From classic lifecycle to Total Portfolio Approach

Teun Loermans & Maurice Geraets

INTRODUCTION

Lifecycle investing has been a familiar principle in asset management and pension investing for decades. The core of this is simple: as the investment horizon shortens, the portfolio gradually shifts towards less risky investments. After all, a young investor can tolerate more fluctuations than an older investor. That idea is intuitively strong and practically easy to explain.

However, that classic approach is often too narrow. It focuses primarily on age and risk profile, whereas an investor's total economic position is much broader. After all, earned income, pension rights, housing assets, mortgage debt, and other potential liabilities contribute to determining the overall financial picture. The question, therefore, is not only how much risk someone is willing to take within the lifecycle alone, but also what risk is already inherent in the total balance sheet.

Therefore, a broader approach is needed. In this article, we show how lifecycle investing can be improved by combining it with a broader Total Portfolio Approach (TPA). In that approach, the investment portfolio does not stand alone in the lifecycle, but forms part of the total economic the investor's balance sheet. The starting point thereby shifts from 'age thinking' to 'balance thinking'. In addition, an extra step can be taken: a dynamic approach that also incorporates the market environment. This combination leads to a workable and practical framework in which the lifecycle portfolio does not stand alone, but is aligned with implicit positions elsewhere on the balance sheet and is dependent on the market environment.

THE STARTING POINT: THE CLASSIC LIFECYCLE

To properly understand the value of classical lifecycle thinking, it is useful to start with a simplified world. As an example, assume an investor with only an investment portfolio, without other assets on the balance sheet. There is no pension, no home, no mortgage, no earned income, and no business capital. Additionally, the market environment is 'constant'. Interest rates, inflation, and risk premiums are stable and predictable.

In such a world, the classic lifecycle makes sense. A young investor still has plenty of time to absorb setbacks and can therefore hold more equity assets and thus invest more riskily.
An older investor has less recovery capacity and is therefore more likely to choose safe investments, such as bonds, cash, or

Teun Loermans, CFA
Senior Investment Strategist and Account CIO at Achmea Investment Management

Maurice Geraets, CFA
Senior Investment Strategist at Achmea Investment Management

other defensive investments. Age and the investment horizon based thereon are then the most important steering variables.

This logic aligns with the classic literature on portfolio selection, in which financial capital, risk aversion, expected returns, and investment horizon are central (Merton, 1969; Samuelson, 1969). The classic lifecycle model is therefore a clear approach: simple, explainable, and useful as a starting point.

However, that model quickly becomes too limited once other components are included. A specific age-dependent equity allocation may be less appropriate when the stability of earned income or the size of existing pension rights is taken into account. This makes it clear that age alone is not enough. The classic lifecycle is a useful starting point, but not a definitive endpoint.

TOTAL PORTFOLIO APPROACH

The Total Portfolio Approach (TPA) is an investment philosophy in which the entire portfolio is viewed as a single, cohesive whole. Not every component is optimized separately; instead, the focus is on the contribution of each component to the overall goal. This represents a clear departure from the traditional approach, in which investment classes are often assessed independently of one another based on return, risk, and benchmarks.

> THE CLASSIC LIFECYCLE LOOKS ONLY BY AGE, WHILE THE TOTAL THE ECONOMIC BALANCE IS IMPORTANT FOR THE INVESTMENT PORTFOLIO

A core principle of the Total Portfolio Approach is to view the portfolio as a cohesive whole. In this spirit, we expand the analysis and include not only financial investments within the lifecycle, but also map out the total economic balance sheet. This balance sheet comprises, among other things, other financial investments, human capital, pension rights, housing assets, mortgage debt, potential other liabilities, and future consumption or pension obligations.

The core of the idea is simple. Assets and risks are not only located within the lifecycle portfolio, but also exist outside of it.

Including the total economic balance makes it

it is possible to adjust the investment policy in the lifecycle accordingly. Someone with a stable income and a large and secure pension already carries a great deal of security in the total balance. Conversely, someone with a cyclical income, significant housing exposure, and substantial mortgage debt already carries a high level of risk. For the total economic balance, we distinguish the following components: Human capital, Pension rights, Housing, and mortgage.

HUMAN CAPITAL

Human capital is the economic value of future labor or business income. For many individuals, this is even the largest component at a young age, even though it is not held in an investment account. The literature on lifecycle investing shows that labor income and portfolio choice cannot be viewed in isolation (Bodie, Merton & Samuelson, 1992; Viceira, 2001).

