EZA 664/01Mar05: Demography is destiny – demographic trends in perspective and conclusions for the economy, capital markets and asset allocation

Demography is destiny – this is a personal life experience for all of us, having been born into families or forming families ourselves. But it is also an experience for whole nations, as we currently experience with the rise of the United States to become the first global power. This rise has been greatly accommodated by out performance in terms of population growth relative to other advanced economies.

But even acknowledging the relevance of demography, what is the relevance of demography for the market? We are used to hearing about economic trends on a time horizon of months and quarters – while demography, at least from what we have learnt – is a story of decades, generations and even centuries. In the short run demographic trends appear relatively stable and predictable, which should make them irrelevant for market movements.

The answer to this apparent contradiction can be found in the following chart presented by the IMF in last year’s world economic outlook. This chart compares stock prices in real terms (for the sake of historic data the US S&P 500) to the share of 40 – 64 year old population, the “prime savers”, showing a distinctly positive correlation between the two over the last 90 years. The only long, but understandable, exception is the 1930s depression era and the war years of the 1940s.

Demography as ultra slow motion of capital markets

It is not necessary to state causality between demography and markets, as it is implied not solely by the IMF. More important in my view are the following two aspects:

1. The systemic forces that govern long term demographic trends, medium term economic trends and short term market trends are the same. In particular, the way all three – demography, economy and markets – are bound to reach a new equilibrium after external shocks.
2. The fact that during this transition period, which usually starts with the external shock, the "normal" short term reaction functions within and between the three are fundamentally different from the steady state, both before and after the adjustment process has been completed.

In plain English: the current hangover from the equity bubble - which burst half a decade ago – can be compared to the hangover from the global population explosion in the second half of the last century. What we are experiencing as a painful re-adjustment of stock valuations after previous excesses, we experience in demographic terms as population ageing – currently under way in the advanced economies and in one or two generations gripping the emerging economies. This means we should review our basic assumptions on “normal reactions” and linear trends – instead we should adopt a new way of non-directional, systemic thinking. I will return to this subject in terms of what it means for the markets and for asset allocation in the latter sections.

Demography – a historic divide between growth and ageing

Today, in 2005, we are at something of a key juncture, as seen in the following chart, plotting the size of the world population against annual growth rates. We are about one generation after the peak of the population explosion in the early 1970s, about one and a half generations before the ageing process in the advanced economies will be almost complete.

Population growth and ageing.

Just a few simple facts taken from the 2002 UN population projection – the long term accuracy of these projections, can be judged by comparing the results of the UN population pro-
jection from 1954: for the year 2000 the projected world population was 6.3 bn, the actual figure was 6.1 bn – an error margin of 3% compared to a tripling of the basic number – a enviable degree of accuracy. The forecast suggests that annual population growth will slow dramatically to 0.77% on average for the current half-century, which is less than half of the growth for the second half of the 20th century. By the end of this period growth will have slowed to 0.33% pa. This implies that the total world population will have grown by only 50% between 2000 and 2050 – compared to 200% in the previous half century.

Over the same period ageing will be a significant force – from both sides: an increase of life expectancy by 10 years to over 75 years will boost the share of the elderly population, while fertility in the developing economies will converge towards the lower levels of the advanced economies, reaching 2.04 (compared to 1.85 in the advanced economies) by 2050. Migration will only act as an offset in a few economies like the US.

Fertility vs Birth rates: fertility and birth rates are used as a key predictive variable for population growth. Actual growth in population is best measured by the “fertility rate” – the rate of birth that guarantees a stable population (the replacement rate). Fertility rates are on average 2.1 births per woman, while birth rates, ie the number of births in a specific year divided by the total population is only meaningful in conjunction with the mortality rate. For a population with a low life expectancy – ie high mortality – a birth rate of 3 for instance may not be sufficient for reproduction, while for a country like the US a birth rate of 1.5 would bring substantial population growth.

As an example we can look at the changes in the age structure for two populations, China, representing a medium to fast ageing developing country, and Germany, a medium to fast ageing advanced country.
As this comparison shows there is an eerie similarity between the two countries, if we lag Germany by 50 years. The age pyramid of China in the year 2000 resembles the one that Germany would have experienced after 1950, while the German age pyramid in 2000 provides a guide for that of China in 2050 (if we make allowance for the German baby boom generation of the 1950s and 60s). As the comparison shows, ageing – measured by median and modal age distribution – is an ubiquitous phenomenon; China by courtesy of its family policy may be ageing faster than is the average among developing countries, but it only precedes their own trends.

