Silver Tsunami: Surfing the Wave of China's Aging Population on Equity Valuation

by

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Contents

Abstract

This paper focuses on the implications of the aging population on equity valuation in China and the business sectors affected by it. How investors and businesses can hedge against it is also investigated. Different aspects of factors that can be influenced by the aging population and ultimately affect the equity valuation process are looked into. These factors are divided into three major groups: economic, labor, and consumption. Each of these factors is examined based on the current social and policy environment in contemporary China, leading to both challenges and opportunities for the development of Chinese companies. An empirical study is carried out to identify the relationship between the aging population and the risk-free rate. Data from six different countries, including both developed and developing countries, is extracted, leading to the conclusion that the aging population will cause the real interest rate to go down. This may lead to capital outflows and increase equity risk premiums, thus deflating the asset price. Businesses and investors can hedge against the possible losses by learning about the impacts of this demographic change and focusing on the products and services catering to the elderly population. Policymakers can also enact new guidelines based on domestic situations and experiences from countries that have gone through this process. Through joint effort, we can maximize the positive impact of the aging population on the Chinese economy.

KEY WORDS: *Aging Population, Equity Valuation, Chinese Economy, Hausman Test*

1. Introduction

As the economy and society develop, the aging population has become a common issue for developed countries in the 21st century. Increasing life expectancy and low fertility rates being the two main reasons, this demographic change drove the developed countries to rethink their social and economic institutions in order to guarantee the wellbeing of the society and the sustainability of its development (World Bank Group, 2022). Despite being a developing country, China has a fast-growing aging population. According to the result of the Seventh National Population Census from the China National Bureau of Statistics, 191 million people in China are aged 65 years or older in 2020, making up 13.5% of the whole population. This number has increased by 4.63% since 2010 and is still expected to grow in the future, which can cause severe challenges to China's economic society (2021). This demographic transition may lead to an increase in social burdens and a decrease in labor productivity, which in turn may cause a transformation in consumption patterns and company strategies. In addition, as Modigliani and Ando put forward in the life cycle hypothesis, human lifetime income is somewhat non-stationary and unpredictable, generally showing an inverted U-shaped structure with age. In order to maximize utility, consumers tend to regulate their income with savings, smoothing out their lifetime consumption levels (Ando & Modigliani, 1963). Thus, the aging population may have a negative impact on the investment market. As the aging population becomes a heated topic, the government and scholars have been looking into its implications on the economic society. Most academics focus on developed nations when researching the effects of an aging population on economic growth, but this is inconsistent with the future trend. By 2050, there will be 2.1 billion people over the age of 60, and the majority of them will reside in developing countries, predicts the World Health Organization (WHO) (2022). Therefore, for this

research program, I would like to take the aging population's implications on equity valuation in China as the research question and look into what impacts this demographic change can have on a developing economy and what are the possible solutions. I will analyze the possible affected factors in different areas and carry out an empirical analysis. The equity valuation framework will also be used to look at the companies and sectors most affected by demographic change, and how investors and businesses can hedge against it.

2. Literature Review

One of the countries suffering the most from the aging population is Japan. Hiroyuki Kawakatsu and Mikiko Oliver analyzed the relationship between post-war Japan's financial market and demographic composition (Kawakatsu & Oliver, 2018). They extracted annual data from 1948 to 2015 and carried out Cointegration and Granger causality tests. The result shows that the proportion of retired people, who are over the age of 65, has a negative relationship with the stock price. Also, as indicated by Han, the aging population in Japan reduced the labor force, slowed down productivity and increased the capital-to-labor ratio (Han, 2019). As a result of which, the natural rate of interest will decline. According to Han's research result, the demographic change's contribution to the decline of the interest rate is increasing over time. In Japan, the aging population has a negative impact on the financial market. The policy interest rate for Japan has been negative for 7 years (FocusEconomics, 2023). On March 26th 2024, The Bank of the Japan (BOJ) raised its interest rate for the first time in 17 years from -0.1% to a range of 0%-0.1% (Oi, 2024).

