A Preliminary Study of Intelligent Lifecycle Funds: Perspective of System Design and Empirical Case

Fur-Hsing Wen, Yao-Chin Lin, and Wei-Hung Chen

***Abstract*—The purpose of this study is to explore ways to sustain the development of pensions. This study uses case studies and analyzes intelligent lifecycle funds from a system design perspective. Research questions are: 1. What is intelligent lifecycle funds? Is there a case of Taiwan? 2.What is the system design for intelligent lifecycle funds? This study used a case study method to explore the small-scale pension funds in Taiwan. The data analysis uses the fund decision program flow chart. The study found that the design of financial information systems and the method of screening out intelligent life cycle funds. Finally, this study presents research conclusions and future research recommendations.**

***Index Terms*—Intelligent lifecycle funds, system design.**

I. Introduction

This study is based on a small-scale pension funds in Taiwan, with a population of about 60,000. The demographic background of the pension fund includes people who have just entered the workplace and are about to retire. Spitzer & Singh (2011) point out that the life cycle (or target date) fund is a relatively new tool which can accumulate retirement savings. The stock portion of the lifecycle portfolio decreases over time, thus when owners approach the (target) retirement date, the portfolio becomes more conservative [1]. Surz & Israelsen (2008) proposed that the target date life cycle funds are relatively new target date funds have now been approved by the Ministry of Labor to prove that they are moving targets for any benchmark comparison. That study provide their method for creating a pure target index series that they define as more than just hypothetical; they can invest completely [2].

According to the above, there are many problems in Taiwan's pension system. The purpose of this study is to explore the ways to sustain the development of pensions.

Research questions are as follows:

1. What is intelligent lifecycle funds, and is there a case in Taiwan?
2. What is the system design for intelligent lifecycle funds?

II. Literature Review

A. Intelligent Lifecycle Funds

Spitzer & Singh (2011) point out that the life cycle (or target date) fund is a relatively new tool, using bootstrap simulations, asset allocations that simulate real-world life cycle fund behavior show lower accumulation than other available alternatives and effectiveness. Life cycle funds themselves are not as safe, reliable or effective as implied [1].

Surz & Israelsen (2008) existing target date fund, whether measured as a peer group or individually, failed to meet the risk-adjusted performance criteria set by the pure target index. We recommend that carefully constructed target date funds should have comparable risk and return characteristics. In addition, since each target date has four indices (defensive through positive), these new target date indices provide a coherent way to measure the risk of all existing target date funds. Other index series (i.e., conservative, medium, positive) sacrificed these two goals to varying degrees in order to be more in line with industry practices and actually exposed to issues that critics have discovered, such as path dependence and the possibility of loss. Time will tell us which life cycle alternatives are gaining greater recognition [2].

Wade (2009) also suggests that the determinant of life cycle strategies can be justified even in a framework that only includes financial wealth after comparing the simulation results of life cycle and fixed asset allocation strategies. Retirement savers may have a specific goal, and their goal is to accumulate wealth before the retirement date. It is important to find the appropriate trade-off between the expected wealth accumulation on the target date and the huge loss of accumulated wealth. The findings are evidenced by strategic reasons for finding life cycles by considering financial and non-financial assets [3].

There are Three Types of mandatory provident fund (MPF) Scheme [4]

1) Master trust schemes

Participants: the most common type of MPF scheme, open to the employees of participating employers, self-employed persons and persons with accrued benefits to be transferred from other schemes.

Characteristics: by pooling together contributions from various employers and their employees, and contributions from self-employed persons, master trust schemes have a high degree of efficiency in terms of scheme administration due to economies of scale.

2) Employer-sponsored schemes

Participants: membership in this type of scheme is limited to the employees of a single employer and its associated companies.

Characteristics: because of its restriction in membership, it is only cost-effective to run an employer-sponsored scheme if the number of employees is large.

Manuscript received March 13, 2020; revised July 14, 2020.

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doi: 10.18178/ijimt.2020.11.4.887

3)Industry schemes

Participants: schemes specially established for employees of the catering and construction industries, particularly casual employees (i.e. workers employed on a day-to-day basis or for a fixed period of less than 60 days).