In addition, income volatility is important.
From an economic perspective, a stable salary with little sensitivity to economic fluctuations resembles a bond-like cash flow.
Such a large and safe component provides room to take more risk in the lifecycle portfolio. An entrepreneur or employee in a cyclical sector, however, finds themselves in a different position. If income fluctuates strongly with the economic cycle, human capital already contains a significant amount of equity-like risk. In that case, a more defensive lifecycle portfolio, or a lower allocation to equities, is more appropriate.

When determining the size of the human capital component, the focus is not on exact valuation, but on a reasonable estimate of size, duration, and certainty. A stable earned income of €45,000 per year that can continue for another thirty years represents a large and relatively secure asset economically. An income of €90,000 per year is considerably higher, but potentially worth less if it fluctuates significantly. It is precisely this difference in certainty that determines how much risk is appropriate in the lifecycle portfolio.

PENSION RIGHTS

Pension is often another major component of the total balance sheet. Economically speaking, a pension is a future income stream. Its value depends on interest rates, inflation indexation, longevity risk, and the degree of uncertainty regarding future benefits. Particularly in defined benefit schemes, pensions have characteristics of an annuity. The value fluctuates with interest rates and, depending on indexation, with inflation (Campbell & Viceira, 2002; Hoevenaars et al., 2008).

This means that pension rights cannot be viewed in isolation from the lifecycle portfolio. Someone with a large and stable pension income has a different economic starting position than someone who is almost entirely dependent on their own investments in the lifecycle. The lifecycle portfolio must therefore take future pension rights into account and not focus solely on the person's age.

HOME AND MORTGAGE

The owner-occupied home is partly a consumer good and partly an investment. A home is primarily intended for habitation, but as an investment, it also entails concentration, liquidity, and location-related risks. For many households, the home constitutes a large part of total assets, giving it a dominant role in the total balance sheet (Cocco, 2005; Flavin & Yamashita, 2002).

Those with substantial assets tied up in their own home already face substantial real estate risk. This may be a reason to allocate less to real estate in the lifecycle portfolio, or conversely to place more emphasis on diversification and liquidity.

The mortgage debt is also part of the total balance sheet and is related to the value of the owner-occupied home. Ultimately, net assets—the home value adjusted for the mortgage debt—are important. In addition, the characteristics of the mortgage play a role. After all, a fixed interest rate and a variable interest rate have different risk characteristics. With a fixed interest rate, the interest rate risk is largely fixed, whereas with a variable rate, interest costs fluctuate with market interest rates.

Housing assets and mortgage debt are important components of the total economic balance and must therefore be included in the relationship with the lifecycle portfolio is examined.
These components collectively determine the interest rate, liquidity, and balance sheet risk of the household. A high mortgage can make a household much more vulnerable than the lifecycle portfolio alone suggests.

FROM AGE-DEPENDENT TO BALANCE-DEPENDENT LIFECYCLE

As soon as the components of human capital, pension rights, housing assets, and mortgage debt are included, the classic lifecycle is transformed into a balance-balance-linked lifecycle. When composing the investment portfolio in the classic lifecycle, only age and risk profile are considered.

As an example, we compare two 35-year-old individuals with the same risk profile but a different total economic balance, and map out what this means for the lifecycle portfolio.

Person A has a stable earned income and is building a relatively secure pension. His human capital thus takes on the character of a predictable, bond-like income stream. Viewed from the perspective of the total economic balance sheet, this creates consequently, there is more room to include business assets in the lifecycle portfolio. Person B, on the other hand, has an income that fluctuates more strongly with the economic cycle, more limited pension accrual, and a higher debt position.
Although the present value of the human capital of A and B may be comparable, the risk profile differs fundamentally.
Person B already implicitly carries more equity-like risk through his earned income and leverage. For him, a lower equity exposure in the lifecycle portfolio is therefore more logical. In a classic lifecycle model that considers only the size of human capital, both individuals could arrive at a comparable lifecycle allocation, given an equal value.

This example illustrates, however, that not only the size but also the nature and risk of human capital determine an appropriate investment mix. The composition of a lifecycle should therefore not be driven solely by age but should also take into account the other components of an individual's total economic balance sheet. In addition to this broadening compared to traditional lifecycle thinking, a second expansion is also relevant: the explicit inclusion of conditions in the financial markets.