In Europe, the research carried out by Mercedes Alda showed that the aging population has almost nothing to do with the relationship between pension funds and the stock market. As

the total population grows, equity pension fund growth exerts a positive impact on the stock market, no matter whether the population is young or old (Alda, 2017). However, he also stated that the results are heterogeneous among different countries. For Europe, this might be the case since mass participation in financial markets is more widespread, and financial knowledge education is more comprehensive in Europe compared to China. Many more socioeconomic factors are affected according to previous studies in other countries, such as the young and aged employment rate (Otsu & Shibayama, 2022), tax rate (Hsu et al., 2022), and so on, which can influence the entire financial market in the end.

The United States is another country facing the challenge of the aging population. The number of the elderly population (aged 65 and above) is predicted to increase from 58 million in 2022 to 82 million by 2050, which is a 47% increase (Mather & Scommegna, 2024). The research carried out by Chung and Hean examined whether the aging of the regional population has had an impact on the US economy. They used instrumental variables on age structure and found out a beneficial impact on productivity and amenities given the aged population. It is also indicated that there is an increase in employment in the healthcare industry, which serves an aging population (Chung & Hean, 2023). Quayes and Jamal, however, discovered that in the United States, the percentage of the population in their peak earning years has a favorable impact on stock prices, whereas the percentage of retirees has a negative impact. The possible continuing increasing proportion of retirees in the future can negatively affect stock prices (Quayes & Jamal, 2016).

In previous studies, researchers mainly focused on the aging population issue in developed countries. In developing economies, the impact of demographic change can be exaggerated or evolved since their economic and social condition is relatively vulnerable.

However, some hypotheses can be made based on past economic phenomena in countries with relevant experiences and the contemporary situation in China.

Hypothesis 1:

The aging population will cause the real interest rate to go down, leading to possible bubbles in certain segments of the equity market. Thus, there can be unsustainable valuations.

Hypothesis 2:

The aging population will have a positive effect on driving some industries to develop and giving rise to the emergence of some new industries, creating new job positions and pushing economic growth.

3. Methodology

a) Factors Affected by Aging Population

Different aspects of factors can be influenced by the aging population and ultimately affect the equity valuation process. The factors are mainly divided into three major groups, which are economic, labor, and consumption. In Figure 1, the possible elements are shown.

i. Economic Factors

Economic changes act as the overall presentation of demographic changes. According to a working paper from RAND corporation, growth in GDP per capita is lowered by 5.5% for every 10% increase in the population over 60 (Maestas et al., 2016). An aging population typically places pressure on government budgets due to increased spending on pensions, healthcare, and other social services for retirees. Higher government spending, particularly on entitlement programs, can crowd out investment in other areas such as infrastructure or education, which could impact long-term economic growth. Decrease in GDP can also be the

result of other changes brought by the aging population, such as labor force dynamics, increase in savings and so on. The following context will discuss more about these factors.

Moreover, the tax rate can also be affected by this demographic change. As the population ages, there is typically a higher demand for social services such as healthcare, pensions, and long-term care. Funding these services requires significant government expenditure. If the tax revenue does not keep pace with the increased demand for services, governments may need to raise tax rates to cover the growing costs. Also, in China, pension systems are funded through a combination of contributions from workers, corporations and government. Three pillars support China's pension system, the first of which is the basic pension system run by the government. The second is the voluntary employee pension plan from employers, and the third is private voluntary pension schemes (2023). Pillar 1 now accounts for two-thirds of China's total pensions (2023). The pension system structure in developed countries is also the three pillars composed of the government, enterprises and individuals, but the proportion is very different from that of China. Take the United States as an example, the total size of the United States pension in 2021 exceeded 40 trillion dollars, about 1.7 times its GDP. Among them, the government-led basic pension accounts for only 6.7%, and the combined enterprise and individual commercial pension insurance accounts for 93.3% (2023). As a result, the government-led first pillar cannot make ends meet, leading to a serious gap in China's pension payments. If pension funds are insufficient to cover retirees' needs, governments may need to allocate additional funds, potentially through increased taxation. In addition, with a larger proportion of the population entering retirement age and fewer young people entering the workforce, there may be a decline in the size of the labor force. A shrinking workforce can reduce tax revenues from income taxes, particularly if there are fewer people contributing to the

tax base. In China, to cope with the aging society, new tax policies are being tested. Since May 1, 2018, individual tax-deferred commercial pension insurance has been implemented in Shanghai, Fujian Province (including Xiamen) and Suzhou Industrial Park (2018). Tax-deferred pension insurance, in which the policyholder charges the premiums before tax and waits until he or she receives the benefits in the future to pay the individual income tax, can slightly reduce the individual's tax burden and encourage individuals to participate in commercial insurance and improve the quality of their future retirement.

