Life cycle options and preferences

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1 INTRODUCTION

Until the 1980s, economic literature provided only limited explanations about the allocation of households' financial portfolios. For decades, economists had been considering savings as a homogenous aggregate and concentrated their studies on its volume and not on its components. Most of the theories were dedicated to the study of household consumption, which explains why savings were considered as a 'residual'. The Life cycle hypothesis theory (LCH), developed by Modigliani and Brumberg in 1954 marked a departure from this perspective and considered saving as a voluntary and rational behaviour. Since the end of the 1970s, LCH has been considered as a useful tool in explaining the patterns of behaviour in saving.

The increasing diversification of households' portfolios led economists to another question: how do households allocate their financial wealth? With LCH, households became forward looking; their behaviour as asset managers raised the question of their attitude towards risk. The problem became one of their preferences and differing attitudes toward risk and the future.

One can understand that – faced with an ageing population – the issues of both savings determinants and portfolio allocation became central. In the near future, a serious decline in the generosity of public pensions is expected to raise the problem of the revenues of retirees. Are they saving enough? How do they and should they save? Because LCH explicitly takes into account the changes in revenues throughout the life cycle, it is the favourite tool for answering these kinds of questions. According to LCH, people should try to smooth their intertemporal consumption – in other words, to save in order to consume as much as they want even after the drop in their revenue when they retire. That means that, still according to LCH, a huge increase in the saving rates must be expected. Equally, the nature of the ageing process is very important. The key factor at present is the increase in life expectancy. Intuitively, it seems that this should lead to higher ownership in equities or risky assets, whose risk decreases with the duration of ownership.

The main purpose of this chapter is to show that these conclusions are not well supported by empirical studies, which leads the observer to approach these theories with caution. The chapter proposes some alternative explanations for households' behaviours. The first section deals with the basic LCH model; the second discusses households' intrinsic attitude towards risk and the chapter concludes with a consideration of the difficulties in distinguishing these attitudes from the specific environment in which they are embedded. The last section examines the effect of so called 'background risks'.

2 THE LIFE CYCLE HYPOTHESIS AND WEALTH COMPOSITION

The basic LCH model, as Modigliani and Brumberg show in their seminal paper, is usefully enriched by additional assumptions or variables, such as uncertainty, or the existence of bequests, that do not change – according to the authors – the general principle of wealth accumulation. LCH, however, remains of very little use in explaining portfolio composition; as noted by Modigliani and Brumberg *'This composition will also be affected by the current and prospective total resources, by the nature of the available alternatives, and, last but not least, by 'social' pressures'* (pp 119-20). While they suggest some link between composition of assets and risk aversion, they implicitly propose a study of individuals' preferences, one of the extensions central to this chapter.

2.1 Life cycle hypothesis

At its simplest, the life cycle hypothesis – LCH -, makes very simple behavioural assumptions. The accumulation strategy adopted by a consumer during his or her active life is to smooth the consumption profile: individuals accumulate wealth during their working lives which will guarantee them a stable standard of living throughout life – during both active and retirement periods.

Two variables will determine the agent's saving behaviour: age and permanent income. This income is determined by the sum of an individual's discounted expected incomes including retirement pensions. In the basic model, people know their exact date of death, do not care for other generations, have time invariant preferences and deal with non risky financial markets. Basic behaviours with no real link with reality result from this model. In order to introduce phenomena like voluntary or non voluntary bequests, economists introduced uncertainty over life expectancy and altruism; they also introduced liquidity

constraints and various imperfections in the financial markets, such as labour market, supply, and rational behaviours, etc (Arrondel 1993).

Various kinds of consumers/savers can be represented diagrammatically. Figure 1 shows the basic model when the date of death is known with certainty, the individual is left with and leaves no inheritance, begins his active life in t_0 , retires in t_1 and dies in t_2 . Income is w (as ‘wage’) during his active life and p (as ‘pension’) in retirement. Figure 1 shows the wealth profile, W , which smoothes life cycle consumption, c . The wealth profile is the well known reversed V curve, maximum wealth being reached when the individual retires, at the point t_1 , when they begin to consume their wealth, which decreases until it is null, in t_2 .

