Patience and Finance

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PATIENCE AND FINANCE

In the East, it is said:

> "One moment of patience may ward off great disaster
> One moment of impatience may ruin a whole life"
> [Chinese Proverb]

In the West, it is said:

> "I often make more money when I am snoozing than when I am active"
> [Warren Buffett]

These observations have common conceptual roots. Underlying both lies patience. Patience, or its alter ego impatience, is a key factor shaping inter-temporal decisions. Whether to save or spend, trade or invest, work or quit, stick or twist. As such, patience has important implications for the evolution of economic and social systems.

This paper considers the role of patience in decision-making, in particular financial decision-making. Patience is not static; it evolves. This paper brings together lessons from economics, history, psychology, neurology, sociology to assess patience and its implications for the evolution of economic and financial systems.

Evidence from social and economic systems points to two evolutionary paths. Along one, patience becomes self-reinforcing. For example, financial liberalisation may encourage patience and improve inter-temporal choice, unlocking growth. But there is a second path, along which impatience is self-reinforcing. Financial liberalisation can also unlock impatience, generating over-trading and under-investment.

These dual equilibria make choosing the right pace and path of financial reform crucial. Some countries, like China, appear to be proceeding along the patient path. The choice is how to pace reform to prevent overshooting onto the impatient path. For countries which have already liberalised, the choice is how to promote patience while harnessing impatience. These are real public policy choices.

Patience and Impatience

Patience, we are told, is a virtue. That has been the verdict of theologians, philosophers and authors for well over 700 years. Interestingly, it was also the verdict of the earliest economists. In his *Theory of Moral Sentiments* (1759), Adam Smith declares:

> "The qualities most useful to ourselves are, first of all, superior reasons and understanding, by which we are capable of discerning the remote consequences of all our actions; and, secondly, self-command, by which we are enabled to abstain from present pleasure or to endure present pain in order to obtain a greater pleasure in some future time".

So for Smith, patience was both a distinctive and valuable human commodity. Subsequent research has shown he was right. Patience is peculiarly human. Our nearest evolutionary relatives, discount almost entirely outcomes more than one minute into the future.[1] It is not that animals are incapable of far-sighted behaviour – for example, squirrels collecting nuts or birds flying south for the winter. But these are not acts of spontaneous self-control, like saving or dieting. Rather, they are genetically pre-programmed. The squirrel does not store food as a dietary device.

The Patience "Gene"

The source of human self-command, or patience, appears to be neurological. Recently, this has become detectable using brain imaging technology. That suggests the pre-frontal cortex of the brain is key to self-control and patience in humans.[2] The pre-frontal cortex develops with age, being least developed in small children. In other words, neurology has confirmed the suspicions, and frustrations, of generations of parents with impatient toddlers.

The pre-frontal cortex is also the part of the brain which has developed most recently. Human skulls developed from prominent brow ridges of Neanderthal man to the high

[1] For example, Stevens et al (2005), although Rosati et al (2007) argue that, when making food choices, chimpanzees and bonobos exhibit greater patience than humans.
[2] Figner et al (2010)

straight foreheads of today's homo sapiens to accommodate the growth of the pre-frontal cortex. That tells us the patient part of the brain was close to being fully developed perhaps around 30-50,000 years ago. Today, although the pre-frontal cortex in humans is no larger than in a gorilla, its evolution has resulted in patience having become a distinctive, perhaps unique, human attribute.

As such, it is not too big a leap to imagine patience having had important implications for the evolution of human systems, economic and social. Take economic growth. The Neo-Classical growth model in economics provides a simple link between patience and development. Patience generates savings by households which in turn finances investment by companies. And capital accumulation by firms, growth theory suggests, is then the prime driver of future output. Countless empirical studies, across time and countries, have confirmed that theory.

Long-run patterns of growth are also consistent with a patience-based explanation. Relative to animals, human systems have experienced extra-ordinary economic development, especially over the past 400 years. And the timing of that development has a neurological link. Between 1 million BC and 50,000 BC, world GDP per capita was roughly unchanged. By the end of that period, Neanderthal man had gone the way of the dinosaurs. Inside our skulls, patience and the pre-frontal cortex became, literally and metaphorically, front and centre.

In the subsequent period, patience brought prosperity. Between 50,000 BC and 1000 AD, world GDP per capita rose around 50%, at an annual growth rate of 0.00072%. Economists today would classify that as anaemic. But, at the time, it must have felt like a Golden Age. In the subsequent millennium, world GDP per capita has risen 50-fold, at an annual growth rate of around 0.4%. Much of that growth has been since 1750 AD, since when world GDP per capita has risen almost 37-fold, at an annual growth rate of 1.4% per annum.[3] It is difficult to imagine patience not having hastened this dramatic journey.

[3] DeLong (1998).

Some studies have drawn a more explicit link between patience and growth. Studies have linked various cultural and religious characteristics to growth.[4] For example, it has been argued that pre-dominantly Protestant countries in Europe grew faster than Catholic countries as a result of differences in patience and work ethic.[5] This has echoes with recent literature emphasising the role of "Asian values", such as thrift and patience, as a driver of growth in the region.[6]

Patience is also likely to have been a key factor in the evolution of financial systems. At root, banks and capital markets are simply a means of matching saving to investment. They are about realising the benefits of patience and thus growth. There is strong evidence for such effects. Financial deepening is known to be an important determinant of long-run growth.[7] Why? Efficient financial intermediation increases the returns to patience, thereby encouraging thrift and promoting growth.

The Impatience "Gene"

For every virtue there is a vice, for every ego an alter ego. So it is with patience. In Smith's *Theory of Moral Sentiments*, he also spoke of a "two self" model. People had both a patient and impatient component. This double-self principle was developed by psychologists and philosophers, such as Freud and Berlin, during the 1950s and 1960s. Latterly the work of behavioural economists, such as Thaler and Shefrin, has formulated the two selves as the patient "planner" and impatient "doer".[8]

Using brain imaging, this model has recently been given neurological support. While patient behaviour is associated with activity in the pre-frontal cortex, impatient behaviour is associated with a distinct part of the brain - the limbic (or midbrain dopamine) system.[9] Humans have distinct patience and impatience "genes". When making difficult inter-temporal decisions, we are quite literally in two minds.