The interest rate can also be pressured due to the aging population. According to a report published by Guotai Junan Securities, a decline in the growth rate of the labor force leads to an increase in capital per capita, a decrease in firms' demand for capital, and a decrease in marginal capital output, causing an inward shift in the capital demand curve and thus exerts downward pressure on real interest rates (Wang & Wang, 2023). Moreover, the increased life expectancy leads to more time after retirement. According to the life cycle hypothesis, the younger generation will increase their savings (Ando & Modigliani, 1963). Capital supply is raised, leading to an outward shift in the capital supply curve and exerting downward pressure on real interest rates. However, the report also stated that the decline in population growth ultimately leads to an increase in the dependency ratio, which would cause a lower propensity of marginal saving for the retired population than that of the labor force. The inward shift of the capital supply curve resulting from a decline in the total savings rate exerts an upward pressure on the real interest rate. Generally speaking, the downward pressure is more likely to outweigh the upward pressure. When the real interest rate decreases, the inflation adjusted return is lower. This may cause investors to look for better returns abroad, particularly in nations with higher real interest rates. As a result, capital may flow out of the country as investors seek better investment

opportunities outside China. Therefore, when capital flows out from a country as a result of decreased real interest rates, investors' confidence is weakened, investment opportunities are reduced, and economic uncertainty increases, all of which can have a negative effect on the equity valuation. Additionally, equity risk premiums rise with population age. Government bonds are among the safer, lower-risk investments that the elderly typically favor. This may result in lower returns and higher prices for safe assets, which would raise the risk premiums on riskier assets like equities. A larger equity risk premium may also result from the slower rate of economic growth. Investors demand higher returns to compensate for the increased risk in equities, leading to lower equity valuations.

ii. Labor Factors

The implications of an aging population on the labor force can have significant effects on equity valuation, particularly in relation to labor quantity and labor quality.

A reduction in the working-age population as the population ages could result in a labor shortage in some industries. Due to competition for a limited pool of talent, this may result in higher compensation and higher salary costs. Increased compensation expenses can squeeze a company's profit margins and have a negative effect on equity valuations, particularly if the company finds it difficult to pass these higher costs through to customers in the form of higher pricing. The effects of labor shortages and growing compensation costs may disproportionately influence some businesses. Pay increases may be more pronounced in industries like technology that depend significantly on trained personnel. Equity valuations in these sectors could be impacted differently compared to sectors with less reliance on labor.

An aging population often leads to an increase in the number of retirees eligible for pension benefits. This can result in higher pension expenses for companies that offer defined benefit pension plans, as they may need to allocate more funds to meet their pension obligations. The increase in pension expenses can reduce companies' profitability and cash flows, which can negatively affect equity valuations.

In addition, even though in China the delay retirement policy is not implemented yet, the 14th Five-Year Plan has clearly proposed to promote delayed retirement, which means that the implementation time is 2025 at the latest (2021). According to Mo Rong, director of the International Labor Security Institute of China's Ministry of Human Resources and Social Security, some developing countries with a similar level of per capita GDP as China's have a retirement age of around 65 years old (2016). This might be the target retirement age for the government. If governments delay retirement age in response to population aging, this could impact workforce dynamics and labor market participation rates. Older workers remain in the workforce for longer periods, potentially leading to increased competition for jobs and wage stagnation for younger workers. From an equity valuation perspective, companies may face challenges in managing a multi-generational workforce and addressing the needs of older employees while also attracting and retaining young talent.

The labor quality can also be affected. The aging population could have an effect on business and innovation. While the experience and entrepreneurial energy of older people can be valuable, innovation and technological growth are frequently driven by younger generations. Aging populations may make it more difficult for businesses to innovate, adjust to changing technology, and satisfy the changing customer demands. This could hinder revenue growth and equity valuations.