**Life Expectancy and other indicators of population ageing**

As we can see in the following three charts based on the 2002 UN population projection, the other key driver in ageing – next to a sharp decline in fertility – is a rise in life expectancy. Life expectancy will rise around the globe, but developing countries are likely to stage a catch up; their life expectancy set to rise on average from the current 65 years to 75 years by 2050, while life expectancy in the advanced countries will rise on average from only 78 years to 83 years. The only areas of doubt come from looking at the epidemic proliferation of AIDS, which in some African countries has reduced life expectancy by more than 10 years.

But the economic relevance of population ageing lies in its effects on the share of the working age population (an initial rise - thanks to declining fertility, followed by a substantial decline) and the share of elderly dependents, ie the population aged 65 years and over. The first stage of the ageing process is also known as the **demographic dividend or demographic window**, given the supply side effects of a rising working age population. The latter stage shows the other side of the coin, denoting the number of people to be economically supported by those
in work. Although in fact the term “elderly dependent” may be a misnomer – in particular in continental Europe, given the significant income flows from older to younger generations.

In the advanced economies the demographic window will start to close rapidly during the next decade. Within a little more than one generation the ratio between the working age population and the elderly will have halved to 1.3. This reversal of hitherto growth-friendly demographic trends in the advanced economies will have deep consequences in terms of economic performance and capital markets. These go far beyond the strains on the pension systems that have become obvious in the last few years – in particular in Japan and continental Europe. The developing markets will trail by about 25 years in this respect.

Doubts could be raised about the UN projections as regards the speed of ageing, for instance the decline in fertility in the developing world might be hampered by entrenched habits and social structures. The “normalisation” of currently low fertility in the advanced markets might depend on pension reforms – meant to redistribute the burden of child-raising from families to the society. But these factors are more likely to cause a delay rather than alter the trends themselves.

What about migration?

Migration

even under optimistic assumptions migration to advanced economies (a.e.)

will only offset natural trends in population between 1990 and 2020

from 2020 natural trends will lead to a significant decline in population in a. e.

Migration is often seen as a cure-all for the demographic problems of ageing populations in the advanced economies as well as a guarantor of faster growth in prosperity for the developing world. Apart from negative economic side-effects – the most obvious being the brain-drain due to the fact that the most mobile individuals among the developing populations tend to be the best educated ones – it is the scale of migration and the relative stability of migration flows that make them hardly sufficient to offset natural population trends. Between the
1950s and 2050 natural population growth in the advanced economies will decline from +1.2% pa. to -0.4%, while migration is seen relatively constant at +0.2%. Migration inflows will outweigh the natural population trend in this decade and probably the next - more by accident than design - because the trend has only just turned negative.

This tendency can be highlighted by the experience of my own country, Germany, which is on a divide between the advanced economies of western Europe and the emerging markets of eastern Europe. After massive migration inflows in the 1990s, culminating at almost 1% of resident population, net migration fell to 0.1% in 2000 before a slight recovery. The central projection of the German statistical office is for an average inflow close to the current level of 0.25% of the resident population or 200k pa. This inflow will be just sufficient to offset the decline in the number of births (from 900k in the early 1990s to 700k in 2004), but pales beside the fact that the number of births has halved since the mid 1960s (the peak of the baby boom). Migration will only delay the shrinking of the German population into the next decade.

Economy – increasing individual prosperity, declining national wealth

Turning now to the economic consequences of the abovementioned demographic trends: a key link between demography and economics is stated by the term “demographic dividend”. In fact this term has two connotations:

1) related to growth - a decline of death rates (from medical progress) preceding the decline in birth rates. The consequence is rapid population growth as experienced in the 19th century in the advanced economies and in the second half of the 20th century in the developing world, leading to an acceleration of aggregate output and incomes.

2) related to ageing - a decline in fertility from above the replacement level to below the replacement level. The consequence is an initial rise in the share of working age population (given the decline in the young population); followed by a substantial decline of the working age population and the expansion of the share of elderly population (given the rise in life expectancy). The latter effect implies an initial rise in per-capita GDP, but a lowering of growth in aggregate GDP and productivity.

Current research on economics and demography in perspective

Let me summarise the insights, which have been generated in this area during recent years, focusing on growth and cross-border capital flows. Other variables such as inflation, labour, public borrowing and fiscal health merit mention. Pension systems will be a focus of the coming sections. Also the ramifications of economic variables on demography – such as the effect of higher prosperity on propagation habits either through life style adjustments or changing opportunity costs of having children – should also be mentioned.