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[4] Barro and McCleary (2003)
[5] Weber (1958).
[6] Franke et al (2007)
[7] Levine (1997)
[8] Thaler and Shefrin (1981).
[9] McClure, Laibson, Loewenstein and Cohen (2004).

Impatience is no stranger to economics. It was discussed by Neo-Classical economists, such as Marshall, Fisher and Pigou writing over a century ago. Pigou memorably described the tendency of humans to discount excessively future outcomes as a "defective telescopic faculty". Today, research has gone one step further: discounting is not just myopic but inconsistent through time. This has been given a somewhat less memorable, if mathematically more accurate, moniker by economists – "hyberbolic discounting".[10]

Hyperbolic discounting describes how people's preferences alter as distant outcomes become closer to the present. Concretely, imagine a person who prefers $100 in ten years' time to $90 in nine years' time. With hyperbolic preferences, this same person would also favour $90 in one year's time to $100 in two year's time. They exhibit inconsistencies in decision-making across time, or so-called preference reversals.

The implications of such behaviour are potentially far-reaching. The patient planner becomes a spontaneous doer when outcomes are within reach. The cautious saver becomes a reckless spender when nest eggs are close to hatching. The long-term investor becomes a short-term speculator if assets can be cashed. As temptation beckons, the devil on one shoulder whispers more seductively than the angel on the other. Preferences switch as the distant becomes instant.

In these situations, the double-self becomes a practical reality for both animals and humans. Experimental evidence lends strong support. Hyperbolic discounting has been found in such diverse case studies as pigeons pecking corn, students choosing video games, women choosing anaesthesia in childbirth and drug addicts assessing their next fix.[11] Psychiatrically, it may emerge as multiple personality disorders.

Addiction is, in some respects, hyperbolic discounting writ large.[12] It is Pigou's defective telescope being held the wrong way round. Immediate gratification (drugs, alcohol, sex, food) is sought irrespective of the long-term consequences. There is a neurological explanation for such behaviour. Drugs and some foodstuffs flood the

[10] For example, Pigou (1920), Ainslie and Haslam (1992) and Laibson (1997)
[11] For example, Ainslie and Haslam (1992), Ainslie (1974)
[12] For example, Madden et al (1997), Bickel et al (1999), Petry (2001), Vuchinich and Simpson (1998)

brain with dopamine, which stimulates the midbrain associated with instant reward. This might explain why addictive behaviour appears to be more prevalent in humans than in animals. While few squirrels are dieters, even fewer are glue-sniffers.

Impatience has implications for economic and financial systems every bit as profound as its well-behaved twin. For economies, hyperbolic discounting would tend to generate under-saving, as people seek instant gratification. And neo-classical growth theory says that under-saving has adverse implications for long-run investment and growth. Some jam today would come at the expense of a whole jam-jar tomorrow.

For financial systems, the implications are just as far-reaching. The flipside of under-saving is over-borrowing. Consumer credit is one means of bringing forward tomorrow's spending to today. In that sense, credit addiction and drug addiction are close relatives. And accompanying over-borrowing is likely to be over-trading: a propensity to realise investments sooner rather than later, to twist rather than stick.

So where does this leave us? Patience is an evolutionary human trait which has played an important role in the development of economic and financial systems. But impatience is also a human trait whose implications for growth are potentially malign. How have these two traits evolved over time? Has the good gene, by a Darwinian process, deselected the bad?

The Evolution of Patience

In most economic models, people's rate of time preference is assumed to be fixed. Studies of real-world behaviour suggest that assumption is rarely satisfied. People's preferences, and their cognitive architecture, have evolved importantly over time. Patience evolved dramatically from Neanderthal to modern man. It continues to evolve today from child to adult. Preferences also adapt with the environment.

Consider people's risk preferences. Economists typically assume these too are fixed. But the real-world suggests that the environment is key. For example, in the face of a losing streak, experimental evidence shows that human risk preferences tend to flip

from risk-averting to risk-loving behaviour.[13] That is why we often hear "double or quits". Such gambles for resurrection can explain the ruin of bankers as well as gamblers, including most recently Lehman Brothers and Bear Stearns.

These shifts in risk preferences are not peculiar to humans. They are also observed in birds, insects and mammals when faced with a losing streak.[14] Birds foraging in mid-winter have been found to take a calculated gamble by pursuing high-risk, high-return strategies, much like the down-at-heel gambler or world-weary CEO. Although Lehman CEO Dick Fuld was nick-named the gorilla, his behaviour during a losing streak was closer to that of a ravenous robin.

Self-Improving Cycles

If preferences evolve over time, this gives rise to the possibility of self-reinforcing patterns of behaviour. Such evolutionary trends have been extensively studied by sociologists, psychologists and even some economists. These studies confirm the old aphorism: virtue is its own reward. Specifically, patience is capable of setting in train a cycle of self-improving behaviour in individuals, economic and social systems.

Take happiness. Studies have shown that happy people save more and spend less.[15] Happy people also take longer to make decisions and expect a longer life. In short, they are patient. These patterns of behaviour are connected and reinforcing. Expecting a longer life, happy people defer immediate gratification and save. In consequence, they enjoy a more prosperous tomorrow as they harvest the fruits of their investment. In these models, happiness is not just fulfilling; it is self-fulfilling.

Exercise and dieting generate similar self-improving behavioural cycles. Take gym attendance. A recent study found that providing a small financial inducement to attend a gym generated radically different fitness behaviour.[16] It served as a catalyst for an exercise regime which, once begun, was much more likely to be completed.

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[13] For example Kahneman and Tversky (1979)
[14] For example, Watson and Platt (2010), Schultz et al (2010).
[15] For example, Guven (2008).
[16] Charness and Gneezy (2009).

Improving health improved life chances, inducing long-sighted behaviour which was then both fulfilling and self-fulfilling.

While self-improving cycles shape individual behaviour, they can also have broader social consequences. Studies have found strong behavioural contagion not just between friends, but between friends' friends and indeed friends' friends' friends. In other words, people's behaviours have "three degrees of influence".[17] Sociological contagion has been found in studies of happiness, exercise and dieting. It may have a neurological explanation, as imaging suggests we often incorporate friends' views and attitudes into our brains as if they were our own.[18]

Latterly, models of economic systems have got in on the act. Growth, too, can be self-improving or endogenous – for example, because investment in human capital is self-reinforcing.[19] Working, like dieting, is good for self-esteem and long-term productivity. Idling, like over-eating, is bad. History suggests a strongly self-reinforcing relationship between saving and growth. That is probably why cross-country studies point to such strong growth enhancing effects of financial deepening.