Reduced labor quality can also hinder companies' ability to identify and pursue profitable investment opportunities, such as research and development, capital expenditures, and strategic acquisitions. A lower reinvestment rate stemming from diminished labor quality can constrain companies' ability to drive future growth and innovation, ultimately impacting equity valuations by limiting potential returns to shareholders.

iii. Consumption Factors

Aging populations often exhibit changes in consumption patterns, such as reduced spending on discretionary items and increased expenditure on healthcare and leisure activities. Companies that cater to these shifting preferences may experience changes in demand for their products or services, which can impact revenue and profitability. Equity valuations may be influenced by how well companies adapt to and capitalize on these changing consumer behaviors. Some industries and companies are now paying special attention to the elderly people as a rising customer group. For example, in Paris Fashion Weeks, more older models are starting to walk in shows, conveying the idea that the elderly people also have a wonderful life in front of them, not just young people (Paton, 2024). The same thing is also happening in China. The huge demand for senior models in China indicates that demographics and growing disposable income for seniors mean aging is the next big thing (2019).

Aging populations may have specific consumption requirements, such as products and services tailored to health and wellness, retirement planning, or mobility aids. Companies that address these needs effectively may benefit from increased demand and market share, potentially leading to higher revenue and profitability. Equity valuations may reflect the growth prospects and competitive positioning of companies in serving these new consumption requirements. This, to some extent, brings new opportunities for the society to develop new industries aiming at the

elderly and create employment chances. For instance, elderly care services may come in various forms and become more and more mature. In some areas in China, eligible elderly people can choose either short-term stays in elderly care institutions or home care services provided by professional elderly care organizations (2023).

b) Empirical Analysis

i. Data

Risk-free rate is a fundamental element in equity valuation. Changes in real interest rates can be disaggregated into two types of factors. For one thing, cyclical factors lead to fluctuations in real interest rates, such as the impact of the financial cycle, monetary policy and other. For another, structural factors also change the trend of natural interest rates, such as technological advances, population growth rate and age structure, income inequality, the need for safe assets, and other factors that lead to downward trends in the developed countries' natural interest rates (Summers, 2014). Among all of them, the age structure of the population is an important explanatory factor.

In terms of the representation of the aging population, I used the old-age dependency ratio (OADR) instead of the proportion of the population over 60 years old, since it is more precise. The formula is as follows:

$$OADR = \frac{the\ number\ of\ individuals\ aged\ 65\ and\ over}{the\ number\ of\ working-age\ population\ at\ ages\ 15\ to\ 64}$$

I extracted the 10-year treasury bond yield as the risk-free rate and OADR from the Wind Database for China, Italy, Japan, United States, England and South Korea.

ii. Process

Since the dataset can be considered as relatively small with 210 entries, the power of the panel unit root test can be limited, meaning they may not reliably detect the presence of unit roots even when they exist. Additionally, including unit root tests in small datasets can introduce noise and reduce the efficiency of estimation.

Therefore, I started with the Hausman Test. The Hausman Test compares two sets of estimates, fixed effects and random effects. The null hypothesis of the Hausman test is that the random effects model is appropriate, while the alternative hypothesis is that the fixed effects model is appropriate (Hausman, 1978). The basic idea behind this test is that the FE estimator is consistent, whether or not the effects are correlated with the independent variable. The fixed effects model both with and without the time effect are modeled and compared.

Table 1 shows the result of the fixed effects model with the time effect and table 2 shows the result of the fixed effects model without the time effect. The model without time effect has a higher R squared value of 0.4648 and a higher F-statistic of 176.27 than the model with time effect. This suggests that the explanatory variables in the model without time effect are collectively more effective at explaining the variation in the dependent variable (the risk free rate). Therefore, the model without time effect was chosen to carry out the hausman test and compare with the random effects model. The statistics of the random effects model is shown in table 3. And table 4 displays the result of the Hausman test. Given the very low p-value (close to zero), we reject the null hypothesis. This indicates that there is a statistically significant association between the variables being tested. In other words, the observed data deviates significantly from what would be expected if there were no relationship between the variables. Therefore, we can conclude that the coefficients estimated in the fixed effects model are

significantly different from those estimated in the random effects model. In this case, the fixed effects model is likely more appropriate for the given dataset.

iii. Result

The parameter estimate for OADR is -0.2599. We can interpret the estimate as there is a negative correlation between the OADR and the interest rate, which proves the previous hypothesis that the aging population will cause the real interest rate to go down. This can lead to asset price deflation due to the outflow of capital and the increased equity risk premium.

