WHARTON FINANCIAL ANALYTICS

Data Lab

Saving for Retirement

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Michael R. Roberts is the William H. Lawrence Professor of Finance at The Wharton School of the University of Pennsylvania. He developed this data lab solely for the purpose of class discussion. The lab is not intended to serve as an endorsement, source of data, or illustration of effective or ineffective decision making. Although based on real events and despite occasional references to actual companies, this lab is fictitious and any resemblance to actual persons or entities is coincidental.

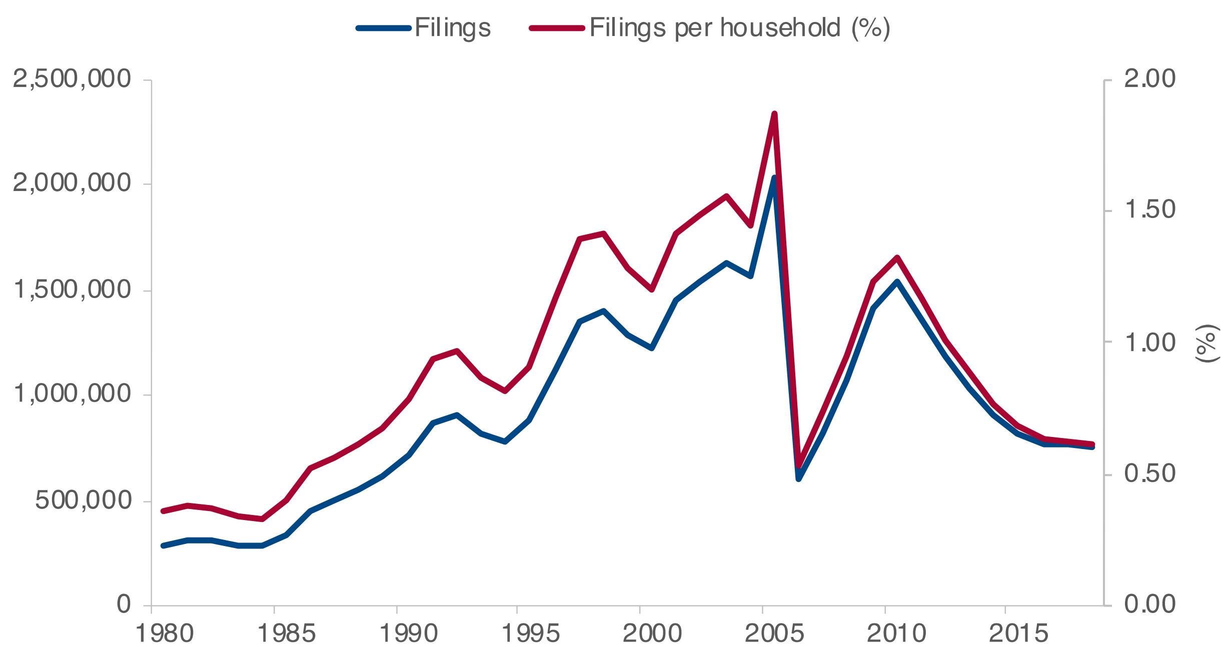
Bankrupt. Of the many things to describe Matthew Billingsley's father, William ("Billy") Billingsley, bankrupt was the one he most wanted to forget. Just before his planned retirement in the Summer of 2014, Billy Billingsley declared personal bankruptcy. Years of undisciplined spending and little, if any, savings had finally caught up to the elder Billingsley. The event was difficult for the entire family. It put a strain on the close relationship between Billy and Matthew, the younger of whom was headed off to Wharton that Fall.

Four years later in the Spring of 2018, Matthew graduated at age 22 and landed an investment banking position at a bulge bracket bank in New York. While enjoying his time at Wharton, Matthew was excited for the start of a new chapter. However, the financial ills of his father continued to weigh heavily on him. Matthew was adamant in his desire to not fall prey to similar circumstances. Upon settling in his apartment in New York, he set forth to construct a savings strategy that would that maximize his chances for a financially secure and comfortable retirement.

Financial Health

Personal bankruptcy is a relatively rare event in the United States. Figure 1 shows the number of non-business (personal) bankruptcy filings in the U.S. since 1980.

Figure 1. U.S. Personal Bankruptcy Filings and Filing Rate



Source: American Bankruptcy Institute and United States Census.

