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Hunter Rhea

University of Arkansas, Fayetteville

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Cost-Benefit Analysis of Retirement Plans

by

Hunter E. Rhea

Advisor: Dr. Craig Rennie

**An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of
Science in Business Administration in Finance and Accounting.**

**Sam M. Walton College of Business
University of Arkansas
Fayetteville, Arkansas**

May 11, 2018

Executive Summary

In my research, I've compared the cost and benefits of defined benefit and defined contribution plans consisting of 401(k)s, IRAs, 403(b)s, and S&P 500 ETFs. A model was used to forecast future value of plans at retirement based on years till maturity, contribution amounts, and plan type. Based on the results, it's beneficial for an individual to invest in a diversified mix of retirement plans to reduce the risk associated with one plan. The future value of each plan witnessed a direct increase in value for an increase in contribution amount and years till plan maturity.

Introduction

This paper focuses on an important issue that applies to every working citizen. My research is a cost-benefit analysis of the varying retirement plans and strategies along with what individuals should start doing now to prepare for retirement at a later age. My analysis will examine the requirement/costs and benefits from contributing to the following retirement plans: Traditional 401(k), Roth 401(k), Traditional IRA, Roth IRA, 403(b), and a simple investment strategy of investing in an exchange-traded fund (ETF) that tracks the performance of the S&P 500. These characteristics will involve the participants who are eligible for them, how much can legally be contributed to the plan on an annual basis, whether an employer/outside party can contribute to the plan, withdrawal limitations near the end of the plan, and any taxes/fees that are attributed to the plan. Furthermore, I've examined each of these strategies by estimating the future value of the plan assets at the age of retirement based on when an individual begins contributing to a plan and the amount that they contribute on a monthly basis. My research does not intend to select one superior strategy, but instead to examine each strategy based on its costs and benefits. In doing this, I intend to provide information on retirement plans and strategies for individual needs. This can result in a portfolio of retirement plans whose components vary in the contribution and time maturity.

401(k) Plan – Traditional vs. Roth

To better illustrate the costs and benefits of retirement plans, I'll describe each on a detailed basis, as well as show the specifics that can make one more beneficial than another. To begin with, I'll first explain in detail what a 401(k) is, as well as the key differences between a Traditional 401(k) and a Roth 401(k). A Traditional 401(k) is a retirement savings plan that is sponsored by an employer, allowing an employee to invest a portion of their paycheck towards their retirement. This is usually a defined-contribution plan in which an employer sets aside a certain amount of money each year for their employees' retirement plans. Essentially this entails that an employee's 401(k) is made up of contributions from both the employee and their employer. The invested portion is managed by an investment manager who assumes sole fiduciary liability for the selection of investments as well as the monitoring of the 401(k) account.

The amount initially and put into the retirement account is originally not taxed, since it's taken out of an employee's paycheck before taxation. However, it is only refrained from taxation at the initial deferral date. In later years, when the deferred amount is withdrawn, it will be subject to taxation. Additionally, there are contribution limits to this plan that change every few years. As of 2018, the maximum annual contribution limit of compensation for a 401(k) is \$18,500. However, employees aged 50 or older can contribute up to an additional \$6,000 in

what are known as “catch-up contributions.” To put this into perspective, an individual who is aged 30 and making \$80,000 could contribute approximately 22.5% of their salary while an individual aged 55 with the same salary could contribute approximately 31% of their salary. Higher contribution amounts are allowed for older individuals to help ensure that they can contribute a necessary amount to plan for retirement. Once contributions have been made and sums of contributions have been compounded, investment managers work on generating returns for individuals by investing in a variety of securities. These administrators, such as a Fidelity Investments, typically invest plan contributions in a mutual fund portfolio. However, under the provisions of government policy, they are allowed to invest in small-cap stocks, large-cap stocks, bonds, and other investment instruments.

Over the contribution time horizon, an individual’s continuous plan contributions, their employer’s contributions, and the returns generated by the investment managers will result in a substantial sum of capital when the individual reaches retirement age. At this time, the individual can choose to distribute a specified amount of the retirement savings into their own hands. There are, however, certain events that must occur for an individual to be able to withdraw their contributions. Contributions are available for withdrawal upon an employee’s retirement, severe disability, separation from service with an employer, or death; when the employee becomes aged 59.5, or upon the termination of the 401(k) plan. Distributions that occur before the age of 59.5 will be taxed as ordinary income and are also assessed a 10% early distribution penalty, therefore, it’s tremendously costly to make early withdrawals. There are a few exceptions that avoid the fee such as distributions that occur after the death of the employee, after a qualified disability of the employee, or after an employee is separated from the service as long as the separation occurs after age 55.

As mentioned earlier, a Traditional 401(k) is a deferred tax asset, therefore, once an individual begins making withdrawals, it will be taxed. The distributions after age 59.5 are taxed as ordinary income, so they’re taxed based on a tax bracket that reflects your income. This means that the higher the amount of the withdrawal, the higher the tax rate for that amount. This implies that it is crucial to have the best timing and amount of withdrawals to avoid paying a substantial amount in taxes. As mentioned before, there are penalties for early withdrawals, but there are also rules that require withdrawals at a later age. By age 70.5, required minimum contributions (RMDs) must begin. RMDs are determined by a various calculation that takes the previous year-end account balance and multiplies it by a factor depending on the dollar-amount of the account, so the RMD for someone with a \$2 million balance would be higher than that of someone with \$1 million. Participants can avoid RMDs if they are still working with the employer that their 401(k) is associated with. Overall, this sums up the workings of a Traditional 401(k) plan.

A Roth 401(k) is very similar in nature with the workings of a Traditional 401(k) with a few differences. Most notably is the way the contributions are taxed. A Traditional 401(k) is tax-deferred, but a Roth 401(k) is an employer-sponsored investment savings account where contributions are made with after-tax dollars. This makes a Roth 401(k) attractive to individuals who believe they will be in a higher tax bracket by the time they are retired and making account withdrawals. Consequently, they would be paying a lower tax rate now instead of a higher tax rate at the time of distributions. This includes young people who are new or recently new to the workforce. The contributions of both Roth and Traditional 401(k) are the same in regard to amount and age, so that isn’t a factor in determining which is more beneficial.

When time comes for the qualified distributions in a Roth 401(k), they will be tax-exempt as long as a couple of criteria are met: the Roth 401(k) account must have been held for a minimum of five years, the distribution must have occurred due to the death or qualified disability of the 401(k) owner, or when the holder of the account reaches the age of 59.5. Based on these distinct differences, it seems apparent that if you anticipate on moving into a higher income tax bracket at a later age, then a Roth 401(k) seems beneficial. However, there are other characteristics that determine which is more beneficial and those can depend on an individual's employer. It's also important to note that an individual can contribute to both a Traditional and Roth 401(k) as to hedge any uncertainty in one plan as compared to another.

IRA Plan – Traditional vs. Roth

A Traditional and Roth IRA (individual retirement account) are a separate type of retirement account that are not employer-sponsored. A 401(k) does allow for an employer match provision, but IRA contributions are solely from the holder of that plan. There are additional distinctions between Traditional & Roth IRAs as compared to their 401(k) counterpart. A Traditional IRA allows an individual to contribute pretax income towards the IRA plan. Like a Traditional 401(k), these investments are tax-deferred so that no capital gains are taxed until withdrawals start occurring. Different financial custodians, such as commercial banks, are then in charge of your contributions where they invest in a variety of financial instruments. An account holder can give directives on how they want their contributions to be invested, as long as it meets the financial custodian's available offerings. Contribution limits didn't change for 2018 and remain at \$5,500 for individuals under the age of 50. The catch-up contribution limit is an additional \$1,000 for individuals 50 or older which enables them to contribute \$6,500 annually. Similar to the 401(k), a Traditional IRA holder may began receiving distributions at age 59.5 with no penalty, and must begin receiving required minimum contributions by age 70.5. The same 10% penalty applies to a Traditional IRA if withdrawals are taken before age 59.5.

A Roth IRA shares the same major distinction between a Traditional IRA that the Traditional & Roth 401(k) had which is in the way it is taxed. Roth IRA contributions are made with after-tax income, therefore, the withdrawals from a Roth IRA are qualified as tax-exempt. This entails that contributions made into a Roth IRA account are not tax deductible. Furthermore, a Roth IRA account must be established with an institution that has the approval to offer IRAs according to the Internal Revenue Code of the IRS. Institutions would include commercial banks, brokerages, savings & loans associations, and credit unions which are federally insured. Contributions limits mirror those of a Traditional IRA, including the catch-up limit. Distribution requirements do differ from those of a Traditional IRA, because they tend to be more lenient. For example, an account holder can withdrawal all their previous contributions, not including returns earned, without a penalty regardless of the holder's age as long as they've held the account for five years or more. If the holder does want to withdraw all their contributions and earned interest, then they must be age 59.5 or older and have held the account for five years. Also, there is no required minimum distribution for a Roth IRA which means that a holder isn't forced to withdraw any of their contributions after age 70.5 and can actually keep contributing after age 70.5 as well.

Whether a Traditional or Roth IRA is better for an individual really depends on the characteristics and desires of that individual. For instance, someone who is in a lower tax bracket now, and expects to be in a higher tax bracket later, near or during retirement would

most likely be better off with a Roth IRA. This is similar to the Roth 401(k) since that individual would be paying a lower tax rate at the moment contributions are made but won't be taxed later on at a higher rate. Also, since a Roth IRA doesn't have RMDs, contributions can accrue indefinitely, and IRS regulations allow an individual to pass on the assets within their account to their heirs. The beneficiary is required to take these distributions from an inherited IRA, but they can stretch out the tax deferral by taking contributions based on their expected life span. Or an individual might just enjoy knowing that they can have a steady tax-free stream of income when they reach retirement.

