Personal Financial Engineering

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1 Introduction

This contains all my knowledge about personal finance and how to allocate one's money. Partially inspired by Carey Nachenberg's Finance 101 guide. You should go read that first.

Written with Emacs Org-mode and LaTeX

2 Goals

I attempt to structure my financial goals with my life goals. This maximizes the chance that I will have what I consider a fulfilling life. The following are some of my financial goals to help me accomplish some life goals.

2.1 Keep up with Inflation

Unfortunately, inflation exists and will continue to exist. Therefore, my goal is to preserve some of my capital, so that time does not at least work against me. Inflation is normally quoted at 2% a year, thus I will need to find some instruments that increase its value by at least 2%.

Note that inflation is actually good for the overall economy. Due to inflation, your money is worth more today than tomorrow. Thus you are incentivized to spend your money now, rather than later. Moreover, if there were deflation, the opposite is true; you are incentivzed to save your money, since money tomorrow is worth more than money tomorrow. That's the theoretical implication anyway. This incentives money velocity, which is a large part of economics.

2.2 Financial Safety and Risk

There is no free lunch however. We have to take risks in order to grow money. The easiest way to kep your money risk free is to stash it under your mattress. (It could be argued that actually carries some risk, because if your house burns down then all your money is gone too)

However, with proper diversification and capital allocation, when can grow our funds while managing risk appropriately. Thus my goal is to achieve some financial safety for my capital while taking the appropriate risks to grow my capital.

2.3 Financial Independence

Financial Independence (FI) is the status of having enough capital to pay for your expenses for the rest of your life without having to be dependent on employment income or others. You live off passive income sources. FI should be able to survive through economic downturns.

2.4 Early "Retirement"

Tied with Financial Independence is Early Retirement, where you can quit your day job. Somewhat ideal, but I doubt I would actually retire early and do nothing, rather I would do my own projects that would stimulate/interest me.

3 Financial Setup

3.1 Emergency Fund

The concept of an emergency fund is that everyone needs a relatively liquid amount of capital that is not touched unless you have some financial emergency that people cannot pay out of pocket with their normal cash flow.

For most people, 3-6 months of expenses is good. 9+ months may be necessary if your income is unstable. What you should not do is invest your emergency fund, because in a market downturn, you want your money to be available; the major risk of investing your emergency fund is having to sell when the market is down (locking in losses) and you may lose your job at the same time, which doubly compounds your worries. One month of expenses means everything you need to survive for a month, including rent, food, etc.

Having 1 month of savings in your checking account, and 2-6 months of money in savings accounts is an adequate emergency fund. If you are concerned about low interest rates, then a third tier of I-Series bonds could suffice.

3.2 Capital Tiers

This is my planned financial setup, ranging from most liquid and least risk to most illiquid and most risky. I aim to hold at least one month's worth of cash on hand to cover immediate expenses.

For my emergency fund, I plan on having a mixture of accounts saved in high yield savings accounts and treasury funds. My emergency fund should hold around 7 months of savings to be used in emerencies. Lastly, the majority of my money goes into various taxable and tax-advantaged accounts.

3.2.1 Checking Account

My checking account should hold about 1 month's worth of expenses. I want this account to be as liquid as possible and be able to access my accounts as often as I want to. Ideally, this account would have no enforced minimums and zero fees. Bonus points for mobile checking.

1. Fidelity Cash Management

   This is my ideal candidate for a liquid checking account. There are zero fees (international spending included), the account refunds all ATM fees, free wires and transfers, and no minimums. Fidelity Cash Management is technically a brokerage account with a lot of great checking features.

   What's most interesting is that you can purchase Fidelity's money markets mutual funds with this account, and still keep all the funds liquid. If you withdraw money and you don't have enough cash in the account, then Fidelity will automatically sell some of your money market fund holdings in order to cover the difference, as specified in their overdraft policies for the cash management account. The 7-day yield for SPRXX as of 3/28/2020 is 1.38% after fees. The money market fund returns vary anywhere from 1.0-2.2% before taxes. I park my funds in the Fidelity California Money Market fund, which has higher yield usually and avoids California's state tax.

   So you get the benefits of a completely free and easy to access checking account with the return of a comparable high yields savings account. Cash in account is FDIC insured up to $1.25 million, and cash in the money market funds is SIPC insured up to $500,000.

In my opinion, this is the best "checking" account there is possible. The only downsides is that you cannot deposit cash (who uses cash these days) and that some deposits may be slow to be cleared. The only real monetary risk is that the buck can break.

2. Ally Bank Checking

   This account does not reward an incredibly high amount of interest compared to Fidelity's offering, at 0.1% APY for balances less than $15,000, and 0.5% APY for daily balances above $15,000. However, you would rarely want to even keep $15,000 in your checking account since rates for high yield savings accounts are so much better.

   On the other hand, Ally is known for their good customer service and mobile app. They are an online only bank, so you cannot walk into a branch and do your business, but everything you can do in person, you can do online (except deposit cash, but if you have a large amount of cash, keep a local credit union account open). If you're chasing high interest rates, Ally allows a high transfer limit while allowing you to earn interest on your money. They also allow a large amount of external accounts, allowing you to view and transfer your money with ease. Overall, a solid account.

3. Alliant Credit Union

   If you like banking with credit unions, Alliant credit union is one of the credit unions that many people can join. Their checking account pays a nice 0.45% APY. If you are not local to their branch (like me) you can make a small $5 dollar donation to Foster Care for Success in order to gain membership. Overall, Alliant is one of the better options for checking accounts and personal banking in general.

4. High Interest Rewards Checking Accounts

   Some checking accounts pay no interest. Then there are some checking accounts that pay up to 5% APY. Rewards checking accounts pay much higher interest rates, even higher than some high yield savings accounts. Most of their requirements are usually something like the following:

   - Enroll in electronic statements
   - Make one automatic deposit (sometimes this must be a payroll deposit)
   - Make at least 10 deposits per month using their debit card.

   All they ask you is to use their account as your main bank account, and they reward you with high interest rates (although only up to a certain maximum balance).

   The flaw in this is that you are relying on debit rather than credit. Building credit is very important, and making at least 10 purchases with your debit card often means you forgo using your credit card. Moreover, you lose out on the cash back bonuses from your credit card, you lose out on opportunities to build credit, and you lose credit card protections (fradulent purchases, transaction disputes, etc. Also, buying on credit is an interest free loan from your credit card company if you pay on time every month). However, if you're a high spender and can stomach less credit card usage, rewards checking may be for you. I personally am not a fan of this, because you often won't be making that much per year (usually less than a thousand a year), in exchange for some non-trivial requirements.

   Find out various rewards checking offers here.

3.2.2 High Yield Savings Account/Money Market Account

High Yields savings accounts are savings accounts that can pay many times more interest for your money compared to normal savings accounts. Some high yields savings accounts have paid 2% or so in the past, compared to 0.1% that is common for most banks. High yields savings accounts are usually offered by online banks, which do have physical branches you can walk into, but you can do most banking (except depositing cash but who has large amounts of dollar bills these days anyway) with your online bank. Because they don't have to pay for physical branches, they can afford to pay higher intereste fees.

Savings accounts are less liquid accounts that should provide slightly higher return over the long term compared to normal checking accounts. Savings accounts are considered less liquid because you can only withdraw 6 times a month before incurring fees. Historically, high yields savings accounts were used to store money to beat inflation slightly and make progress towards certain savings goals (such as a down payment). However, many high yield accounts yield less than 2%, but these are still the best liquid accounts we can get.

There are a lot of online credit unions that allow you to pay a small one time membership fee in exchange for access to one of their high interest accounts. I've listed some of these credit unions below.

I find most of my information from Doctor of Credit's High Yield Savings List, an invaluable resource. The list is updated constantly, and has user reviews and comments that add details for each account.

Below are what I believe to be the best options. I don't place all of my savings in one account, because some accounts offer high interest accounts for low balances; hence my savings are rather spread out amongst institutions.

1. Patelco Credit Union Reverse Tier Money Market

   Essentially, this account is good for small balances to accrue APY. The APY tiers are as follows.

Amount ($)	APY
0-2000	2%
2000.01-5000	1%
5000.01-10000	0.5%
10000+	0.35%

   This account was better when the top APY was 3% rather than 2% before the Fed dropped rates. But it's still a decent account that gives you a high APY for small balances. The 2% still beats most other current high yields savings accounts.

2. DCU Primary Savings

   DCU's savings account rewards small balances up to $1,000 with a yield of 6.17% APY. The account pays a whooping 6.17% APY on the first $1,000, then the APY drops steeply after that. DCU is a credit union that is local to Massachusetts, but anyone can sign up by becoming a member of the Reach Out for Schools non-profit, which costs a single donation of $10 dollars to join. There are no yearly fees.

   In my opinion, it's almost always worth putting a thousand into this account and generating sixty dollars a year. In an interest starved environment, we have to eke out what we can. I can personally vouch for this account, as I am using it now.

3. Ally Bank High Yields Savings

   Aside from small fund accounts, Ally is a good general savings account. Ally bank was my first online savings account that I opened, aside from Wells Fargo which I closed. Ally is one of the most trusted online banks and has a good reputation online (highly recommended by r/personalfinance and Bogleheads. They have a good website/mobile app, and makes it very easy to manage all your money. They're also a good general bank with different CD, mortgages, and other financial services. Everything I mentioned about their checking account also applies to Ally's savings account.

   Ally currently offers 1.5% APY. Unlike the previous two institions, Ally's rates do not have a maximum cap, which makes Ally a good general bank to store your savings. If you're undecided about where to store your money, Ally bank is a good default option.

4. Other Good High Yield Savings Account Options

   Credit unions often have some high yield savings account that is capped by some balance, such as DCU ($1,000 capfor 6.17%) or Patelco. These credit unions often have some method to donate to some charity to gain membership. The high interest balances may be small and may require you to spread out your money into more disparate accounts, but its a way to squeeze out more interest in a low interest environment. The following is a list of credit unions that also have some good high APY savings accounts.

   - BECU Member Advantage Savings
   - Premier Members Credit Union Reverse Tier Money Market
   - Blue Federal Credit Union
   - Redstone Federal Credit Union Brighter Day Savings
   - St. Mary's Bank Rainy Day Savings

   Here are some other great high yields savings accounts that don't have some maximum balance. Pick and choose based on the interest rate, potential signup bonus, and general banking features (mobile app, ease of use, online transfer limits, etc).

   - `https://www.marcus.com/us/en/savings`
   - `https://www.bankrate.com/banks/sterling-national-bank/125471/`
   - `https://www.alliantcreditunion.org/bank/high-yield-savings`
   - `https://www.americanexpress.com/personalsavings/home.html`
   - `https://www.briodirectbanking.com/high-yield-savings/`
   - `https://firstfoundationinc.com/personal-banking/bank/online-savings`

   After the Fed dropped interest rates to 0-0.25%, high yields interest rates have been dropping as well, but these accounts are still worth considering. Check Doctor of Credit's High Yield Savings List for the latest information.

5. Prepaid Savings Accounts

   An interesting type of account is to have signup for a special type of credit card, prepay it, then move that money into a special savings account you can only have with the credit card. The savings account is the best part however, it pays about 5% APY on account balances up to $1,000. There are seven total cards that allow this, each 5% APY up to $1,000, so you can earn 5% on $7,000.

I'm wary of these accounts, because of the amount of hoops you have to jump through to get the APY. People on the Bogleheads forum have said this checks out however, so if you're adventurous give it a shot. I might try it out myself one day.

3.2.3 Short term treasury bills fund and ISeries Bonds

In theory, you could also use fixed income to supplement your emergency fund. This of course introduces more risk and less liquidity. However, conventional finances tell us that the bonds should be relatively liquid, and U.S. T-Bills are considered risk-free, i.e. the U.S. government will never default on its debt obligations. Moreover, if interest rates fall, then high yields savings APY rates will also fall in general, but bond values should increase because their interest rates are fixed. Hence there is some downside protection from macro economic trends.

ISeries bonds are a good option to look into to park cash. They have two components to their interest rate: the variable inflation rate and a fixed rate. Therefore, these bonds are guaranteed to at least keep up with inflation, with some possibility of profit based on the fixed rate. In shaky financial times, these bonds are very popular. These bonds cannot be sold on a secondary market. You can only buy and sell from the U.S. government on their (shitty looking) website.

Liquidity wise, ISeries bonds cannot be sold within the first year they are bought. They can be sold after the first year, but if you sell the bonds before the full maturity date, then you lose the last three months of interest. I believe ISeries bonds usually lock up your money for up to 5 years.

An option then is to build a ladder of ISeries bonds, such that you have some money being released from ISeries bonds every year, and after that year put the money back into another ISeries bond. If you have 5 bonds rotating, you should effectively have one year of free cash, 3 years of slightly penalized cash, and one year of cash you cannot touch.

ISeries bonds are good options to add to your emergency and savings fund setup, but are obviously less liquid. However, their upside is that they are at least guaranteed to beat inflation and can provide some decent yield. In low interest rate times, high yields savings accounts may come close to inflation but do not beat inflation (which is about ~2% a year or so).

(Well, now that the Fed's interest rates are zero, bonds are looking quite a bit better.)

3.2.4 Laddered CDs

Certified deposits lock away your money for a certain time period and also locks in a certain interest rate. CD yields are often lower than high yields savings accounts, but carries less risk because the interest rate cannot change, protecting you if interest rates dip. You get your money + interest at the end of the CD's life. withdrawing your money early usually results in a penalty.

