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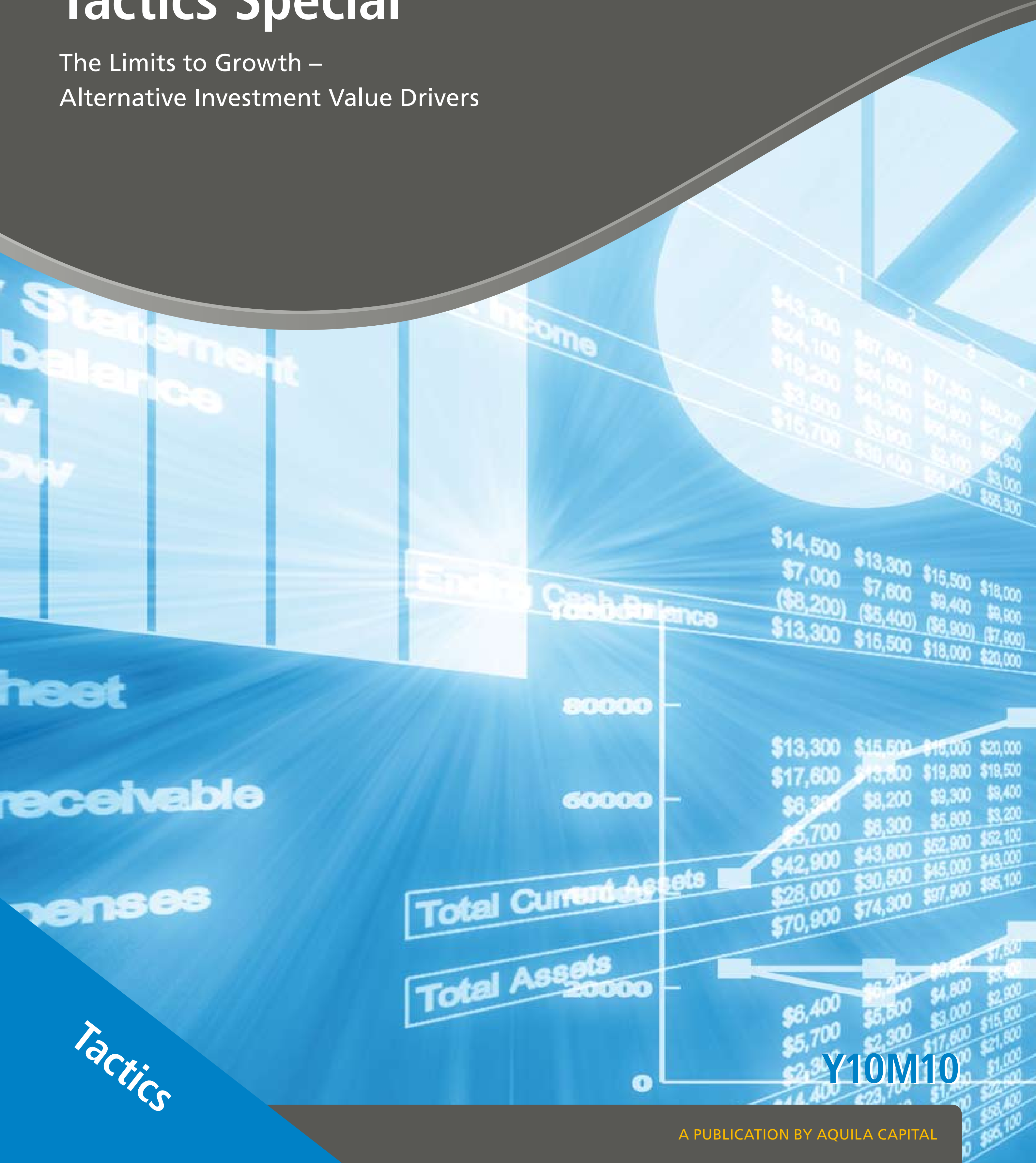
Tactics Special

The Limits to Growth – Alternative Investment Value Drivers



Tactics

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A PUBLICATION BY AQUILA CAPITAL

THE LIMITS TO GROWTH – ALTERNATIVE INVESTMENT VALUE DRIVERS

During our traditional Aquila autumn roadshow at the beginning of October we once again visited many investors from all over Europe. We were particularly pleased to welcome our Advisory Board member Prof. Dr. Dennis Meadows as our guest in Germany for one week. In addition to the main show in Munich, several individual events were held that provided for lively discussions. Below you will find a summary of the core messages and key findings discussed, a selection of slides including comments, as well as an overview of the most frequently asked questions and popular subjects.

SECTION 1:
Traditional Financial Markets: The big picture

The general opinion today is that as a whole, conventional investments such as equities, bonds and real estate exhausted their performance reserves during the bull market 1982 – 2007 (at least outside of Germany). This period is labelled the "golden age of financial investments" for a reason, with the relative value of financial assets and real estate rising by up to 600% compared to the rest of the economy during this time.

However, we are now living in a "new normality", a time in which return and risk profiles have completely changed. We can easily calculate the average return potential of bonds for the coming decade (see chart "Return potential of German government bonds until 2020", page 8). It amounts to between 0% and 2.5% annually, while the potential for equities will be an estimated 6% annually, including dividends. If we base the calculation for real estate on the historical average of around 6% annually and assume that the typical portfolio allocation – for example in Germany today – is 70% bonds, 20% real estate and 10% equities, the expected return over the coming 10 years will be approximately 2.7% annually. It therefore comes as a surprise that US pension funds expected an average annual return of 8% on their portfolios at the end of 2009. They are apparently basing their estimates on the average value of the past 25 years (or on portfolio returns required for covering liabilities).

If the performance potential of fixed interest investments has obviously been exhausted and equities exceed the average trend in the long term by approximately one standard deviation, alternative value drivers from outside the financial markets must be included in portfolios. Due to the unbalanced supply and demand situation, value drivers can now be found particularly in the real economy sector and chiefly amongst natural resources, because the "limits to growth" are no longer fiction but have become a reality that many indicators have been able to prove.

SECTION 2:
The Limits to Growth – an Update after 38 Years

In 1972, the Club of Rome commissioned and published the study "The Limits to Growth". For the first time, this book questioned the mantra "Growth is not everything but without growth everything is nothing!" and pointed out the consequences of unlimited growth. The after-effects of this study were immense, in fact greater than anyone expected. Dennis Meadows is the author of this book.

The Author

Prof. Dr. Dr. h. c. mult. Dennis Meadows (born 1942) is a pioneering systems scientist. He studied chemistry and was awarded a doctorate in management at Massachusetts Institute of Technology (MIT). He was the director of three university research departments: MIT, Dartmouth College and University of New Hampshire. He holds an honorary doctorate at three European universities and he has lectured in over 50 countries. The manuscripts of his lectures have been translated into many languages and are being used in more than 30 countries. Dennis Meadows is the author and co-author of 10 books on future issues, systems sciences and computer business games that have been translated into over 30 languages. His most famous book is "The Limits to Growth" published in 1972, the popular version of a research project at MIT, commissioned by the Club of Rome and financed by the Volkswagen Foundation. It became a bestseller, was translated into 38 languages and sold millions of copies around the world.

Dennis Meadows is regarded as one of the first people to warn us about growth. In 1972, he used a computer simulation to calculate the systematic development of the world as an economic area until 2100. The result of the analysis showed that the growth of economies and populations is limited by food supply shortages, environmental pollution and resource depletion. The global economy will only achieve long-term stability through mankind's massive efforts, particularly regarding birth control and environmental protection as well as the frugal use of resources and their recycling. These subjects were classed as outdated by the 1990s. But now, in view of food supply shortages and high oil prices, these visions, previously discarded as apocalyptic, are being taken seriously again. Climate change is in full swing and the most important energy sources such as oil can no longer be produced in unlimited amounts. The earth has reached its performance limits. Resource depletion, population growth, pollutants and soil erosion are all enlarging our economic footprint, which has reached 150% by now.