403(b)

A 403(b) is another retirement option available for specific employees of public schools, organizations that are tax-exempt, and certain ministers. It is also known as a tax-sheltered annuity (TSA) plan which is set up only by an employer. Employers can offer matching contribution such as a 401(k). Individual 403(b) accounts can either be an annuity contract, custodial account, or a retirement income account. An annuity contract is a contract provided through an insurance company and a custodial account is an account that is invested in mutual funds. A retirement income account is generally set up for church employees and are invested in either annuities or mutual funds. A 403(b) is comparable to a Traditional 401(k) and IRA, because an individual doesn't pay taxes on allowable contributions until they begin making withdrawals from the plan, therefore, contributions are made with pre-tax dollars. There is also a Roth option that allows for contributions to be made with after-tax dollars where later withdrawals are tax-exempt.

Eligible employees for a 403(b) differ from those of a 401(k) or IRA, because much of the private sector is excluded. Those who are eligible are employees of tax-exempt organizations under IRC section 501(c)(3), public school systems who are involved in the day-to-day operations of the institution, and cooperative hospital systems. Eligible employees are also ministers who are employed by 501(c)(3) organizations and self-employed ministers. If an individual is a self-employed minister, then the 403(b) must be set up by organization (denomination) of which they are a chaplain. Contribution limits for a 403(b) match those of a 401(k) by being an amount of \$18,500. Additionally, individuals over the age of 50 have a catch-up amount that allows them to contribute \$24,500 annually. The 10% early withdrawal fee before age 59.5 still applies, and the account holder must begin taking required minimum distributions by age 70.5. Overall, a 403(b) is very similar to a 401(k). The main difference that a 403(b) is mainly only available to public employees, religious ministers, and a few other niche areas of the workforce.

S&P 500 ETFs

The final retirement strategy I will be covering is not officially a retirement plan, but instead is a list of market indexes that track the performance of the publicly traded companies listed on the NYSE or NASDAQ. All these stocks listed in the S&P 500 are US large and midcap size stocks. There are three S&P 500 exchange-traded funds (ETFs) that I will be analyzing to show how all three can offer a secondary option to planning for retirement. First off, an ETF is a marketable security that tracks an index (for this research, the companies represented on the S&P 500 index) and are traded like common stock is traded by being sold and purchased on stock exchanges. The value of an ETF is directly based on the performance of the

underlying asset which would be the collective performance of the publicly traded companies listed on the S&P 500. Perhaps the most beneficial aspect of S&P 500 ETFs is that they offer the investor an easy way to diversify their investments since they're comprised of companies that cover a wide variety of industries and sectors. In addition, they have low transaction fees and have a high liquidity, both of which are better than that of a mutual fund.

The most well-known ETF that tracks the S&P 500 index is the SPDR S&P 500 ETF (Ticker: SPY) that was issued by State Street Global Advisors. SPY tracks the market-weighted index of the US large and midcap size stocks that collectively represent the S&P 500. It is the best-recognized and the oldest S&P 500 benchmark. In terms of assets under management, it is the largest, holding an astounding \$248.58 billion in assets. It's liquidity is high with an average daily trading volume of \$30.68 billion. However, it does have the highest expense ratio of the three at 0.09%. Overall, returns in this ETF have been impressive with a one year return of 13.75%, three-year return of 10.64%, and five-year return of 13.17%. These returns are figured as of April 2018.

Vanguard S&P 500 ETF (Ticker: VOO) is another well-recognized index tracker of the S&P 500 that is issued by Vanguard. It may be the newest of the three ETFs, but it is still a highly-recognized and well-respected ETF. It is the lowest of the three in terms of assets under management holding \$85.77 in assets. On the other hand, it is the cheapest of the three with an expense ratio of 0.04%. The one-year returns are 14.02%, three-year returns are 10.77%, and the five-year returns are 13.31%.

The final of the three S&P 500 ETFs is the iShares Core S&P 500 ETF (Ticker: IVV) issued by BlackRock. It currently has \$154.54 billion in assets under management and is very cheap to trade with an expense ratio of 0.05%. As of April 2018, the one-year returns are 13.99%, 3-year returns are 10.76%, and five-year returns are 13.29%.

Analysis

My analysis will examine different characteristics of individuals who contribute to a 401(k), 403(b), IRA, or S&P 500 ETFs. These characteristics include the individual's annual dollar amount of the contribution, age of the individual/maturity of the plan, and the type of plan the individual is using. In these scenarios, all the individuals will retire at the set age of 65, therefore, the scenarios run each retirement plan until the individual becomes 65 years old. Each retirement plan will grow at a specified rate that will be clarified later. Additionally, the scenarios do not take into account future increases in contribution limits to each plan since they are usually irregular and don't follow a detailed pattern.

401(k) & 403(b) Returns

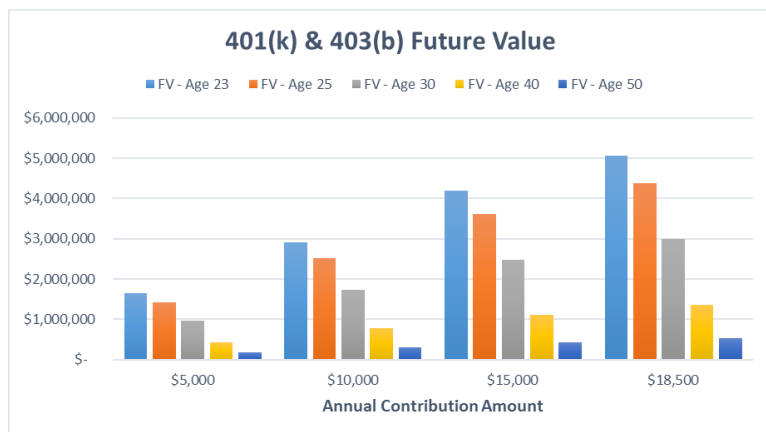
For a Traditional/Roth 401(k), as well as the 403(b), I've used one return calculator since returns between the accounts are historically similar. As mentioned earlier, contributions and withdrawals to each plan differ. However, for this analysis, I'm strictly examining how contributions compound over time. Therefore, it's important to remember that Traditional 401(k) withdrawals will be taxed while Roth 401(k) will not be since they were taxed before being contributed. This calculator incorporates each annual contribution made to a plan and compounds the interest earned over the life of the plan to give a future value (value of the plan at age 65). The result was 20 scenarios that differed in the age of when the individual started

contributing to the plan and the annual contribution that the individual made each year. There are five ages at which the individual could start contributing in this plan: 23, 25, 30, 40, and 50. There are four contribution amounts that the individual could make each year: \$5,000; \$10,000; \$15,000; and the maximum annual contribution of \$18,500. Additionally, each scenario also shows the maximum contribution that the individual made over their life, as well as the cumulative interest they earned over the life of the plan. Historical annual returns in a 401(k) tend to be from 7-10% so this scenario uses a nominal annual return of 7%. Each scenario also has an employer match of 50% for the first 6% of the individual's salary (using the U.S. median salary of approximately \$50,000). Below is a table of the scenario results:

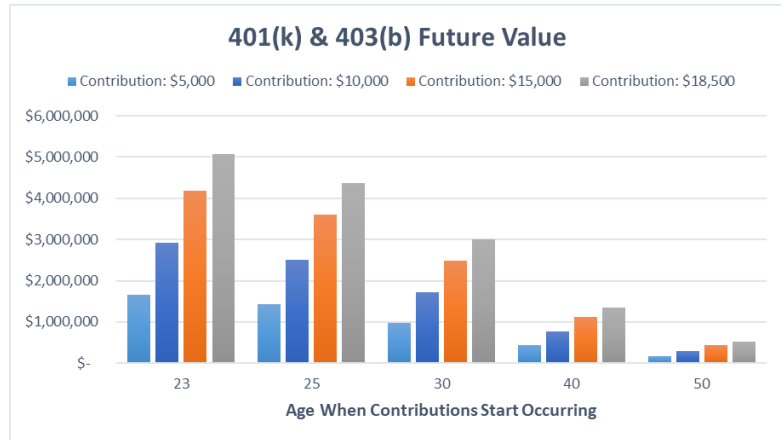
Scenario #	Age	Years till Maturity	Contribution Amount	Future Value	Your Contributions	Cumulative Interest
1	23	42	\$ 5,000.00	\$ 1,648,675	\$ 210,000	\$ 1,375,675
2	23	42	\$ 10,000.00	\$ 2,916,886	\$ 420,000	\$ 2,433,886
3	23	42	\$ 15,000.00	\$ 4,185,097	\$ 630,000	\$ 3,492,097
4	23	42	\$ 18,500.00	\$ 5,072,845	\$ 777,000	\$ 4,232,845
5	25	40	\$ 5,000.00	\$ 1,421,774	\$ 200,000	\$ 1,161,774
6	25	40	\$ 10,000.00	\$ 2,515,446	\$ 400,000	\$ 2,055,446
7	25	40	\$ 15,000.00	\$ 3,609,118	\$ 600,000	\$ 2,949,118
8	25	40	\$ 18,500.00	\$ 4,374,689	\$ 740,000	\$ 3,574,689
9	30	35	\$ 5,000.00	\$ 975,571	\$ 175,000	\$ 748,071
10	30	35	\$ 10,000.00	\$ 1,726,011	\$ 350,000	\$ 1,323,511
11	30	35	\$ 15,000.00	\$ 2,476,450	\$ 525,000	\$ 1,898,950
12	30	35	\$ 18,500.00	\$ 3,001,758	\$ 647,500	\$ 2,301,758
13	40	25	\$ 5,000.00	\$ 438,789	\$ 125,000	\$ 276,289
14	40	25	\$ 10,000.00	\$ 776,319	\$ 250,000	\$ 488,819
15	40	25	\$ 15,000.00	\$ 1,113,849	\$ 375,000	\$ 701,349
16	40	25	\$ 18,500.00	\$ 1,350,119	\$ 462,500	\$ 850,119
17	50	15	\$ 5,000.00	\$ 171,688	\$ 75,000	\$ 74,188
18	50	15	\$ 10,000.00	\$ 303,756	\$ 150,000	\$ 131,256
19	50	15	\$ 15,000.00	\$ 435,823	\$ 225,000	\$ 188,323
20	50	15	\$ 18,500.00	\$ 528,270	\$ 277,500	\$ 228,270

In the table above, Column 1 represents the scenario number. Column 2 represents the age when the individual starts making contributions to the retirement plan, and Column 3 is the years till maturity of the plan or how long until they reach age 65. Column 3 has an inverse relationship with Column 2 since every time the age of the individual increases by one, Column 3 will decrease by one. Column 4 is the annual contribution amount of the individual. Column 5 is ultimately the final value of the retirement plan right before the individual turns 65. Column 6 shows the cumulative contributions made by the employee, and Column 7 shows the cumulative interest that the individual has made throughout the retirement plan.