However, there are also some limitations in this model. For example, the data I used is extracted from China, Italy, Japan, the United States, England and South Korea. Most of the countries are developed countries except for the targeted country China. Whether the relative per capita income makes a difference to this regression result needs further exploration. Another possible solution to solve this potential problem can be to include more developing countries that are also facing an aging population.

4. Discussion

The aging population affects companies in various aspects, both positively and negatively. This creates opportunities for new startups aiming at the aged population and challenges for traditional enterprises to transform and update.

Industries like healthcare, senior facilities will stand to benefit from increased demand for products and services catering to the aging population. Financial institutions, including insurance companies, asset managers, and retirement planning firms, can also benefit from the aging population's changing financial needs, including retirement planning services and long-term care insurance products. However, industries relying on a young and dynamic workforce may face

challenges due to labor shortages resulting from the aging population. Sectors such as manufacturing and construction may experience difficulties in recruiting and retaining workers. Retailers targeting younger demographics may experience a decline in demand as the proportion of younger consumers shrinks relative to the aging population. Also, companies in the fast-food and soft drink sectors may experience slower growth or declining sales as the aging population becomes more health-conscious and shifts towards healthier eating habits.

But opportunities and challenges always coexist. Labor-intensive industries can take this as a chance to carry out enterprise digital transformation and upgrading, cutting down the reliance on the young labor force. Retailers originally targeting the young can develop new product lines aiming at the elderly, such as more elderly fashion shows and elderly entertainment venues. Fast food companies can roll out healthier products tailored to elderly people's needs. Investors and businesses do have chances to hedge against the challenges posed by the aging population and capitalize on the opportunities it presents. Investors can diversify their portfolios by including companies from sectors that are likely to benefit from the aging population, such as healthcare, senior living and financial services. To develop goods and services that meet the needs of the aging population, businesses can set aside capital, adopt a long-term strategic focus, and make investments in R&D and innovation. In order to make use of complementary knowledge and resources in tackling the opportunities and problems brought about by an aging population, Chinese businesses might also look into acquisitions and merges, and collaborating with other companies. In addition, current service and product offerings can be modified to better meet the requirements and tastes of the elder population.

Furthermore, legislators are essential in advancing programs that encourage workforce development, innovation, and healthy aging. Good policies should strike a balance between the

support that businesses require to sustain their growth and the care that the elderly population requires. This will promote economic expansion and maintain equity valuations in the face of demographic transitions.

5. Conclusion

In conclusion, the implications of the aging population on equity valuation in China are multidimensional and deserve careful consideration by investors, businesses, and policymakers. As China's population continues to age, significant shifts in economy, labor dynamics and consumer behaviors are expected, presenting both challenges and opportunities for businesses. Improvements can also be made to this theoretical structure of factors impacted by the aging population. For instance, the technology can also be added to the structure. Nowadays, artificial intelligence is rapidly developing. In the future, there will be a chance that some of the work no longer requires a labor force. This technological advancement can affect businesses and investments. More investigation can be made into factors like this.

The specific investigation on the relationship between the risk free rate and OADR shows that the more the population ages, the lower the risk free rate is, which might create asset price deflation due to the outflow of capital and increased risk premiums. The decline in asset price can affect the value of investors' holdings and lead to a more conservative consumption pattern. It can also worsen the economic growth and cause an unstable financial market. Investors should learn about the implications of the aging population on the Chinese financial market and carefully assess the interest rate changes when considering investment opportunities, taking diversification and risk management strategies into account to navigate these challenges effectively. For companies, it is important to know the opportunities and challenges. Developing

products and services catering to the aged population might be one of the best ways to ride on this trend. Despite some differences from the developed countries who have gone through this stage, China can still learn from their experiences and find the suitable methodology. There's an old Chinese saying, "fortunes and misfortunes follow each other." As a developing country, the aging population in China is certainly a concern, but if the government, businesses, and individuals can work together and take proactive action to innovate and develop, the problem can also be transformed into an engine for social progress.

