

Financial Logic

*Empowering Ambitious Minds with
Financial and Business Literacy*

Disclaimer:

This book is for educational purposes only. All information is based on my own studies and research. Nothing in this book should be considered financial advice or investment advice.

Preface

I write this book with an open mind. There are many people in the world who are far more educated than I who could teach you more than I ever could. I am open to discussion, and I always want to learn more myself.

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Introduction

Before I started writing this book, I spent a great deal of time pondering on how I could better serve people and make a difference in the world. Personal development is a major part of my life, and the current stage of my growth, I am realizing that there is no great success without great contribution. Many have tried to convey this message via social media, but I feel it is still lost on many who still attempt to make it about significance and themselves. We all have biases, and it is important that we remain aware of that so that we don't make mistakes that cost us big in the future, so I make every attempt to keep myself in check as well so that I never make that mistake.

I look around me in the world and I see a lot of frustrations and disheartenment. I meet people in passing at stores and other locations, and I strike up conversations only to be met with what can only be described as anger and extreme stress and fear. Unfortunately, where I am originally from, that's just the culture there, which is why I moved, and I never thought I would see that kind of attitude and thinking in such a beautiful beach town like where I live now.

I will admit, it is easy to become frustrated when interactions like this are so prevalent, but I always make it a point to stay and listen for a moment to see if there is any way that I can help at all. I have found that it is always the issue of money, debt, housing, etc. When I was younger it was the same thing, but it was far more about relationships than money. Times change, I guess.

I know far too many people who would hear me make such an observation and respond with how negative I am and that is my perception of the world and a whole lot of other immature and manipulative things, but the truth is when you never make it a point to open the door for conversation and listen to people, you never hear bad things, and that is a shortcut I am not willing to take in my life. Not caring about anyone but myself is not "positive" nor does it warrant any

sort of reward in the form of confirmation or praise, and it most certainly should never be labeled and taught as the way to be.

I decided a week or two before I started writing this that I was going to serve and try to make a difference in some people's lives. I started looking for ways that I could make my difference, and after much thought, I believe my great contribution at this time can be teaching information about how to make intelligent decisions with money and the people around you, in the form of the mathematical equations, thought processes, strategies, and skills for solving these problems and making these decisions.

In this book, I'm going to discuss more than just math and where everyone gets it wrong. I want to try my very best to teach you how to keep yourself in check by exposing your biases and your blind spots in your life. I want to teach you the necessary skills that you must have to succeed in finance and business today, whether you want to start a company or just be smarter with money.

Right now, I am speaking in a very frank tone, because this is a serious issue. It's more than a late water bill. It's more than someone at work who is absurdly incompetent. People are unhappy. People believe there is no future for them. I had a young girl, maybe twenty years old, look down at the floor and tell me that homeownership isn't for little people like her, it's for rich people. Belief systems like that become self-fulfilling quickly. Beliefs like that are not true. No one should ever be made to feel that way, and no one should ever sit and make themselves feel that way.

Life is a gift and the world we live in can be as beautiful as we want it to be. At any moment in time, we can make a decision that changes our trajectory for it is not what happens to us that determines our outcomes and our destiny, but our decisions. Our decisions determine everything about our future.

It is vital in times like these that we take ownership of our outcomes and not place blame. Sometimes people marry the wrong person, and rather

than say, “*I* married the wrong person.”, they choose to say, “*They* ruined my life!” Some people experience financial wintertime, and rather than say, “*I* need to learn how to handle situations like these.”, they choose to say, “*The market* is doing something that hurts me.”

If we expect to have any happiness in life and any desirable future at all, we simply *must* stop thinking this way. We *must* stop being the victim of circumstance and making these excuses. Again, it is not what happens to us, but what we do about it that shapes our lives and determines our destiny.

The cold hard truth is that you *absolutely can* build an amazing life for yourself and your loved ones! You have always had the ability to. There are highly energizing ambitious people in the world who love to see you succeed! There are so many empowering opportunities out there for you, but if you don’t believe they exist, you’ll never look for them.

The cold hard truth is that, good or bad, you *learned* how to be in the situation you are in. You listened to someone or a group of people who taught you to get where you are. When we listen to the wrong people, we end up in the wrong places. We become a person who feels like there’s no hope. We come a business owner who hits plateau they can never seem to overcome.

The way you build a life that you are in love with is simply to learn how! Learn how to budget better. Learn how to make better meals for less money. Learn how to save more. Learn how to earn more. Learn the skills. Learn the disciplines. Learn better philosophy. Learn new beliefs. Learn new routines.

What I have found in my life is that once I learned better information, I *always* ended up in a better situation. I *always* ended up happier. I *always* ended up empowered to do more. Better information is what we all need.

I hope and pray that at least one thing in this book can serve you well on your path in life. If there is even one instant of inspiration and hope for you, I will feel that I have accomplished my mission.

You can do it, my friend. Don't quit yet.

Chapter One

AN OPEN MIND FOR WHO WE CAN BECOME

“Life is a lot like a game of chess against the universe. If you make a mistake in the early game, the mid and end game will be far more difficult for you. If you do great in the early game, but make mistakes in the midgame, the end game will be far more difficult for you. Play good chess.”

– Chris Woodward

Today, it seems everywhere we look there are more problems coming at us. Inflation is a major concern; housing prices are far too high; groceries are at levels most people cannot afford. These prices are pushing people to use credit cards just to not be hungry and keep the lights on, which creates an entirely new set of problems for those people and their families. I want you to know today that if you are one of these people, this is not the end for you. I know there are droves of people telling stories that lead you to believe it is hopeless, but it most certainly is not hopeless!

The truth is what we have today is an opportunity to grow and become more. We have a new situation that will make us better than we ever imagined we could be if we just embrace evolution and allow our experiences to teach us and continue to seek more knowledge from people around us who know. Right now, is a time for us to change the way we believe and think and reframe our lives in a way that exposes all the gifts and opportunities that are right in front of us.

Rapid Growth

At some point in our lives, we stopped growing so rapidly. One day we're learning fifteen to thirty new words a day and the next, we aren't

learning any new words some days. We used to learn all these new skills that were so challenging to us, and we ran the risk of experiencing pain such as learning to ride a bicycle or a skateboard, or jumping up and down on a pogo stick, and we were happy and playing and our imaginations were running wild! One moment we're in outer space and the next we're in a racecar winning a championship! We learned all these skills that built many of our greatest memories while also going to school eight hours a day, doing homework and studying, spending time with family and friends, playing ball and other sports, and getting better and better at playing video games. Now, it is very rare to meet people who are still learning at this rate and pushing themselves like this!

We stopped at some point. One day, we didn't sign up to play ball anymore. One day, we came home from school, and we didn't grab our bicycle and take off looking for something to build a ramp ever again. We stopped going to school, either because we graduated or decided we didn't want to continue our education any further. One day we woke up and our lives were: 1.) Wake-up 2.) Go to work 3.) Go home 4.) Go to bed. All that action and learning stopped, and now we find ourselves frustrated, depressed, angry because we don't feel like our life is going anywhere, and someone somewhere told us it is because we "don't have time", and that sounded like a good enough explanation, so we accepted it.

What really happened? Why did we stop? Did someone make us stop? Who told us this was the way life is supposed to be? Where is the rulebook that states when you get to point x, your life instantly turns into *this*?

As we get older, more things begin to influence us. When we were kids, our entire world was going to school, doing our homework, riding our bike, drawing a picture, playing games, using our imagination, spending time with family, playing ball, etc., and as we got older more factors became relevant.

What's interesting to me about this is we took away school and added a job, and everything else stopped! We take away skateboarding and add paying bills, and our entire lives are now meaningless, and we just don't have the time to do *anything* anymore! My friend, this is not true and if we want to have a great life, we must learn to stop thinking this way.

What really happened is at some point mom and dad couldn't make us anymore. There was no real incentive to do any of those other things. We weren't encouraged too anymore. We don't *have* to go take a class, so we don't! We don't *have* to learn how to handle more situations, so we don't! We don't *have* to learn more skills, so we don't! There's a clear belief system that is stopping us from becoming the ultimate version of ourselves and limiting our progress in life: *we don't have to*.

Reframing How We Think

Here's a fact: Some of us believe we don't have to, and we are not happy with our results, while many of us believe we must continue to grow and learn, and we are still learning new things to this day and enjoying our lives and the fruits of our labor.

The truth is, *we do have to*. The evidence is all there in our own individual lives. We were once happy children with countless things to do every single day, learning at a rate many people believe to be impossible for us now, and we were happy! When we stopped doing those things and living that way, we became less happy. This does not have to be our story. All we need to do is change the way we believe.

Let's observe the two opposite beliefs we've been discussing:

Belief 1:

“I don’t have to continue learning and listening to people who want to teach me things. I went to school; I made good grades; I’m grown now, and I have everything I need to live a great life.”

Belief 2:

“If I learn new things every day, I will be empowered to do far better for myself and my family. I will have the skills and knowledge to do anything I want whenever I want. I will be limitless. I will always be doing something interesting and fun. I must learn something new every day.”

Which one of those beliefs creates a person who has unshakeable confidence and can handle anything life throws at them? Which of the beliefs is that of a person who can decide they want to start a business to make some extra money, and they know exactly what to do and get started immediately? Which of those beliefs is that of someone who seems to always be doing something incredible and fun in their lives and they’re always making memories they’ll never forget? While neither belief is wrong, one of the beliefs is far more empowering and energizing than the other.

How we believe affects how we think and make decisions, and those decisions determine our outcomes. If we want to become something more than we currently are, we must first begin with reframing how we currently think and believe. We must literally *become* the person we wish to be before we can be that person.

Who You Become

Here is an exercise I do with people close to me. I want you to take a moment and do this:

Imagine the ultimate version of you, the version of you that God knows you are meant to become, the version He created you to be. You have everything you have ever dreamed of in your entire life. Maybe you

dream of having your own plane, an exotic car, or maybe ten exotic cars! Maybe you live in a mansion somewhere with a beautiful garden. I want you to imagine yourself having it. Go there right now and live in that moment. Touch those things. Hear those engines. Kiss your wife or husband and your children if you have them. Look at how beautiful and amazing your life is.

Now, stay there, and go find a mirror. Go to a mirror in your beautiful life and look at yourself in that mirror. What do you see? Do you see cheap wrinkled up clothes? Tattered shoes? A hat with profanity on it? Are you overweight? Underweight? Very muscular? Are you pale skinned or are you tan? Are you wearing any jewelry? What are you wearing? Are you wearing a T-shirt or is it a nice button shirt? Blue jeans or something a little more formal? Sunglasses? How does your hair look? Take a very hard look at yourself and notice every detail.

Now ask yourself: What does that person do all day? Do they stare at their phone for hours? Do they watch television all afternoon? Do they play video games until two o'clock in the morning? Do they get out of bed at eleven in the morning? Which of the two beliefs we discussed earlier do you think that person has? Maybe it's another belief system entirely... What is it? What is their philosophy of life? Do they believe everything is hopeless? Do they see opportunities everywhere? What does that person you see looking back at you do all day? What goes through their mind? What do they read? What do they talk about? Who do they associate with?

Now that you know that person, you need to learn this fact:

That life did not create that person; that person created that life. You must become that person to have that life.

People frequently make the mistake of believing when they have that kind of money and that kind of car and that kind of home and that kind of lifestyle, then they'll stop the reckless spending and the time wasting and reading the garbage and the hanging around with people of little substance; but it doesn't work that way. You must make those changes

before you can have those things. You must *become* the person you are supposed to be to deserve all the great rewards!

There's a saying that if you give a man a million dollars, he best become a millionaire quickly so that he can keep it. I don't know who originally said that, but my gosh what a great way to put it!

Now, don't get me wrong; you cannot go out spending all your money on clothes and jewelry and cars. Those are the rewards, not the person. Your mission in life is to become that person so that you may reap all the benefits of being that individual. That person has everything you want in life, and they live inside you just waiting to come out!

Visit this version of you frequently. Keep their image in the front of your mind. Continue studying how they think and what they do every day. Stay focused on these details as they are your road map to becoming that person and achieving all that they can and have achieved. This is the first step to becoming the ultimate version of you!

What we have learned so far

Up to this point we have focused on reframing ourselves to see opportunities and we have observed what we already have inside of us such as the knowledge of what we must do to become the person we want to be and to have the results we wish to have.

These bits of knowledge themselves are all it takes to change the way you think and what you believe about yourself and your life. Annihilating limiting beliefs that stop us in our tracks is the first step to a newer and better future. We must make a daily effort to reframe our thoughts about our lives and our situations. It will not always be easy, for there will be days and weeks, maybe even months, that are much more difficult than others, but we must remain self-aware and continue to empower ourselves with an outlook that shows us where we want to go and not where we don't want to go! Where we place our focus is surely where we will see the most output.

Where we are all going we will surely arrive, my friend. Look where you are going! Don't end up in the wrong place.

Chapter Two

SUPERIOR DECISION-MAKING

Things are not always what they seem.

Have you ever been in a financial situation that looked obvious at the time, but later you realized you were wrong about it and were having to deal with the consequences? This is something that happens with long-term decisions quite a bit. In a more fast-paced world, we are more often looking at what is right in front of our faces rather than looking down the road several days, weeks, months, or years. This kind of near-sightedness makes it easy to make decisions that produce positive short-term results, and negative long-term results. Even our emotions come into play with the short-term decisions and usually that can make the long-term implications that much worse. What we need is a new way to keep ourselves in check; we need a new strategy.

There is more than one way to keep yourself in check. You can turn to your friends and loved ones and ask them to be honest with you. You can hire a mentor or a “big brother” type figure. You can journal your thoughts and when things go poorly you can go back and read what you were thinking and contrast it with how were thinking when things were going well. There are also situations where we can do the math...

Math is the language of the universe. It is how everything is measured and how everything is connected. There is a number for everything, and most things can be quantified. When I was in school, we had critical thinking questions where we were given real-life scenarios to apply the math we had learned to. Critical thinking is an excellent thing to practice daily!

If we wish to learn superior decision-making, we must learn to remove the emotions and biases from the problems. This means we have the incredible opportunity to use our minds and creativity to test the problem and each outcome, to see what the best route forward is. There are an

infinite number of ways to do this, and I am going to show you a few. I want you to remember that the point here is to learn a new skill and to make strong associations between these skills so that we have the knowledge and creativity that we need to solve our problems the best way we know how, so take notes! Write things down. Write down how you may be able to apply these things in your life and the situations you find yourself in. Actively seek the opportunity to make things better.

Thinking Logically

One of the most helpful lessons I have learned in my own personal growth journey was to make my decisions with expected value calculations. This has helped me make many financial decisions where I had a lot on the line, and I needed to be sure I was making the right decision.

Expected Value 1.1

Let's look at how to do an expected value calculation in a real-life scenario:

We're going to imagine we are playing a game; maybe it is a video game; maybe a board game or a card game; or any game where there is risk or loss involved. In this game, we have one hundred points, and we find ourselves faced with a situation where we can win and advance forward, but we must risk all our points, and we know what the odds of winning and losing are.

Let's lay this scenario out clearly:

- We have one hundred points.
- We have the option to risk them all.
- If we succeed, we gain 10x our points (+1000 points).
- If we fail, we lose our points (-100 points).
- There is a ninety percent chance of failure (90%).
- There is a ten percent chance of success (10%).

Now we ask ourselves: *Is this a good decision?*

Some people look at a situation like this and they see a ninety percent chance of failure and decide solely based on that information. There are also people who see the reward of +1000 points and make their decision based on that information alone. This decision is best made with the expected value of the decision. We calculate expected value as the weighted reward minus the weighted risk.

- The reward: Gain 1000
- The probability of success: 10%
- The penalty: Lose 100
- The probability of failure: 90%
- Multiply the reward by the probability of success: $1000 * 0.1$
- Multiply the penalty by the probability of failure: $100 * 0.9$
- Subtract the weighted penalty from the weighted reward:
 - $(1000 * 0.1) - (100 * 0.9) = \text{Expected Value.}$
 - $100 - 90 = 10$
- Our expected value is positive ten (+10).

The fact that we return a positive value means that this could be a good decision even though the odds are not in our favor.

Let's explore something that is a bit more common:

You have 100 points. You are going to toss a coin. Heads: you win 100 more; Tails: you lose your 100 points.

- The reward: 100
- The probability of success: 50%
- The penalty: 100
- The probability of failure: 50%
- Multiply the reward by the probability of success: $100 * 0.5$
- Multiply the penalty by the probability of failure: $100 * 0.5$
- Subtract the weighted penalty from the weighted reward:
 - $(100 * 0.5) - (100 * 0.5) = \text{Expected Value}$

- $50 - 50 = 0$
- Our expected value is zero.

There is no expected value. Why would you do something if there were no value to be gained; furthermore, why would you *risk* your one hundred points if there were no value to be gained?

Expected Value 1.2

Since we now have a general working understanding of how this is done, why don't we dive a little deeper? What do we do when we have more than two possible outcomes? What if there is one positive outcome and two negative possible outcomes? How do we do structure our calculation in that situation?

Let's explore and make our observations:

We can only ever have one hundred percent; there is not one hundred and one percent chance so we must be accurate with our probabilities to the very best of our ability to get an accurate calculation.

In this hypothetical scenario, we have one positive outcome and two negative outcomes. We have 100 points in our game. The reward if we are successful is we get another 100 points. The probability of this happening in this case is thirty percent (30%). There are two other possible outcomes: 1.) We lose and the penalty is we lose our 100 points, and the probability of this penalty is fifty percent (50%) 2.) We lose and the penalty is we lose half of our 100 points (50 points), and the probability of this penalty is twenty percent (20%). Let's declare our variables and put our equation together:

- We have 100 points.
- Reward: 100 points.
- Probability of Reward: 30%
- Penalty 1: We lose our 100 points.
- Probability of Penalty 1: 50%
- Penalty 2: We lose 50 points.

- Probability of Penalty 2: 20%

We will still be subtracting the weighted penalty from the weighted reward, but this time will subtract the second weighted penalty as well.

All we must do now is piece together our equation and get the expected value of this decision. This time I will illustrate the equation for you rather than using bullet points:

$$ExpectedValue = (100 * 0.3) - (100 * 0.5) - (50 * 0.2)$$

$$Expected Value = 30 - 50 - 10$$

$$ExpectedValue = (-30)$$

This time we see that the expected value of the decision is negative, so this could be a poor decision.

This is the kind of thinking that produces far more positive outcomes than negative because you are no longer making decisions with negative expected values or expected values of zero.

By the way, just to boost your confidence a bit. This is the equation that you now understand:

$$EV = (R * Rp) - (P_1 * P w_1) - (P_2 * P w_2)$$

I don't know about you, but I think mathematical notation just looks cool!

Linear Equations

I bet you remember $y = mx + b$ from high school. I know when I was growing up, my belief at the time was that I would never use that again as long as I lived. I believed that was just busy work they gave me to memorize in school and I didn't need to know it. Since then, I have been proven massively wrong! Oh, how wrong I was! This helpful and simple little equation can show us accurate projections of our earnings.

Let us again imagine a scenario where we are starting a business providing a simple service, like dog-walking for example. We have a dog-walking business where we charge a flat fee of \$20 and then \$5 per dog walked every day. All we have to do is declare our variables and put them into our equation to project how much money we would make:

- y = How much we would make
- m = How much we charge per dog (\$5)
- x = How many dogs
- b = Our flat fee (\$20)

If we walk one dog:

$$y = mx + b$$

$$y = 5(1) + 20$$

$$y = \$5 + \$20$$

$$y = \$25$$

If we walk two dogs:

$$y = mx + b$$

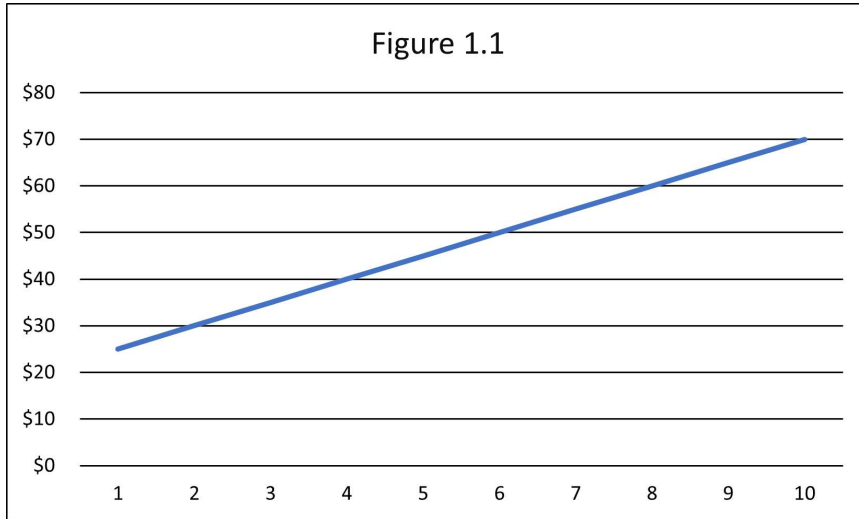
$$y = 5(2) + 20$$

$$y = \$10 + \$20$$

$$y = \$30$$

We can plot this on a graph to get a visual of our projected income. In Figure 1.1, we see good news: we're making money.

Figure 1. Chapter Two-1 shows a linear increase in projected income.



We can use this visualization to take a more detailed look at the future based on a few different possibilities so that we may choose the one that produces the most profit.

Let's say we have a different scenario with our dog-walking business. This time we have \$25 in expenses, and we charge \$10 per dog. We can input our variables and look at our outcome:

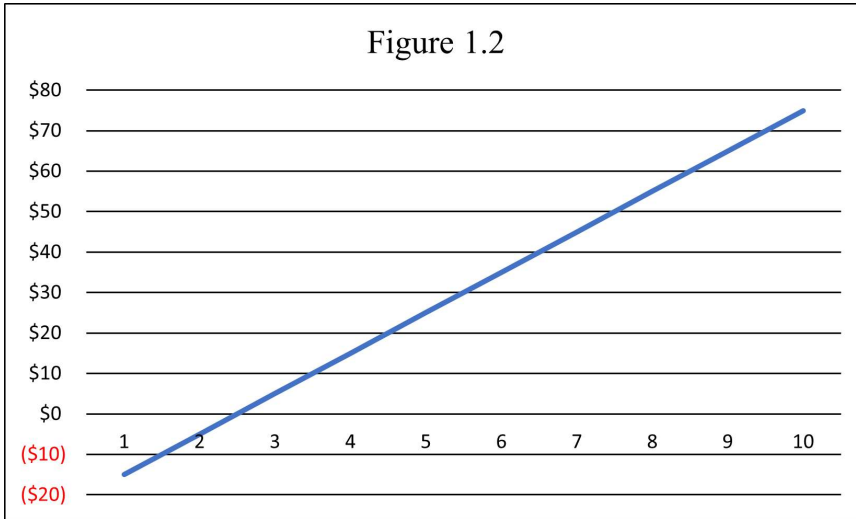
$$y = mx + b$$

$$y = 10(x) + (-25)$$

$$y = 10(x) - 25$$

We can now substitute for x the number of dogs just like we did before. In Figure 1.2, I have plotted our new projections:

Figure 1.2 shows a linear increase; however, it starts with a loss.

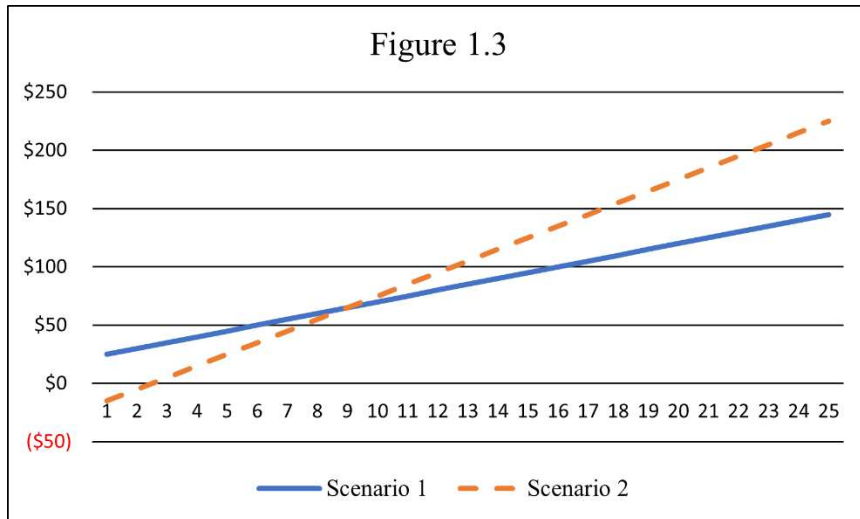


As you can see, we are still moving up, but not as much as we were before.

Now we pose the question: Which situation makes more money?

Judging by our current data, the second scenario makes less money, but remember you cannot just make a decision based on the short-term. What does this look like when we walk twenty-five dogs instead of ten? In Figure 1.3, I will plot both lines on the same graph so that we can compare them.

Figure 1.3 illustrates that Scenario 2 is the most profitable strategy long-term.



Now, can see things from a different perspective. Before, it appeared as though the first scenario was the more lucrative. It didn't have the expenses; it came with a flat fee charged; and you started off with a profit. In the second scenario, you had to walk three dogs just to get out of the red and you had the expenses with no flat fee; however, now we see that the second scenario is the most lucrative long-term, and it appears to be the far better option, the more dogs you can walk in a day.

As you can see, putting your ideas to the test and doing the math to make sure you are right is valuable. This is why big corporations spend so much money analyzing data and looking for trends not just in the market, but in their business as well. We have looked at a hypothetical scenario here to explore and make observations. You should continue to do this on your own. Maybe you have three different scenarios you would like to test; or maybe you have twenty. It is worth your time to sit and develop this skill so that you may make far better long-term decisions.

There is a great life lesson in these sorts of analyses. Sometimes you must make a sacrifice in the beginning to reap the benefits later.

Also, I was very wrong about $y = mx + b$ being useless in my life. I'm elated, I went back and learned it again.

Strategizing With These Sorts of Analyses

I don't know about you, but when I look at those two lines intersecting, I personally feel that it is a no-brainer to use the pricing structure of Scenario 1 until I reach the number of clients where the lines intersect, and then start all new clients on the pricing structure from Scenario 2. It's clear to me on the graph that this is the optimal strategy to make the most money.

These are the types of things small businesses should especially do to optimize regularly, otherwise you fall into the trap of advertising random discounts all the time trying to get people to come in the door because you don't know the best way to price your services. Those are just my thoughts.

Chapter Three

INTEREST AND RETURNS

The borrower is a slave to the lender.

Interest rates and the returns on investments are both hot topics in our country. It has been my experience that the vast majority of people genuinely have no idea how debt works at all, and I've worked with real estate agents, loan originators, investors, business owners, entrepreneurs, you name it; I've met them at some point and some conversation with them of some shape or form. It is clear that people largely end up having to figure things out for themselves, and that often even creates resentment towards those who were able to get the education they needed. Many people feel like those educated folks were given a shortcut.

On the flip side of this, I have seen that people who got an education often see those who figured it out themselves at gatekeepers of the information and opportunities they need to take care of themselves and their loved ones. These attitudes create division in our society, and that division always leads to misinformation, which always makes the innocent struggle more than they should ever have to.

Today, I am going to share what I know about interest and debt, so that you at least know what I have been able to gather from my conversations and studies on my own.

In my conversations and studies, it is clear to me that there are four areas that people don't understand: 1.) Mortgage principal and interest 2.) Credit card debt 3.) Return on investment. I have found that the lack of knowledge is so great that it's beyond a mere wrong opinion and it is to the point of becoming militant with people. This kind of intransigence

and arrogance does major financial damage not just to ourselves, but to our family, the future generations of our families, and to the economy as a whole. We must learn how to learn so that we can learn how to form correct opinions and make better decisions.

In this chapter, we will dive deep into how these things work. We should at least walk away with a working knowledge so that we can all continue our own research.

Amortization

If you have ever bought a home, you have likely seen an amortization table where they illustrate how your monthly payments contribute to your principal and interest on your loan. Seeing this and understanding this are two different things. Amortization basically means paying off your loan over time. I want to share with you how amortization works so that you will never be in the dark about it again. Grab some paper and let's practice!

Let's say we're going to borrow \$500,000 at 8% interest; it is a 30-year mortgage, and your monthly payment is \$3,669.

The first step is to calculate 8% of \$500,000:

$$500,000 * 0.08 = 40,000$$

That \$40,000 is your interest for the year; to get the monthly interest you divide that \$40,000 by 12:

$$40,000 / 12 = \$ 3,333.33$$

Now that we know how much interest to pay in month one, we can calculate how much of our payment goes to the principal by subtracting our interest payment from our monthly payment:

$$\$ 3,669 - \$ 3,333.33 = \$ 335.67$$

To figure out the next month, we subtract the principal payment we just made (\$335.67) from the loan amount (\$500,000) to get the balance that we still owe.

$$\$ 500,000 - \$ 335.67 = \$ 499,664.33$$

With this new balance, we can calculate the payment to interest and principal in month two.

The first step is to calculate 8% of the balance (\$499,664.33):

$$\$ 499,664.33 * 0.08 = \$ 39,973.1464$$

That \$39,973.15 is the interest for the year; to get the monthly interest you divide that by 12:

$$\$ 39,973.15 / 12 = \$ 3,331.10$$

Now that we know how much interest to pay in month two, we can calculate how much of our payment goes to the principal by subtracting our interest payment from our monthly payment:

$$\$ 3,669 - \$ 3,331.10 = \$ 337.90$$

Now let's do one more month just to make sure we understand how to continue this cycle:

To figure out month three, we subtract the principal payment we just made (\$671.24) from our previous balance to get our new balance:

$$\$ 499,664.33 - \$ 337.90 = \$ 499,326.43$$

With this new balance, we can calculate the payment to interest and principal in month two.