Figure 1: The basic model of the Life Cycle Hypothesis (LCH)

Figure 2 shows an individual's wealth profile when this individual gets an inheritance, H , in t_{0+i} and overestimates his life expectancy (targeting his wealth profile in order to smooth consumption until t_2 but will die in t_{2-j}); the result is that this individual will leave an involuntary bequest, B .

Figure 2: A more complex LCH model of an individual's wealth profile

One problem arises from individuals' different expectations of the future. The usual illustration of the impact of time preference comes from Robinson Crusoe. At a given moment, Crusoe decides to consume only part of his harvest and to seed the remaining part of the wheat: in economic terms, he saves and invests. That means that he takes into account his future and gives a value to his future: his time preference favours future consumption. An intuitive first result is the relationship between time preference, savings and interest rate: when the time preference increases – when individuals favour the present period - the saving rate decreases, and maintaining the same saving behaviour requires a better return for these savings, i.e. a higher interest rate.

A useful concept is the discount rate; it transforms the value of X monetary units earned within T periods at the present value. For example, the present value of 100 monetary units within one year if the discount rate is 10% per year is 90.9 monetary units ($100/[1+0.10]$). A crucial point is that people will proceed to intertemporal choices according to the way they value the future; if they have to trade off between the present and the future for the allocation of financial resources, they have to compare the interest rate (the value of their resources in the future if they are remunerated by the financial sector) and their preferences (the price of renouncing immediate consumption).

Is this theory borne out by empirical studies? Various studies try to compare the age-wealth profile with the life cycle hypothesis perspective. They generally conclude that the theory – *per se* – is unable to explain individuals' saving behaviour. In the U. S., Bernheim et al. (1997) point to marked discontinuities in consumption at retirement, but these

discontinuities do not correlate with income profiles (including retirement pensions), an independence that leads the authors to conclude that households do not use savings in order to smooth their life cycle consumption. In France, the reversed V curve is truncated for the oldest age group, the wealth profile being flat after the age of 69. In addition, if we share the components of households' wealth in risk free assets and risky assets, the reversed V shaped profile can be seen to be caused by financial assets (non liquid ones). As an aside, the share of ownership of risky assets shows a constant increase in portfolios over 10 years.

An international comparison highlights very different behaviours in different countries confirming the idea of an institutional component and/or cultural differences. Arrondel and Masson (2003), show that inequalities in wealth levels depend on the countries under consideration: France is comparable to Canada and Germany, is more equal than United Kingdom or United States but with wealth levels less concentrated than in Northern European countries. They add that the differences in wealth levels are actually quite independent of age and income: for France, variables such as income, age and the existence of a bequest explain less than 50% of the inequalities in wealth levels. In Japan, Kitamura et al. (2001) confirm that the differences in saving behaviours across income classes are much wider than across age groups; they also find a huge heterogeneity of saving behaviours among elderly households.

To sum up, there is no real agreement among the empirical studies. Despite the fact that they all indicate that there is a wealth effect, cultural differences remain, leaving a serious need for further work about individuals' preferences. Nevertheless, at the end of the 1970s, LCH was considered to be powerful theory in explaining the saving rate. This theory is still very useful, as indicated by the huge theoretical and empirical literature about expected changes in the savings rate as the population ages or when the generosity of public retirement pensions decreases.

Studies of the interactions between savings and pensions have been the source of both abundant economic literature and debates among policy makers since Feldstein's article, published in 1974 established a negative link between the existence of a public pension scheme and household savings. Subsequently, numerous economists have tried to test Feldstein's findings empirically but the results do not provide any clear conclusion.