In 2014, a little over 900,000 individuals filed for personal bankruptcy, less than half a percent of Americans. Even at its peak in 2005, the filing rate was only 5.3 for every 1,000 people.[1]

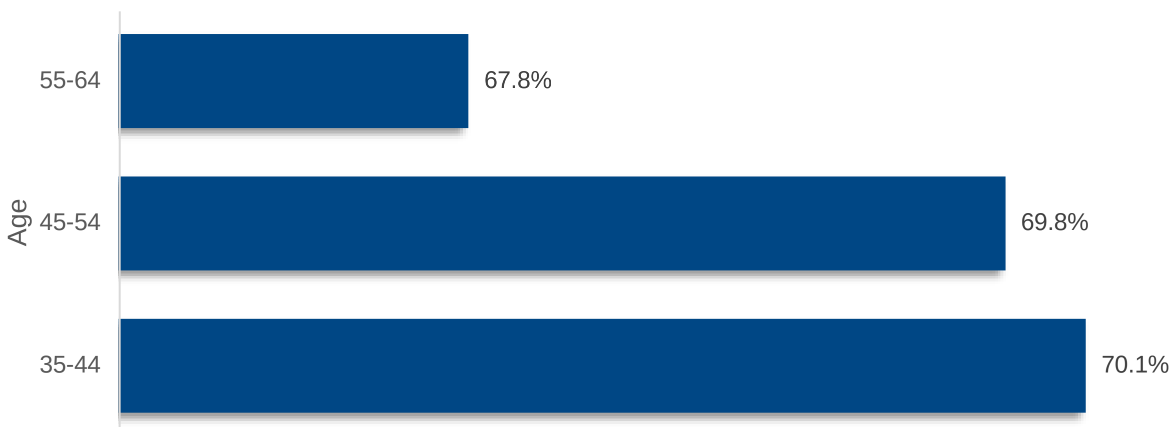
More common is not having enough money for retirement. The Government Accountability Office (GAO) notes that most households approaching retirement have "low savings." Table 1 details exactly what low savings means. As of 2016, 29% of Americans have no money for retirement, and 20% have a defined benefit plan but no retirement savings. Figure 2 shows that more than two thirds of Americans fail to meet their retirement savings target each year.

Table 1. Percentage of Households Aged 55 and Over with Selected Financial Resources

Household financial resources	2013	2016
No retirement savings	52	48
No retirement savings and no defined benefit (DB) plan	29	29
A DB plan but no retirement savings	23	20
Retirement savings but no DB plan	23	26
Retirement savings and a DB plan	25	26

Source: United States Government Accountability Office

Figure 2. Share of Households not Meeting Retirement Savings Target by Age Group



Source: Nari Rhee, "The retirement savings crisis: Is it worse than we think," National Institute on Retirement Security, 2013.

Put differently, there is a "retirement crisis" in the U.S. and a key reason behind the crisis is Americans' inability to save a sufficient amount consistently over time.

[1] The steep drop from 2005 to 2006 is due to the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA), which added new provisions to the bankruptcy process. Before the BAPCPA, consumers could file for Chapter 7 bankruptcy and liquidate all their debts regardless of their income. The BAPCPA stipulates that consumers can only file Chapter 7 bankruptcy if they make less than the median income in their state or they pass a means test demonstrating they wouldn't be able to afford a payment plan for their debts. If neither of those is true, the consumer must file Chapter 13 bankruptcy, which involves a three- to five-year payment plan.