Self-Destructive Cycles

Just as patience can self-generate, so too can impatience. And while patience generates self-improving cycles, its alter ego can create self-destructive cycles. Addiction is the classic self-destructive cycle. Drugs and alcohol chemically alter the balance of the double-self, increasing the value of instant gratification. This shortens time horizons, increasing further the value of instant gratification in a downward spiral. Unless arrested, this unfulfilling equilibrium becomes self-fulfilling.

Similar cycles have been found with a more commonly-prescribed drug – work. Workaholism arises from a spiralling imbalance between work and life.[20] Too much work lowers the value of life away from work. This encourages even greater work

[17] Christakis and Fowler (2009)
[18] For example, Tuckett (2009).
[19] For example, National Institute on Drug Abuse (2007).
[20] For example, McNamara (2004).

and an even greater work/life imbalance in a downward spiral. Obesity can likewise generate self-affirming negative behaviours, often operating through low self-esteem.

As with self-improving cycles, these self-destructive spirals have a social dimension. Bad behaviours rub off just as much as good, with three degrees of influence. It is not just happiness, diet tips and gym membership cards which pass between friends' (friends' friends). So too do depression, chocolate cake recipes and membership of addiction clinics.[21] As patience is contagious, impatience is infectious.

So self-destructive cycles in social systems are the result of a neurological seed nurtured by sociological forces. Self-destruction, like self-improvement, is part nature, part nurture. Finance has both these raw ingredients. Most traders' brains harbour the impatience gene. Often, they harbour little else. And traders' behaviour is shaped every bit as much by the footfall of their friends in the herd. So, in theory, we might expect similar cycles of self-destruction and self-improvement in finance.

Gresham's Law in Finance

To illustrate these theoretical dynamics in action, consider a sketch model. Imagine three classes of investor:

- an impatient *short-term speculator*, who follows the momentum of the herd, buying when prices are rising and selling when they fall;
- a patient *long-term investor*, who invests according to where prices are relative to their long-term fundamentals;
- an *untested investor*, who can mimic either the speculator or the long-term investor, but whose performance either way is assessed at frequent intervals by end-investors who withdraw or maintain funds accordingly.

Market prices in this model are buffeted by two winds. Momentum-based speculators cause deviations from fundamentals, while long-term investors drive prices back towards fundamentals. These are the double-selves of the financial brain, the patience

[21] Christakis and Fowler (op.cit.).

and impatience genes. And as in social systems, the balance of these two genetic types results in two very different evolutionary equilibria.

Under one equilibrium, patience wins the day. When long-term investors start in the ascendency, prices tend to correct towards fundamentals. The performance of untested investors pursuing momentum strategies falters, while those pursuing long-term strategies flourish. The fraction of long-term investors rises. The self-correcting tendencies of market prices are thus reinforced, further supporting long-term investors. The patience gene thrives, the impatience gene dies. Natural selection results in a self-improving cycle, as with dieting, happiness and exercise.

But there is a second equilibrium where this cycle operates in reverse gear. With a large fraction of momentum traders, prices deviate persistently from fundamentals. Among untested investors, momentum strategies now flourish while long-term fundamentalists fail. The speculative balance of investors rises, increasing the degree of misalignment in prices. The patience gene falls into terminal decline. Natural selection results in a self-destructive cycle, as with drug, alcohol and food addiction.

These self-destructive dynamics would have been familiar to economist, and some-time investor, John Maynard Keynes. He quipped: "markets can remain irrational for longer than you or I can remain solvent". In the sketch model, a Keynesian dynamic selection process is at work. Myopic finance bankrupts the long-sighted.

This echoes an earlier evolutionary game in finance - Gresham's Law. Named after English financier Sir Thomas Gresham in the 16th century, this refers to the tendency for bad money to drive out good. The first paper money example of Gresham's Law pre-dated Gresham. It came from China during the Yuan (1271-1368) period. Then, paper money drove out silver coinage.[22] This bad money dynamic has since been replicated across many monetary economies.

China also provided the world with its first example of the reverse phenomenon - a self-improving cycle of good money driving out bad. During the Ming (1368-1644)

[22] Chen (1995)

dynasty, paper money was swept away by commodity money.[23] This dynamic has also since been replicated across a number of monetary economies, including dollarizing emerging market economies over recent decades.

Today, finance faces its own Gresham's dilemma – the patient or impatient path. Innovation has, of course, transformed finance over the intervening years. Liberalisation has resulted in far greater information and liquidity in financial markets. Perhaps these developments have helped good finance drive out bad, nudging money towards the patience path? Not necessarily.

Take information. In an evolutionary game, information is a double-edged sword. It supports the cause of the long-term investor, by allowing them more easily to compare prices with fundamentals. But it also tests the patience of the untested investor subject to regular performance evaluation. Investors whose judgement is right, but whose timing is wrong, stand an increasingly high chance of exiting the game. More frequent information on performance risks contaminating the gene pool, driving out the patient to the benefit of the impatient.

Anecdotally at least, performance evaluation intervals have progressively shortened. Over recent decades, companies have migrated from annual general meetings, to a six monthly or quarterly reporting cycle to today's steady stream of within-cycle trading updates. In finance, information is in general a good thing. But in finance, as in life, it is possible to have too much of a good thing.

Liquidity is similarly double-edged. It reduces the impact of momentum trading on prices, thereby increasing market efficiency. But it also reduces the costs of pursuing such strategies. In other words, liquidity unlocks the impatience gene. Investors whose judgement is wrong, but whose timing is right, can lock in immediate gains. Liquidity, too, can pollute the gene pool by allowing the impatient to prosper. Like information, liquidity can be too much of a good thing.[24]

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[23] Bernholz (1997)
[24] For example, Laibson (1997).