An alternative to having bonds in your emergency fund, at the expense of liquidity, is to have a laddered CD. The idea is to have a revolving set of CDs, so that you always have some cash that is available each year. Each year, when the next CD is about to expire and release some more of your money, you lock in another CD with your current money. For example, you can have five 5-year term CDs, and each year you revolve around having these CDs.

I don't favor this idea, because it requires a good amount of money to have adequate CD rotation. Moreover, CD rates aren't exactly too much higher compared to regular savings or money markets accounts in exchange for much less liquidity.

3.2.5 Investment Accounts

A longer treatment of various investment strategies is below. Here are some brokerage options.

Honestly, there's not much difference between brokerages. Most of them have free commission and access to most securities you will want to hold.

1. Vanguard

   I use Vanguard as my broker. They have cheap fees, and their admiral index funds are only available to Vanguard users. That said, their ETFs are just as cheap and are available to everyone.

   I also like their ownership structure. They are owned by its funds, which are in turn owned by their customers. Their interests are aligned with the customers (supposedly anyway) and so should do the right thing for their customers in the long run. Additionally, they were founded by Jack Bogle, one of the initial believes in index funds.

   Note that Vanguard's money market mutual funds are usually considered the best, they have low costs and higher yields than other funds. If you want a place to park cash temporarily, then VMMXX is a great option.

2. Fidelity

   I don't use Fidelity, but along the lines of exclusive mutual funds are Fidelity's zero cost mutual funds. If you are attracted to zero costs, then use Fidelity. You can't access these outside of Fidelity. Do note that these funds don't track an outside index like the S&P 500, but Fidelity's own index that

   I believe Fidelity's total market and S&P 500 funds have slightly lower costs than Vanguard's but their overall cost is higher if you want to get into some slightly less well known stuff, especially small cap and value indices if you are factor investing.

   If you use Fidelity's Cash Management service, then you are probably also incentivized to use their brokerage services.

3. Charles Schwab

   Reading Bogleheads and r/personalfinance tells me Schwab is a good brokerage with very little fees. I have no experience with this brokerage personally.

4. M1 Finance

   A simple robo advisor. They can automate your new contributions to maintain specific allocations that you have defined.

   Personally, I am most interested in their cheap margin loans for leveraged investing. Other brokerages have higher interest rates (Vanguard's interest rates start at 8.5%) whereas M1 Finance charges a flat 3.5%. If you are a long term investor assuming a growth of 7-8% after inflation, then M1 Finance's margin rates are pretty much the only way to lever up your portfolio at a reasonable rate for a young investor with less capital. (I talk more about using leverage for investing here)

5. Robinhood

   The pioneer of free everything on mobile brokerages. They first introduced zero commissions on trading, and now all brokerages have driven commissions to zero. A great mobile app, and free options trading if you like a bit of risk. The user experience of older brokerages sucks; Vanguard signup requires using paper mail, compared to Robinhood's seamless user onboarding. Robinhood is what I hope brokerages look like in the future.

Robinhood also provides leverage through Robinhood Gold. It requires a monthly subscription however, which must be factored into the rate.

4 Investments

This is a very long section, because investing is a complicated topic. There are many styles and beliefs in investing, and I try to cut through them to find out what is true and false.

More importantly, I try to find sources for what I believe, especially academically reviewed financial papers. I believe that there is a right way to invest based on historical data and research. It is also important to not invest emotionally, but intelligently.

4.1 Investment Philosophy

I prefer to invest in low cost, broadly diversified index funds. My belief is back by academic review evidence, detailed below. Feel free to skip this section if you already passively invest for the long term.

4.1.1 Efficient Market Hypothesis

An efficient market is a market in which asset prices fully reflect all information available to the public. If this is true, then the only way to profit from an asset market is to take risks that has already been priced into the market (ex: Google's cloud platform could take over the market, but it faces competition. If GCP takes over the market, then Google's stock prices rises. This is visible to all investors.) If the efficient market hypothesis is not true, then it is possible to *consistently* buy under valued stocks and sell overvalued stocks.

Of course, real life markets can only approach efficient markets. There is undoubtedly inefficiencies that allow arbitrage to occur: the Medallion Fund's stellar returns reflect that there are opportunities to gain a profit aside from market growth. However, for the average investor, empiracal evidence tells us that it is almost impossible to consistently pick the best stocks, and active managers also do not produce better risk adjusted returns.

There are good reasons to believe that markets should approach efficiency, aside from the fact that it is difficult to pick stocks correctly in the long run. Buyers and sellers compete in capital markets for their self interest. Buyers and sellers come to a agreement of the price to execute the trade. At high enough volume of trades (liquidity), the price becomes a mechanism to collect all information that buyers and sellers have (by putting a trade order out, you are affecting the price of the security, hence you are signaling you have some information that leads you to believe that some security is worth some price). No market participant can interact with the market in isolation (aside from illegal insider trading). All of this makes it very hard to trade on information, because you do not know how the trader on the other side has interpreted that same information.

Some hedge funds and quants may be able to identify arbitrage opportunities through advanced computing. *Retail* investors, without big fancy statistical machine learning models and GPU farms to crunch through data, are at a massive disadvantage compared institutional investors. Retail investors may be able to pull off a win once in a while due to luck; just as many lose money due to that same luck. Only with massive amounts of data can you truly identify arbitrage opportunities; without such information advantages, it is impossible to attribute stock picking success to skill rather than luck. Institutional investors are likely to come up with prices closer to the true intrinsic value of a security. For more information about why it is so hard to pick out the true intrinsic price of a security, watch this or this.

Therefore, retail investors should rely on the growth of capitalism and risks that have already been priced into the markets to grow their capital.

4.1.2 Active Management vs Passive Management

Active Management is the belief that a skilled manager can accurately pick stocks to grow capital in *excess* of the market. Market benchmarks are typically considered as broad indicies of stocks, such as the famed S&P 500 or a total market index. Because active management requires skill, actively managed funds often have higher fees associated with them (in the 1-3% range). Because actively managed funds have such high fees, they must profits returns in excess of the fees + the market benchmark before they can truly claim they have beat the market, else the fees eat away at returns.

Passive Management is the belief that because stock picking is so hard, investing in the market indices themselves is the best way to turn a risk-adjusted profit in the long term. Because there is no active stock picking to be done, index funds have much lower fees (Vanguard's fees for the S&P 500 is just 0.4% per year).

Buffet famously offered a 1 million dollar bet against hedge funds, claiming that the S&P 500 would out perform the hedge funds. Buffet won by a large margin, where the S&P 500 beat all the hedge funds in all years except in the beginning of the 2008 financial crisis. Of course, Buffet was helped out by an extraordinarily long bull run, and 10 years is technically not even long in terms of capital markets. But its a popular story for those who advocate for low cost diversifed index funds.

Eugene Fama and Kenneth French's paper titled Luck versus Skill in the Cross-Section of Mutual Fund Returns sampled 3165 mutual funds between 1984-2006 and found that very few actively managed funds even managed to cover their cost, let alone produce profits in excess of the market. According to Morningstar, who tracked the performance of actively managed funds compared to passively managed funds, found that only 38% of actively managed funds outperformed passive index funds in 2017. Only 24% of actively managed funds actually beat their passive rivals in longer time horizons of 10+ years.

This statistics are bolstered by the fact that active funds who do badly go out of business. Hence, there is a lot of history and survivorship bias that indicates that some active funds beat their benchmark. One of the most important things to realize is that past performance does not indicate future performance. The Tiger Fund, formed in 1980, spent 18 years beating the S&P 500, managing about 30% returns every year. The following 2 years, the fund lost roughly half its value and closed its doors. The lesson to be learned is that stellar performance does not predict future stellar performance. Indeed, returns can be easily reversed while trying actively managed strategies.

TLDR: pick passively managed, low cost, diversified index funds.

1. Aside: Dave Ramsay's Bad Advice Some people listen to Dave Ramsay. You should probably only listen to his debt management advice, with a grain of salt. He advocates for emotionally better ways to management debt (paying off the smallest debt first) rather than the mathematically best way to pay off debt (pay off the highest interest rate first); however, people that get into enormous amounts of debt aren't mathematically inclined anyway, so this advice may be good.

   More importantly, Ramsay advices that you pick a active management mutual fund that has shown great past performance. Aside from what we have seen that past performance does not indicate future performance, Ramsay does not publically say which active funds he himself uses. He refers you to a financial advisor he calls "Smartvestor Pro", who pitches to you expensive funds that the advisor gets to make a commission on for selling to you. Ramsay makes money from the advisors he refers clients to. Hence, their profit incentive is entirely against your own best interest.

Ignore Dave Ramsay; stick to low cost, broadly diversified index funds.

4.2 Which Index Funds?

So I've gone on and on about why I invest with cheap passively managed index funds. Unfortunately, *not* all index funds are born equal. Some funds and types of securities have produced better risk-adjusted returns in the long run. Here I go over how to select certain types of index funds.

4.2.1 3-Fund Portfolio and Asset Allocation

The 3 fund portfolio is the classic Bogleheads portfolio; the default portfolio that is recommended to new investors. You can't really go wrong with this portfolio. It is assumed that all investors should hold domestic U.S. stocks, international stocks, and U.S. bonds. Thus, we construct the portfolio to have these three things. The Bogleheads wiki has information on which specific funds can qualify.

The 3-fund portfolio, as passionately advocated by Taylor Larimore, is very simple and easy to maintain, very diversified (almost 15,000 securities worldwide), very low expense ratios, very low turnover costs (selling and buing securities causes taxable events that are passed onto customers), no tracking error, no front-loaded costs, and essentially guaranteed to perform as well as the market.

Taylor's recommends that 20% of your portfolio is dedicated to international stocks. He has no sound analysis for this, only his preference. I prefer to weight international equities higher; by capitalization markets, the U.S. market is about 55% of the world's equities. Therefore, by underweighting interntional stocks, you are underweighting half the securities market. I prefer a more even split on domestic and international stocks. See my discussion on home country bias.

The 3-fund portfolio is probably the most efficient portfolio that tracks the market. Statistically, a market portfolio will outperform an actively managed portfolio in the long run. A 3-fund portfolio is therefore the best portfolio who want long term growth without taking on any extra risk.

1. Total Market Index

   A Total Market Index tracks all publically traded U.S. corporations, weighted by their market cap. Thus, I consider this index to be better than a S&P 500 index, since the Total Market includes all those 500 companies, but many more companies to increase diversification, though it is still heavily weighted towards the biggest companies. Diversification reduces risk and also increases returns. Additionally, they include some small cap companies, which we see later improves returns in the long run.

2. Total Bond Index

   I recommend that young investors start out with zero allocation to bonds, because the time horizon is much longer and we can stomach market downturns in order to maximize our long term gains. When you start getting older, then you should allocate more to bonds, to reduce risk as you get closer to retirement.

   However, bonds play an important role in a portfolio, because while their returns are not as stellar as equities in the long run, their downside potential is consequently much less compared to equities. Thus, an investor should consider how much risk they can tolerate when deciding their bond allocation.

3. International Index

   According to Dimensional's analysis of "the Lost Decade", the first decade of the 21st century produced mediocre returns for the S&P 500. Yet more surprisingly is that international stocks, especially emerging markets stocks outperformed the U.S. Thus, had U.S. investors invested more globally, they could have captured some of those returns and avoided the lost decade. Some argue that U.S. investors don't need international exposure, since U.S. corporations have so many global supply chains that they inherently get international exposure. There is no real evidence to support this, and not all companies have global supply chains; this is probably only true of large corporations. Additionally, you also miss out on growth and arbitrage opportunities in international markets that don't affect developed markets.

   The decade following flipped the script. The U.S. entered a bull market (that just ended due partially to COVID-19) and vastly outperformed the international equities. Its been considered China's lost decade due to their disappointing growth.

   Thus, it is important to invest internationally and domestically, because we never know where the growth will come from. Diversification increases returns once again while reducing risk.

4. The three funds

   I would choose (using Vanguard ETFs) the following (90/10 means 90% stocks and 10 % bonds). The more bonds, the more conservative but more stable your long term investments are. The more equities, the your long term holdings should experience more growth. As you age and near retirement, you should increase your bond holdings over time.

Ticker	Name	Expense Ratio	100/0	90/10	80/20	70/30	60/40
VTI	Total Stock Market ETF	0.03%	50%	45%	40%	35%	30%
VXUS	Total International Stock ETF	0.08%	50%	45%	40%	35%	30%
BND	Total Bond Market ETF	0.035%	0%	10%	20%	30%	40%
		Total ER	0.055%	0.053%	0.051%	0.049%	0.047%

   On average, with an 80/20 portfolio, you would pay \$5.10 dollars per year to expense ratios. This is very cheap. The goal is to minimize costs, because they are a significant factor reducing your long term growth potential. In comparison to an actively managed portfolio that charges 1-2%, you would be paying \$100 dollars every year per \$10,000; the actively managed portfolio must outperform the total market index by 1% each year in order to break even before even starting to consider excess returns.

   All in all, this is a very cheap and easy to maintain portfolio that should suit most passive investors.

4.2.2 Factor Investing and DFA

While a 3-fund portfolio is a simple option that is easy to allocate to, it potentially misses out on maximizing certain stock characteristics that produce greater risk-adjusted returns in the long run. There are called factors, first introduced by Fama and French in their famous paper describgin the 3-factor model. Since then, the number of factors has been expanded.

A simple way to think about factors is that they are a set of characteristics that are applicable to a broad range of asset classes in each security, across most of the financial time data we have available to us. Factors explain more of the differences between individual stock returns and the overall market. The goal of factors is to help "tilt" a portfolio towards equities and securities that produce better risk-adjusted returns in the long run. By risk-adjusted, it means by holding these types of securities, you expose your portfolio to more risk but in return you receive more returns in the long run. We are trying to optimize for risk-adjusted returns by selecting classes of securities that perform better in exchange for being riskier, in the hopes that overtime, taking on more risk produces more returns.