THREE RISK COMPONENTS IN THE LIFECYCLE

Market conditions and investment regimes have a major influence on final investment results. In an investment regime of low interest rates and stable economic growth, different investment classes flourish than during periods of high inflation or geopolitical unrest. The classic lifecycle ignores these economic conditions. We identify three risk-

Table 1
Total indicative balance for two people

Feature	Person A: stable earned income	Person B: entrepreneurial income
Age	35 years	35 years
Retirement age	67 years	67 years
Remaining working years	32 years	32 years
Risk profile	Offensive	Offensive
Net earned income per year	€45.000	€90.000
Income stability	High	Low to medium
Indicative discount rate	~2,4%	~8,1%
Estimated value of human capital	Approximately €1.0 million	Approximately €1.0 million
Financial investments	€150.000	€300.000
Pension rights / pension assets	€250.000	€100.000
Home value	€450.000	€750.000
Mortgage debt	-€300.000	-€600.000
Net housing assets	€150.000	€150.000
Key balance sheet risk	Limited	Cyclical income + leverage
Equity-like risk outside portfolio	Limited	High
Liquidity risk	Limited	High
Room for business values in lifecycle portfolio	Relatively large	More limited

Source: Achmea IM

components that have a major influence on future real investment outcomes: equity risk premium, interest rates, and inflation.

Stocks are expected to offer a risk premium over safe investments in the long term. However, that return is uncertain and fluctuates over time. Valuations, earnings expectations, and risk appetite influence the size of that premium for stocks (Campbell & Shiller, 1988; Campbell et al., 2003).

Interest rate risk is broader than the market risk of bonds alone. Interest rate levels also affect pension rights, mortgage burdens, and the price of safety. Consequently, for long-term investors, bonds can also serve as a hedge against interest-sensitive liabilities (Campbell & Viceira, 2002).

Inflation is the risk to purchasing power in the long term. For many investors, this is ultimately the most important risk, because their goal is not nominal wealth, but real consumption. Inflation protection can be sought in inflation-linked bonds, real estate, or infrastructure, but no single asset class is a perfect hedge. Inflation-linked bonds are sensitive to changes in real interest rates, while real estate and infrastructure entail other risks.

HUMAN CAPITAL, PENSION RIGHTS AND HOUSING ASSET CO-DETERMINE THE COMPOSITION OF THE INVESTMENT-PORTFOLIO ON THE LIFECYCLE

Moreover, interest and inflation are related. The nominal interest rate consists of the real interest rate plus expected inflation, as defined in the Fisher relation (Fisher, 1930). In practice, that relationship is not always clear, because monetary policy, liquidity, and risk premiums influence the level of the components (Mishkin, 1992).

In this analysis, the risk components—equity risk premium, interest rate, and inflation—are central. These factors are among the most important systematic sources of risk for investors, as they have a major influence on both the value of investments and the development of future real obligations. Together, these three components represent the most important factors in the financial markets with which investors have to deal with. This does not mean that this selection is complete; it may be expanded in the future.

By taking the situation on the financial markets into account, the classic lifecycle can become more dynamic. However, this is not a plea to trade frequently in the short term or to continuously adjust the investment portfolio. It is a plea to make the standard *glidepath*— the reduction of business assets as a person gets older—more dynamic. Based on pre-established policy rules, the weights of the investment classes are recalibrated within certain ranges.

THE LIFECYCLE IN FOUR REGIMES

The design of a dynamic lifecycle becomes more concrete when specific investment regimes are analyzed.
As an example, we use the following regimes:

- Neutral
- High real interest rates, high inflation
- Low real interest rates, stable inflation
- High inflation, negative real interest rate

These regimes are not a prediction of the future. They help to determine in advance which lifecycle adjustment is appropriate under various circumstances. The adjustments always remain limited by the basic glide path, the risk appetite, and the investor's total economic balance. Using the four investment regimes, we demonstrate the effects on the composition of the investment portfolio within the lifecycle.

The investment portfolio in the lifecycle consists of the following components:

- Business assets, especially stocks;
- Fixed-income securities, especially government bonds;
- Inflation-related values: inflation-sensitive investments such as inflation-linked bonds;
- Liquidity, cash.

The inflation parameter determines the allocation to the inflation-related values component.

THE INFLATION PARAMETER

Within the fixed-income portion of the portfolio, the inflation component is explicitly managed using the inflation parameter.
This parameter determines which portion of the fixed-income portfolio goes to real assets or inflation-linked instruments. It is possible to determine the optimal parameter per inflation and interest rate level based on hedge optimization.
In the example below, we use a stylized approximation of this parameter (see Table 2).