Characteristics: casual employees do not need to change schemes when they change jobs within these two industries, so long as their previous and new employers have registered with the same Industry Scheme.

B. Financial Information System Design

A well-functioning financial management information system provides timely, reliable and comprehensive reporting, and many systems now focus on core functions, such as accounting and reporting, budget execution and cash management, rather than try to cover all or most of the public financial management functions (Uña, Allen & Botton, 2019). The information technology platform used and the convenience of sharing data with other IT systems. This "how to pay attention" discusses how to deal with these challenges. Replacing system with a completely new system may not be the best strategy. By taking advantage of the latest technology, a better approach can be to update or replace one or more core modules of the system: the so-called modular approach [5]. This study will explore the analysis and design of the system through this method conceptual model.

III. Research Design

A. Instrument

This study uses case study method to explore the small-scale pension funds in Taiwan with a population of about 60,000. The main analysis is how intelligent lifecycle funds works with the relevant financial information system.

B. Data Analysis

The data analysis uses the fund decision program flow chart (see Fig. 1). Retrieving information about funds in the database from the TEJ or Cmoney database, One-year return rate (%), Beta (12M), a total of 650 funds. According to the analysis of the above flow chart, the study writes the program out of the statistical results (see Appendix for the code), and finally contributes the recommended fund.

A description of the three risk assessments is shown in Table I The three types of risks are divided into different types by each person who participates in the pension system after filling out the risk questionnaire.

TABLE I: Risk Assessment Forms

Risk Appetite of private schools faculties	Description
Conservative	You cannot take any risk at all and are suitable to invest in the conservative portfolio to secure your principal.
Stable	You can take few risks to gain stable earnings.
Aggressive	You can take higher risks to aggressively pursue profits.

IV. Finding

A. Financial Information System

According to the research design, the analysis of the system in this study is as follows (see Fig. 2):

- Fund database: It is planned to purchase the right to use the domestic and foreign fund database and provide the investment management team of the reserve management committee.
- System integration function module: Integrate the system connection and data exchange between the trust bank and the deposit management committee, the deposit management committee and the staff.
- System database: Design the database of the CIFA and the bank-side database. The repository of the CIFA is a backup database, providing the management of the deposit, the supervision committee, the Ministry of Education, statistics, and reports other functions.

B. Intelligent Lifecycle Funds

According to the risk value, three types of funds are selected (see Fig. 3). This study uses 650 funds that Taiwan can purchase as a database, giving different risk values and obtaining three types of funds.

1. Low pay and low risk (conservative): 0<ß<1
   Yongfeng mainstream brand, Taixin North American income asset securitization, unified Grand Slam...
2. Risk in remuneration (stable): 1<=ß<1.5
   Antai ING global brand, JF Taiwan BRIC, Bora New Taiwan...
3. High reward and high risk (aggressive): ß>=1.5
   NaN

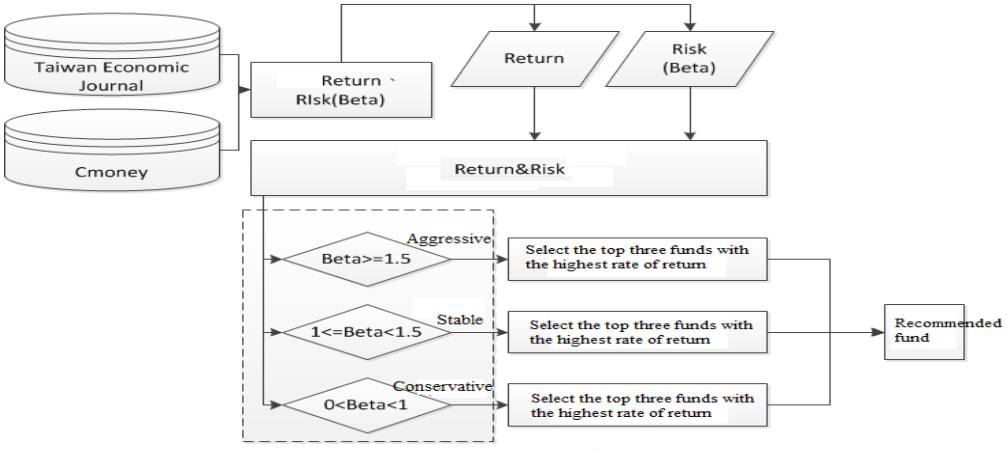

Fig. 1. Fund decision program flow chart.