This may sound a little like active management; didn't we just go through a whole bunch of evidence that active management sucks? The difference here is that we are not trying to pick individual stocks to beat the market. We are overweighting certain asset classes because the data tells us that they have produced higher returns. However, these higher returns don't come out of nowhere (there is no free lunch). The higher returns are comphensated with higher downside risk.

Another way to explain it is that a total market index weights according to company market caps; there are other ways to weight too, that still allow for diversified portfolios. A total market index may include a large portion of high market cap stocks as a result, but according to historical data, this may not be efficient, as we will see with small cap stocks.

Another difference from active management is that factor investing is evidence based investing. The factors have been chosen based on statistically significant advantages based on historical data. When we choose to tilt our portfolio in a certain way, it is due to evidence rather than gut feeling that a certain type of stock will perform in a certain way.

There is of course the maxim "past performance does not indicate future performance." Hence, there is the risk attached to factor investing. But because there are risk-based explanations for why factors produce higher returns, there is reason to believe that factors will continue to produce higher premiums in the future. If a factor was based on human behavior, then we would expect a factor disappear once it is discovered, much like how most arbitrage opportunities disappear once they are widely known. But if it is a risk-based advantage, then factors should be priced into the market for their risk.

I am going off of the factors that Dimensional Fund Advisors (DFA) targets. DFA was started to create factor tracking indices, and both Fama and French (the researchers who first proposed the efficient market hypothesis and evidence based investing) are advisories on the DFA board. DFA only includes factors when the evidence for a particular factor is present after thorough research.

1. Small Cap Premium

   The small cap premium states that small companies grow longer over long time horizons. Figure 1 shows the returns small vs large stocks from 1926-2000. (Data provided from `http://www.efficientfrontier.com/t4poi/Ch1.htm` who in turned sourced it from Kenneth French.) The growth of $1 is shown in the table below.

Table 1: Ending Wealth and Annualized Return of Small and Large Stocks from 1929-2000. Source

	End Wealth	Annualilzed Return
Small Stocks	$5,522	12.35%
Large Stocks	$2,128	10.91%

   As shown, small stocks performed better over the long run. This advantage is not extreme, only about 1.5% difference compared to large cap stocks. However, 1.5% more return over 75 years resulted in more than twice the ending wealth. (Small cap stocks are usually defined as market cap valuations of $2 billion or less.)

   The small cap premium has been detailed since the 1980s. There are index funds that try to deliver the small cap premium, which are available to retail investors.

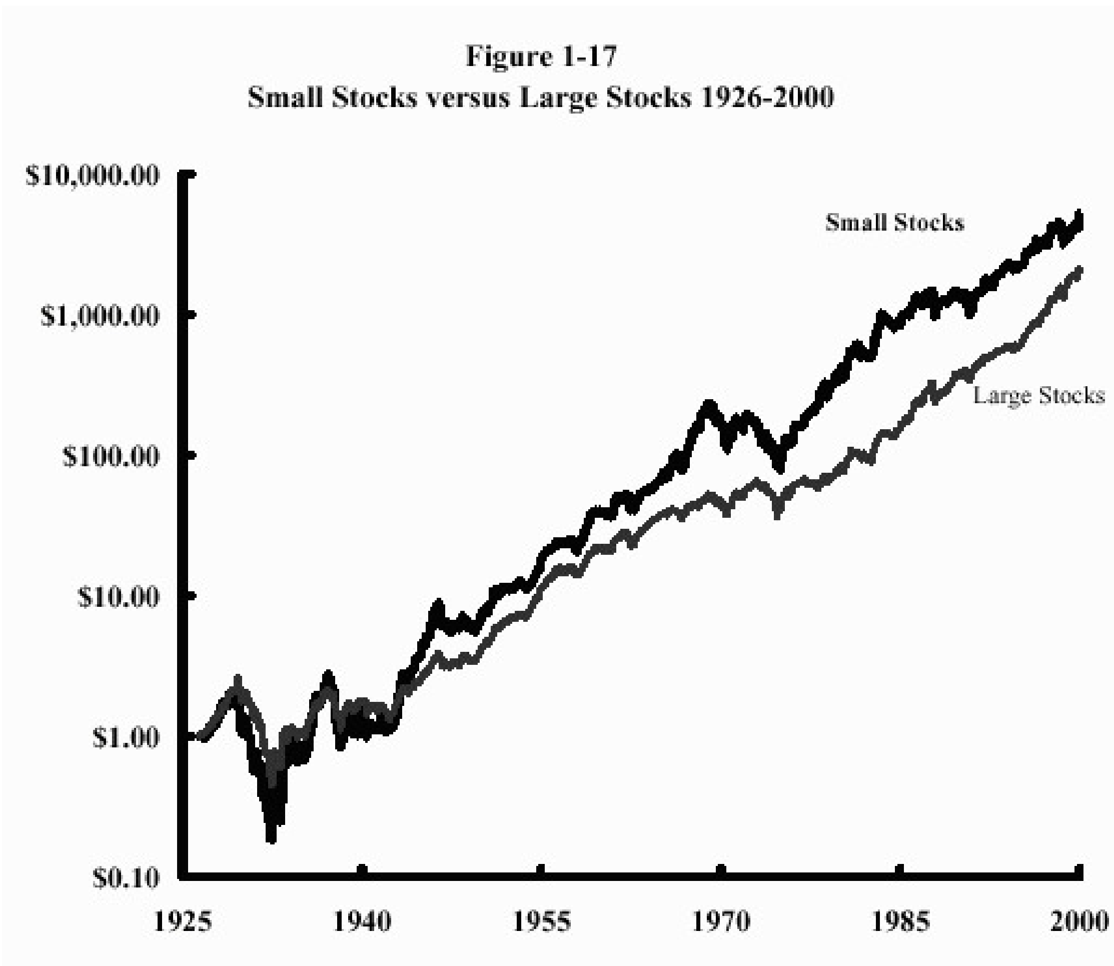

Figure 1: Growth of Small Stocks vs Large Stocks from 1926-2000. Source

Of course, this is not without more risk. During the Great Depression and the 1970s bear markets, small stocks sustained higher losses. But even with that the end result for small stocks is greater.

Let's take a look at small caps vs large caps from January 1972 to March 2020 on this portfolio visualizer that you can try yourself. Instead of the growth of $1, we have a starting wealth of $10,000, and an additional investment of $1,000 each year. Figure 2 represents this graph.

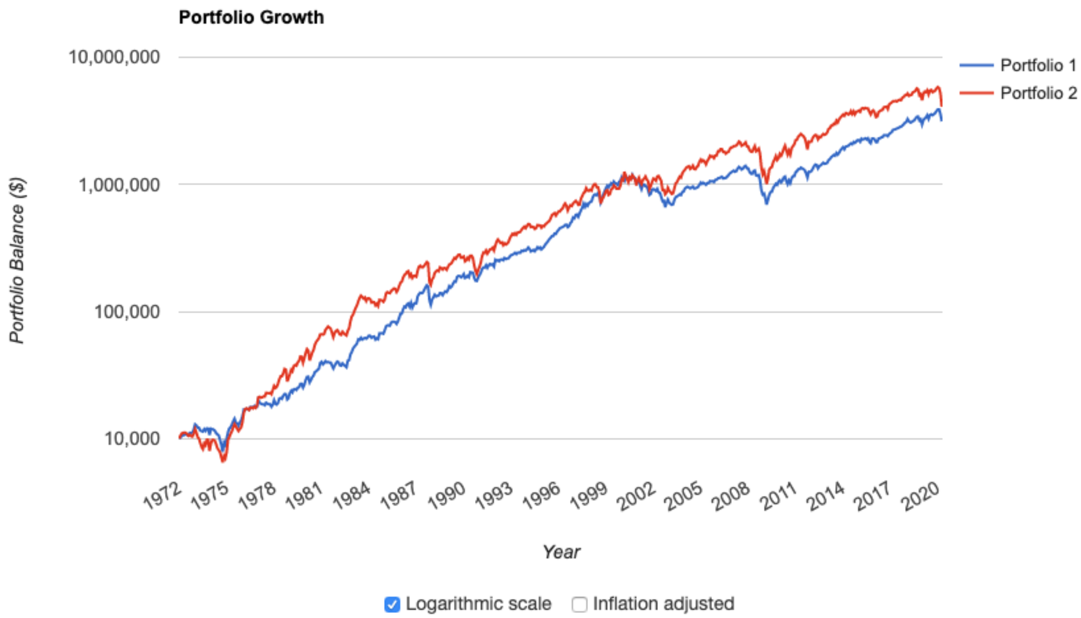

Figure 2: Small vs Large Stocks from 1972-2020. Portfolio 1 represents large caps, Portfolio 2 represents small caps.

We see once again that while small caps (Portfolio 2 in 2) have larger drawdowns during market downturns (hence more short-term risk), in the long term small caps have had substantially more growth. The ending wealth for Portfolio 1 (large caps) was $3,130,817, while the ending wealth for the small caps was $4,075,183. In this case, the small caps portfolio represented an advantage of 0.62% per year.

The risk based explanation for the power of small cap stocks is that they have more room to grow their market cap, yet as small companies they have fewer resources to grow that with, which represents risk. However, with more to grow compared to large cap stocks, over time small cap stocks have greater risk-adjusted returns.

2. Value Premium

   The other premium included in the original Fama-French 3-factor model was value. Value stocks are commonly cited as companies with low price-to-earnings ratio or price-to-book ratio.

   It is contradictory to think about, but good stocks are bad in the long run, and bad stocks are good in the long run. Growth stocks (high P/E ratio) have much less potential to return more over time, either because they are expected to grow more over time with less risk, or they are already a safe company with an exceptional track record.

However, riskier companies that have not yet proved themselves yet are riskier. Therefore, *we should expect riskier companies to have higher returns*! Otherwise, we would never invest in a riskier company. Another way to think about it is that as value companies, their price is lower because they have more room to grow, if they overcome the risks that their business faces. However, this higher return is far from guaranteed, hence the risks. The fact that bad companies produce more returns is a very counterintuitive point.

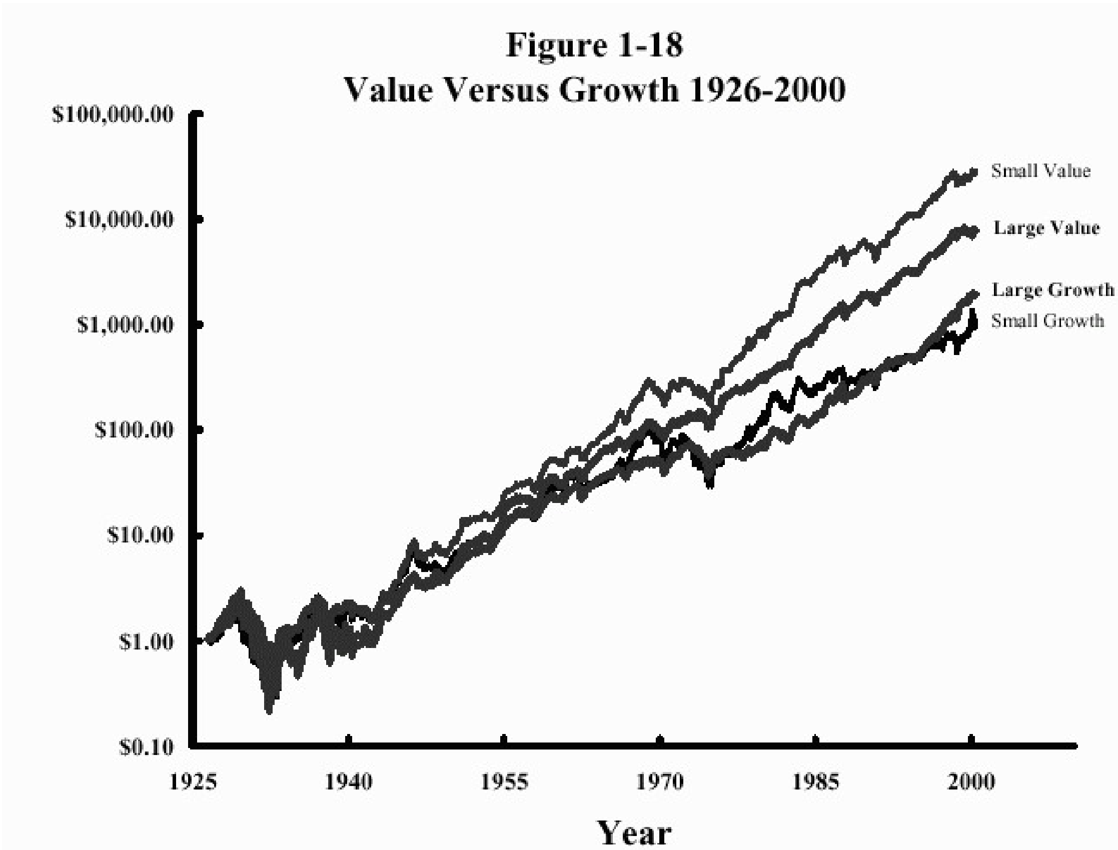

Figure 3: Value vs Growth stocks from 1926-2000. Source

We can see the value premium in action in Figure 3. Do note that the y-axis of the graph is on a logarithmic scale.

