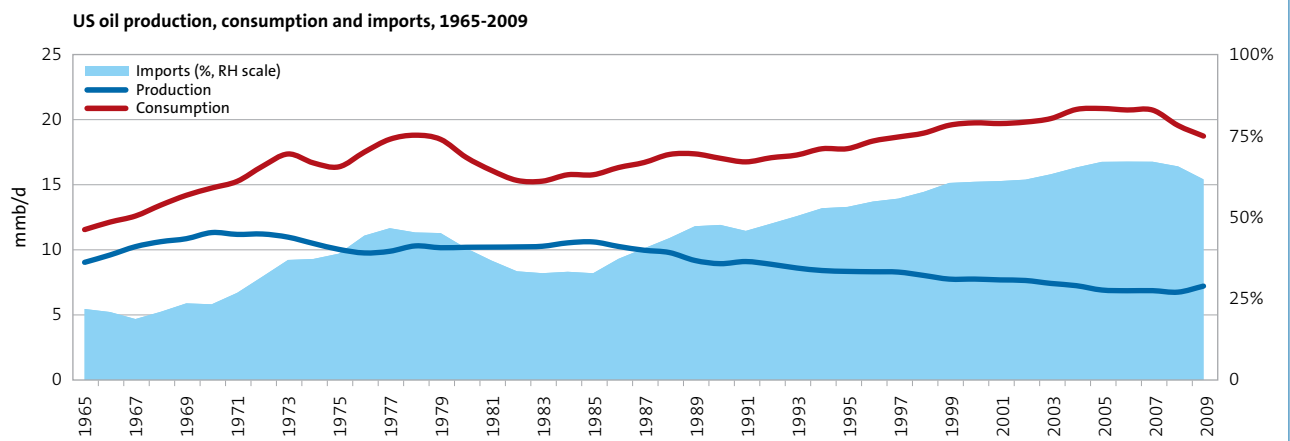
Last year, America consumed 18.7 mmb/d of oil and produced only 7.2 mmb/d, with the biggest shares of imports being sourced from Canada, from Mexico (where production is in rapid decline), from Venezuela (whose government is trenchantly anti-American), from West Africa (where Western oil companies are in fierce competition with oil-hungry Chinese players) and, of course, from the perennially unstable Middle East.

The fundamental problem, for the US as for the other OECD economies, is a massive imbalance between consumption and reserves of oil. Last year, the US consumed 22% of world oil supplies on the basis of just 2% of reserves, whilst Europe accounted for a further 17% of consumption yet has barely 0.5% of global proved reserves (fig. 31).

<sup>43</sup> Propaganda designed to reassure expatriate residents in British Singapore seems to bear out the accusation. British residents were informed that an invasion was improbable because the Japanese were baffled by complex machinery, made their aeroplanes out of bamboo, and were prevented from flying at night by bad eyesight

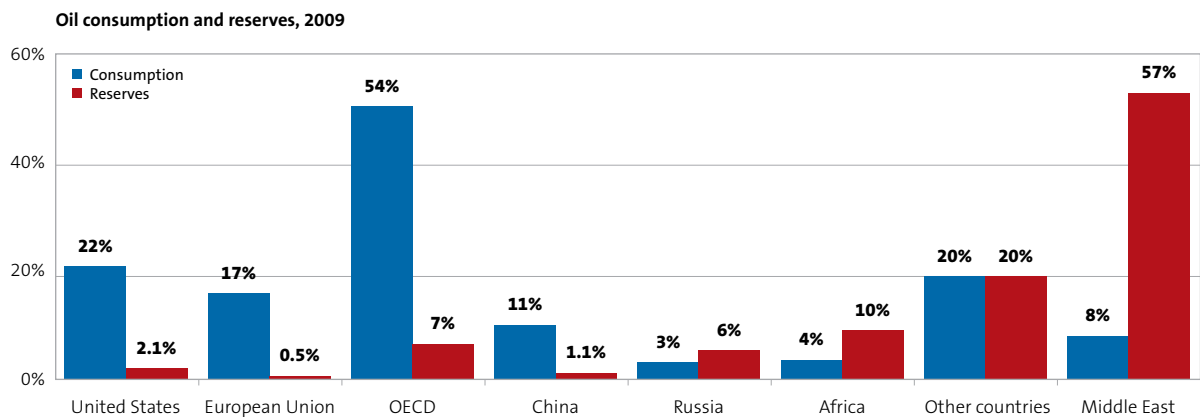
<sup>44</sup> USS *Enterprise*, Lexington and Saratoga

Fig. 30: Running out of gas? – the US petroleum balance, 1965-2009\*



\*Source: BP Statistical Review of World Energy 2010

Fig. 31: Over a barrel #1 – shares of oil reserves and consumption, 2009\*



\*Source: BP Statistical Review of World Energy 2010

One way to look at the oil-economy equation is to state American income not in dollars but in barrels of oil, as set out in fig. 32. In this calculation, US per capita GDP for each year is divided by the oil price prevailing at that time. For example, per capita GDP in 1970 was \$5,090 and the price of oil was \$1.80 per barrel, so per capita income equated to 2,828 barrels.