The first step is to calculate 8% of the balance (\$499,326.43):

$$\$ 499,326.43 * 0.08 = \$ 39,946.11$$

That \$39,919.45 is the interest for the year; to get the monthly interest you divide that by 12:

$$\$39,946.11 \div 12 = \$3,328.84$$

Now that we know how much interest to pay in month three, we can calculate how much of our payment goes to the principal by subtracting our interest payment from our monthly payment:

$$\$3,669 - \$3,328.84 = \$340.16$$

Now, you subtract the principal payment we just made from the previous balance to get the remaining balance:

$$\$499,326.43 - \$340.16 = \$498,986.27$$

You continue this process until you have calculated all three hundred and sixty payments.

Total Amount Paid and Total Interest Paid on A Mortgage

This is fairly simple. Take your monthly payment and multiply it by how many payments there are; if you have a thirty-year loan, you multiply thirty by twelve to get three hundred and sixty monthly payments. After you have multiplied your monthly payment by three hundred and sixty, you subtract the loan amount to find the total amount you paid in interest.

We had a \$500,000 mortgage loan before. Our monthly payment was \$3,669. We need to multiply the monthly payment by 360 months.

$$\$3,669 * 360 \text{ months} = \$1,320,840 \text{ Total Amount Paid}$$

Now to find the total interest paid, we subtract the loan amount (\$500,000) from the total amount paid:

$$\$1,320,840 - \$500,000 = \$820,840 \text{ Total Interest Paid}$$

Total Amount Paid

Some people see that number and they say, “Wow! I did not realize I was paying that much more for my home!”. It is staggering to see that you are paying more than double for the home by the time you have it paid off.

This is one of the factors that made me feel so moved to write this book was to try and help people understand what they are paying. This sort of education and the ability to calculate the finances is a superpower for you and your family!

Total Interest Paid

Seeing that the interest paid in our hypothetical situation is higher than the original loan amount should come of no surprise; this is from thirty years of interest. There are ways that you can spare yourself a lot of the costs of this. One excellent way to save thousands of dollars is to make your regular monthly payment as scheduled and then make another payment “to principal” every single chance you get; there are some folks who can afford to just double up their monthly mortgage payment, so their strategy would be to pay \$3,669 as scheduled and then \$3,669 again to the principal. You could see a thirty-year mortgage be paid off more than ten years early like that.

I won’t do another amortization table, but imagine you go ahead and make that payment to the principal every month and you can comfortably afford to make that a \$1,000 payment. Just add \$1,000 to what you pay to the principal every month and look at how quickly that amount starts to diminish. Just beware of any penalties for paying off your mortgage early!

Return on Investment

Return on Investment is a far simpler subject to understand than amortization. Return on investment is commonly called “ROI” for short. The goal of investing is to get back more money than you put in.

Calculating ROI

Calculating your return on investment is simple enough. Let’s say you bought an item for \$100, and you sold that item for \$110. You a return of \$10, and in this case, we can see it is a 10% return, but we need to learn the math.

To calculate the return on investment (ROI) you subtract your initial investment from what you sold the investment for.

$$110 - 100 = 10$$

Now that you have your profit of ten, you divide your profit by your initial investment (\$100).

$$10 / 100 = 0.1$$

0.1 as a percentage is 10%, so your return on investment is 10%.

Let's try another example:

You purchase a stock for \$345 and you later sell that stock for \$386.

First, find your profit by subtracting your initial investment from the amount you were paid when you sold the stock:

$$\$386 - \$345 = \$41$$

Now, you divide your profit by your initial investment:

$$\$41 / \$345 = \sim 0.12$$

0.12 as a percentage is 12%. Your ROI would be 12%.

Simple enough, right?

Calculating Actual ROI

We can take this to the next level by accounting for some expenses. Let's imagine that we are buying an asset for \$100,000; we have expenses of \$55,000; and we sell the asset for \$175,000. What is our return now? All we really need to do is add an extra step to what we did before.

First, subtract your initial investment from what you were paid when you sold the asset:

$$\$175,000 - \$100,000 = \$75,000$$

The next step is to subtract your expenses from your profit:

$$\$75,000 - \$55,000 = \$20,000$$

That \$20,000 is called you “actual return”.

Now, we divide our actual return by our initial investment to get our actual return as a percentage:

$$\$20,000 / \$100,000 = 0.2 \text{ or } 20\% \text{ Actual Return on Investment}$$

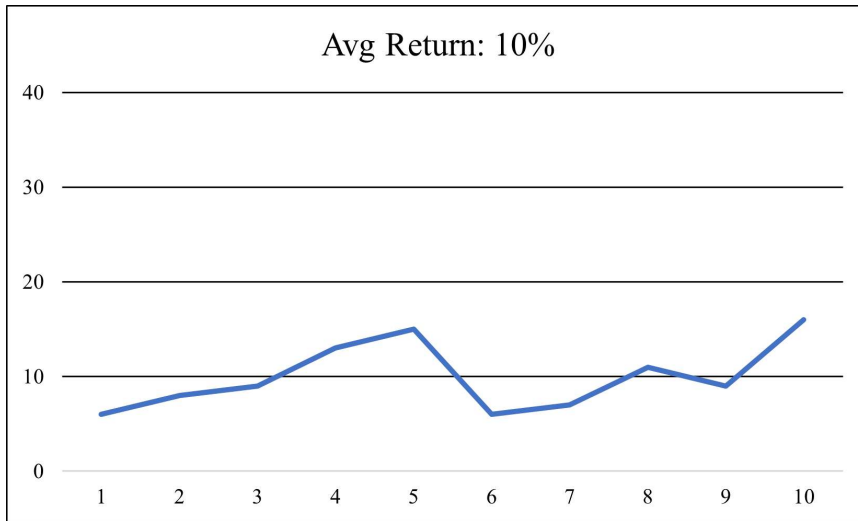
The Average Return 1.1: Risk

Average returns are a great way to measure an investment’s performance over time. Think of average returns as a way of smoothing the information out to one quantifiable metric rather than reading what it has done for the past ten or so years and analyzing each one individually. This way of thinking makes it easier for the investor to make a decision, but it also makes it easier to not see certain areas of performance, such as risk.

You can have two investments, each showing an average return of 10% for example, and the two look wildly different from each other. In ***Figure 3.1***, I have illustrated a hypothetical situation where an asset shows an average return of 10%¹.

¹ Plotted as the percentage return for each year.

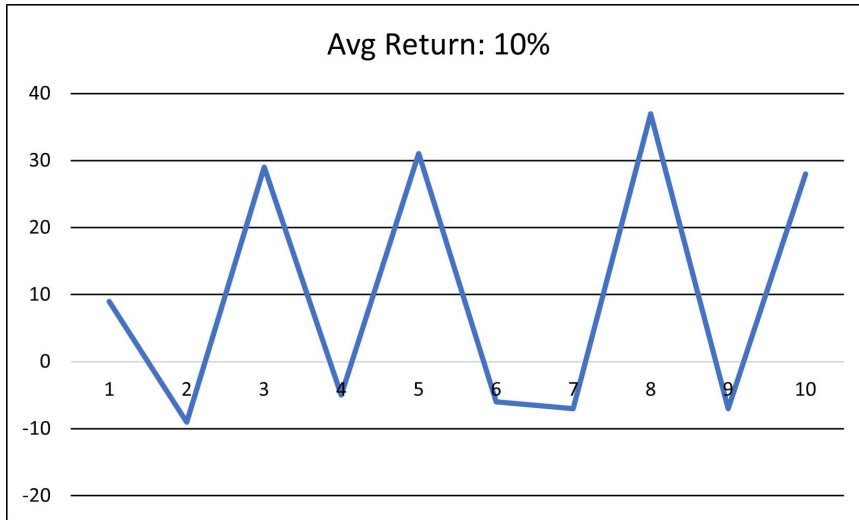
Figure 3.1 shows an average return of 10%



In **Figure 3.2**, I have illustrated another hypothetical asset that also shows an average return of 10%².

² It is plotted as the percentage return for each year.

Figure 3.2 illustrates an average return of 10% but displays quite a bit more volatility.



These two look vastly different. In **Figure 3.1** we see the hypothetical asset made 6%; the next year it made 8%; the next year it made 9%; and so on. In **Figure 3.2** we see the second hypothetical asset made 9%; then it lost 9%; then it made 29%; then it lost 5%; and so on.

What I find fascinating here is that they each have an average return of 10% and they each look vastly different, because under the covers they have very different standard deviations. Think of the standard deviation of an asset's returns as a way to assess risk.

The hypothetical asset in **Figure 3.1** has a standard deviation of 3.435113, while the hypothetical asset in **Figure 3.2** has a standard deviation of 18.09972. Now *there* is a difference! We could gather that the second hypothetical asset in **Figure 3.2** is ~5.27 times riskier! This shows us that the first hypothetical asset has more return on the risk we take on if we invest in it, and since we get essentially the same amount of money for less risk, this one may look more appealing to some.

Some investors have a higher risk tolerance and for a chance at making more money, would go for the riskier asset, while others who invest more conservatively would go for the less risky asset for a greater chance at slightly less returns over time. Some investors may also look at the fact that the first hypothetical asset never lost money in our data while the second hypothetical asset lost money fifty percent of the time.

This is all a matter of risk tolerance and personal financial goals. There is a great deal of individualism with this sort of thing. Just like I mentioned in a previous section how there are many ways to analyze, you have to educate yourself as much as possible and build a strategy that works for you personally while not getting distracted by what others are doing unless you seek to learn from them.

Always gather as much information as you can before making a major financial decision and if you trust it in the hands of someone else, make every effort to ensure that person is qualified and has your best interest at heart rather than their own.

Average Return 1.2: Breaking Even

In my personal and professional life, I have met many who are perfectly fine with breaking even. In this case, breaking even means you have an average return of 0%. A very simple example of what that looks like is:

25%, (-25%), 25%, (-25%), 25%, (-25%), 25%, (-25%).

Before, I plotted the percentage returns to make a point about risk. In this scenario of a hypothetical asset behaving this way, it is more effective for me to use a dollar amount as a starting point to show you what happens to the balance over time.

Let's pretend I invest \$100 into an asset that behaves the way I stated. In ***Figure 2.3***, you can see what happens to the balance over time.

Figure 3.3 illustrates an average return of 0%, by moving up 25% and down 25% repeatedly effectively displaying the loss that occurs.

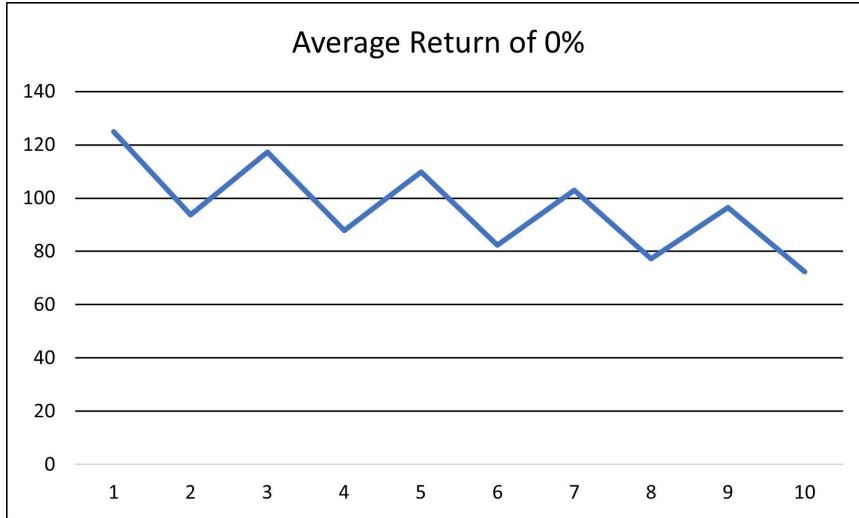


Figure 3.4 is a table to show what happens to my imaginary \$100:

Figure 3.4

Initial Investment	\$100
+25%	\$125
-25%	\$93.75
+25%	\$117.19
-25%	\$87.89
+25%	\$109.86
-25%	\$82.40
+25%	\$103.00
-25%	\$77.25
+25%	\$96.56
-25%	\$72.42

Now we ask the question: *Am I actually breaking even?*

This is an example of how our own biases and thinking can get the better of us when it comes to making decisions with our money. In most of the cases, I have had experience with “breaking even” was usually a reason to not make any decisions, which as you can tell wasn’t a decision.

Average returns are a good metric to simplify what is going on, but they do not necessarily give us accurate information. It is vital to gather as much information as we can before we make decisions.

Confirmation Bias

There are many different metrics for measuring performance in finance and accounting. What I have shown you is not how everyone does it. There are some who do not account for taxes when they account for their expenses. There are some who do not account for interest payments on loans when they calculate expenses. You can do research on financial analysis, and you will find an endless selection of calculations that can be made. What I want you to understand is it is very important that you account for expenses when calculating return on investment. When you do not account for expenses, your calculations may show that you made big money when in reality you lost big money. Always do the real math and get the real numbers no matter what anyone tells you. Do not be swayed by people who love confirmation bias in their calculations. Use mathematics and financial analysis to try and break things and prove to yourself how wrong you are. If the errors are there, you will find them. If you do not look for the errors and assume you are always correct, you will never find the errors and you will always be correct. This opens doors for potential costly mistakes.

Credit Card Interest Rates

Credit card debt is not amortized. Credit card interest is calculated based on the average daily balance, and it is charged monthly. There is a mathematical formula for calculating monthly interest:

$$\text{Interest} = \frac{(\text{Balance} * \text{Annual Interest Rate})}{12}$$

Let's say for example I have a credit card with an interest rate of 29%, and I have a balance of \$3,000. We can add these figures to the formula to calculate my monthly interest:

$$\text{Interest} = \frac{(3,000 * 0.29)}{12}$$

We can now begin to solve:

$$\text{Interest} = \frac{870}{12}$$

Finally:

$$\text{Interest} = 72.50$$

This means, I owe about \$72.50 in interest this month on my hypothetical credit card. To calculate the payment, we add this to the minimum required payment. Let's say the minimum monthly payment is 1% of the balance:

$$\text{Minimum Payment} = \text{Balance} * 0.01$$

$$\text{Minimum Payment} = \$ 3,000 * 0.01$$

$$\$ 3,000 * 0.01 = \$ 30 \text{ Minimum Payment}$$

$$\text{Payment} = \$ 30 \text{ Minimum Payment} + \$ 72.50 \text{ Interest}$$

$$\text{Payment} = \$ 102.50$$

It is important to understand that credit card companies are not all the same and they each have their own policies and procedures. Make sure you read your policy carefully to understand how your credit company does things with your credit card. For example, your credit card company may state that they require a minimum payment of \$50 or 2% of the

balance, whichever is higher. Make sure you are aware of any factors like these when you do calculations.

Out Of Control Credit Card Debt

It is an understatement to say in 2023 that credit card debt in our beautiful country is totally out of control. When you look at our previous math, it really looks like credit cards are a wonderful thing to have, because the interest just isn't that bad. Who cares about \$0.73, right?

Here is how they get out of control:

Imagine with me that I have my hypothetical credit card, and my interest is \$72.50, so I'm not too worried about it right now as I can easily handle that. This attitude and belief system leads me to swipe the card a little more freely because I believe I can. Before you know it, one thing leads to another, and I now have a balance of \$10,000. Let's do some calculations and observe how much damage has been done.

First, let's figure out how much interest I owe this month:

$$\text{Interest} = \frac{(\text{Balance} * \text{Annual Interest Rate})}{12}$$

$$\text{Interest} = \frac{(10,000 * 0.29)}{12}$$

$$\text{Interest} = \$ 241.67$$

The interest is only \$241.67; I can handle that, right?

The moon turns red...

Let's calculate my minimum payment which if you remember is 1% of the balance:

$$\text{Minimum Payment} = \text{Balance} * 0.01$$

$$\text{Minimum Payment} = \$ 10,000 * 0.01$$

$$\text{Minimum Payment} = \$100$$

Now we add our interest to our minimum payment to get the total amount we must pay:

$$\text{Total Amount Due} = \text{Minimum Payment} + \text{Interest}$$

$$\text{Total Amount Due} = \$100 + \$241.67$$

$$\text{Total Amount Due} = \$341.67$$

Some people may say that still isn't terrible...

A small ember begins to glow in the forest...

The Wildfire

Here is how it happens. I have become overconfident with my hypothetical card, believing I can handle the payments and I haven't gone too far; and then something goes wrong... I have an unexpected expense and now I can only afford to pay \$100 this month on my credit card... And I think to myself, "It will be fine. I'll catch up next month."

$$\text{Interest} = \frac{(\text{Balance} * \text{Annual Interest Rate})}{12}$$

I had a balance of \$10,000 with a minimum payment due of \$341.67. I paid \$100. My balance is now \$10,241.67.

$$\text{Interest} = \frac{(10,241.67 * 0.29)}{12}$$

$$\text{Interest} = \$247.51$$

Interest is higher this time...

$$\text{Minimum Payment} = \text{Balance} * 0.01$$

$$\text{Minimum Payment} = \$10,241.67 * 0.01$$

$$\text{Minimum Payment} = \$102.42$$

Minimum Payment is higher this time...

We can't forget what we *did not* pay last month, so we must add that to our minimum payment due:

$$\$102.42 + \$241.67 = \$344.09 \text{ Minimum Payment Due}$$

Now let's add on the interest that we owe...

$$\text{Total Amount Due} = \$344.09 \text{ Minimum Payment Due} + \$247.51$$

$$\$344.09 + \$247.51 = \$591.60 \text{ Total Amount Due}$$

And by the way... There's a late fee of \$40 for my not making my minimum payment on time last month...

$$\$591.60 + \$40.00 = \$631.60 \text{ Total Amount Due}$$

And there's \$23 in fees...

$$\$631.60 + \$23 = \$654.60 \text{ Total Amount Due}$$

And the fire is out of control...

Next month I can only afford to make another partial payment and the effects compound again. I am now looking to increase my income drastically just to be at zero again, and such drastic changes usually take a lot of time, all the while my problem grows worse and worse.

Not-So-Humble Advice

I personally have been in this situation. I am writing this book with an open mind as I need to learn more every day and I wish to keep learning. Maybe I have gotten a figure or two wrong in this book; maybe I do not fully understand how these mechanics work. I am open to learning and bettering myself.

One thing I am going to tell you in my not-so-humble opinion is you do NOT want to put yourself in this situation. Avoid this happening at all costs!

If this is your situation, I want you to put the book down, go get your credit cards and a pair of scissors, and I want you to chop those cards up into little pieces and throw them in the trash. You think you will catch up and it will be alright, but I am here to tell you that it absolutely will not be alright as long as you have those cards in your possession. The chains of habit are too light to be felt until they are too heavy to be broken. Butcher those cards and throw them away!

If you are under the age of thirty-five, you have spent your entire life being told that you have to be in debt and you have to have a credit card so that you can build your credit score so that you can eventually get into even more debt. This belief *will* ruin your life.

You do not have to be in debt. You do not have to be applying for credit cards so that you can build your credit score. This is merely getting the fire going. Most people will tell you if they had a million dollars, they would pay off all of their debt. The happiest people I know are completely totally debt free. Do not put yourself in a situation where you go to work every day to give more money to some big financial institution that doesn't care about you. You can just as easily go to work every day and use the money you make on yourself and your family (which is what the people who own those companies do with their money). If you are not already in it, stay out of it; and if you are already in it be as aggressive and relentless as possible to get out of it as quickly as you can.

Chapter Four

WRONG BELIEFS AND WRONG OPINIONS

"...According to your faith, let it be done to you."

-Matthew 9:29

We are now at a place of intelligence and acumen in this book that would impress anyone, and it is time once again to hone our skills in using our beautiful cognitive abilities to address the world around us. Everywhere we look, we can see people who do not understand why on Earth they struggle when they truly work themselves as hard as they can, and they live frugal lives. Innocent people are unsure of where they went wrong and wonder if they even did. This is where frustration can take over and lead us down a path that has no return for many, and that is the path of learned helplessness.

Many people, not just in our country, but around the globe, are starving working countless hours a day. There are fathers who feel underappreciated and unhappy because no matter how hard they seem to try; it just doesn't want to get better. It doesn't take long before we begin to think maybe happiness and stability isn't for us; it is only for the elite few. Maybe not everyone is meant to have happiness and abundance. Thinking this way is a one-way ticket to victimhood. It is so hard to bounce back from this set of beliefs, especially if we are surrounded by people who feed the fire of doom, despair, and agony.

In this chapter, I want to give you more than hope; I want to call out all of the ridiculous stories I hear amazing people just like you and me tell themselves and others and convince themselves to not even try and just live a life of anger and frustration. The truth is no one is out to get you. No one of any substance or sophistication whatsoever is going to spend their time trying to hold you down or hold you back in life, and if they are, you need to be moving on to bigger and better people, my friend. Life is too short to waste, and you were born to make an impact!

Conspiracy Theories

I want to go ahead and start with what is the most far-fetched story I have ever heard anyone tell themselves, and that's the belief that the government spends billions of dollars making sure the poor stay poor, the small stay small, and the dumb stay dumb. This is an absurdly untrue story.

When I was a musician years ago, I knew a person who at one time was an excellent mentor to me; he really taught me so much, however he never accepted that he didn't become one of the guitar gods of the 1980's. You could tell he had spent the entirety of his 30's doing battle with it. He would sit and read things on search engines about these celebrity cults and how all the billionaires would get together and perform rituals; he let the internet put some of the craziest ideas anyone has ever heard in his head, and he believed the all without question. In his mind, he never became a rock and roll god, because of the secret societies who control the world. He wasn't a member, so he was never included in any of the success.

This led him to become very complacent and resentful of anyone and everyone he saw as a threat to what he had built for himself on a local level. He was a fantastic human being until someone questioned him at all, pointed out something flawed, or got in his spotlight; then he was unbearable to be around.

Here is his painful truth and the truth of so many like him:

He didn't become a world-famous rock and roll god millionaire because he wasn't as good as he thought he was.

This is the truth for many people who do not understand what it takes to achieve on the highest level.

We have to be so unbelievably good at what we do to achieve on that level, and yes, sometimes undeserving people get lucky; however, when they keep their good fortune, it is important to understand that luck runs

out. Their sustaining their success means it is clear they chose to grow into their opportunities, like it or not.

It is hard to sit and watch so many other people have the things that we want while we work tirelessly. I did it my entire childhood while my parents were fighting, other kids got to go on vacation; and then I did it as a teenager from foster homes with families who did not love me. It is never easy to watch others succeed while we struggle. These things are not evidence that the government is out to get us, or that the system is built around a handful of elite monarchs who want and control it all; it isn't true.

What is true is the fact that many people decide to "take a break" after high school and then end up not going to college. It is true that many Americans spend several times more than they make since they got their hands on social media and decided they needed more than they actually need. It's true that when the world tried to educate us through platforms like social media, we saw people with millions of followers and rather than listen to the high-quality messages, we tried to become copycats and started abusing the system that was built to serve us. Many people are even hateful to those who try to help because they just cannot get past their insecurities and listen to someone who worked just a little bit harder than they did, even though it could change their entire life for the better.

The first step towards everything being better is taking full ownership and responsibility for our outcomes. We must abandon every excuse and every story that says we already know, we have already learned it, we don't need help, we don't have to listen, it doesn't matter, I don't want to hear it.

Instead, we need to embrace discomfort and celebrate those who have gone further and learned more, because the fact that we even know they exist means we have access to their knowledge!

“The Algorithm”

The next wild and wonderful story I hear so many tell themselves is that there is some magical mathematical formula that they need to figure out in order to break the internet, jackpot their phone, and live a life of unlimited abundance and freedom. What they actually want is a shortcut...

The truth is this kind of behavior is deeply rooted in the human desire to be significant. Significance is a drug more addictive and habit-forming than any opioid or narcotic could ever be. Significance and addiction to it has destroyed many wonderful people and all of the relationships and opportunities for success they could have ever had. People see someone with any shred of confidence whatsoever seemingly moving toward their goals and within minutes they've created fake accounts to go and harass them. They've become stalkers and abusers. They go and get their other hopelessly addicted friends and like wild unlettered fanatics, they try to do harm with no goals for their future at all past hurting someone else. Why? Because someone has their drug they so desperately need, and they are coming to take it away if they can.

There is no algorithm. There is no cheat code. There is no shortcut to success and fame and fortune. If it existed and it could be figured out, two-thirds of America (that's how many waste time on this stuff) wouldn't be complaining about the price of a gallon of milk and thinking only the elites are actually allowed to be successful. These beliefs are downright, flat out wrong. Period. If you are wasting your life away on this nonsense, you need to get it out of your head and stop right now before it is too late for you. Stop and don't ever go back to that way of thinking again. That is *loser* behavior!

“Only People with Rich Parents Can Make It”

Another story I hear is that if your parents didn't hand it all to you, then you can't make it. I have one question for you: How did *their* parents get

it? If you believe they had it handed to them as well, I have another question for you: How did *their* parents get it?

America is only about two hundred and fifty years old... We don't have to go very back until we hit people trading three chickens and a goat for a new set of wooden wheels to put on their wagon. Your story is *incorrect*. You are *wrong* and whoever taught you that story is also *wrong*.

There is only one part of this awful story that is correct, and that is you are always going to meet someone somewhere who has had it all handed to them. Those people do exist, but they are one in a million and you are doing yourself and everyone you spread the disease that is that story to as well by pretending they are absolutely everywhere. They are not.

“Nobody Cares”

This is the last nonsense story I will cover in this book because even writing about it is enough to turn me off, but I came to write this book and put it in people's hands in particular to prove that this story is especially not true; and that is the belief that nobody cares.

Unfortunately, we had a trend on the internet in the past ten or so years where the cool thing to do was to go around saying, “Stop complaining. Nobody cares.”, and while it is not a good thing at all to complain because we live in the wealthiest and most diverse county in the entire world, it is absolutely not true that no one cares.

You are loved. You are supported. You are admired. You are wanted. However, you must try! A fig tree must produce figs. You cannot contribute nothing and have the world come to you jumping up and down and cheering for you. You don't deserve that. You must push yourself beyond your limits and grow. You must serve something and someone other than yourself of you are not going to make it.

The Truth

I am so excited to finally to get to this part of the chapter... The truth is you were born with something inside you that no one can take away. You were born with a gift that will place you exactly where you need to be exactly when you need to be there to have all of the blessings and abundance promised to you by God.

The truth is who we are around in life is a major part of how far we are going to go. Our survival is dependent upon those around us. This is an undeniable fact. When we are surrounded by coworkers, friends, and yes, family that do not try, do not learn, do not read, do not work hard, do not stretch themselves, do not contribute... we will become exactly like them. It is a matter of survival that we blend into the crowds we are in so as not to be vulnerable and singled out. Why do you think public speaking is such a major fear in humans! Why do people “copycat” others on social media? Why do people follow trends dressing the same and listening to the same music?

A great man who changed the human race and its attitude towards business before he passed away, Jim Rohn, once said, “It’s not what happens, but what you do that changes everything. What happens happens to about all of us. The sun went down on us all last night...” I hope I quoted him correctly. What a fantastic speech he gave that day. It was before I was born. Thank God for video so that I could have the opportunity to watch and listen as much as I have and do.

The truth is if we want more, we must become more. We must learn more. We must do more. We must believe higher quality beliefs. We must commit to learning rather than intransigence. Life is simply too short and too precious to go through it believing we weren’t born to do something special with it.

Do not live a life doing what feels good. Do not live a life based on crazy stories, wrong beliefs, and wrong opinions. Live based on truth. Live a life of cause and effect. Live a life of reaping and sowing.

The sky is the limit for the very few who will *decide*. It is our decisions, not our conditions that change everything.

Chapter Five

GOING INTO BUSINESS FOR YOURSELF

Business is where leaders shine.

Going into business for yourself is one of the most challenging and yet most rewarding endeavors you can ever do. There are many skills to learn to build your acumen and you will have to become a very connected person, because the reality is people do business with people they know.

Apart from networking and selling there are a few other skills that one must learn if they wish to be able to navigate the economic landscape well. The math, the accounting, and the analysis are all necessary to make superior decisions at the times when it is necessary and vital to do so.

Some people want to provide a service while others want to sell a product. Regardless of your business, it is essential that you understand how to interpret the economics around you as well as your own business if you want to succeed. Let's be clear about something; running a business is not as simple as posting on social media or buying and selling stock. Calculating ROI and how counting how many clicks you get on content will not be enough to weather the economic winters that will inevitably come like clockwork.

The absolutely vital financial skills you must learn or know someone who can help you or perform these tasks for you for a fee are:

- Accounting
- Financial Analysis
- Data Analysis
- Risk Management

In this chapter, I am going to do my very best to simplify these skills to give you as much familiarity as possible, however you must remember it

is your responsibility to build upon your knowledge and verse yourself in these skills or hire someone to do them for you.

Double-Entry Accounting

Double-entry accounting is a fantastic invention that keeps everything in your journal (your ledger) balanced well. This will be one of the most valuable skills you will ever learn in your life, especially if you wish to start your own business or continue to grow the one you already have. Accounting is the language of business, so make sure you know it well!

In ***Figure 5.1***, I have created a mock journal with one transaction so that you can see it in action.

Figure 5.1

Date	Account	Debits	Credits
1-Dec	Inventory	\$100	
	Cash		\$100

As you can see, there is an account debited and an account credited for this one transaction. This has an astounding number of benefits, the greatest of which is precision. You know exactly where every single penny of your money has gone with this principle. Single-entry accounting is the basic “in and out” method.

In ***Figure 5.2*** let’s look at a sale. We’ll pretend we have x amount of inventory and just start at this sale for the sake of example.

Figure 5.2

Date	Account	Debits	Credits
1-Dec	Sales Revenue		\$100
	Cash	\$100	
	Inventory		\$25
	COGS ³	\$25	

You can see here that we credited \$100 to our Sales Revenue account. We debited our cash Account the \$100, because we now have \$100 in cash. We sold \$25 in inventory in the sale, so we credited our Inventory account; and we recognized the expense by debiting the Cost of Goods Sold account⁴.

