

Adventures of an Economist: Modigliani and business cycles

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1. INTRODUCTION

The life-cycle theory, firstly introduced in 1954, represents a key turning point in understanding the behavior of individuals concerning consumption and saving.

In this paper we will analyze the theory and the possible contradictions and implications in depth, to derive the implications in the behavioral finance field.

To begin to comprehend the theory we deemed it imperative to first talk about the author, Franco Modigliani. Exploring his life and diving into the socio-economic period he lived are essential to the analysis of the theory.

2. HISTORICAL AND BIOGRAPHICAL HINTS

Franco Modigliani, born in Rome in 1918 from a pediatrician father, was not an outstanding pupil. Only after the death of his father, whom he deeply admired, he blossomed at Liceo Visconti, the best high school in Rome. Encouraged, he decided to skip the last year of the Liceo and entered the Faculty of Law at the University of Rome at 17, two years ahead of the norm. Obtaining a good economics education under Fascism was knotty, leading him to self-study under the guidance of the few good economists he knew personally, such as Riccardo Bachi. In 1939, Modigliani and his wife, Serena Calabi, moved to the U.S. amid the impending war. He worked odd jobs and attended evening economics courses at the New School, where he was influenced by economists Jacob Marschak and Abba Lerner, adopting Keynesian principles.

In 1944, at just 24, Modigliani published "Liquidity Preference and the Theory of Interest and Money", a groundbreaking mathematical formulation of Keynesian economics. He challenged market virtues, introducing the life cycle model, positing that savings patterns change with age. This theory, honored with a Nobel Prize in 1985, influenced the study of savings determinants. To date, he is the first and only Italian to have been awarded the Nobel Prize in economics, "for his pioneering analysis of savings and financial markets".

In the 1960s, with the rise of Milton Friedman's monetarism, advocating reduced government intervention, the Keynesian revolution lost strength and polish. Modigliani, as president of the Association of American Economists in 1974, highlighted the stark differences between Keynesianism and monetarism, emphasizing the need for economic stabilization advocated in The General Theory.

Franco and Serena Modigliani were people of extraordinary human warmth. They welcomed young economists arriving from Italy to their home in Belmont, in the Boston suburbs. Serena nurtured them and advised them on their personal problems. Franco, who had an insatiable intellectual curiosity, would inquire about their research and often suggest that they work together on some topic.

In academia, Modigliani's contributions span various fields. His collaboration with Merton H. Miller on financial markets demonstrated that, under certain conditions, a firm's value is

independent of its debt-to-equity ratio. The life cycle hypothesis of saving, developed with Richard Brumberg, marked a significant contribution in individual and aggregate savings behavior.

Modigliani's journey encompassed diverse roles, from an instructor at Bard College to a Research Consultant at the Cowles Commission and later, a professor at Carnegie-Mellon University. His return to MIT in 1960 marked a prolonged association, allowing him to delve into macroeconomics, international finance, and policy debates. He actively participated in designing an influential U.S. economic model and engaged in policy discussions, particularly addressing the adverse effects of public deficits.

In 1998-2000, Modigliani, along with Giorgio La Malfa, contributed to the discussion on the Maastricht Treaty and the single currency. His legacy endures, emphasizing the importance of economic policies that prioritize full employment and stability, drawing inspiration from a lifetime of academic, research, and public engagement.

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3. THE LIFE-CYCLE THEORY

Franco Modigliani and his graduate student Richard Blumberg published in 1954 a paper in which it was introduced the idea that people make intelligent choices about how much they want to spend at each age, factoring their future income in the equation.

This model was called the “Life-Cycle Theory” and it argued that people seek to maintain the same level of consumption throughout their lifetime, and in order to do so they take on debt or liquidate assets early and late in life and save during their earning years.

It follows from this hypothesis that individuals save in order to maintain their habitual standard of living when they retire, so savings for individuals should be positive in their working years and negative when they retire.

Consumption is then a function of wealth, expected lifetime earnings and number of years until retirement. This leads to the idea that consumption of the whole economy is a function of wealth as well as income.

The former hypothesis predicts that wealth accumulation will have a “hump-shaped” pattern, low near the beginning of adulthood and in old age, peaking in the middle, as we can see from “Graph 1”.