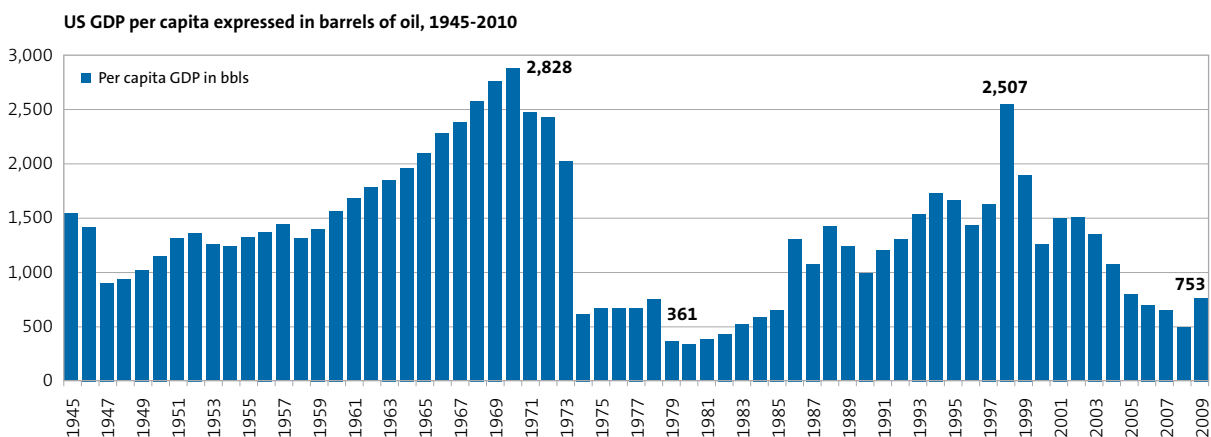
During the oil crises of the 1970s, the soaring price of crude oil reduced this number to just 361 barrels. By the end of the 1990s, the equation had

improved, though not to the 1970 level even in the spike year of 1999 (when sharp falls in oil prices pushed the number up to 2,507 barrels). Despite a small respite in 2009 – when slack demand reduced oil prices – the trajectory since 1999 has been relentlessly adverse.

This type of calculation does not tell the whole story, for which two other critical factors need to be taken into account. First, and in contrast to the not-too-distant past, America now *controls* only a small proportion of

global oil supplies, and this can be expected to decline further in the future. Second, and as established earlier, absolute volumes of oil (or of any other form of energy) are not the critical issue, which is *the relationship between energy extracted and energy consumed in the extraction process* (EROEI). In the US, this equation has weakened successively as ‘easy’ sources of oil have been depleted and have been supplanted by fields which are costlier (in energy as well as in monetary terms) to produce.

Fig. 32: Over a barrel #2 – US income measured in barrels of oil\*



\*Source: US Census Bureau, Bureau of Economic Analysis & BP Statistical Review of World Energy 2010, and Tullett Prebon estimates

Of course, American (and broader Western) EROEI has been deteriorating for many decades, but two geopolitical changes have tightened the screw. The first of these has been loss of Western control over sources of oil. Prior to 1960, production of oil in countries such as Saudi Arabia, Iraq and Iran was controlled by Western companies, principally the so-called “Seven Sisters”. These companies extracted cheap oil in the Middle East and elsewhere and shipped it to be refined at home for their domestic markets. As a result, **any weakening in the domestic EROEI was cancelled out by access to high EROEI sources overseas**. This advantaged position was undercut by the processes first of independence and latterly of nationalisation.

Second, there are, increasingly, competing purchasers for high EROEI energy supplies, principally (but by no means only) in Asia. The problem posed by American (and European) energy dependency is a much-discussed topic, but *the role of exponential energy in leveraging the economy* has not been properly understood because certain key linkages have been neglected.

In short, then, **the US economy was for many decades an economic powerhouse partly because of American access to high EROEI energy supplies from both domestic and foreign sources**. As this advantaged position has eroded, the leveraging effect has been undermined.

Awareness of America’s petroleum vulnerability has led many observers to believe that the invasion of Iraq was motivated by a desire to take over that country’s huge petroleum reserves. Our interpretation is that oil was indeed critical, but that the explanation is somewhat more nuanced than a simple ‘resource grab’, and has a direct bearing on economic policy.