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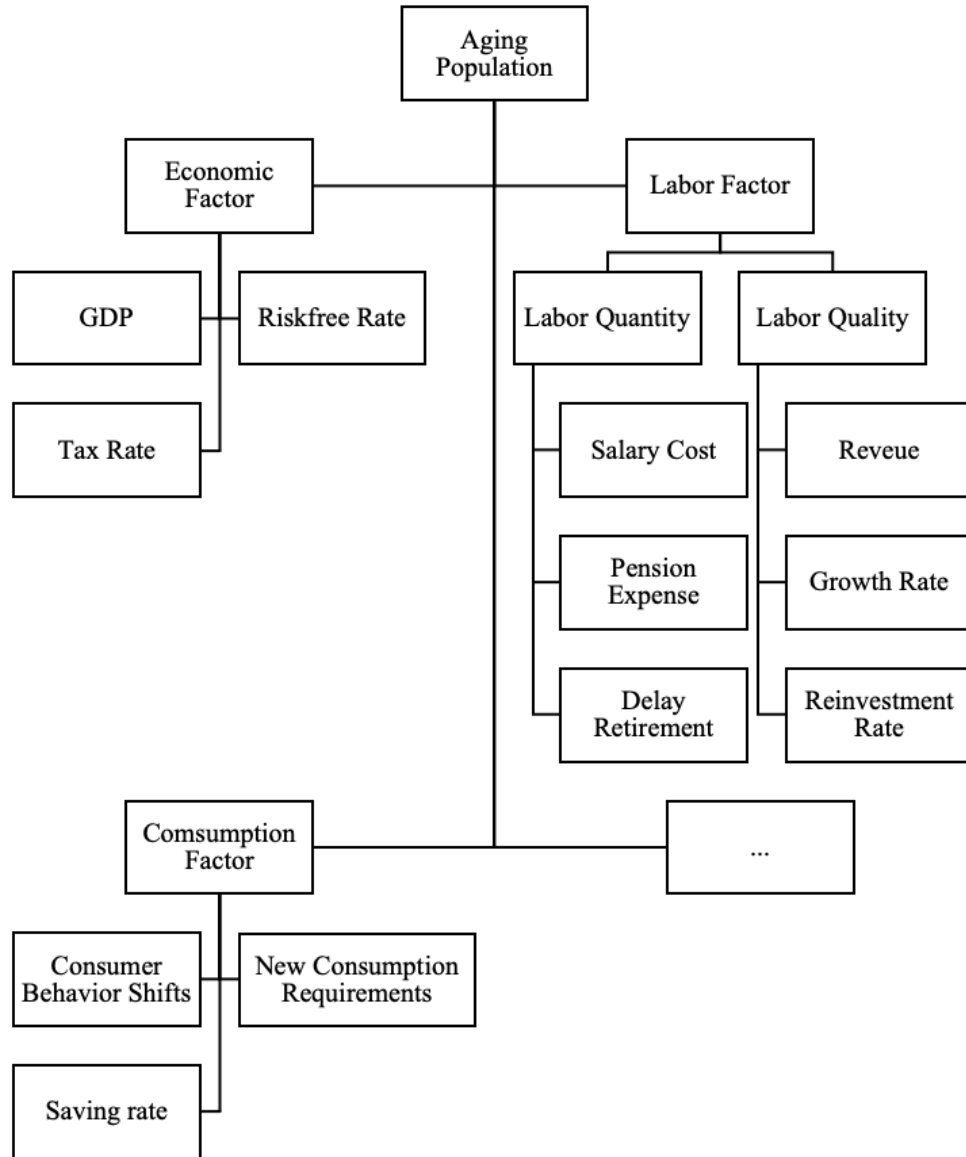
Appendix A: Factors Affected by Aging Population