What do the results of the year 1972 tell us in view of today's knowledge and data (the study was already updated in 1992 and 2004)?

The Limits to Growth – 38 Years Later

- The conclusions reached 38 years ago have not changed. Our world, however, has. The core messages of the LTG scenarios in 1972 and of the updates in 1992 and 2004 always stated that the limits to growth would only become apparent between 2010 and 2050. This remains true, apart from that things have developed quicker than originally anticipated. By now, the resources we use amount to 150% of maximum capacity, compared to 85% in 1972!
- In 1972, the goal was to slow down growth before the maximum limit was reached. Today, the aim is to drop back below the upper limit again before causing incalculable damage.
- In the coming 10 to 30 years, population and industrial production growth rates will become negative. To this day, there is no economic theory that works with negative growth rates.
- New technologies will be helpful to the adjustment process but will be unable to solve the fundamental problem.
- Highest priority must be given to tackling the impending energy shortage ("peak oil") and climate change.
- We will experience more change over the next 20 years than occurred during the past 100 years. Who would have thought just three years ago that the US would nationalize its automotive industry or that the US Congress would only take four hours to decide to exceed its budget by USD 700 billion?

More to Come

China remains the most alarming example for continuous, exponential growth. Current estimates predict that the Chinese real economy will grow between 8% and 10% per year in the coming five to seven years (the average value of the past 30 years), implying that economic performance will double by 2017. According to the simple mathematical law of exponential growth, China will use more resources in these seven years than in its entire history.

These abstract growth figures are directly reflected in China's infrastructure planning for the next 10 to 15 years. An estimated 350 million Chinese people will migrate from the country to the cities during this period – three times more than the 103 million Chinese who have already done so since 1990. This urbanization is a major driver for demand in industrial and agricultural resources and requires massive development of the existing infrastructure. According to current plans, China will construct:

- 1,000,000 km of new roads,
- 28,000 km metro lines,
- 170 new local transport networks,
- 97 new airports,
- 40,000,000,000 sqm office floor space,
- and energy use will double.

Judging by experiences made over the past 30 years, China will be able to actually achieve these targets. The impact of this urbanization on food supplies is also enormous as the current middle class of around 120 million people (with incomes exceeding USD 7,000 annually) will continue to grow steeply. The consequences will be the same for China as they were for Japan, when it underwent similar developments in the 1960s: the population's eating habits will change towards high-quality food (rich in protein).

As agriculture could be regarded as a conversion of water into calories (rule of thumb: you need one liter of water to produce one calorie), China's drinking water deficit becomes a particular problem. Compared to the rest of the world, China owns only one third of the average drinking water reserves, and this water shortage is most acute in the densely populated north, where 46% of the population live but only 19% of water reserves are located. On top of that, this region holds 65% of the country's agricultural land, a fact that dramatically increases this problem and is the reason why China is carrying out large acquisitions in the agricultural sector (as well as other sectors) abroad.

Another example of the interaction between non-linear and exponential trends within a limited system is the well-known "peak oil" scenario. It illustrates how energy supplies would collapse if dropping oil output was to create a sudden energy supply shortfall.

SECTION 3:
Peak Oil – the Danger of the Impending Energy Gap

- The peak oil (PO) scenario describes the point in time at which the global natural oil (and gas) output reaches its peak. This point is not the same as the point at which supplies run dry, which will occur only decades later. It rather means that the fossil energy supplies are no longer sufficient to cover global energy demand.
- The USA experienced its PO in 1970 and since reaching this high, US output has dropped by 70%.
- Great Britain went through its PO in 2000 and output has decreased by 50% since then.
- Simple oil reserves have been exploited by now:
  - From the 20 largest oil fields in the world, 18 were discovered between 1917 and 1968, two in the 1970s, and none after that.
  - In 2006, only 9 billion barrels were still found but 31 billion barrels were consumed.
  - In 2007, government oil companies controlled 50% of global output and 88% of reserves compared to less than 20% respectively in 1973. Today, essential energy reserves are no longer left in the hands of the open market.
- A study on this subject commissioned by a German foundation caused quite a stir in Germany (www.energywatchgroup.org). It came to the conclusion that "oil output will drop several percent each year in the future. Global oil output is expected to drop dramatically by 2020 and even more so by 2030. This will create a supply shortfall that even increasing outputs of other fossil, nuclear or alternative energies will hardly be able to make up for within this period of time."
- The energy gap in numbers:
  - Expected energy demand in 2050: 30 terrawatt.
  - Expected energy gap: 17 to 20 terrawatt.
  - If we were to build one 1 GW nuclear power plant per day over the next 50 years, the resulting energy potential would be 10 terrawatt.
- A good indication of the PO scenario becoming reality would be if governments continued to intervene in the energy sector. The oil price itself is an indirect indicator, as it can be/is being controlled to a large extent by governments.

SECTION 4:
Questions and Answers / Theses and Antitheses

As was to be expected, many theses once again met with questions and even scepticism. Here are some of the questions and answers we encountered during the resulting discussions:

Q: Could it be that you have made mistakes when calculating your figures?

A: No doubt we have made mistakes – it is inevitable when modelling complex systems. But the results of the past 38 years show that some of the scenarios have been right on track for many years. This proves that the models are solid – sadly they are all negative scenarios.

Q: Won't the market ensure that a new equilibrium is created as supplies are getting shorter?

A: Absolutely! But the question is if we are going to like it when prices start rising as gasoline and natural gas will be rationed and air travel will once again become a luxury.

Q: What is your remedy for saving the world?

A: We do not have to save the world, it looks after itself. It will reach a new equilibrium, as it has done many times before. The question is if humankind will still be included in this balance and which standard of living we can expect. In other words, we have to ask ourselves if we can save our civilization as we know it.

Q: What can each individual do to help?

No one can save the world by him or herself. If there won't be any supranational consensus and we will not take appropriate countermeasures, the only thing left to do is making small preparations. Many small steps in the right direction can buffer some of the collapse and buy us time. Everybody knows the answer: Sustainable development, reducing our footprint to below 100% and mentally preparing for the impending changes, so that we are ready and do not get a shock when it finally happens.

Q: Do sustainable investments or investments in general still have any effect?

A: Sustainable investments alone cannot save the world, but each individual step is a step in the right direction and these investments make sense. Even a collapse scenario does not mean that we will sit around bonfires in caves. The financial markets and need for investments will continue to exist but with a different orientation.

Q: What will happen to the political systems in the case of a collapse?

A: We have to abandon the idea that the current political systems are the only and final possibilities, and humans have reached the final stage of evolution. Germany has seen it all in the past 100 years: an empire, an unsuccessful democracy followed by dictatorship and now another democracy. I could imagine that the next 100 years will bring about similar changes.

Q: What do you think is the fundamental problem?

A: Growth itself is the problem. Exponential growth is important because it quickly results in large figures. You will achieve the same result with linear growth but it will take longer.

Unfortunately, the global population and industry both grow exponentially due to the nature of their underlying structures.

Q: Aren't you underestimating the possibility of adapting?

A: Adapting does not tell us if the system is as we would like it. If you take a large group of people and reduce their amount of food, you are adapting to the situation – because some will starve to death. That's adapting, but should we be happy about it? No. Of course, mankind will adapt; they won't be able to use what they don't have. But the question is rather how we will adapt. Will we keep our freedom and maintain a proper standard of living or will it all end in disaster? War is adaptation. Nobody likes war. The aim of the adaptation process is the important part.

Q: You are using a model for your prognosis that calculates the interaction of some factors way into the future. But models are only extremely simplified pictures of the real world. Your model does not take into account any positive or negative outside influences, for instance. If the world was to see a breakthrough in nuclear fusion tomorrow, all your scenarios would suddenly become obsolete as the long-term growth potential would increase dramatically.