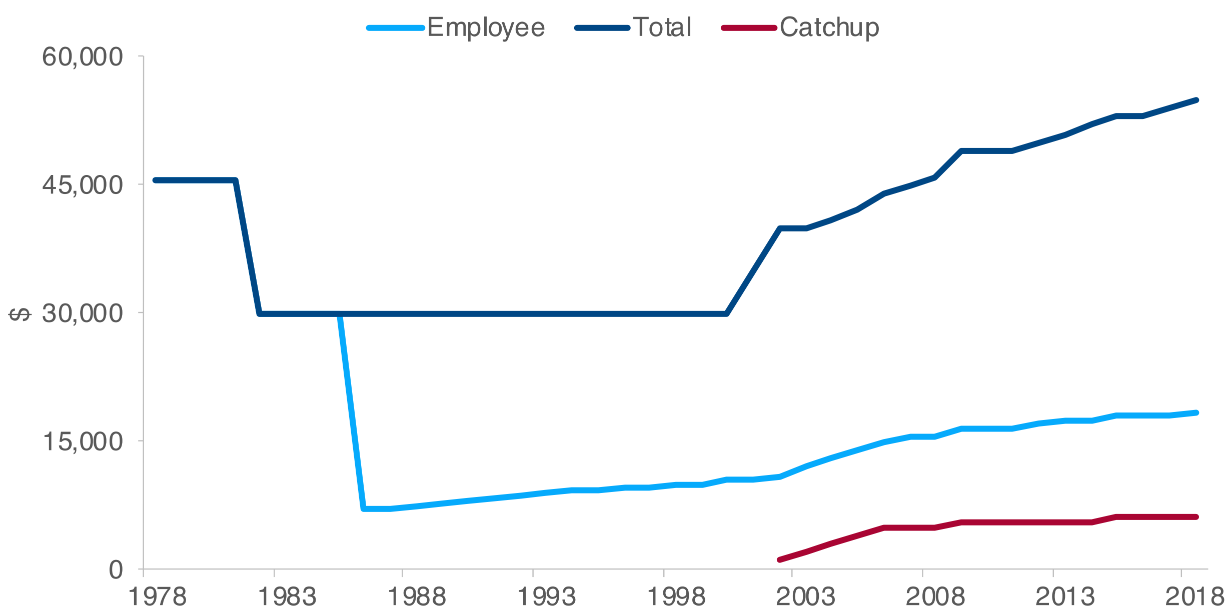
The Bank's Retirement Plan

The bank offered a generous defined contribution plan consisting of two levels. In the first level, the bank contributed 1% of Matthew's salary into a retirement savings account. If Matthew stayed with the bank, this fraction would increase to 2% when he turned 30, and 3% when he turned 40. This money was automatically contributed for Matthew, with no contribution requirements on him.

The second level was a matching plan in which the bank would match each dollar that Matthew contributed to a retirement savings account. Matthew could choose from a traditional 401-k or a ROTH 401-k. The difference between two was their tax treatments. Contributions to traditional 401-k's are made on a pre-tax basis. That is, contributions are deducted from employees' salaries before taxes are computed. These pre-tax deductions reduce taxable income for each paycheck. However, withdrawals from these plans are taxed as ordinary income. ROTH plans work in the opposite manner. Contributions to ROTH plans are made on an after-tax basis, but withdrawals are tax-free.

Both plans are subject to an annual limit of $18,500 in 2018, a limit that increases relatively slowly over time. Figure 3 shows the historical series of contribution limits to 401-k plans.

Figure 3. Federal Retirement Contribution Limits to 401-k Plans



Source: United States Internal Revenue Service.

Employee contributions have increased from $7,000 to $18,500, or a little over $350 per year, on average. Total contributions – employee plus employer – have increased at roughly twice that rate or $781 per year. Since 2002, employees over the age of 50+ have been allowed to contribute additional "catchup" contributions each year, equal to roughly one third of the employee's contribution as of 2018.

Matthew's Budget

While the bank's retirement plans were appealing to Matthew, and something in which he would participate, he knew that the federal limits on those plans would be insufficient to ensure a comfortable retirement for him and any family he may wish to have. So, he set forth determining what he could save outside of those plans. His process began with the budget presented in Table 2.

Table 2. Matthew's Annual Budget, 2018

Annual income ($)	
Gross	160,000
Taxes & deductions (40%)	64,000
Net income	96,000
Nondiscretionary expenses	
Rent	36,000
Utilities	7,200
Groceries	6,000
Commute	1,560
Phone	1,200
Total	51,960
Discretionary expenses	
Travel	6,000
Dining out	7,200
Misc	3,960
Total	17,160
Total expenses	69,120
Savings	26,880