A comprehensive framework of analysing the link between demography and economy is offered by the two economy case of Ralph C. Bryant. In his model he examines relative performance of two economies, a home economy and a rest of the world economy, in terms of various economic variables after an asymmetric demographic shock, leading to a fast decline in fertility of the home economy and a much slower decline in the rest of the world. In his model a “fast” decline implies a fall of fertility from significantly above replacement level to replacement level within 90 years, the “slow” decline spans a period of 140 years.
The key economic variables to be affected will be (1) human wealth, (2) financial wealth, (3) output, (4) consumption, (5) aggregate capital stock. In all five variables there has to be made a general distinction between their behaviour on the individual level and on the aggregate level. Since the impact of declining fertility on output, consumption and capital stock is rather intuitive, I will focus on human wealth and financial wealth.

Turning to the aggregate level: a relative decline in fertility of the home economy will naturally result in lower human wealth either in terms of growth or - once fertility falls below replacement level - in terms of the actual population level. This can be regarded as a simple definition equation, since the shortfall in births filters immediately through to aggregate demand – for child care services etc. – while the effects on the supply side become apparent after a delay of about 20 years, at completion of professional training. But equally as important as the mere quantitative aspect seems the qualitative aspect. In Germany for instance the likelihood of a woman born in the mid 1960s having no child is about 1/3 for the population average, but among woman with an academic degree this ratio rises to 40% – thanks to higher professional opportunity costs for highly trained woman. The fact that the best-trained women are most likely to “consume” their training in a professional career rather than “re-invest” it into offspring implies an above-average loss in genetic potential for the future. A recent headline puts it in simple terms - “the Germans are getting stupid.” This conclusion is supported by the PISA study of high school students as well as by empirical evidence at universities, where examination standards have had to be lowered to secure a minimum pass rate.

As regards the second variable, financial wealth, the decline in fertility and the ensuing ageing of the population implies that the financial means generated by the society are consumed for old age care rather than invested in child-raising – the negative impact on growth potential of this sort of under-investment corresponds to that shown by the Nobel laureates Solow and Domar.

More relevant for the capital markets is that a production function with a limited degree of substitutability of production factors – as generally assumed for advanced economies – implies that a smaller workforce lowers the rate of marginal capital productivity. As we know by textbook economic theory this will lower the real interest rate and finally the real exchange rate of the home economy.

The process of how ageing filters through to a nation’s prosperity is best illustrated on an individual level. The initial effect of lower fertility on a person’s financial wealth and savings is positive - the individual is spared the cost of child-raising. But once they are of pensionable age the individuals, or society on their behalf (as in pay-as-you-go pension schemes), will have to use their savings. Given increasing longevity and the higher consumption of elderly dependents relative to young dependents, normally the amount of savings used vastly outweighs the initial savings, This implies an initial appreciation of real interest rates and exchange rates followed by a decline below the starting level, once the transition has been completed in the home economy.

This case can be illustrative for Japan versus the US: while Japan’s savings rate in the 1980s was one of the highest in the world, it has collapsed during the last five years. Conversely the sharp decline of savings in the US has no demographic basis and can be seen as an aberration from an equilibrium state, which is likely to be corrected in the not too distant future.
The effects of demography on growth are illustrated by the IMF projection in the following chart, comparing the effects of demography during the current half century with those in the second half of the 20th century. The biggest shortfall in terms of GDP growth – 0.9% p.a. – occurs in Japan, but also (eastern and western) Europe experience a distinctly negative effect, with demography cutting 0.5% from GDP growth, while the US, Asia and Latin America will see their GDP growth cut by less than 0.25%. Africa and the Middle East are in the beginning of the demographic window experiencing distinctly positive effects.

**Demography and growth**

![Chart showing impact on real GDP per capita growth](chart.png)

Based on static equation (e.g. Bloom/Canning)

\[ \frac{Y}{c} = \frac{w}{c} \times l \times p \]

[income per capita = wage per employed * share of working age pop. * participation rate]

“holding the clock” would require:

- Immigration of 30% by 2050 (last 40 years 7%)
- Raise pension age by 7 years
- Increase participation by 12% (7.5%) close to impossible given the highly elevated level implied.

**What does it take to stop the demographic clock?**

Starting with a simple definition of per capita income (wage per worker times share of working age population times the participation rate) we have three alternative levers to offset the effects of demography on income: (1) increasing the participation rate, (2) increasing immigration, (3) raising the pension age – with the latter two impacting the share of the working age population.