So we have pitchfork equilibrium: along one prong virtue, along the other vice. As in other social systems, these two financial equilibria have neurological roots and sociological branches. They yield, however, very different economic fruit. This dual-self world is structurally schizophrenic: financial innovation is both good and bad; information is both solution and problem; liquidity is both cure and curse; investors are both abstemious and addicts.

So which evolutionary gene is dominating finance in practice? Is bad money driving out good or the reverse? Is history repeating itself as the Yuan or the Ming dynasties?

Patience in Finance

There is ample evidence, theoretical and empirical, of self-improving financial cycles. From the Medici banks in Italy in the 13th century to the joint stock banks of the 19th century to the explosion of capital market finance in the latter part of the 20th century. Today, China provides no better example of that self-improving cycle in motion.

But can financial systems overshoot onto the impatient path, where too much liquidity and information unlock the impatience gene and its ugly progeny. Along that path lies excess – excess trading, excess credit and excess volatility. What evidence exists on these phenomena?

Patience and Puzzles

One source is the enormous literature on financial market efficiency. If markets were efficient, asset prices would mirror fundamentals. This would be indirect evidence against impatience, which tends to cause prices to deviate persistently from equilibrium. In fact, empirical finance is full of puzzles - economist code for deviations from market efficiency. And, interestingly, many of these observed puzzles are consistent with impatient dynamics. They include:

- *Excess volatility puzzle*: There is strong evidence that asset prices, both real and financial, are both considerably more volatile than fundamentals and can deviate for persistent periods.[25]

- *Serial correlation puzzle*: There is strong evidence that asset prices do not follow a random walk, but instead exhibit short-term positive correlation (for example, due to momentum traders) and medium-term negative correlation.[26]

- *Equity premium puzzle*: The required yield on equity over safe assets is greater than can be explained by conventional asset pricing theory - a puzzle which some have explained using hyperbolic discounting.[27]

- *Excess sensitivity puzzle*: Contrary to standard theory, consumption is "excessively" sensitive to movements in income, violating the predictions of the permanent income model - a puzzle which impatience and under-saving can also help explain.[28]

- *Dividend payout puzzle*: In practice, there is strong evidence of high and persistent dividend payout ratios, consistent with investors valuing immediate returns (dividends) over future returns (capital gains).[29]

- *Discounting puzzle:* The discount rates used to value firms, and to evaluate projects, appear to be consistently higher than can be explained by fundamentals, a finding consistent with short-termism in investment.[30]

- *Fund management puzzle*: Actively-managed investment portfolios appear, if anything, to underperform passively managed funds, consistent with the Buffett "snoozing rule" for successful investment.[31]

Patience and Efficiency

If impatience in the financial system is growing, there should be evidence of financial prices having become more volatile and more divorced from fundamentals over time. Excess volatility and misalignment would rise alongside short-termism, with market efficiency the casualty. What does the evidence suggest?

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[25] For example, Shiller (1981).
[26] For example, Poterba and Summers (1988)
[27] For example, Benartzi and Thaler (1995).
[28] For example, Laibson (1997), Laibson et al (2001).
[29] For example, Black (1976)
[30] For example, Miles (1993)
[31] For example, French (2008)

Chart 1 plots equity prices in the US back to 1880, relative to a model-based measure of equity market fundamentals based on discounted expected future profit streams. Chart 2 shows a measure of excess volatility in these series over time (a moving average of the ratio of actual to fundamentals-based volatility), while Chart 3 shows a measure of price misalignment (the absolute deviation of prices from fundamentals, expressed as a percentage of prices).

Chart 2 suggests that, on average over the past century, US stock prices have been over three times more volatile than fundamentals, confirming the excess volatility hypothesis. But the trend in the degree of excess volatility is also telling. Up until the 1960s, prices were around twice as volatile as fundamentals. Since 1990, they have been anywhere between six and ten times more volatile. Excess volatility in equity prices has risen as financial innovation has taken off.

The pattern is much the same with measures of misalignment. Up until 1960s, the average absolute deviation of US equity prices from fundamentals was just over 20%. Since 1990s, the average absolute deviation has been well over 100%. Charts 4-6 present the same evidence for UK equity prices since 1920. While less dramatic, the patterns are much the same. Misalignment correlates with innovation and liquidity.

Patience and Profits

To bring these market inefficiencies to life, consider a simple experiment to gauge the relative performance of momentum and long-term investors. Both are assumed to follow a simple strategy: the speculator buys (sells) when prices have risen (fallen) in the previous period; the fundamentalist buys (sells) when prices are low (high) relative to fundamentals. Portfolios are evaluated and re-optimised on a monthly basis, based on a $1 initial stake. How would these strategies have fared historically?

Charts 7 and 8 show cumulative returns to these strategies in the US and UK. They suggest a dramatic evolutionary pattern. The speculator's $1 stake in US equities in 1880 would by 2009 have grown to over $50,000. The fundamentalist's same $1 stake would have fallen to be worth around 11 cents. Impatience would have trumped patience by a factor of half a million.

This out-performance is mirrored in the UK, if less dramatically (Chart 8). Starting in 1920, the value of the speculator's £1 stake would have risen to around £1.56, while the fundamentalists' stake would have fallen to 32 pence. Momentum would have mopped the floor with fundamentals. The sheep would have defeated the goats.

In an evolutionary game, these profit profiles would alter the balance of investors. Impatient investors would have profited and thrived, while patient investors would have lost and died. Nature would have deselected the patience gene. As Keynes predicted, market inefficiencies would have supported the myopic and irrational at the expense of the solvency of the far-sighted.

Patience and Trading

If impatience strategies flourish, we would expect this to be reflected in a secular fall in the average duration of asset holdings, as the fraction of short-term investors rises. Again, what does the evidence suggest?

Chart 9 plots the average holding period of investors in the US NYSE index since 1940. This is estimated by simply looking at the ratio of the market value of the shares outstanding to the value of shares traded in any given year. It suggests a striking pattern.

In 1940, the mean duration of US equity holdings by investors was around 7 years. For the next 35 years up until the mid-1970s, this average holding period was little changed. But in the subsequent 35 years average holding periods have fallen secularly. By the time of the stock market crash in 1987, the average duration of US equity holdings had fallen to under 2 years. By the turn of the century, it had fallen below one year. By 2007, it was around 7 months. Impatience is mounting.