Based on the results of the multiple scenarios, one major lesson stands out. Either time can be in your favor or it can be against you. Most individuals know that it's better to start contributing toward a retirement plan early, but many don't understand the degree to which it can help. For instance, waiting just a few years to start planning for retirement can have a drastically, negative effect on the

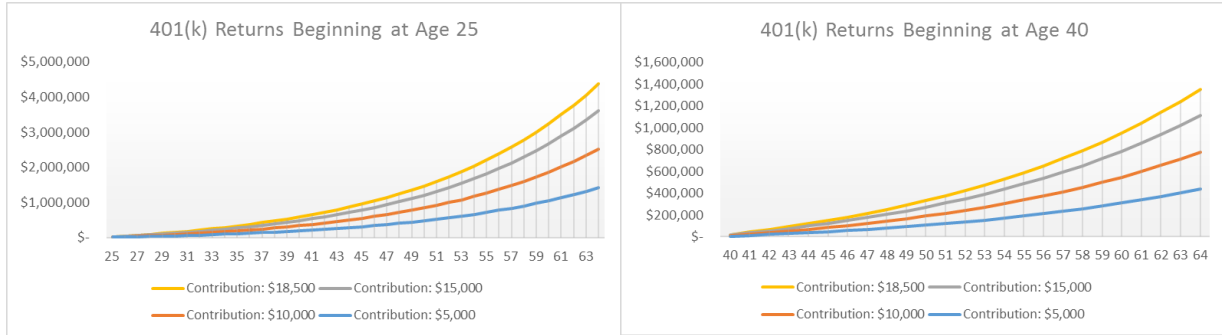


future value of the plan. This would be the opportunity cost of waiting to retire. To better illustrate, I've presented two graphs that show the same data but presented in two different perspectives. Both show the varying contribution amounts and ages of when an individual begins planning for retiring.



As expected, someone who begins contributing to the retirement plan at age 23 is much better prepared than someone who begins contributing at age 50. For example, an individual who begins contributing \$5,000 annually at age 23 will have approximately \$1,648,675 saved by age 65. On the other hand, an individual who contributes \$5,000 beginning at age 50 will only have \$171,688 saved by the time they reach 65. An even more vital figure is the difference in the future values of someone who begins making contributions at age 23 instead of 25. As mentioned before, an individual contributing \$5,000 annually beginning at age 23 will have a future value of approximately \$1,648,675. Now if that same individual were to wait two years until the age of 25 to start making the same contributions, they'd end up with a future value of \$1,421,774. That means that the two-year delay in contributions ended up decreasing an individual's future value of their plan by about \$227,000 even though the difference in their own personal contributions was \$10,000. This is a result of compounding interest that can accumulate more returns for an investor over time. The other logical observation is that the larger the contribution amount, the greater the future value of the plan. For instance, an individual at age 30 that begins contributing an annual amount of \$10,000 per year will end up with a future value of \$1,726,011, whereas someone of the same age who is contributing \$5,000 per year will attain \$975,571 per year.

Based on the observations of cumulative interest and contribution amounts, an individual would most definitely be better off contributing to a retirement plan at the earliest age possible and contributing the most that they financially sustain. However, it's understandable that an individual early off in their career would have difficulties contributing the maximum amount of \$18,500 on an annual basis, but it's not unreasonable to start contributing as soon as that individual has a steady job and employer. That amount could be \$1,000-\$5,000 or more if it's affordable. It's just important to understand that at least some substantial amount of money needs to be accumulating interest in the 401(k)/403(b). Below are a few of the scenarios displayed in line chart form to better display the relationship between future value and time-to-maturity/contribution amount. The entirety of these infographics can be found in the appendix.



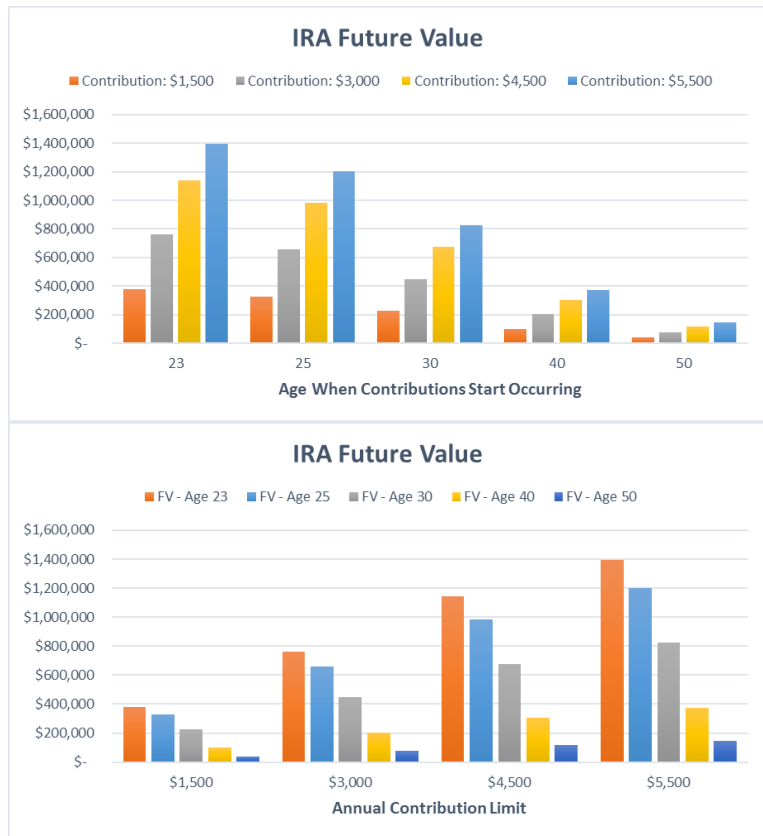
IRA Returns

Similar to that of the 401(k) and the 403(b), I’ve used a model to create the future value of Individual Retirement Accounts. The basics of the model are comparable to that of the previous model used for the 401(k) but with a few minor changes. Firstly, I discarded the employee match since an IRA is made up of contributions made solely by the holder of the account. Contribution limits also had to be changed since the maximum contribution for an IRA is significantly different from those of a 401(k)/403(b). The contribution amounts were changed to the following: \$1,500; \$3,000; \$4,500; and the maximum contribution limit of \$5,500. The age of the individual when they start making contributions stays the same with the following ages: 23, 25, 30, 40, and 50. Annual nominal rate of return was also set at 7%, which was the rate previously used in the 401(k)/403(b) plan. The result was 20 scenarios that differed in the age of when the individual started contributing to the plan and the annual contribution that the individual made each year. Once again, these scenarios show the future value of the plan, the cumulative contributions made by the individual, and the cumulative interest that is earned over the life-span of the IRA. As mentioned earlier in the 401(k) analysis, there are tax differences that need to be taken into account in both a Traditional and Roth IRA. This analysis is simply looking at the returns of the contributions in the plan. It’s important to take note that a Traditional IRA would be taxed once withdrawals are made while a Roth IRA would be tax-exempt at the time of withdrawals. Below is a table of the scenario results:

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value	Total Contributions	Cumulative Interest
1	23	42	\$ 1,500.00	\$ 380,463	\$ 63,000	\$ 317,463
2	23	42	\$ 3,000.00	\$ 760,927	\$ 126,000	\$ 634,927
3	23	42	\$ 4,500.00	\$ 1,141,390	\$ 189,000	\$ 952,390
4	23	42	\$ 5,500.00	\$ 1,395,032	\$ 231,000	\$ 1,164,032
5	25	40	\$ 1,500.00	\$ 328,102	\$ 60,000	\$ 268,102
6	25	40	\$ 3,000.00	\$ 656,203	\$ 120,000	\$ 536,203
7	25	40	\$ 4,500.00	\$ 984,305	\$ 180,000	\$ 804,305
8	25	40	\$ 5,500.00	\$ 1,203,039	\$ 220,000	\$ 983,039
9	30	35	\$ 1,500.00	\$ 225,132	\$ 52,500	\$ 172,632
10	30	35	\$ 3,000.00	\$ 450,264	\$ 105,000	\$ 345,264
11	30	35	\$ 4,500.00	\$ 675,395	\$ 157,500	\$ 517,895
12	30	35	\$ 5,500.00	\$ 825,483	\$ 192,500	\$ 632,983
13	40	25	\$ 1,500.00	\$ 101,259	\$ 37,500	\$ 63,759
14	40	25	\$ 3,000.00	\$ 202,518	\$ 75,000	\$ 127,518
15	40	25	\$ 4,500.00	\$ 303,777	\$ 112,500	\$ 191,277
16	40	25	\$ 5,500.00	\$ 371,283	\$ 137,500	\$ 233,783
17	50	15	\$ 1,500.00	\$ 39,620	\$ 22,500	\$ 17,120
18	50	15	\$ 3,000.00	\$ 79,241	\$ 45,000	\$ 34,241
19	50	15	\$ 4,500.00	\$ 118,861	\$ 67,500	\$ 51,361
20	50	15	\$ 5,500.00	\$ 145,274	\$ 82,500	\$ 62,774

In the table above, Column 1 represents the scenario number. Column 2 represents the age when the individual starts making contributions to the retirement plan, and Column 3 is the years till maturity of the plan or how long until they reach age 65. Column 3 has an inverse relationship with Column 2 since every time the age of the individual increases by one, Column 3 will decrease by one. Column 4 is the annual contribution amount of the individual. Column 5 is ultimately the final value of the retirement plan right before the individual turns 65. Column 6 shows the cumulative contributions made by the employee, and Column 7 shows the cumulative interest that the individual has made throughout the retirement plan.