Feldstein maintains that the creation of the OASDI (Old Age, Survivors and Disabled Institution) in 1937 in United States prompted a huge decrease in Americans' saving rate (less 50%). The argument is as follows: given the assumption that a pay-as-you go public pension scheme provides the same yield as a fully funded scheme (a pension scheme that functions on

a capitalisation basis), the social security subsidies of the pay-as-you-go public scheme are a perfect substitute for the saving products. That means that each time the government increases social security pensions, the saving rate decreases. Feldstein adds that if social security contributions are so high as to cause people to work less, people will save more in order to finance a longer inactive period. However, according to his empirical results, the substitution effect dominates the income effect. These developments prompted a long economic debate (see Caussat 1992, or Jafari-Samimi 1984), notably between Feldstein and Barro. According to Barro (in Barro and Feldstein 1978), these social security transfers are neutral. The demonstration is the same as for public debt and holds for all the negative transfers towards next generations: if the public debt increases (by a public deficit that is caused by increased social transfers, for example), or if pension subsidies are generous, the current generation is aware that the following generations will have to pay for it, whether by taxes, or by contributions. The current generation will not consume the transfers and will have a higher saving rate in order to bequeath more to their children, a behaviour called ‘altruism’, or ‘Ricardian neutrality’, which implies voluntary bequests. Altruism then increases the saving rate throughout the life cycle including retirement. This is one explanation for the particularly high saving rate of the elderly people in Japan.

If there is a difference in the returns between fully funded and pay-as-you-go schemes (for example, the interest rate is higher than the economy growth rate because there is a lack of capital due to a low saving rate), it is clear that the effect described by Feldstein is strengthened: an increase in the contribution rate impoverishes the contributors and this increases the deficit in both savings and productive capital.

The LCH theory is elegant but is clearly not powerful enough to explain the saving behaviours of households. The simple comparison between countries requires a lot of characteristics to be integrated. First, cultural differences are often neglected but a comparison between time preference in the French and the American studies (Blanchet and Mahieu 2001) shows a much higher psychological discount rate for the Americans than for the French populations and a higher risk aversion in the French case. These two characteristics can explain the observed differences between saving rates. Second, altruism questions the link between age, savings, and intergenerational transfers; for example, it has often been suggested that the high saving rate among Japanese people over 75 is due to the high public deficit. Third, some authors have found that the recent increase in the ownership of risky assets can be attributed to the higher financial literacy of younger generations, highlighting the role of information.

2.2 Some preliminary views about asset allocation and age

Financial advisers first questions to a client often deal with the client's investment horizon: while equities are more risky in the short run, they are less risky in the long run and could be considered – at first glance – as the first choice savings vehicle for retirement.

This is reflected in the forecasts made by financial experts when they write about the ageing process and its consequences. Because the number of retirees will increase relative to the number of contributors, the share of equities in the institutional investors' portfolio will decrease while the share of bonds increases - a phenomenon that will be detrimental to equities prices. Table 1, drawn from Mantel (2000) for Merrill Lynch, illustrates this kind of study.

Table 1 Changes in Asset allocation due to the ageing process (2000-2050)

	U.K.		U.S.		Netherlands		Japan	
	2000	2050	2000	2050	2000	2050	2000	2050
Equities	72%	60%	62%	54%	45%	30%	40%	28%
Non equities	28%	40%	38%	46%	55%	70%	60%	72%

Source: Mantel (2000) for Merrill Lynch

At a more microeconomic level, financial advisors generally consider that older people should invest less in stocks than younger people (Mankiel 1996); a typical rule of thumb is that the equity share should be equal to 100 minus one's age. The three basic arguments that underpin this advice have been criticized by Jagannathan and Kocherlakota (1996). First, the fact that the risk of common stock declines with long term ownership does not compensate for the fact that people are generally concerned by the huge loss that they can face with stock detention. Second, the argument which says that people have to draw on their wealth in order to fulfil their mid-life obligations such as children's education would lead people to save to meet these obligations and to switch from stocks to bonds when they age. However, families react differently when faced with these commitments. The only valid argument is the third one: while young people can diversify risk with their wages, or with the incomes that they will earn over a long period of activity, this is not possible for older people. They note that this is true only if the risks associated with their stock portfolio and their human capital are not correlated.