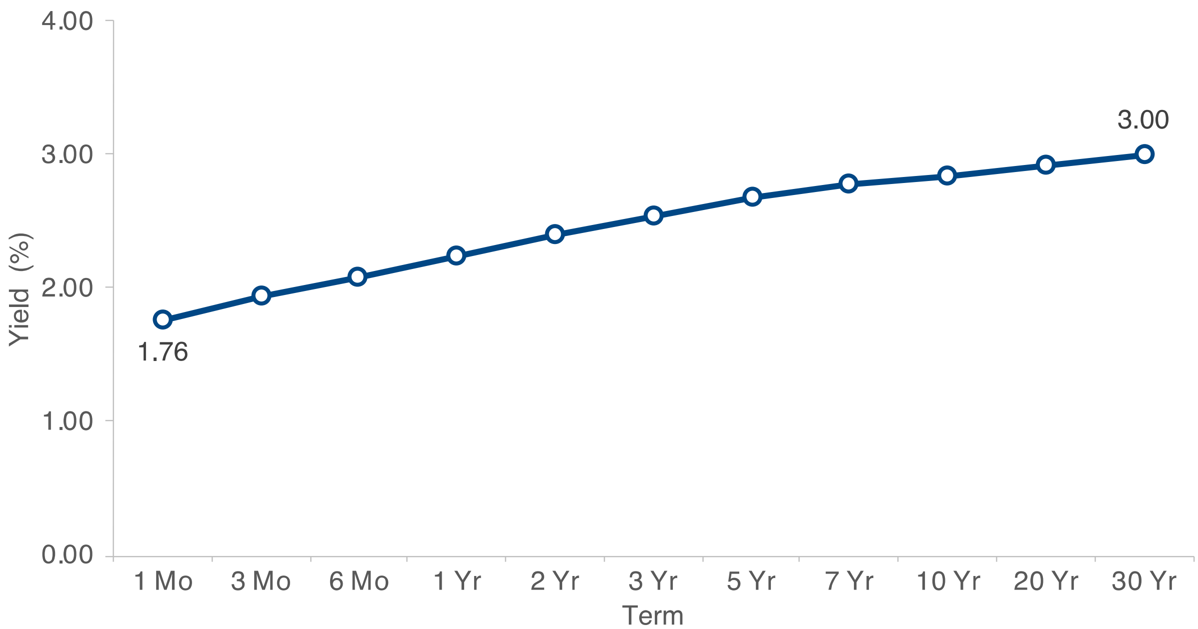
His starting base salary was $90,000 on top of a signing bonus of $20,000. The end-of-year bonus varied between $20,000 and $60,000 based on his discussions with other recent hires at the bank. Given the firm's pipeline of business and positive economic outlook, Matthew estimated that he would earn approximately $160,000 in total gross income in his first year. After-taxes and deductions that amounted to 40% of his gross salary, Matthew estimated he would be left with $96,000 of disposable income for the year.

While sizable, this money would only go so far in New York. He split his expenses into two groups, nondiscretionary and discretionary. The former group was largely unavoidable, the latter was more flexible. Matthew knew that he could always cut back on vacation and dining out if he needed. He also figured he could save quite a bit by eating at the office, which offered free meals throughout the day. The office also had a great gym, saving him additional money. In total, he estimated $69,120 in annual expenses, leaving him with $26,880 in savings – a 28% savings rate.

The Future

Predicting his income going forward would be difficult. Salaries in banking are erratic. Further, Matthew's not even sure how long he will stay in banking. Complicating matters were how he would invest his savings and the taxes on any investment earnings. Figure 4 and Figure 5 illustrate the unique interest rate environment in 2018.