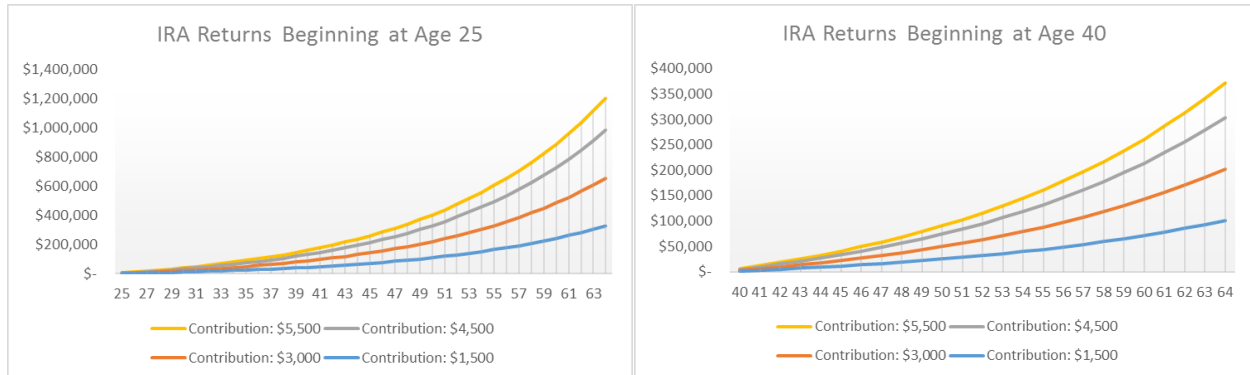
Overall, the relationship between the future value of the plan assets and the contribution amount/time-to-maturity are very similar to those of a 401(k) which is expected. The earlier an individual starts contributing to retirement, the more their assets are worth at retirement and vice versa. The more that is contributed, the more the retirement account will be at retirement. These relationships are still equivalent, but an IRA still has a key difference that separates it from a 401(k). Of course, this would be the contribution limit of the IRA being significantly less than that of a 401(k). In the long run, this makes the potential value of a IRA considerably less. To put this into perspective, I'll consult back to the returns of the 401(k) and compare them with the returns



of an IRA. For this example, I'll compare the returns of an individual that begins contributing the maximum limit for a 401(k) and an IRA beginning at the age of 30. Referring to my previous analysis of 401(k)s, that individual would end up with a future value of \$3,823,137; this is including all the assumptions that I've previously stated. As for the IRA, the investor would have a future value of \$825,483. That equates out to a 401(k) return ratio (401k/IRA) of 4.63. Below is a table of the ratios for the return of a 401(k) over an IRA based on the maximum contributions at ages 23, 25, 30, 40, and 50.

Age	401(k) Return	IRA Return	Return Ratio (401k/IRA)
23	\$ 6,867,490	\$ 1,395,032	4.92
25	\$ 5,818,346	\$ 1,203,039	4.84
30	\$ 3,823,137	\$ 825,483	4.63
40	\$ 1,585,044	\$ 371,283	4.27
50	\$ 576,730	\$ 145,274	3.97
Mean:			4.53

Based on these returns, the average return ratio was 4.53. This insists that when both plans are maxed out, expect the 401(k) future value to be 4.53x of the IRA future value. I also, calculated the average return ratio for contributions that are approximately 27% of the limit for both the 401k (\$5,000) and IRA (\$1,500). This resulted in an average return ratio of 5.39. Therefore, one would expect the future value of a 401(k) to be 4.53-5.39x larger than that of the IRA, based on similar contribution percentages. Presented are a few more of the scenarios displayed in line chart form to better display the relationship between future value and time-to-maturity/contribution amount for IRA characteristics. The entirety of these infographics can be found in the appendix.



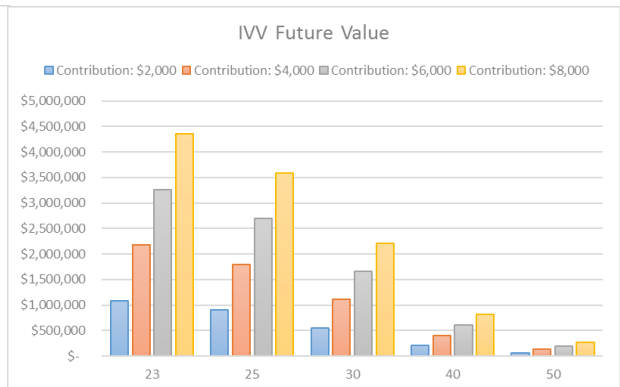
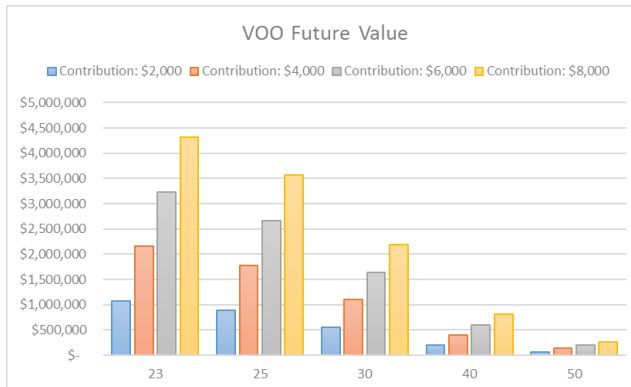
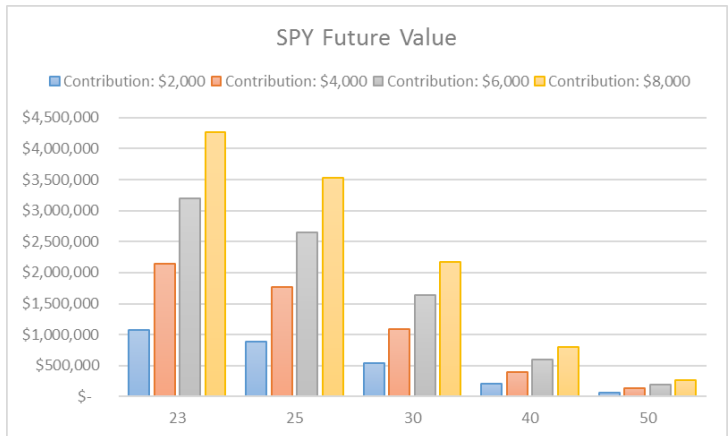
Overall, the wise piece of information to take away from the IRA returns is that they make a great secondary retirement account. While they can be used as a primary retirement account, the lower contribution limit makes it more difficult to save up a substantial amount for retirement account. However, making annual contributions to an IRA allows an individual to save up even more than just a 401(k). My recommendation would be for an individual to contribute to a 401(k) or 403(b) offered by an employer and contribute to a Roth IRA on the side as a secondary retirement plan. This ensures that they would be getting excess accumulating returns outside of a 401k/403b and will be able to draw the assets from the Roth IRA without paying taxes at the time of retirement.

S&P 500 ETF Returns

Once again, I've used a model calculator to forecast out the future value of an investment strategy. This time I've focused on three different ETFs that track the S&P 500 index which are SPDR S&P 500 ETF (SPY), Vanguard S&P 500 ETF (VOO), and the iShares Core S&P 500 ETF (IVV). For the calculations, I used an annual return of the average ten-year return for both the SPY and IVV. VOO has not existed for ten years so I used an average of the ten-year returns for SPY and IVV. The annual percentage returns for SPY, VOO, and IVV is respectively 9.41%, 9.44%, 9.47%. Also, I've changed the annual contribution amount (in this case, the amount of money put forth to purchase ETFs each year) to four distinct amounts that can be found in the table below. I've also used the same ages that were used in previous calculations of when an individual starts making contributions. Below is a table of the results for each ETF:

Scenario #	Age	Years til	Contribution Amount	Future Value (SPY)	Future Value (VOO)	Future Value (IVV)
1	23	42	\$ 2,000.00	\$ 1,068,088	\$ 1,078,354	\$ 1,088,726
2	23	42	\$ 4,000.00	\$ 2,136,176	\$ 2,156,708	\$ 2,177,453
3	23	42	\$ 6,000.00	\$ 3,204,264	\$ 3,235,063	\$ 3,266,179
4	23	42	\$ 8,000.00	\$ 4,272,352	\$ 4,313,417	\$ 4,354,906
5	25	40	\$ 2,000.00	\$ 881,873	\$ 889,853	\$ 897,912
6	25	40	\$ 4,000.00	\$ 1,763,746	\$ 1,779,707	\$ 1,795,823
7	25	40	\$ 6,000.00	\$ 2,645,619	\$ 2,669,560	\$ 2,693,735
8	25	40	\$ 8,000.00	\$ 3,527,492	\$ 3,559,413	\$ 3,591,647
9	30	35	\$ 2,000.00	\$ 543,957	\$ 548,128	\$ 552,335
10	30	35	\$ 4,000.00	\$ 1,087,913	\$ 1,096,257	\$ 1,104,670
11	30	35	\$ 6,000.00	\$ 1,631,870	\$ 1,644,385	\$ 1,657,005
12	30	35	\$ 8,000.00	\$ 2,175,826	\$ 2,192,513	\$ 2,209,340
13	40	25	\$ 2,000.00	\$ 200,123	\$ 201,136	\$ 202,154
14	40	25	\$ 4,000.00	\$ 400,247	\$ 402,271	\$ 404,307
15	40	25	\$ 6,000.00	\$ 600,370	\$ 603,407	\$ 606,461
16	40	25	\$ 8,000.00	\$ 800,493	\$ 804,543	\$ 808,615
17	50	15	\$ 2,000.00	\$ 65,453	\$ 65,632	\$ 65,812
18	50	15	\$ 4,000.00	\$ 130,907	\$ 131,264	\$ 131,623
19	50	15	\$ 6,000.00	\$ 196,360	\$ 196,896	\$ 197,435
20	50	15	\$ 8,000.00	\$ 261,814	\$ 262,529	\$ 263,246