Now let's imagine together that we have been keeping up with our money this way all year, month, quarter, month, or whatever time period you want to imagine. We have made it to the end of the year, and we want to know where all of our money has gone and look at how we have performed. We can look at every dollar in and out of Cash, Inventory, Cost of Goods Sold, Sales Revenue, (and maybe also) Loans Payable, Accounts Receivable, Salaries Payable, and many more. You have no limits on how you track your funds. Here is something the majority of people may potentially find even more useful: you can do this with your income and your household expenses as well!

There are so many fascinating truths that lie within the accounting of our personal budgets and our businesses as well. All of the answers are in the accounting. It is invaluable to those who wish to grow their wealth and understand how their business works. You must know where your money goes, and this is the way to track it!

The benefits of having at least a working understanding of accounting really come into play when you begin to understand the difference

³ Cost of Goods Sold

⁴ Actual accountants are far better at this than I am, but you can see the principle.

between equity and assets. I'm sure there are some savvy investors reading this right now who just started smiling and nodding their heads at that statement.

While assets and income are taxed, equity is generally not taxable until it is realized through withdrawals or distributions; otherwise, it just sits inside your business and grows until you take it out! This begs the question: *What is the best way to build equity?* Answer: Revenue! Increase your income!

When you are sitting with your spreadsheet and you are making mock-up accounting journals and practicing double-entry accounting principles, you will start to understand how equity is built. It can be more complex than this depending on the accounts and the business, but it looks something similar to this:

$$\text{Owner's Equity} = \text{Capital Contribution} + \text{Net Income} - \text{Withdrawals}$$

You will notice that liabilities are not included in this calculation. We see liabilities when we calculate for Assets.

$$\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$$

These are the awesome formulas that will change the way you think about money, my friend; but you have to learn how to keep up with it first. Do not stop learning at my working knowledge of the subject. Keep going and achieve mastery if you can! You will never be sorry you learned accounting.

Financial Analysis

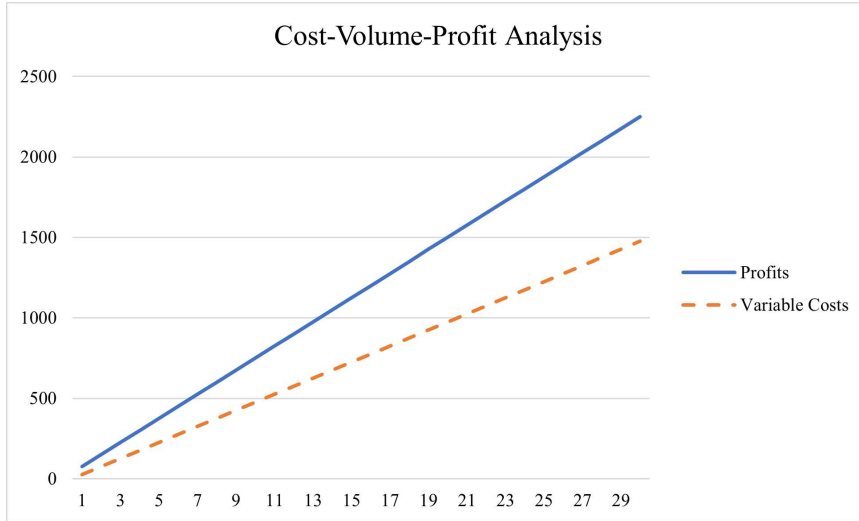
Now is the time to learn how to not let money slip away in the financial realm. Earlier in the book, I pointed out how breaking even actually means losing money, but another great way to lose money is to only look at fixed costs rather than total costs. We sometimes believe that because we paid the bills and there was nothing left over, we broke even, but this is not the case. Let's explore...

Cost Volume Profit Analysis

What we are about to do is called *Cost Volume Profit Analysis*.

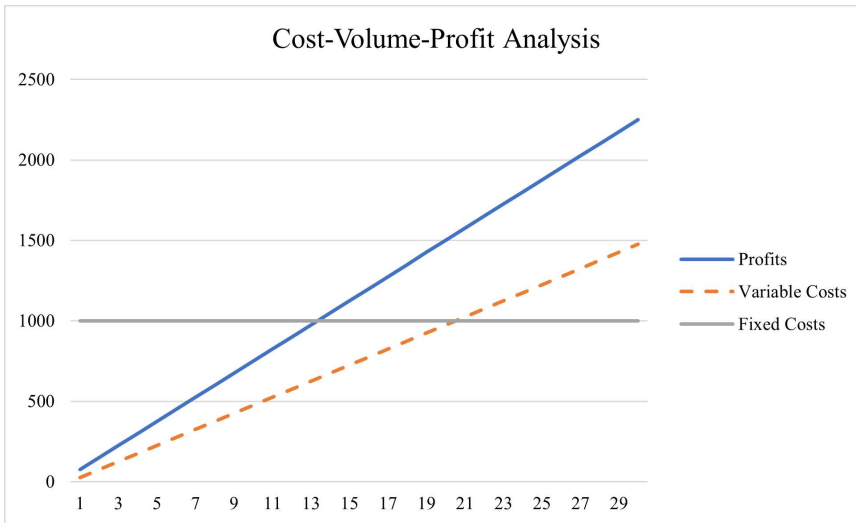
Imagine you have a store and to make this as simple as possible, let's say you only ever sell one product; we're going to call it "Product A". You have \$1,000 in bills you must pay. The cost on Product A is \$50, and you're going to sell it for \$75. Let's take a look at what this looks like.

Figure 5.3: We can see that our profits are exceeding our variable costs.



In **Figure 5.3** we can see that, as expected, our profits are exceeding our costs, and we are making money. Now let's add our fixed costs of \$1,000 and see if we were able to break even and pay the bills.

Figure 5.4: We see our profits exceed our fixed costs.

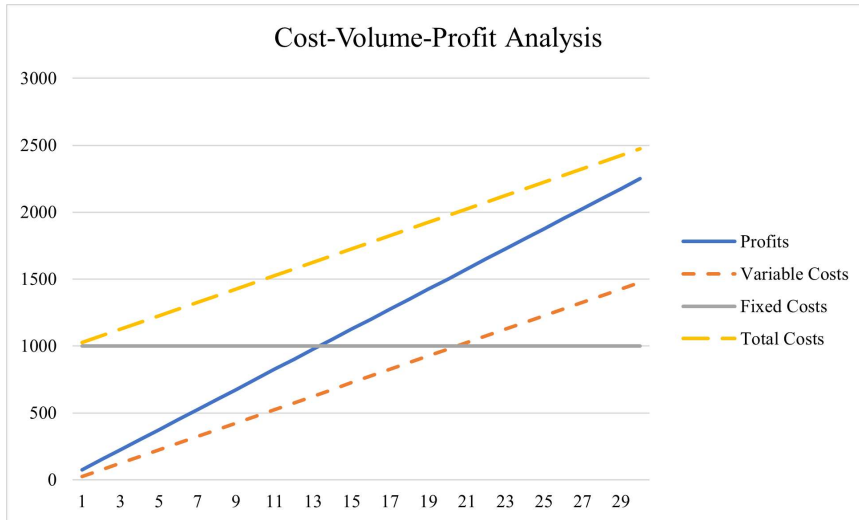


We can see in **Figure 5.4** that our profits exceed our fixed costs.

Now... *Did we break even?* If we analyze the finances this way, it appears as though we did; however, we remained focused on our fixed cost or “paying the bills”.

Let’s see what happens when we factor in Total Costs in **Figure 5.5**.

Figure 5.5 shows the profits do not intersect with the total costs. We did not break even.



Now we see the truth! *We did not break even!*

You may be looking at this wondering what happened, and it is simple. We often times get so focused on one thing that we neglect other things, and in this case it is very common for people to focus on their fear of not paying the bills so much that when they cross that line, they feel they have broken even, are safe, and they don't have to worry for another month. The problem with this is when you calculate the sum of your fixed costs and your variable costs, you realize quickly that the actual break even line is up higher than we thought. This is valuable insight to a small business owner who needs to optimize better.

Variable Costs

Let's talk a little more about what variable costs. There isn't much to it in the scenario we explored together; the idea is it costs you \$50 for one unit of Product A, so it will cost you \$100 for two units, and \$150 for three, and so on. The costs vary depending on how many you buy and sell. This can get complex when you start taking fuel, shipping, taxes,

and other factors into consideration, but we'll keep it simple for the sake of learning for now.

Fixed Costs

Your fixed costs are things that don't change. You can sell one unit or one hundred; your fixed costs remain the same. These are things like rent, insurance, and hourly wages.

Total Costs

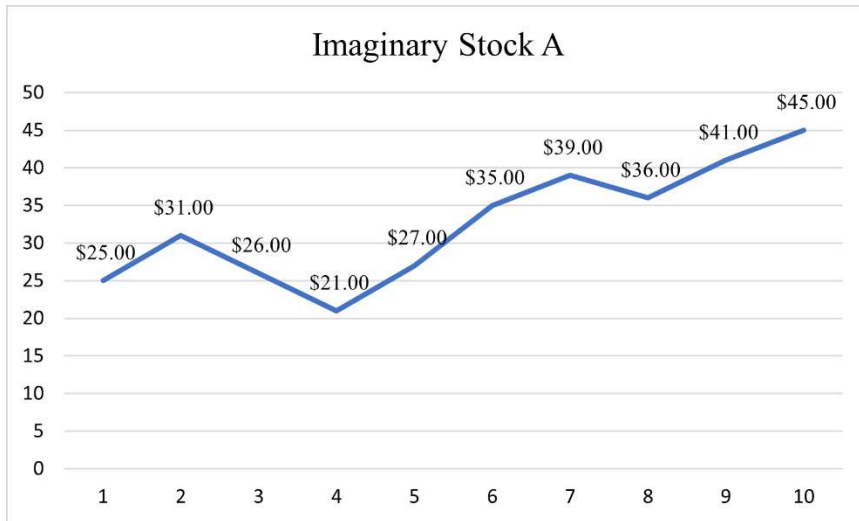
Total Costs are the sum of your fixed costs and your variable costs and should be used for figuring out your breakeven point.

Average Price

I'm going to use buying a stock to explain how average price of your products might look like. What if you decided you were going to invest in Stock A, and because you will be investing over time, you are going to be buying shares of Stock A at different prices. Knowing your average price is an invaluable insight!

In ***Figure 5.6*** I've created a mock-up of Stock A's imaginary price action.

Figure 5.6 Shows our imaginary stock's price action over time.



Let's imagine that our horizontal axis is months, so there are ten months; and you are going to buy one share of Stock A each of these months. It would be invaluable to you to know your average price and have a good idea of about where you are in your costs. All you would have to do is find the sum of one of each price and then divide it by the number of shares (ten).

$$\$25 + \$31 + \$26 + \$21 + \$27 + \$35 + \$39 + \$36 + \$41 + \$45 = \$326$$

Now we divide \$326, which is our total cost, by the number of shares which is ten to get our average price.

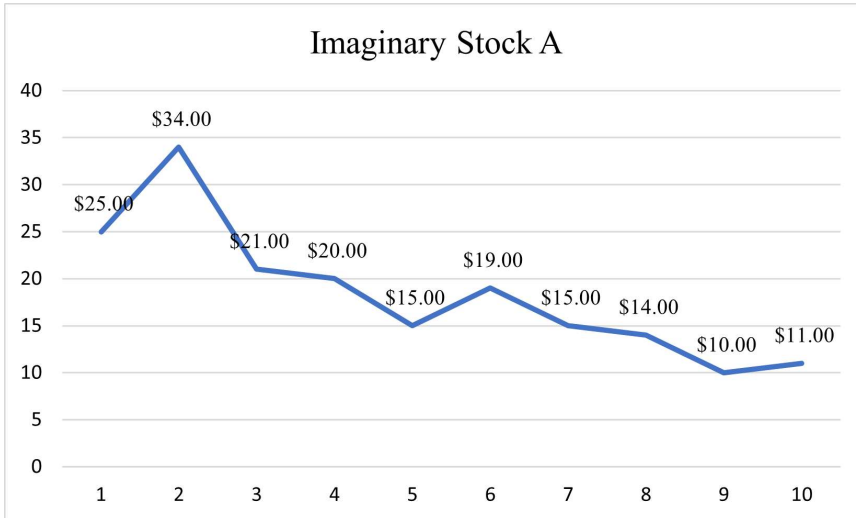
$$\frac{\$326}{10} = \$32.60$$

Look at that! We're making money. Not too bad, right?

Before we move along too quickly, I do want to say that none of these principles or lessons I'm teaching you are perfect. The market is going to do what it wants to do, and you still have to be very smart. Even this average pricing method can cost you if you aren't careful.

In **Figure 5.7** I have illustrated how this can end up not working out in your favor.

Figure 5.7



If you did the same thing in this situation, your average price would be \$18.40 showing a loss.

This same principle of average price could apply to the products you buy to resell in your business or anything else you can think off where your costs may vary but remember you should always be as precise as possible when it comes to your business and your finances.

Chapter Six

DATA ANALYSIS

Data analysis is something that I find truly fascinating. There are so many different fun layers to it, but I love to look at all the different dimensions as well! Data analysis is very important to you as an entrepreneur. It is heavily used in marketing, and it is the map to find all the hidden secrets that lie within your business.

There is the level of data analysis of figuring out conversion rates and what age group your customers are mostly comprised of, but there is a level beyond that as well, a very deep level. I am going to teach you some math that you can use to study your own data and find the messages hidden inside⁵!

The Mean

You probably remember this one from school. The mean is the average number of your set. You add up all of the numbers and then divide the sum by the number of numbers; the resulting quotient is your mean.

I'll choose ten numbers at random to do the calculations:

12, 15, 8, 11, 19, 26, 9, 21, 5, 31

Now that we have a set of numbers to work with, all we need to do is find the sum:

$$12 + 15 + 8 + 11 + 19 + 26 + 9 + 21 + 5 + 31 = 157$$

⁵ This is fun for me.

Now that we have the sum, all we have to do to find the mean is divide by the number of numbers in our set which is ten:

$$157 / 10 = 15.7$$

The mean is 15.7! That was easy enough, right?

You may be wondering how useful something this simple can be, and it's more powerful of an equation than you might realize!

Advanced Math

This is where things start to become more challenging and complex. We have to learn how things are done if we want to know how the world works. When analyzing statistical and financial data, you are going to be doing far more than simple arithmetic most of the time.

In these next few sections, I am going to be teaching you some math that you must know if you intend to have a very strong financial future. All of these functions are built into most spreadsheet software programs, so you don't have to do it on paper, but to build a strong working knowledge of these concepts and to understand their applications, we need to know what is happening behind the short and simple line of code that is provided to us in those programs. How else will we know which ones to use? We simply must understand them, and not just copy and paste them or use the code. Not understanding what is actually happening greatly limits our knowledge of what we are studying.

All that being said... Let's take it to the next level!

Mathematical Notation

Here is the formula for standard deviation in mathematical notation:

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (X_i - \mu)^2}{N}}$$

I know that probably looks intimidating, but we have to learn it. At the very least, we must understand it. The calculations that happen in data and financial analysis are not always basic arithmetic. We have to get a working understanding of these things work. I'm here to help you, so let's dig in together.

First, we need to know what we are reading. I know that formula may look complicated, but it is a short-hand way to write a very long equation. Let's say you are measuring one thousand data points. To find the standard deviation, you would have to add all of those numbers together and then divide by the number of data points to get the mean; then you would have to subtract the mean from each individual data point and find the square of the difference; then you would have to find the sum of all of the squared differences; and then divide by the number of data points; and finally find the square root of the result.

That is what that formula says in short and simple readable terms. My book isn't focused on math, but I'm here to help, and we are both here to learn; and we must know this stuff, so I'm not going to leave you hanging.

Let's learn how to read that formula together so that we may understand and use this superior kind of notation going forward. I'm going to break down the symbols and what they mean.

- $\sigma = \text{Standard Deviation}$
- $\sqrt{\square} = \text{SquareRoot}$

- $\sum_{i=1}^N$ = The symbol “Sigma” which is the big “E” means we are doing a summation. “i = 1” means we start at data point number one (the beginning), and we go all the way up to “N” the number of data points; so, if there are ten numbers, we start at one and go up to ten.
- X_1 = The data point we are currently using. You have seen x and y values. If you are calculating with the first X value, it is X_1 . If you are calculating with the second X value, it is X_2 and so on.
- μ = The mean
- N = The number of data points.

Those are the symbols that are not as common in our daily lives. I’ll assume that you are fairly familiar with the others.

Practice and Understanding

Let’s say we have a data set of just three numbers, and we want to find the sum of the squared differences from the mean, which is the majority

of our formula. It is this part: $\sum_{i=1}^N (X_i - \mu)^2$.

Our three numbers are: 11; 14; 23.

- First, we find the mean:
 - $11 + 14 + 23 = 48$
 - Divide by the number of data points (3)
 - $48 / 3 = 16$
 - $\mu = 16$
- Second, we subtract the mean from each data point and the square the result:
 - $(X_1 - \mu)^2$
 - $(11 - 16)^2 = 25$
 - $(14 - 16)^2 = 4$

- $(23 - 16)^2 = 49$
- Third, we find the sum of those numbers:
 - $25 + 4 + 49 = 78$
- The sum of the squared differences is 78.

We can continue now to finish the formula for standard deviation.

- We divide 78 by N (the number of data points (3)):
 - $78 / 3 = 26$
- We find the square root of 26:
 - $\sqrt{26} \approx 5.1$
- The standard deviation of our data set is about 5.1.

Not so bad, right? All you have to do is take it one step at a time. Don't try to do everything in one step. That's a valuable life lesson as well!

We now possess the ability to calculate the sum of the squared differences which is essential to many other analytical equations we will use in our lives.

Standard Deviation

Standard deviation is the next level of analysis. Previously, when discussing average returns, I mentioned standard deviation and how it is a measure of risk in finance. We walked through the calculation in the last section, so I won't go through that again. What we do need to do is *understand* standard deviation. It is critical that you have an actual understanding of it and not just memorize it.

To understand standard deviation, let's imagine we have a bag of blue marbles, and we place one red marble in the bag and mix them up and dump them out on the table (and hopefully they don't go everywhere). Now we measure the distance of each blue marble from the red one and calculate the mean. Next, subtract the mean from each measured distance, square the results, sum those squared values, divide by the

number of marbles, and finally find the square root of that quotient. The result is *the standard deviation* of distances from the marble.

As you can tell, these explanations can be long-winded and overwhelming; there is a lot to take in. It is much easier to use mathematical notation:

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (X_i - \mu)^2}{N}}$$

Variance

Variance is a measure of how spread out a set of data points are (sound familiar?). It encapsulates the extent to which each number in a data set differs from the mean. This means it emphasizes overall volatility.

Variance is used in data analysis and financial analysis. The formula for variance looks very similar to the formula for standard deviation!

Variance = the sum of the squared differences divided by the mean. Here it is in mathematical notation:

$$\sigma^2 = \frac{\sum_{i=1}^N (X_i - \mu)^2}{N}$$

We have stepped through this process already with standard deviation. The main difference here is that we do not find the square root at the end.

So, what's the difference between the two when it comes to application? The answer has to do with the amount of detail. Variance tells us on average how spread out the blue marbles are, while standard deviation

tells us on average how far they are from the red marble, so we get a more detailed insight into the average distance of each data point to the mean. This is why standard deviation is such a great indicator of risk when analyzing financial assets such as stocks or when analyzing historical cash flow data of a business!

Covariance

Covariance is a measure as to what degree two variables move together. It indicates whether an increase in one variable corresponds to an increase in another variable. We can use my marbles analogy for a simplified explanation of covariance.

If we have a bag that is filled with red marbles and blue marbles, and we spill them onto the table; if we notice that the red marbles and blue marbles tend to move the same direction together across the table, we could say that have a positive covariance; conversely, if we spill them onto the table and we see that the red marbles and blue marbles tend to move away from each other in opposite directions, we could say they have a negative covariance. If we spill them all onto the table and they all just tend to scatter and go random directions independently of each other, we could say they have no significant covariance.

You can likely see how this would be a good calculation to know how to do if you were diversifying your portfolio of investments for example. There are some powerful applications for this! Just like before, we must seek to understand and not merely memorize if we wish to use this as a tool in our lives to make ourselves more effective. We must understand so that we can apply.

Here is the formula for covariance in mathematical notation:

$$\text{cov}(X, Y) = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{N}$$

Just a quick note: \bar{X} and \bar{Y} stand for the mean of the X data set and the mean of the Y data set. Other than that, this is pretty straightforward. We've done this before. We take the sum of the products of the differences between each data point and the mean of their respective variables. The sum is then divided by the total number of data points. This gives you the covariance of the two data sets.

I'm sure you can see the usefulness of knowing how two things move together. Diversification comes to mind especially. This level of problem-solving and thinking has a high utility to value to all of us!

Correlation

Correlation serves as a crucial measure when we want to understand the strength of the relationship between two variables. Unlike covariance, which tells us that they move in the same direction, correlation goes a step further, revealing how much they move together.

To elaborate, let's consider two variables with different scales – one ranging from one to fifty and the other from one hundred to one hundred sixty-five thousand and three million. If we were to measure their covariance, the results would reflect the scale of the data sets, making direct comparisons challenging, especially with significant differences in unit scales.

To overcome this challenge, we use correlation, which is essentially a standardized form of covariance. The scaling in correlation involves finding the product of the standard deviations, resulting in a value always between -1 and 1.

Here is the formula for calculating correlation:

$$r = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^N (X_i - \bar{X})^2 \times \sum_{i=1}^N (Y_i - \bar{Y})^2}}$$

That's a doozy, huh?

While the formula might seem complex, the key takeaway is that it provides us with a numerical measure of the strength and direction of the relationship between variables. For example, in managing a stock portfolio, seeking assets with a strong negative correlation can help diversify risk – when one goes down, the other goes up, protecting your capital.

**Reminder:*

All these mathematical functions can be overwhelming at first; there really is a lot to take in if you don't usually do math like this, but you absolutely can do it. I also want to remind you that there are spreadsheet programs that likely came free with your computer that you can use to make these calculations; they have these functions built in. You only need to learn how to use them.

Use these spreadsheets to practice. Make mock-up data and analyze it. Practice regularly. You will over time begin to learn how variables interact with each other and how one seemingly unrelated thing can change just slightly creating a ripple effect that makes a major difference somewhere else. You need these skills in life!

Chapter Seven

FINANCIAL ANALYSIS 2.0

Millions and millions of people can make up stories in their head and be massively wrong, and one person who does their homework can get it right. It happens all the time.

After all of that complexity and familiarizing ourselves with how all those mathematical functions relate to real life scenarios, I believe it is time we take things up a notch and learn the next level of financial analysis. At this level, we begin to see a new perspective of diversification and calculating returns. Most of this will feel easy after the last chapter, I'm sure.

If you are going to invest in a portfolio, a business, or start your own you are going to want to learn how to project forward to get some idea of what you might expect if you make certain decisions.⁶ This type of analysis can be as simple as calculating expected return on one investment or as complex as calculating the risk level of your entire portfolio. No matter the complexity it is crucial that you learn how to do this.

We're going to touch on some of the principles of analyzing a stock and some of the principles of analyzing a business. They are the same in many ways, but the examples I use will be different, so we are looking at a diverse selection of hypothetical real-world applications.

⁶ Don't forget our discussion of expected value calculations.

Analyzing Stock

We have already discussed some of the common formulas and functions for analyzing stock such as average return and standard deviation, but now we're going to dive a little deeper into some of the methods of analyzing a stock.

There are many figures calculated for you and provided by the broker on the profile of the stock. You can open up the app of your choice, go to the stock of your choice, and you'll find several items where loads of analyses have already been done and the results have been provided to you. This is valuable because every time the price ticks one way or the other, all the numbers change. The market never sits still, so it is nice to have these analyses done by their state-of-the-art computer systems and provided to you.

We are however going to take a look at a few and learn at the very least what they mean and how to interpret them, along with several others that you will likely not find so easily done for you.

Expected Return of A Portfolio

If I have \$100 and I were going to buy three stocks to hold; Stock A has an average return of 12%; Stock B has an average return of 23%; Stock C has an average return of 14%; and I wanted to know what the return of the entire portfolio would look like, how would I do it? This is called calculating your expected return.⁷

The expected return of a portfolio is essentially just a weighted average return. What we must know beyond the average returns of Stock A, B, and C is our chosen allocation.

Let's go to the next page and look at all of our data and choose an allocation.

- Stock A

⁷ Which is an estimate.

- Average Return: 12%
- Stock B
 - Average Return: 23%
- Stock C
 - Average Return: 14%

Let's allocate 50% of my money to Stock A; 25% of my money to Stock B; and 25% of my money to Stock C. Here is our updated data:

- Stock A
 - Average Return: 12%
 - Allocation: 50%
- Stock B
 - Average Return: 23%
 - Allocation: 25%
- Stock C
 - Average Return: 14%
 - Allocation: 25%

We can now calculate my expected return on this portfolio. We use the allocation as a weighting factor, and we multiply this weighting factor by the stock's average return.

$$Expected\ Return = \sum_{i=1}^N (AvgReturn\ n_i \times Allocation\ n_i)$$

Written out normally:

Expected Return = (Stock A's Average Return x Allocation) + (Stock B's Average Return x Allocation) + (Stock C's Average Return x Allocation)

If we plug in the numbers, we can get our result fairly easily:

$$ER = (12 \times 0.5) + (23 \times 0.25) + (14 \times 0.25)$$

$$ER = 6 + 5.75 + 3.5$$

$$\text{Expected Return} = 15.25\%$$

The expected return of the portfolio is a great way to estimate what your returns on your investments will be.

Maybe you are looking at this and you're thinking, "*Why wouldn't you put most of your money into the one with the highest average return?*"

This is where things start to get interesting...

The price of the stock doesn't have to change for us to have a higher expected return, does it? Let us recalculate based on this allocation:

- Stock A: 20%
- Stock B: 50%
- Stock C: 30%

Now the greatest average return highest the greatest allocation, going down to the one with the least average return. Let's do the math!

$$ER = (12 \times 0.2) + (23 \times 0.5) + (14 \times 0.3)$$

$$ER = 2.4 + 11.5 + 4.2$$

$$\text{Expected Return} = 18.1\%$$

That's about an 18.7% increase in the returns, or another 2.85% return on the money just by changing the allocation, and I did not have to invest more money to do it! Now, you have to admit it; that's pretty cool.

Beta

Beta is a measure of risk, but more specifically, it is a measure of an asset's sensitivity to market fluctuations. If Beta is equal to 1, the asset has the same level of risk as the market. If Beta is less than 1, the asset is

less risky than the market. If Beta is greater than 1, the asset is more risky than the market.

Here's the formula:

$$\beta = \frac{\text{Cov}(\text{AssetReturns}, \text{MarketReturns})}{\text{Variance of Market Returns}}$$

Now that we have done this a few times, we can get right to it. I'll mockup five years of returns for "Asset A" and "The Market".

Year	Asset A	The Market
1	23	9
2	19	11
3	24	10
4	27	12.3
5	29	13

All we have to do now is calculate the covariance of the asset and the market as well as the variance of the market.

$$\text{cov}(X, Y) = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{N}$$

- Asset A:
 - Mean: 24.4
- The Market:
 - Mean: 11.06

	Asset A – Mean	The Market – Mean	Products
1	23 – 24.4 = -1.4	9 – 11.06 = -2.06	2.884
2	19 – 24.4 = -5.4	11 – 11.06 = -0.06	0.324
3	24 – 24.4 = -0.4	10 – 11.06 = -1.06	0.424
4	27 – 24.4 = 2.6	12.3 – 11.06 = 1.24	3.224
5	29 – 24.4 = 4.6	13 – 11.06 = 1.94	8.924

Sum		15.78
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Now that we have the sum of the products (15.78), we just need to divide it by the number of observations (5).

$$\text{Cov}(X, Y) = 3.156$$

Next is the market variance:

$$\sigma^2 = \frac{\sum_{i=1}^N (X_i - \mu)^2}{N}$$

We know the mean of the market returns already (11.06), so this should be a bit faster.

1	$(9 - 11.06)^2 = 4.2436$
2	$(11 - 11.06)^2 = 0.0036$
3	$(10 - 11.06)^2 = 1.1236$
4	$(12.3 - 11.06)^2 = 1.5376$
5	$(13 - 11.06)^2 = 3.7636$
Sum	10.672

Now, we divide the sum of squared differences (10.672) by the number of observations (5).

$$\text{Var}(\text{MarketReturns}) = 2.1344$$

To complete our task of calculating β , we divide the covariance we calculated previously by the market variance we just found.

$$\beta = \frac{3.156}{2.1344}$$

$$\beta = 1.478636$$

The *beta* of Asset A is 1.478636. This means Asset A is more risky than “the market” in that it has a higher level of sensitivity to market fluctuations.

Being able to find the *beta* of an asset is a powerful ability! The most common benchmark that I am aware of is the S&P500 Index, but I am sure you can benchmark against whatever you want.

Alpha 1.1

Alpha is used to measure the performance of an investment compared to a benchmark such as the S&P500. If Alpha is positive, this figure suggests that the investment manager or strategy has added value beyond the market’s performance. If Alpha is negative, this figure shows that the investment has not delivered its expected returns relative to its *beta*.

That’s a more sophisticated way to say that the investment didn’t deliver as well as expected relative to the amount of risk the investor took on with the investment.

Here’s the formula for Alpha:

$$\alpha = ActualReturn - (RiskFreeRate + \beta (Market\ Return - RiskFreeRate))$$

You likely noticed we are seeing something new. We have a variable called the “Risk-Free Rate”.