The debate is important, and draws on different arguments: financial advice relies on the statistical behaviour of financial series while the criticisms levelled by Jagannathan and Kocherlakota are based on economic and psychological issues linked to risk aversion, personal life, social constraints, and position on the labour market. The main difficulty is to identify the different influences in order to extract from the debate the issues relevant to a discussion of what stems from individuals' preferences.

3 INDIVIDUAL PREFERENCES AND AGE

The diversification of households' wealth and portfolio according to age and life expectancy has become a huge topic in economic studies; first it is of increasing importance for economists and policy makers, and second, financial institutions have every incentive to understand this phenomenon, and its relationship to an ageing population. Despite their interest in maintaining demand for stocks, financial analysts advise people to reduce the share of stocks in their portfolios as they age. Do people follow this advice? While empirical analysis suggests that the answer is negative, theoretical analysis provides some interesting studies about age, risk perception and portfolio selection.

While the LCH model has played a major part in explaining wealth accumulation with respect to age, the ideal model would link these life cycle decisions to a portfolio selection model (Markovitz 1959 type). This synthesis was done at the end of the 1960s by the lifetime portfolio selection theory after the seminal paper by Samuelson (1969). In his model, Merton (1969) studies the wealth accumulation and asset allocation by an individual who wants to maximize his expected utility according to his risk aversion. Merton's model is probably most relevant to professional portfolio managers but it still provides a good reference point for the key issues in this discussion.

3.1 The influence of age on the composition of portfolios: empirical studies

Most studies are based on panel studies but two types of analyses can be distinguished. First, virtual experiments (laboratory experiments where the situations are simulated) the purpose of which is to measure consumers' risk aversion or tolerance, and links these indicators with the decisions individuals take in order to allocate their portfolios. A second type of analysis is based on surveys that provide effective portfolio allocation linked with other variables such as age, profession, education. Within the first family of analyses, Barsky et al. (1997) and Guiso and Paiella (2001) draw two important conclusions:

- first, the agent's preferences cannot be represented with certainty by a simple function;
- second, even after controlling for a number of variables, behavioural heterogeneity cannot be explained.

The results of studies of the relationships between age, preferences, and the holding of risky assets are more divergent. On a sample of 3,458 individuals, Guiso and Paiella find that absolute risk aversion is a decreasing function of consumers' resources - the richer individuals are, the less risk averse they are. They also find that risk tolerance is an increasing and concave function of wealth, which means that rich people take more risks than poor people but the increase in risk taking is not proportional to the increase in wealth. This leads them to reject both isoelastic utility functions (characterized by constant relative risk aversion) and constant absolute risk aversion function, the two types of functions that are supposed, in economic theory, to represent the consumer/saver's behaviour. The implication is that the age risky portfolio should be upwardly sloping. The results are consistent with this: the share of risky assets increases with age with a portfolio share increasing by 2 points every 10 years of age increase.

On a sample of 11,707 persons, Barsky et al. (1997) show a clear correlation between risk tolerance index and stock holding while risk free assets are characteristic of risk adverse people. The relationship between risk tolerance and age is less clear since they show a slight U shape; but their sample is restricted to people over 50. They also try – but fail - to solve the 'equity premium puzzle' and suggest that many more variables than just risk aversion characteristics must be introduced in order to reproduce the saver's behaviour. Effectively, according to theory, the aggregate risk aversion must be very high in order to explain the 6 points excess return of equities above Treasury bills rate of return during the last century. This is obviously not the case in their measures of risk aversion.