According to the data, the IVV security offers the highest future value at the age of 65 simply because it has the highest ten-year rate of return. Since all of these securities track the S&P 500, returns are going to be highly correlated, so one shouldn't expect much of a difference in the performance of IVV compared to VOO. There are differences in the overall historical returns of each, but that is due to the fact that the ETFs were created in different parts of the business cycle. When looking at the returns, the same relationships exist between the future value and contribution amount/years till maturity. Overall, I'd recommend investing in S&P 500 ETFs as a secondary or even a tertiary option. The main reason is because the individual is the only holder of these options. That means that there is essentially no money manager or financial custodian monitoring the performance of the assets. Therefore, all the risk monitoring is done by the investor. The SPDR S&P 500 ETF (SPY) is



most likely the best option of the above based on characteristics separate from its performance. It's the most well-established of the three and manages the most amount of assets at \$275.42 billion, which implies that it's a highly liquid security.

Conclusion & Recommendation

From examining each retirement strategy on a detailed level and running multiple scenarios of each strategy to come up with a final value for each scenario, a couple of important conclusions can be drawn. The first is that it's difficult to determine that any scenario is the best for the overall population since each favor certain individuals with specific needs and/or restrictions. While it would be financial advantageous to contribute \$18,500 to a Traditional 401(k) each year beginning at age 23, it's not financially possible for every individual to do so. However, it is important to take away that it's never too early to start contributing towards a retirement plan and to contribute a substantial amount each year that is still affordable. It's also beneficial to invest in multiple retirement plans as to hedge against the uncertainty of another or to gain certain advantages that may only be available to one specific plan. Going forward, perhaps the best advice I can give is what my intentions are and why I feel that they will be financial advantageous when I finally reach the age of retirement. My intentions are to make contributions to a Traditional 401(k) starting at the first available opportunity at my work. This will be approximately \$12,000-\$13,000 annually. As my salary increases, I intend to increase the contribution each year until I reach the contribution limit. As a secondary retirement account, I plan to open a Roth IRA so that I can receive tax-free withdrawals when I reach retirement age. Initially, I plan to contribute \$2,500 to this plan and continuously put an increasing amount in each year until I reach the contribution limit. Additionally, in a few years, I anticipate that I will start buying ETFs that track the S&P 500 index or another type of market index. This won't be a substantial amount and will most likely fall between \$1,000-\$2,000 annually. To conclude, whatever plan an individual looks to partake in, it's important to research the characteristics that will apply to them and to know that it's most beneficial to start saving early, live below their means, and diversify their contributions into multiple accounts.

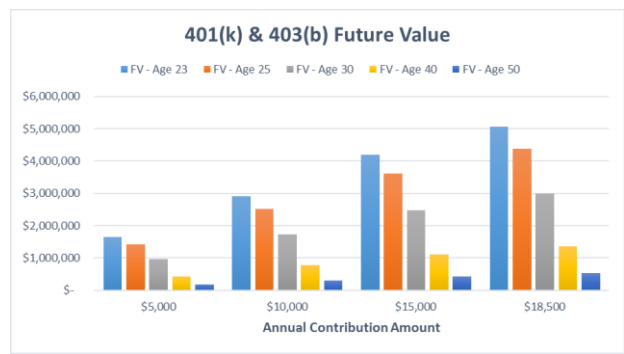
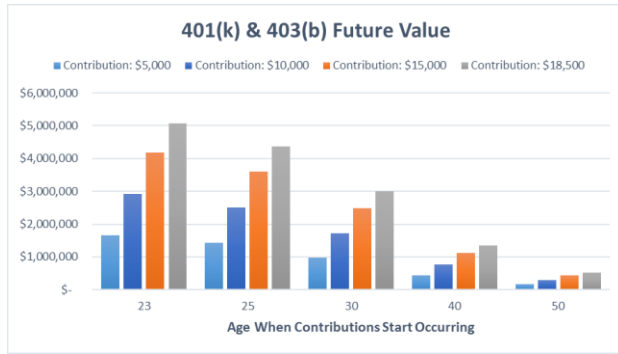
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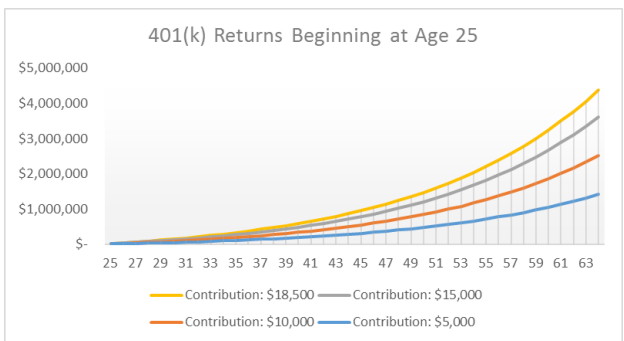
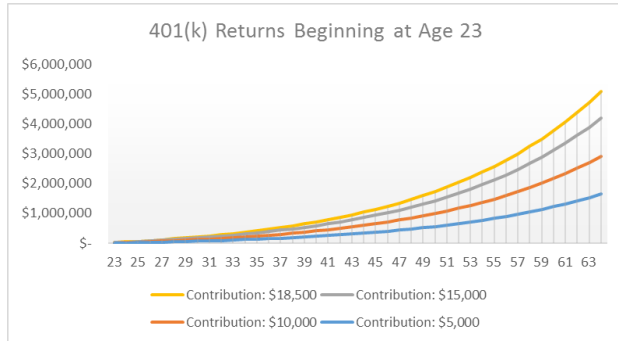
Appendix

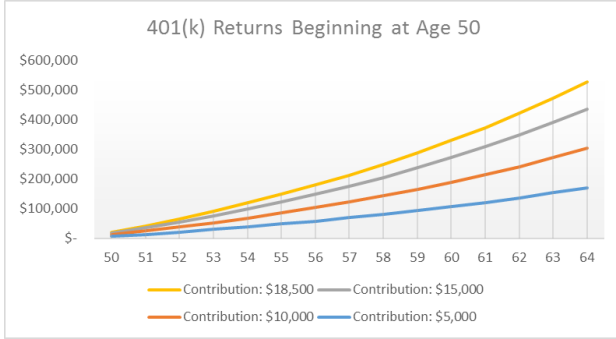
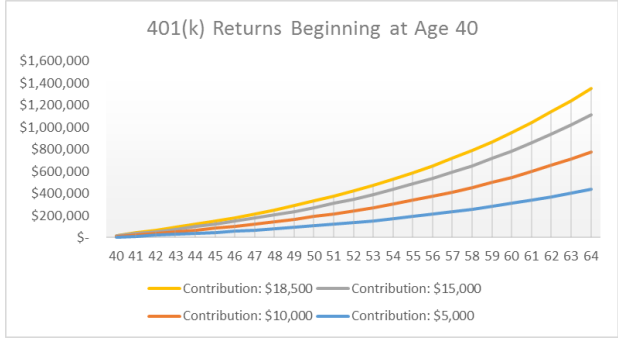
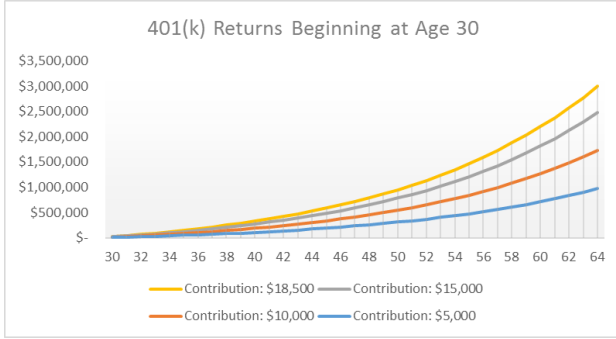
401(k) Analysis Results – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value	Your Contributions	Cumulative Interest
1	23	42	\$ 5,000.00	\$ 1,648,675	\$ 210,000	\$ 1,375,675
2	23	42	\$ 10,000.00	\$ 2,916,886	\$ 420,000	\$ 2,433,886
3	23	42	\$ 15,000.00	\$ 4,185,097	\$ 630,000	\$ 3,492,097
4	23	42	\$ 18,500.00	\$ 5,072,845	\$ 777,000	\$ 4,232,845
5	25	40	\$ 5,000.00	\$ 1,421,774	\$ 200,000	\$ 1,161,774
6	25	40	\$ 10,000.00	\$ 2,515,446	\$ 400,000	\$ 2,055,446
7	25	40	\$ 15,000.00	\$ 3,609,118	\$ 600,000	\$ 2,949,118
8	25	40	\$ 18,500.00	\$ 4,374,689	\$ 740,000	\$ 3,574,689
9	30	35	\$ 5,000.00	\$ 975,571	\$ 175,000	\$ 748,071
10	30	35	\$ 10,000.00	\$ 1,726,011	\$ 350,000	\$ 1,323,511
11	30	35	\$ 15,000.00	\$ 2,476,450	\$ 525,000	\$ 1,898,950
12	30	35	\$ 18,500.00	\$ 3,001,758	\$ 647,500	\$ 2,301,758
13	40	25	\$ 5,000.00	\$ 438,789	\$ 125,000	\$ 276,289
14	40	25	\$ 10,000.00	\$ 776,319	\$ 250,000	\$ 488,819
15	40	25	\$ 15,000.00	\$ 1,113,849	\$ 375,000	\$ 701,349
16	40	25	\$ 18,500.00	\$ 1,350,119	\$ 462,500	\$ 850,119
17	50	15	\$ 5,000.00	\$ 171,688	\$ 75,000	\$ 74,188
18	50	15	\$ 10,000.00	\$ 303,756	\$ 150,000	\$ 131,256
19	50	15	\$ 15,000.00	\$ 435,823	\$ 225,000	\$ 188,323
20	50	15	\$ 18,500.00	\$ 528,270	\$ 277,500	\$ 228,270