When we combine the value and small cap premium in Figure 3, we see that small cap value companies far outstrip the other asset classes. In fact, the small cap premium is more pronouced when we remove the bad small growth stocks that were dragging down returns. The theory why small growth underperforms by so much is that people are expecting these companies to blow up and become the next hottest thing; their stock price is driven up prematurely, and so they have almost no room to grow. As a small company already, they face more dangers and risks compared to larger companies, and so when they fail to meet risk-adjusted growth expectations, their price falls dramatically, causing underperformance.

The value advantage is also present in international stocks. Fama and French looked at Value vs Growth abroad; I have taken the liberty of replicating that data in Table 2. In almost every country, value has beaten growth over longer periods of time. The advantage in less developed markets is often even more pronouced.

Table 2: Value vs Growth in International Markets. Source

Country	Value	Growth	Value Advantage
Japan	14.55%	7.55%	7.00%
U.K.	17.87%	13.25%	4.62%
France	17.10%	9.46%	7.64%
Germany	12.77%	10.01%	2.76%
Italy	5.45%	11.44%	-5.99%
Netherlands	15.77%	13.47%	2.30%
Belgium	14.90%	10.51%	4.39%
Switzerland	13.84%	10.34%	3.50%
Sweden	20.61%	12.59%	8.02%
Australia	17.62%	5.30%	12.32%
Hong Kong	26.51%	19.35%	7.16%
Singapore	21.63%	11.96%	9.67%
Average	16.55%	11.27%	5.28%

You can try out value asset comparisons on portfoliovisualizer.com. I have linked a comparison of large-cap value, mid-cap value, and small-cap value U.S. stocks from 1972-2000.

Also, here's an interesting tidbit: from January 2000 to March 2020, the total US market and the total Bond market ended at the exact same value, whereas small-cap value handidly beat both. The visualizer is linked here and shown in Figure 4.

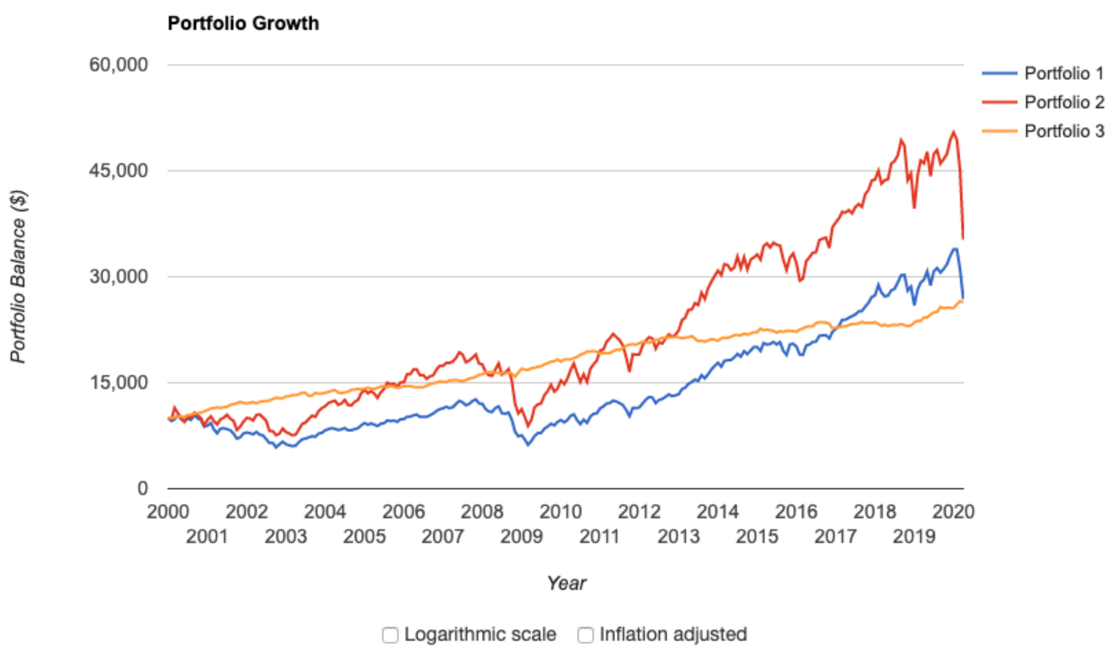

Figure 4: Total US Market, Total US Bonds, Small-Cap Value from January 2000-March 2020.

Due to all the evidence presented, we should heavily favor cheaply priced value companies for our long term portfolio. The value premium has been detailed since the 1990s. There are index funds that try to deliver the value premium, which are available to retail investors. There are also index funds that combine the small cap and value premium, to capture the best possible risk-adjusted returns.

3. Profitability Premium

   According to MSCI's research, profitable firms have had higher returns over time compared to firms with less profitability. In market downturns, profitable companies are more likely to survive intact and turn their profitable cash flows into higher earnings; this could be as simple as continuing to give out dividends/engage in stock buybacks. The profitability factor may act as a hedge against market downturns; this is further amplified by their findings that profitability factor has a negative correlation with the value factor. During market downturns, risks in the system are more exposed and vulnerable firms are hit harder with risks.

   I admitted know less about the profitability factor because it is a more recent factor, but there is some logical premise as to why profitable companies can yield higher earnings. Alpha Architect has found that the profitability factor is robust and pervasive, i.e. it appears across various regions and has a long history.

   There is some confusion for me as to why the profitability factor returns a premium, since risk based explanations do not explain why stronger companies provide better returns, since their futures are more certain and profitable companies are more likely to be growth companies. However, as much as we want to take on more risk, investors actually like stocks that don't go to zero. Therefore, the profitability premium may exist because it counter balances the value premium and reduces volatility, increasing potential returns.

4. Investment Premium

   The investment premium states that companies that invest more into their own company outperform companies that invest in themselves less. The 2015 paper Digesting Anomalies: An Investment Approach details the investment premium, showing that it is both robust and pervasive. Fama and French have since incorporated both the investment and profitability premium in their Five-Factor asset pricing model.

   Again, it is not clear why firms that invest in themselves more have a higher risk-adjusted return. There is one explanation that firms often invest in themselves when they have low leverage (banks do not trust the firm to return the capital) and they have less ability to sell equity to raise funds, thus the investments in themselves occur when risk is high; this would account for a risk based reason.

   Its interesting that the research has shown that with the investment and profitability premiums, the value premium does not explain any more asset mispricings, i.e. the value premium may be redundant.

   It is worth noting that DFA has agreed with the investment factor and incorporated it into its index funds.

5. Default and Term Premiums (Bonds)

   These premiums are also not worth worrying about, because the goal of bonds is to reduce risk, rather than maximize returns. Though they exist, equity factors produce better risk-adjusted returns were we to take on more risk. I have not done much research into bond factors, but those who are interested can take a look at the original paper by Fama and French. I believe the essense is that riskier binds (lower credit ratings) with higher default rates and long bond terms (interest rates vary more over longer periods) have provided higher returns in the long run.

If you view bonds as the safer part of your asset allocation, avoiding default and term premiums is probably a better idea, because in market downturns, bonds should act as your safety buffer. You don't want higher risk bonds causing your bond portfolio to drop along with your stock portfolio.

4.2.3 Factor Investing Asset Allocation

The best place to access factor-titled funds is through Dimensional Fund Advisors. One can usually only access DFA funds with selected financial advisors. The reason being is that DFA does not want expensive withdrawals when markets go bad or when market factors are not present for some time. According to their research, investment factors can be not present up time periods of up to a decade, which can cause inderperformance relative to the market for some periods of time. For the 2010-2020 decade, the value premium lost out to growth. Yet the investment factors can come back suddenly as market conditions change. Dimensional's blog post succintly summarizes how the value premium seemingly did not appear for the 20 year periods ending in 2000, but in the 20 year periods ending in 2001, the value premium appeared extremely positive. In one year, it was able to turn around 20 years of bad returns.

All goes to say, if you are factor investing, you should be in it for the long term; factors may not be visible for some time, but we never know how the future appears or when the factors could come back. The worst thing would be to sell after a period of underperformance and then the factors start kicking in as market conditions change. After all factor investing is risk-based. Investors should be prepared for periods of underperformance.

Thus, DFA relies on financial advisors to keep investors invested during bad time periods. Unfortunately, advisors can be quite expensive (especially for low networth individuals), taking 0.5-1% of your holdings every year regardless of how your portfolio performs, not even accounting for DFA fund expense ratios themselves. (I have found an interesting company called FPL Capital who charges only a flat fee of $1,000 and allows you to access DFA funds).

That being said, I have created after some research a simple portfolio that attempts to target the value and small cap factors. Targeting the small-cap and value factors is easiest for retail investors because those factors have been around since the 1990s and are much more researched. The other equity premiums do not have easily tracked indices yet. A lot of credit goes to Ben Felix and his Rational Reminder portfolios.

Ticker	Name	Expense Ratio	100/0	90/10	80/20
VTI	Total Market Index	0.03%	25%	22.5%	20%
VIOV	S&P Small Cap 600 Value	0.15%	25%	22.5%	20%
VEA	International Developed Markets	0.05%	10%	9%	8%
VWO	FTSE Emerging Markets	0.12%	15%	13.5%	12%
VSS	FTSE All-World ex-US Small-Cap ETF	0.11%	25	22.5%	20%
BND	Total Bond Market	0.035%	0%	10%	20%
		Total ER	0.09250%	0.08675%	0.08100%

This portfolio is slightly more complicated than the 3-fund portfolio, and has a higher expense ratio (largely due to our higher allocation to emerging markets and small cap value). However, it does tilt more towards small-cap value (from VIOV), with a quarter of our equities allocation in small-cap value. Another quarter captures the broad U.S. market, with half our equities portfolio domestic to the U.S.

The other half is international stocks. I choose to overweight emerging markets since its probably countries like China and India will have good growth (which might be an irrational bias honestly). I use a combination of VEA + VWO, which holds 9019 securities total, while VXUS only holds 7429 securities, so this combination increases diversity. Lastly, a quarter of our portfolio is allocated to small-cap international stocks, for more factor tilting. In backtests, small-cap international has beaten the U.S. market from January 2000 to March 2020.

In this backtest, I compare my 80/20 portfolio with a comparable 80/20 three fund portfolio. The results seem somewhat better. The end growth is shown in Figure 5.

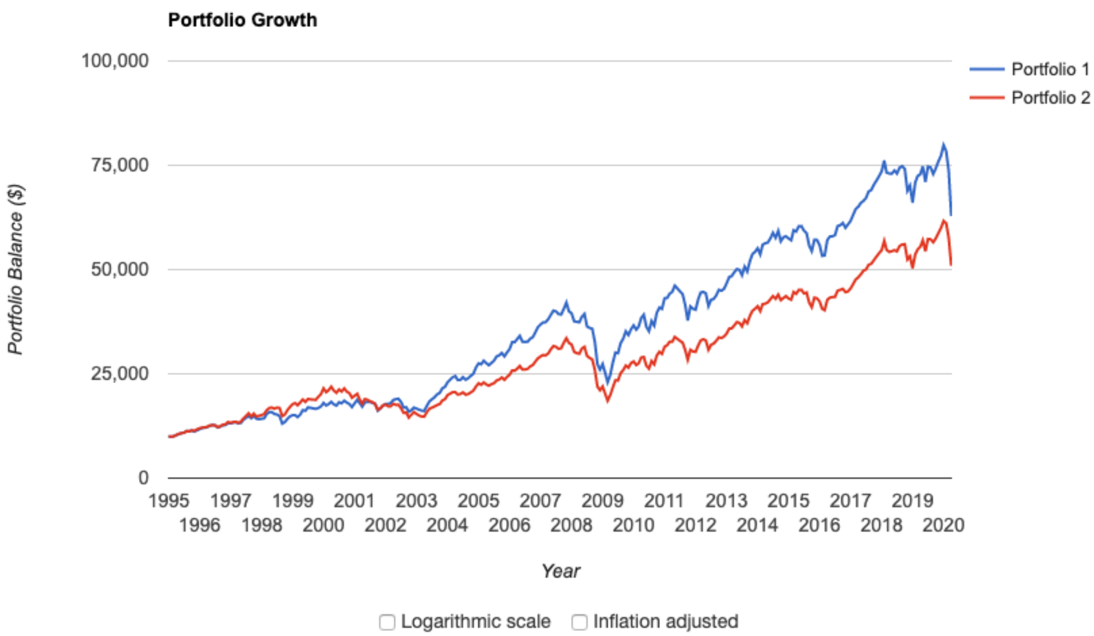

Figure 5: Factor Tilted (Portfolio 1) vs Three-Fund (Portfolio 2) 1995-2020

4.2.4 Buy and Hold

Regardless of which asset allocation you choose, make sure you choose and allocation and stick with it. You do not want to panic to sell at a loss. Know why you are picking an allocation (risk preferences) and don't look at your portfolio too much. Know that the equity risk premium should increase the value of your assets overtime. Just look once in a while to rebalance back to your desired asset allocation.

4.3 Account Types and Asset Location

There are many different types of accounts where you can store your assets. Where you put your assets usually depends on how you want to optimize your taxes.

4.3.1 401k/Roth 401k

A (Roth) 401k plan is a company sponsored retirement plan that employees can contribute to. Traditionally, companies often match up to a certain limit of your contributions (if they match

50%, then every dollar you put into your 401k, the company puts in 50 cents). The company match is free money, so always at least contribute enough to get at least the match.

You can contribute up to $19,500 per year, and workers older than 50 can contribute an extra $6,500 more for a total of $26,000. If you contribute to both Roth 401k and the traditional 401k, you can still only contribute up to the limit combined.