The Risk-Free Rate

The risk-free rate is what an investor believes they can essentially make with no risk at all. You commonly see the yield on the 10-year Treasury

Bond for longer-term investments, but it could also be the 3-month Treasury Bill for a shorter-term investment. The reason for using the treasuries is they are considered a safe investment as they are backed by the good faith and credit of The United States of America. The risk-free rate is taken into consideration because investors who are taking on risk generally expect to see more returns than what they can virtually risk free.

Put yourself into this situation for better understanding: If you can invest \$100,000 and receive a 5% return on that money with nearly zero risk of losing money, why would you invest \$100,000 and risk losing a big portion of it for a mere chance at making 4% returns? You see? It doesn't make sense.

You may likely see people use the risk-free rate plus an additional return that they require for an investment to be worthwhile. Example: An investor may find that they can make a 6% return with nearly no risk at all by purchasing a Treasury Note, so when looking at another investment, they may require a minimum of 4% more than that (10%) to consider the investment because they are taking on more risk and they in turn expect a proportionally higher return. The investor may also want a disproportionate amount of return for the investment. It is practical for investors to have a flat rate of return that they expect from anything. Example: An investor may require the risk-free rate plus 5% on anything at all. This kind of consistency is not only practical; it is also a great way to keep biases and emotions from coming into play and affecting their investments in a negative way.

Alpha 1.2

With a newfound understanding of the risk-free rate, we can now move forward with our formula and learn how to find Alpha.

$$\alpha = \text{ActualReturn} - (\text{RiskFreeRate} + \beta(\text{Market Return} - \text{RiskFreeRate}))$$

Let's use our imaginary "Asset A" and our imaginary "The Market" from before, and let's say the risk-free rate is 4%.

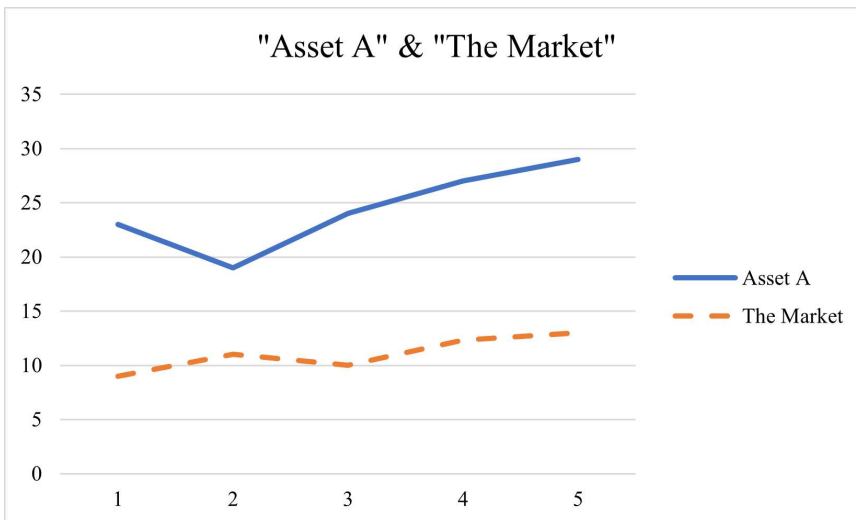
$$\alpha = 0.29 - (0.04 + 1.478636(0.13 - 0.04))$$

$$\alpha = 0.29 - 0.17307724$$

$$\alpha \approx 0.17$$

The alpha value of Asset A is ~ 0.17 . This means our imaginary Asset A has underperformed relative to its β value. This is an interesting observation. Let's plot the mock returns we had for Asset A.

Figure 7.1 Shows a visual comparison between our imaginary "Asset A" and our imaginary benchmark "The Market".



When we look at them on the chart together, it seems as though "Asset A" is outperforming "The Market"; however, our data says otherwise! This goes to show that the skills of financial literacy and making data-driven decisions are invaluable and of great importance. An untrained eye and

mind might look at **Figure 7.1** and believe that “Asset A” is the superior decision, when in reality, it is underperforming.

Earnings per Share

Net Income minus dividends on preferred stock divided by average weighted average number of outstanding shares. Earnings per share is a metric that can usually be found on the profile of a stock you want to buy. The information for this calculation is available on a company’s income statement in their financial statements. This is a bit of an inconvenience for the average person, but every publicly traded company makes these reports publicly available on their website, usually under “Investor Relations”.

Here's the formula again:

$$EPS = \frac{\text{Net Income} - \text{Dividends on Preferred Stock}}{\text{Weighted Average Number of Outstanding Shares}}$$

Net Income and Dividends on Preferred Stock are numbers clearly printed on the income statement, so there is no formula for that, however we do need to learn how Weighted Average Number of Outstanding Shares is calculated.

We have used weighting factors already so it shouldn’t look too abnormal to you. Basically, what we do is we take the shares outstanding at the beginning of the period we are analyzing, multiply it by the fraction of the year, then the shares outstanding at the end of the period we are analyzing, and multiply that by the fraction of the year; then we divide that by two because we have two numbers we are seeking the mean of.

There’s a lot of text to type in this formula so let’s declare some variables:

x = Shares Outstanding at the beginning of the time period

y = Shares Outstanding at the end of the time period

z = Fraction of the year being analyzed (decimal form)

n = Weighted Average Number of Shares Outstanding

$$n = \frac{((x \times z) + (y \times z))}{2}$$

We're going to use very simple numbers here because the math itself is what we are seeking to understand. It doesn't serve us to put difficult numbers into the equation to try and make it look like real life; the function will do the same job.

Here's our imaginary scenario:

- Net Income: \$500,000,000
- Dividends on Preferred Stock: \$15,000,000
- Shares at the beginning/end of the period (we will do a year):
 - Beginning: 30,000,000
 - End: 28,500,000

First, we need to figure out the Weighted Average Number of Shares Outstanding:

$$n = \frac{((x \times z) + (y \times z))}{2}$$

$$n = \frac{((30,000,000 \times 1) + (28,500,000 \times 1))}{2}$$

$$n = \frac{((30,000,000) + (28,500,000))}{2}$$

$$n = \frac{58,500,000}{2}$$

$$n = 29,250,000$$

Now, we can calculate Earnings per share:

$$EPS = \frac{\$ 500,000,000 - \$ 15,000,000}{29,250,000}$$

$$EPS = \frac{\$ 485,000,000}{29,250,000}$$

$$EPS = \sim \$ 16.58$$

Our earnings per share in this situation would be about \$16.58.

This almost certainly begs the question: *Is that high or low?*; and this is where we talk about how you can't use a mere indicator like earnings per share to assess a business's strength as an investment. This figure alone doesn't tell us much. What we would have to do is go and find several other similar businesses in the same industry, calculate their earnings per share as well, and then make comparisons to see how strong each business's performance is relative to each other.

For example, if you had Grocery Store A and you observed an EPS of \$16.58, you don't know much; but if you put Grocery Store B, C, and D next to it, and B has an EPS of \$21.32; C has an EPS of \$20.64; and D has an EPS of \$20.87, you can now see that Grocery Store A may be struggling to keep up with the others in its industry. This comparison is how you discover the message that earnings per share has to offer.

Price to Earnings Ratio

The price to earnings ratio is calculated as the current stock price divided by the earnings per share. This figure takes into account the stock price action, so you know how much value the market places on a company's earnings. You can use this as an indicator to assess whether or not a company may be overvalued, undervalued, or priced fairly on the market. Price to Earnings Ratio is an excellent indicator as to whether or not a great deal of gain in a stock's price is due to speculation or due to strong earnings, which can save you a lot of pain in losses by investing money into something as weak as a social media trend pushing up demand.

$$\text{Price } \& \text{ Earnings Ratio} = \frac{\text{Stock Price}}{\text{Earnings Per Share}}$$

This calculation is simple enough as we already know the earnings per share figure we can substitute into this to see how it works. Let's say the stock price of our Grocery Store A is \$56.76, and we know its earnings per share are \$16.58.

$$\text{Price } \& \text{ Earnings Ratio} = \frac{\$56.76}{\$16.58}$$

$$\text{Price } \& \text{ Earnings Ratio} = 3.42$$

Our price to earnings ratio in this case is 3.42. Again, we are faced with the question as to whether or not this is high or low. Just like before, we need a few similar businesses within the same industry to compare with to gain context. Let's borrow Grocery Store B from our previous example as it had a higher earnings per share value. We'll say the stock price for Grocery Store B is close to the same; let's say it's a tad bit higher at \$54.97.

$$\text{Price } \& \text{ Earnings Ratio} = \frac{\$54.97}{\$21.32}$$

$$\text{Price } \& \text{ Earnings Ratio} = 2.58$$

This gives us excellent context. There is a difference between the two, but not a drastic difference. This could mean on a macroeconomic level that people are just putting their money elsewhere and they aren't concerned about the grocery store industry in this hypothetical case.

Do you see the value of comparison and context, and how not jumping to conclusions based on an indicator or any single figure can empower you to make far superior decisions? These are the insights that can hedge major losses in capital and wealth as well as prevent tax inefficiencies from being in and out of a position because it just doesn't seem to be moving or going the way you initially theorized it would.

Price to Book Ratio

The price to book ratio is a simple figure to see if the market prices the stock where the balance sheet prices the stock. The formula for price to book ratio is:

$$\text{Price to Book Ratio} = \frac{\text{Market Price per Share}}{\text{Book Value per Share}}$$

All we need is the current market price of the stock, then we need to find the book value per share to calculate this ratio, and it is simple enough:

$$\text{Book Value Per Share} = \frac{(\text{Assets} - \text{Liabilities})}{\text{Shares Outstanding}}$$

You get the company's balance sheet from their investor relations page on their website, and you subtract total liabilities from total assets; then you find the total number of shares outstanding and substitute into the equation.

Let's say there are \$1,000,000,000 in assets and \$250,000,000 in liabilities and there are 50,000,000 shares outstanding.

$$\text{Book Value per Share} = \frac{(\$1,000,000,000 - \$250,000,000)}{50,000,000}$$

$$\text{Book Value per Share} = \frac{\$750,000,000}{50,000,000}$$

$$\text{Book Value per Share} = \$15$$

Now that we know our book value per share, we can calculate our price to book ratio:

$$\text{Price to Book Ratio} = \frac{\text{Market Price per Share}}{\text{Book Value per Share}}$$

Let's use the stock price from Grocery Store A again (\$56.76).

$$\text{Price to Book Ratio} = \frac{\$56.76}{\$61}$$

$$\text{Price to Book Ratio} = 0.93$$

A price to book ratio of less than one could indicate that the stock is undervalued; while a price to book ratio of greater than one could indicate that the stock is overvalued. Even though this hypothetical situation is constructed from the balance sheet, it is still a good idea to find similar companies in the same industry and make comparisons.

Analyzing a Business

Analyzing a business is very similar to analyzing a stock, and ultimately you should place most of your focus on learning to analyze the underlying business. While price action of a stock can tell us what the market is willing to pay, it does nothing to tell us the value of the underlying business. This is another very important facet of finance and economics to keep in the front of your mind.

The truth is, you do not need the stock to do any analysis whatsoever on the business, but you do need the business to do analysis on the stock. The business is what matters, not the colorful charts that make a very pleasing '*ding*' when we execute a trade, but the underlying business itself.

The stock market is irrational, and it is filled with speculators who treat it like a casino. Have you ever noticed how colorful all those indicators and bars and lines on a chart for a stock are? Have you noticed the '*ding*' I mentioned when a trade is executed? Reminds you of a game room in a casino doesn't it? Very pleasing on the eyes and ears.

Business analysis, in particular, the value of a business can be done in a multitude of ways just like a stock, but what you will find is that while trying to make projections on a stock based on lines and theories is more gambling than it is investing, looking at a business's reputation and their history of performance is not gambling. How do I know Mike Tyson is a

good bet in a fight? *Look at his track record...* You just can't do that as well with the price action of a stock.

The idea that Stock A has touched this pretty pink line over and over again, therefore it will continue to do that like clockwork is nothing more than a guess and a fallacy, but noticing that a business has had strong earnings when it rains, when we're in a recession, when times are great, when times are hard, when it's raining outside, when it's sunny, when there's a disaster, when we elect a new president... These are indicators of a strong business, and you should pay attention to them.

Think about it for a second... Some little, short skinny guy with no experience hops in the ring with Mike Tyson. Everyone starts betting on the skinny guy without paying any attention to Tyson's track record. You have a decision... You can follow the crowd and bet on the little guy against Iron Mike Tyson, or you can pay attention to the data and make your own decision. Who are you betting on? I know who I would. I think it's a no-brainer. Millions and millions of people can make up stories in their head and be massively wrong, and one person who does their homework can get it right. It happens all the time.

Compound Annual Growth Rate (CAGR)

The compound annual growth rate (CAGR) is very important for you to learn. When analyzing a business, you look back at let's say ten years of cash flow. You take the first year of cash flow and the current or previous year of cash flow, and you are calculating on average what the rate of growth was. Just to make sure this is clear; it is currently 2023, and if I were calculating the compound annual growth rate of Business A with the past ten years of data, I would start at 2013 and end at 2023 or maybe 2022, depending on what the most recent financial report available is, and I would calculate on average the rate of growth for each year.

That looks something like this:

$$CAGR = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{N}} - 1$$

If Business A had \$1,000,000 in cash flow ten years ago and this year it had \$3,500,000 in cash flow, I know everything I need to know to find the compound annual growth rate of the business:

$$CAGR = \left(\frac{\$3,500,000}{\$1,000,000} \right)^{\frac{1}{10}} - 1$$

$$CAGR = (3.5)^{0.1} - 1$$

$$CAGR = \sim 1.13346 - 1$$

$$CAGR = \sim 0.13346$$

$$CAGR = \sim 13.35\%$$

The compound annual growth rate is about 13.35% which means on average Business A's cash flows increased by about 13.35% per year. This gives us some strong data to make decisions with. This is a good track record. We could gather that this performance is our *expected return* if we were to buy Business A.

Discount Cash Flow Analysis 1.1

This brings us to where we need to be able to make projections into the future about what Business A could do over the *next* ten or so years. There's a catch to this. \$100 today is worth significantly more to us than \$100 in the future, so we must discount those future cash flows to bring them to their present-day value to get an accurate estimate of what those cash flows will look like to us. You will see on financial statements that there are other cash flow figures. Discount cash flow analysis is based on all cash flows.

If we say we will make \$100,000 a year for ten years, it is not accurate to assume that the sum of all of those periods of income will be equal to \$1,000,000. It is worth more to you to have \$100,000 now than it is to have it later. This is why discount the cashflows back to their present value.

I know that sounds like a lot, but it is actually very simple. Here is the discount cash flow formula:

$$DCF = \sum_{i=1}^N \text{Cash Flow} / (1 + \text{Discount Rate})^i$$

Discount Rate

The discount rate in the very simplest possible terms is the return you require in order to purchase this business. If you find yourself saying, “If I can’t make 15%, I’m not buying it.”, then your discount rate is 15% (0.15). There are standardized ways to calculate the discount rate of an investment, but for the average individual investor, it doesn’t make sense to worry about that. The model is called Weighted Average Cost of Capital (WACC). You are going to find a lot of passionately mixed opinions about cost of capital, and the model adds layers of complexity that I personally do not believe are going to serve you, so I am leaving it out of the book. Here is why I feel that way: If you have \$100,000 cash, and you are investing \$50,000 of your cash, you have no cost of capital; you have the capital. Some would argue this.

I’m not going to let my own opinion cloud my mission of serving on the highest level with my book so I will tell you that WACC is a standardized way of calculating an appropriate discount rate for investments made by institutions and corporations. The model is used as a standard for investors and board members as a “this is how we all do it” financial model. It keeps things straight and fair across the board so everyone at the company in question feels like we’re all being fair and not using our own creative ideas that could create some disadvantage. It is not required to my knowledge that people on that level use it, but to the best of my knowledge it is just a widely accepted “this is how it’s done” model for calculating the discount rate.

So how do you and I calculate the discount rate? We can do what I said previously and say, “If I’m not making x%, I’m not investing.”, and x% is your discount rate; this is called a “hurdle rate” when you do it this

way. It is a very simple and practical way to do things as long as you are consistent. You can also take the risk-free rate into consideration, as we mentioned earlier, and add to that rate what you feel is appropriate for the risk you are taking on. You can be as simple or as complex as you want.

The only thing that I would likely add as something to think about is what you are investing in. You should have a realistic outlook. If you calculate a compound annual growth rate of 5%, and the risk-free rate is 6%, and you decide your discount rate is 12%, you are going to find that you are likely not going to have an investment that performs well by your standards. Keep in mind what it is that you are dealing with. It really pays to understand the business you're investing in.

Discount Cash Flow Analysis 1.2

Back to our analysis, we can now do another mock analysis on Business A. If Business A has a historical compound annual growth rate of 13.35%, and its most recent cash flow amount was \$1,000,000, we can discount the next 5 years of cash flows back to the present and see if there's good reason to believe we are going to make our return.

Here's the formula once again:

$$DCF = \sum_{i=1}^N \text{Cash Flow} / (1 + \text{Discount Rate})^N$$

Our cash flows should theoretically grow at 13.35% a year, and we're going to assume we are making an initial investment of \$3,000,000. The risk-free rate is 5% and we want to make more than that because we are taking on some risk, so let's say the discount rate is 10% to make it easy.

Let's begin the analysis:

Year	Equation	Present Value
1	$\$1,133,500 / (1 + 0.1)^1$	\$1,030,454.55
2	$\$1,284,822.25 / (1 + 0.1)^2$	\$1,061,836.57
3	$\$1,456,346.02 / (1 + 0.1)^3$	\$1,094,174.32

4	$\$1,650,768.21 / (1 + 0.1)^4$	\$1,127,496.90
5	$\$1,871,145.77 / (1 + 0.1)^5$	\$1,161,834.31
Sum		\$5,475,796.65

The next figure we need is called the *net present value of cash flows*. I calculated the sum of discounted cash flows in the table above already. All we have to do is subtract our initial investment from that number. If the result is a positive number, we have a good chance at getting our return. If the result is a negative number, we have a good chance at not getting our return.

$$NPVCFs = \sum \text{ of Discounted Cash Flows} - \text{Initial investment}$$

$$NPVCFs = \$5,475,796.65 - \$3,000,000$$

$$NPVCFs = \$2,475,796.65$$

We have a positive value! Looks like we could be in good shape on hypothetical Business A.

Free Cash Flow Analysis

Free flow analysis is essentially the exact same thing as discount cash flow, however there are two differences: 1.) Free cash flow is based on cash flow from operating activities, and 2.) You subtract capital expenditures from your cash flows. The free cash flow is basically what the owner gets to take home, so it can be another great way to analyze a business and learn what it is worth.

I am not going to go through all of that math again, but I will give you the formula and discuss the differences:

$$\text{Free Cash Flow} = \text{Cash Flow } \downarrow \text{ Operating Activities} - \text{CapEx} \frac{\quad}{(1 + \text{Disc})}$$

Cash flow from operating activities is on the income statement so there is no formula for that. Capital expenditures (CapEx) is the amount of

money that must be spent on necessary investments such as factories, land, equipment, vehicles, etc. It is worth noting that capital expenditures are not expenses, they are investments into assets that will provide benefits to the business long-term. Capital expenditures can be found on the cash flow statement. CapEx affects “Cash flow from investing activities”.

There is a more specific way to do this analysis that adds another level of detail and accuracy. To take it to this level you would add back depreciation and amortization to your cash flow from operating expenses. Let’s dig a bit deeper into what I mean by that.

Let’s say Business A has \$1,000,000 in net income (cash flow from operating activities). It is common for Business A to include depreciation of assets in their expenses; however, depreciation doesn’t actually take any money out of your account, does it? You don’t actually lose money. Depreciation and amortization are non-cash expenses; therefore, these amounts can be added back to the cash flows for this analysis, giving you a more accurate look at the cash flow being generated.

If Business A has \$100,000 in cash flow and it owns a tractor that has been depreciated \$25,000, the net income is \$75,000; however, that \$25,000 didn’t cause an actual loss of the \$100,000 in cash flow as the tractor was purchased in the past and all that money has already been spent. This is why we add that \$25,000 back to the cash flow.

Amortization refers to the non-tangible assets, such as patents. If Business A purchases a patent, the patent will be depreciated over the number of years of its useful life just like how we spread the cost of the tractor over its useful life and depreciate its value. Once again, this depreciation is included as an expense, but it does not take actual cash away; therefore, we can add amortization back to the cash flow from operating activities.

This version looks more like this:

$$\text{Free Cash Flow} = \frac{(\text{CFFOA} + \text{Amort} + \text{Dep}) - \text{CapEx}}{(1 + \text{Discount Rate})^N}$$

Now you can see that we are adding the depreciation biases back to the cash flow and when we subtract capital expenditures, that's where we are subtracting where we actually purchased a tractor or a building or land or some other necessary asset.

Intrinsic Value

Intrinsic value is a hot topic in investing because of wonderful people such as the legendary Warren Buffet and Charlie Munger. Many people have been extremely curious about running this sort of analysis as both of the greatest of all time have mentioned it at shareholder meetings.

Intrinsic value is calculated with free cash flow. You do a free cash flow analysis; you discount the future cash flows back to the present as we did before; and you divide the net present value of those free cash flows by the number of shares outstanding. The resulting figure is the intrinsic value of one share of the company's stock.

It is important to note that you *do not* need to the stock to calculate intrinsic value of a business. If you are buying your local candy store down the street and you will be the sole owner, there is one share; divide by the number of outstanding shares (one).

So, let's say you are going to buy the local candy store down the road. Here is one way you could estimate the value of that business:

$$\text{Total Value} = \text{NPVCFs} + \text{Tangible Assets} + \text{NonTangible Assets} - \text{Liabilitie}$$

This formula would take your discount rate (your required rate of return and the risk-free rate) into account through net present value of cash flows that you calculated by discounting the future free cash flows back

to the present. It then adds the depreciated and amortized value of owned assets that you would be buying as a part of the business; and it subtracts the liabilities the business has.

There is subjectivity involved in doing this with a small local business, because a business in an area that has high demand for that business is worth significantly more than a business out in the middle of nowhere where people don't even know it exists; however, you would see that demand reflected in the business' track record when you look at historical cash flows and calculate the compound annual growth rate, so you have to really think about what you're doing. As I mentioned before, knowing the business you're buying adds a lot of value to the decision.

Annuity Factor

We have used the annuity factor a few times already, but let's apply it to this technique of analyzing a business. To better understand what we are doing here, let's put it into question form: *What is a business or investment worth based on its useful life?*

- We need the value of the business.
- We need all of the debt that is remaining.
- We need the annuity factor for its useful life.
 - Let's say its useful life is twenty-five years (n).
- We need the discount rate.
 - Let's say it is 15% (r)
- We need the total annual budgeted costs:
 - Operating costs
 - Debt-servicing (payments on debt)
 - Any other expenses

$$\text{Annual Worth} = \frac{(\text{Investment} - \text{Debt Remaining})}{\text{Annuity Factor}}$$

$$\text{Annuity Factor} = \frac{1 - (1+r)^n}{r}$$

Now, we subtract the total budgeted annual costs from the annual worth:

$$\text{Annual Worth} - \text{Total Budgeted Annual Costs}$$

;and we ask ourselves: *Is it worth more than we are paying for it? Does the difference satisfy our margin of safety?*

Margin of Safety

Margin of safety is the magnitude of how far the market has the asset priced below its intrinsic value. This has a lot to do with your risk tolerance. If you find that the intrinsic value of a stock is \$100 and your margin of safety is 20%, and you see that the stock is currently valued at \$90, even though it is undervalued and you are seeing an opportunity, it does not meet the standard of your margin of safety. It must be 20% lower than the intrinsic value. You decide your own margin of safety.

What is the amount you want to see between where the price is and where it should be for you? If you calculate an intrinsic value of \$100 and your margin of safety is 10%, and you find that the market price of the stock is \$75, then it has met your margin of safety and then some. The idea here is that you want to get something out of this. There is a presupposition here that if the intrinsic value is \$100 and the market price is \$90, it will only go up \$10; conversely if the intrinsic value is \$100 and the market price is \$110, it will eventually be \$100 again; so how much growth are you looking for? Another idea here that aligns more with the term “margin of safety” is that if it is too close to the intrinsic value already, there is potential for the price to go down further before it goes back to its true value.

Your margin of safety is just that; it is yours. You make the rules, and you decide what you require to make a decision to invest. It is essential that you put thought into all of this before you even begin looking for investments. Know your parameters. Know exactly what you are looking for. Know the business you’re in. This gives you so many durable advantages if you can train yourself to think this way.

Opportunity Cost

Opportunity cost is how highly intelligent people make decisions.

Opportunity cost is arguably the single most effective way to make the best possible decision given your circumstances. It is not quantifiable.

There is no formula. You must possess the cognitive ability of logical and rational thought. This form of decision-making does not sound like it is based on real data like the other principles I have taught you, but I can assure you that it most certainly is.

Assume you have \$10,000 and zero business acumen. You have heard through the internet or some other source that there are all these excellent investing opportunities in the world; you have found about five or so that seem to be the most popular, but you don't know anything about them at all. All you can do is watch videos and read blogs and try your best to figure something out. *Which one do you invest your money in?*

That is a very difficult situation, because you are not taking opportunity cost into account. You have \$10,000. You don't know anything about business or investing. In the above scenario, you have omitted the massive opportunity you have to take your \$10,000 and go to business school or get some other form of higher education and learn about business and investing. You could do that and get a higher paying job which would empower you to invest on a level that you do not currently have access to.

- You can invest \$10,000 and make an average return of 9%/year.
 - $(\$10,000 * 0.09) + \$10,000 = \$10,900$
 - You *could* make \$900 in the next year if you don't lose money.
- You can invest in yourself and increase your earning power, which could increase your annual income by \$10,000 or \$15,000.
 - $\$15,000 \text{ pay raise} - \$10,000 \text{ initial investment} = \$5,000$ return on your investment
 - $\$5,000 / \$10,000 = 0.5$

- You made a 50% return on your investment.
- Which is better?
 - Do you take a chance on making 9%?
 - Do you take a chance on making 50%?
 - You may lose your money pursuing the 9% and walk away empty-handed.
 - You may lose your money on the 50%, and you walk away with an education of immeasurable value.

This is this the idea of opportunity cost, and it is absolutely how the wealthiest individuals on the planet make their decisions, not indicators on some chart, and *definitely* not podcasts, social media, and videos.

Here's another example of opportunity cost:

Let's say your parents owned a bakery, and all your life you have been around the bakery and all of the business that happens in the front and back behind the scenes. You are familiar with the costs and the supply chain, and how the handling of food is properly done. You basically have a lifetime of experience with bakeries. You read on your social group's favorite social media app that everyone is investing in this hot new thing, and you don't know anything about it at all. You and all your friends are trying to watch videos and you're all following these random people that seem to know what they're talking about; you hope they do at least, they look believable enough; they have a large following that is hopefully real, right? There's enough views there to convince you this person isn't playing pretend to get attention, right?

You have a decision to make: Do you A.) use your money to invest in a bakery or your own bakery even where you *are* the expert and you are in a position to dominate in your space, or B.) throw all your money at "this thing" that gets a lot of views on your phone that you don't know anything about? One of those choices is based on real data, and one of those choices is nothing more than an uneducated guess and a gamble.

It is outrageous how many people have no ability to make a good decision in that situation. They just throw money out the window hoping the wind will blow it back in plus more tomorrow sometime.

I have saved opportunity cost for the end of this chapter of the book, and while I don't want to infuse too much of my own opinion into my work as my goal is to help people learn and make better decisions on their own, I will say I believe strongly opportunity cost should be the first analysis you do on every decision you make in your life, followed only by expected value which may require a lot of the other things we have discussed.

Life is too short, time is too precious, and what resources we have are too valuable to waste trying to hit a homerun blindfolded so we can impress our friends who have motivated, but not educated, themselves over the years. If all you do is motivate a bunch of idiots, what you've got are motivated idiots. Motivated idiots are a bad influence. Please, for heaven's sake, make good decisions; and make friends with intelligent people.

Chapter 8

RISK MANAGEMENT

Business and investing are just as much about keeping the money you already have as they are making significantly more of it.

Managing your risk is the true game of investing and business. It isn't as much about trying to make more money as it is trying not to lose what you already have; keeping your money is just as important if not more so. There are a number of ways to manage and hedge risk, and I do not know all of them. I merely have what I can share with you in this book. Hopefully, in good time you will be able to develop your own risk management strategies that work for you in your specific situation.

There are many great tools available for managing risk, and some of them have certain requirements that must be met before access is given to them such as options and futures; however, there are a few skills that can be learned and put into practice by absolutely anyone such as diversification, and businesses can even use forwards, which is something I will talk about later in this chapter, along with others.

Once you are in a position where you have a lot of equity and cash, you have to protect it. Prices can change and all of sudden, you have found yourself in a situation where you are losing money and/or business. You must know how to protect yourself (and your customers) from losses in your investments or your own business.

If you were running a business that had a very loyal group of customers and fans because your prices are great and your service is wonderful, and then all of a sudden your prices change, you have a major decision to make: 1.) Pass the cost onto your customers meaning you will inevitably lose some of them forever; 2.) Take that cost on yourself and lose efficiency and profitability which will inevitably create problems in other areas of your business as well as your business overall in the future; or 3.) adapt risk management strategies that hedge these problems.

Another bothersome scenario is if you just bought five hundred shares of a stock and no sooner than you begin to accrue a return on your equity in that stock, there is turbulence in the market which could drive your position down. You have choices to 1.) exit the position which may create tax inefficiencies, and you'll have to start all over again building up the compound interest from the very beginning; or 2.) adapt a strategy for hedging this risk in some way.

Risk management is at the very heart of all business and investing; it is not about trying to take as much as you can from the market. The market can beat you anytime it wants. You must learn how to protect yourself and your wealth from these hard times.