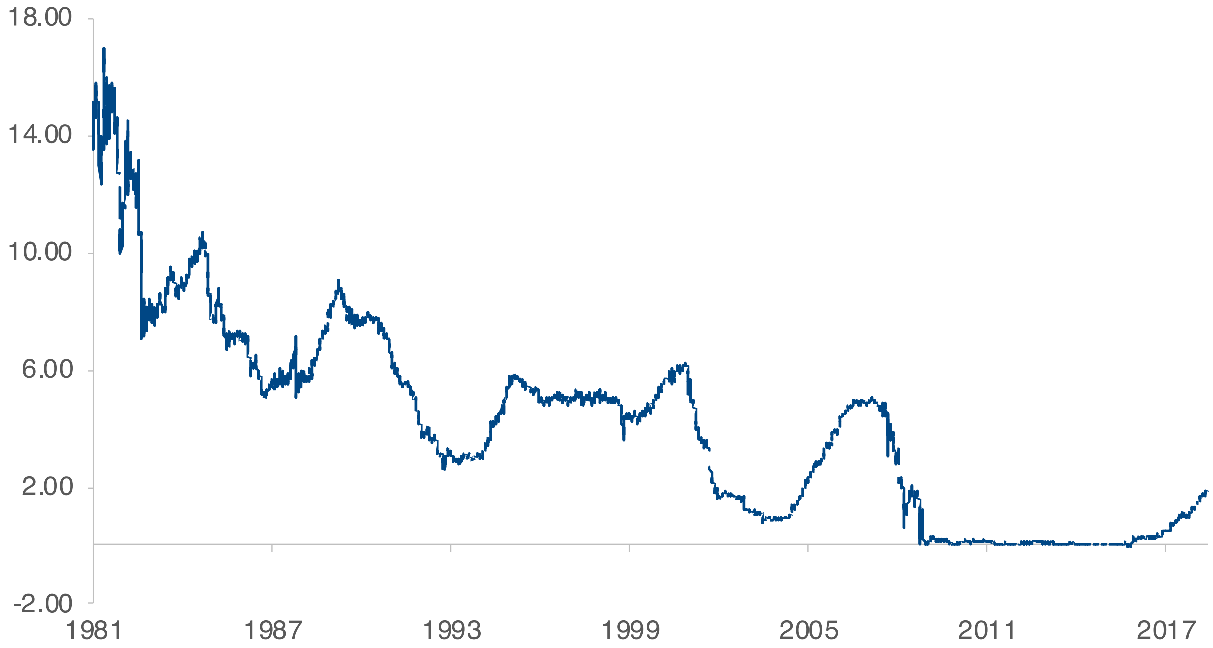
Figure 4. Treasury Yield Curve, May 31, 2018



Source: United States Treasury

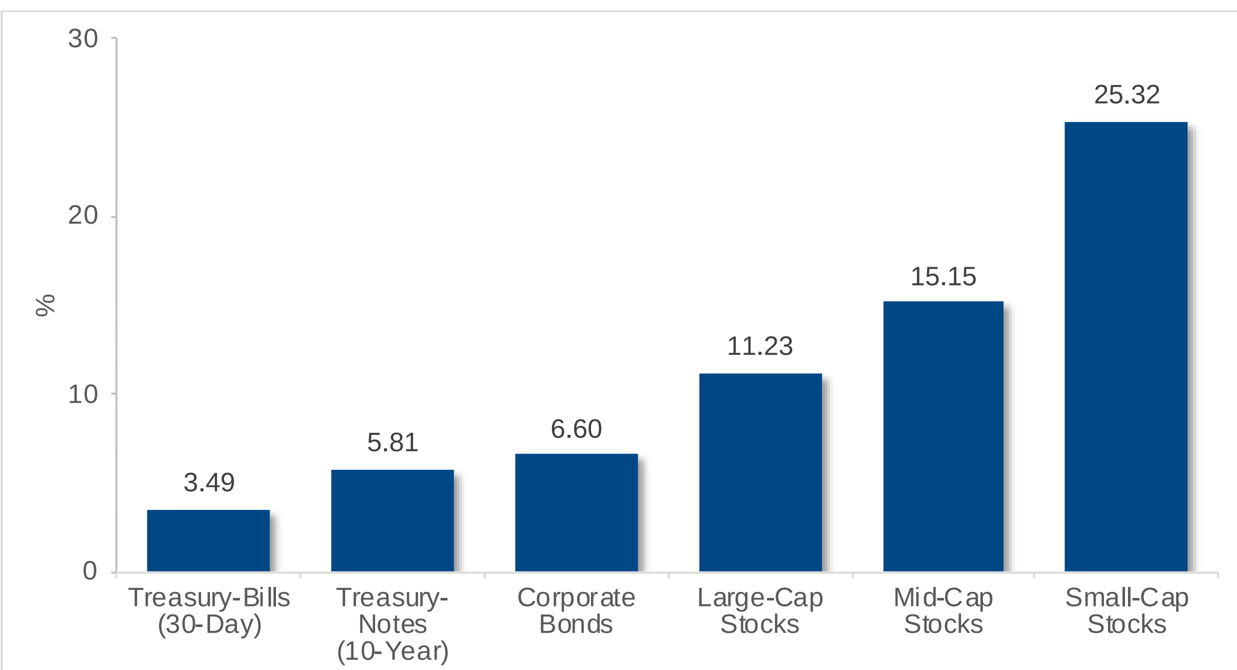
Despite the upward sloping yield curve, even long-term interest rates were near historical lows. Figure 6 shows the wide range of average annual returns on different investments since 1926. Figure 7 illustrates the risk of several of those investments. The differences in variation across the strategies are nearly as striking as the differences in value. Matthew's investment strategy would dictate both the expected return and risk of his savings strategy, which in turn would have a profound effect on what any retirement savings plan might look like.