But why is it called “Cycle”? The name comes from the fact that this theory implies that the wealth of a nation gets passed around: retired people sell their assets off to provide for themselves, and their assets are taken up by people in their first working years, who are in the “accumulating” part of their life.

Finally, the theory implies that the wealth of a nation is not accumulated by the 1%: in a growing population, there will be more saving than spending, leading to a richer nation. The same will happen with an increase in the per capita income: what matters most is an increase in the rate of growth of total income. If there is no growth, the wealth of the nation would only be passed around.

The “Life-Cycle Theory” introduced a new point of view, in contrast with the Keynesian view, implying that the saving ratio depends on the growth rate of income and it’s still used to this day.

4. APPLICATIONS

The LCH has notable implications both on the theoretical level, with several micro-based explanation, such as the loss of driver’s licenses among the elderly (Hyungsoo Kim and Virginia E. Richardson, 2006) and testing being done during the years, such as Butelmann and Gallego (2001) on Chile or Modigliani and S.L. Cao (2004) on China; as well as relevant implications on the aggregate level for the major role of savings rate of aging population consequences on financial markets, international trade, and long-term growth trajectories.

FROM THEORY TO THE REAL WORLD: THE LCH APPLICABILITY

When it comes to proving the applicability of the life-cycle model, there is a discrepancy between macro-level and micro-level findings. The firsts do suggest that the LCH applies to the real world, while the seconds do not. According to Weil (1994), the solution is to be found in the interactions between generations: older generations save in order to leave an inheritance, as a consequence children save less anticipating the request from their parents. This explanation does confirm the applicability of Modigliani’s theory.

As a matter of fact, population aging and historically low fertility rates, major trends in most OECD countries, are likely to impact financial markets and the overall economy. In particular, the entry of the Baby-boom generation into retirement may lead to households trying to sell financial assets to support retirement consumption, coherently with the Life-cycle Hypothesis. Hence, it is crucial to examine the implications of the phenomenon on financial markets, as well as the overall economy. The two following sections will cover these two topics.

FINANCIAL MARKETS: A DOOMSDAY SCENARIO?

The question to be answered is: What are the implications of this demographic trend for asset pricing and asset allocation?

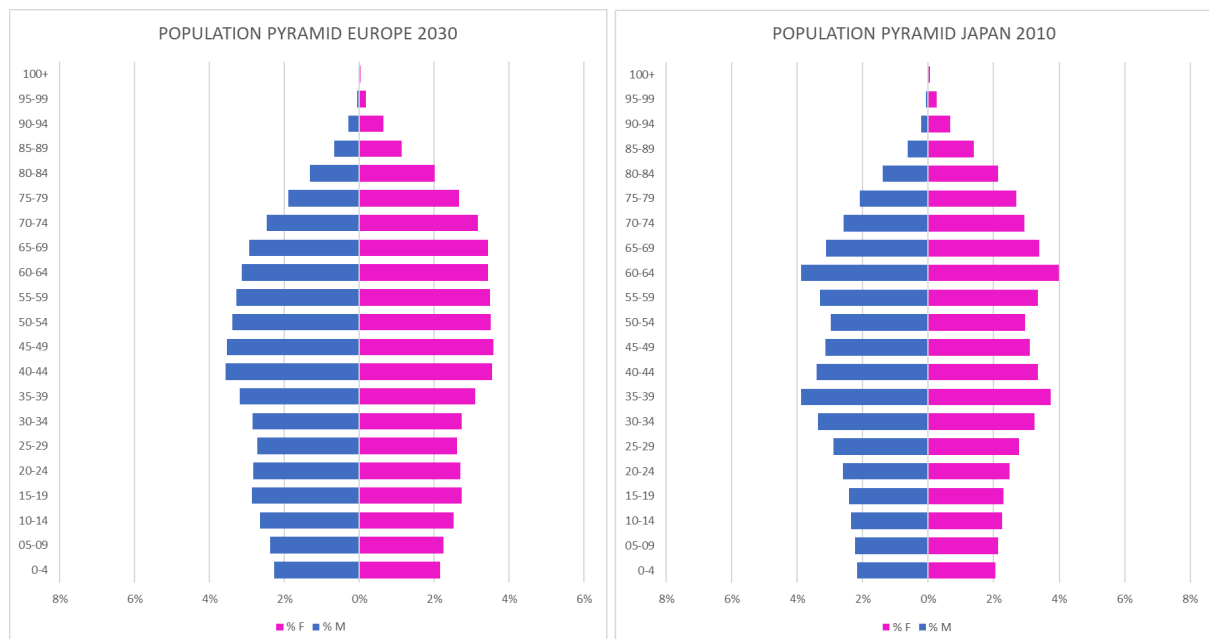
With regards to asset pricing, Arun Muralidhar, Kazuhiko Ohashi and Sunghwan Shin (2013) even suggest modifying the traditional CAPM to adjust for the demographic shift. Another noteworthy study comes from Geanakoplos, Magill, and Quinzii (2004), where the MY ratio