Of course, this kind of 'virtual' study has to be treated with caution. A second group of studies aims to correlate observed behaviours to other variables. For France, and using data from the 'wealth survey' of 1998, El Mekkaoui-de Freitas et al. (2001) show a clear influence of age on the ownership of risky assets; the probability of owning a diversified financial portfolio increases with age. Equally, individuals aged between 26 and 35 are less likely to own an entirely risk free portfolio than those aged between 35 and 39, a fact which shows the effect of linking the age and generation effects.

Ameriks and Zeldes (2002) separate these generation and age effects. Their data is based on five surveys of consumer finances to which they add the TIAA-CREF (the largest American private pension fund) data. They confirm the heterogeneity across individuals in

portfolio allocations and the low activity of transfers for individuals. When looking at the whole sample, the authors observe a mild hump shape in the age pattern in equity shares in more recent years, and a strictly downwardly sloping age profile and find that the proportion of stocks is constant with age. This shows, at least, a sensitivity to the period of estimation. The authors follow each cohort through time and find that equity allocation increases with age, while the time effect shows that most of the stock held has been 'pushed' by the recent high yields.

These studies, however, are of little help in explaining savers' preferences. At most, one can suggest that older people seem to be more risk tolerant than younger people, and people do not follow the advice they are given by their financial advisers. This clearly indicates that individuals make their own choices, according to their preferences. The pattern of these preferences now has to be clarified.

3.2 Individual horizon and financial decision: the theory

Merton's model is an extension of the portfolio choice theory to the continuous time case. As noted by Arrondel and Masson (1989), this rather technical formulation provides some advantages: on the one hand, it offers the possibility of reallocating the portfolio when necessary, and not at pre-determined periods as in the discrete time model; on the other, it can apply without the restrictive assumptions such as normally distributed yields or quadratic preferences. This flexibility in the choice of the utility function is a very valuable card.

Merton made a number of assumptions: that information about assets and their yield, and the capital market is perfect; there are no transaction costs and human capital incomes are certain. This set of assumptions implies that the only source of uncertainty is asset prices and yields. These prices are generated by a stochastic process, which means that they are time independent and not self-correlated.

Merton first confirms Samuelson's separation theorem: for isoelastic marginal utility, consumption behaviour is independent of past asset prices and consumption path. Finally, the asset allocation decision and the consumption decision are independent. The intuition of this result is that with an added utility function, preferences will be time independent (no age effect) which is why these portfolio choices are generally described as static. The isoelasticity of the preference function (utility function called CRRA, an acronym for Constant Relative Risk Aversion) entails an attitude towards financial risk independent of an individual's level of wealth). In addition, for the same CRRA utility function, Merton finds the same portfolio as Markovitz: the asset demand only depends upon the mean and variance of their yields.

Finally, in this model, the optimal portfolio selection rule is constant and depends only upon the degree of risk aversion: when relative risk aversion increases, the share of the portfolio which is invested in risky assets decreases, and is independent of the individual's age and accumulated wealth. That would mean that, in order to prepare for their retirement, all individuals own the same amount of risky assets and differ only in the amount of their savings. This seems at odds with the empirical evidence of diversity in households' portfolios and prompts calls for a better model. It also points to the important variables: individuals' preferences and the way they vary through the life cycle, and individuals' environment, the so called 'background risks'.

Ameriks and Zeldes (2002) take a simple example from Jagannathan and Kochoerlakota (1996) in order to show how different preferences can generate an investment horizon or age effect. They imagine an individual whose utility function (representing his preferences) is such that his/her satisfaction depends on a target represented by a minimum level of wealth (fixed *ab initio*) that has to be reached at a given horizon. If the effective wealth is below this target, the individual's satisfaction drops to an infinitely negative level; if the effective wealth is over this target, satisfaction will grow proportionally to the difference between the effective level of wealth and the target. The result of the individual's choice is quite simple to understand: in order to avoid any possibility of ending up with less than the target, the individual will place in the risk free asset – at each period - the discounted value of the target, taking as discount rate the risk free return. If the risky asset return is greater than the risk free return, total wealth will tend to grow, and the wealth invested in the risky asset will tend to grow as the horizon approaches. If the total wealth is constant, however, the wealth invested in the risky asset will shrink as the horizon approaches; the preferences and horizon effects depend upon the size of wealth. This purely mechanical approach lacks rationality; if wealth is really constrained so as not to increase, there are no incentives for having any risky assets even if their expected returns are very high.