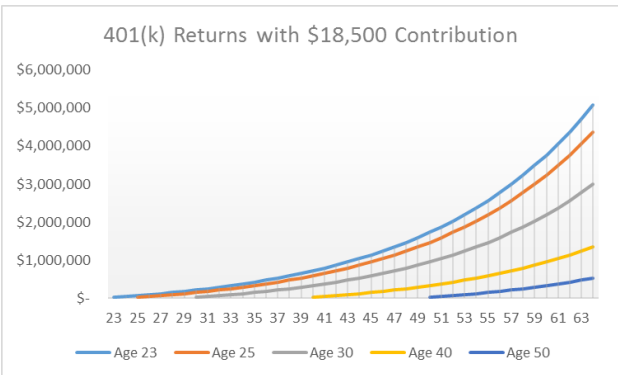
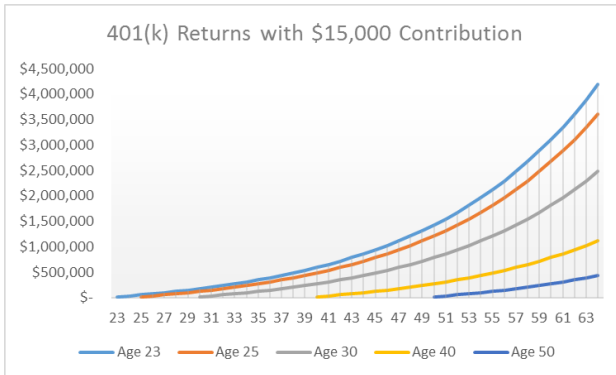
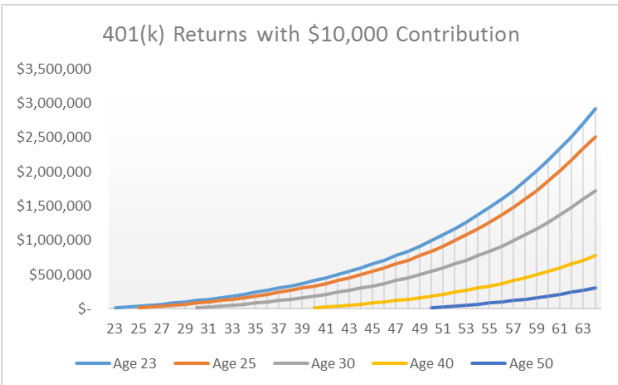
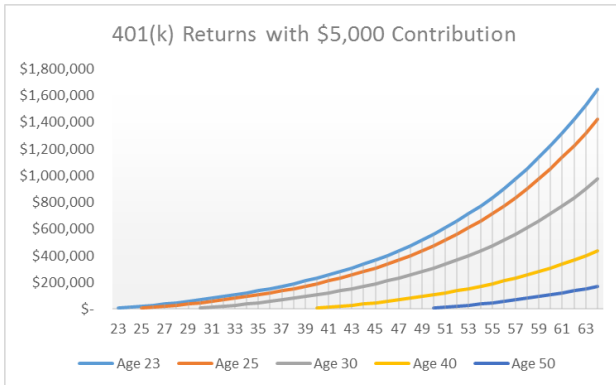


401(k) Returns Based on Age (Years till Maturity):



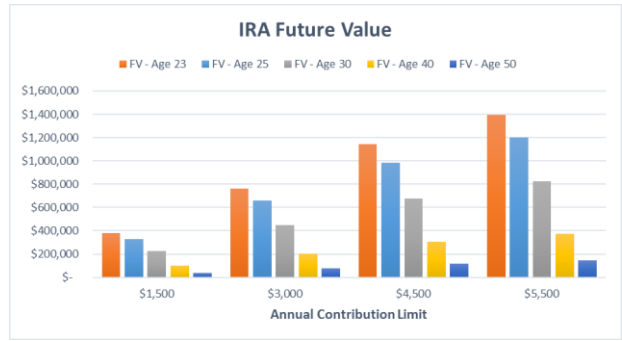
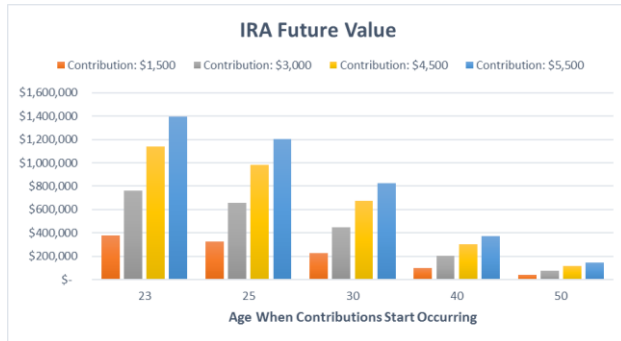


401(k) Returns Based on Annual Contribution Amount:

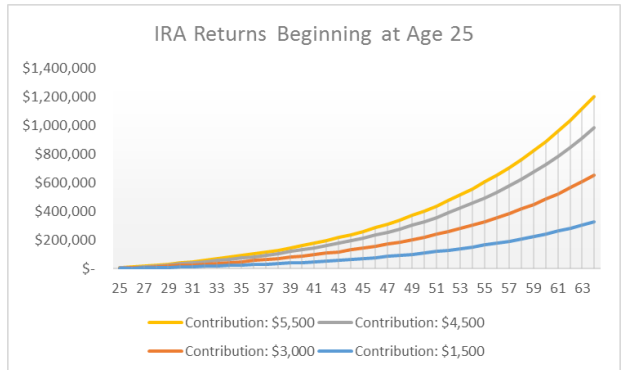
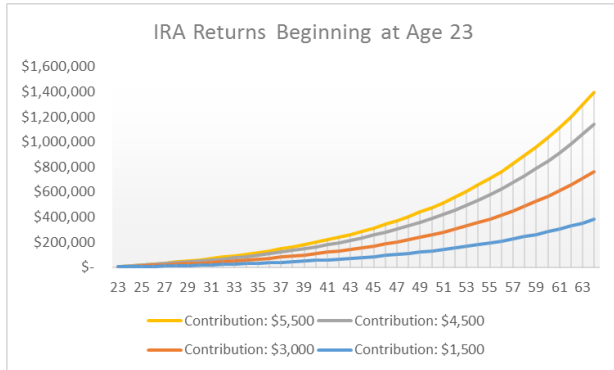


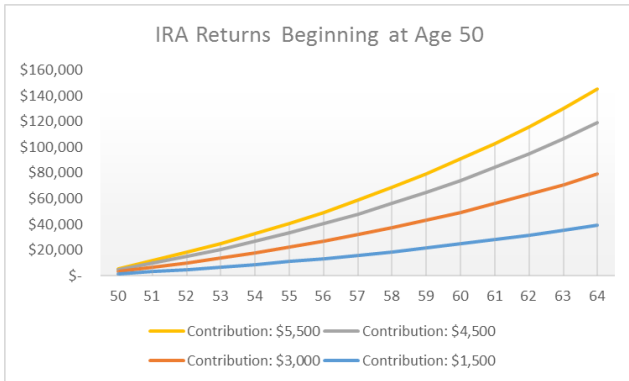
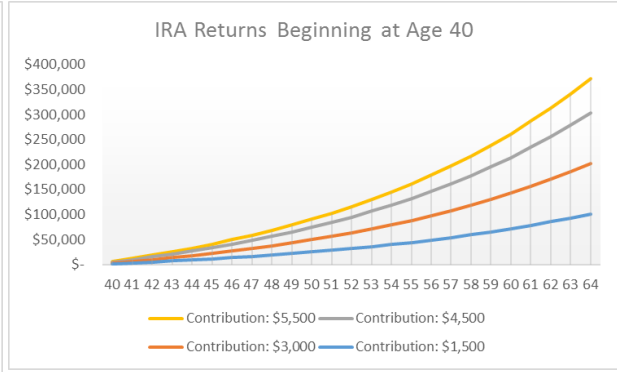
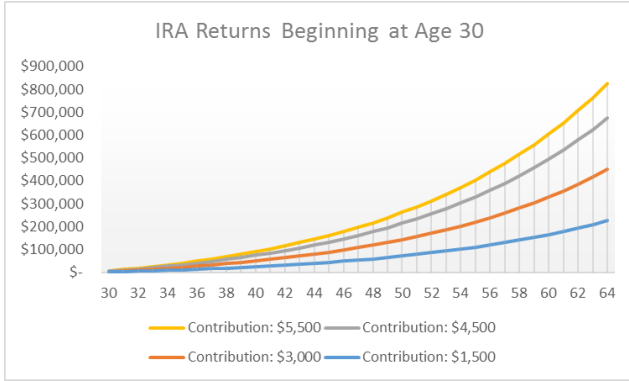
IRA Analysis Results – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value	Total Contributions	Cumulative Interest
1	23	42	\$ 1,500.00	\$ 380,463	\$ 63,000	\$ 317,463
2	23	42	\$ 3,000.00	\$ 760,927	\$ 126,000	\$ 634,927
3	23	42	\$ 4,500.00	\$ 1,141,390	\$ 189,000	\$ 952,390
4	23	42	\$ 5,500.00	\$ 1,395,032	\$ 231,000	\$ 1,164,032
5	25	40	\$ 1,500.00	\$ 328,102	\$ 60,000	\$ 268,102
6	25	40	\$ 3,000.00	\$ 656,203	\$ 120,000	\$ 536,203
7	25	40	\$ 4,500.00	\$ 984,305	\$ 180,000	\$ 804,305
8	25	40	\$ 5,500.00	\$ 1,203,039	\$ 220,000	\$ 983,039
9	30	35	\$ 1,500.00	\$ 225,132	\$ 52,500	\$ 172,632
10	30	35	\$ 3,000.00	\$ 450,264	\$ 105,000	\$ 345,264
11	30	35	\$ 4,500.00	\$ 675,395	\$ 157,500	\$ 517,895
12	30	35	\$ 5,500.00	\$ 825,483	\$ 192,500	\$ 632,983
13	40	25	\$ 1,500.00	\$ 101,259	\$ 37,500	\$ 63,759
14	40	25	\$ 3,000.00	\$ 202,518	\$ 75,000	\$ 127,518
15	40	25	\$ 4,500.00	\$ 303,777	\$ 112,500	\$ 191,277
16	40	25	\$ 5,500.00	\$ 371,283	\$ 137,500	\$ 233,783
17	50	15	\$ 1,500.00	\$ 39,620	\$ 22,500	\$ 17,120
18	50	15	\$ 3,000.00	\$ 79,241	\$ 45,000	\$ 34,241
19	50	15	\$ 4,500.00	\$ 118,861	\$ 67,500	\$ 51,361
20	50	15	\$ 5,500.00	\$ 145,274	\$ 82,500	\$ 62,774