- defined as the number of 40-49 year olds divided by the number of 20-29 years olds - is used to find a statistically significant correlation with real stock returns, suggesting therefore that the real level of share prices - S&P 500 index - is related to the MY ratio. The same approach is applied to international settings on the association between the MY ratio and real stock returns of France, Germany, Japan and the United Kingdom. The results are positive for France and Japan's equity but no clear relationship is found for the other nations. Additionally, Poterba (2001) and Yoo (1994b) finds weak evidence that an older population has a negative impact on real returns on Treasury Bills, but no other clear patterns.

Aside from influencing the overall trend of asset returns in the market, aging populations can also alter the types of financial products sought after by households, with a rising influence of pension funds and its participants. Also public pensions are of major relevance on the policy agenda in many developed countries and, increasingly, in developing countries also, reflecting the challenges that demographic changes are creating when it comes to retirement savings.

Generally, the findings are nuanced and subject to the methodology and specification used. The question is still calling for an answer.

THE DISSAVING'S OF ELDERLY: JAPAN'S CASE



The literature review done by Horioka (2006) suggests that the saving behavior of the aged in Japan aligns with the predictions of the Life-Cycle Hypothesis. While there are variations in saving behavior based on age, employment status, and other factors, the overall pattern supports the idea that individuals adjust their saving behavior over the course of their lives, as predicted by the life-cycle model. Therefore, analyzing the Japanese economy is essential to understand the impact of an aging society on the economy. First, Keiko Murata (2019) finds that on average, elderly individuals tend to dissave over the long term. Notably, retired

elderly exhibit a slower dissaving pace than predicted by conventional LCH. The primary factor contributing to this phenomenon is identified as the strong desire to leave a bequest, coherently with what is said in the third paragraph (Weil, 1994). The presence of precautionary savings also plays a role, except in cases where bequest intentions are absent. According to Horioka et al (2007), the likelihood of a decrease in household savings accompanies an aging population. However, this decline is anticipated to be counterbalanced by increased savings from corporate and government sectors. Additionally, investment for an aging population is expected to be constrained, given the limited requirements for productive capacity.

Overall, these insights highlight the critical role of the Life-Cycle Hypothesis in interpreting and predicting saving behaviors in the context of Japan's demographic trends, and these could translate in the other advanced economies with similar demographic trends.

5. A MORE RECENT APPROACH

In this section, we will explore Modigliani's life cycle theory within the context of more recent research and behavioral finance. We aim to do this by challenging the rationality assumptions and exemplifying instances where behavioral theories offer alternative perspectives, utilizing real world cases.

a. Mental Accounting

Mental Accounting, developed by Thaler and Shefrin, studies how individuals mentally compartmentalize their financial resources. Their paper challenges the LCT with a three-account model, which is different from the assumption that people uniformly optimize their consumption and savings.

In the traditional theory, the Marginal Propensity to Consume (MPC) is considered to be uniform throughout an individual's wealth. Thaler and Shefrin, in their behavioral framework, propose three distinct mental accounts: current income (resources available for immediate consumption), assets (accumulated wealth), and future income (present value of future income flows and long-term investments). Each account corresponds to different MPCs. For example, according to traditional theory, a €10,000 bonus received at work, €10,000 increase in the value of the individual's house, an inheritance to be received with certainty in 10 years with a present value of €10,000 all have the MPC, while the three-account model recognized different MPC's for each.

Their survey study, MBA students were presented with different type of windfalls (a monthly bonus, a lump-sum bonus, and a future inheritance). Windfalls that were perceived as regular income (current income account) showed a higher MPC compared to those perceived as future income (future income account), supporting the three-account framework. Though this

conclusion is based on a theoretical scenario, they are also supported by similar studies conducted by Simon & Barnes and Courant, Gramlich and Laitner.