A: Yes. If tomorrow scientists were to make a breakthrough in the laboratory, run into the streets and shout: "We have invented nuclear fusion, the key to a never-ending source of energy!", it would still take 40 to 50 years until we would be able to obtain energy from nuclear fusion. Nuclear fission was invented in the 1940s and after a period of great political and financial support, nuclear reactors provided only 3% to 4% of the total energy volume by the 1970s. We are not exactly certain what will happen in the future, but we know that this kind of delay will still occur within the system. Somebody could invent a technology tomorrow that eliminates carbon dioxide emissions when burning fossil energies, but it would take a hundred years until we would see the first positive results.

Please note:

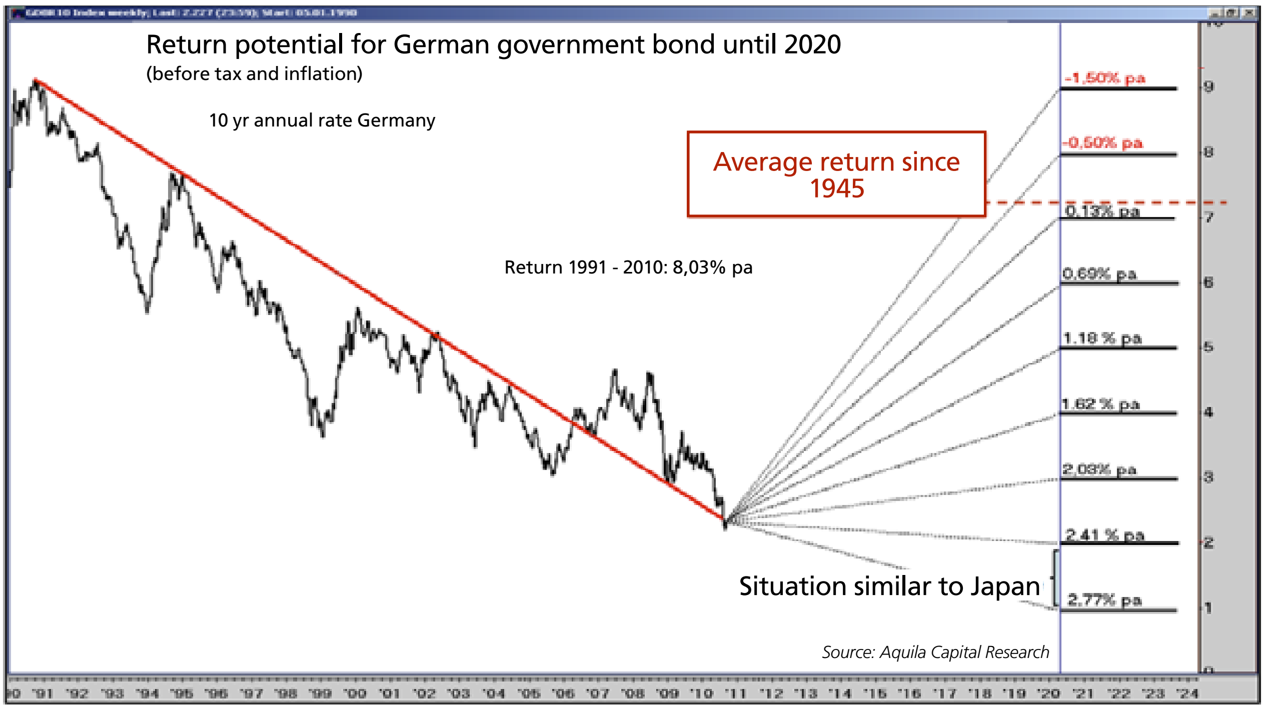
For you to obtain a clear picture about Prof. Meadows, we would like to draw your attention to the following: Prof. Meadows is neither a missionary nor a supporter of the "conspiracy theory". He is a renowned scientist and as such used to questioning all knowledge and results. He is the ambassador of his message but not its originator. He belongs to the league of protagonists of other shortage theories on the subjects "peak oil", "peak water" and "peak agriculture", which also arrive at their sobering results on the basis of hard facts and data.

For each opinion there is someone who opposes it. This also applies to the subjects "peak oil", "peak water" or limits to growth. It is always sensible to listen to both sides. Aquila Capital does not necessarily agree with all conclusions either, but we believe that mentally preparing for the issues discussed above would be cheap insurance should everything turn out well in the end.

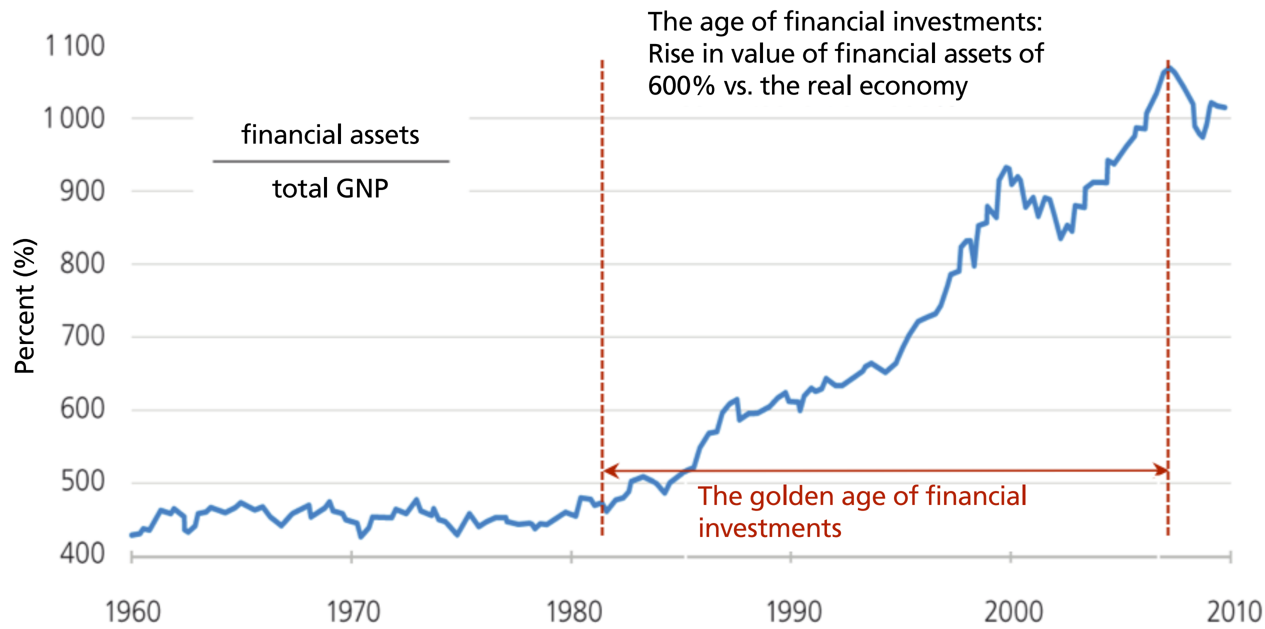
Over the past 110 years, the patterns on the Dow Jones have been repeating themselves – long sideward trends are followed by significant bull periods. For about 10 years now, the Dow Jones has been fluctuating around the 10,000 points mark. Has the time now come again for a bull market? The fact that the index stands at one standard deviation above the average (blue line), corresponding to a rise (excluding dividends) of 5% annually, speaks against this. From this development, we can conclude that the potential in the next decade would be around 3% + return on dividends (currently 3%) = 6% annually.

Not just the Dow's relatively high level within its price channel points towards below-average returns in the future, but the last three significant bull periods started with a PE of six to seven (according to the method of Prof. Shiller). The current PE of 19 is therefore another sign of a long-term overvaluation.

After 30 years of bull market, the global bond markets have dropped to interest levels last encountered during the Cuba crisis, with low inflation rates and poor growth expectations in the Western world being the cause. Even if the much feared rise in interest rates does not become reality (see Japan for the last 20 years), the potential for returns on bonds is exhausted, as you can see from the calculation below.