Chart 10 plots the same measure for the UK over a shorter window. It shows a similar trend. The average duration of equity holdings has fallen from around 5 years in the mid-1960s to around 2 years in the 1980s. At the turn of the century, it had reached just over a year. By 2007, it had fallen to around 7 ½ months.

Chart 11 shows the average duration of equity holdings across a wider set of international equity markets over the past 15 years. The trends are much the same. Average holding periods have fallen. Today, they are typically below one year. For the Shanghai stock index, the mean duration is closer to 6 months. Some investors have bucked this trend. Warren Buffett told Berkshire Hathaway investors in 1988 "our favourite holding period is forever". But for an increasing fraction of the financial world, the favoured investment horizon seems to be whenever.

A number of structural factors help account for these trends, some of them positive. Transactions costs in equity markets have fallen significantly. This has encouraged growth in a particular class of investor - high-frequency traders (HFTs). While HFTs are not new, their speed of execution has undergone a quantum leap. A decade ago, the execution interval for HFTs was seconds. Advances in technology mean today's HFTs operate in milli- or micro-seconds. Tomorrow's may operate in nano-seconds.

HFTs operate in size as well at speed. HFT firms are believed to account for more than 70% of all trading volume in US equities, 40% of volumes in US futures and 20% of volumes in US options. In Europe, HFTs account for around 30-40% of volumes in equities and futures. These fractions have risen from single figures as recently as a few years ago. And they look set to continue to rise.

Asian is not immune from these trends. HFT is believed to account for between 5 and 10% of Asian equity volumes. In China, HFT is still in its infancy. But market contacts suggest as much as 80-90% of trading on the Shanghai stock exchange may be done by day-traders, many small retail investors. Impatience is socially, as well as technologically, contagious.

This evolution of trading appears already to have had an effect on financial market dynamics. On 6 May 2010, the price of more than 200 securities fell by over 50% between 2.00pm and 2.45pm.[32] At 2.47pm, Accenture shares traded for around

[32] Giffords (2010).

7 seconds at a price of 1 cent, a loss of market value close to 100%. No significant economic or political news was released during this period.

The causes and consequences of this "flash crash" are no clearer now than at the time. But it is known that a number of large HFT trading positions coincided with these chaotic dynamics. In response, market-makers and liquidity-providers withdrew. Gresham's Law re-emerged as bad money drove out good, its effects now taking milli-seconds rather than months. Trading in securities generated trading insecurities. The impatient world was found, under stress, to be an uncertain and fragile one.

Patience and Dividends

Another way of gauging short-termism is to look at investors' implied preferences for income today (dividends) over income tomorrow (retained earnings).[33] In theory, investors should be indifferent between these options, as the dividend payout ratio ought not to affect the value of a firm.[34] Empirical evidence suggests, however, strong evidence of high and sticky dividend payout ratios, almost irrespective of profits.[35] Moreover, dividends appear to be becoming stickier over time.

Between 1825 and 1870, a study of over 500 NYSE listed firms found that dividend increases and decreases were roughly equally split.[36] Chart 12 plots dividend payout behaviour among US firms during this period. Dividend reductions occurred just less than 50% of the time, as might be expected. Similar behaviour has been found among UK quoted firms during the 19th century.[37]

Now fast forward a century. As Chart 13 illustrates, dividend behaviour has altered dramatically. Between 1980 and 2010, the world's largest 200 companies reduced dividends only 8% of the time. This was despite dividends being greater than earnings in over 10% of cases – and, indeed, dividends being positive despite negative earnings in 5% of cases.

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[33] Several alternative explanations have been proposed including the signalling benefits of maintaining dividend ratios (Mann (1989))
[34] Stiglitz (1974)
[35] For example, Skinner (2008)
[36] Goetzmann, Ibbotson and Peng (2001).
[37] Braggion and Moore (2008)

Chart 14 plots the standard deviation of earnings and dividends across a panel of international firms. Over recent years, earnings have been more than six times more volatile than dividends. Berkshire Hathaway has again bucked the trend. Since 1967, it has paid dividends only once. And that may have been once too often for Buffett: "I must have been in the bathroom when the dividend was declared".

Patience and Discounting

A more direct test of short-termism would involve estimating directly the discount rate people assign to future outcomes. Conducting your own test is fairly simple. Ask your friends how they would feel if the price of their favourite luxury good were to rise by 10%. Then ask them how they would feel if the price of their house were to rise by 10%. The first is likely to meet with a frown, the second a smile. In general, people dislike goods price inflation, but like asset price inflation.

This feels rational right? Wrong. These perceptions suggest a sub-conscious myopia. Higher goods prices cut today's disposable income. Higher asset prices cut tomorrow's disposable income. So disliking goods price inflation and liking asset price inflation suggests a potential time-inconsistency in preferences. It is leaving as a bequest for your children the mortgage but not the house.

It is possible to test more formally the evolution of discount rates by extracting them from the prices of financial assets, such as equity prices, using asset pricing theory.[38] This suggests that discount rates in asset prices are higher, often much higher, than implied by rational expectations theory, consistent with short-termism.

For example, in studies of UK companies it has been found that actual annual discount rates can be materially, perhaps as much as 300%, higher than their rational value. Or, put differently, cash flows four years ahead are discounted at rates more appropriate for cash flows 6 to 10 years ahead.

[38] For example, Campbell and Shiller (1988).

Equivalently, studies have found that future cash flows are undervalued by investors. These effects compound over time. So if cash flows 5 months ahead are undervalued by 5% today, those occurring 5 years ahead are undervalued by 40% today. This finding is common, although not uniform, across countries. It also appears to have grown in the second half of the 20th century.[39]

Evidence from the US over the period since 1880 suggests a similar pattern. Stock market evidence suggests that agents may be undervaluing cash flows by up to 40% each year. Or, put differently, if cash flows six months ahead are undervalued by 20%, those occurring 5 years ahead may be undervalued by up to 90%. The stock market appears to be a quite defective Pigouvian telescope.

Patience and Jobs

If impatience is part nature, part nurture, it ought to have implications beyond finance. So take another key inter-temporal decision – the choice of job. Like financial assets, the market in employment is likely to have become more liquid and information-efficient over time, facilitated by the growth of job search services. But as with finance, information and liquidity has the potential to cause over-trading.