**Is it achievable?**

How does the adjustment theoretically needed until the middle of this century compare with the experience of the last 40 years? The participation rate would have to increase by more than one and a half times that seen in the past – on top of the 7.5% seen in the past we would have to add another 12% - close to impossible given the highly elevated level implied. Even less feasible would be the necessary quadrupling of immigration, while the alternative rise in pension age by 7 years has not even started yet. Even by combining the adjustment routes holding the demographic clock will remain an extremely difficult challenge. But it serves to highlight what we should expect in the near future.
Demography and capital markets – Is an “Asset Meltdown” coming?

Demography will also have an effect on capital markets through its impact on economic performance. The key focus of this section, however, will be the direct impact demography exerts on stocks, bonds and foreign exchange, as illustrated in the chart plotting the share of the prime savers in the total population against real S&P 500 performance. The changes in the potential pool of savers are compounded by a rising share of elderly dependent (consumers), which demand a higher equity premium going forward – either through higher profitability or an adjustment of stock prices. Both ways of looking at the demographic challenge imply a modest performance of the stock markets for the coming 25 years – to say the very least. Some more aggressive forecasters like Prof. Reisen even use the term asset meltdown, with a decline of the S&P 500 price earnings ratio to 14 – a halving relative to the level at the time he wrote his analysis.

Capital Markets – Asset meltdown hypothesis

The market impact of demographic changes has been related to various asset classes

Explanatory variables
- Share of prime savers (40/65)
- Share of elderly dependent

Dependent variables
- Stock price levels
- Equity premia
- Dividend returns

The Thesis of an asset meltdown is based on a simple formula

\[ p \times K = N_y \times s \]

price x capital supply = number savers x sav rate

Whichever way we look at it, the theory of the asset meltdown is based on the assumption that both determinants of asset prices, supply of capital (ie savings) and the demand for capital (by companies) are invariably fixed. While demand is determined by companies’ investment opportunities, the supply of capital, as a product of the number of savers and the savings ratio – through the life cycle savings hypothesis – is related to demographic trends.

Doubts about both assumptions have been raised by various empirical and theoretical research. The first; the demand for capital (ie issuance of securities) may be responsive to expected trends in real demand, marginal costs of capital – relative to marginal productivity –
and long term commitments such as pension liabilities. This makes it quite difficult to predict the direction in which the demand for capital will evolve.

The trend in terms of the variables determining the supply of capital will be equally uncertain because the age effect (based on the life-cycle-savings-hypothesis and the main focus of research so far) may be temporarily superseded by two other effects; the “time” effect and the “cohort” effect - researched by James Poterba.

The **time effect** simply denotes the impact of previous market trends on savings behaviour. For instance an individual who retired during the 1990s with rising security markets would have found himself in a position of excessive savings, and would therefore be much more willing to use those savings than an individual retiring ten years later, who by extrapolating previous gains would now see himself in a position of being “under funded.” Therefore it seems quite difficult to apply the savings behaviour for a specific age group or cohort to any following cohorts. This effect can be regarded as medium term – related to 5 to 10 year market cycles.

The other effect superseding the age effect will be the so-called **cohort effect**, denoting a specific behaviour of a cohort (individuals born within the same defined period). For example in the 1950s thriftiness was en vogue in the US – as that generation of professionals had lived through the 1930s depression and the war years of the 1940s. In the 1990s, the generation then in the prime savings age, was influenced by abounding optimism on lasting income growth, and thus tended to be much less thrifty than its predecessors. Given the generational experiences these habits can last significantly longer than the time effect.

Next to the savings behaviour the more general question concerns **age-specific holdings of asset classes**. Until recently it was common wisdom in asset management that at the beginning of their working life investors should overweight equity positions, given the chance of higher returns. As they progressed through their working life and approached pensionable age, the focus should shift from returns to reliability of income streams, hence reducing equity weights to the benefit of bonds. This, however, is not consistent with US savers. According to the survey of consumer finances (which specifies the holding of assets by asset class and age group) stock holdings are peaking for the 55 to 59 year old population (57%), while the peak in bond holdings occurs between 40 and 44 years. This implies that, at least in the US, an ageing population is less likely to translate into lower demand for stocks than is commonly assumed.

**Demography and asset allocation – Overweight bonds: a foregone conclusion?**

This key theme of asset allocation – the relative weight of fixed income instruments and equities in balanced portfolios – is the focus of this final section. Let me just summarise a few thoughts on this comprehensive subject, as given in current theoretical and practical literature.