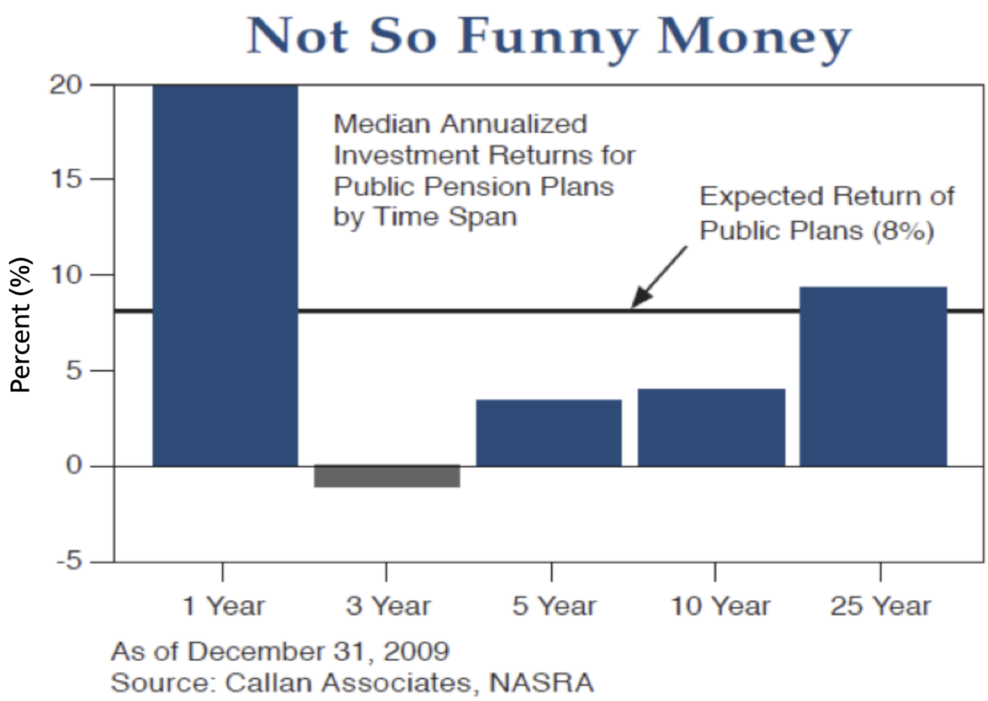


The future potential for bonds can be worked out from the current coupon and price changes. Our 10-year German government bonds will not be able to gain more than 2.5% annually over the next 10 years (should a situation develop like in Japan), therefore losing their importance as portfolio stabilizers or sales returns reserves. If interest rates were to increase again to post war levels of approximately 7.2%, investments in bonds would have achieved zero total performance during the entire period!

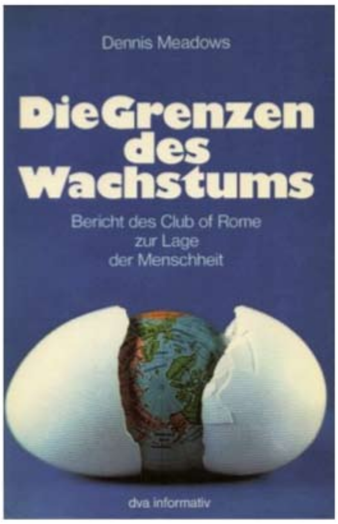


Source: BCA Research 2010

In the 1960s and 1970s, the ratio between financial assets and real economy fluctuated at around 450%; between 1982 and 2007, it increased by about 600%, topping at 1050%. In the best of cases, a new sideward move can be expected in the coming years/decades – a return to real economy!



In the past 3, 5 and 10 years, US pension funds generated average returns of -1%, 3.5% and 5% annually, and current expectations for the coming 10 years are 8% per year! Such figures resulted from calculations taking into account the bull markets of the 1980s and 1990s but will only be realistic if additional sources for returns outside the financial sector can be found. (Source: Pimco)



1972

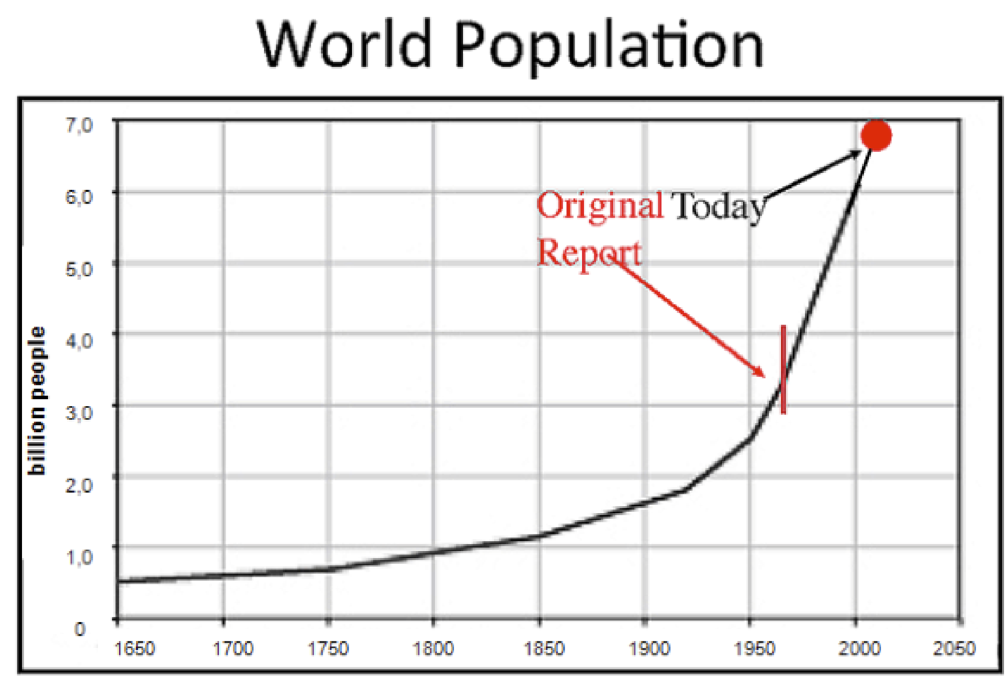
Living Planet Report 2010

2004

38 Years after *The Limits of Growth: Lessons learned and not learned*

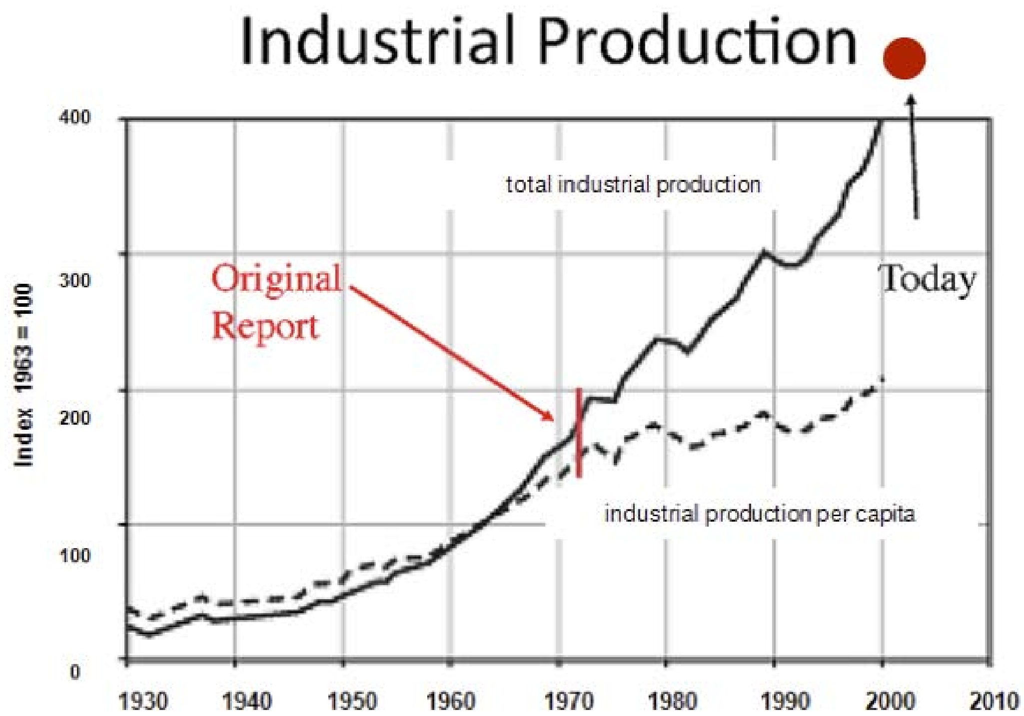
By Dennis Meadows

Prof. Meadows: "I have been speaking on the subject for 40 years. I have heard all arguments and questions many times by now. Sadly, hardly anything has changed, neither facts nor arguments."