There is one very important fact I want to highlight: *The object is not to completely eliminate all loss; that would be impossible. You are strategizing to make the inevitable losses lesser.*

Options

Options are a derivative of an underlying asset and a great way to hedge risk, but only after a certain amount of money is at stake due to their costliness. When it comes to stocks there are two kinds of options: Calls and Puts. Depending on what you are trying to do, you will want one or the other. Options are purchased at what is called a "strike price" or a "strike" which is basically the agreed-upon price of the stock in the contract. If buy a call option with a strike at \$120 and the price of the underlying stock goes up to \$150, you can *exercise* your option to buy

the stock at the *strike* of \$120 for an immediate net gain; it is the same for puts as well. I will go into more detail on strategies later in the chapter.

You will find in your own research that options have become a trend among speculative traders who have a higher risk tolerance and tend to lean more towards derivatives.

What exactly does it mean that an option is a *derivative*? It means that one option contract represents one hundred shares of the underlying stock. An option is the right to buy or the right to sell; conversely, it can be the obligation to buy or the obligation to sell. Options are standardized and can be bought and sold through most brokers, who will almost certainly require you to have a certain amount of knowledge of options and other derivatives as well as sizeable sum of cash held in your account to cover your margin. This means in order to be allowed to buy or sell an option, you may be required to have enough cash in your account for at least a fraction of the option should your position not go well, or enough to cover the entire thing if you have no margin. These are things to ask your brokerage after you have gone to lengths to learn and understand how derivatives work; do not consider this book “all you need to know” as derivatives are nothing like stocks and require a great deal of knowledge and understanding.

Options are highly speculative in nature. Their prices and values do not move like the stocks they represent. Understanding how they work on a highly detailed level is crucial to your success with them. The prices of options are affected by “the Greeks” which are Delta, Theta, Gamma, Vega, and Rho. I will give you a brief explanation of each of them, but I cannot stress enough that you must pursue education in options outside of this book; they are very complex, and my explanation is not enough for you to be competent enough to build an options strategy for your portfolio.

Delta

Delta measures the sensitivity of the option's price to changes in the underlying asset's price.

A Delta of 0.50 means if the underlying asset's price changes \$1, the option price will increase \$0.50 for Calls, or decrease \$0.50 for Puts.

Theta

Theta measures the sensitivity of the option's price to the passage of time.

A negative Theta means the options loses value as time passes. It represents the time decay of the option premium⁸.

Gamma

Gamma measures the rate of change of Delta concerning changes in the underlying asset's price.

Gamma shows how much the Delta of an option will change for a \$1 change in the underlying asset's price.

Vega

Vega measures the sensitivity of the option's price to changes in implied volatility⁹.

A high Vega means the option is more sensitive to changes in volatility.

Rho

Rho measures the sensitivity of the options price to changes in interest rates.

⁸ I'll explain this shortly.

⁹ Implied volatility is unique to options. As I said before, pursue further education in derivatives.

Rho indicates how much the option price will change for a 1% change in interest rates.

Importance of Education with Derivatives

It is worth taking another moment to stress again now that you have seen just how complex options truly are, it is of great importance for you to continue educating yourself in derivatives and trading them. It just isn't as simple as "they go up and down". They have no similarity to stocks in that sense. Later when we discuss futures as well as forwards, I won't be stopping as much in the book to stress self-education about them; I am just going to discuss them and move on. It is up to you to make good decisions with your money. Education is essential.

This chapter is about risk-management, and part of hedging risk is making sure you have all the details and a strong understanding of what you are doing so that you are competent and confident you are making the correct decisions for yourself and/or your business.

Options Strategies

There are plenty of creative and strategic ways to use options to protect your stock portfolio and even generate income from it. I'm going to start with very simple and common uses and work up to spreads. I will discuss the idea of an option spread, but I won't deep into detail in the book; I'll leave spreads for you to learn from industry professionals who can very likely teach those to you far better than I can. Some stock brokerages have excellent education centers on their website that contain a large library of videos and articles that can help you a lot.

Some important terminology to know going forward are the terms "covered" and "naked". Covered means you have the stock to sell or the cash to buy the stock. Naked means you do not. You will likely not be allowed to take naked positions for a while even if you learn a lot about options.

Buying a Call

If we decide we want to take a position of 100 shares (a “round lot”) in Stock XYZ, we can absolutely just buy the stock without any problems as long as we have the cash; however, there is another way to enter the position using a call option.

Let’s say Stock XYZ has a current market value of \$50 a share, and we believe based on all of our analysis we have done on the underlying business that the stock is undervalued, and the price will eventually go up to \$75 a share (50% increase). As previously mentioned, we can buy 100 shares of the stock at \$50 a share without any problems, or we can buy a call.

If we buy a call at \$50, we are purchasing the right to buy the stock at \$50 no matter what the price is. We do not have to exercise our right if we do not want to, but we do have the right until the option expires to purchase the stock at any time for our strike price of \$50.

Let’s pretend we want to buy a call on Stock XYZ. We buy an “at the money” call on Stock XYZ with an expiration date six months out, which means our strike price is the same as the current underlying stock’s price. We have to pay a “premium” for the contract¹⁰. We will pretend this premium was \$1,000.

Our imaginary Stock XYZ is \$50 a share. 100 shares would cost \$5,000. We have spent \$1,000 for our call. At any time in the next six months, we may exercise our option and buy 100 shares of Stock XYZ at \$50 a share, and the individual who sold us this option has the legal obligation to sell it to us. Let’s say four months has gone by and Stock XYZ is now at \$80 a share, and we choose to exercise our option.

We have exercised our option to buy 100 shares of XYZ for \$50 a share. That’s \$5,000. We paid \$1,000 for the option. We are now at \$6,000. The

¹⁰ Options pricing is very complex, and I will not be covering it in this book. You can see options prices in the option chain through your brokerage to get an idea of what they look like.

stock is \$80 a share (\$8,000). \$8,000 minus \$6,000 equals a net gain of \$2,000. We enter the position up \$2,000.

Why would we do this when we could have bought the stock without the call at \$5,000; and we would have been up \$3,000 on the position now? It is because there is always a chance that we were wrong. There is always a chance that a law will be passed, and that stock will go down and will never come back up. We managed our risk of that situation by buying the call to make sure we were right. If we had been wrong, we would have lost only \$1,000. If the underlying stock had fallen to \$25 a share, it would be foolish to exercise our option to buy at \$50 a share; so, in that case, we do nothing and let the option expire worthless. We lose \$1,000 rather than \$5,000, which is significantly better for us.

Whether or not you decide to do things this way is up to you. You must learn how options work and how their pricing is calculated; and you must develop your own strategy and make your own decisions; or you can contact your broker and get help from a professional for a fee.

To answer the question as to why speculators like trading options: If you paid \$1,000 for and own a call option to buy Stock XYZ at \$50, and the underlying stock price goes up to \$80, your call is now worth more than what you paid for it, and you can sell it for a profit if you want.

Beware of speculative trading; options can go all the way to \$0.00!!!

Covered Calls

Arguably the most common options strategy is the covered call. This strategy is more geared towards generating extra income from stock positions in a portfolio, and it will likely be the first one you are ever given the ability to do from your broker.

Let us imagine that we buy 100 shares (a “round lot”) of Stock XYZ. We buy them at \$50 a share. We hold this stock for a few years, and it has gone up to \$80 or so, and we are ready to sell the stock. We can sell it anytime we want and take that capital gain. We can also sell a covered call. Notice we are not buying this time... We are selling the call.

Since we are selling the call option, we will have the legal obligation to sell our shares at the strike price if the person who bought the option chooses to exercise their option. Now, we don't care about this. We are ready to sell anyway, so this is totally fine. We feel confident that the stock will not go higher than \$90 a share, so we select the strike of \$90, which is "out of the money" since the price of the underlying stock is lesser than this, and we sell a call with an expiration date three months out. Someone buys the call, and we are paid our premium of let's say \$1,000.

We now have our \$1,000 which is ours to keep no matter what happens. The price of underlying Stock XYZ end up decreasing, and it never goes up to or above \$90, and the option expires worthless. It is very unlikely that the person who bought that call from us will exercise their option to buy at \$90 if the underlying stock is less than that. Why would they do that? We have made \$1,000 free and clear, and we still have our stock! So go ahead and select an out of the money strike price and we sell another call.

We can repeat this process until the underlying stock price goes above the strike price of the option, and the buyer exercises their right to buy, and the stock is sold. Let's take a look at what happened:

We purchased 100 shares of Stock XYZ at \$50 a share. The price of the stock went up to \$80. Let's pretend we managed to sell three calls before the stock was finally sold. We'll pretend for simplicity that we made \$1,000 on each call. When the stock was finally sold, it sold at \$90 a share. We made \$4,000 on the stock in capital gains alone, but we also made an additional \$3,000 with our stock while we had it selling calls to exit the position. This means we made a total \$7,000 profit. We almost doubled our profit on the stock.

This is the covered call strategy. I presented this strategy to you in a way that makes it sound like it is for generating profits rather than managing risk because I feel like the strategy is learned and understood more quickly that way. This same strategy can be used to hedge the risk of a

decline in the stock's price. As the stock price goes lower, the value of the sold call would decrease as it becomes far less likely the option will be in the money. You could buy the option back at the lower price, and you will have made back some of what you lost. I would say it is better to buy a put on your position if this is your goal, but now you hopefully understand the covered call strategy.

Buying a Put

Buying puts is something you might do to protect yourself against a decline in the price of the underlying stock. In this case you have 100 shares of Stock XYZ, and you feel there is a chance for a decline in the stock's price and you want to manage your risk and hedge that potential loss.

You buy the put at the strike of your choice, with the expiration date of your choice; you pay the premium, and you now have the right to sell your shares at the strike price anytime you want before the expiration date. If Stock XYZ is \$90 a share and you buy a put at \$90; and the stock falls to \$50 a share, you can exercise your option to sell the stock at \$90 anytime you wish before the expiration date of the option, and the individual who sold you the option has the legal obligation to buy the stock. We discussed the entire process before. I'll assume you get the idea.

Selling a Put

This is just like selling a call, but the other way around. If you believe the stock will go up, you can sell a put, collect your premium, and if the option expires worthless, you keep the premium; however, if the buyer of the option chooses to exercise their right to buy, you have the legal obligation to buy their shares at the strike price. This strategy can be advantageous if you want to buy the shares. Just like with the call when we wanted to sell, we don't care if we buy these shares. We have done all of our analysis of the underlying business. We want the underlying stock the option derives from, and we know what price, so we select our strike price and sell the put to collect our premium and if we end up buying the

stock, we bought it at the price wanted to buy at and we collected a premium as well to get some of our cash back.

Spreads

Spreads are highly advanced option strategy where you buy two or more options contracts that are opposite from each other to hedge your risk on the options themselves. I am not going to cover spreads in the book, because they are so complex; I will give you my reason: options have a high degree volatility, and their price does not move a like their underlying stock's price does. When we think about the price action of a stock, we can all picture the chart showing what the price is doing. Options are not like that, and when you get into spreads, you may even see a parabola, which means you must close your positions at the right time or lose your money.

The odds are good that your broker will not allow you to do options spreads for a long time. You will have to learn a lot and gain some experience showing that you know how to use options properly.

Here are some names of some spreads that you can do your own research on and learn about:

Options Spread Strategies:

- Straddlesⁱ
- Strangle
- Butterfly Spreadⁱⁱ
- Calendar Spread

It is my own personal opinion that you should go to your broker's website seeking education on these types of things and not watch social media videos from random people, but you can do whatever you want. There's a good chance your broker shares their educational videos on social media, in which case that's fine. I just want to do my part in service to you by saying your broker is an expert, and some kid with a

video channel likely isn't. Make sure you learn from people who have your best interest at heart and not just their own.

Futures

Futures are generally centered around commodities like gold, silver, crude oil, soybeans, corn, and lumber, but there are also futures for things like cryptocurrencies and stock market indices. Futures are different from options in that there isn't a premium paid and their value is much simpler.

Just like there are stock brokers, there are also commodity exchanges that only trade these derivatives, and these exchanges are huge; they primarily deal with large corporations and institutions. Generally, the underlying commodity of a futures contract is a very large amount of that commodity, one-thousand barrels of crude oil for example. Brokerages that allow people like you and me to trade futures are giving us large amounts of margin which comes with large amounts of trust and responsibility. Just like with options, brokers don't allow everyone to trade futures, and if they do, they require x amount of cash or assets in your account to cover you if you have a trade go very wrong.

The brokerages that work with individuals trading futures understand that individuals are speculating on the contracts for profit and are not actually buying 6,000 bushels of corn for our business. These brokerages do not allow their clients to take delivery and if you do not close your positions yourself before the expiration date, they will generally do it for you.

Futures Pricing 1.1 – Simplified Explanation

As I mentioned before, there is no up-front premium for futures contracts. A futures contract is an agreement between the buyer and the seller. The buyer "locks in" today's price and agrees to pay and accept delivery at a future date.

If we were going to buy corn futures, and we will greatly simplify this for educational purposes so you can get a good understanding of what's happening in these transactions, we are speculating that the price of corn will go up and we want to hedge our price risk. If corn is currently \$10 and we expect in six months corn will be \$20, we can enter into a futures contract to lock in today's price of \$10, and we will pay for the corn and the costs associated with it such as storage and whatnot during this six-month period at the end of the six months.

If corn is \$10 and the costs equal \$3, the contract is \$13. There is no premium. Brokers may and likely will charge you fees, but I am talking about how the contract works between the buyer and seller with no middleman.

So, how do people speculate with futures? Let's imagine we are wrong, and corn falls to \$5. The contract falls in value with corn and is now worth \$8. If corn goes up to \$25, the contract goes up with the corn to \$18. This is one of the three reasons people speculate with futures. Two and three are also simple reasons: 2.) futures contracts are very volatile and can be worth a great amount of money, and 3.) futures trading isn't regulated by SEC, which means there's no pattern day trader rule.ⁱⁱⁱ

You may be wondering why sellers would do this if there is not premium. What is in it for them? It certainly seems like they can only lose; however, the market can go either way. If we lock in our corn price plus costs now and our contract is \$13 for the corn plus the costs of storage and what have you and corn falls from \$10 down to \$5, we have a contract to pay the price we locked in. This is why commodity sellers trade futures. They are hedging their risk as well.

Since we now understand how futures work, we need to learn how they are correctly priced. Up to this point we have simplified it for understanding sake, however it is more complex than how we have learned it.

Futures Pricing 1.2 – Tick Values

Futures prices are based on tick values. A tick is the smallest increment that a contract's value can go up or down, such as \$0.25. We don't want to jump to conclusions when we see that \$0.25, because that is a coefficient in the price.

If we are trading futures and we decide to buy a contract for ten thousand bushels of corn, we must first *learn the tick value for the contract* (very important first step), and then we multiply the tick value by the number of bushels of corn.

$$\text{Future Contract Price} = \text{Tick Value} \times \text{Number of Units}$$

If the tick value were in fact \$0.25 and we were buying a contract for 10,000 bushels of corn, this would be the math:

$$\text{Futures Contract Price} = \$0.25 \times 10,000$$

$$\text{Futures Contract Price} = \$2,500$$

These contracts can be *very* expensive. To show you an example of just how expensive they could be, let's say we are looking at a contract for 100,000 barrels of crude oil and we learn that the tick value for this contract is \$25:

$$\text{Futures Contract Price} = \$25 \times 100,000 \text{ barrels}$$

$$\text{Futures Contract Price} = \$2,500,000$$

\$2.5 million is a big price tag; this is why futures are traded with leverage. Brokerages give their clients that they approve for futures trading a great deal of margin, so you wouldn't have to put up the \$2.5 million; it would only be a percentage of it. You must have a good track record with your brokerage if you wish to trade derivatives for this reason.

I would love to break down margin requirements for you and explain how it works, but all brokerages are different in their policies and what

they require; so, the best thing to do once again is go to your brokerage's website, visit their education center if they have one as well as read their margin requirements, and find out for sure for yourself rather than me try and tell you exactly how it works.

Forwards

Forwards are essentially the exact same things as futures, with the exception of you don't trade them on any exchange; they are also far simpler and give you significantly greater flexibility. Forwards are what you would use in your everyday life, however they are far lesser known and consequently not as common.

Let's say you own coffee shop, and your coffee bean supplier is right across the street or even next door. When you place your orders, you just walk over and say hello to them and place your orders personally the majority of the time. Now, imagine you have reason to believe your costs will go up in the future because coffee bean prices look like they will rise significantly. You do the same thing we did with futures only there is no brokerage or standardized contract; you walk over and enter a contract to lock in today's price and you agree to pay and take delivery at a later date. This is called a "forward".

Unless your contract specifies otherwise, or local laws do not allow it, you can assign this contract to someone else as it grows or declines in value and take any profit on the contract you may have gained just like futures and options. It is not as common to do this with forwards, but you can if you want to. Simple enough, right?

Just a quick bit on the contract itself: Even though people who know each other personally may draft informal contracts, you should consult with an attorney who understands derivatives and can write a standard contract for this in which you can fill in the blanks. This ensures clarity in the terms and compliance with any and all local, state, or federal laws that may come into play. Try and do everything precisely in finance. Don't just wing it. It creates problems.

Chapter Nine

YOU CANNOT BEAT THE MARKET

Before we move on to other things, I want to talk with you about some of the things that we face as human beings such as overconfidence and confirmation bias. There are emotional issues associated to finance, the stock market, trading equities, going into business, and the like that lead us to believe at some point or another that we can “beat the market”.

While it may be true that you can outperform the market, we must understand that it is a very rare and very select few unicorn-type people who can do this. Think of it as running a three-minute mile, deadlifting over one thousand pounds, being on an undefeated streak of 30 as a professional heavyweight boxer. There’s just no secret or strategy or method that is going to teach you how to beat the market just like there’s no way possible to learn how to do all of those other things. There are just going to be a handful of people in the world who are born with a unique gift and ability to accomplish things like this. That’s why we don’t see thousands of Warren Buffet’s or Ray Dalio’s all over social media. It is because there is one Warren Buffet and one Ray Dalio, and that’s that. Period.

It is easy to begin to believe that there is some trick or something to “cracking the code” that’s kept secret from all us regular folk. Especially young people from what I have seen are very eager and confident they can bring down the titan that is the stock market and become an overnight billionaire. This kind of thinking is almost archaic at this point, and I believe firmly that it is deeply rooted in the get rich quick scheme of the old days. These schemes are still out there today, and people still fall for them. I’m not saying that you don’t know any better, but we need to discuss what you are up against if that’s the way you are thinking.

High Frequency Trading

Let's start right off the bat with high frequency trading (HFT). If you have never heard of high frequency trading before, basically it is a company with billions of dollars to spend that uses an algorithm to execute a very large number of stock trades in a very short period of time, millions per day to give you some idea of just how many. These companies sprung up as a means of adding liquidity to the stock market, which at one time, believe it or not, was a problem.

These companies that engage in high frequency trading have massive amounts of money and can trade faster than you could ever dream of. The human mind doesn't work as quickly as these computers and even though algorithmic trading is more popular today, the average person still does not have the computational power or the incredibly fast internet connections that these companies do. It's literally impossible to keep up with them.

Some people say that it isn't fair that these companies basically control the market because the average person has no possible way of being competitive against such a system; however, the flip side of that is without these companies you would not be able to click "buy" or "sell" on your phone and instantly execute a trade.^{iv} There are two sides to every coin, I suppose.

"The Little Guy"

Another thing to take into consideration is the fact that big corporations deal in very large amounts of money. There are people with enormous sums of money buying and selling on the stock market, which means when we buy one hundred shares or less because it's what we can afford after we have done all the analysis and due diligence to make sure we are making a high-value decision with our money, a stock market titan can sell five-million shares of the stock and it goes down and stops moving because the market sentiment towards the company is now negative because of it. The truth is most people don't have one hundred million

dollars to invest and there are some who do. Those who do, can swing the market at times and there is nothing us “little guys” can do about it, except one thing...

Learn The Rules and Play The Game

The big business moguls are big business moguls. The billionaires are billionaires. The high frequency traders are high frequency trading. The hedge funds are hedging. They have more money you and I both put together times a lot! It is part of it.

The correct thing to do is what you're doing; read the books, take the courses if you can find some, and get around people who have a good attitude and a lot of ambition. Stay away from bad influences. Play the game and play the game right. Sometimes when people say things like that, they mean to do things we shouldn't do. We can all agree; it goes without saying; you should never do anything to hurt another person.

You Have The Advantage

In this book up to this point, if you have truly grasped the concepts and you are putting forth the effort, making the spreadsheets, mocking up the data to practice your analysis, reading the financial statements, going to your broker to learn how these things work, and avoiding timewasters and wastes of time, you currently have an advantage the majority of people do not have.

There are many who would become insecure hearing a statement this strong, but the truth is most people are not sitting around honing these skills, and young people are especially vulnerable to time wasting on things like confirmation bias and believing they can jackpot their phone and become an overnight millionaire. You're way ahead of the herd, my friend! You absolutely cannot “beat the market”, but you most certainly can educate and develop yourself into someone who can achieve a great deal of success and abundance for yourself and your family.

Another fallacy of the mind is that we think everyone cares about what we do, and this leads us to believe that everyone around us sits around figuring up the beta values of their assets and how strong the correlation is between these two investments, and we're all just sitting around reading financial statements; we all already know and do all that stuff. It is not true. What you are doing is rare. What you are doing is special. What you are doing matters. What you are doing can change your life in a big way if you'll just buckle down and get after it unapologetically. You are empowering yourself with knowledge and skills that will set you apart from the average person who "doesn't have time" and "already knows". Maybe you haven't seen that behavior out of the people around you yet, but you keep building on yourself, and you will; you will realize that very few people take the initiative to actually learn.

Some say it's insecurity. Some say it is jealousy. Some say it is laziness. In my opinion it is the very same thing that makes a teenager not listen to reason: lack of experience and lack of knowledge. If they had any idea how hard it was, they would listen, wouldn't they? If they what it truly takes, they would treat the people who do their time and learn with more respect, wouldn't they? If they had any idea just what it takes they wouldn't make up these stories about the president and the government and all these other self-sabotaging theories.

You cannot beat the market, but I am here to tell you that you can beat the average person who doesn't listen and won't listen, won't learn, and won't try. You have the advantage!

Chapter Ten

BEHAVIORAL FINANCE

Behavioral finance or “Behavioral Economics” has shown itself in the book quite a bit so far, but we haven’t yet given it a name. Behavioral finance is the subject of the cognitive biases and emotional decision-making that happens with money. Biases such as loss-aversion become part of the conversation. Learning that this is a thing brings some questions to mind such as how frequently we make unconscious decisions with money that affect our future in a potentially negative way? That’s why I want to talk about it. We can’t do anything about poor decision-making, especially unconscious decision-making, until we bring it forward to the front our minds and become aware that we do these things.

Saint Petersburg Paradox

One fascinating phenomena is the *Saint Petersburg Paradox*.^v This interesting way of thinking shows that people believe that expected value of what they are doing is infinite; however, they won’t place an infinite bet. The focus turns to the expected utility of the investment. I personally have seen this happen with real estate investing. I have only met one other real estate investor in my life who doesn’t believe real estate goes up to infinite.

There are many real estate investors who genuinely believe that because they own it or they did something to it that the value has now increased, when that is not the case.

You can see people on social media who you can tell believe if they buy a stock at \$100 a share, they can become a millionaire if it goes up.

$$\text{Expected Value} = (\$1,000,000 - \$100) / \$100 = 9,999\% \text{ ROI}$$

It’s almost comical when you do that math; yet, people believe it can happen, and at the exact same time worry about losing all their money in

a stock market crash so they don't invest anything at all. Here is what that belief looks like: *"I'm going to make a 10,000%, but I'm not going to do it because I will lose my money."* And then... we decide we should invest in; you guessed it... *real estate*. I bet you can guess why, can't you?

Expecting returns this large is not based on knowledge. There is no denying that this way of thinking is irrational and emotionally charged. "The value of this thing is infinite, but I refuse to pay money for it." You have to admit it; that's a total contradiction. This is something that we all do, just maybe not to get rich quick scheme extent. We make small decisions on a daily basis that expose our illogical and irrational thinking towards money.

Risk-Aversion

Here's an example of risk-aversion (also called Loss Aversion), which is something that shows in our lives on the regular:

You have two options:

- A guaranteed \$1,000
- A 50% chance at \$2,000 with a 50% chance at nothing

Which one do you choose?

I have had a lot of practice over the years with these kinds of decisions and I immediately want to make an expected value calculation (Not from the earlier paragraph. The real expected value calculation from earlier in the book). We don't have anything at stake in this decision *until* we see the second option which has some risk. There is a strong bias in our minds to just take the first one. When you do the expected value calculation on them, you find that the expected value is the same for both of them. Neither option is wrong, but I believe we can all observe that we tend to go for the first one, and we do it before any mention of an expected value calculation. This is risk-aversion.

Another interesting phenomenon of risk-aversion is the fact that the fear of losing money is a more powerful motivating force than the reward of gaining money. This is why so many people work jobs they absolutely hate rather than go into business for themselves. They are literally more afraid of failure than they are of not being successful, so they continue down what they perceive to be the safer path to travel. How much damage to one's mental health do you think that can do over time? This is a real part of life, that we must become and stay aware of. As you can see, it makes a significant impact!

Here are a few other situations in life to draw attention to:

- Do you find yourself doing the free trial^{vi}, loving the product, and then canceling before they can take a payment even though you really do love the product and its utility value is high?
- Do you only learn a musical instrument or other skills from free videos you can find, because your adverse to paying someone to teach you?
- Do you choose to eat lower quality foods because they cost ever so slightly more even though it damages your health? Do you buy them because they “save time”?

Prospect Theory

Imagine being risk averse and risk accepted at the same time. Would you say you are like that? Do you have insurance? If you do have insurance, how do you feel about gambling? Do you have insurance but will not gamble?^{vii} That's an interesting observation. Some people don't like the risk of gambling, but they fully accept that life has risks and they buy insurance.^{viii}

Let's explore an example:

We invest \$1,000 into Stock XYZ, and our investment grows to \$1,500. We now have a decision: 1.) Sell the stock and collect our gain, or 2.) maintain our position in Stock XYZ, and there is now a 50% chance the

stock will go back down, and a 50% chance the stock will continue to rise in value. What do you do?

Many people would choose to sell the stock. The expected value of both decisions are the same; however, they will forgo the potential gain to avoid the emotional impact of the loss.

We buy insurance so we don't lose. We won't gamble so we don't lose. Gambling can reward us, but the emotional impact of losing is too strong, so we don't do it. This emotional impact is significant in many ways, and it drives how we make most of our decisions.

I was a professional musician for years. I played rock guitar in several bands and did a lot of traveling; I was very successful compared to the average musician. I taught guitar lessons in between road trips to go perform. I saw prospect theory in nearly every single person who ever approached me to learn. I am not exaggerating at all when I tell you for every one-thousand potential students only one to maybe five of them did not display the biases of prospect theory.

Here is how it showed up in them:

There is a 100% chance that they have to pay to learn from me. They perceive a nearly 0% chance that they will become a famous rockstar; therefore, taking lessons from me is worthless. Do you see our bias showing itself in that? If we pay any amount of money whatsoever and we do not see a significant monetary gain, because we made a monetary sacrifice, the music lesson has no utility value^{ix} whatsoever. That isn't true. They had a goal to learn to play. They wanted to learn to play. They would have learned to play. They would have enjoyed playing. There was a positive utility value, but it was erased by the fact that they had to pay for it. This evoked the prospect bias part of the brain that did not want to *not* become a rockstar after they paid their money to learn how to play. In their mind, they are "throwing away" the money.

Where in your personal finances and your personal life can you spot yourself doing this? We all do it at times...

The Self-Serving Bias

This rears its ugly head in a lot of people. When we are successful and everything is going well, it is because we are great; we are amazing; we are just that damn good! However, when we are failing, and times are hard, and things aren't going well it's the market. "The market's crazy right now." "The government's doing something again." "The President did this or that." Then we have a strong season of success again, and of course that's because we're amazing. We're on social media counting our likes on the pictures we take of all the things we're spending all of our money on going broke again so we can continue our cycle that we're in, and when we run out of money and wave has crashed into the beach and there's no show to put on it's because "interest rates are high". All those republicans are doing what they always do. Those crazy democrats...

It's incredible how when things go well, it's us; but when things aren't going so well, we're placing the blame elsewhere and in some cases even demonizing those we choose to place the blame on. You can see in my example how we need to learn how to handle money better, but we never will because we're amazing and when times are hard it isn't because we are wrong; it's because someone else is. The emotional impact of use being wrong (just like in prospect theory) is too great; therefore, when times are tough, it's everyone else's fault. That's a vicious self-sabotaging cycle!

Cognitive Framing

Social media has spread cognitive framing like a disease! Cognitive framing is when we value things based on how they are presented to us rather than by calculating the true value of what we are looking at. Think about how people don't look for seminars to go and attend anymore, because they believe they can just watch videos on the internet. Go learn from an expert who is successful and has an abundant life in the real world or watch the video by a young kid with no real experience. No brainer, right?^x

How information is presented to us does *not* increase the accuracy, value, or utility of that information, but we all make decisions this way on a regular basis. Why did you choose can of beans A over can of beans B? Think about the train of thought that makes that decision, and then start taking a calculator with you to the grocery store. Someone reading this will thank me later.

Another example of cognitive framing on social media is the fact that get rich quick schemes are everywhere. If your sibling came to you and told you that you could get all your friends and family to just give you \$5,000,000 to start an “all passive seven-figure side-hustle laptop lifestyle real estate wholesaling crypto business you can run from your phone”, you would probably laugh at them because it is totally absurd, but when you are shown imagery of Patek Phillippe watches, Bugatti’s, Lamborghini’s, mega yachts, and hundred-million dollar mansions suddenly you find yourself looking for the “hack” for how to get more followers. You find yourself spending your valuable time trying to figure out “the algorithm”. Why? So, you can do that stuff! There’s a bias in there that’s telling you if you can figure that out, you’ll be rich!