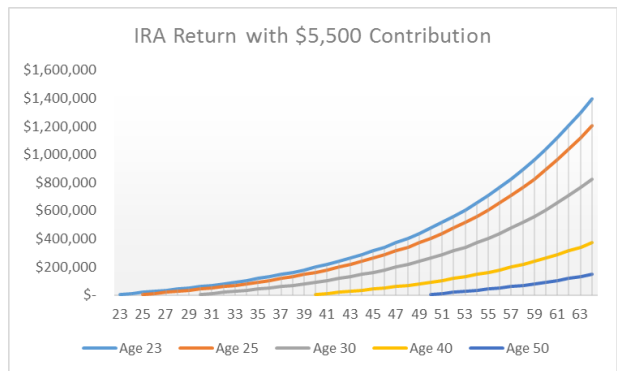
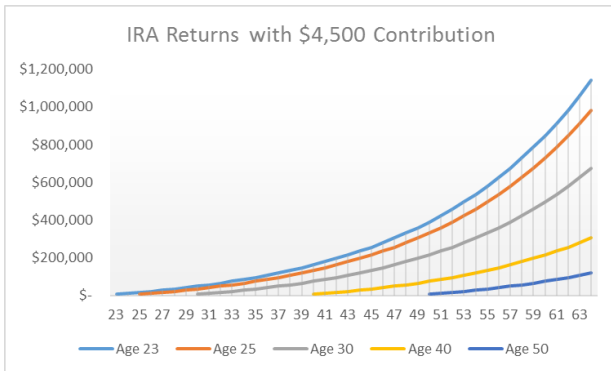
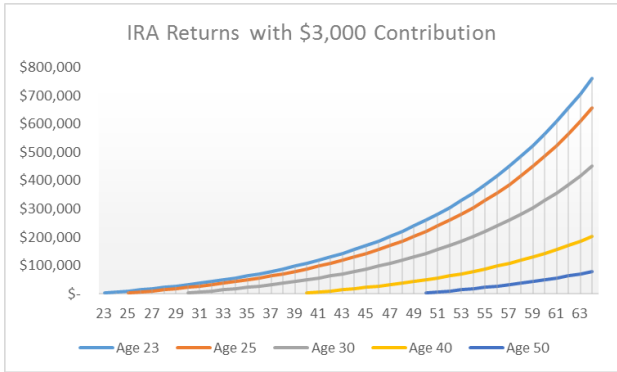
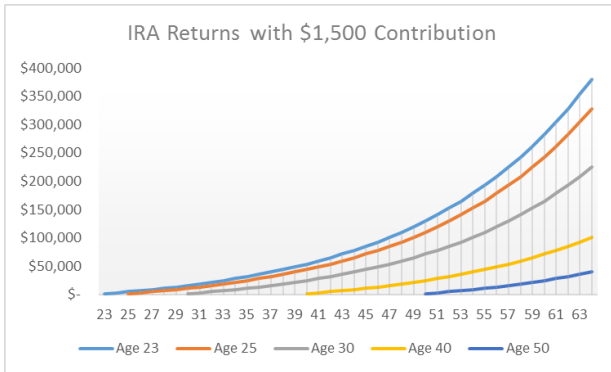


IRA Returns Based on Age (Years till Maturity):





IRA Returns Based on Annual Contribution Amount:

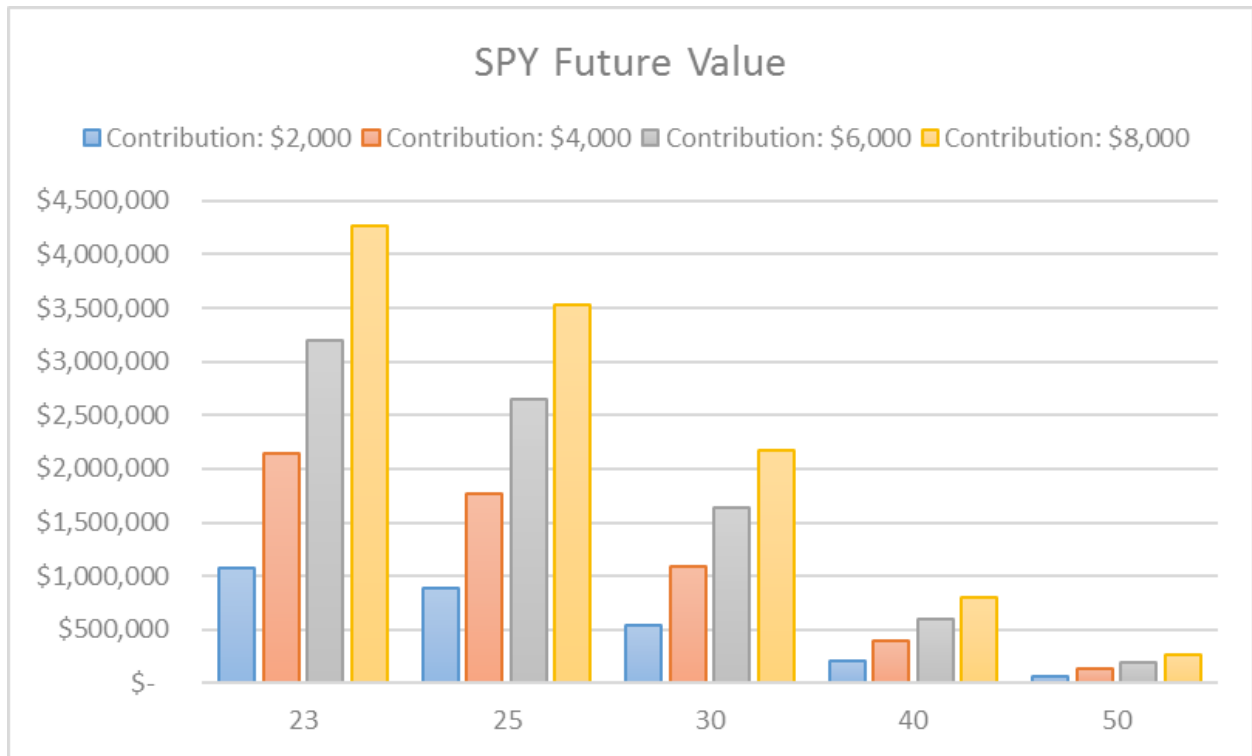


S&P 500 Indexes – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value (SPY)	Future Value (VOO)	Future Value (IVV)
1	23	42	\$ 2,000.00	\$ 1,068,088	\$ 1,078,354	\$ 1,088,726
2	23	42	\$ 4,000.00	\$ 2,136,176	\$ 2,156,708	\$ 2,177,453
3	23	42	\$ 6,000.00	\$ 3,204,264	\$ 3,235,063	\$ 3,266,179
4	23	42	\$ 8,000.00	\$ 4,272,352	\$ 4,313,417	\$ 4,354,906
5	25	40	\$ 2,000.00	\$ 881,873	\$ 889,853	\$ 897,912
6	25	40	\$ 4,000.00	\$ 1,763,746	\$ 1,779,707	\$ 1,795,823
7	25	40	\$ 6,000.00	\$ 2,645,619	\$ 2,669,560	\$ 2,693,735
8	25	40	\$ 8,000.00	\$ 3,527,492	\$ 3,559,413	\$ 3,591,647
9	30	35	\$ 2,000.00	\$ 543,957	\$ 548,128	\$ 552,335
10	30	35	\$ 4,000.00	\$ 1,087,913	\$ 1,096,257	\$ 1,104,670
11	30	35	\$ 6,000.00	\$ 1,631,870	\$ 1,644,385	\$ 1,657,005
12	30	35	\$ 8,000.00	\$ 2,175,826	\$ 2,192,513	\$ 2,209,340
13	40	25	\$ 2,000.00	\$ 200,123	\$ 201,136	\$ 202,154
14	40	25	\$ 4,000.00	\$ 400,247	\$ 402,271	\$ 404,307
15	40	25	\$ 6,000.00	\$ 600,370	\$ 603,407	\$ 606,461
16	40	25	\$ 8,000.00	\$ 800,493	\$ 804,543	\$ 808,615
17	50	15	\$ 2,000.00	\$ 65,453	\$ 65,632	\$ 65,812
18	50	15	\$ 4,000.00	\$ 130,907	\$ 131,264	\$ 131,623
19	50	15	\$ 6,000.00	\$ 196,360	\$ 196,896	\$ 197,435
20	50	15	\$ 8,000.00	\$ 261,814	\$ 262,529	\$ 263,246