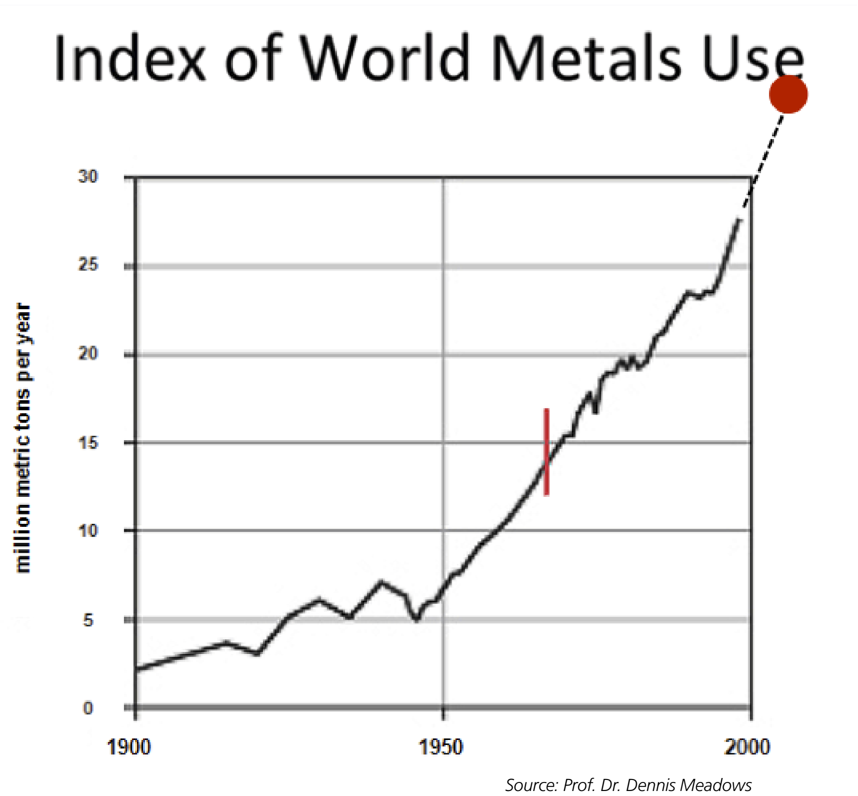
Source: Prof. Dr. Dennis Meadows

Thirty-eight years have passed since the study "The limits to Growth" was first published. Since then, exponential population growth has not lost much of its dynamic.

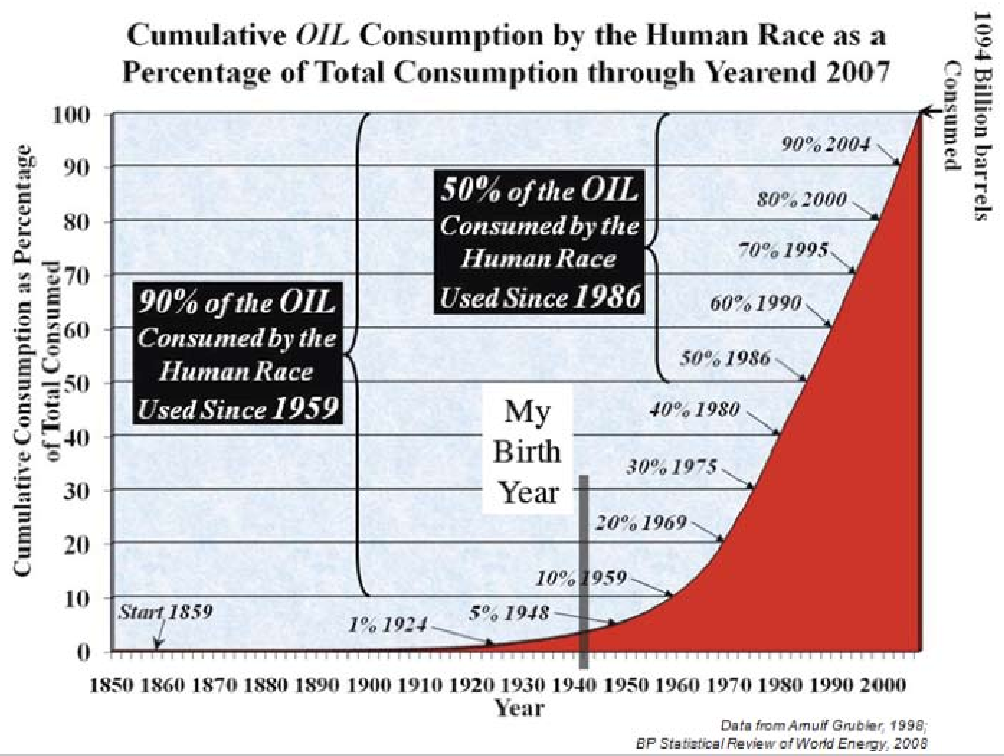


Source: Prof. Dr. Dennis Meadows

Since the first publication, total industrial production has also continued growing exponentially (as a result of the population growing exponentially all this time). But also the "per head" rate has risen (!), doubling exponential growth and increasing the problem.

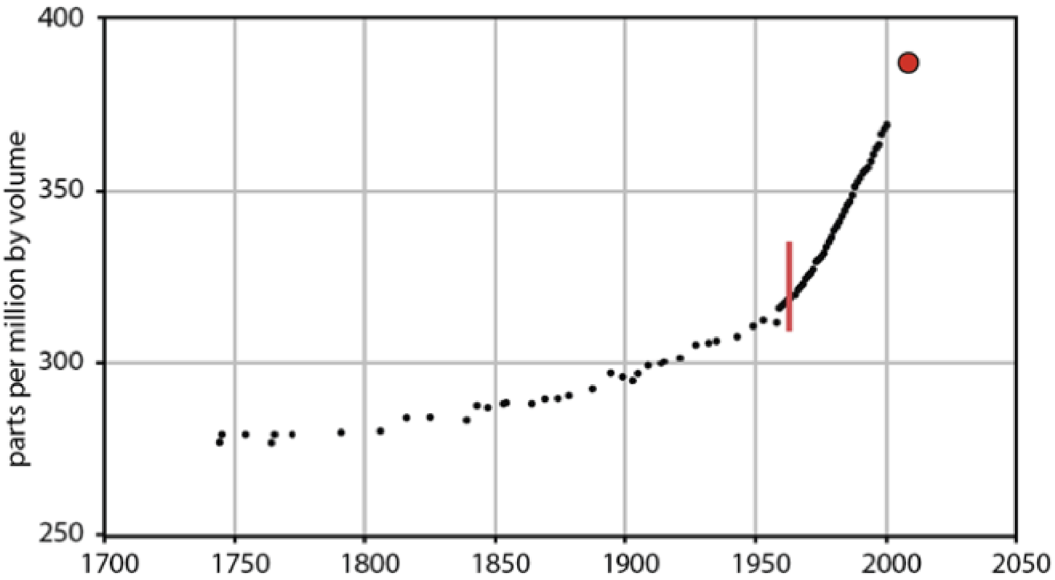


Since the study was first published in 1972, consumption of industrial metals has been rising exponentially.



A poignant picture of the oil age: Prof. Meadows is 68 years old. Ninety-eight percent of the oil produced to this day has been consumed since his birth in 1942. We are therefore living in an extraordinarily privileged age – it will have taken us only around 300 years to ransack the earth's energy reserves that took 300 million years to develop.