And here comes the status quo bias (discussed later in this chapter) when someone tells us it isn’t true... Now, we’re angry and we’ll spiel out stories about all these fourteen-year-old kids who make \$50,000 a month. We don’t know a single one of them; we can’t name even *one*, but we saw the Rolex’s, the Ferrari’s, the Gucci suit, and... we believed it like it read it in The Bible!

The Familiarity Bias

Another powerful cognitive bias is the familiarity bias. We tend to gravitate toward what is familiar and comfortable to us. When faced with a decision, we will tend to choose what feel most comfortable with even if the alternative would make a serious positive change in our lives. Again, the fear of not being comfortable outweighs the positive rewards of making the change. This can be seen as another reason people stay in the job that do not like rather than go off on their own and fend for

themselves. The job is familiar; it never changes; we know what to expect. There are no surprises.

Staying where everything is familiar can stop us from doing anything at all that could be to our benefit, as you can see. We may choose not to invest anything at all, because we don't really understand it which causes us forty years later to not have enough in our retirement. We end up having to work until we're eighty years old. It's a scary thought, but it is a necessary thought. We can't make poor decisions like this. It's not okay!

The Status Quo Bias

Strikingly similar to the familiarity bias is the status quo bias which is the exact same principle; however, the focus is on being resistant to change. We focus on the change we don't want to make where with the familiarity bias we focus on what makes us comfortable and we stay there.

The status quo bias leads us to heavily resist anything that may change our current situation even if the change is a positive one with many remarkable positive benefits to us. We may even see a successful and highly rewarding endeavor as a threat to us merely because it poses a change in our lives and what we already know. We may see people who have knowledge that proves our current beliefs about things wrong as a threat to us, because they bring about change in our minds. Imagine the ripple effect this can cause in our lives.

Sometimes, when faced with an individual who is biased towards their status quo, we may chalk these people up as merely jealous or insecure and they very well may be those things as well; but there is a much deeper force inside driving their actions and it could be the status quo bias, because the emotional impact of them being wrong and having to make a change is far too strong for them.

Irrational and Illogical Thinking in Finance

As you can see, these biases are all connected by one powerful factor: *emotional impact*. Our fear of losing something shows up in so many different ways and it can sway us to make vastly irrational decisions in life. We may even go as far as to say making a *gain* of five percent is actually a *loss* because it isn't 10 percent! When we think this way it becomes impossible to win! All we'll ever do is lose at that point. To overcome these biases means to realize that we do it and absolutely no one is immune to them; they affect us all; and begin to challenge them with real data and real knowledge.

Make an expected value calculation everywhere that you can make one. If you can make all of your decisions based on expected value calculations you will be significantly better off in life. It is difficult to do, to challenge everything we know and everything we believe, but if we want to grow and make progress in finance we must do it. There aren't any exceptions. Becoming self-aware of our emotions and biases goes to the top of our list and we must always seek to prove ourselves wrong, like I mentioned earlier in the book.

Become a Mad Scientist

Become a mad scientist making observations in all areas of your life. Walk around everywhere carrying a hard-bound journal notebook and a pen and start writing down every tiny instance where you find yourself being biased, closed-minded, and thinking irrationally. Sit down and do the math on the decision with what you have learned so far. It will change your life. Your outcomes in everything you do will be noticeably better, and it will happen quickly. Taking this kind of ownership will show you that *your decisions* are what determines everything, so beware of the status quo! Keep yourself in check.

This mastery of the skill known as self-awareness will take you to financial heights you never thought of previously.

Chapter Eleven

COST-VOLUME PROFIT ANALYSIS 2.0

Previously, we discussed going into business for yourself and the things you will need to understand to be as efficient as possible. One thing we covered specifically is cost-volume profit analysis. We can take these things to the next level by understanding how we can use it for multiple products rather than just one. This adds a whole new dimension of precision to our managerial accounting and financial acumen.

Which of your products that you sell or which of your services that you provide with your business contribute the most to covering your fixed costs? On the surface, it looks like the product that puts the most cash in the register or the largest single deposit in the bank is one, but this isn't necessarily the case. Businesses may sometimes become inefficient with their pricing strategy for not knowing *exactly* what is contributing the most to the fixed costs of the business.

In my own personal experience, in conversations I have had with owners and managers of businesses and companies, the most common tactic I have seen to generating more money is to give discounts to generate more sales, and if you're a business owner reading this you likely know from experience that this strategy does not work. You end up less efficient and less profitable by merely giving people discounts to get them to come in the door. There's a significantly better way to strategize this where you could still give the discount if you wanted, but also *increase* your profitability making you more efficient.

Efficiency in your business is not merely about selling more products or providing more services in a day. The question, "How efficient am I in my business?" can be reworded to the question, "*What does it cost me to run my business?*" Spending more than we should and even spending more than we produce is easy to do. I showed you how easy it is to mistake paying the bills for breaking even; you can lose a lot of money over time thinking like that. One thing that I have found to be an

excellent indicator of inefficiency in a business is if you can show every year on your taxes.¹¹ There's only one way to show a loss every year, and that is to have a negative net income every year.^{xi} Showing a loss every year should absolutely not be your goal as a businessman or investor. Your mission in this life should be to make as much money and build as much equity as you can, because when you do this, you can contribute more. This is why we *must* learn how we can be more efficient.

While there are many ways to build the efficiency of your business such as having the right people working for you, having the correct individuals in leadership roles rather than just friends or people with seniority, and of course actually showing up for work, I am going to stick to the analysis the chapter is focused on. I have said it before, and I'll say it again; there is no shortcut. There's no "one way" to do it. You must develop yourself by learning the skills and practicing and building upon your strategy. Cost-volume profit analysis is an excellent way to develop your pricing strategy and optimize your business.

Contribution Margin Percentage

Your contribution margin percentage is how much of your revenue contributes to paying your fixed costs. What that means is, when you sell a product, you have already spent your variable costs, or you have borrowed to cover them. That money is gone. What you have left over¹² is what contributes to paying the fixed costs; this is your contribution margin. You can likely already tell just by that definition why throwing unsystematic discounts around to get customers in the door can be wildly inefficient and create even more problems if it is overdone; so, how do we calculate our contribution margin percentage of one of our products?

Calculating the contribution margin percentage on one product is relatively straightforward. We subtract variable costs from the revenue to

¹¹ I do not condone being dishonest on your taxes.

¹² The profit

get our contribution margin¹³; then, we divide our margin by our revenue to get the contribution margin percentage. This is an excellent time to pull out a spreadsheet so that you can increment and decrement your variable costs and your revenue and understand the relationships between these figures. When you start to gain a solid understanding of what is happening in this seemingly simple arithmetic it will shock you at just how simple it can be to make a remarkably positive change in how you do business.

$$\text{Contribution Margin} = \text{Revenue} - \text{Variable Costs}$$

$$\text{Contribution Margin \%} = \frac{\text{Contribution Margin}}{\text{Revenue}}$$

Here is the goal: We want to make the contribution margin percentage as high as possible. Notice I am not saying, “We want our profits to be as high as possible.”; I am saying we want the contribution margin percentage to be as high as possible. We do not want to put ourselves into a mindset where we are going to our business to take everything we can from it. This leads to inefficiencies, because our focus is on what we can get rather than what we can do better. Another example is when we go to the stock market, and all we think about is how much money we can make. We end up putting *zero* thought into managing our risk, and we end up losing money. While the overall goal is to make money, we are here to discuss how to do it as efficiently as possible, and thinking about how to raise profits produces different results than thinking about how to increase profitability. Let’s take a look at what I mean by this.

If I am selling Product A for \$129.99 and my cost is \$74.99, I can make our calculations right now:

$$\text{Contribution Margin} = \$129.99 - \$74.99 = \$50$$

¹³ The profit again

$$\text{Contribution Margin \%} = \frac{\$50}{\$129.99} = 0.3846 = 38.46\%$$

To experience the transformative magic that is the realization of the relationships between these numbers, all we must do is increment the cost and the price by the exact same amount at different times, and we will see irrefutably which one is the most efficient way to increase profitability. I'm going to make a table to display these results for readability.

	Original	Increase Price (+\$10)	Decrease Cost (-\$10)
Price	\$129.99	\$139.99	\$129.99
Cost	\$74.99	\$74.99	\$64.99
Contribution Margin %	38.46%	46.43%	50%

Let's make our observations, shall we? When we increase our price by \$10 in an attempt to increase our profits, our contribution margin percentage rises from 38.46% to 46.43%; conversely, when we decrease our cost by \$10 our contribution margin percentage rises from 38.46% to 50%! On the surface, one may be led to believe that doing it either way would produce the exact same result, therefore it is easier to just raise your price rather than go and do the more tedious task of lowering variable costs. When we revisit the idea of giving discounts to generate more business, we are leaving the variable costs exactly the same and lowering our price. Let's say we lower our price to \$100 and we don't change the costs:

	Original	Lower Price (\$100)
Price	\$129.99	\$100
Cost	\$74.99	\$74.99
Contribution Margin %	38.46%	25.01%

When we lower our price to \$100, our contribution margin percentage *decreases* from 38.46% to 25.01%; therefore, an unsystematic discount is not going to produce more profits for you in the future. It may bring in a new customer or two, but how long before you break the news to them that the price will be going up 29.99%, and people start to catch on that that is how you bring people in.¹⁴ There is a strategic way to offer discounts to new and existing customers that does not create this potentially problematic scenario where you choose to be inefficient for a chance at a new customer that only stays around for a short time. Remember that our focus is on lowering variable costs for when we lower the variable costs we increase the contribution margin percentage by more than if we raise the price.

Pricing Strategy

Knowing what we now know, what could we do that would increase our contribution margin percentage as well as make customers happy and maybe even have us gain a few more good ones? What does that look like with this new information that we are now aware of? First of all, the obvious way to maximize contribution margin percentage is raise your price and lower your variable costs. Second to that is leaving your price alone and lower your variable costs. Is there some way we can lower our costs, and give good customers an attractive deal from time to time that still increases our contribution margin percentage?

¹⁴ Some people like to say, “sucker people in”.

Here is my current way of thinking, and I stand firmly on my belief that you should take what I say and see if it resonates with you in a significant way and if it doesn't, you should take the real data part of our discussion and develop your own strategy that works best for you:

I like to start each analysis with a question so that it has some direction, and we can reach a simple answer as to whether or not something is worth doing. Question: *What if I could lower my variable cost \$10 and do a sale for a short period of time where I lower my price only \$5? Would my customers be getting an attractive deal while I also benefit from the sale by increasing my margin percentage?* Let's do the math and find out conclusively.

Our strategy in question is to lower the variable costs \$10 and lower the price only \$5 to see if our contribution margin percentage is still higher than with the original price and costs.

	Original Price	Strategy in Question
Price	\$129.99	\$124.99
Cost	\$74.99	\$64.99
Contribution Margin %	38.46%	48%

The math shows us that we can use this strategy to provide a discount to customers and for marketing purposes that will *raise* our contribution margin percentage. I'll reiterate to you that making a spreadsheet is an excellent way to optimize this math. There are multiple variables involved that can be incremented and decremented to find the highest possible contribution margin percentage as well as the lowest possible price maintaining it. This knowledge and this sort of strategic thinking can give you a very durable advantage over your competition on the economic landscape, and it empowers you to break even faster so that you have essentially covered your fixed costs earlier in the month and you are spending significantly more time generating free cash flow.

Indexing

Indexing helps account for inflation, so it is a good addition to this section on pricing strategy. The technique is to use an index such as the Consumer Price Index to adjust your prices, so that inflation doesn't eat away at your profits.¹⁵ This can be a little difficult to understand, but when compared to other material in the book, this is very simple. Let's step through the process:

Imagine we have an imaginary index called "The Index". Currently, the index has a value of 1.7. Our price on our Product A is currently \$100. A few months go by, and the index is now at 1.85. We need to adjust our price for inflation.

There's two ways we can do it. There's a hard way to do it; and there's an easy way to do it. Here's the hard way to do it:

Adjusting Price for Inflation: The Hard Way

*AP = Adjusted Price; CP = Current Price

$$\text{Difference} = \text{New Value} - \text{Old Value}$$

$$\text{Percent Increase (decimal)} = \frac{\text{Difference}}{\text{Old Value}}$$

$$\text{AP} = (\text{CP} \times \text{Percent Increase (decimal)}) + \text{CP}$$

That will work, but it is simpler than that. Here's the easy way to do it:

Adjusting Price for Inflation: The Easy Way

$$\text{Adjusted Price} = \frac{\text{Current Price}}{\text{Old Index Value}} \times \text{New Index Value}$$

That's it. Let's apply our scenario to this easier one.

$$\text{Adjusted Price} = \frac{\$100}{1.7} \times 1.85 = \$108.82$$

¹⁵ This is also how landlords adjust rents over time.

Analyzing with Multiple Products

Understanding how to perform cost-volume profit analysis on one product gives us incredible insight into our business and pricing strategies, but what about the more common scenario of when there are multiple products with different variable costs and prices? Think about this with me: When you walk into a store and you see that there are certain products on sale, *why* is *that* product on sale? What is special about that product? Why is it special enough to get its own display just for this one sale? We have insight into some of the reasons for this, and we will never know exactly why they made those decisions without coming out and asking them, but we can still think about how this ties into our own business; we can think about how they worked out putting a product on sale which means spending *more* for a display and lowering their price temporarily. It seems they raised their cost ever so slightly *and* lowered their price.

A big grocery store like you probably have in your local area makes so much money it's not likely that a few dollars on a display matters too much. They are going to be focused far greater dollar amounts in their costs than something that small; but for the small business owner, maybe a family-owned shop, these costs often do matter. Even though it is a totally different level of business and accounting when you get to a larger scale, we can still take a look at how they do things and try to begin to understand. After all, they had to do something right to become such a large enterprise even if it is only on a local level, and while business must evolve and change as they grow, the math doesn't change.

Let's imagine we have two products now: Product A and Product B. Product A is currently priced at \$150, and Product B is currently priced at \$135. The cost of Product A is \$87.95, and the cost of Product B is \$92.95. Here it is in a table for readability:

Products	Price	Cost
Product A	\$150	\$87.95
Product B	\$135	\$92.95

What we need to do now is create a table where we can account for total units of each product sold, total revenues, total costs, total contribution margin, and total contribution margin percentage so that we may form a comprehensive analysis of how efficient we are overall. I am going to simplify this as much as possible because I cannot put a dynamic spreadsheet in a book, but I am going to dive as deep as I can without making it overwhelming. Let's say we have sold 120 units of Product A and 180 units of Product B. To calculate the revenue of each item, we multiply the price by the number of units of each item; we do the same to figure out the total variable costs.

$$\text{Product A Revenue} = \$150 \times 120 \text{ units} = \$18,000$$

$$\text{Product B Revenue} = \$135 \times 180 \text{ units} = \$24,300$$

$$\text{Product A Costs} = \$87.95 \times 120 \text{ units} = \$10,554$$

$$\text{Product B Costs} = \$92.95 \times 180 \text{ units} = \$16,731$$

Now, all we need to do is insert these terms into a table and we can make our observations up to this point before we move on to make the other necessary calculations for our analysis.

	Product A	Product B		Totals
Units	120	180	Units	300
Revenue	\$18,000	\$24,300	Revenue	\$42,300
% of Total Revenue				
Cost	\$10,554	\$16,731	Cost	\$27,285
Contribution Margin			Contribution Margin	
Contribution Margin %			Contribution Margin %	

We can now see more clearly what is happening up to this point with our imaginary products. We have how many of each product we have sold as well as the total number of units sold. We have the revenue generated from each product as well as the total revenue generated; and we have our cost for each product as well as our total variable cost. The next step is to calculate our percentage of total revenue which will tell us how much of our total revenue comes from each product. This is found by dividing the individual revenue by the total revenue.

$$\% \text{ of Total Revenue} = \frac{\text{Product Revenue}}{\text{Total Revenue}}$$

$$\text{Product A \% of Total Revenue} = \frac{\$18,000}{\$42,300} = 42.55\%$$

$$\text{Product B \% of Total Revenue} = \frac{\$24,300}{\$42,300} = 57.45\%$$

To check our work, we add those two percentages together and see if they equal 100%:

$$100\% ? = 42.55\% + 57.45\% = 100\%$$

We're correct on our math. Let's update our table:

	Product A	Product B		Totals
Units	120	180		Units 300
Revenue	\$18,000	\$24,300		Revenue \$42,300
% of Total Revenue	42.55%	57.45%		
Cost	\$10,554	\$16,731		Cost \$27,285
Contribution Margin				Contribution Margin
Contribution Margin %				Contribution Margin %

We can now see that Product B is responsible for the majority of our total revenue, but this isn't enough information. We need to go all the way through and find the contribution margin as well as the contribution margin percentage of our products as well as our business (the totals). To find the contribution margin we subtract our cost from our revenue of each individual product. Let's look at the updated table:

	Product A	Product B		Totals
Units	120	180		Units 300
Revenue	\$18,000	\$24,300		Revenue \$42,300
% of Total Revenue	42.55%	57.45%		
Cost	\$10,554	\$16,731		Cost \$27,285
Contribution Margin	\$7,446	\$7,569		Contribution Margin
Contribution Margin %				Contribution Margin %

We are not yet concerned about the total contribution margin. We do not calculate that by adding across the board from left to right. Let's finish the individual products before we move over to the totals. Next, is the contribution margin percentage for each individual product. This is our contribution margin divided by the revenue as we discussed previously:

	Product A	Product B		Totals
Units	120	180		Units 300
Revenue	\$18,000	\$24,300		Revenue \$42,300
% of Total Revenue	42.55%	57.45%		
Cost	\$10,554	\$16,731		Cost \$27,285
Contribution Margin	\$7,446	\$7,569		Contribution Margin
Contribution Margin %	43.03%	31.15%		Contribution Margin %

An interesting observation: our supposed top contributor has a lower contribution margin. Finally, let's calculate the totals and update the table. To get our totals, we use the totals. Subtract total cost from total revenue to get total margin, and then divide total margin by total revenue to arrive at the total contribution margin percentage:

	Product A	Product B		Totals
Units	120	180	Units	300
Revenue	\$18,000	\$24,300	Revenue	\$42,300
% of Total Revenue	42.55%	57.45%		
Cost	\$10,554	\$16,731	Cost	\$27,285
Contribution Margin	\$7,446	\$7,569	Contribution Margin	\$15,015
Contribution Margin %	43.03%	31.15%	Contribution Margin %	35.5%

We can make some valuable observations here. Our total contribution margin percentage is only 35.5% and Product B is generating most of our revenue even though its individual contribution margin percentage is only 31.15%. We have discovered an inefficiency! We can see that our bigger seller of the two has the lower contribution to the fixed costs. Now that we know this, we can begin to strategize.

This is where we brainstorm all of our options and think about what may be best for the business. At this point, we have come a very long way in our journey together, and you well know that there are many things you can do bring the total contribution margin percentage up higher than 35.5%. I would assume that our imaginary business won't be in business long with a margin like that. Start with the question, "What can be done to raise the total contribution margin percentage?"

- Sell more of Product A
 - This could mean a strategic discount like we discussed before.
 - Marketing aimed more at selling Product A.

- Maybe the cost cannot be lowered more at this time; can the price be lowered, and the contribution margin percentage stay higher than that of Product B?
- Make an upward adjustment to the price of Product B is in order.
 - As we saw before, this is not as efficient as lowering variable costs, but it is an option.
- Product B seems to be the more popular product, so raising the price may be appropriate.
 - Is it the more popular product, or are our efforts geared more towards Product B because we think it *should be* the most popular product.
 - Biases are part of life. Think it through.

Those are just some of the potential options. Your situation is and/or will be unique to you, so be sure and do a thorough analysis and see if you can build a strategy that optimizes your endeavors to the best of your abilities with your resources in your situation.

This utility value of this analysis grows more and more as you add more products to the analysis, however you must practice rock solid accounting. Your bookkeeping skills need to shine in this situation. Since most businesses use accounting software, it should be fairly simple to keep up with. Keep everything as detailed as possible to make analyses like this as simple as possible. If your business is small enough that you won't be overwhelmed doing it on paper, keep a ledger and use double entry accounting to keep up with everything. Accuracy and precision are the key. You cannot be efficient if you are not accurate. You may find that you can export your sales data to a .CSV file which will open in your favorite spreadsheet software; this would be invaluable to you! Then you may begin to increment and decrement variables such as units sold, cost, and price of each product to create and optimize a strategy for your business.

I understand that not everyone is tech savvy and in today's time it is much simpler to automate the accounting process with accounting

software, but you cannot automate the analysis process, not on a level this deep and thorough. The only analyses that are usually automated to my current knowledge are conversion rates, which is arbitrary when it comes to your finances because conversion rates are a measure of the performance of your marketing, not your businesses efficiency. You may say that the marketing is part of your businesses efficiency, and I understand why you may feel that way, but what does your conversion rate do for your accounting and risk management? What does it do for your bottom line on you financial statement? You must learn to gather your data so that you may perform these types of deep analysis on your own or hire an accountant to do them for you, which will raise your fixed costs. At the end of the day, the very best thing you can do is consult with a professional, as a professional is who is best at this, but you should verse yourself well in your own business. Period.

Chapter Twelve

THE HOLY GRAIL

It's time for the big boy stuff. This is about diversification and not the kind of diversification that the average person does. This is the way it is done! Imagine you have been analyzing businesses and their stock price, and you have been looking at bonds and interest rates; and you have chosen a few good businesses and assets to invest in. How do you figure out the best way to allocate your funds to those assets to get the highest return *at the lowest level of risk*? That is what we are about to cover.

Previously we discussed calculating the expected return of a portfolio, which is basically just a weighted average as you saw; all you need to do is adjust the weights to get the allocation that will produce the highest expected return on the portfolio. Now, we are taking it to the next level where we are going to calculate the risk associated with the entire portfolio as well. We discussed before that standard deviation is an excellent measure of risk in the price action of a stock or some other asset. Just as we can calculate the expected return of the portfolio we can calculate the standard deviation of the portfolio and see the magic of diversification take effect; we only need to know the correlation between the pairs of assets.

Let's say we're looking at two stocks: Stock A and Stock B. One of them has a standard deviation of twenty-six and the other has a standard deviation of thirty-two, and they have a correlation of -0.23 . If we put them together equally weighted into a portfolio, what do you think the standard deviation of the portfolio as a whole is? The answer is *18.15!* The portfolio has a lower measurement of risk than either of the two assets individually. If the expected return of Stock A was 25% and the expected return of Stock B were 29% the expected return of the portfolio would be 27%. That would mean we have a return on risk of 1.46. This means that for every unit of risk, we can expect a return of 1.46. This information teaches us that randomly buying stocks based on biases and things we read on social media, while that is diversifying, is not necessarily going to give us more return on risk.

Let me ask you a question. If you were going to invest just \$1.00 and you had two choices, would you invest in Scenario A: You have a chance to get back \$0.75, or Scenario B: You have a chance to get back \$1.25? Scenario B shows a positive gain so, Scenario B, right? This is calculating your return on risk. We just made this decision taking our risk of \$1.00 into consideration. I want to point out that what you have likely seen on the internet, the "Risk/Reward Ratio", is not what we're talking about. It sounds the same, but most of what you are seeing on the internet is speculative traders who purchase a stock at \$1.00 and if they set a stop loss order at \$0.50 and a limit order to sell at \$2.00 they have a risk to reward ratio of 1:2. They also believe if they move their limit order up to \$2.50 that they would then have a risk to reward ratio of 1:3. That is absolutely not how that works. You cannot draw a line and then draw a line somewhere else and change your odds of success. That type of thinking is how you make critical errors which many of them do. (*See Chapter Ten: Behavioral Finance*) Real math and real data based on real and thorough analysis are how we make superior decisions.

Portfolio Standard Deviation

So, how do we do this math? How do we find out how much risk we are taking and how much return we can expect to see from our risk? The more risk we take on, the more return we expect to see is generally how people would look at it from my personal experience. We need to know how to find this out. I am going to teach you to calculate *portfolio standard deviation*. Let's start with two assets like we just did. Here's the formula for portfolio standard deviation with just two assets:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2}$$

That may look pretty complex so let's break it down with some bullet points:

- The Standard Deviation of the portfolio (σ_p) is equal to
- The square root ($\sqrt{\quad}$) of
- Weight one squared times the standard deviation of asset one squared ($w_1^2 \sigma_1^2$)
- Plus (+)
- Weight two squared times the standard deviation of asset two squared ($w_2^2 \sigma_2^2$)
- Plus (+)
- Two times weight one times weight two times the correlation coefficient of assets one and two times the standard deviation of asset one times the standard deviation of asset two ($2 w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2$)

Be sure and maintain consistency in how you enter your variables into the formula.^{xii}

We can now substitute our variables from earlier in the chapter:

- Stock A
 - $\sigma = 26$
- Stock B
 - $\sigma = 32$
- Correlation Coefficient for the pair
 - $\rho_{1,2} = -0.23$
- Equally weighted

Let's substitute in:

$$\sigma_p = \sqrt{0.5^2 26^2 + 0.5^2 32^2 + 2 \times 0.5 \times 0.5 \times -0.23 \times 26 \times 32}$$

$$\sigma_p = \sqrt{169 + 256 + 2 \times 0.5 \times 0.5 \times -0.23 \times 26 \times 32}$$

$$\sigma_p = \sqrt{329.32}$$

$$\sigma_p = 18.15$$

See? It's not too bad.

That formula is fairly simple with two assets; however, it does get far more complex as you add more assets. Once you get to about four, that equation seems to explode and become overwhelming if you aren't used to looking at larger equations. This has to do with the fact that we take every possible pair into consideration, for example the term, " $(2w_1w_2\rho_{1,2}\sigma_1\sigma_2)$ " takes the pair of Stock A and Stock B into consideration as well as the pair of Stock B and Stock A. They are the same, but they must be accounted for as they are present. That is what the "2" is in this term. Rather than write it all out twice, it just multiplies the result of this term by two.

Just for fun, let's see the equation with 4 assets: Stock A, Stock B, Stock C, Stock D. They are equally weighted. We'll use bullet points for clarity:

- Stock A
 - $\sigma = 24$
- Stock B
 - $\sigma = 31$
- Stock C
 - $\sigma = 27$
- Stock D
 - $\sigma = 35$

Now, to clearly see our correlation coefficients, we need a *correlation matrix*. That looks like this:

A correlation matrix provides us with a clear and concise way of seeing the correlations of each possible pair of data sets in our analysis.¹⁶

	Stock A	Stock B	Stock C	Stock D
Stock A	1	-0.21	0.64	0.57
Stock B	-0.21	1	-0.46	0.78
Stock C	0.64	-0.46	1	-0.89
Stock D	0.57	0.78	-0.89	1

The correlation matrix is a table of all the possible pairs. You may have noticed that the table repeats itself, and we only actually need half of it, so if we wanted, we could just do this:

	Stock A	Stock B	Stock C	Stock D
Stock A	1	-	-	-
Stock B	-0.21	1	-	-
Stock C	0.64	-0.46	1	-
Stock D	0.57	0.78	-0.89	1

¹⁶ It is important to note that the correlation of anything paired with itself is always one, for example Stock A and Stock A.

That makes it a little easier to read, and if this is for our own analysis, we don't have to be formal in how we present our information; we only need to be clear and correct for our own understanding.

Now that we have our bulleted data, our correlation matrix, and we know that each asset is equally weighted, we can begin to calculate the standard deviation of the portfolio as a whole. This is the formula (brace yourself):

$$\sigma_p = \sqrt{\begin{aligned} &w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + w_3^2\sigma_3^2 + w_4^2\sigma_4^2 \\ &+ 2w_1w_2\rho_{1,2}\sigma_1\sigma_2 + 2w_1w_3\rho_{1,3}\sigma_1\sigma_3 \\ &+ 2w_1w_4\rho_{1,4}\sigma_1\sigma_4 + 2w_2w_3\rho_{2,3}\sigma_2\sigma_3 \\ &+ 2w_2w_4\rho_{2,4}\sigma_2\sigma_4 + 2w_3w_4\rho_{3,4}\sigma_3\sigma_4 \end{aligned}}$$

Pretty complex, huh? The growth in complexity has to do with calculating for each pair. Read each term individually and you will see that even at this level, the equation is relatively straightforward. It's easy to become overwhelmed by such advanced mathematics, but I assure you that you can do this if you set your mind to it and break it down into small bite-sized pieces. Looking at the individual terms such as “ $2w_1w_2\rho_{1,2}\sigma_1\sigma_2$ ” make it far more digestible.

Well.. We didn't come this far to only come this far... Let's slay this monster and find out the answer. I'm far too curious; I must know!

$$\sigma_p = \sqrt{\begin{aligned} &0.25^2 24^2 + 0.25^2 31^2 + 0.25^2 27^2 + 0.25^2 35^2 \\ &+ 2 \times 0.25 \times 0.25 \times -0.21 \times 24 \times 31 \\ &+ 2 \times 0.25 \times 0.25 \times 0.64 \times 24 \times 27 \\ &+ 2 \times 0.25 \times 0.25 \times 0.57 \times 24 \times 35 \\ &+ 2 \times 0.25 \times 0.25 \times -0.46 \times 31 \times 27 \\ &+ 2 \times 0.25 \times 0.25 \times 0.78 \times 31 \times 35 \\ &+ 2 \times 0.25 \times 0.25 \times -0.89 \times 27 \times 35 \end{aligned}}$$

Wow...

$$\sigma_p = \sqrt{\begin{aligned} &36 + 60.0625 + 45.5625 + 76.5625 \\ &+ 2 \times 0.25 \times 0.25 \times -0.21 \times 24 \times 31 \\ &+ 2 \times 0.25 \times 0.25 \times 0.64 \times 24 \times 27 \\ &+ 2 \times 0.25 \times 0.25 \times 0.57 \times 24 \times 35 \\ &+ 2 \times 0.25 \times 0.25 \times -0.46 \times 31 \times 27 \\ &+ 2 \times 0.25 \times 0.25 \times 0.78 \times 31 \times 35 \\ &+ 2 \times 0.25 \times 0.25 \times -0.89 \times 27 \times 35 \end{aligned}}$$

Now, it is straightforward. We just plug it into the calculator:

$$\sigma_p = \sqrt{262.87625}$$

$$\sigma_p = 16.21$$

That was a lot of work, but now we have the portfolio standard deviation for the imaginary portfolio we created, and we can make some *powerful* observations.