Consider, for example, the market for CEOs. Their positions are likely to be particularly at risk from short-term performance evaluation in capital markets. And as with holding periods for financial investments, CEO tenure patterns have changed strikingly over recent decades.

In 1995, the mean duration of departing CEOs from the world's largest 2,500 companies was just less than a decade.[40] Since then, it has declined. By 2000, it had fallen to just over 8 years. By 2009, it had fallen to around 6 years. This pattern is replicated across regions, but is marked in North America and non-Japan Asia.

Nowhere are these trends more striking than in the market for CEOs in a particular high profile, high finance industry – the football industry. As high frequency traders

[39] For example, Black and Fraser (2002), Cuthbertson et al (1997).
[40] Karlsson et al (2008) and Favaro et al (2010)

are to the financial sector, football clubs are to the corporate sector. In the English Football League, the average tenure of departing football club managers has close to halved since 1993.[41] Today, it stands at less than 1 ½ years, a managerial half-life of less than a full football season.

Put differently, there are 92 English football league clubs. Among that 92, only two managers - Sir Alex Ferguson at Manchester United and Arsene Wenger at Arsenal - have been in post significantly longer than the average departing CEO in non-football companies. Since 1993, these two clubs have between them won the Premier league on three-quarters of occasions. Patience has brought its own reward.

Patience and Public Policy

This evidence is no more than illustrative. But it does point to the potentially adverse side-effects of improved information and liquidity in markets. The public good of information and liquidity may unleash the public bad of myopia and volatility. So what are the potential public policy implications? These include:

(a) Countries, like China, embarking on financial liberalisation need to walk a fine line. On one side of this line is the self-improving cycle of increased saving, investment and growth – the patience path. On the other is the self-destructive path of increased volatility and consumption – the impatient path. China today is an intriguing mix of the two paths. Patience is the dominant gene in the high savings rates of households and corporations. Yet the impatience gene is dominant in the behaviour of frothy equity and property markets. Finance in China is being buffeted by opposing winds – the mild east and the wild west. Dynastically, it is part Ming, part Yuan. China today is proof that financial innovation can be a double-edged sword. It is important to keep on the right side of that sword. That calls for careful sequencing of financial reform, in China and elsewhere.

[41] League Managers Association (2010)

(b) If excess volatility in market prices is a distortionary tax on long-duration investments, policy measures may be needed to offset this distortion. Pigou's defective telescope may need to be repaired, perhaps reversed. One way of doing so is to provide incentives for longer-duration asset holdings. Another would be to introduce disincentive devices for short-termist behaviour: holding period-related levies on financial investments is one such example.[42] A third potential instrument is governance - for example, some have proposed that voting rights and the appointment of board members could be made conditional on the duration of equity holdings.[43]

(c) Impatient preferences can be constrained by pre-commitment devices – diets, exercise regimes, tattoos of your partner's name. The financial equivalents include trust and pension funds, Christmas Clubs and pre-nuptial agreements. Some economists have called these "golden egg" investments – investments which cannot be realised quickly, so that temptation is constrained.[44] Pre-commitment can also work for non-financial contracts. For example, job contracts could be based on long-duration performance measures. These contracts may require a public policy "nudge".[45] For example, savings schemes might require people to opt out rather than opt in.

(d) Institutional arrangements, and policy frameworks, are another such pre-commitment device. They are a means of resisting the temptation to place short- over long-term policy objectives. Government's policy preferences, which are derived from people's preferences, can be hyperbolic too. That is the essence of the policy time-consistency problem. A solution to that problem is to delegate policy to a patient, low discount rate agent. Because central banks have very long horizons, they fit the bill. Increasingly over the course of the past century, central banks have been chosen to safeguard the long-run objectives of price and financial stability, as a means of leaning against short-termist temptations.

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[42] The Aspen Institute (2009)
[43] For example, Securities and Exchange Commission (2010).
[44] Laibson (1997).
[45] For example, Thaler and Sunstein (2009).

To illustrate some of the benefits of pre-commitment and long-duration investment, imagine having placed that $1 stake in 1967 with an investment firm whose motto was "our favourite holding period is forever". By 2009, that long-term investor's stake would have risen to $2650. Over the same period, the momentum traders' stake would have returned $75. Buy-and-hold would have out-performed bought-and-sold by a factor of around 36.

How different the world may have looked. Fundamentals would have triumphed over momentum. The sheep would have been herded by the goats. Facing a losing streak, speculators may have gone the same way as despairing Dick Fuld or the ravenous robin. The gene pool may have been cleansed of the impatient. Patience may have helped ward off great disaster, the like of which we have recently seen.

Just as patience can ward off great disaster, impatience can ruin a whole life. Generations of dieters and addicts are testament to that. So too is finance, not least in the light of the crisis. It is important finance sticks to the patient evolutionary path. To do so, the fidgeting fingers of the invisible hand may need a steadying arm.

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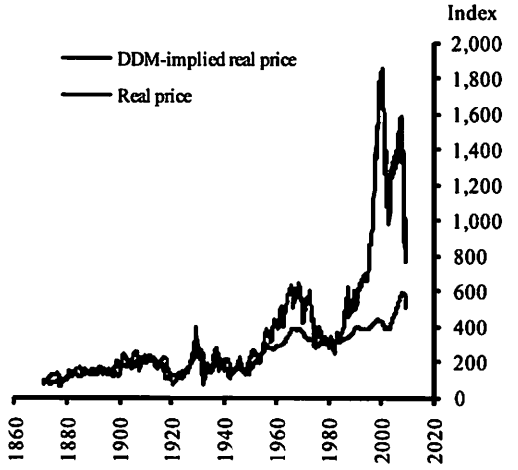
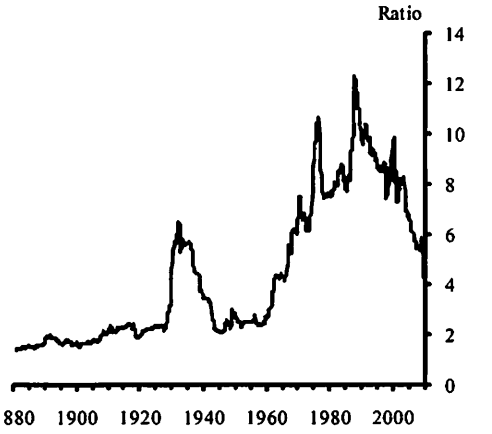
ANNEX