CO_2 Concentration



Source: Prof. Dr. Dennis Meadows

Exponential growth and climate change: Growing populations, rising industrial production and increasing need for energy, combined with shrinking forests… have been exponentially accelerating CO2 production for around 100 years.

Relying on Present Net Value to Choose Assumes:

- All consequences of an action are known
- All consequences can be expressed in monetary units; they are commensurate
- This generation is the ones that is entitled to pick the interest rate
- Maximizing financial benefits is the goal of society
- Current mistakes can be corrected by paying some cost in the future

Every single one of these assumptions is false for the issue of climate change!!

Most environmental problems are evaluated by the financial damage they cause (future damage is discounted from the NPV) and this figure is used to assess countermeasures. This method has serious flaws, one being that it is based on linear correlations. But the largest shortcoming is that current decision-makers are being given the right to freely choose discount rates over long periods of time. The interests of 100 weeks or less are ending up having an effect for 100 years or more.

Main Insights from the Scenario

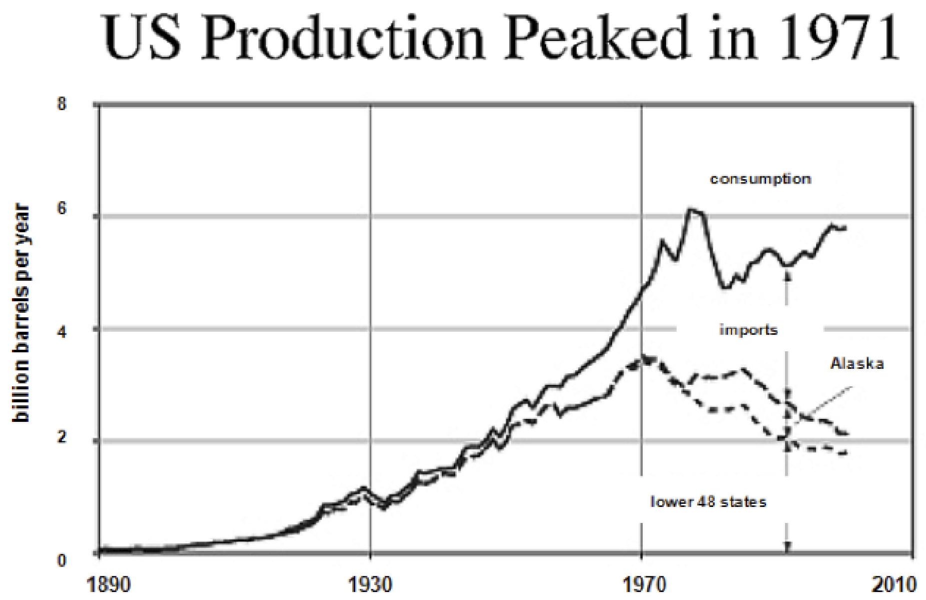
- In 1972 we projected another 40-80 years of growth.
- All our scenarios showed growth ending in the period 2010-2050.
- The most common behavior pattern was overshoot and decline, not gradual slowing within a limit.
- Technology advance did delay the end of growth by a few years, but not eliminate it, and it did not avoid the decline.
- Social and economic changes were required to attain the most attractive futures.
- Today's "problems" are not actually problems; they are symptoms. The real problem is physical growth in material and energy flows pressing against the limits of a finite planet.

The main statement of the 1972 "standard scenario" is: between 2010 and 2050, the growth trend will have to face the fact that the earth's resources are limited. The problems we know today such as climate change, shortage of drinking water, overfishing etc. are only symptoms of the underlying problem – exponential growth within the limited system of this earth.

The Sequence of Objections

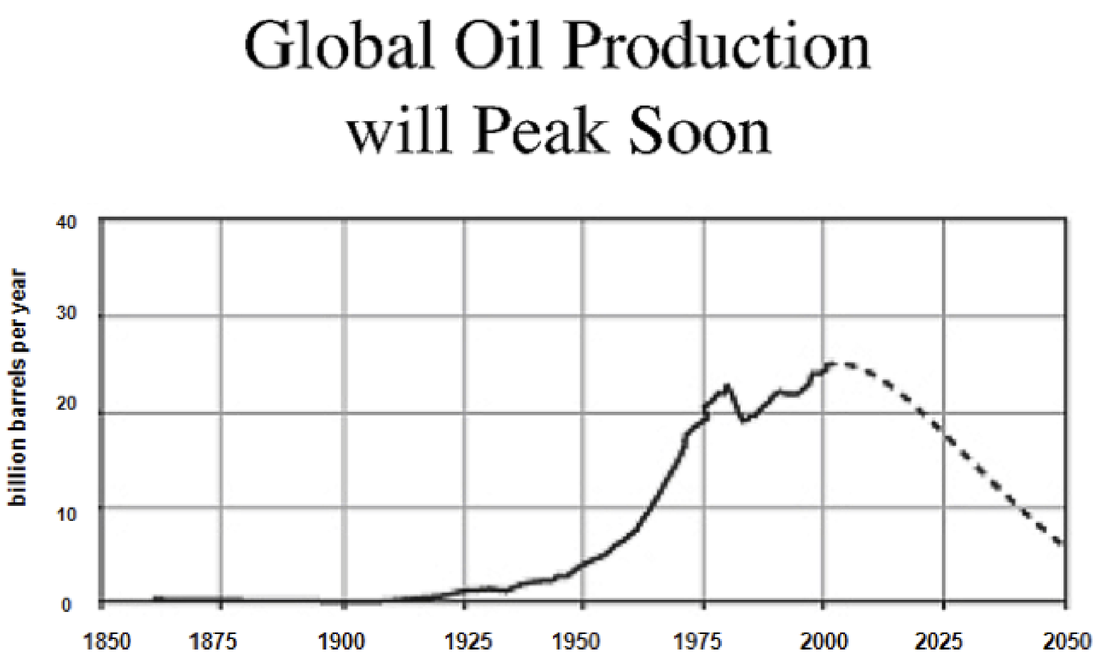
- 1970s: There are no limits.
- 1980s: There are limits, but they are distant in time.
- 1990s: The limits are near, but they are irrelevant, since they will be dealt with by the market.
- 2000s: The market is not adequate, but new technologies will let us evade the limits without requiring that we stop growth.

The similarities to many investors' chains of reasoning prior to the financial crisis are striking: investors first fundamentally denied the existence of a real estate bubble, then put it to the back of their minds and then hoped for a "financial wonder" – the attitude today is similar regarding the shortage of natural resources. There is just one difference: Resources cannot be printed!