1. Tax Treatment of Contribtions
   - 401k: Contributions are made pretax, which lowers your taxable current gross adjusted income.
   - Roth 401k: Contributions are made after tax, which does not affect your taxable current gross adjusted income. All employer contributions are made pretax.
2. Tax Treatment of Withdrawals
   - 401k: Withdrawals are taxed at regular income tax levels.
   - Roth 401k: No taxes on any withdrawals or capitals gains.
3. Withdrawal Rules
   - 401k: Distributions are penalized by 10% if withdrawn before $59\frac{1}{2}$ (in addition to normal taxes!) except for certain IRS exceptions. Consider your money locked up until retirement.
   - Roth 401k: For qualified distributions and if the account has been owned for at least 5 years, and due to disability, death, or the recipient is older than $59\frac{1}{2}$, then the withdrawals are not taxed. Unqualified distributions are subject to a 10% penalty.

Now which should you contribute to? If the marginal tax rate before and after retirement is exactly the same, then mathematically there is no difference between these accounts.

Next, read my discussion on tax rates. Due to tax brackets, money put pretax into a 401k is taken from the top, most expensive tax bracket. When you withdraw from your 401k, you start again at the lowest tax brackets, which aren't even taxed! You'd have to withdraw enough from your 401k (or generate enough income overall) to reach the same tax bracket again for the marginal tax rates to be the same. Otherwise, your tax rate when you withdraw from your account will be lower during retirement.

With a regular 401k, you can avoid state income tax. You may work in a high paying state that also has high taxes (California, New York, etc) but you can retire in a cheaper state with no state income tax. Then withdrawing from your 401k helps you dodge those state income taxes in retirement.

You can also rollover a 401k to a traditional IRA if you leave your firm. You can convert the traditional IRA into a Roth IRA when you feel like you are in a lower tax bracket. Thus, putting money into a traditional IRA gives you the flexiblity to choose when you pay your taxes, versus paying your taxes always up front. You may sink into lower tax brackets if you go back to graduate school, or lose your job, etc. The flexibility is worth considering.

A Roth 401k is best for those with low incomes now, but much higher incomes later on. For example, medical doctors in residency get paid much less than doctors that have finished their residency. Thus, they should invest in their Roth 401k during residency, assuming when they retire they will spend more money than they are making now. If you are already in a high tax bracket and have no chance of moving down tax brackets, then a Roth 401k should be considered since you can lock in the tax rate you have now; there is no guarantee that taxes will not go up in the future (of course it could go down instead).

Thus, for most workers, a traditional 401k seems to be more valuable.

4.3.2 IRA/Roth Ira

The IRA (Individual Retirement Account) and Roth IRA have virtually all the same rules as their 401k counterparts, except with more rules added on.

1. Income Limits:
   - tIRA: Contributions are still made pretax, but after a certain modified adjusted gross income (MAGI), you cannot deduct contributions to your IRA from your taxes anymore. However, you are still taxed on your contributions when you withdraw. Therefore, after a certain income limit, there is no point to contributing to the traditional IRA.
   - Roth IRA: The Roth IRA has a higher MAGI limit than the traditional IRA, but unlike the traditional IRA, once you are above a certain income limit, your contribution limit to the Roth IRA decreases, and after a high enough MAGI, you cannot contribute to the Roth IRA at all.
2. Early Withdrawal:
   - tIRA: The withdrawal rules are much stricter than the Roth IRA's rules. It is still possible, but you should tread carefully.
   - Roth IRA: You can withdraw all your *contributions* (not earnings) early from the Roth IRA without penalty (not that it would be a great idea).

So if you are above the income limits for the Roth IRA, are you stuck contributing to the traditional IRA with no taxable benefits? Let me introduce the Backdoor Roth IRA.

1. Backdoor Roth IRA

   This backdoor allows high income individuals to contribute to a Roth IRA anyway. You put money into a traditional IRA *post tax*, you fill out the paper work to convert the traditional IRA to a Roth IRA, pay some taxes, and you're done. It is important not to attempt to claim the deduction on your traditional IRA contributions, because they were converted to a Roth IRA! You might also have to pay some taxes on the capital gains you earned while your money was sitting in the traditional IRA when you convert.

   This method is completely acceptable according to the IRS. Note that you cannot go backwards, you can only convert from a traditional IRA to Roth IRA. Honestly, this method only sounds shady due to the name, but it is a logically necessary action to take to avoid paying more taxes than you need to.

2. Mega-Backdoor Roth IRA.

   If the Backdoor Roth IRA sounded cool, wait until you hear about the Mega-Backdoor Roth IRA conversion. Not everyone is able to conduct a mega-backdoor Roth IRA. You must:

   - have a company 401k plan that allows after tax contributions.
   - have a company 401k plan that allows withdrawals while you are still an employee.

The total amount your 401k allows you and your employer to contribute in total is $57,000 or $63,500 if you are 50 or older (in 2020). The steps to do the mega-backdoor roth is as follows.

(a) Contribute up to the maximum of after-tax dollars into the 401k. Make sure these contributions are not Roth 401k contributions. If your employer has contributed a match, then you must deduct the match amount from the post-tax contributions you can contribute.

(b) Withdraw the post-tax amount into your Roth IRA. This allows you contribute up to an extra $37,500 into your Roth IRA for tax free growth.

The Mega-Backdoor Roth conversion should only be done with high income individuals. Again, the IRS has rubber stamped this procedure.

4.3.3 HSA

The HSA is the ultimate savings account. While initially meant for medical expenses, the rules are flexible for it to be counted as another retirement account that is more tax friendly than the IRA or 401k retirement accounts. Only those who have high deductible health insurance plans are elligible for an HSA account. The IRS defines a high deductible as $1,350 for individuals and $2,700 for families.

In exchange for a high deductible, you can put your money into the HSA, and invest the funds. Each year, you can contribute up to $3,550 for individuals and $7,100 for families, with an additional $1,000 in catch up contributions for those over 55. These contributions are pre-tax. The growth from invested funds is tax-free as well.

Withdrawals are very interesting. If you use the invested funds for qualified healthcare expenses, you can withdraw the money tax-free. If you do take out money for distributions for non-medical purposes, you pay income tax as well as a 20% penalty. Withdrawing funds for non-medical purposes when you are 65+ does *not* incur the 20% penalty, only the taxes. In this regard, it functions as an extra IRA account. As an extra tax-advantaged investment vehicle, it is already a great account.

Even more interesting, HSA have no time limit for reimbursements. You can get a knee surgery when you are 25, pay for it now, upload the receipt onto the HSA portal, then claim reimbursement when you are 65. If done correctly, you just bought yourself tax free growth for *40* years. There's an interesting amount of things that count as qualified reimbursements, but this list changes over time. More importantly, keep receipts of all medical transactions, because those receipts lead to tax free growth of your investments!

This account can easily pay for all your medical expenses in retirement if handled correctly. Do note that starting this kind of account is riskier when you are older; you have less time to grow funds, but are more susceptible to various illnesses and health problems. You are also stuck in a "worse" healthcare insurance plan with a higher deductible, so sudden surprises may incur bills that far outstrip your gains. However, if you are young and relatively healthy, this account is pretty much perfect for you.

4.3.4 529

A 529 plan allows tax free contributions and withdrawals for college related expenses. A 529 plan is not as flexible as the HSA plan, but you can still purchase things like textbooks, computers, and printers with 529 funds. 529 plans do not have contribution limits, but usually do not allow more contributions than necessary to pay for an education. Withdrawing for non-educational purposes is subject to a 10% penalty and taxes.

529 plans are state plans, so states usually give out a state tax deduction for investing in their 529 plan.

There is the concept of account holder and beneficiary. The account owner controls the funds and the money, but the expenses withdrawn for the beneficiary are tax-free. You can change the beneficiary at any time (i.e. child decides not to go to college, can use the funds for another chold). Lastly, if the beneficiary recieves a scholarship, the owner can withdraw money equal to the amount of the scholarship without penalty (there are still taxes).

You probably should not fund this before your child is born, because you cannot contribute more than what it would take to fund an education; thus waiting til your child is born before starting to contribute can be a prudent decision.

4.3.5 Taxable

The standard brokerage account. Your brokerage should send you tax forms every year indicating how much you owe in taxes to the government. Beware of capital gains tax: securities held for more than a year are taxed at 0%, 15%, or 20% based on income, while short term capital gains are taxed at regular income levels. Long term capital gains tax is almost always less than short term capital gains tax.

4.3.6 Asset Location

Asset location is the idea that certain securities are better off placed in a certain type of account, be it taxable or tax-advantaged. Asset location tries to find to optimal placement of your funds to minimize taxes.

If you like math, the Bogleheads wiki on tax-efficient fund placement is a great resource. Essentially, bonds and bond funds generate many taxable events when they pay out dividends, hence they are not tax efficient. Fixed income is taxed at your full marginal rate. By comparison, stocks are more tax efficient; they mostly appreciate through capital gains and only dividends are really taxed. You are only taxed on equities if you sell them, which incurs capital gains tax. If you sell equities after holding them more than a year, you incur long term capital gains tax, which is taxed at your income bracket and is much cheaper than short term capital gains tax.

Because of this, you should strive to put most of your fixed income assets (bonds, REITs, etc) in your tax-advantaged accounts, to avoid unnecessary taxes. If you have a high dividend paying asset or fund, then should you prefer to place this asset in a tax-advantaged account as well, since these are tax generating events as well.

How much does this affect your overall returns? According to Morningstar's paper, optimizing asset location generally does yield higher returns, on the order of 23 basis points after tax per year. Thus, these strategies do not add an incredible amount of value. More recent papers have cited that asset location value is actually lower than cited.

The simplest way to manage your asset location is to replicate the same allocation to all accounts. If you can, place some more bonds in your tax-advantaged accounts. In the end, it probably doesn't matter too much, especially if we cannot predict the future; regulations, laws, and expected returns can change as time passes.

4.4 Index Funds vs ETFs

Many investment products have both ETFs and index funds that track the same index. For example, VFIAX and VOO both track the S&P 500. However, they are different entities that are treated slightly differently.

Index funds are simply mutual funds; you put money into the fund, and it grows or shrinks depending on the assets. ETFs are shares tradable on financial markets. You can buy and sell ETFs like a regular stock. This gives ETFs more flexibility, since you can determine the price at which you enter your position (using limit orders and the like). With index funds, your money enters the fund at the end of the trading day; you get less choice at what NAV your money enters the fund. You get no choice in the timing of the trade. For long term investors, this should not make much of a difference.

Unfortunately, with choice comes some pain; ETFs are then subject to the bid-ask spread. With ETFs that have less trading volume, they are subject to higher spreads and negatively impacts individual traders. For widely traded ETFs like VOO, this should not be much of an issue. ETFs may also trigger commissions when buying or selling, although most brokerages have zero commissions nowadays thanks to Robinhood.

ETFs often have lower expense ratios compared to the equivalent mutual fund. VFIAX has an expense ratio of 0.04%, while VOO only has an expense ratio of 0.03%. A minor difference, but this is prevalent throughout most ETFs and index funds.

Index funds often have a minimum investment. VFIAX has a investment minimum of $3,000. ETFs do not have an investment minimum, aside from the price of one share. This lowers the barrier for entry. However, ETFs can be slightly inefficient because you may be left with leftover money that could not purchase a share evenly. Index funds do not suffer from this problem because you can put any amount of money into the fund so long as you meet the minimum. If your brokerage allows for fractional shares, then this weakness of ETFs largely goes away. This issue of leftover money also affects dividend reinvestments. Index funds allow you to reinvest dividends down to the last penny; ETFs may not allow you to do that, or are less efficient at it.

Finally, ETFs may be more tax efficient. ETFs do not pass on capital gains tax to their customers, while index funds may pass on capital gains tax. This article explains more about tax efficiency.

In the end, the differences are very minute. Both are good ways of matching an index and keeping invested. Personally I use ETFs in taxable accounts, and a mix of both in tax-advantaged accounts, though I may switch to ETF only for the sake of convenience.

4.5 Home Country Investment Bias

According to Vanguard's paper on Home Country Bias, they find that holding international equities consist of 60% of one's portfolio reduces volatility and increases diversification and overall returns. Therefore, allocation to international stocks should not be trivialized.

However, there are also some tax concerns. Foreign dividends are taxed at higher rates, at least in the U.S. Therefore, it is acceptable to have a home country bias, but you should still be invested internationally, because diversification is still a huge benefit since it reduces volatitlity and risk.

International exposure also reduces the risk that a country collapses altogether, and avoids systemic problems in a country (take Japan's aging inverted population and their refusal to take immigrants). A 50/50 of home country vs international stocks split is an easy ratio to maintain improves expected long term returns.

4.6 Why Dividends are Irrelevant

Many beginner investors irrationally target dividend paying companies or funds. Dividends are not relevant to determining which stocks return more over time. There is peer-reviewed academic evidence that investors should not have a preference dividend stocks alone.

Dividends do not come out of nowhere. They come from the company's leftover cash. How this is presented is that on a balance sheet, companies track their total asset values and total liabilities and debts. This leads to the equation: Assets - Liabilties = Stockholder's equity. When you give out dividends, you are giving out money taken out of the stockholder's equity and returning it to stockholders. Because the stockholder's equity partially determines the stock price, the stock price will drop after dividends are paid out. This must be true as long as $1 = $1, because again dividends do not come out of nowhere. Therefore, the value of a company drops when they give out dividends, which makes sense because they are giving out cash they could use to invest in themselves away.

Ben Felix's videos on Dividends gives a great example. If you had two companies with the exact same price-to-book ratio. Company 1 pays dividends. Company 2 does not pay dividends. They otherwise have the same size, same profitability, same reinvestment rates, and trade at the same price relative to their book value. Then if Company 1 gave out dividends, and their stock price drops by the same amount, and Company 2 did not give out dividends, the total asset values of both portfolios are the same, just that the portfolio holding Company 1 has some cash instead of all stock in Company 2.