In the years prior to 2003, Saddam Hussein had been undertaking a strategy which, if it had been implemented successfully, could have had severely adverse implications for the American economy. Essentially, Saddam was offering access to Iraqi oil to companies from China, Russia and France, with two principal objectives in view. First, he wanted these countries to have a vested interest in lifting

UN sanctions on Iraqi oil exports. Second, and even more significantly, he planned to price Iraqi oil *in a currency other than American dollars* (probably in euros).

The status of the dollar as the global reserve currency is vital to the US, and has looked vulnerable for a number of years. Reserve status effectively allows Washington to issue debts and to grow the money supply without provoking a sharp decline in the international value of the dollar. If the dollar were ever to lose its reserve status, its value could be expected to fall sharply, triggering very high inflation whilst massively undermining America’s influence in the global economy. As growing US indebtedness has put the dollar’s reserve status under ever greater pressure, the ‘petroleum prop’ – the role of the dollar as the currency in which oil is traded – has become successively more important. This, we believe, may have prompted the Bush administration to seek to prevent Iraq’s government from inviting competitor participation and simultaneously weakening the oil market role of the dollar.

### the second linkage – reckless finance

On one of the two dimensions of the exponentials equation – energy leverage – it seems clear that the United States and other Western countries are being adversely affected by a loss of access to premium (that is, high EROEI) sources of energy. That the US is also becoming a victim of the other exponential process – that of an excess accumulation of unsustainable forward obligations – seems equally clear, most obviously in the truly massive scale of formal and informal debts accumulated by individuals, businesses and government.

Total credit market debt – including that portion of Federal debt owed to the public – totals 350% of GDP. In addition, we have identified – using official sources of data – a further \$61.8 trillion of obligations, which takes the combined total to \$112 trillion, or 770% of GDP. This number compares with \$50.9 trillion nine years ago (\$24.6 trillion of credit market debt plus \$26.3 trillion of Federal off-balance-sheet liabilities). Over that period, therefore, aggregate indebtedness has increased by 9.1% annually, whereas the growth rate for nominal GDP has been 4.3%.

This describes a situation which looks to be to all intents and purposes out of control. Why has it happened?

Essentially, two factors have been at work here. First, profiting from the simple process of moving money around has grown in part because of the declining real productivity of an economy squeezed by a sharp deterioration in available EROEIs.

Second, **the US** – like a number of other Western countries, most notably the UK – **has bought into recklessly excessive deregulation**. It is by no means coincidental that the ‘financialization’ of the US economy has accelerated in a post-Glass-Steagall era in which massive integrated finance houses have created instruments (such as MBSs<sup>45</sup>) which have outpaced the capabilities of a regulatory system which has itself been given low priority in a political system excessively attached to – to borrow a British phrase – “light-touch” regulation.

The system has pushed a **relentlessly consumerist ethos** – to paraphrase Descartes, “I buy therefore I am” – and has simultaneously used low interest rates to make available consumer finance on seemingly attractive terms. Legislation has been passed which tightens credit card companies’ hold over debtors to an extent that at least one American observer has likened to indentured labour.

In short, America has indulged in a debt binge which, whilst adding hugely to the burdens of median earners whose *real* earnings have been declining anyway, has benefited only a tiny minority of the very rich. This is the ‘Wall Street versus Main Street’ divergence which Mr Obama promised to address, but has been able to do precious little about.

In his farewell address<sup>46</sup>, President Eisenhower told Americans that they “must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex”. Perhaps he should have warned instead about a “*credit-industrial complex*”, because that is what the United States now has.

The intellectual underpinning for this process has been the *laissez-faire*, monetarist philosophy sometimes also called ‘the Washington consensus’. We believe that *any* systemic extreme (such as excessive state control, excessive socialism or excessive theocracy) can prove extremely damaging. Unbridled free market economics, by driving a culture of greed and short-termism, has exposed the US (and many other Western countries) to the denouement of exponentials.

One question remains – what happens next? Is an exponentials-driven collapse inevitable, or can policymakers craft a suitable response?

### avoiding disaster – can we break the linkages?

Thus far in this report, we have explained our view that the Western economies are in the grip of exponential processes that are weakening the energy leverage equation whilst building unsustainable tendencies into the financial system. This situation is not irremediable, so long as it is recognised that fundamental change is inevitable, that ‘business as usual’ is not an option, and that economic and social life as the West has known them for more than a century are no longer sustainable.

Change that is not understood cannot be managed, and change that cannot be managed can be extraordinarily unpleasant and disruptive. What follows can at best be a set of outline policy suggestions.