Table 2
Investment regimes with corresponding inflation parameter

Regime	Inflation parameter	Interpretation
Neutral	30%	Basic level of purchasing power protection.
High real interest rates, high inflation	20%	More room for nominal matching.
Low real interest rates, stable inflation	30%	Real protection remains useful, without an additional inflation shock.
High inflation, low real interest rates	60%	Loss of purchasing power is dominant.

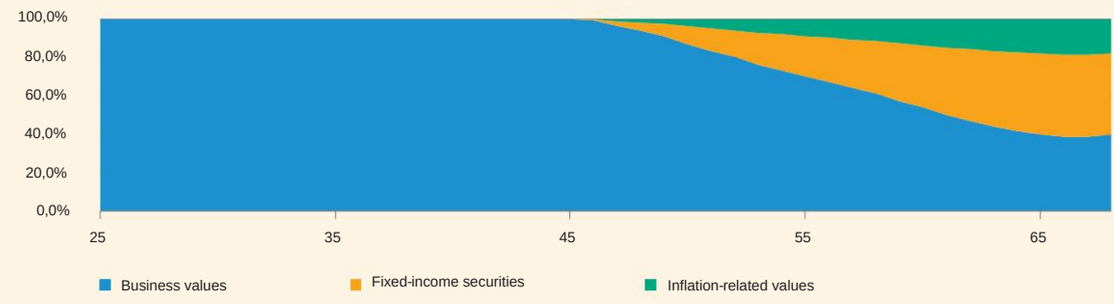
Source: Achmea IM

Table 3
Subdivision of portfolios in a neutral regime

Lifecycle-component	Adjustment in a neutral regime
Business values	Basic glide path
Fixed-income securities	Neutral
Inflation-related values	Basic level
Liquidity	Normal
Goal	Balance between growth, stability and purchasing power protection

Source: Achmea IM

Figure 1
Lifecycle under a neutral scenario



Source: Achmea IM

1. Neutral regime

In a neutral regime, real interest rates, inflation, and risk premiums are roughly in balance. The real interest rate is neither extremely high nor low, inflation does not pose a dominant threat, and nominal bonds are a stable building block. The portfolio then primarily follows the basic glide path based on financial and human capital, with a standard level of purchasing power protection. The inflation parameter is set at 30%, so that approximately one-third of the fixed-income portfolio goes to real protection and two-thirds to nominal bonds (see Table 3, Figure 1).

2. High real interest rates, high inflation

In the presence of high real interest rates, safe government bonds are relatively attractive. Nominal bonds then offer not only stability but also an attractive real return. As a result, the need to seek additional returns through equities decreases.

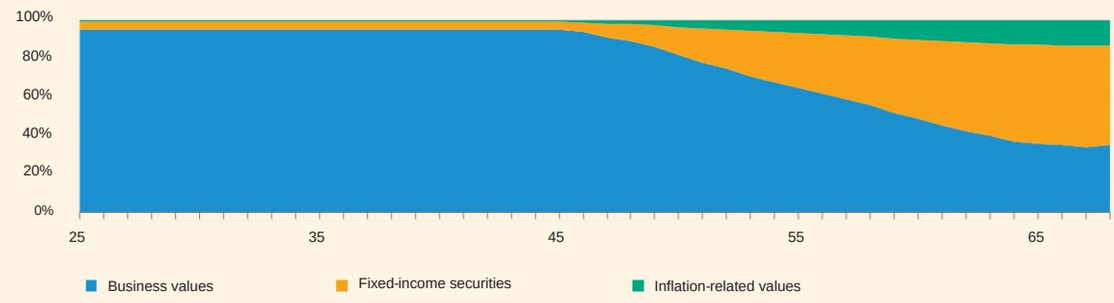
Within the bandwidth, the share weighting can then be reduced slightly. Older investors, in particular, benefit from the more attractive real return. The inflation parameter falls to 20%, creating more room for nominal investments (see Table 4, Figure 2).