Figure 1

Appendix B: Regression Result of the Fixed Effects Model With the Time Effect

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PanelOLS Estimation Summary
================================================================================
Dep. Variable:          RiskFreeRate    R-squared:                    0.0106
Estimator:                 PanelOLS     R-squared (Between):         -0.0780
No. Observations:              210      R-squared (Within):          -0.0859
Date:             Mon, Mar 18 2024      R-squared (Overall):         -0.0836
Time:                     10:16:35      Log-likelihood               -270.47
Cov. Estimator:          Unadjusted
                                        F-statistic:                  1.5075
Entities:                        6      P-value                       0.2216
Avg Obs:                    35.000      Distribution:         F(1,141)
Min Obs:                    16.000
Max Obs:                    63.000      F-statistic (robust):         1.5075
                                            P-value
0.2216
Time periods:                   63      Distribution:         F(1,141)
Avg Obs:                    3.3333
Min Obs:                    1.0000
Max Obs:                    6.0000


                            Parameter Estimates
================================================================================
           Parameter    Std. Err.    T-stat    P-value    Lower CI    Upper CI
--------------------------------------------------------------------------------
intercept    4.0155       0.4307     9.3239     0.0000      3.1641      4.8669
OADR         0.0230       0.0187     1.2278     0.2216     -0.0140      0.0601
================================================================================

F-test for Poolability: 13.455
P-value: 0.0000
Distribution: F(67,141)
```

Table 1

Appendix C: Regression Result of the Fixed Effects Model Without the Time Effect

```
PanelOLS Estimation Summary
================================================================================
Dep. Variable:           RiskFreeRate   R-squared:                     0.4648
Estimator:                   PanelOLS   R-squared (Between):          -2.8207
No. Observations:                 210   R-squared (Within):            0.4648
Date:               Mon, Mar 18 2024   R-squared (Overall):           0.2532
Time:                        10:18:13   Log-likelihood                -438.99
Cov. Estimator:            Unadjusted
                                        F-statistic:                   176.27
Entities:                           6   P-value                        0.0000
Avg Obs:                       35.000   Distribution:                F(1,203)
Min Obs:                       16.000
Max Obs:                       63.000   F-statistic (robust):          176.27
                                        P-value                        0.0000
Time periods:                      63   Distribution:                F(1,203)
Avg Obs:                       3.3333
Min Obs:                       1.0000
Max Obs:                       6.0000


                          Parameter Estimates
================================================================================
            Parameter  Std. Err.    T-stat    P-value   Lower CI   Upper CI
--------------------------------------------------------------------------------
intercept      10.420     0.4639     22.460     0.0000     9.5050     11.335
OADR          -0.2599     0.0196    -13.277     0.0000    -0.2985    -0.2213
================================================================================

F-test for Poolability: 19.709
P-value: 0.0000
Distribution: F(5,203)
```
Table 2

Appendix D: Regression Result of the Random Effects Model

```
RandomEffects Estimation Summary
================================================================================
Dep. Variable:          RiskFreeRate    R-squared:                      0.4333
Estimator:              RandomEffects   R-squared (Between):           -2.3663
No. Observations:                 210   R-squared (Within):             0.4634
Date:             Mon, Mar 18 2024      R-squared (Overall):            0.2561
Time:                     10:29:35      Log-likelihood                 -445.86
Cov. Estimator:           Unadjusted

                                        F-statistic:
      159.02
Entities:                         6     P-value                         0.0000
Avg Obs:                     35.000     Distribution:                 F(1,208)
Min Obs:                     16.000
Max Obs:                     63.000     F-statistic (robust):           159.94
                                        P-value                         0.0000
Time periods:                    63     Distribution:
F(1,208)
Avg Obs:                     3.3333
Min Obs:                     1.0000
Max Obs:                     6.0000

                            Parameter Estimates
==============================================================================
           Parameter  Std. Err.    T-stat    P-value   Lower CI   Upper CI
------------------------------------------------------------------------------
intercept  9.7447     0.6522      14.941     0.0000     8.4589     11.030
OADR       -0.2460    0.0195     -12.647     0.0000    -0.2843    -0.2076
==============================================================================
```

Table 3

Appendix E: Result of the Hausman Test

```
                    FE         RE  Difference  sqrt(diag(v_fe-v_re))
intercept  10.419774  9.744650    0.675124                      NaN
OADR       -0.259890 -0.245992   -0.013897                 0.002197

chi-Squared: 39.94
degrees of freedom: 2
p-Value: 0.00000
```

Table 4

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