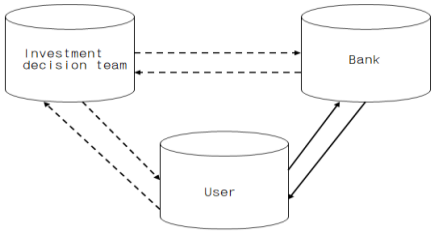

Fig. 2. Data base design model.

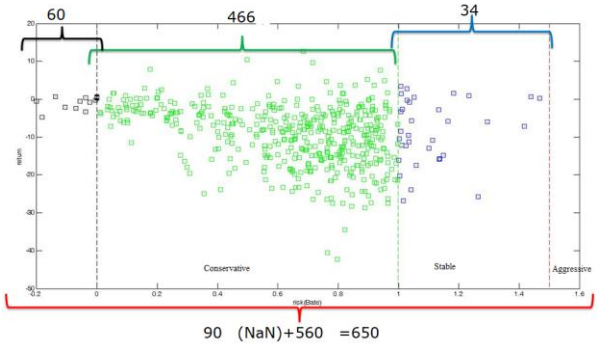

Fig. 3. Fund distribution map.

V. Discussion and Conclusions

A. Conclusions

The life cycle fund is an investment strategy that gradually reduces the portfolio of investment risks as we age. The basic investment philosophy is based on high returns and high risks, while low risk will only have low returns.

Applicable to: Investors who prepare for pensions, they are usually ordinary non-professional investors who do not have enough time or interest. Usually the age at which the retirement age is set to terminate working (no income) (for example, 65 years old), the basic living expenses after retirement mainly depend on the retirement fund accumulated during the period of employment. Life cycle fund portfolio and age relationship: Employees under the age of 30 are 100% invested in an active portfolio. At the age of 31-35, the investment proportion of the active portfolio was reduced to 80%, and the remaining 20% was invested in a stable portfolio. By analogy, for those aged 41-45, the proportion of active and robust configurations is 20% and 80% respectively. 46-47years old, 100% in a stable portfolio, 48-49 years old, the proportion of robust and conservative configuration is 80% and 20% respectively. By analogy, for those aged 54-55, the proportion of stable and conservative configurations is 20% and 80% respectively. Those over 56 years old are not suitable for taking excessive risk of volatility because of the retirement age. The guarantee is 100% configured in a conservative portfolio.

Several studies have also suggested that dynamic lifecycle strategies outperform traditional lifecycle strategies. After any age-based rule of thumb, the mechanism conversion strategy from growth to conservative assets is not as good as the dynamic strategy actually accumulated in retirement accounts before converting assets [1]-[3]. Our study proposes a specific dynamic asset allocation strategy in which asset conversion at any stage is based on the cumulative investment performance of the portfolio relative to the investor's target at that stage. Unlike traditional life-cycle asset allocation rules, asset conversion is scheduled to be one-way. This dynamic strategy can switch assets in both directions - from positive to conservative, and the results show that, in most cases, experienced in the later stages of employment. The growth in portfolio size seems to justify holding a portfolio that is at least as positive as it was in the early years. For some participants, this may mean holding 100% of the stock. They themselves acknowledge that financial advisors who recommend a lifecycle asset allocation strategy focus on two goals: (1) maximizing growth in the first few years of investment; and (2) reducing the volatility of returns later. Our findings suggest that the bulk of the cumulative wealth value growth actually occurred in later years. Therefore, the first goal has little to do with the overall investment objective of increasing the final value of the planned assets. Indeed, some support was found to achieve the second goal of reducing late volatility to mitigate the effects of a severe market downturn [6], [7].

B. Practical Implications

The US federal employee's thrift savings plan (TSP) and Hong Kong's mandatory provident fund (MPF), both of which plan to use the life cycle fund as their default investment strategy fund. Life cycle funds have been adopted in September 2015 and April 2017. The American Teacher Retirement Foundation also uses the Life Cycle Fund. [4], [8].