Table 4
Portfolio subdivision at high real interest rates

Lifecycle-component	Adjustment in case of high real interest rates
Business values	Slightly on the move within bandwidth
Fixed-income securities	Consider, depending on duration and obligations
Inflation-related values	Lower or neutral weight
Liquidity	Normal
Goal	Benefit from more attractive defensive real returns

Source: Achmea IM

Figure 2
Lifecycle under a scenario with high real interest rates and high inflation



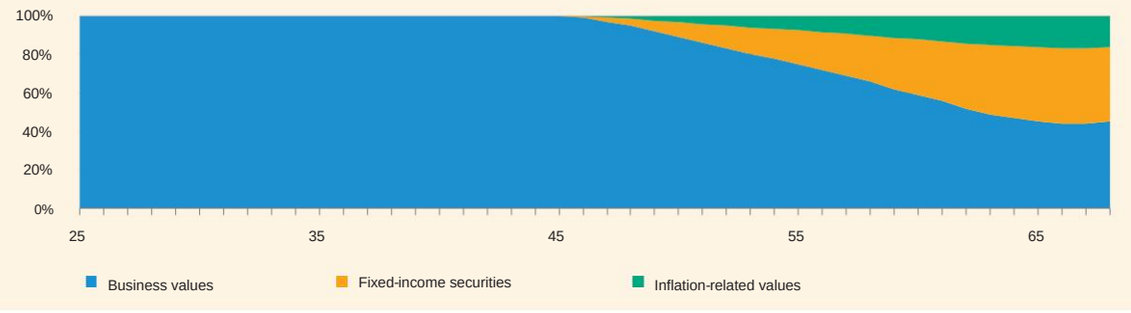
Source: Achmea IM

Table 5
Portfolio subdivision at low real interest rates

Lifecycle-component	Adjustment at low real interest rates
Business values	Consider within bandwidth
Fixed-income securities	Neutral to limited, subject to obligations
Inflation-related values	Basic level
Liquidity	Normal
Goal	Maintain sufficient real asset growth

Source: Achmea IM

Figure 3
Lifecycle under a scenario with low real interest rates and stable inflation



Source: Achmea IM

3. Low real interest rates, stable inflation

In the presence of low real interest rates, safe bonds yield little real return. Nominal bonds remain useful for stability, but their contribution to real capital growth is limited. Consequently, equity securities remain important for long-term returns.

In this regime, the equity weighting within the bandwidth may actually be higher than in the neutral regime. Young and middle-aged investors with substantial human capital, in particular, can bear more risk. The inflation parameter then remains at the base level of 30% (see Table 5, Figure 3).

4. High inflation, negative real interest rate

In a regime of high inflation and negative real interest rates, the loss of purchasing power is central. Nominal investments are eroded by inflation, while the negative real interest rate offers no compensation. For long-term investors, this is a difficult regime, especially when future consumption or pension outcomes are the focus.

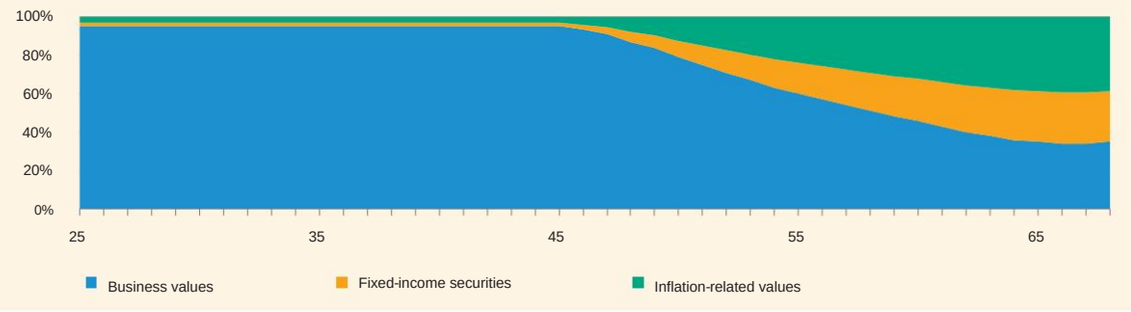
Stocks can offer some inflation protection in the long term, especially when companies can pass on higher costs. At the same time, the picture remains mixed, as costs typically rise and margins are under pressure. The emphasis is therefore not on more stocks, but on inflation-sensitive investments. The inflation parameter rises to 60% (see Table 6, Figure 4).