Chart 1: Real S&P 500 price index and its DDM-implied value[a][b]



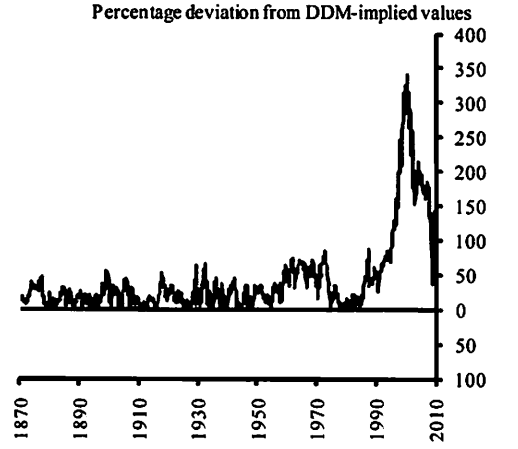
Source: www.irrationalexuberance.com.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', Journal of Economic Perspectives (2003).
(b) Assuming future real dividend growth rates and real discount rates equal to average values since 1923.

Chart 2: Ratio of volatility of returns on real S&P 500 price index and its DDM-implied value[a][b][c]



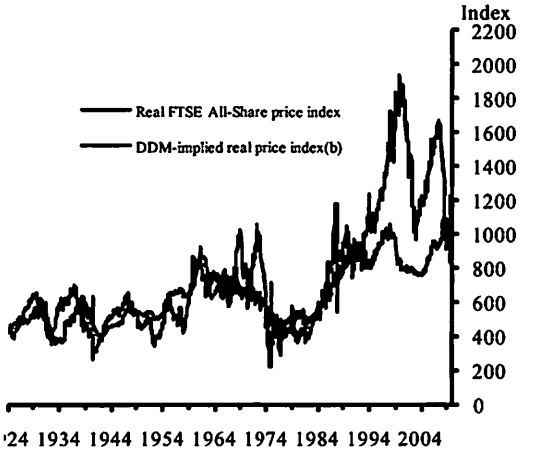
Source: www.irrationalexuberance.com.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', Journal of Economic Perspectives (2003).
(b) Assuming real dividend growth rates and real discount rates equal to average values since 1923.
(c) Volatility calculated as standard deviation over ten years of annualised monthly returns.

Chart 3: Mis-valuation of S&P 500 price index[a][b]



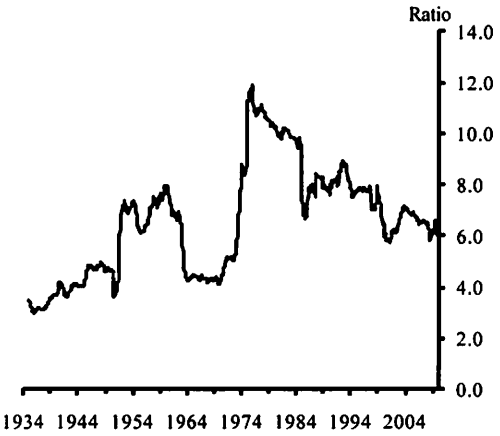
Source: www.irrationalexuberance.com.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', Journal of Economic Perspectives (2003).
(b) Assuming future real dividend growth rates and real discount rates equal to average values since 1923.

Chart 4: Real FTSE All-Share price index and its DDM-implied value[a][b]



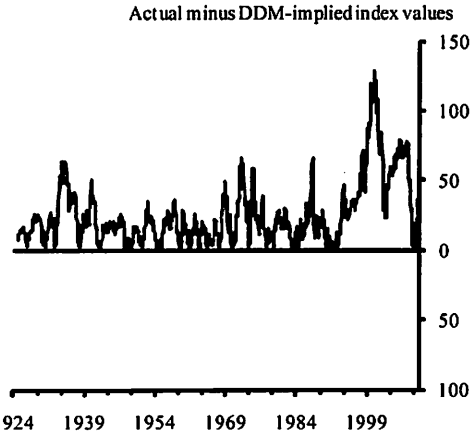
Source: Global Financial Data and Bank calculations.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', *Journal of Economic Perspectives* (2003).
(b) Assuming future real dividend growth rates and real discount rates equal to average values since 1923.

Chart 5: Ratio of volatility of returns on real FTSE All-Share price index and its DDM-implied value[a][b][c]



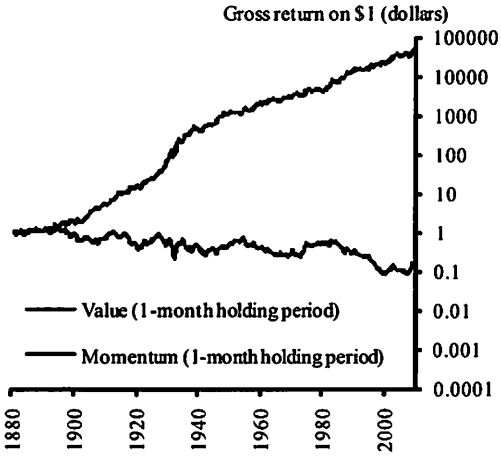
Source: Global Financial Data and Bank calculations.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', *Journal of Economic Perspectives* (2003).
(b) Assuming future real dividend growth rates and real discount rates equal to average values since 1923.
(c) Volatility calculated as standard deviation over ten years of annualised monthly returns.

Chart 6: Mis-valuation of FTSE All-Share price index[a][b]



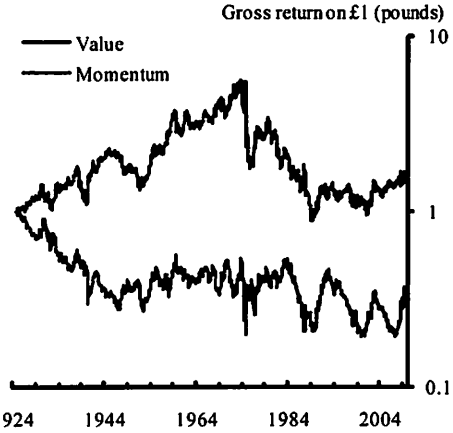
Source: Global Financial Data and Bank calculations.
(a) For further details see Shiller, R., 'From Efficient Markets Theory to Behavioral Finance', Journal of Economic Perspectives (2003).
(b) Assuming future real dividend growth rates and real discount rates equal to average values since 1923.