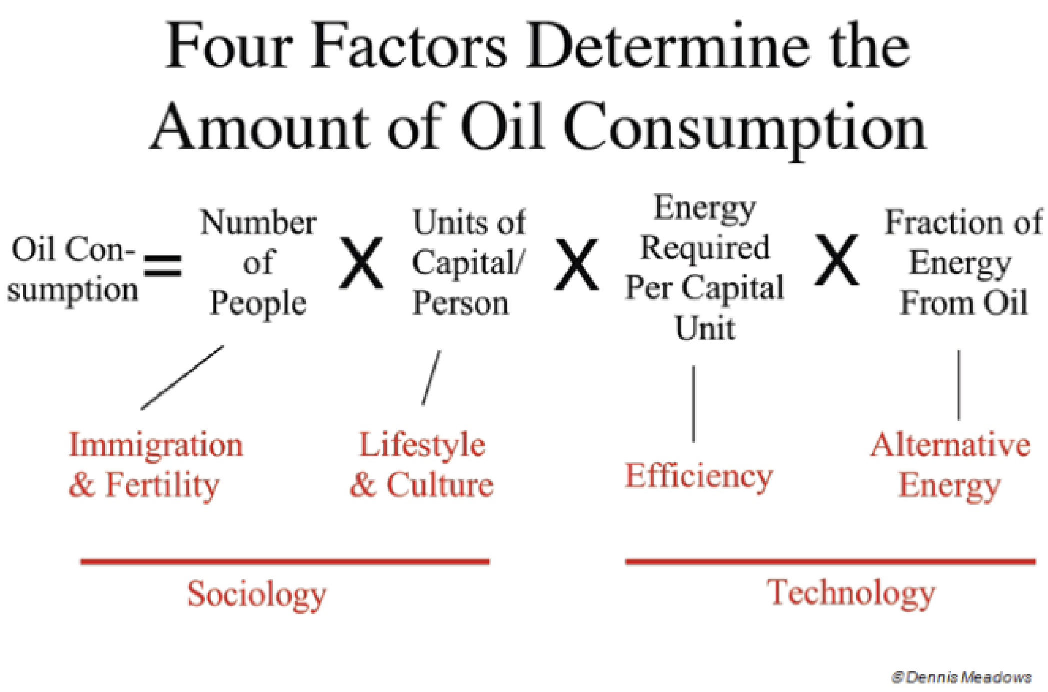
Source: Prof. Dr. Dennis Meadows

As early as 1954, K. Hubbert, an oil geologist working for Shell, calculated the US oil output to reach its maximum (peak oil) between 1970 and 1975. People laughed at him given the oil flood of the 1950s. But US output did in fact peak in 1970 and despite finding new reserves (Alaska since the mid 1960s), today's output is about 70% lower than the maximum value back then.

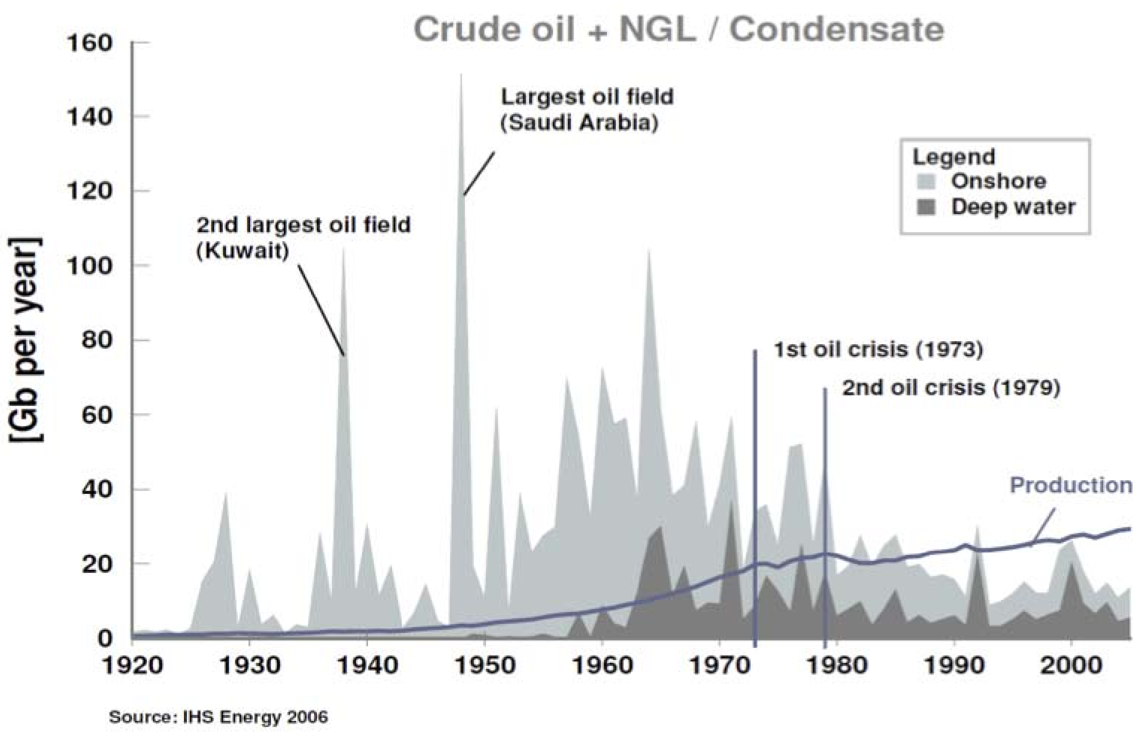


Source: Prof. Dr. Dennis Meadows

If we take K. Hubbert's calculation for the USA and apply it to global oil output, we find that it will peak between 2005 and 2015. Afterwards, it will drop by up to 8% annually but demand is going to keep rising at the same time.



A simple look at energy demand factors shows that only two out of four factors can be influenced by technology or market mechanisms. Rising population and growing need for energy coupled with increasing wealth are mostly unrelated to the market. The same applies to food and water... the impact of market mechanisms and new technologies on the problem is 50% at the most.



All large oil fields were discovered prior to 1980, but only two after 1970. Since the mid 1980s, annual oil output has been exceeding the number of new discoveries, even including new deep sea wells. (Source: Energy Watch Group)

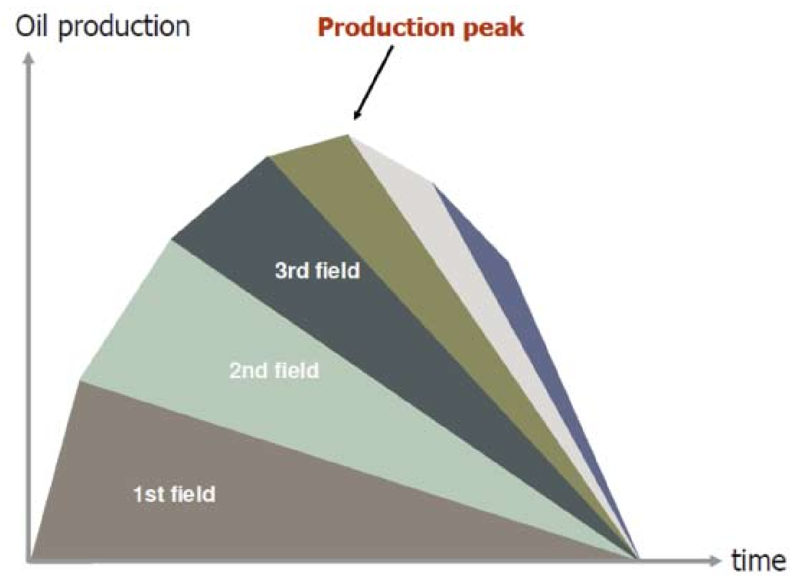


Abbildung 3: Typisches Förderprofil einer Ölregion

Typical development of output in one oil region: First, large fields are discovered and exploited, then smaller fields are tapped. It becomes increasingly difficult and expensive to increase output volume until operators are no longer able to tap new sources. This moment is called "peak oil" and output drops rapidly afterwards. (Source: Energy Watch Group)