Table 6
Portfolio subdivision during high inflation & negative real interest rates

Lifecycle-component	Adjustment during high inflation and negative real interest rates
Business values	Selective, preference for quality and pricing power
Pension / duration	Limit long nominal duration
Inflation protection	Strongly consider
Liquidity	Normal to elevated
Goal	Protecting purchasing power

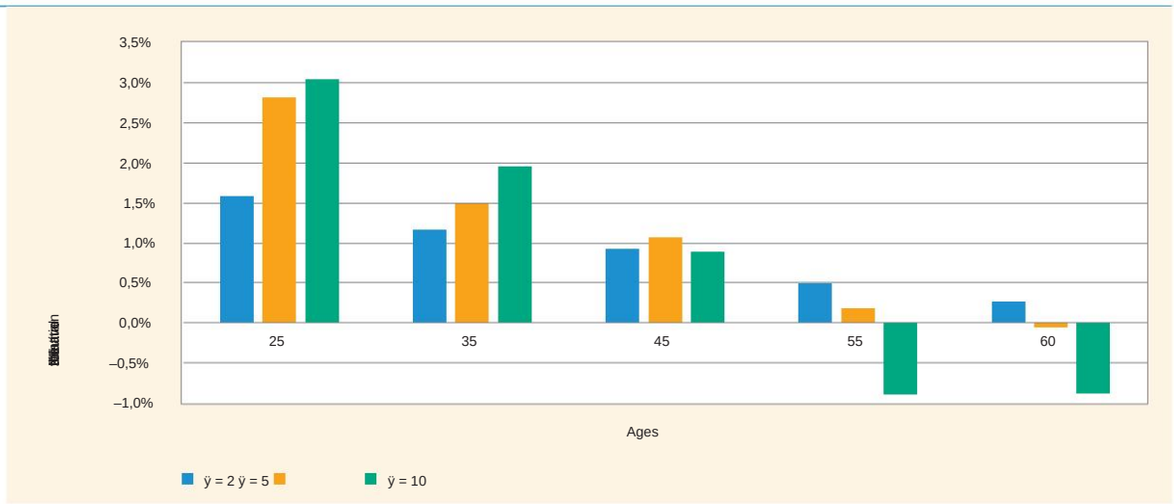
Source: Achmea IM

Figure 4
Lifecycle under a scenario with high inflation and negative real interest rates



Source: Achmea IM

Figure 5
ZE relative to the
Neutral situation (%)



Source: Achmea IM

REGIME-DEPENDENT LIFECYCLE STRATEGY

In the analysis above, the emphasis was on adjustments within the lifecycle based on the prevailing investment regime. For the quantitative substantiation, we compare a fixed neutral lifecycle with a regime-dependent strategy that adjusts the allocation annually based on the level of real interest rates and inflation expectations. In doing so, we test a variant that alternates between predefined lifecycles based on the regime definition. The aim is to investigate whether macro-regime information leads to better pension outcomes and whether that improvement is robust from a risk perspective.

BY TAKING INTO ACCOUNT THE PREVAILING INVESTMENT REGIME CAN THE LIFECYCLE PORTFOLIO FURTHER IMPROVE

We use American historical data for this (among others) Shiller), inflation expectation data from the Cleveland Fed Center for Inflation Research, and for the stochastic analysis, the Achmea IM scenario set Flags & Frictions. The portfolio consists of euro government bonds, euro inflation-linked bonds, and equities.
The regime is determined annually based on the real ten-year interest rate relative to a moving average.

HISTORICAL BAKING TESTS (1983–2025)

The historical analysis simulates a participant aged 25 to 68 with annual, inflation-indexed contributions. During this period, both regime strategies prove to perform better than the neutral life cycle. The full-switch strategy realizes approximately 7% higher nominal final capital than the neutral version, while the tilt variant yields nearly 10% higher. Historically, utilizing regime-
-information, thus to add value. At the same time, this concerns a single realized path, whereby the period 1983–2025 is a specific experienced interest rate and inflation dynamics. For a robust assessment, we therefore also look at a stochastic simulation.

STOCHASTIC SIMULATION (2000 SCENARIOS)

In the stochastic analysis, we use 2,000 scenarios with 60 years of returns and interest rate curves. For a participant starting at age 25, 43 years are calculated.
The evaluation is based on CRRA utility on the final real pension benefit. CRRA utility *(Constant Relative Risk Aversion)* is a widely used method to model risk aversion, where the degree of risk aversion remains constant in relative terms.
An investor consistently gives equal weight to percentage fluctuations in outcomes, regardless of the asset level. The performance measure is the relative certainty equivalent (ZE) relative to the neutral lifecycle for different values of the risk aversion parameter ÿ. The certainty equivalent is the certain outcome that an investor considers equally attractive as an uncertain investment strategy, given their degree of risk aversion ÿ. An improvement of approximately 0.5% to 1% in certainty equivalent is generally considered economically relevant in a long-term pension context (see Figure 5).