On average, dividend growth stocks do tend to beat the market. But that is relating correlation with causation. The fact that they give dividends is not an indicator of a good stock. It just happens that dividend growth stocks tend to have some exposure to the profitability and investment factors, which help explain their returns in excess of the market. But by only investing in dividend stocks, if the profitability and investment premiums are not present for some time, then you have reduced returns because you are not exposed to the broad market and other factors by reducing the diversification of your investments. That is not to say that dividend funds have negative size and value factors.

In fact, dividends are just a forced tax event. If you took the same two companies, you could have achieved the same liquidity by selling some of your holdings in the company that didn't give dividends; the difference there is that you have a choice in when and how much stock you want to liquidate. Dividends are really just a forced taxable event, since you are forced to pay taxes on those capital gains. Moreover, therefore, to truly maximize returns, you would automatically be reinvesting dividends dividends anyway. Focusing on dividends reduces diversification and increases risk.

Dividends feel emotionally good. Getting cash always feels great. But mathematically they make no difference. Therefore, investors should not prefer dividend growing stocks.

4.7 Downside Protection and Investment Hedges

Downside protection sounds great. Protect your portfolio from a crash! Financial markets are volatile in the short term, but in the long term, riskier assets (stocks) have outperformed risk-free assets. Therefore, in the short term, declines in your portfolio are temporary.

With that in mind, downside protection only really protects you against temporary downturns. Note that "temporary" may be a few years or even a decade, but if your time horizon is long, such as several decades, they these market downturns do not truly affect your long term return. These downturns just become noise.

Downside protection appeals to irrational/emotional investors that don't want to experience short term downsides. However, risk and return are always related. You must take some risk in order to capture greater returns. If your time horizon is longer, you can afford to take more risks, since you have more time to rebuild.

If your time horizon is shorter, then it makes sense to invest a portion of your portfolio in bonds, because bonds are less volatile, but return less in the short term. It also helps to know your own risk tolerance, so that you don't make irrational decisions during bad times. However, know that your long term expected return should be reduced if you continually engage in downside protection assets.

One of the most prolific commonly cited downside protection assets is gold. But gold does not offer great downside protection.

4.7.1 Gold

Gold is store of value. It does not produce cash flow (such as bonds), and as a commodity that is not tied to a cash flow producing asset (such as stocks), it should have limited expected future return. Gold will only derive its value from prices that buyers seek. This makes gold more speculative in general, because there is nothing to say that gold will be valuable going into the future, *aside* from investor preference.

Warren Buffet argues that gold does not produce cash flow and that anything you buy with that gold instead that could produce cash flow would be inherently more valuable, because the discounted cash flow of money in the future also adds value to such an asset. Additionally, such assets can grow, be it farmland or ownership in companies.

In a 2012 paper, Claude and Campbell argue that gold is not a great inflation hedge. In incredibly long time periods, may beat out inflation; however these incredibly long time periods may be longer than your lifespan. Gold is volatile in the short term as well, which reduces its usefullness as an inflation hedge.

Nor is gold a good source of downside protection. In 2008 during the financial crisis, stocks dropped 40% globally. Gold's value increased by about 5.53%. Better than stocks, but bonds increased by about 14%, a much better increase.

Gold does have a slight negative correlation to stocks, but because it delivers no cash flow, it is not inherently better than stocks in the long run. It also does not do a good job of being an inflation or downside hedge, as there are other assets that do a demonstrably better job.

4.8 Environmental, Social, and Governance Investing (ESG)

I have no problem with socially responsible investing; after some people hold onto their morals tightly. Just know that if you do invest in ESG companies, you should expecting lower future returns.

First and foremost, socially responsible investing reduces diversification. You reduce the number of companies that you can invest in, or overweight companies that are not weighted as highly in a traditional market-cap weighted index. Lack of diversification increases risk and and volatility, and likely reduces expected returns.

Recall that parts of investing are counterintuitive, such as the value factor premium. By buying up ESG company stocks, socially responsible investors bid up the price of such securities. In doing so, ESG companies have easier access to capital (they can raise more capital in financial markets). But in doing so, they lower the future returns of those securities, since those securities become more valuable than before. Recall that the value premium shows that cheaper value companies produce higher returns in the long run. Then by bidding up the price, ESG companies have a negative value factor, which impacts long term returns.

By investing in ESG indices, and you are almost making a bet that the markets in the long term will favor ESG companies, that one day in the future, non-ESG companies will be heavily penalized somehow. There is no data to support if this bet will come true or not. Socially responsible investors can also be reassured that ESG companies are usually more profitable. This could offset the negative value premium that ESG companies face.

You should also make sure the ESG index you track is actually, you know, socially responsible; 8 of of the 10 biggest ESG funds are invested in oil companies that are slammed by environmentalists. Matt Levine's funny analysis underlies a problem; investors want to invest in ESG funds and they also want to invest in the S&P 500. Therefore, the "goal is to track the S&p 500 while having ESG in the name" and so you need to be really careful about how ESG conscious a fund really is, because they attempt to invest in the least offending companies; if the least offending companies in a sector still pollute the environment heavily, then you don't have too many choices!

4.9 Real Estate

Real estate can be a great investment. You get easier access to leverage through mortgages. You can save up for one property, pay parts of your mortgage over time to build equity in the property, then remortgage it or refinance the property to finance the purchase of your next property. Compared to the leverage options available to equities investors, mortgages are a very easy source of debt and capital. Hence, real estate almost has a leverage multiplier that allows you to accumulate multiple cash-flow producing properties quickly if you follow the BRRRR strategy.

I am not otherwise familiar with the specifics of investing in multiple real estate properties. I do know the risks are quite high and rental properties suffer during economic crisis, especially if you are heavily leveraged.

4.9.1 Buying vs Renting

Renting an apartment and buying your own home is not the simple comparison of monthly rental versus monthly mortgage payment. There are risks to homeownership and additional taxes. You cannot compare renting to building equity in a property. Rather, you must compare the total unrecoverable cost in renting to the total unrecoverable cost in owning a home.

This video, this video, and this video, give various good explanations for why renting is not as bad as it seems and the evidence behind these assertions. The unrecoverable costs for a home come from maintenence, taxes, and the loss of income from renting your property (property derives its value from both price appreciation and rental income and by living in your home you forego the rental income). Additionally, as a homeowner you are exposed to various risks of property, such as storms, plumping, and other bad luck. Therefore, you should not just consider the monthly cost of a mortage vs a monthly rental, you should consider the overall cost of owning a home.

4.9.2 REITs

REITs (Real Estate Investment Trusts) are a way to invest in the profits of real estate without actually owning real estate. REITs own real estate and rent them out to produce cash flow. Investors can buy REITs on the stock market and take part of some of these cash flows. Appreciation of properties is reflected in appreciation of REIT shares.

Do REITs belong in a diversified portfolio? REITs solve some real estate problems, such as high buy-in cost, lack of diversification, and ease of access. There are of course index funds that track REITs, providing further diversification. Because they trade on stock markets, REITs are already included in total market indices, in proportional to their market share. Thus, the question is not if REITs belong in your portfolio, but if you should overweight REITs in your portfolio.

The academic literature does not support the idea that REITs belong in a well diversified portfolio. In a 2017 paper, Kizer and Grover are able to explain REIT returns through previously explaned asset class factors. REITs can be explained with a mixture of stock factors and the bond factors (because they produce fixed income). They were able to produce a portfolio that had the same factor exposure as REIT indices using small-cap value stocks and corporate bonds, and found that the stock and bond portfolio had better returns and better risk-adjusted returns. This video by Ben Felix gives a bit more detail into the paper.

Lastly, REITs are tax inefficient. REITs produce many taxable events from rental income. In a taxable accounts, REITs are espcially inefficent.

REITs do not add diversification beyond the normal risks that equities face normally. Moreover, they are susceptible to normal risks of real estate (property damage, etc), that are not well comphensated by taking this risk. Thus, in an optimized portfolio, REITs should not play a role beyond their normal market-cap weight. A better way to access REIT-like returns would be to weight small-cap value and some corporate grade bond funds to your portfolio.

4.10 Lump Sum into the Market?

According to a Vanguard paper, if you have a large sum of cash available for investing (bonus, lottery, etc), you are better off investing the cash into the market all at once rather than splitting the investments into multiple investments over time. 2/3rds of the time, putting the lump sum into the market results in a better long term outcome.

It is only better to split the investment into multiple investments (called dollar cost averaging, or DCA, for some reason) when there is a market downturn; logically by splitting the payments, you are more likely to buy in the dip, which results in a better outcome. However, as we know, we cannot accurately time the market! You could end up splitting the payments over months, missing out on some gains as you buy, then after you buy the market drops; then you are far worse off than if you had just put it all into the market at once. It is only emotionally better for investors to split a lump sum, on the chance they invest it all right before a crash; it is mathematically better to put your money in at once.

4.11 Leveraged Investing

Lastly, it should be considered whether an investor should take on debt to increase their returns on their portfolio over time. Ayres and Nalebuff write that it is considered prudent for young investors to use leverage while they are young and can take greater risks to ensure better returns in the market in the long run.

The basic idea is that young investors when they are beginning to invest have very little cash to actually invest, when it is most important to invest. Therefore, the bulk of your investments come when you are older, and so you are not "time" diversified. For example, you could be investing the bulk of your money during a downturn, and you cannot really avoid this. Therefore, using leverage can frontload your investments, giving you more time diversification, increasing returns now.

Of course, we should consider the cost of leverage. It is difficult to sevure a line of credit without previously owning assets (quite the catch-22). One way to secure leverage is to use margin loans, which use your currently invested assets as collateral. Your brokerage provides you a loan at some interest rate, and there is no pay back date. Instead, every month you hold the loan, you pay some interest to keep the credit line open. Additionally, if your portfolio declines below some value, the brokerage reserves the right to sell your assets to cover the value of the loan, known as a margin call. Taking a loan magnifies both gains and losses. With margin calls that could happen and magnified losses, margin loans must be carefully considered.

Another way to gain leverage is to use leverage built into securities themselves. For example, SSO is a leveraged ETF that seeks to deliver twice the returns of S&P 500 daily. Gains and losses are both magnified. One problem with leveraged ETFs is that they reset their leverage at the end of day. Over the long run, a leveraged ETF is likely to produce returns less than the multiplier they advertise, due to this time decay. Sideways volatility in price movement also negatively affects gains.

The last way to achieve cheap-ish leverage is to use options, but I don't know very much about options to really comment on that yet. Ayres and Nalebuff recommend using LEAPs, which are a form of options. LEAPS (Long-Term Equity Anticipation Securities) have the advantage in that they use leverage implicitly, rather than explicitly. Your losses are capped at 100% of your stake, you cannot end up owing money, which is a huge draw. Read more about LEAPS.

However leverage is achieved, the investor should put the long term in perspective. Even if your account is wiped out due to leverage, you have many years to rebuild your capital, especially if you are a high income earner. Therefore, taking this kind of risk can make sense in the long run, especially if interest rates are low enough. Of course, risks are magnified, and so behavioral risks are also magnified. The most important thing is still to keep invested, even in the face of losses. If leverage would make you more likely to panic sell at a loss, you were better off not levering up your portfolio in the first case.

In short, leverage should be considered for young investors to achieve greater long run returns, if appropriate leverage can be found.

5 Tax

> But in this world nothing can be said to be certain, except death and taxes – Benjamin Franklin

It's great to use a quote to make me sound wise.

Planning for taxes is a prudent measure for your financial well-being. Recall that Al Capone was arrested not for his many crimes as a mafia boss, but for tax evasion. Even the Joker is afraid of the IRS. Make sure to always pay your taxes come April 15th!

5.1 Tax Brackets

How do taxes work? The U.S. taxes its citizens in a progressive fashion. All income within certain brackets are taxed at that rate; then all money at the next rate are taxed at that next rate. If you increase your income enough to put you in the next bracket, not all of your money is taxed at that bracket; only the money you earn above the tax bracket cutoff is taxed at the new rate.

For example, Bob earns $38,000 a year. The money from $0-$9,700 is taxed at 10%, then money from $9,701–$39,475 is taxed at 12%. If Bob earns a raise of $2,000 a year, he would earn $40,000 a year, enough to put him into the next tax bracket. But only $525 of his income is taxed at the next tax rate, 22%. The rest of his income is taxed exactly the same. This is known as the *marginal tax rate*.

Considering only taxes, it is always better to earn more income. (The trouble with low income earners is that increasing their incomes may trigger several welfare benefits to fall off and decrease one's overall spending power.) Therefore, it is (almost) always worth increasing your income.

You can calcuate your *effective tax rate* by totaling how much tax you are paying this year and dividing by how much total you made.

5.2 Tax Refund

It may feel good to get a tax refund instead of paying taxes come April. After all, its more money in your pocket! However, this is the wrong way to think about tax refunds. In reality, tax refunds represent interest free loans to the government.

If you get a tax refund, that means you paid too much last year. While the government was storing your money, they were able to put it to use and earn money with it. If you withhold your taxes correctly each paycheck and pay taxes when you file, you were able to put that money to use, such as investing it or earning interest. In most cases, avoiding a tax refund is avoidable, by filling out your W-4 correctly or if you are self-employed estimating your deductions more accurately.

If you fill out your W-4 to minimize withholdings, then you must make sure to save enough for taxes or have enough credit lines to pay for your taxes.

5.3 Free Tax Filing Software

By law, there must always be an option to file your taxes for free, no matter how high your tax bracket is.