There are two key factors, through which demography impacts on asset allocation. (1) Pension reforms; through which the first generation pay-as-you-go pension systems of key advanced economies in Europe and in the US – partly originating in the 19th century – will be transformed into a more balanced multi-pillar pension structure. In this framework pensions will be delivered through a mix of funded and unfunded income streams, with varying sources of funding and ways by which contributions are accounted for – ie defined contribution schemes vs. defined benefit schemes. With the pension system increasingly perceived as a deterrent to forming families – the costs of child-raising are left with the families, while the...
benefits in terms of pension generation are reaped by the society – cutting down the significance of the first pillar (pay-as-you-go state pension) - could be a powerful tool to reverse the sharp decline in fertility observed in most of Europe and to a lesser extent in the US.

(2) Rising longevity – average life expectancy for a German citizen at the age of 60 rose from 17 years in 1950 to currently 21.5 years and will reach 25 years in 2050. This heightens the dilemma for asset allocators in the second (company schemes) and third pillar (individual schemes): on the one hand they need to generate a steady income flow through an overweight of fixed income instruments, on the other hand a lengthening of the post-retirement phase demands larger funds at the time of entering pensionable age, which should be generated through higher return instruments. The increased post-retirement lifespan might even suggest a substantially higher equity weight at the beginning of the post retirement phase than is currently observed in continental European pension plans. In this respect the US citizens may be quite right.

Asset allocation – old age longevity

Rising old age life expectancy may cause a dilemma for private investors

• a steady income flow
• sufficient returns to cover an increasing time span

Arguments for and against increasing bond weights

The need to increase bond weights in pension portfolios – which seems to prevail in general literature – is based on the foreseeable demographic trends in conjunction with the life cycle savings hypothesis, accommodated by legal provisions regarding pension protection. Avoiding the over-funding / under-funding cycles in private pension plans coinciding with the stock market movements and the ensuing risk of asynchronous incurrence of pension obligations would, according to the IMF, require a switch to less volatile products in the course of maturing pension schemes. In our view this could imply a gradual shift down the “risk-ladder” from equities to corporate bonds to government bonds and finally to index linkers. The arguments in favour of higher fixed income weights have been elaborated recently by various well-
known Dutch financial institutions in analysis on the occasion of the Dutch pension directive - perceived as ground braking by the IMF in its latest report on financial risks.

The arguments against higher bond weights mainly derive from the need for higher returns as a consequence of rising longevity and from different individual preferences and requirements. Changing attitudes and expectations as regards the risk/return trade-off may lead to different holding patterns among citizens. In addition the rationale might change for future generations. For example: for a generation which is currently 40 years old it may be perfectly rational to hold more bonds at a given age than for a generation currently 10 years old (who at the time of their retirement will see the demographic transition completed) or for those under 10 years old, who might again live in a totally different world in terms of demographic challenges.

Finally I would like to mention two arguments that may defy the general perception of the need to increase bond weights:

1) **Asset allocation will be governed by the regulatory requirements and the type of schemes.** Just compare defined benefit schemes, which prevailed in the US until the mid 1970s with defined contribution schemes: while the first leaves the market risk with the companies leading to a relatively lower equity exposure of 53%, the latter, by shifting the market risk to the employee leads to a substantially higher equity exposure of 60% – which from a mere statistical angle may sound counter-intuitive.

2) **Both equity returns and volatility might be different for the home economies of the pensioners and the target economies for pension investment**, ie the emerging markets. Emerging markets, given their lag in terms of the demographic transition, might bolster international equity returns.

In conclusion it may be unsatisfactory for you as decision makers to say that we know that demography will have an impact on market variables as well as on asset allocation but we don’t know which direction this will take. We are at a key juncture of demographic transition with a switch from growth to ageing this implies a different time horizons with short, medium and long term cycles as well as individual behaviour which differentiates itself by age groups, regions and regulatory frameworks. **It is time to end thinking in directional terms and think of systemic behaviour of individuals and markets.**

*This report is based on the presentation given by EZA partner Dr Michael Clauss at the recent Macro 05 Conference held in London.*

**Dr Michael Clauss:**
Tel: +49 89 64254045
clauss@ezadvisors.com

This research is confidential and intended solely for the named person or entity to whom it is addressed. If you have received this e-mail in error you are not permitted to disseminate, copy or take any action in reliance on it, and are requested to please notify the sender by return e-mail or telephone. No part may be reproduced or passed on without permission. Neither the information nor the opinions herein constitute or are to be construed as an offer or solicitation of an offer to buy or sell investments. EZA information is based on sources believed reliable. Their accuracy cannot however be fully guaranteed.

Copyright Eurozone Advisors Ltd 2005

www.eurozoneadvisors.com