First and foremost, we need to understand that **neither Keynesian demand management nor free-market laissez-faire economics is an effective management tool for the future.** Both are outdated. The free market assumptions of ‘the Washington

consensus’ were discredited during the 2008-09 crisis, even if policymakers and vested interests are unable or unwilling to recognise this fundamental change. At the same time, a reversion to pre-1980s Keynesian management is not an option, since what is required now is fundamental change, not simply the more competent management of the existing system. Instead, what is needed is the development of a wholly new approach to economic issues. In short, we need a new discipline – **exponential economics.**

For this to happen, we need something more than an understanding of exponential issues, imperative though that is. Two essential tools are required if the new discipline of exponential economics is to inform a more accurate reading of the outlook.

The first of these tools is an effective calibration of **the critical economic equation**, which is Energy Return On Energy Invested (EROEI). A great deal of interesting work has been done on this issue in academic circles, but this now needs to go mainstream, with agreed methodologies and consistent calibration. Richard Feynman once referred to “the idiocy of all the different units which [physicists] use for measuring energy”<sup>47</sup> Such vagueness is no longer affordable.

At the same time, there is a huge need for data which is both reliable (in that it is accurate) and suitable (in that it uses the ultra-long timescales which are imperative for an understanding of exponentials). There is an urgent need for the creation of an economic database which provides exponential economists with data which is both long-term and free from Pollyanna distortions.

In both areas, we believe that a combination of private sector and government will prove the best route to the provision of this essential intellectual and interpretative resource.

Both private enterprise and government institutions have a strong vested interest in developing the essential tools for an understanding of this revolutionary approach to economic interpretation. If we are right about the interpretative merits of exponential economics, it can provide investors and corporate managers with a competitive edge because it offers a basis for interpretation and prediction which is far superior to anything else available. As the process of change accelerates, policymakers have an imperative need to access the insights that exponential economics can provide.

<sup>47</sup> Richard Feynman, *The Character of Physical Law*, 1964

Specifically, it is evident that inflation represents a huge threat going forwards. *Inflation is implicit in printing money, and is likely to impact the economic system as soon as the velocity of money recovers.* In any case, inflation is likely to become unstated policy, as devaluation is the only way (short of outright default) in which excessive formal debts can be eliminated.

Together, accelerating inflation and resource constraint imply *steady rises in the values of physical commodities*, most notably in the energy field. Some countries (such as China) already recognise this trend, and can be expected to use every effort to convert their devaluing currency (and especially dollar) holdings into physical resources.

Whilst inflation can erode the real value of formal debts, it cannot work the same alchemy for informal obligations such as future welfare payments. These future obligations, which are already impossibly large, are set to worsen as the boomer generation retires. *Governments need to come clean on the fact that the delivery of benefits promised for the future has become impossible*, and would be likely to remain so even if taxes were to rise dramatically. Meanwhile, a combination of demographic change and weakening productivity – the latter driven by a deteriorating energy leverage equation

– mean that some *current* welfare systems are no longer affordable, most notably in Europe.

After the events of 2008-09, it should hardly need to be explained that a financial system which has been free to generate sequential asset bubbles needs to be curbed, by tighter regulation over products such as mortgages and through specific measures such as the reintroduction of absolute separation between retail and investment banking activities, the kind of separation that was imposed by the US Glass-Steagall Act between its introduction in 1933 and its disastrous repeal in 1999.

**One of the delusions that the West needs to rethink is globalisation.** The first organisations to question this process were US labour unions – which feared, quite rightly, that it was a mechanism for exporting American jobs – but there is a lot more to it than that. Certain emerging economies are exploiting the globalisation process by manipulating their currencies whilst at the same time operating tariff systems expressly designed to inhibit exports from OECD countries. **This process not only enriches the emerging countries at the expense of the OECD economies, but also hollows out Western nations' economic structures by destroying their indigenous manufacturing industries.**

Students of economics are routinely instructed that free trade is “good” because it makes everyone richer through optimisation of their capabilities, but this is the type of purely theoretical interpretation that gets economists a bad name. “Free trade theory”, John Williams explains, “assumes all involved nations are at full employment. When that is not the case the wealthiest and highest salaried countries end up with a declining standard of living and redistributing their wealth to the other free-trade participants, as is the current circumstance for the United States”<sup>48</sup>.

In the longer term, exponentials analysis indicates that the entire Western consumerist ethos, with its resource profligacy and its short-termism, is no longer sustainable. Before that point arrives, however, there is an imperative need to rethink our financial institutions and our trade relations whilst developing the intellectual and data resources needed if the West is to understand and to manage the denouement of exponentials.



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