Another example is given in a paper by Bommier and Rochet (2004) exploring the reasons why older people hold more risky assets than the theory would indicate. They take a simple non additive model where consumers' preferences depend on past preferences. In this case, a clear relationship between horizon length and risk aversion appears. The intuition can be found in a parallel with the addictions in consumption; when past consumption of a good raises the marginal utility of present consumption, obviously the length of addiction influences present consumption (Becker and Murphy 1988).

Finally, Merton's CRRA utility function appears to be a very specific representation of preferences (Hanoch 1977) and the only function that provides two results: first, wealth has no impact on optimal portfolio; second, there is a separation between decisions about portfolio allocations and decisions about consumption and saving. The difficulty of representing the consumer/saver's psychology is compounded by the difficulty of taking into account his/her environment, the 'background risks'.

The trade off between preferences and background risks faced by agents is perfectly represented by the 'Duration Enhances Risk' clause (Gollier and Zeckhauser 1997). The decisions of both young and older savers (or wealth owners) to invest in more or less risky assets will come from two factors acting in opposite ways. On the one hand, a longer horizon is synonymous with more flexibility, which means that young people will invest in more risky assets because they expect to live long enough to be able to reallocate their portfolio. On the other, these young persons will face 'background risks' because they are still involved in the labour market: they risk unemployment, a decrease in the work they are paid for, etc. Portfolio composition is based on a consideration of these various phenomena. Gollier and Zeckhauser showed that the 'Duration Enhances Risk' clause – called DER clause – is valid when the first factor (flexibility) dominates the second one (labour market risks). This is the case when the risk tolerance is convex and a decreasing function of consumers' resources, when the young are less risk adverse than the old.

These results are interesting if compared to the empirical findings by Guiso and Paiella (2001): they find that the young are more risk averse than older consumers. This leads to a conclusion about the role of preferences : absolute risk aversion should be a decreasing function of a consumer's resources, and risk tolerance, which is the opposite, should be concave and increasing. Relative risk aversion should be an increasing function of wealth, allowing the wealth effect to moderate the decrease in absolute risk aversion. Of course, this shows that both the CARA (Constant Absolute Risk Aversion) function and CRRA (Constant Relative Risk Aversion) function do not accurately represent household preferences, a finding consistent with the fact that young households face more background risks than the more mature.

Finally, two conclusions can be drawn; first it appears to be impossible to set a simple and representative preference function (the so called "utility function") which is able to explain each individual's savings and portfolio choices at any age; second, it is clear that these choices are the result of interactions between unconstrained preferences and background risks.

4 INDIVIDUALS AND 'BACKGROUND RISKS'

The study of background risks leads to a consideration of the risk that affects the consumer's resources and not only the variance of these resources. For example, a pension fund manager generally has a higher but more risky wage than a civil servant. Should we conclude that the civil servant should have a more risky financial portfolio? Or that the decisions are linked and that the individual is a civil servant precisely because he or she is risk averse and consequently holds a large share of risk free assets. This is one of the conclusions by Barsky et al. (1997). They find that the degree of risk aversion depends a range of factors including religion, ethnic origin, and influences behaviours: a smoker is more risk tolerant than a non smoker, males are more risk tolerant than females and risk tolerant individuals would accept a more risky situation on the labour market and a more risky financial portfolio.