Below are several options

5.3.1 FreeTaxUSA

Free for federal, small fee for state taxes

5.3.2 Credit Karma

Should be free for everything, but newer player on the block and may make some mistakes. Still a valuable resource.

EDIT: They have been bought by Intuit, the company that owns TurboTax. This free filing option may not be available in the future.

5.3.3 IRS Free File

Only applicable to those with incomes below $69,000 a year. The IRS's own free filing software.

5.3.4 Turbo Tax

Try not to use them. The reason the U.S. even has tax filing is because they lobby to prevent the IRS from just doing our taxes for us and make the tax code complicated enough that software is needed to accurately calculate everything.

5.4 Standard and Itemized Deductions

A deduction simply lowers the amount of tax you have to pay. The vast majority of tax payers will take the standard deduction that applies with their marriage status. The standard deduction is $12,000 for a single person. You can find more about the standard deduction here.

For self-employed tax payers or those with high costs outside of your job, you may want to itemize your deductions. This allows you to claim some expenses or losses and reduce your taxable income.

You typically only want to claim itemized deductions if your itemized deductions are higher than your standard deduction. Common expenses that qualify as itemized deductions are:

- Home mortgage interest
- Property, state, and local income taxes
- Investment interest expense
- Medical expenses
- Charitable contributions
- Gambling losses
- Miscellaneous deductions

The most interesting thing to note is that margin and real estate mortgage loans can be itemized and deducted from your taxes, a minor benefit that may increase your overall returns. Thus, itemized deductions are an argument for leveraging your investments, if your itemized deductions get higher than your standard deductions. Normally, it is not trivial to get up to $12,000 in deductions.

5.5 Tax Loss Harvesting

Tax loss harvesting is the act of selling assets that have declined in value, then claiming a loss. This is another way to lower your taxes for the year. Usually after selling you buy a similar security, so that you don't actually miss out on any potential future gains. But because you have sold at a loss, you can then claim the loss on your tax filing and receive a deduction.

You can buy back the original security after 31 days. If you do buy back that security before 31 days, you cannot claim this loss. Tax loss harvesting is a great way to lower your tax bill, but you should try to time it correctly, otherwise you may sell out at an unopportune time and sell at a gain instead of a loss.

Note that the security actually has to be different. You can exchange a S&P 500 ETF for a total market ETF, but you cannot exchange a S&P 500 ETF for a different S&P 500 ETF, because those are essentially the same ETFs. By buying a similiar investment product, you avoid missing out on gains during the 31 days you cannot buy the original ETF.

Tax Loss Harvesting is completely legal according to the IRS.

5.6 Private RSUs

Normally for RSUs, you are taxed when you received them as income; that's how it works for public companies. But for *private* RSUs, they cannot be sold except in some rare occasions; however you are still considered to have received income, and so must pay taxes on this income that you cannot use.

Companies have long realized it's dumb for employees to pay taxes on RSUs they can't actually sell, so most private companies issue *double trigger* vesting RSUs. You get the RSUs when

1. The vesting date arrives
2. The company goes public or there is some other liquidity event such as a sale.

If you company does not offer double trigger vesting RSUs, then perhaps the 83(i) tax election may help you. This allows you to defer paying taxes on private RSUs for up to 5 years, which hopefully allows your company to go public by then. However, there are some weird requirements your company must satisfy for this exception to be applicable.

Also remember that you owe taxes on the whole sum of RSUs if both triggers for vesting are triggered in the same year! This is likely to push you up in tax brackets. To counter this, you may want to donate to charity on that year, since the taxable deductions have also gone up! In all likelihood however, you will need to plan ahead in order to meet your tax requirements come liquidity day.

5.7 Startup Options

If you exercise your options at least a year before the stock is sold or the company goes public, then your taxes are treated as long term capital gains, which reduces your taxes significantly. This does require some luck/foresight, because a lot can happen in one year; your options might become worthless. Thus, it is always a long term investment into startup options.

6 Managing Your Credit

Credit is the ability to borrow money for goods and services, with the understanding that you will pay it back later and that the cost of advanced money also comes from the future (interest). Credit history is your history of lending and borrowing. Lenders use your credit history to determine how trustworthy it is to lend money to you.

Good credit is necessary to finance cars, purchase homes, or make large investments. Additionally, landlords you want to rent from, companies looking to hire you, insurance agencies trying to determine your rates, and others will look at your credit score to determine if you are a trustworthy person they want to engage with. Hence having good credit is always important.

6.1 Credit Report

Your credit report contains all the information about your borrow history. Your credit history contains the following items

- Number of credit accounts you have (loans, credit cards, mortgages, etc)
- Payment history of loans, whether they were on time or missed
- How much you have borrowed in the past
- Any severe credit infratures, such as car repossessions, foreclosures, credit card closues, bills sent to collections, etc.

Lenders use all this information to make a decision about whether to lend to you and at what rates. Information usually stays on your credit report for 7 years. Therefore an early mistake early in your life is not the end of your good credit history, but it will take some time to correct it.

6.1.1 Free Credit Reports

You should review your credit report each year, to ensure all the information is correct and that you have no lines of credit open that you do not know about; if you do, you may be subject to identity theft.

You are mandated by the law to receive at least 3 free credit reports each year, one from each of the major credit bureaus. Get your free report at the Annual Credit Report Website. It may be best to stagger your credit reports throughout the year, since you only get one credit report from each of the three credit bureaus each year. Hence split over four months.

It also may not be the best idea to get your credit report from http://annualcreditreport.com if you need it in a hurry. If you contest something on the credit report using a free report, then they have 45 days to respond and fix your report, rather than the normal 30 days. (This is something built into the law through lobbying, of course.) So if you need something disputed immediately, it is best to just pay for the credit report from the bureau directly.

Make sure you save your credit report before you leave the website!!! If you leave the website, you won't be able to view your report again for another year or so.

Experian also offers free credit reports. It doesn't include a free FICO score, but that can be found elsewhere.

6.2 Credit Score

To help narrow the decision to give you credit and at what limits and rates, creditors compute a credit score that determines how trustworthy you are. The higher the score, the lower risk of a borrower you are.

There are six factors that determine your credit score:

- Payment History: You want to stay at 100% of ontime payments. This factor counts for a large part of your credit score, and even one missed payment can drop your credit score by a lot. This has high impact on your credit score.
- Credit Utilization Ratio: This is computed by how much credit you used in a cycle divided by your total credit limit. You want a low utilization score that is not 0%. A sub 10% utilization ratio is the best utilization ratio. Lenders want to see that you are responsibly using your credit. Maximizing your credit usage means that you are not saving well and you may be stretch financially, and this puts you in a higher risk category. This has high impact on your credit score.
- Deragotory Marks: Bankruptcies and debts sent to collections. These really impact your credit score, so avoid this at all possible. Collections records can often be removed if they are false, but bankruptcies are harder to remove. This has high impact on your credit score.
- Average Age of Credit: Lenders like to see you have been using credit responsibly for a long time. Don't close your oldest account, since that will negatively impact your credit score. An account being open for 9+ years is optimal. This has medium impact on your credit score.
- Total Number of Accounts: Having lots of accounts actually helps build your credit score. Lenders like to see that you are using many different types of credit responsibly. Opening more lines of credit is also great if you need to access money in a pinch. This has medium impact on your credit score.
- Credit inquiries (hard checks): Credit inquiries happen if a potential lender runs a check on your credit. There are two types of credit checks:
  1. Soft pulls do not negatively impact your score. They are typically used by non-lenders who want to check that you are responsible, such as landlords or prospective employers.
  2. Hard Pulls do negatively impact your credit score for a short time. It is slightly counterintuitive, but if you are applying for credit, lenders may believe you are a higher risk

because you have new debt obligations to fulfill, making you less likely to fulfill your other debts. However, they do not affect your credit score for long, and other credit scores are more important to increase as a result. Hard pulls are also not a big factor in determining your credit score.

6.2.1 Different Credit Scores

Unfortunately, there are many different scores that can be computed from the same factors.

- FICO 8: This is the score used by many lenders. Unfortunately, it is the score that is hardest to get your hands on as a consumer.
- FICO 9: This is a newer score used by some lenders. However, it is not as widely used as the FICO 8.
- VantageScore 3.0: This score was created by the credit bureaus themselves who don't want to pay Fair Isaac Corporations to use the namesake FICO credit score. However lenders do not often use this score, because it gives different weights and adoption is not so widespread. Credit bureaus will market this score to consumers; free credit monitoring services often give a VantageScore 3.0, where the credit bureaus want to push this new credit score.

If you are denied a loan or credit line due to your credit score, the lender is usually legally bound to give you a reason why; this involves your credit report and score, and so they will tell you your credit score, which gives you a glimpse into how you are doing as well.

6.2.2 Number of Credit Cards?

Credit cards will often be consumers most easy to access line of credit, and longest lasting credit line. Therefore, opening more than one credit card is recommended and in fact advised.

- If you are just starting out with credit or if you are recovering from financial disaster, get a secured line of credit. These are simple cards that help you start rebuilding credit.
- If you have decent credit, but need to transfer balances, then open up 2-3 credit cards to transfer the balance.
- Once you have excellent credit, you can open up several rewards credit cards that give you bonuses. You can have anywhere from 3-5 credit cards; ideally they should have great bonuses in different categories so you can take advantage of different types of purchases.
- If you are trying to churn credit cards, well you can probably have 10+ credit cards open at a time casually.

You can open a credit card a year without drastically affecting your credit score (hard checks usually stop affecting your credit after a year or so). Also remember that you can ask for a credit limit increase from your provider, which can help lower your credit utilization ratio.

6.2.3 Free Credit Score Options

It is more difficult to find a FICO 8 score, but most viewing your VantageScore 3.0 is still very valuable, since all the factors that go into your different scores are the same. With that being said, here are the best resources to get your credit score for free.

With a combination of Credit Karma, Discover's Credit Score offering, and free monthly Experian reports, you can view your credit report and score from all three credit bureaus, so you can ensure they are all consistent and accurately reflect your financial health.

1. Credit Karma

   Credit Karma offers two VantageScore 3.0 scores from Equifax and Transunion, and also gives you some details into how your credit score was determined. Even though this is not the FICO score used by most lenders, the factors that go into this score are the same and so these scores should be a reflection of your normal FICO score.

   Credit karma also lets you look at your credit report without having to pay.

2. Mint

   Mint automatically gives access to your VantageScore 3.0 from Transunion.

3. Discover's Credit Score Offering

   Discover gives everyone access to a real FICO 8 score from Experian.

   Therefore, using Credit Karma and `https://creditscorecard.com` should give you a view of all credit scores from all three credit bureaus.

4. Wells Fargo FICO 9 Score

   Wells Fargo offers a monthly credit score derived from Experian. This FICO score is a FICO 9 score, a more recent credit score but it does give you a way to view how good your overall credit is.

6.3 Credit Freezes

This is quite important for financial safety and preventing identity theft. If you are not applying for a loan, then should freeze your credit report until you actually need to apply for a loan. A credit freeze makes it difficult to access your credit report, which prevents someone from masquerading as you and taking out a loan in your name. You should only have your credit unfrozen when you actually need it, rather than it being unfrozen all the time.

In the aftermath of the Equifax breach, 147 million people had their credit information exposed by hackers. If you are one of those 147 million people, you should freeze your credit immediately! Prevent yourself from financial headache as you try to battle loans that aren't even yours. Credit freezes are free by law.

Credit freezes do cause annoyances however, since services like opening a bank account, insurance, new jobs, etc may look at your credit to determine if you are a good potential customer or employee. There are some downsides.

7 Insurance

Insurance premiums: the fee you pay every month and question why you do, until you get into an accident then thank the heavens that you have life insurance, until your insurance company screws you over and you still have huge fees to pay *and* your insurance goes up.

7.1 Health Insurance

You should have some. It's a good idea. Here are some health insurance terms:

- Premium: the monthly amount you pay every month to keep your insurance plan active.
- Deductible: the amount you pay before your insurance plan starts to pay.
- Copayments: the rate that you pay for prescriptions, doctor visits, and other types of care. Different types of services have different rates (doctor checkups are cheap, surgeries are more expensive). In general, copays don't count towards your deductible, but do count towards your out of pocket maximum. Most plans cover 100% preventative services, so you won't have to pay for those.
- Coinsurance: The amount you would pay after your deductible. The rest of the
- Out of pocket max: how much you are allowed to pay maximum for the year. Once you exceed this amount, the health insurance company pays the rest.

Below are some types of health insurance:

- Exclusive provider organization plans (EPOs): You can only use the network providers for health insurance coverage. You will not be covered for visits to providers out of network.
- Health maintenance organization plans (HMOs): they have a list of providers you can visit, and they (may) require you to pick a primary physician or provider. If you need to see a different specialist, you will need consent from your primary physician. Usually have some deductibles and copays for non-preventative vists.
- High deductible health plans (HDHPs): they have a high deductible, but are cheaper in other ways compared to other plans. Their main benefit is that they allow plans to have an HSA. I covered HSAs in a previous section. These are good tax-free accounts, but HSAs usually only come attached with high deductible health insurance plans, which means you pay more out of pocket. If you're an older person you should likely get a low deductible health insurance without HSAs, since you can't really benefit from the growth part of the HSAs anyway.
- Point of service plans (POS): point of service plans allow you to pay higher costs for flexibility to visit out of network providers. Visits outside of the network require paying the deductible first.
- Preferred provider organization plans (PPOs): they have a list of preferred providers, but unlike HMO plans you do not have a primary physician you must see before you can see a specialist. You can see any doctor you like directly. You will likely have copays or coinsurances for non-preventative care and an annual deductible.