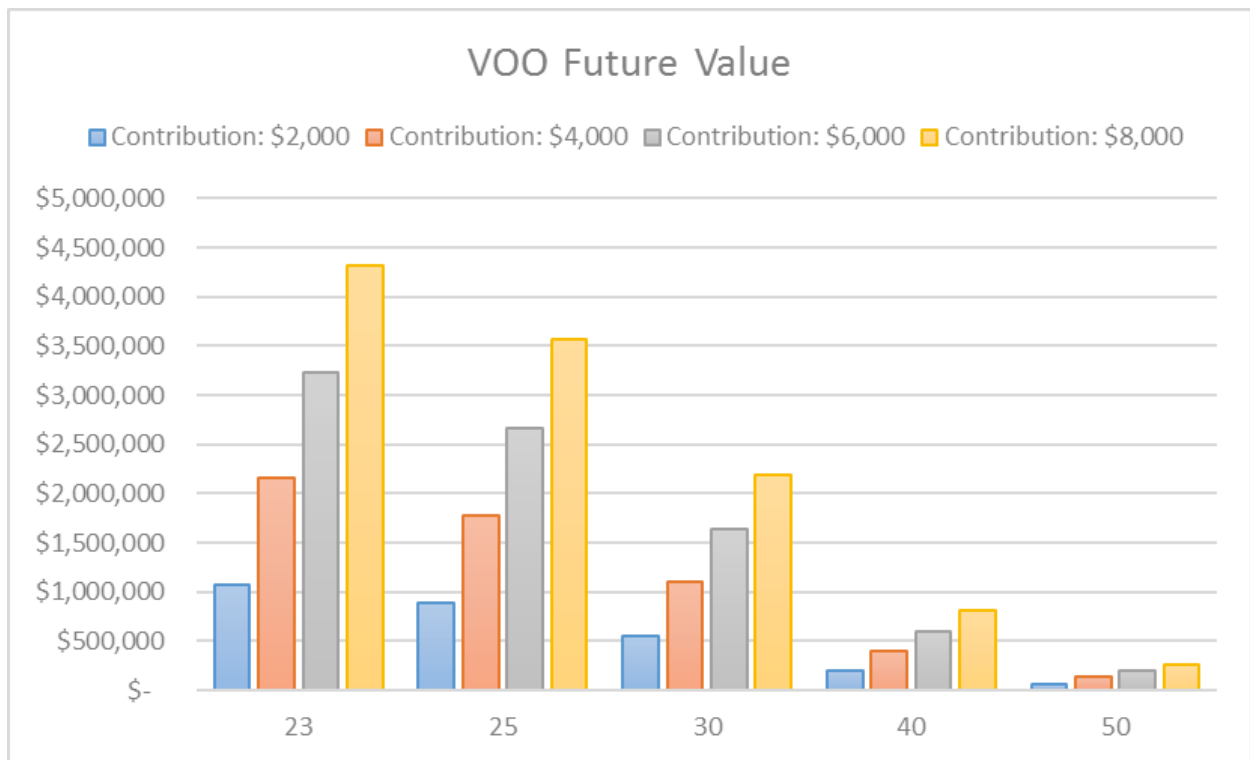
SPDR S&P 500 ETF (SPY) Analysis Results – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value (SPY)	Your Contributions	Cumulative Interest
1	23	42	\$ 2,000.00	\$ 1,068,088	\$ 84,000	\$ 984,088
2	23	42	\$ 4,000.00	\$ 2,136,176	\$ 168,000	\$ 1,968,176
3	23	42	\$ 6,000.00	\$ 3,204,264	\$ 252,000	\$ 2,952,264
4	23	42	\$ 8,000.00	\$ 4,272,352	\$ 336,000	\$ 3,936,352
5	25	40	\$ 2,000.00	\$ 881,873	\$ 80,000	\$ 801,873
6	25	40	\$ 4,000.00	\$ 1,763,746	\$ 160,000	\$ 1,603,746
7	25	40	\$ 6,000.00	\$ 2,645,619	\$ 240,000	\$ 2,405,619
8	25	40	\$ 8,000.00	\$ 3,527,492	\$ 320,000	\$ 3,207,492
9	30	35	\$ 2,000.00	\$ 543,957	\$ 70,000	\$ 473,957
10	30	35	\$ 4,000.00	\$ 1,087,913	\$ 140,000	\$ 947,913
11	30	35	\$ 6,000.00	\$ 1,631,870	\$ 210,000	\$ 1,421,870
12	30	35	\$ 8,000.00	\$ 2,175,826	\$ 280,000	\$ 1,895,826
13	40	25	\$ 2,000.00	\$ 200,123	\$ 50,000	\$ 150,123
14	40	25	\$ 4,000.00	\$ 400,247	\$ 100,000	\$ 300,247
15	40	25	\$ 6,000.00	\$ 600,370	\$ 150,000	\$ 450,370
16	40	25	\$ 8,000.00	\$ 800,493	\$ 200,000	\$ 600,493
17	50	15	\$ 2,000.00	\$ 65,453	\$ 30,000	\$ 35,453
18	50	15	\$ 4,000.00	\$ 130,907	\$ 60,000	\$ 70,907
19	50	15	\$ 6,000.00	\$ 196,360	\$ 90,000	\$ 106,360
20	50	15	\$ 8,000.00	\$ 261,814	\$ 120,000	\$ 141,814



Vanguard S&P 500 ETF (VOO) Analysis Results – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value (VOO)	Your Contributions	Cumulative Interest
1	23	42	\$ 2,000.00	\$ 1,078,354	\$ 84,000	\$ 994,354
2	23	42	\$ 4,000.00	\$ 2,156,708	\$ 168,000	\$ 1,988,708
3	23	42	\$ 6,000.00	\$ 3,235,063	\$ 252,000	\$ 2,983,063
4	23	42	\$ 8,000.00	\$ 4,313,417	\$ 336,000	\$ 3,977,417
5	25	40	\$ 2,000.00	\$ 889,853	\$ 80,000	\$ 809,853
6	25	40	\$ 4,000.00	\$ 1,779,707	\$ 160,000	\$ 1,619,707
7	25	40	\$ 6,000.00	\$ 2,669,560	\$ 240,000	\$ 2,429,560
8	25	40	\$ 8,000.00	\$ 3,559,413	\$ 320,000	\$ 3,239,413
9	30	35	\$ 2,000.00	\$ 548,128	\$ 70,000	\$ 478,128
10	30	35	\$ 4,000.00	\$ 1,096,257	\$ 140,000	\$ 956,257
11	30	35	\$ 6,000.00	\$ 1,644,385	\$ 210,000	\$ 1,434,385
12	30	35	\$ 8,000.00	\$ 2,192,513	\$ 280,000	\$ 1,912,513
13	40	25	\$ 2,000.00	\$ 201,136	\$ 50,000	\$ 151,136
14	40	25	\$ 4,000.00	\$ 402,271	\$ 100,000	\$ 302,271
15	40	25	\$ 6,000.00	\$ 603,407	\$ 150,000	\$ 453,407
16	40	25	\$ 8,000.00	\$ 804,543	\$ 200,000	\$ 604,543
17	50	15	\$ 2,000.00	\$ 65,632	\$ 30,000	\$ 35,632
18	50	15	\$ 4,000.00	\$ 131,264	\$ 60,000	\$ 71,264
19	50	15	\$ 6,000.00	\$ 196,896	\$ 90,000	\$ 106,896
20	50	15	\$ 8,000.00	\$ 262,529	\$ 120,000	\$ 142,529



iShares Core S&P 500 ETF (IVV) Analysis Results – 7% Nominal Rate of Return

Scenario #	Age	Years till Maturity	Contribution Amount	Future Value (IVV)	Your Contributions	Cumulative Interest
1	23	42	\$ 2,000.00	\$ 1,088,726	\$ 84,000	\$ 1,004,726
2	23	42	\$ 4,000.00	\$ 2,177,453	\$ 168,000	\$ 2,009,453
3	23	42	\$ 6,000.00	\$ 3,266,179	\$ 252,000	\$ 3,014,179
4	23	42	\$ 8,000.00	\$ 4,354,906	\$ 336,000	\$ 4,018,906
5	25	40	\$ 2,000.00	\$ 897,912	\$ 80,000	\$ 817,912
6	25	40	\$ 4,000.00	\$ 1,795,823	\$ 160,000	\$ 1,635,823
7	25	40	\$ 6,000.00	\$ 2,693,735	\$ 240,000	\$ 2,453,735
8	25	40	\$ 8,000.00	\$ 3,591,647	\$ 320,000	\$ 3,271,647
9	30	35	\$ 2,000.00	\$ 552,335	\$ 70,000	\$ 482,335
10	30	35	\$ 4,000.00	\$ 1,104,670	\$ 140,000	\$ 964,670
11	30	35	\$ 6,000.00	\$ 1,657,005	\$ 210,000	\$ 1,447,005
12	30	35	\$ 8,000.00	\$ 2,209,340	\$ 280,000	\$ 1,929,340
13	40	25	\$ 2,000.00	\$ 202,154	\$ 50,000	\$ 152,154
14	40	25	\$ 4,000.00	\$ 404,307	\$ 100,000	\$ 304,307
15	40	25	\$ 6,000.00	\$ 606,461	\$ 150,000	\$ 456,461
16	40	25	\$ 8,000.00	\$ 808,615	\$ 200,000	\$ 608,615
17	50	15	\$ 2,000.00	\$ 65,812	\$ 30,000	\$ 35,812
18	50	15	\$ 4,000.00	\$ 131,623	\$ 60,000	\$ 71,623
19	50	15	\$ 6,000.00	\$ 197,435	\$ 90,000	\$ 107,435
20	50	15	\$ 8,000.00	\$ 263,246	\$ 120,000	\$ 143,246