Figure 5. Three-Month Treasury Bill Rate



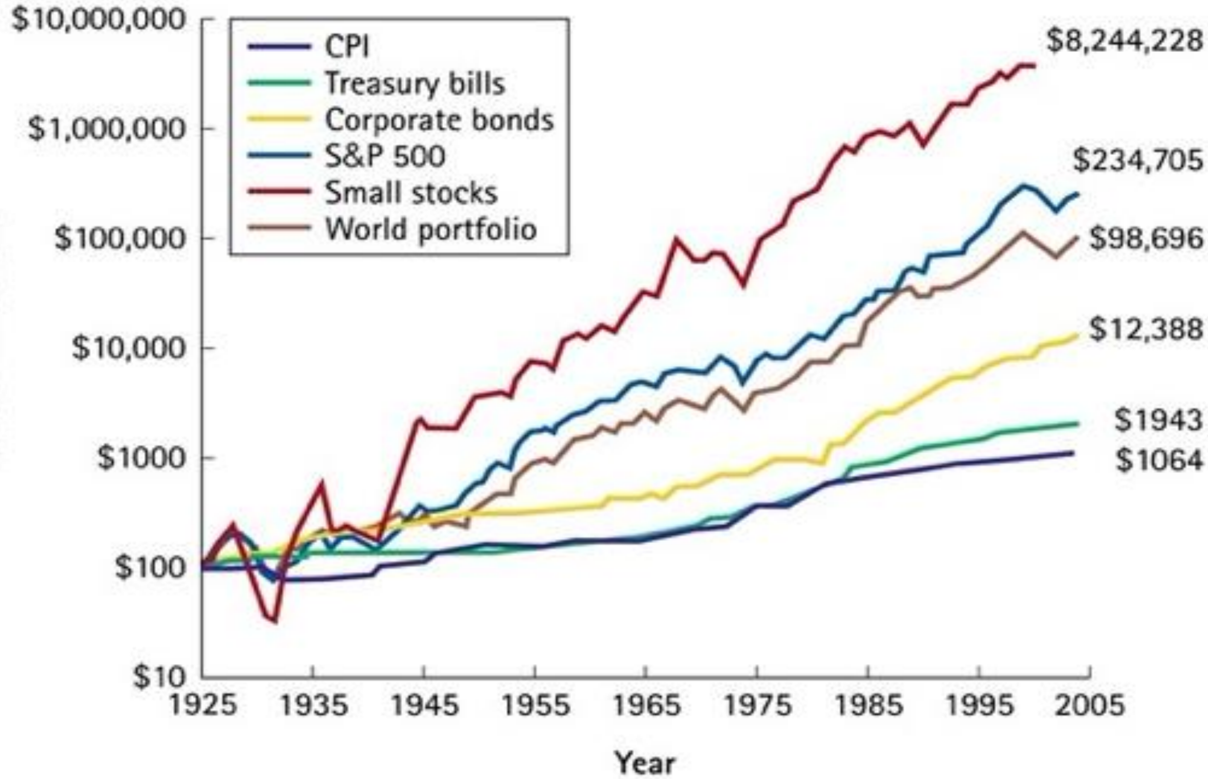
Source: Federal Reserve Bank of St. Louis

Figure 6. Average annual returns, 1926 - 2008



Source: Jonathan Berk and Peter DeMarzo, Corporate Finance, 2nd Edition.

Figure 7. Value of $100 Invested at the End of 1926



Source: Jonathan Berk and Peter DeMarzo, Corporate Finance, 2nd Ed.