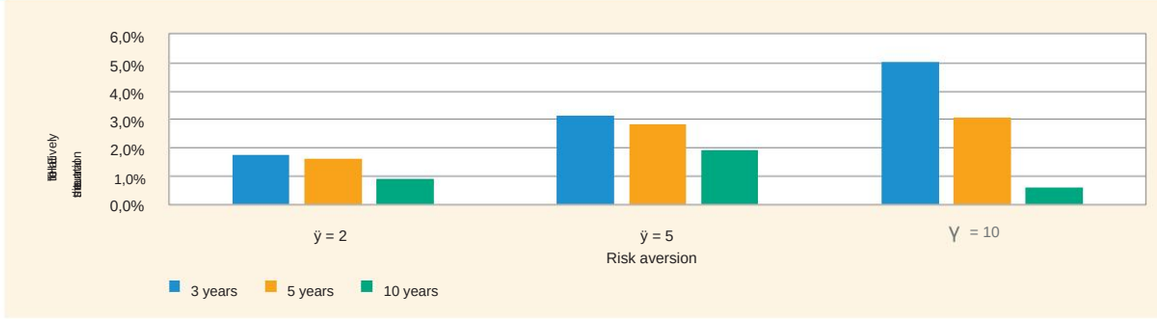
For long horizons, the full-switch strategy is clearly positive, even with higher risk aversion. As the investment horizon shortens due to the participant's age, the capital appreciation decreases and, in the case of high risk aversion, can turn into a disadvantage (see Figure 6).

Shorter time periods increase regime sensitivity and, consequently, the impact on the certainty equivalent.

CONCLUSION

The results show that regime information, applied via a moving average of the real and nominal interest rates, can add value in stochastic analysis compared to a fixed neutral lifecycle. For long investment horizons, the full-switch strategy is generally positive, even when risk is explicitly factored in. As the horizon

Figure 6
Sensitivity
progressing period



Source: Achmea IM

as it becomes shorter and risk aversion increases, the added value decreases and can turn into a disadvantage.

RULE-DRIVEN DYNAMICS

A dynamic lifecycle should not be confused with market timing. The goal is not to predict where financial markets are headed in the short term. The goal is to determine in advance how the portfolio will react to specific conditions in the financial markets.

> A GOOD LIFECYCLE IS NOT STATIC, BUT PLAYS INDOORS PRE-ESTABLISHED RULES ON CHANGING CIRCUMstances

An approach based on predefined rules is attractive because it prevents ad hoc decisions.
It also limits behavioral *biases* and makes decision-making more transparent. The base glide path remains the anchor, but within predefined bandwidths, the portfolio may deviate based on objective indicators.

This aligns with insights from *behavioral finance.* Investors are susceptible to loss aversion, overconfidence, and herd behavior, among other factors, causing decisions under market pressure to deviate from long-term interests (Barberis & Thaler, 2003; Kahneman & Tversky, 1979). These behavioral biases often lead to procyclical behavior. Establishing rules in advance reduces this likelihood.

IMPLEMENTATION AND LIMITATIONS

The proposed broader Total Portfolio Approach requires more information than a classic lifecycle. In addition to age and risk profile, data is needed on, among other things, earned income, pension rights, home value, mortgage, liquidity needs, future liabilities, exposure to equity, interest rate, inflation, and real estate risk, and indicators for risk premiums, real interest rates, and inflation.

At the same time, the approach is more complex than a standard lifecycle. Human capital is difficult to value exactly. Pension entitlements depend on regulations, indexation policy, and longevity risk. Housing value is uncertain and illiquid. Risk premiums are often not directly observable and must be estimated. Furthermore, regimes are not objectively given but are derived from indicators that contain noise and sometimes give contradictory signals (Brennan, Schwartz & Lagnado, 1997).

That is no reason to reject the proposed approach, but rather to avoid aiming for false precision. The described Total Portfolio Approach is not a formula that yields a single optimal portfolio. It is a framework for making decisions more systematically, realistically, and in a more explainable manner (see Table 7).

CONCLUSION

The classic lifecycle is a useful starting point for shaping an investment portfolio. Age, and the related investment horizon, and risk appetite are important variables. However, these variables are not sufficient.

In addition to these financial investments, an investor also holds human capital, pension rights, and housing assets. All these components together determine the amount of economic risk someone bears.