The standard deviations of the individual stocks in the portfolio were 24, 31, 27, and 35; however, the standard deviation of the portfolio as a whole is only 16.21. That is remarkable! This isn't all either. These assets

are equally weighted. The weights can be optimized to lower the risk even more, but that would be far too much to put in the book. I'll talk more about how optimization can be made easier later in the book. It would take far too much time to sit and increment each of the weights by anything from tens down to a one-hundredth to get the optimal allocation. We could do that in the book, but the book would be thousands of pages of nothing but numbers and equations and that wouldn't be advantageous for either of us. The fact that we can lower the risk of the portfolio as a whole with our allocation is extremely powerful. This is nothing to shake a stick at; this changes the paradigm of investing for all who learn it. It isn't limited to just stocks either. All you need is to gather the data of returns over the years of any investment and you can do this analysis. You can have a "portfolio" of gold and real estate or lumber futures and treasury bonds; it doesn't matter as long as you have access to accurate reliable data.

Correlated Relationships

What you will notice when analyzing the portfolio standard deviation of the whole portfolio containing only two assets is that a negative correlation between the two will greatly lower the risk of the portfolio. As one goes down, the other goes up offsetting the loss. As you get into more and more assets and you are measuring your return on risk, you are going to notice that little to no correlation will produce better results. On that note, right now is a great time to very clear that you must have *good* assets. There is no optimization of that. There's no formula that makes a compilation of terrible decisions work out for you. You must do your due diligence and make good decisions leading up to this point. We cannot allow biases to have use convince ourselves that we can make bad decisions and achieve good results. It won't work.

Expected Return of The Portfolio

We have covered how the expected return of the portfolio is calculated, but we're going to do it again as we move towards our return on risk.

Let's do the math with some mock average returns and get a figure that we can use. Let's declare that the average returns are:

- Stock A
 - 25%
- Stock B
 - 31%
- Stock C
 - 23%
- Stock D
 - 27%

Our assets are equally weighted in the portfolio as we declared before, so let's do the math:

$$ER_p = (0.25 \times 25) + (0.25 \times 31) + (0.25 \times 23) + (0.25 \times 27)$$

$$ER_p = 6.25 + 7.75 + 5.75 + 6.75$$

$$\text{Portfolio Expected Return} = 26.5\%$$

Return on Risk

Now we can calculate our return on risk. Remember: This is how much we get for each unit of risk we take on. If we see a return on risk of 1, then we are getting one unit of return for every one unit of risk; it's an even trade-off. Ideally, we want to see a return on risk greater than one. Let's do the math:

$$\text{Return on Risk} = \frac{\text{Return}}{\text{Risk}}$$

$$\text{Return on Risk} = \frac{26.5}{16.21}$$

$$\text{Return on Risk} = 1.64$$

A return on risk of 1.64 is not bad. This means we are getting more return for our risk in this imaginary scenario, and again, this was an equally weighted portfolio. Those weights can be optimized to find out if even better results can be achieved. It is also important to remember what we discussed about how correlations affect the outcome. To increase the return on risk when you have a larger number of assets, you need no correlations or correlations as close to zero as possible. When you are dealing with a small number of assets, negative correlations deliver the better outcomes. This is subjective to the data from the analysis and also to your ability to find assets with little to no correlation. As you can probably guess, out of all the possible pairs in a portfolio that has fifteen or twenty assets in it, it is difficult to maintain correlations of zero for all of them. It is highly unlikely actually. This goes back to you developing your strategy and deciding on the threshold you would consider close enough to zero to make the decision to add an asset to your allocation.

Chapter Thirteen

HOW WE THINK DETERMINES OUR OUTCOMES

You and I have come a very long way together so far, my friend. You have a lot to be proud of! I have mentioned in this book that you will meet a plethora of folks who will tell you they already know all this stuff, and they will happily fill your head with ideas that they sit around all day with spreadsheet software up on their computer and a stack of books honing their skills in analysis, forming hypotheses, and brainstorming creative strategies for the financial vertebrae of their business. I am doing the very best I can to not infuse this book with my own opinions, but rather stay focused on things I know are factual and let you decide for yourself; but, let me tell you, those people are not telling you the truth when they tell you that story. The vast majority of people don't know one-tenth of this information and the reason is because it isn't available to them.

I have spent the majority of my adult life seeking growth in many areas. I do not own a television set. I refuse to buy one. My return on that television set is negative; I lose the money. I do, however, buy more books every chance I get. There is nothing more empowering and transformative on this planet than ingesting information through written word. There are many who will say watching videos is better, but it's not true. That goes back to biases about how information is presented to us. Videos are produced to be colorful and engaging; they have pleasant music playing in the background and a good-looking someone pressed and dressed to take on the role of "the expert" in that little movie, but it is not the best way to learn. For thousands of years, we as humans have been recording information in the form of writing^{xiii} and for thousands of years we have been learning from it. Beginning with ancient cuneiform^{xiv} in 3500 BC^{xv} and leading all the way up to present day, as civilization becomes more complex, so does our language and writing.

Up this point we have discussed some of humanity's most self-destructive biases as well as some of the most complex mathematics in

finance. We have discussed the common beliefs and conspiracy theories that I have personally heard come out of people's mouths, and at this point, I believe we have disproven at least the ones that can be disproven by math. The main focus of my work in this book and the conversation at hand is to share financial literacy and empower everyone I can with knowledge and confidence that will render them unshakeable when tough seasons befall us. In my life, I have seen that lack of information gives our mind a wide-open canvas to start painting on, and who knows what it will come up with sometimes. Our brains seem to seek to understand and where there is no evidence at all, it starts to try and "connect the dots" however it can, creating irrational beliefs and making up stories that ultimately affect the way we make decisions and consequently, the quality of our lives.

You and I have embarked together on a data-driven journey to a higher understanding and a broader perspective of our economic world. It is with this broader and deeper understanding that we may build the strategies that take us to the next level. We can now see what we could not see before, and this leads us to a higher level of decision-making. We may now look and finally see exactly what it is we must do to go forward and achieve on the level that we have always known inside that we are capable of. I personally believe that we *must* do this. To learn and not change anything means to have never learned. I have met many in my life who believe this information is kept from them by "the elites" and it just isn't so. This information has been available in books in libraries, book stores, online book retailers, and now you have it in the palm of your hand. This information has never been kept from you, but rather it has been outside the scope of your peripheral vision.

The people around us influence us in many powerful and invisible ways. One day we are this person and slowly over time, so slowly we don't even notice anything, we become someone else. This is the miracle of evolution, and it is on your side, if you will learn to leverage it to your advantage and surround yourself with information like what is contained in this book and with people who want to see you succeed. Maybe you

currently believe that no one wants to see you succeed, but with this book in your hand you now know that isn't so. Someone cared enough to write a book filled information to help you along your way. Another wrong belief and wrong opinion disproven; another lesson learned; another step forward; another increment of personal growth taking us towards our destiny. There are people on this paradise planet we call Earth that live to see your success and would love nothing more than to be around you and to share in great achievement and success with you, but you must allow it, for these people are gentlemen and ladies, and they do not go where they are not welcome. You must open the door when these people knock. You must answer when they call. They are on a mission in life as well, and just like you, they have to keep moving or live to regret not doing so.

The next chapters of this book are there to take us to an even higher level of knowledge, skill, and efficiency. I hope that they will be as transformative to you as they were for me when I learned them. I'm going to share with you how skills such as stress-testing and simulating so that after you have done all the research and the analysis, and the calculations, you don't have to wait for time to tell you what may come; you can simulate the future millions of times if you wish and weigh out the simulated outcomes before you make your decisions. This does not mean I'm going to teach you to predict the future and it will never give you any guarantees, for the laws of economics and nature will checkmate you without remorse. Don't ever believe you can beat the market. However, you will have a skill valuable beyond measure that will help you to strategize and make intelligent plans and decisions for yourself and your future.

Chapter Fourteen

TECHNOLOGY IN FINANCE

When it comes to doing things such as optimizing weights for your allocations and stress-testing a strategy, you will be doing many iterations and testing many different combinations of variables, possibly millions of them. This is simply not something that can be done by hand on paper. There are not enough years in a lifetime to complete an analysis like that, and even if there were, by the time you were even a fraction of the way finished with what you were doing, so much time will have passed that it would be an entirely different market, and your analysis would have no merit anymore. This is why we need to learn to use the computer, and I don't mean go searching for some app we can use to do it for us. We can no longer be dependent on everyone else to give us the tools we need. We have the knowledge. We have the intelligence. We have people around us. It is time we learn to use our resources rather than introvertly and selfishly trying to do everything ourselves by taking shortcuts.

I cannot give you a full-on comprehensive training with the computer, and this book is not focused on computer science; but it is the time we live in, and technology is part of life. It is most certainly part of finance. If you have no ability to use technology, you are going to struggle and on a long enough timeline, you are going to fail. Now is the time to learn while we have all of this powerful new knowledge fresh in our minds so that we may learn through application. We need to take the things that we have learned on paper and streamline them so that it doesn't take us hours and hours to study our data. This is where the computer comes into play.

Algorithmic Trading

Financial giants use computers for a multitude of things. High frequency traders use them to not only execute trades for them, but their computers also *find* the opportunities for them. There are algorithmic trades

happening every single day between market open and market close. Traders from all over the world have written algorithms that follow a security's price action every second the market is open and will execute trades on their behalf based on the parameters they have decided on for their trading strategy and entered into the computer. There are even some brokers who have their own coding languages that they teach to their customers *for free* so that they may do this if they want to!^{xvi} There are brokers who offer an API¹⁷ to their customers who wish to connect to their system and use their coding language of choice to do this very same thing.¹⁸ This is so common that as of 2009, upwards of *sixty percent* of *all trades* were executed by a computer!^{xvii}

This seems like an excellent way to keep the emotional biases out of stock trading, but it does have some cons. It is possible that the market could potentially go a little further one way or the other and all these computers could react to it causing a potential irrational crash of stock^{xviii} or an irrational parabolic gain which will turn around and drop right back down. These types of things can exacerbate the sentiment towards the market and the economy from the individual who is logged-in making trades themselves and seeing this.^{xix} The individual may think they missed some big news and make a poor decision based on the peer pressure of what seems like everyone buying or selling and have to deal with the repercussions later. You don't get mulligans on these things.

Superior Decision-Making 2.0

It doesn't stop at algorithmic trading either. You can use the computer to make expected value calculations with decisions that have multiple possible choices with multiple outcomes. Structuring such a decision in the computer can have many great benefits:

- Putting the problem into the computer gives you an objective view, allowing you to disassociate from it.

¹⁷ "Application Programming Interface"

¹⁸ Do not forget about the pattern day trader rule.

- Computers have no emotions and will tell you the best outcome based on the math and the data that you put in.
- The problem can be solved quickly as a computer can do things we can do, but in a fraction of a second.
- You can add to, take away, increment, or decrement variables at your will.
- You can automate multiple processes.
- You can record each outcome to be compared and contrasted.
- You can analyze the outcomes with the same computer that you used to reach those conclusions to pick the superior option with the best benefits.

This is how we take everything we have learned to the next level, and then to the next one beyond that.

Stress Testing

Imagine you have put together a portfolio like we learned before and now you want to find out how it would do in a severe market downturn or upswing. What would your return be? If you put it through one-hundred thousand different outcomes, what would the average return of your portfolio be based on those outcomes? Wouldn't that be valuable to know? A computer can do that in just a few seconds if you can tell it how. Later in the book, I am going to teach you how you can do that.

The Monte Carlo Simulation

This is one of my favorite things to do with any strategy. It is a form of stress testing. Imagine you did what we were talking about before; you have an allocation; you have calculated the standard deviation of the portfolio, and you know your expected return and your return on risk. A Monte Carlo simulation is when you randomize the variables and see what happens. You randomize the returns of each asset in the portfolio, and you record the outcome. Then you do it again. Then you do it ten-thousand more times! The idea is to see if in ten-thousand or one-

hundred thousand or a million different scenarios varying in severity, how many times are you safe versus how many times are you losing money? This is a very advanced form of risk management!

The Power of Technology

As you can tell, you need technology after a certain point in your career. There comes a time that what you are doing is too big and too complex to do on a sheet of paper. Our time in this life is far too valuable to waste doing things that way when we have the tools and resources we need to draw these conclusions in just a few seconds.

This chapter was to tell you about the benefits and necessity of technology in today's finance. I feel strongly that technology is now part of financial literacy and the most financially literate need to know something about it, at the very least how to use it. It is now time to begin the process of teaching you to use this infinitely powerful tool to your advantage. I want you to keep an open mind and apply what you are reading to the very best of your ability.

Chapter Fifteen

LEARNING TO CODE 1.0: THE FUNDAMENTALS

The computer takes commands, not hints.

When it comes to learning to code for data analysis and financial analysis, I have no choice but to give you my opinion. You can do this with just about any coding language. Nearly all of them have the ability to do math. Math is the language of the universe. There is no avoiding math. In my opinion, Python is the very best language for this, and it is the one I am going to use in this book. I am not going to talk about any other programming language. I firmly believe Python is the best one and it is the one you should learn. If you were going to build video games, I would tell you to learn C#. If you were going to build desktop apps, I would tell you to learn C#. For what we are doing, which is learning how superior decisions are made in finance centered around business and investing, you need to learn Python. I have never found anything better.

The first thing we must understand about computer code is that the computer does not know what you mean. You have to be very clear about what you are trying to do. The computer takes *commands*, not hints. This means if you write code that says “blue” and what you mean is “robin’s egg blue”, you are going to get blue. If you do not put *all* of the information in that you can, you will get very generalized and likely even incorrect outcomes. You cannot make a half-reared effort at this. The second thing we must understand is what we have seen on the internet, meaning that endless wall of code like technological hieroglyphics, is not what you have to be able to do. You *can* learn that, but it is not necessary for everyone to be that advanced. To use an analogy, you do not have to learn to play the harpsichord like Mozart to be able to play the harpsichord well. It isn’t necessary.

Integrated Development Environment

If you have never written any code before you are going to have to install what's called an "IDE" onto your computer. That stands for Integrated Development Environment. The one that I like the most is Visual Studio Code.^{xx} Once you have that installed, you will need to install Python. I am going to leave that to you as I have no idea what kind of computer you have or what is in front of you. Find an IDE that you like, there are a lot of them, and install Python and we will get started learning you first lines of code and writing your first program.

Your First Python Program

It's now time to write your very first computer program. Right now, we don't care about anything other than your ability to write a line of code and run the program and it do what it is supposed to do. If you cannot run your code, it does you no good to know how to write the code. I am going to add a block of code for you to just copy into your IDE and run. Type it *exactly* as I have typed it. Punctuation and capitalization matter. I have written the code the way it should be written. Here's your code:

```
print("This is my first program!")
```

Once you have written your code, you are looking for the button to run or "debug" your code. Typically, it looks like a play button. Click that, and a terminal should open up that says, "This is my first program!".

If you were successful in doing that: *Excellent!* You are on the right track already. You are coming out guns blazing!

Let's learn exactly what we are doing here. "print" is a function in Python. It is built-in for you to use. The parentheses encase the "arguments". In this case the only parameter is our text. We put our text inside the parentheses inside of double quotes to tell the computer that we want it to *print* literally what we are saying to the terminal; this is why our text inside these parentheses is called a "literal string". What

you should do at this point is go back to your program and just put literal strings into this function and have some fun. Put weird stuff in there. Put funny stuff in there. You need to “get your hands on it” and learn that it is okay to use this and toy with it and use it creatively. You can even use multiple functions in one program, and in fact you absolutely will be in the future; so, use more than one print function. Here’s an example:

```
print("This is my first program!")
print("I have never done this before.")
print("Coding is great!")
print("Learning new things is how we grow.")
```

As you can see, it doesn’t hurt a thing to put multiple print functions in your code. What will happen is it will put a line break after each literal string. Let’s try it again, but this time do it this way:

```
print("This is my first program!","I have never done
this before.,"Coding is great!","Learning new things
is how we grow.")
```

It will show up on one line for you. I’m doing it here, so the lines get broken down to the next one. Basically, what is happening here is you are inputting multiple arguments into the print function. You are putting a comma between each literal string to separate them. When you run the program, it will print each of the four literal strings to the terminal, but it won’t do a line break like it did with multiple print functions.

Not too bad, right?

Doing Math with Code

Now, let's do some math. Here's something wonderful: the computer knows how to do math. All you need to do is put a math problem into the print function as a parameter and run the program, and it will print the solution to your math problem. It will *not* print your math problem. Run this code:

```
print(2+2)
```

You notice how it did not print "2+2"; it printed "4". This is because your computer understands how to do math. You can go as crazy as you want to go. You aren't going to stump your computer on math unless you input something that returns an error. Go ahead curate some incredibly complex mathematical equation, input it as a parameter, and run your program. I'll do it too:

```
print(2+2*45/37-45*347+615/8*0.06457+467578/15)
```

That's what I punched in. I was just putting in random stuff, and when I ran it, my computer told me the answer almost instantly. This is more to the point that you are not going to hurt anything by being creative and playing with it. Next, let's use our knowledge that we can input multiple arguments and have the computer print the math problem we are solving as well as the answer it calculates. We are going to have to pass our math problem in as a parameter as a literal string, type a comma to let the computer know there is another parameter, and then pass our math problem again without the quotes so the computer knows it is not a literal string and we want it to solve the problem. I will write the code for you. Here's what you need to type:

```
print("2+2=", 2+2)
```

That will print “2+2= 4” in the terminal when you run the code. Now, you have even more to be proud of as you are already combining coding principles, and this is your first day.

Variables

There’s a familiar word! We now need to learn how to use variables in our code. We have been variables in our math up to this point so it shouldn’t be too hard for you to get the hang of it. What you want to remember is that our goal is to be able to increment and decrement things like the weights in our calculations. We do not want to go digging through our code and rewriting a big part of it just to do this. We want to declare our variables at the beginning of our code and then use the variables in our code. This may take a moment to get used to, but once you do, you will understand that this is far superior to hard coding everything and having to rewrite it all when you want to make a change. Here’s an example of what we have already done using a variable:

```
variable = 2
print(2+variable)
```

If you run that code, it would print “4” to the terminal, because you have told the computer that “variable” means “2”. You can name your variables anything you want, just know that there are some words reserved by the coding language that the coding language needs such as “print” and you may not be able to use them to declare variables. You also should take notice of capitalization. We are not using capital letters as a word starting with a capital letter means something, and we don’t want to do that yet. Other than that, you can declare “bicycle = 3”, “trumpet = 2”, and then tell the computer to print bicycle+trumpet, and it will print “5” in the terminal. Go ahead and try it if you want:

```
bicycle = 3
trumpet = 2

print(bicycle+trumpet)
```

See? This isn't so bad. You can do this, and you can do it well.

Incrementing and Decrementing Variables

It is finally time for you to get to do this. You do not have to rewrite your code. Change "trumpet" from "2" to "3" and run your code and it will print "6" to the terminal. That's pretty handy, right? Think about how you can adjust your weights in your calculations with this much ease. You do not have to write the equation out all over again. You don't have to lose your place on the calculator. You don't have to rewrite your code. You can just change the variable and run the code. This is why I personally feel that learning this skill is essential. It is part of financial and business literacy.

We have already seen multiple instances together where we would need to increment and decrement variables to optimize and test things. Now is as good a time as ever to start putting it into practice. Let's do an expected value calculation in Python. I will write all the code and all you need to do is code along with me.

Expected Value Calculation in Python

Let's say we have \$1,000. We have a situation where we have a 70% chance of losing all of it and a 30% chance of doubling it. Let us bullet point that for clarity:

- We have \$1,000.
- Reward:
 - An additional \$1,000
- Probability of reward:
 - 30% (0.3)

- Penalty:
 - Lose the \$1,000
- Probability of penalty:
 - 70% (0.7)

We have the knowledge and the means to do this clean and readable. We can build a very handy tool that will help us make a superior decision. Here is what we must do:

- Declare our variables.
- Build our equation using our variables.
 - A bonus if the equation is stored in a variable.
 - We can store the equation in a variable and then use `print(<our variable>)` to print the result.
- Run the program.

I will do it all for you. Here's the code:

```
reward = 1000
reward_probability = 0.3
penalty = 1000
penalty_probability = 0.7

expected_value_calculation =
(reward*reward_probability)-
(penalty*penalty_probability)

print(expected_value_calculation)
```

Remember that my equation is indented because I don't have enough width on the page. You should just type the equation out without doing line breaks.

That will print “-400” to the terminal telling us that this is not a good decision. You can now change the reward, penalty, reward probability, and the penalty probability to anything you want and just run the

program and look at the results. We can even add a little flair to our program with what we know to create a more robust version. Let's add some code that will print some text and present the information to us in a way that is more pleasing than merely the expected value by itself. We don't *have* to do this, but to get better at coding, let's give it a try:

```
reward = 1000
reward_probability = 0.3
penalty = 1000
penalty_probability = 0.7

expected_value_calculation =
(reward*reward_probability)-
(penalty*penalty_probability)

print("The expected value of this is decision
is:",expected_value_calculation)
```

I don't know about you, but I rather like that. It makes me feel like my results are more valuable. I appreciate the outcome more this way. What are some ways you can get creative with this information? How would you have the computer present your data and the results to you? Use your skills and see what you can do. Right now, is the time to get comfortable with this. Right now, is the best time to become more familiar with changing variables and learning how it all works together. A great thing to learn right now is that the sum of your weights must be equal to one. You cannot have 103% for example. You can only have 100%. 0.3 and 0.7 sum up to one; therefore, if you are going to change one, you must change the other. Right now, is an excellent time to build the habit of this level of critical thinking, because the computer doesn't know what you meant. It will do the math you give it to do even if it is the wrong math.

Expected Value With More Than One Outcome

As we both well know, there are situations with more than one outcome. Let's take a look at some code that expands on what we just saw by adding more than one positive outcome and more than one negative outcome.

- We have \$1,000.
- Reward 1:
 - We double our money (+\$1,000).
 - Probability: 15%
- Reward 2:
 - We make \$500.
 - Probability: 25%
- Penalty 1:
 - We lose our money (-\$1,000)
 - Probability: 50%
- Penalty 2:
 - We lose double our money (-\$2,000)
 - Probability: 10%

We have all of our variables to put this equation together. Remember, all we must do is subtract the weighted risk(s) from the weighted reward(s). I'll write the code for us to read over. You code along with me. I'm going to use variables and literal strings to make a more robust program, just for fun.

```
reward1 = 1000
reward1_probability = 0.15
reward2 = 500
reward2_probability = 0.25
penalty1 = 1000
penalty1_probability = 0.5
penalty2 = 2000
penalty2_probability = 0.1

expected_value_calculation =
(reward1*reward1_probability)+
(reward2*reward2_probability)-
(penalty1*penalty1_probability)+
(penalty2*penalty2_probability)

print("The expected value of this is decision
is:",expected_value_calculation)
```

We declare all our variables in the beginning of the code. We put the equation together adding the positive outcomes together and the negative outcomes together. We subtracted the negative outcomes from the positive ones. We printed the result to the terminal with a literal string to make it look a little nicer.

Calculating The Mean

Now that we have an idea of how to do this, let's take it up a small notch and learn something new. We are going to do a simple math problem, but to make it even easier we are going to use a Python library which has functions built-in for us to use. In this program we will declare variable called "data". Data is going to be a "list", which means we are going to put the numbers in brackets []. It's best for me to show you the code:

```
data = [1,2,3,4,5,6,7,8,9,10]
```

That's as difficult as it is. We comma-separate the numbers we are using inside of square-brackets. Rather than calculate the mean by summing the numbers one-by-one in a line of code, we are going to import and use the NumPy library. You will be using this library a lot for doing the kinds of analysis we have covered in this book. You will want to learn as much about it as you can. You will need a line of code telling the computer to import this library and what we will be calling it. We are going to call it "np" for simplicity's sake. Here is the line of code you must put at the very beginning of your code for your program:

```
import numpy as np
```

That's not so bad, right? Now we have access to the entire library in our program and we can call it whenever we wish. Let's call the NumPy library now and use its built-in function "average()" to calculate the mean. Remember, will be passing our "data" variable into the "average" function. Then we want to print the result so that we can learn the mean. Here's the code:

```
import numpy as np

data = [1,2,3,4,5,6,7,8,9,10]

avg = np.average(data)

print(avg)
```

Let's debug¹⁹ the program together.

- First, we imported NumPy as np.
- Second, we declared our list variable "data" and inputted our comma-separated list of numbers in square-brackets.

¹⁹ Step through the code.

- Third, we declared a variable “avg” to store our math for calculating the mean.
 - For this we used `np.average()` to use the average function from the NumPy library.
 - Then we passed our list, “data”, into the average function as a variable.
- Last, we used the `print()` function to print the result.
 - To do this, we passed our variable “avg” in as a parameter.

If you can understand this up to this point, you are already in a position to begin using code to make expected value calculations and even find your average price on a stock or a product you are selling. Just this little bit of code we have learned has already empowered us to begin doing complex financial analysis in an efficient way!

Portfolio Expected Return

We could take this to the next level and create a “portfolio” using three mock data sets, calculate their respective means, then assign weights to each one, and calculate the expected return! Let’s give it a try. I’ll do the code for you and you code along with me:

```
import numpy as np

asset1 = [23,29,24,18,32,26,11,25]
asset2 = [15,21,16,24,19,23,29,22]
asset3 = [34,18,26,24,15,31,28,24]

avg_rtrn1 = np.average(asset1)
avg_rtrn2 = np.average(asset2)
avg_rtrn3 = np.average(asset3)

w1 = 0.50
w2 = 0.25
w3 = 0.25

portfolio_ER = (avg_rtrn1*w1)+(avg_rtrn2*w2)+
              (avg_rtrn3*w3)

print("The portfolio's expected return
is:",portfolio_ER)
```

You can see that we have our asset's returns declared as list variables. We declared our avg_rtrn variables and stored the average returns of our imaginary assets inside them. We declared our weight variables and chose our allocation. Then we declared our variable for the equation (portfolio_ER) and put the equation together using our variables. Finally, we used the print function, along with our code savvy skills, to pass a literal string along with our variable containing our math into the function. When we run the program it will say, "The portfolio's expected return is: 23.28125", which means the expected return from the portfolio is ~23.28%. It's nice to see all of that math in neat, simple, readable blocks of code isn't it. I told you this was worth your time to learn.

Daily Practice

This is a great time for you to start really practicing making programs that do these sort of calculations for you. Spend time every day making *something*. It doesn't have to be some corporate finance level machine; you just need to code something each day. You can do a mock expected value calculation like we have in the book. You can create an imaginary portfolio and calculate the expected return of that portfolio. You can just do simple mathematics or just print funny messages to the terminal with your children if you want to. It's been my experience that kids love to make the computer say things and if you make it fun, they'll pick up on programming fairly quickly. Just keep it simple for them.

If You Don't Know How...

This is one of the most important coding principles you will ever learn: If you don't know how to do it, look it up. Go to a search engine and just look for how to do it. "How do I write 15^{23} (fifteen to the twenty-third power) in Python?"²⁰ The best programmers on the planet look stuff up. Don't be afraid to look it up and use what you learn. There is a vast amount of coding information online. While I am not a big fan of learning things online from random sources, you just cannot beat the internet for learning code other than working with someone who has years of experience doing it already.

For Loop

There are going to be many times where you will be typing the same line of code with maybe one difference over and over again because you need to. Think about our discount cash-flow analysis where we repeated the same equation over and over again for each year. While it sounds simpler to just write out the code than to learn another coding principle, you will find that it is much easier on you to learn how to loop lines of code. It is faster, more readable, and more efficient. While writing this, I sat and

²⁰ It is "15**23".

wrote a few different programs to see how I could make this as easy as possible. My first hypothesis was to not talk about loops and focus on just getting the job done, and I quickly realized that will make anyone frustrated with coding. I deleted my programs and I started from scratch using a for loop and quickly realized this is the way I would recommend any beginner learn how to do this. It is so much better.

A for loop will look at a range of numbers or variables and it will run the code inside the loop that number of times; for example, if we had a list of vegetables called “vegetables” which would look like this: `vegetables = [corn, broccoli, cauliflower]`, rather than typing out code to list each one of them, we use the for loop and say, “for vegetable in vegetables: `print(vegetable)`”. That’s it. It is that simple. Imagine if there were fifty vegetables, how much you would want an easier way to print them than listing them each individually. Here is the code for a very simple for loop:

```
vegetables = ["corn", "broccoli", "cauliflower"]  
  
for vegetable in vegetables:  
    print(vegetable)
```

That is much easier to do than writing code to pull each of those out of that list and print them. Don’t forget, by the way, that those are strings in that list and strings must be in double quotes. The same thing can be done for a list of numbers.^{xxi} We would declare a variable called “numbers” and create our list just the same, but no double quotes, because they are numbers and not strings. Let’s look at that code:

```
numbers = [1,2,3,4,5]  
  
for number in numbers:  
    print(number)
```

As you can see, it is very simple. When you run the code it will print each of the numbers on a new line in the terminal.

Discount Cash Flow Analysis

Now we come to the question of how this can be applied to make our lives easier in our analyses. I mentioned discount cash-flow analysis a moment ago. That would be a great time to do it. The simplest way to explain what is happening is that for each iteration through the loop, we are using the next number in the list. There are other ways to do this as well, but for the sake of application, I will show you how to do it this way.