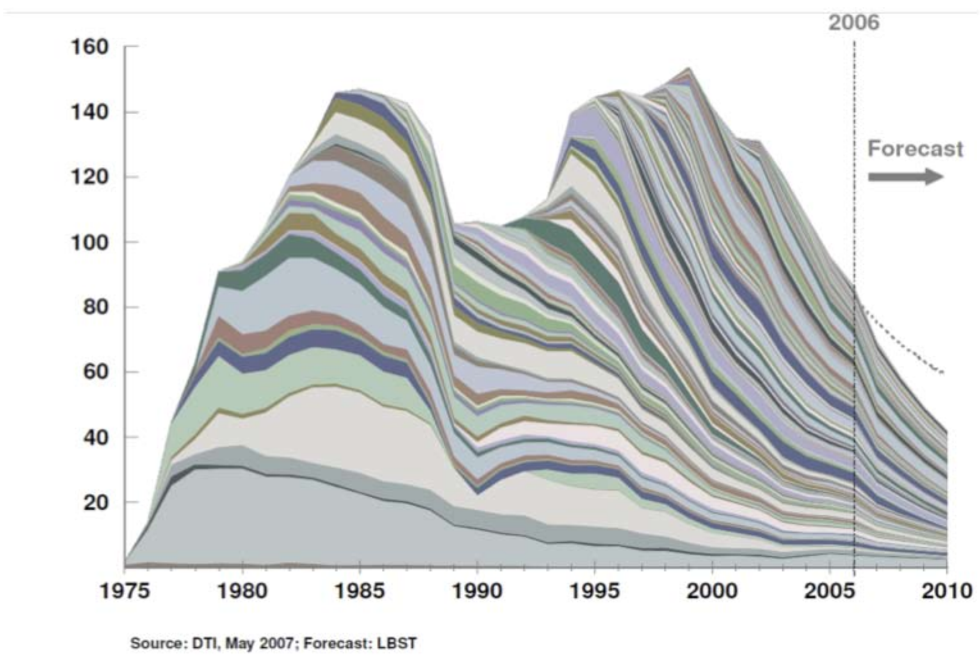
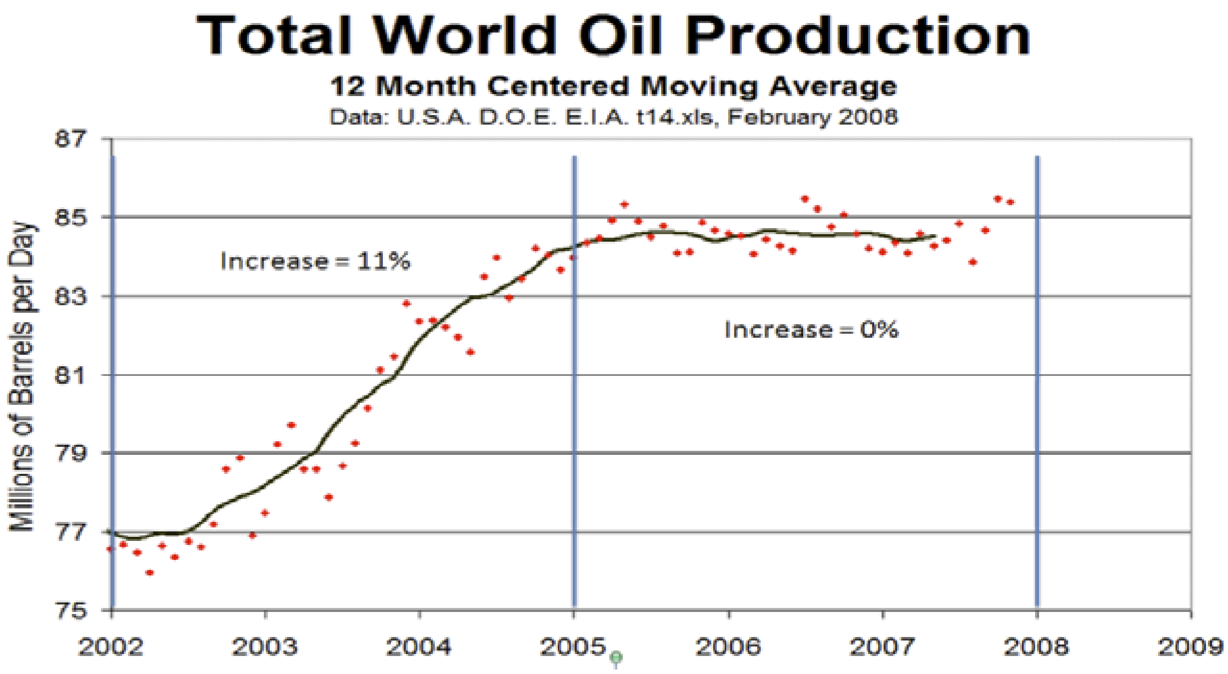
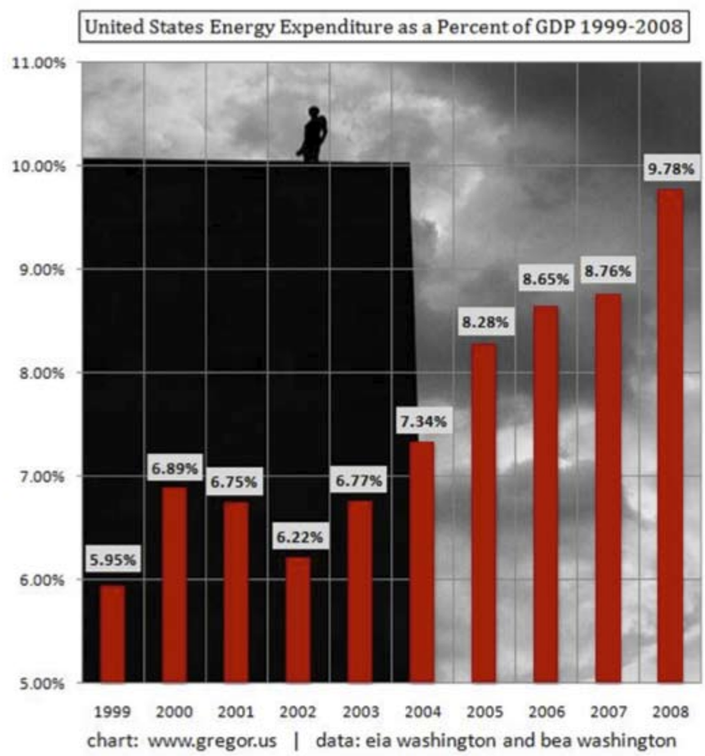


Abbildung 4: Ölforderung in Großbritannien

The example of Great Britain shows the typical development of actual oil output in one region. The country reached its maximum output volume at the beginning of the 21st century (the previous slump had been due to a fire on an oil platform and a temporary production stop). Since then, output has dropped by approximately 50%, even quicker than in the 1970s in the USA. (Source: Energy Watch Group)



In the boom years before the financial crisis, oil output stagnated at almost 84 million barrels per day despite oil prices tripling. The defenders of the peak oil scenario see this as a clear sign that the maximum had already been reached some time ago.



The price of oil provides only unreliable evidence of the resource's availability, as governments have too much influence on it (output volumes). The ratio between GNP energy expenses and total expenses gives a clearer indication of shortages. It has doubled in the USA in the past 10 years.

The Time of Greatest Stress

- Most people assume that the major global difficulties would occur after the end to growth.
- This is not correct.
- The globe's population would experience the most stress prior to the peak, as pressures mount high enough to neutralize the enormous political, demographic, and economic forces that now sustain growth.
- We are in the early phases of that period now; you will experience more change over the next 20 years than occurred during the past 100 years.

The core message of Prof Meadows' speech and many of his interviews is: You will experience more change over the next 20 years than occurred during the past 100 years!

Consequences for Investors

Investors will be faced with two fundamental challenges in the coming years:

- The exuberant debt problem and money creation in the Old World lends equal weight to inflation and deflation scenarios. In both cases, conventional investments such as bonds and equities barely provide any protection or returns.

- The continuous, intact, demographically driven growth development in the New World will lead to a shortage of resources that will not go unnoticed in the financial markets.

Can One Approach be Applied to Both Cases?

One possible scenario would be an "inverse stagflation". Developments in the 1970s and 1980s are best described as a "typical stagflation": High rate of inflation, sharply rising interest rates, stagnant economic growth and dropping stock and commodity markets.

Stagnating economies and stock markets form the basis for inverse stagflation. But due to excess debts, interest rates also remain low (otherwise it would be impossible to repay or refinance these debts). The old emerging markets, headed by China and India, are becoming increasingly independent, and demand for all resources is therefore not easing up. Limits to growth are now becoming apparent but are resulting in rising prices for all resources.

Conclusion: Little economic growth is resulting in underperformance of conventional asset classes such as equities and bonds. Prices for resources and other real assets, on the other hand, are rising steeply. This is a reversal of the situation during the "golden age of financial investments". Economies that are based on and rich in resources with solid financial policies are particularly benefiting from this situation, as are direct investments in basic resources in sectors such as agriculture, forests and renewable energies.

In Jim Roger's words:
"Farmers will be driving Ferraris."

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