Hong Kong's MPF Scheme: The Guardian Preset Fund (DIA) enters the new Life Cycle Pre-set Fund Strategy (DIS) Important Notice. If the account holder believes that the new "Delayed Investment (DIS)" is appropriate for them, no action is required. If you do not agree to invest in a new "Pre-Sponsored Investment (DIS)" and wish to invest in the original "Pre-Order" (DIA), the Member must complete the form and deliver it to the Trustee; otherwise, the MPF Account will Transfer from the original plan (DIA) to the "Preset Investment (DIS)" within 14 days after the specified date.

The US TPS Life Cycle Fund is divided into five phases (L 2020, L 2030, L 2040, L 2050, L Revenue). The Foundation allocates different proportions among the five funds of G, F, C, and S, and allocates according to the year of the proposed withdrawal. The employees will select different life-cycle funds for investment in the year of the estimated withdrawal.

C. Recommendations for Future Research

This study uses case study method to analyze intelligent lifecycle funds from a system design perspective. However, in order to achieve the "intelligent" function, the system also needs to add some tools of artificial intelligence, such as: AI and customize, deep learning training and so on.

Therefore, future research is suggested that the research sample can be increased and simulated by AI. The life cycle fund can be truly intelligent and develop a pension-compliant AI investment system.

Appendix: Funds Decision Code

```
clear;clc;
load 'FundsData.mat';
Funds(:,3)=data(:,1);  % 1: Code
Funds(:,2)=data(:,12);  % 12: One-year return rate(%) return
Funds(:,1)=data(:,27);  % 27: Beta(12M) risk
```

```
Count_Conser=0;        % Conservative
Count_Stable=0;        % Stable
Count_Positi=0;        % Aggressive
Count_Nan=0;           %NaN
Count_LowZero=0;       %above0

for i=1:length(Funds(:,1))
   if isnan(Funds(i,1)) == false
      if  isnan(Funds(i,2)) == false
           if Funds(i,1) > 0 && Funds(i,1) < 1
            %     0 <  bate < 1     (Conservative--Green)
            plot(Funds(i,1),Funds(i,2),'--gs');
            Count_Conser = Count_Conser + 1;
            Funds_Conser(Count_Conser,:) = Funds(i,:);

  elseif Funds(i,1) >= 1 && Funds(i,1) < 1.5
            %     1 <= bate < 1.5   (Stable--Blue)
            plot(Funds(i,1),Funds(i,2),'--bs');
            Count_Stable = Count_Stable + 1;
            Funds_Stable(Count_Stable,:) = Funds(i,:);

           elseif Funds(i,1) >= 1.5
            %   1.5 >= bate        (Aggressive--Red)
            plot(Funds(i,1),Funds(i,2),'--rs');
            Count_Positi = Count_Positi + 1;
            Funds_Positi(Count_Positi,:) = Funds(i,:);

           else
            %     0 <= bate
            plot(Funds(i,1),Funds(i,2),'--ks');
            Count_LowZero = Count_LowZero + 1;
            Funds_LowZero(Count_LowZero,:)              =
Funds(i,:);

    end
             hold on;
          else
            Count_Nan = Count_Nan + 1;
            Funds_Nan(Count_Nan,:) = Funds(i,:);
       end
    else
            Count_Nan = Count_Nan + 1;
            Funds_Nan(Count_Nan,:) = Funds(i,:);
    end
end

xlabel('risk(Bate)');
ylabel('return');

x=[0 0];   y=[-50 20];
plot(x,y,'--k')
text(0.45, -45, 'Conservative');
x=[1 1];   y=[-50 20];
plot(x,y,'--g')
text(1.25, -45, 'Stable')

x=[1.5 1.5];   y=[-50 20];
plot(x,y,'--r')
text(1.51, -45, 'Aggressive')
clc;
```

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Fur-Hsing Wen, Yao-Chin Lin, and Wei-Hung Chen jointly designed the research and prepared the manuscript. All authors have read and approved the final manuscript.

Acknowledgment

The authors express their gratitude to Dr. Shan (Associate Professor in Accounting UWA Business School) for his great help throughout the research.

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