4.1 Background risks: what are they?

For Merton (1969), portfolio choices are independent of age. That means that age has no direct or indirect influence on portfolio choices. An indirect influence would be, for example, the influence of anxiety over job insecurity, especially if this increases with age. In Merton's model such influences do not exist for four reasons:

- H1. the CRRA utility function implies an independence between wealth and portfolio choices (via an independence between wealth and preferences);
- H2. the list of assets is reduced to financial assets (no human capital i.e. no wages and no uncertainty on these wages);
- H3. the yields of these assets are independently distributed over time;
- H4. the financial market is perfect.

We have already discussed the form of the utility function, and shown that the CRRA preferences are questionable. A consideration of background risks shows that some variables related to wealth may have an influence on portfolio choices. People have a life aside from their financial behaviour and may experience uncertain income. Thus, the individual's total wealth, W , is seen as the sum of financial wealth (W_{FI}) and human wealth (W_{HU}). Human capital includes wages and other incomes (for example self employed persons' incomes, pensions, and retirement incomes). Human capital is deeply correlated with age since at the beginning of one's life span human capital is at its maximum and decreases with age. With a CRRA preference function, the total share of risk free asset will be constant over the life

cycle, keeping constant the total share of risk free assets (human and financial) with a declining amount of (risk free) human capital, which implies an increase in the share of risk free assets in the portfolio. In fact, both may have uncertain yields: financial returns, of course, and human capital incomes like wages, pensions and various social subsidies because social policies can change. A household's human capital can also be affected by exogenous events such as divorce or health problems. The portfolio pattern will then depend on the correlation between the assets yields. If financial yields are perfectly correlated with human wealth yields then – in order to keep constant the share of risky assets – the share of risky financial assets will increase with age (again because human wealth, which is now risky, decreases with age). If financial yields are not correlated with human capital yields, in order to keep constant the risky asset share, individuals will increase share of risky financial assets while (risky) human capital stock decreases. These considerations show that even with a structure of preference that would imply independence between portfolio choices and age, the introduction of background risks provides age effects.

Another type of risk concerns future incomes of children and grand-children. If the altruism assumption holds, – if individuals care about the welfare of future generations – they will organize their wealth accumulation and allocation in order to bequeath. This radically changes the time horizon of their portfolio and, will radically change their asset allocation. When the altruism hypothesis holds, an individual takes care of his/her children and future descendants, and includes their welfare in his/her utility function arguments. The implication of this is that these people will act as if their lives were infinite. In these circumstances, reference to age has no meaning unless there are breaks in the time horizon, like succession taxes, differences in preferences between parents and children. This could explain for example a preference for bequeathing equities to real estate.

Do background risks matter? Empirical studies do not succeed in showing an adequacy between data and theory. For France, El Mekkaoui-de Freitas et al. (2001) look at various variables including professional status. Theoretical considerations would suggest that the self employed have a smaller share of risky assets than civil servants. In fact, they have a larger share of risky assets, providing confirmation that they are less risk averse than civil servants. Again, the theory is not confirmed if we look at household composition: single people and couples with no children are more likely to own risky assets than households with children; unemployment risk and the disease risk appear not to influence the holding of risky assets. The only significant variable is home ownership, which increases the probability and the share of risky assets. A possible explanation is that home ownership can be perceived as a

cover against background risks. For Italy, Guiso and Paiella (2001) reach similar conclusions - these variables explain little. Finally, these studies seem to confirm that households are not really active in their allocation of assets but passive, one of the main findings of Ameriks and Zeldes (2002).

The share of risky assets is smaller for individuals with a low degree of education. Here again it is quite difficult to capture the true mechanism: is it a consequence of low human capital or because managing a financial portfolio requires financial literacy? This meets the 'experienced saver argument': stock markets have a high entry cost which tends to ensure that only experienced savers get in. These arguments are mainly based on the idea of a degree of imperfection in the financial markets.