Table 7
Comparison of different lifecycles

Type lifecycle	Sends to	Advantage	Limit
Classic lifecycle	Age and risk preference	Simple, cheap and easy to explain	Ignores overall balance and market environment
Balance-dependent lifecycle	Age plus total economic balance	Take into account human capital, pension, housing, and mortgage	Requires customer data and valuation of implied positions
Dynamic lifecycle	Age, balance and market environment	Adjusts risk to levels of inflation, real interest rates and equity risk premium	Requires robust indicators, bandwidths and discipline

Source: Achmea IM

An approach based on the Total Portfolio Approach therefore makes the classic lifecycle broader and more realistic. The allocation to various investments depends not only on age and risk profile, but on the total economic balance and, within clear rules, also on market conditions.

Human capital, pension rights, housing value, and mortgages are included as components of the total economic balance sheet. The level of risk premiums, interest, and inflation is taken into account in determining the investment regime.

The investment regimes are translated into lifecycle adjustments for business values, nominal bonds, and inflation protection. This reveals when equities are more important for real capital growth, when nominal bonds are more attractive as a defensive building block, and when purchasing power protection should take center stage.

However, these investment regimes are not a license for tactical market timing. They provide a framework based on predetermined rules to systematically respond to changing market conditions within predetermined ranges.

This shifts the central question from: “which investment portfolio suits this age?” to: “which investment portfolio fits the overall economic balance and the prevailing investment regime?”

DISCLOSURE

In this article, generative AI tools (such as ChatGPT) were used exclusively to edit the text. The authors assume full responsibility for the content.

Literature

— Ang, A., Goetzmann, W. N., & Schaefer, S. M. (2009). Evaluation of active management of the Norwegian Government Pension Fund – Global. Norwegian Ministry of Finance.

— Barberis, N., & Thaler, R. (2003). A survey of behavioral finance. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), Handbook of the economics of finance (Vol. 1, Part B, pp. 1053–1128). Elsevier.

— Bodie, Z., Merton, R. C., & Samuelson, W. F. (1992). Labor supply flexibility and portfolio choice in a life cycle model. Journal of Economic Dynamics and Control, 16(3–4), 427–449.

— Brennan, M. J., Schwartz, E. S., & Lagnado, R. (1997). Strategic asset allocation. Journal of Economic Dynamics and Control, 21(8–9), 1377–1403.

— Campbell, J. Y. (2006). Household finance. The Journal of Finance, 61(4), 1553–1604.

— Campbell, J. Y., Chan, Y. L., & Viceira, L. M. (2003). A multivariate model of strategic asset allocation. Journal of Financial Economics, 67(1), 41–80.

— Campbell, J. Y., & Shiller, R. J. (1988). Stock prices, earnings, and expected dividends. The Journal of Finance, 43(3), 661–676.

— Campbell, J. Y., & Viceira, L. M. (2002). Strategic asset allocation: Portfolio choice for long-term investors. Oxford University Press.

— Clevelandfed. clevelandfed.org/center-for-inflation-research

— Cocco, J. F. (2005). Portfolio choice in the presence of housing. The Review of Financial Studies, 18(2), 535–567.

— Cocco, J. F., Gomes, F. J., & Maenhout, P. J. (2005). Consumption and portfolio choice over the life cycle. The Review of Financial Studies, 18(2), 491–533.

— Fisher, I. (1930). The theory of interest: As determined by impatience to spend income and opportunity to invest it. Macmillan.

— Flavin, M., & Yamashita, T. (2002). Owner-occupied housing and the composition of the household portfolio. American Economic Review, 92(1), 345–362.

— Hoevenaars, R. P. M. M., Molenaar, R. D. J., Schotman, P. C., & Steenkamp, T. B. M. (2008). Strategic asset allocation with liabilities: Beyond stocks and bonds. Journal of Economic Dynamics and Control, 32(9), 2939–2970.

— Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 263–291.

— Merton, R. C. (1969). Lifetime portfolio selection under uncertainty: The continuous-time case. The Review of Economics and Statistics, 51(3), 247–257.

— Mishkin, F. S. (1992). Is the Fisher effect for real? A reexamination of the relationship between inflation and interest rates. Journal of Monetary Economics, 30(2), 195–215.

— Samuelson, P. A. (1969). Lifetime portfolio selection by dynamic stochastic programming. The Review of Economics and Statistics, 51(3), 239–246.

— Shiller Data. Shillerdata.com

— Viceira, L. M. (2001). Optimal portfolio choice for long-horizon investors with nontradable labor income. The Journal of Finance, 56(2), 433–470.