Chart 7: Returns on momentum and value strategies based on the S&P 500[a]



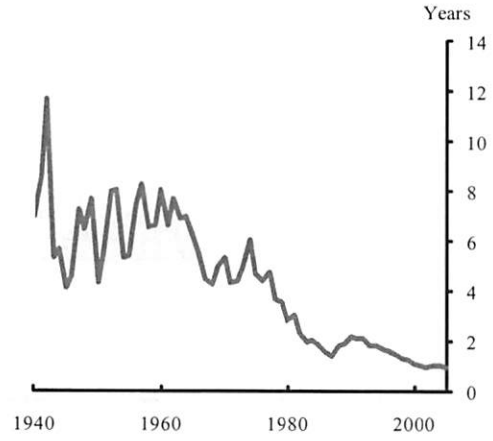
Source: www.irrationalexuberance.com.
(a) The 'value' strategies involves going long $1 when the actu value of the S&P 500 is below its Shiller (2003) DDM-implie value and short $1 when the actual value is above the DDM-implied value. The momentum strategies involve going long $1 when the return from the previous holding period was positive and short $1 when the return from the previous holdin period was negative.

Chart 8: Returns on momentum and value strategies with one-month holding period based on the FTSE All-Share[a]



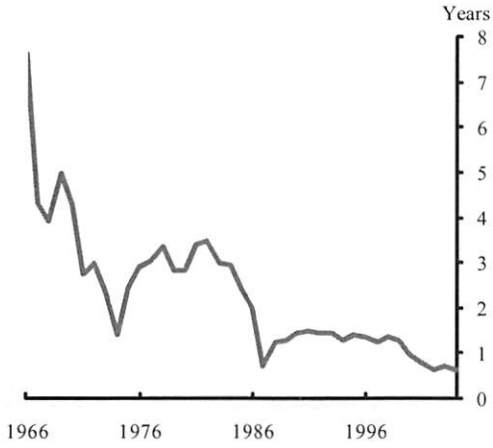
Source: Global Financial Data and Bank calculations.
(a) The 'value' strategy involves going long £1 when the actual value of the FTSE All-Share is below its Shiller (2003) DDM-implied value and short £1 when the actual value is above the DDM-implied value. The momentum strategy involves going long £1 when the return from the previous holding period was positive and short £1 when the previous return was negative.

Chart 9: NYSE average holding period, 1940-2005



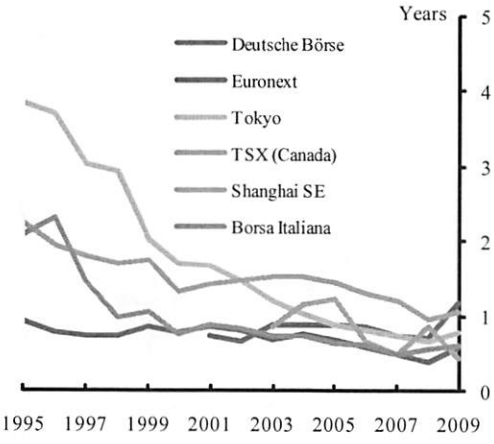
Source: New York Stock Exchange

Chart 10: FTSE average holding period, 1940-2005



Source: London Stock Exchange

Chart 11: Average holding period in other major stock exchanges



Source: World Federation ofExchanges

Chart 12: Dividend payouts in US firms in the 1800s

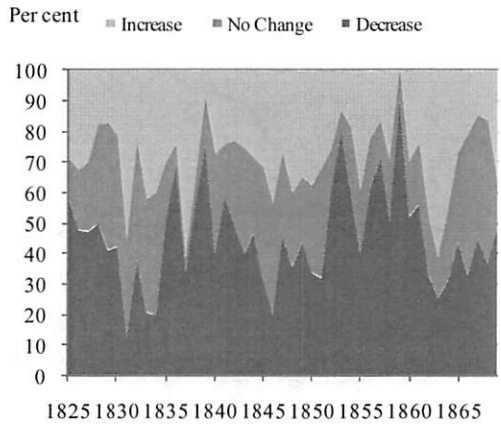


Chart 13: Dividend payouts in the world's largest 215 companies between 1980 – 2010

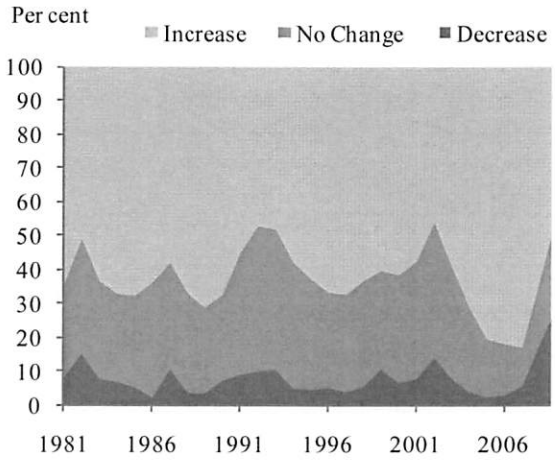
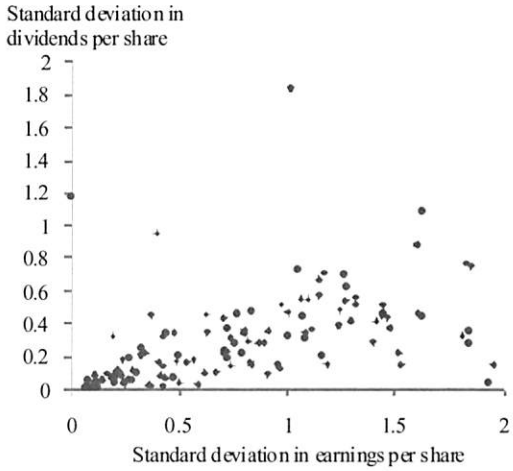


Chart 14 Dividend smoothing



(a) Chart shows the correlation between the standard deviation EPS and DPS for the top companies listed on the S&P500, Topix, FTSE, DAX, CAC.