4.2 The effects of market imperfections and institutional framework

This leads us to the last assumption made by Merton (1969) about perfection of the markets. In reality, markets are far from perfect so that the composition of wealth can be far from the theoretical optimum. Adjustment costs on the assets markets, transaction costs, liquidity constraints, information costs, institutional environment are some factors that ensure that actual portfolio choices differ from those that would result from the application of economic theory. To offer some examples: many countries organized their fiscal policy in order to produce a particular saving behaviour: incentives for pension funds, life insurance, savings for housing like the German 'Bausparkassen' or French 'Epargne logement'.

The weight of information costs and the need for a degree of financial literacy if one wants to hedge on the financial markets have been evaluated by Clark and d'Ambrosio (2002). They found a positive and significant relationship between financial literacy, on the one hand, and saving behaviour and asset allocation, on the other. According to them, informed individuals adopt a saving behaviour which is more consistent with population ageing and the anticipated financial imbalances in public pension schemes, and adopt an asset allocation which is closer to their real needs. A financial culture, linked with a lower risk aversion, is often given as a reason for the higher ownership of risky assets of American or British savers compared to households in continental Europe. According to some authors, these information costs are the source of the so called 'Stock holding puzzle'. This 'puzzle' is rooted in the idea that everyone should hold some equities in their financial portfolio, which is not the case. This 'experienced saver argument' was used by King and Leape (1987), to explain why older people hold more risky assets than younger ones.

5 CONCLUSIONS

Does the theory work? Modigliani's life cycle theory is a very powerful framework to explain how agents should save rationally, and provides some explanation for observed changes in saving rates, with the addition of certain assumptions and external factors such as expectations and cultural characteristics.

Portfolio selection raises some other problems. At first glance, it appears impossible to represent households' preferences in terms of the usual utility function. On a closer look, it seems that these behaviours are based on a whole range of factors, the implications of which are hard to distinguish. These factors can be placed in three groups:

1. the preferences themselves. Despite a review of the literature in this chapter, it is still not clear if individuals are more or less risk adverse as they age. In addition, if they care about their children and grandchildren they can be considered as immortal as economic players, throwing into doubt the whole the age/risk relationship;
2. Even if we assume that individuals' relative risk aversion is constant over age, the population and its habits change. Let's imagine a demographic change that produces a higher proportion of males in the population. As males are less risk averse than females, macroeconomic studies would show increasing risk tolerance, but would not learn anything about individuals' preferences.
3. Even microeconomic studies, dealing with individuals and controlling for the above problems, have difficulty in capturing the rationality of behaviours because of 'background risks' and othe variability of the effects of these risks over individuals.

In the end, the mix of characteristics and preferences makes the perfect model difficult to build and the agent's preferences difficult to summarize, a conclusion borne out by the enormous heterogeneity of behaviours in portfolio choices. And what about institutional characteristics such as changes in legislation, macroeconomics, differences in financial engineering? In a recent paper, Artus noticed that portfolio allocations are deeply influenced by macroeconomics and by regulations; in Europe and the United-States, the share of bonds and real estate within institutional investors' portfolios have increased since 2000, and he links this to increasing public deficits and the new accounting principles (IFRS) which are detrimental to equity ownership by households who direct their savings towards institutional investors. Another explanation is that institutional investors follow their own advice; in this case, the structure of portfolio changes comes from the increased share of intermediated savings in household portfolios. But this change remains unexplained.

Two issues emerge as important territory for future research. The first one is the altruism hypothesis. This has been widely used to explain why the saving rates of older people are often higher than LCH theory would admit. However as far as we know, it is less used when trying to solve the 'portfolio allocation puzzle': if people care about the next generations, they leave them some wealth to meet any increase in taxes. But what about portfolio composition? If people really care about their children, why should they bequeath them a financial portfolio that may be inappropriate, because it is illiquid or constraining?

The importance of the second is reflected in the large number of papers devoted to 'behavioural finance' following by Kahneman and Tversky's publication in 1979. Since then this line of inquiry into modern finance has tried to capture the psychological factors which result in actual financial portfolios being so far from the teachings of economic theory. . Undoubtedly, there are some interesting inquiries to be had in this promising line of research.

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