That strategy would also have a large effect on any taxes owed on investment earnings. Interest income from any fixed income investments (e.g., Treasury's or corporate bonds) would be taxed as ordinary income at his marginal tax rate. The same is true of any dividends from stock investments. Capital gains (or losses) would be realized only when he sold his investments and the rate at which any earnings would be taxed depended upon the duration of his holdings. Gains on investments sold within a year of their purchase would be considered short-term capital gains and taxed as ordinary income. Gains on investments held longer than one year would be taxed at long-term capital gains rates, which are detailed in Table 3

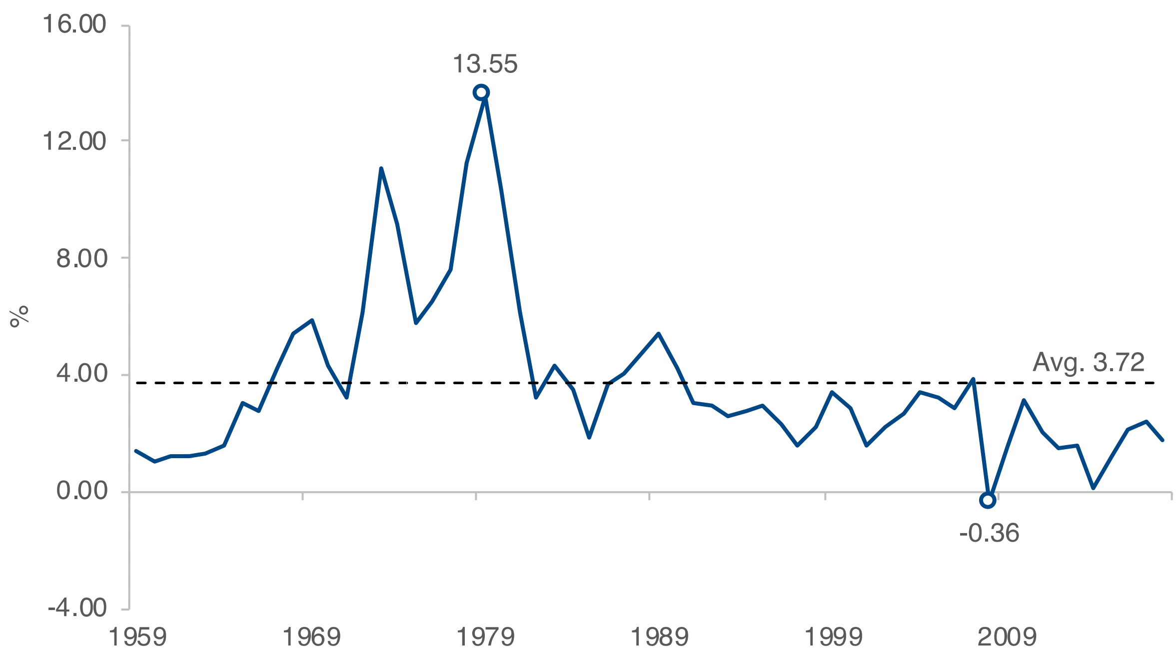
Table 3. Capital Gains Tax Rates, 2018

Long-Term Capita Gains Tax Rate	Single	Married Filing Jointly	Head of Household	Married Filing Separately
0%	$0-$38,700	$0-$77,400	$0-$51,850	$0-$38,700
15%	$38,700-$426,700	$77,400-$480,050	$51,850-$453,350	$38,700-$240,025
20%	$426,700 or more	$480,050 or more	$453,530 or more	$240,025 or more

Source: United States Internal Revenue Service

While retirement was far off, Matthew considered what his needs might be at that time. His plan was to retire when he turned 65, at which time he would likely be finished with most big-ticket expenses, such as a mortgage and supporting children. He also recognized that other expenses would be larger because of inflation (Figure 8) and increased healthcare needs. Additionally, as his income grew, so too would his tastes. Thus, he expected his standard of living to increase as well. And, if he decided to have a family, he wanted the option of leaving an inheritance for his wife and children.

Figure 8. Annual Inflation of Consumer Prices for the United States



Source: Federal Reserve Bank of St. Louis

The Center for Disease Control (CDC) Life Tables for 2017 showed that Matthew could expect to live for another 55 years. Though not always an optimist, one concern he had, and a common one among many retirees, is outliving his money. So, he factored in his family experience and healthy lifestyle, both of which led him to believe that he could live to 84.

Implementing

Matthew recognized that there was a great deal of uncertainty in planning for retirement. Every assumption he would make, despite being well-informed and defensible, was almost sure to be incorrect. Investment earnings, income growth, taxes, etc. were all unknowable. While daunting, Matthew knew all too well the importance of constructing a plan early. He also recognized that the plan would change over time as his needs changed and new information revealed itself. Ultimately, Matthew strongly believed the discipline of consistent saving and the continuous knowledge of his financial health would greatly alleviate many of his worries about future financial security.

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