The mental accounting bias demonstrates that individuals do not always make decisions based on overall wealth considerations but rather on mental categorization of their financial resources, challenging the proportionality and perfect fungibility assumptions in the LCT.

b. Present Bias and Hyperbolic Discounting

Present bias and hyperbolic discounting also question the assumptions of Modigliani's LCT. Present bias explains the inclination of individuals to favor immediate gratification over future rewards, leading to impulsive spending habits and inadequate savings. Hyperbolic discounting introduces a mathematical element to time preferences. Unlike the exponential discounting assumed by the LCT, hyperbolic discounting suggests that individuals show a steeper decline in the perceived value of future rewards as they approach the present moment. This non-exponential nature of discounting explains how individuals tend to make decisions that are not aligned with their long-term interests.

Many researchers have explored these concepts of inconsistent intertemporal choices. In the context of retirement savings, it has been shown that individuals often exhibit procrastination in saving for retirement, leading to inadequate contributions to pension plans. Real-life findings have clearly challenged the assumptions of the LCT.

c. Save More Tomorrow: A Behavioral Approach to Retirement Savings

Save More Tomorrow (SMarT), established by Richard Thaler and Shlomo Benartzi, reshapes retirement savings through behavioral strategies.

The core principle of SMarT lies in leveraging individuals' inertia by taking advantage of their inclination to postpone decisions. Rather than requiring an immediate commitment to increased savings, the program encourages participants to commit to future savings increases whenever they receive pay raises.

The SMarT plan operates on four key components. Employees are approached about increasing their contribution rates before scheduled pay raises, with the increment beginning after the raise. The rate continues to rise with subsequent raises until reaching a preset maximum. Employees can opt out at any time, providing flexibility and control. In the initial implementation, a substantial increase in average saving rates from 3.5% to 11.6% over 28 months was observed, showcasing the plan's efficacy.

According to the latest calculations, it's estimated that Save More Tomorrow has helped approximately 15 million Americans significantly increase their savings rate.

By making use of behavioral principles, SMarT challenges the assumptions of LCT and stands as a promising strategy for enhancing retirement savings.

6. CONCLUSION

In this paper we delved into the LCT, aiming to understand individual and aggregate behavior regarding consumption and saving. The LCT explains that in order to sustain a consistent level of consumption throughout one's life, individuals borrow in their early, save during their working and dissave during their late years. Many researches showcase the relevance of the theory on a micro and macro level. Noteworthy correlations have been identified, such as the effect of loss of driving license among the elderly on falling consumption of non-essential items, as well as demographic trends impacting asset pricing. Dissaving trends among older generations, specifically in the case of Japan, have been observed. Contradictory evidence also exists, including increased savings of the elderly to leave an inheritance. Challenging the fungibility and discounting assumptions set by the theory, more recent behavioral research focuses on mental accounting, present bias and hyperbolic discounting to build a behavioral model. Considering the importance of understanding consumption and saving behavior on an individual and aggregate level, we anticipate increased exploration of real-world applications in the future.

7. APPENDIX

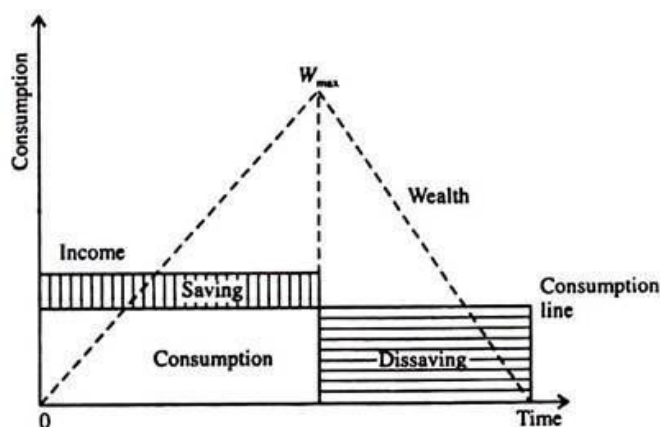


Fig. 17.13 Consumption, Income and Wealth over the Life Cycle

Graph 1

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