7.2 Auto-Insurance

You should have some. It's a good idea.

Unfortunately young people pay higher premiums, but its probably justified because us young people are kinda dumb. You should shop around for the lowest rates before you commit to a certain plan and provider.

7.3 Life Insurance

There are usually two types of life insurance products. Only one of them is worth getting. The purpose of life insurance is to make sure that whoever you leave behind (family, dependents, etc) is well taken care of and won't suddenly be left with a huge bill and half or none of the previous income. For example, your life insurance may help pay off your mortgage if you die prematurely, and provide financial support for your partner and children.

7.3.1 Term Life Insurance

Term life insurance insures a payout in the case of your untimely death. It is only active for a set amount of time; once that time period runs out, you can renew it or let it expire.

There is no savings component compared to whole life insurance. You pay the premium each month, and if you die, a payout occurs that was specified at the time you signed up for the insurance. Because of this, term life insurance premiums are much less compared to whole life insurance premiums. Term life insurance is usually the least costly life insurance available.

7.3.2 Whole Life Insurance

Whole life insurance pays out a death benefit and also includes a savings component where your cash value accumulates over time.

If a financial adivsor or insurance agent pitches you whole life insurance, you should laugh them out of the room. Whole life is such a bad investment, it can't even be considered a real investment. Whole life insurance provides

- a death benefit in case you die while someone else depends on your income.
- a death benefit if you die while no one depends on your income
- accumulates a cash value you can borrow against, using the insurance as collateral.
- an tax-free investment vehicle.
- some esoteric estate planning uses that most people don't need.

For starters, if no one depends on your income, then you don't need whole life insurance. This most commonly occurs when you are retired and have a comfortable savings. If you are retired and are not financially comfortable, you can only unlock this insurance money after someone dies! Which automatically allieviates some financial pressure in a morbid way. While someone depends on your income to survive, term life insurance is a better buy.

Whole life insurance is expensive, and the returns are low; they average around 1.5-3% per year. Thus whole life insurance as an asset class is not a good asset class to invest in; you can invest in bonds or Treasuries to be extra safe and get a better return. Whole life insurance is pitched as a long term investment, which is even worse; for long term investments, you do need some risk to capture real returns, i.e. some equities in your portfolio. Because it is such a bad investment, it's not even a good tax-free withdrawal account to withdraw from retirement, because sometimes the returns don't even beat inflation.

Whole life insurance has high costs. The link does some math between term and whole life insurance, and the results are just heavily tilted against whole life insurance. Moreover, whole life insurance often has front-loaded costs, which costs you valuable time to compound your returns.

The cash value in the whole life insurance plan often does not constitute enough value to serve as adequate collateral for most things you want to buy. If you have a house, its easier to remortgage your house or take out a home equity line of credit (HELOC). Or you can just use your investment portfolio as collateral. Or you might not even need collateral, because for loans that require significant collateral, you probably have other assets you can borrow against already.

Even more damning is that 80% of people who purchase a whole life policy surrender it before they die. For a purchase that is meant to last a lifetime, it really doesn't.

Insurance agents pitch whole life insurance because of how profitable it is, and how useless it is for us. Insurance agents are paid on commission, so they usually receive a nice kickback to sign a customer for whole life insurance. Insurance agents are not legally bound to give you good advice, hence their advice should always be taken with a grain of salt. After all, they're just trying to make money.

8 Financial Advisors

What is the value of financial advice? There's the common saying good financial advice is the best advice you could ever receive in your life, but to pick out a good financial advisor requires good financial knowledge to begin with; by the time you can pick out a good financial planner, you could do it all yourself.

I don't think that's necessarily true. There are a lot of things many people know how to do themselves, but may want to let experts do for them, such as fixing their cars or plumbing their pipes. And it is always good to get a second opinion; having financial knowledge to evaluate others recommendations is always a good idea. You may not always be able to come up with the best ideas, but being able to rationally recognize what is a good idea is an important thing do.

In short, financial advisors don't just help with numerical finance, but also behavioral finance (how one behaves rationally even during bad times). If you feel like you might need help from panicking during a recession, then a financial advisor can save you lots of money in the long run.

8.1 Fudiciary Advisors

Fudiciary Advisors are bound by the law to put the clients interest above their own; they must disclose how they are comphensated and any potential conflicts of interest they have.

Moreover, it is illegal to masquerade as a fudiciary advisor. Thus, the easiest way to ask if your advisor is a fudiciary advisor is to ask your advisor if they are a fudiciary advisor.

If you are looking for financial advice, look for a fudiciary advisor.

8.2 Fee Only Advisors

Fee based advisors are likely to be your best bet; they usually take a percentage of your overall networth you have invested with them, in exchange for financial advice that you may not be able to access elsewhere. Being fee based puts the financial incentive of the advisor largely in line with yours. By growing your networth, they earn more profits. They are not incentivzed to push expensive financial products onto you such as actively managed mutual funds. They are incentivized to help you grow your funds long term.

The only downside with fee-based advisors is that they are encouraged to keep you invested as long as possible. If you want to get out into cash, they are not incentivzed to let you do so easily; however, it could be viewed that cashing out your investments unless you are retiring is not a good financial decision anyway. If no one can predict markets accurately, then how would you know going to cash would be a good decision? It is the financial advisor's job to keep you from making rash and irrational decisions. In this frame, a financial advisor's role is to keep you invested during the bad times, and help you manage long term risk in the long term.

9 Misc

Some stuff that didn't really fit elsewhere.

9.1 Risk Premium

A quick note on risk premium. By taking on risk, you expect higher future returns. Not guaranteed returns, but hopefully in the long run with more risk you have been rewarded with higher returns. In a simple example, this is why bonds return less than equities over the long run; fixed income represents less risk compared to stocks reliance on capital gains to produce returns. By taking more risk, you should expect higher returns, otherwise you would prefer to invest in a less risky asset that produces the same return.

Hence we talk about risk-adjusted returns. Stock prices should already price in the risks that companies face. We expect higher stock prices in the future, but because that reality has not come to pass yet, the price of an equity is lower right now, with a chance of rising (risk). These are the kinds of risk that an efficient market should price.

9.2 Currency Hedges

9.3 Money Market Mutual Funds

Money Market Mutual Funds are low risk investment vehicles that invest in assets with a maturity date of less than a year. They are supposed to be highly liquid funds that are relatively risk free and are supposed to maintain a net asset value (NAV) of $1/share.

The types of funds are:

- General Money Market Funds: These funds invest in a variety of instruments, including treasury bills, CDs, commercial paper, etc. They are non-weighted towards treasury bills. These instruments are exposed to higher credit risk due to higher exposure to commercial paper and non-treasury holdings. These types of funds are taxable by both state and federal incomes.
- Treasury Money Market Funds: Treasury funds invest only in government treasuries. Thus they theoretically have no credit risk, because the U.S. government is determined to have no credit risk (especially since it can just print more fiat money). Treasury interest is exempt from state taxes but still taxed federally.
- Tax Exempt (Municipal) Money Market Funds: These invest in municipal money market instruments, and are immune to federal taxes. They are subject to credit risk.

9.3.1 Money Market Account vs Money Market Mutual Funds

This is not entirely related to investments, but there is often confusion between money market *accounts* and money market *mutual funds*.

Money market accounts are entities created by banks as a savings vehicle, much like a regular savings account. Money market accounts differ from savings accounts because they can invest in short-term, fixed income investments such as municipal bonds to try and attain a higher interest APY. Money market accounts are FDIC secured up to $250,000. As with normal savings accounts, you are limited to six withdrawals per month.

Money market mutual funds also invest in riskier assets like fixed income, as do money market accounts. This enables money market accounts to return better interest rates compared to to normal savings accounts over time, though this is not always true. Money market mutual funds are not FDIC insured, but allow greater flexibility in transfers and withdrawals. Moreover, there is the concept of money market mutual funds maintaining a share value of $1, thus you are buying shares of the mutual fund that hopefully pay a good dividend. Money market mutual funds often deliver more varying returns, where money market accounts usually state a fixed APY that reflects the Fed's interest rate.

9.3.2 "Breaking The Buck"

It is important that money market mutual funds maintain a value of $1/share. If the fund's NAV (Net Asset Value) drops below $1/share, it is known as "breaking the buck". Businesses rely on these funds to maintain their assets overnight. Thus, they are thought to be as secure as cash. However, in the 2008 crisis, the NAV for the Reserve Primary Fund fell to 97 cents per share. This reduced confidence in the funds and almost led to a run on the money market funds. The government stepped in to ensure that the NAV went back to a dollar per share. Dozen of other money market funds were in danger of breaking the buck too, which forced those companies to subsudize the losses.

This is relevant to us, because money market funds often generate higher returns, while being treated almost like cash. Indeed, I advocated for using Fidelity's Cash Management system to invest your liquid debit holdings into a money market fund; however there is a risk of the NAV actually falling below $1 and asset values declining. I believe that most companies and the government cannot allow these funds to fail, else the confidence in the economy and market as a whole falls, but intervention by these entities cannot be relied upon to preserve the value of your cash. Note that these markets should only fail in a black swan event.

Money held in between investments are held in money market mutual funds. Thus there is already the implicit hope that such funds do not decline in value.

9.4 Churning

Churning is the act of signing up for some product with the goal of attaining the signup bonus associated for new uers and cancelling the product after. The goal is to go through as many of these products as possible, getting all the signup bonuses. Churning is usually associated with credit card and bank account churning.

9.4.1 Credit Card Churning

Users with high credit scores can apply for the best credit cards, which have the best cash back bonuses and signup bonuses. Most notably, the signup bonuses are pretty easily accomplished; spend $500-$1000 within a certain time (usually 3 months) with the new credit card. If you chain these bonuses well enough, then you can finance entire free vacation trips. Once you have claimed the bonus, you can cancel the card, and move onto the next card.

There's a whole culture devoted to "churning" through credit cards, i.e. signup for a new credit card. See r/churning for more information; they have great resources and referral resources for newcomers and ongoing information. Doctor of Credit also has an updated list of bonuses and requirements for credit cards.

Tips and tricks:

- Opening many credit cards at once can be advantageous; credit bureaus will assume you are just shopping around for credit, and combine all the hard checks into one, so you can get multiple cards for one credit check!
- Read the fine print. Some cards have restrictions that make it not worth to sign up for, such as having to open a bank account with the company as well, or if you have a card with that institution already, they will not give you the bonus.
- If a card has an annual fee, most cards won't change an annual fee if you cancel the card before the year is up.
- Don't mess up, or the amount of credit you have can really tank your score.

9.4.2 Bank Account Churning

Bank accounts also offer signup bonuses if you open an account with them and meet certain criteria, such as making a certain number of deposits or deposit a certain amount of money. Then obviously you can make a couple thousand by just storing your money around for a few months at one institution, and once you have earned the bonus, move your money to the next bank and set up your deposits to earn the bonus again. Doing this you could make a cool few thousand or so.

Be warned that you do need some decent credit to do this. Banks will often not give the bonus if you don't have good credit to begin with (banking risk). These account signup bonuses may require a soft pull or even a hard pull when you open the account.

This is another good reason to use credit cards. It abstracts away how you store your money from how your fund your immediate life; if you were tied down to debit cards, bank churning strategies would be much harder.

You can make some serious cash with churning. If you have $10,000 in the bank with a generous 2% APY high yields savings account, you should expect to make around $400 in interest that year. A survey of bank account bonuses seem to indicate average bonuses range around $150-$200. Assuming that you need to keep your money in the account for 3 months to keep the bonus, you could make $600-$800 with bank account churning; this doesn't count any interest you could accumulate with your money sitting there, since some of these account bonuses are attached to high yield savings accounts. So with some work, you can make more than just having your money sit there. Anecdotally, stories on r/churning have people making a couple thousand through these methods.

Doctor of Credit has an updated list of bank bonuses and their requirements.

9.5 Negotiating

These points are taken from haseeb qureshi's tips about how to negotiate. He may be a sleezy former poker player turned software engineer, but his points are good.

1. Get everything in writing
2. Always keep the door open
    - Don't say, yes I will sign, or give them a target number

3. Information is power
4. Always be positive
    - Tell them you are excited, but tell them you are also in the interview process for several other companies. It really sounds like a good fit, etc.
5. Don't be the decision maker.
    - I have friends and family I need to consult.
6. Have alternatives
7. Proclaim reasons for everything
8. Be motivated by more than just money
9. Understand what they value
10. Be winnable

9.6 Financial Management Resources

9.6.1 Budgeting

I use both these apps, each has their own benefits and drawbacks. They all have been able to link all of my external accounts so far.

- Mint: Decent budgeting app, can link to all your external bank, investment, and billing accounts.
- YNAB (You Need a Budget): Good budgeting software, but requires a subscription. For those who seriously need a budget, this is better than Mint, because it can actually help keep you on track.
- Personal Capital: More for tracking networth and planning your investments. Be aware they offer great financial analysis tools, but the account is used by Personal Capital Wealth Management to pitch their own services, which most investors won't need.

9.6.2 Other

- `https://www.portfoliovisualizer.com`: great for optimizing your portfolios and run a couple Monte Carlo simulations for your retirement savings. You can simulate market downturns and account for expected inflation as well. I use it all the time to model different portfolios and see their expected returns as well as largest downturns. The website also supports the 5-Factor Investment models, and can give you the values of each factor for a given index fund or portfolio. Fantastic tool all around, mostly free.

10 Financial Events and History

A summary of remarkable events and my observations during my financial history.

10.1 COVID-19 Financial Crisis

10.1.1 Fed Drops Interest Rate to 0

10.1.2 Financial Stimulus Bill