- First, we define our variables.
 - Our initial investment
 - The discount rate
 - How many years of cash flows we want to include in our analysis
 - The income we expect to see each year
 - An empty list of cash flows
- Second, we create our for loop.
 - We will say “for year in years:”
 - Within the scope of this loop (you’ll see what I mean in the code), we declare a variable for our discount cash-flow equation.
 - At the end of the equation, rather than putting the number of the year, we are going to use our variable “year”
 - The last thing that must happen in the loop is we need to append the result of our equation to the empty list we made for the cash flows. This will populate that list with each years discounted cash flow.
- Finally, back outside the scope of the loop, we need to tell the computer to print the list of cash flows

Here is the code I have written to show you an example:

```
investment = 100
discount_rate = 0.1
years = [1,2,3,4,5]
annual_income = 10
cash_flows = []

for year in years:
    cf = annual_income / (1 + discount_rate)**year
    cash_flows.append(cf)

print(cash_flows)
```

That looks quite a bit different from what we are used to, but if we single out the for loop, it is a bit more absorbable. I used the variable “cf” for cash flow to store the equation because I needed something. I could have used anything, but I chose “cf” to make sure everything made sense. The equation is exactly what we would expect; however, at the end I used “year” from the list “years” in place of the exponent.²¹ Look at the for loop: “for year in years”; we are going to use “year”, because that is what we are iterating. We are moving from the first “year” in our list to the last one, and that is where the loop will “break” or stop, and the program will continue on to the print() function and print the list of results.

There is a small change that we can make that will make our lives just a bit more easy, and that is to use the range() function for years rather than type out a list of comma-separated years. With the range function, we are telling the computer to start wherever we tell it, in this case one, and go up to the last number in the range. What that means is the computer will perform our loop, check to see what the next number is, if it is not the last number in the range, it will move forward and perform the loop again. This saves us time in situations like this, where we are working

²¹ I said it in a previous note, but exponents in Python are 2**2 for 2².

with a small list of numbers that are in numerical order. Here is the code with this change made:

```
investment = 100
discount_rate = 0.1
years = range(1,6)
annual_income = 10
cash_flows = []

for year in years:
    cf = annual_income / (1 + discount_rate)**year
    cash_flows.append(cf)

print(cash_flows)
```

You'll notice that I used the arguments "1" and "6" rather than "1" and "5". This is because of how the computer checks the next number, as I said previously. The computer is checking for "6". It performs the fourth iteration of the for loop and it checks for six and sees that the next one is five, so it does it again. When it checks this time, it sees that the next iteration is six, so it stops at five giving us the behavior we expect. Remember this in the future, because if you put `range(1,5)`, you will only get four iterations. Writing code this way is mostly personal preference, but there are some cases where this would not work. Just remember that you can do it both ways. You will surely encounter situations where one is better than the other.

The Convenience of Using Code

You have seen that there are many functions built-in for us to use with Python, and even more so when we take the libraries into account. Several of the equations and formulas that we have learned in this book are built-in and may be used at any time for our convenience. Some of them may be accessed without use of a library as they are part of the Python programming language, while others may require different

libraries. This makes our lives significantly easier as with these resources, our code is just a matter of declaring variables and passing them as arguments into these prebuilt functions. An analysis that would normally have taken hours can now take just a few minutes if one were so inclined to write the code. This is why I mentioned at the beginning of this chapter that we can no longer be dependent on an app someone else built. It is limiting for us to do that. We must learn to write the code we need for the job we are trying to do so that we can get it done and move on. Let's look at some of these functions. They should look easy to you as this point:

Sum

Doing a summation with Python is almost as easy as doing it in the calculator. We just use the `sum()` function that is built-in to the programming language. Here is an example:

```
numbers = [12, 51, 654, 32, 15, 65, 89]
solution = sum(numbers)
print(solution)
```

Run that code and it will print the answer. It's as simple as that. The `sum` function will iterate over the list of numbers and return a summation of those numbers.

Variance

Calculating variance is far simpler with code.²² We need to import the NumPy library and use the `var()` function passing our list of numbers as a parameter. Here is what that code looks like:

²² It is also simple with spreadsheet software, maybe even simpler.

```
import numpy as np

numbers = [12,51,32,15,65,89]

variance = np.var(numbers)

print(variance)
```

It's as simple as that. All we must do is call the NumPy library so that we may use it by using “np.var()” and pass our variable representing our list of numbers as a parameter in the var() function.

Covariance

The next logical step is to write code for calculating the covariance between two data sets. Covariance is every bit as simple; we merely need to have two data sets and pass them both as arguments in the cov() function from the NumPy library. Here is some code for your studies:

```
import numpy as np

numbers = [12,51,654,32,15,65,89]
more_numbers = [21,54,98,15,54,12]

covariance = np.cov(numbers,more_numbers)

print(covariance)
```

Again, it is very simple. There's not much to this! I told you; you can do it! We're getting better and better with each repetition.

Correlation Matrix

When we find the correlation coefficient of two data sets with Python, we will usually get it in a correlation matrix. We have seen a correlation matrix with multiple pairs in it. I'm going to show you a few ways to build a correlation matrix, because with the kinds of analyses we have been discussing, you'll likely be putting them together from time to time. The first example is just with a single pair of data sets. Our goal is to compute the correlation between them. There are a few ways that I like to code this. I'm going to use the NumPy library to do it, as I like to do it that way. Here is the code for a simple pair of data sets:

```
import numpy as np

data_set = np.array([[1,2,3,4,5,6,7,8,9,10],
                    [10,9,8,7,6,5,4,3,2,1]])

correlation_matrix = np.corrcoef(data_set)

print(correlation_matrix)
```

We have to do a little more work this time as you can see. We also see a new word: "array". Arrays look like lists; you can't really see that we have done anything all that different. The difference between arrays and lists are how they are structured. In code, they are commonly called "containers", as they are used for storing data. A list can hold anything we want. Think of it as a bucket we can put a bunch of different information in. An array is more structured and precise. All elements in an array must be the same data type. Arrays are generally more tailored toward mathematical problems while lists are used more generally.

When calculating correlation coefficients, we will most likely have to use an array. In this case, we used the array structure from the NumPy library. This is specifically a 2D array. You will notice that the two data sets are in square brackets, and the pair are inside square brackets Like

this: `[[data],[data]]`. That is passed as an argument into the NumPy array function. After this, we called the `corrcoef` function from NumPy and passed our properly structured `data_set` as an argument, and of course this was stored in a variable that we then passed as an argument in the print function. That was a long-winded way of explaining in detail that we structured our data properly so that we could use the `corrcoef` function from NumPy to calculate and create our correlation matrix. There is just one issue with this. You may not want the entire matrix. Usually, you will just want the correlation coefficient by itself. There is a very simple adjustment that can be made to the code to achieve this. Here is the code with that adjustment:

```
import numpy as np

data_set = np.array([[1,2,3,4,5,6,7,8,9,10],
                    [10,9,8,7,6,5,4,3,2,1]])

correlation_matrix = np.corrcoef(data_set)[0,-1]

print("Correlation Matrix:")
print(correlation_matrix)
```

We added the feature `"[0,-1]"` to the end of the `corrcoef` function. This gives the computer a set of coordinates if you will. We want the number at that position inside the matrix specifically; the rest may be omitted. If you run the code with and without this feature, you will see that this feature gives you the single value you seek.

There is another way we can do this where we do not put both sets of data inside a single 2D array. That way of doing it looks like this:

```
import numpy as np

data1 = [1,2,3,4,5,6,7,8,9,10]
data2 = [10,9,8,7,6,5,4,3,2,1]

correlation_matrix = np.corrcoef(data1,data2)

print("Correlation Matrix:")
print(correlation_matrix)
```

That may look simpler or more familiar to you; or maybe you prefer the other way. It is completely up to you how you do it, as long as you are consistent. Again, you can add the feature to specify that you only want the single value and not the entire matrix. Here is that code:

```
import numpy as np

data1 = [1,2,3,4,5,6,7,8,9,10]
data2 = [10,9,8,7,6,5,4,3,2,1]

correlation_matrix = np.corrcoef(data1,data2)[0,-1]

print("Correlation Matrix:")
print(correlation_matrix)
```

That version of the code will only return the single value. You need only the single value when you are trying to store it inside a variable to be used for things like portfolio standard deviation.

Let's look at some code for creating a correlation matrix for many different sets of data or maybe even assets in a portfolio. When calculating portfolio standard deviation, we need the correlation coefficient for every possible pair in the portfolio. Being able to use code to create that matrix would be very handy, right? I'll write the code for your studies. You code along with me:

```
import numpy as np

asset1 = [1,2,3,4,5,6,7,8,9,10]
asset2 = [10,9,8,7,6,5,4,3,2,1]
asset3 = [14,15,14,21,25,12,16,21,23,14]
asset4 = [8,5,4,2,9,1,3,7,5,8]
asset5 = [1,9,5,7,3,4,6,2,8,4]

data =
np.array([asset1,asset2,asset3,asset4,asset5])

correlation_matrix = np.corrcoef(data)

print("Correlation Matrix:")
print(correlation_matrix)
```

That was ever so slightly more complex. What I did was I declared variables for each set of data. I then declared the variable “data” to create my array for the analysis. I used the array function which I called from the NumPy library. I passed each of the variables containing my data as arguments into that array function. I then declared the `correlation_matrix` variable to call the `corrcoef` function from NumPy passing my array as an argument. Finally, I printed the result to the terminal, which displays the correlation matrix when I run the program.

Standard Deviation

Standard deviation is another built-in function we can call from NumPy. Standard deviation is one of the ways we measure risk in finance, so we should know an efficient way to calculate it. Let’s take a look at the code for this calculation:

```
import numpy as np

asset_a = [23,31,28,24,18,23]

standard_deviation = np.std(asset_a)

print(standard_deviation)
```

Just a few simple lines of code is all it takes. You could gather the historical returns of any asset you like and write just a few lines of code to measure its volatility. Pretty nice, right? It's more convenient than doing it on paper; although, I do recommend that you understand what is happening in the equation and how we get the result. Knowing how we calculate the result empowers us with tremendous understanding and critical thinking skills. Don't get caught up in the convenience of code and forget to stretch, bend, and work your mind. The problem-solving skills are far more valuable than any coding language.

Comprehensive Analysis

So, what if we want a more comprehensive analysis of a data set? Can we write code for a program that will tell us all of these things about the data we input? The answer absolutely, yes! It isn't any harder than what we have already done either. All we need to do is declare our variables and call our functions from the proper libraries correctly and print the results. What takes hours and hours on paper can take just a moment or two with code. I hope you are seeing the utility value of this skill as we are discussing it together. It really is life-changing!

Here's an example of what that program might look like just to give you some idea how easy it is to create such a helpful tool for your analyses:

```
import numpy as np

asset1 = [1,2,3,4,5,6,7,8,9,10]
asset2 = [10,9,8,7,6,5,4,3,2,1]
asset3 = [8,5,4,2,9,1,3,7,5,8]

data = np.array([asset1,asset2,asset3])

correlation_matrix = np.corrcoef(data)

covariance_matrix = np.cov(data)

var1 = np.var(asset1)
var2 = np.var(asset2)
var3 = np.var(asset3)

stdev1 = np.std(asset1)
stdev2 = np.std(asset2)
stdev3 = np.std(asset3)

print("Correlation Matrix:")
print(correlation_matrix,"\n")
print("Covariance Matrix:")
print(covariance_matrix,"\n")
print("Asset 1:")
print("Variance:",var1)
print("Standard Deviation:",stdev1)
print("Asset 2:")
print("Variance:",var2)
print("Standard Deviation:",stdev2)
print("Asset 3:")
print("Variance:",var3)
print("Standard Deviation:",stdev3)
```

I simplified it down to three assets so it would fit on the page. You will notice that I added a new coding principle. You will see that in the code to print the matrices, I added a string as an argument: “\n”. That is how you tell the computer to do a line break if you don’t want to type an empty print function to skip a line.

You can dress this up and make it as fancy and robust as you wish. It’s yours; make the very most of it. Find every way you can to increase this skill’s utility value in your life.

Chapter Sixteen

LEARNING TO CODE 2.0: THE LOGIC

Computers can be used to make excellent decisions. They have no emotional investment. They are data-driven machines. It's incredible.

The world has changed a lot in recent decades, and just like how you had to learn to use a calculator when you took a math class, I personally feel it is crucial to learn to use the computer and code for finance and business. I know it is one of the greatest and most powerful things I ever learned; it changed my life in a big way. I cannot stress enough that you should take this seriously and work very hard to be good at it.

We have taken our skills to the next level adding programming to our arsenal of financial and business acumen. If you have a strong competence level for the coding we have done up to this point, you are coding on close to a graduate level.^{xxiii} You're doing great! Now, we are going to start adding a whole new dimension to our analysis skills, and that is the logic in programming.

Computers are an outstanding tool for decision making. They don't feel emotions and they aren't biased towards anything. They make decisions based on real data and real math. Learning to use the computer to make difficult decisions can give you a massive advantage over those who succumb to the biases we discussed earlier. Don't get me wrong; the truth is, we are all biased in some ways. It's part of being human but using the computer can empower us to bypass those biases and see the real answers when the emotional impact of loss may become too great. An excellent example of this is using it for expected value calculations, which we have already done. We can use programming logic to help us do so much in the realm of making superior decisions. I'm going to teach you how you can write some of this code, and I'm going to share with you some of my creative ideas as to how someone might put those skills to use for themselves.

If-Statements

If-statements are a way of telling the computer if a certain is met to do one thing, and if it is not met to do something else. This very simple line of code can empower us to make more robust programs to help us make more superior decisions. There isn't much to an if-statement. If <this> happens do <this>. Here is some simple code illustrating this principle:

```
import numpy as np

numberA = 10

numberB = 5

if numberB < numberA:
    print("numberB is less")
```

As you can see, we tell the computer to check if numberB is less than numberA, and if it is, print the string we passed as an argument to the print function. To take this to the next level, we can do an if-else statement.

If-Else Statement

An if-else statement is the same thing as an if-statement with the exception that we provide code to run in the even that our parameter has not been met. It would read simply as, "If <this> happens do <this>, otherwise do <that> instead". This is a very common coding principle, and it is even more powerful than a fundamental if-statement by itself. I'll write the code. You code along with me:

```
import numpy as np

numberA = 10

numberB = 5

if numberB < numberA:
    print("numberB is less")
else:
    print("numberA is less")
```

Here we see the if-else statement in action. In the event that numberB is actually greater than numberA, it would print “numberA is less”. Using these if-else statements can provide a junction if you will in our code for things to go a different direction when certain parameters are met versus others, which brings us to something I want to point out: You can code however you want to code, but there are ways of doing things with code that are far simpler than they seem at times. What I mean by that is even though the if-else statement can be a pivot point for our code to go different directions and make different decisions, it does not have to get as complex as it sounds. For example, if you wanted use the if-else statement above, and if a parameter is met, it takes you to the next decision, and the next, and to the next, ad infinum... This leads us to believe that “nesting” if-statement inside of one another like this is the way to do this. Let me show you what that code might look like.

Imagine we were measuring the risk of a few assets, and we are using code to perform the analysis and decide what will go into an imaginary portfolio to be analyzed later. The program is very basic. We use the std

Additional Notes:

There are also other forms of logic in computer code that each have different uses. While they are not all covered in this book, some of them include:

- Else-If
- Case/Switch (not a Python principle)

There are also other variable types such as:

- Dictionaries

```
import numpy as np

mylimit = 23

asset1_returns = [12,15,-6,23,8,10]
asset2_returns = [23,27,31,20,-14,17]
asset3_returns = [12,15,21,19,13.5,11]

portfolio = []

asset1 = np.std(asset1_returns)

if asset1 <= mylimit:
    portfolio.append(f"Asset 1: {asset1}")
    asset2 = np.std(asset2_returns)
    if asset2 <= mylimit:
        portfolio.append(f"Asset 2: {asset2}")
    else:
        asset3 = np.std(asset3_returns)
        if asset3 <= mylimit:
            portfolio.append(f"Asset 3: {asset3}")
else:
    asset2 = np.std(asset2_returns)
    if asset2 <= mylimit:
        portfolio.append(f"Asset 2: {asset2}")
    else:
        asset3 = np.std(asset3_returns)
        if asset3 <= mylimit:
            portfolio.append(f"Asset 3: {asset3}")

print(portfolio)
```

Now, don't misunderstand. You can do that. That program will work as expected. There shouldn't be any problems, but there are simpler and shorter ways to write that code. This code does the exact same thing:

```
import numpy as np

mylimit = 23

asset1_returns = [12, 15, -6, 23, 8, 10]
asset2_returns = [23, 27, 31, 20, -14, 17]
asset3_returns = [12, 15, 21, 19, 13.5, 11]

asset1_std = np.std(asset1_returns)
asset2_std = np.std(asset2_returns)
asset3_std = np.std(asset3_returns)

portfolio = []

if asset1_std <= mylimit:
    portfolio.append(f"Asset 1: {asset1_std}")

if asset2_std <= mylimit:
    portfolio.append(f"Asset 2: {asset2_std}")

if asset3_std <= mylimit:
    portfolio.append(f"Asset 3: {asset3_std}")

print(portfolio)
```

That is much simpler, right? Be sure and continue your education with this so that you may learn simpler and easier ways to perform complex

²³ The strings you see here are written as f'Asset 1: {asset_1}'. This is another way to include the variable in what we want printed. You put "f" before your double quotes, and within the string you enclose your variable in curly braces.

tasks. Both ways work just fine, but you don't want to make a very complex system if you do not have to. Keep it as simple as possible. Simplicity not only makes your code easier to write and read, but it also saves you a good bit of time. It can take hours to write some programs. There are programs I have written that I save on an external drive for later use. If you are going to save your code to use again later, you want to make sure when you come back to it, you can still read it and understand it. In the moment, we can create some beautifully intricate programs with many turns and twists and features, but if you don't look at it for a month and come back to it, you may struggle to understand how to use it or even what it does. Do your very best to make your code as simple as possible even if the task at hand is complex.

Simplifying The Complexity In Your Code

You probably noticed I wrote my literal strings differently in the last two code blocks. I added a footnote (footnote 22) to explain it. I want to touch on that and show you how you can make your code shorter and simpler by using small features like those. You saw that we can type our string with an "f" at the beginning. This tells the computer that we are typing a literal string, and it allows us to add variables inside the double quotes if we choose to do it that way rather than the comma-separated arguments format from earlier. Here is some code that does both for you to code along with me and study:

```
age = 35

print("Age:",age)
print(f"Age: {age}")
```

When you run that code, you will see that both ways of doing this will print the same thing in the terminal. We can take this even further. We can skip one of the steps we have been making previously if we wish.

Up to this point, we have been using a variable to calculate things like standard deviation, and then we passed that Variable

as an argument in the print function. We don't have to do it that way if we don't want to; we can just use the standard deviation function as an argument in the print function. Here is some code that shows that we can do this, and we can do it with either format of our string as well:

```
import numpy as np

data1 = [1,3,5,7,9,11]
data2 = [3,6,9,12,15]

print("data1 standard deviation:",np.std(data1))
print("data2 standard deviation:",np.std(data2))

print(f"data1 standard deviation: {np.std(data1)}")
print(f"data2 standard deviation: {np.std(data2)}")
```

When you run that code, you will see that it prints the results just fine. This way of coding this calculation removed the variable for storing the calculation. You can do this any way you wish. I only point it out to teach you different ways to perform the same task. Just as I write this book to share with you and encourage you to develop your own strategies, I encourage you develop your own coding style that works perfectly for you. It is a tool, and you can use this tool however you wish.

While Loop

The while loop is another form of logic programming, and it is very simple to implement. If we have a number, we can say, *while* our number is less than twenty, do something. We can write code to increment our number for each iteration and control how many times the code will be looped before the loop is broken and we continue with our program. Here is some code demonstrating the while loop. Code along with me:

```
number = 1

while number < 20:
    print("Number:", number)
    number += 1
```

This is pretty straightforward. Our number is one. While our number is less than twenty, we are going to print our number and then increment our number by one. In code, we increment with the “+=” operator. This operator is a shorthand way of saying “our number = our number + one”, which increments our number by one for each time we loop the code. When you run this code, you will notice that it stops at “19”. The reason for this is *we said less than twenty*. Twenty is not less than twenty; it is equal to twenty. If you want to include twenty in the output, you need to say, “while number <= 20”. Here is the code with this adjustment:

```
number = 1

while number <= 20:
    print("Number:", number)
    number += 1
```

Calculating Compound Interest With A While Loop

We have all heard about compound interest at some point or another. Have you ever sat down to calculate it yourself, or have you always used a compound interest calculator online? There are quite a few steps to calculating compound interest; it can take a long time depending on how many years out you are doing calculations for. To calculate compound interest, you add x% to your initial investment for the first year; take the new value of your investment and add x% to it again; and so on. To do this you have to multiply your money by the interest, and then add the result to your money to calculate your returns; we learned this earlier in

the book when we talked about how to calculate our returns. This can be done quickly and efficiently with code using our while loop.

Let's say we have one-hundred dollars, and we want to know what our money will be if it compounds at ten percent a year for ten years. Let's write the code!

```
our_money = 100
interest = 0.1
years = 1

while years <= 10:
    our_money = our_money + (our_money * interest)
    print("Year:", years)
    print("Money:", our_money)
    years += 1
```

That is much easier than doing it on paper, isn't it? Now, we did just learn something a moment ago; we learned the += operator. There is a place in our code where we can use that to shorten our code, and it is the equation in the loop. I'll rewrite the code to include this so you can see the difference it makes in what you're reading:

```
our_money = 100
interest = 0.1
years = 1

while years <= 10:
    our_money += (our_money * interest)
    print("Year:", years)
    print("Money:", our_money)
    years += 1
```

While it is not a colossal difference, it does make the code ever so slightly more simple. We have another advantage at this point as well!

What if we want to change the interest rate? We have to redo all that math all over again, right? *Nope!* We can just go to our variable for interest and change it to whatever we want; the same goes for our variable for the number of years as well as the variable for our money which represents our initial investment before we run the code. In a sense, you now could use this to build a compound interest strategy; you can find out how much you need to invest to achieve your goals.

I love stopping to point out and reiterate the advantages in finance and business of learning this invaluable skill. The utility and efficiency of coding and creating the tools we need is almost infinite. We can learn this quickly and put it to use almost immediately. I love it!

Portfolio Standard Deviation

Let's revisit portfolio standard deviation with Python and see how different it is with code. We'll calculate the portfolio standard deviation for two assets with some mock up data. This will empower us to use our coding skills to calculate the correlation and point the computer to which value in the matrix we wish to use as well as use our variables to increment and decrement and make changes for optimization's sake. We need two data sets, two weights, and our equation. It should be relatively straightforward. Remember that we seek to make this easier for ourselves. We want to make this very complex math problem as simple as possible in our code. We want to streamline the process of making these calculations as much as possible and increase the utility value of these new skills we are learning. I'll write the code, and you code along with me:

```

import numpy as np

asset1 = [15, 21, 23, 34, 49, 12, 26, -11, 14]
asset2 = [18, 31, 19, -13, 26, 17, 12, 25, 31]

w1 = 0.5
w2 = 0.5

std1 = np.std(asset1)
std2 = np.std(asset2)

correlation_coefficient = np.corrcoef(asset1, asset2)
[0, -1]

portfolio_standard_deviation =
np.sqrt((w1**2 * std1**2) + (w2**2 * std2**2) +
(2*w1*w2*correlation_coefficient*std1*std2))

print("Asset 1 Standard Deviation:", std1)
print("Asset 2 Standard Deviation:", std2)
print("Portfolio Standard
Deviation:", portfolio_standard_deviation)

```

The equation may look a bit jumbled to some, but if we step through it one step at a time, it makes perfect sense:

- We imported the NumPy library for our use.
- We declared two variables for our lists of mock returns.
- We declared two variables (w1 and w2) for our weights.
- We declared two variables (std1 and std2) for our standard deviations.
- We declared a variable for the correlation coefficient.
- We declared a variable for the portfolio standard deviation formula.

- For our equation, we used the `sqrt()` from the NumPy library to contain our equation, because we need the square root of the result.
- We put each term of the equation into parentheses, such as `(w1**2 * std1**2)` which means weight one squared times standard deviation of asset one squared.
- We used our variables in the proper places.
- We used our knowledge of strings and the print function to make our output nice and organized for readability.

Overall, we have a simple program for a complex problem.

As you add more assets to experience the full effect of this amazing mathematical equation, you will still see that the equation grows exponentially as you have to account for every possible pair in the portfolio. This is where you can start using logic and loops to do a lot of that work for you, but that is going to get into some complex code that I won't be covering in the book. I encourage you to continue practice programming, using and being creative with code, and honing your skills and doing that sort of thing will come along as you become more familiar with it.

Chapter Seventeen

PERSONAL GROWTH

You and I are on quite the journey together. We have covered some wildly complex topics up to this point. It is my deepest wish that I am fulfilling my mission in making this information as simple and easy to understand as possible for you. I want nothing more than for you to be reading this and feeling so inspired and motivated and excited for your progress that you can feel it in your very soul. Topics like this really challenge us. They make us think in ways that maybe we never have before. Discussions about things like this cause discomfort and insecurity at times; we feel like maybe we aren't enough. Those are what I call growing pains. We went through it in school growing up. We studied difficult material and had to take exams we didn't know if we knew enough to pass. We stayed up all night studying and there were times we still didn't think we would pass, yet here we are. We made it, and we are stronger having done all of those things. Some say what they learned in school has no application in life, but those challenging topics made many of us who we are, even if we can't recall most of it right away.

This bending and shaping of our minds is how we grow and take ourselves to the next level in life. This is what takes us from where we are to where we want to be, which for some of us is a business leader while for others it is an investor or some other life endeavor. To make it this far is to show great ambition and potential; it's to show pride in yourself and what you do. These subjects are not comfortable for most people. It has been my experience that the majority of people shut down and tend to "run-away" mentally from material like this. This can be very frustrating for an entrepreneur looking for their people. For the few who light up and come to life in conversations like this, it can be a lonely adventure. The material is hard enough as it is, much less feeling like no one around you cares about this stuff. It makes you feel like you are having to force yourself to learn something of little value. I want you know that this is an illusion. It is merely a combination of peer pressure

and biases. This is the emotional need to follow the crowd and be “liked”.

The Moment of Decision

There comes a point in our lives when we make a decision. We make decisions all the time, but this decision is a special one. History changes in a moment. When the moment comes that we make this special decision, our life takes on a whole new meaning, and our story takes a turn from which it will never come back. As we grow up, we learn so many things about life and about people. We learn the beauty of life and the harshness that comes with it as well; some of us more so than others. At this pivotal moment of decision, we take all of things we have learned up to that point, and we *decide* to do something with it all. When we look back, some of us remember a hard break-up or divorce. Some of us remember packing our things and moving across the country and starting over with a clean slate. Some of us remember when decided enough was enough and we started working out and staying in better shape. Some of us remember the day we decided we were never going to live in fear again. This moment of decision in our lives is the moment that creates all success. You won't just have one of them either. The more you grow, the more you learn, the more intelligent and wise you become, the more of these moments you will have in your life.

The Road Less Traveled

One of the most difficult kinds of decisions to make is the one you made to read this far into this book, or to even read it all. Just reading itself, much less reading to grow and get better, has cognitive consequences that extend beyond merely absorbing a message from a passage of text.^{xxiii} The effects on the mind gained from reading are exponential in nature^{xxiv} and they compound over time.^{xxv} Studies show a phenomenon known as “Matthew Effects”^{xxvi} in people who are good readers versus those who aren't. This follows the adage that the rich get richer, and the poor get poorer.^{xxvii} What this means is that in the beginning, people who

struggle with reading begin to be exposed to far less text than their counterparts who excel at reading.^{xxviii} Exacerbating the problem more is the fact that people who struggle with reading often find themselves reading material that is too difficult for them to absorb.^{xxix} This results in an unrewarding experience and consequently less involvement in reading^{xxx} which will stunt the growth of anyone trying to achieve vast amounts of success in a difficult field. This lack of reading as a consequence of struggling with it delays our development and our speed of word recognition, which means more mental resources are required for this area taking away from the parts of our brain that we use to absorb the message.^{xxxi} This takes the meaning away from reading, which makes reading unrewarding, which makes people avoid reading all together or leads them to just tolerate the reading process rather than actually being focused and involved in the material being read.^{xxxii} If we aren't focused and engaged with what we're doing, we don't learn.

On the flip side of this, those who excel with reading due to having positive experiences with it early enough experience this compounding effect the other direction, becoming faster readers who enjoy reading, and in-turn learning exponentially more, which provides an entirely different set of opportunities in life for the things we are involved in as well as the people we associate with.

Just making the decision to sit down and read a book because you know it will provide you value sets you apart. You have an advantage in life. It may not feel like it at the time, because as we just discussed, many people don't experience the rewards that come from doing such a thing, so they aren't interested. This goes with many of the decisions we make in life to grow and develop ourselves. People don't last very long with the gym-related New Year's resolutions. Why? Because they struggle with it. They never get any exercise, so when they do it for the first time or the first few, it is miserable for them, which removes the reward, which motivates them to stop doing it. This means that those who are well-practiced and honing their skills regularly may begin to feel like they are the only ones who do; it can get lonely. It really is the road less traveled, and it is hard road, mentally.

Who You Surround Yourself With

There's a saying that you may have heard or read on the internet: "Who you surround yourself with is who you become." I can personally testify that this statement holds a lot of truth. The people we are around every day is the number one indicator of where we will end up in our lives. In a study done on obesity it was found that a person's chances of becoming obese increased by 57% if a friend became obese within a given interval.^{xxxiii} Among adult siblings, if one sibling were to become obese the chance the other would become obese increased by 40%.^{xxxiv} If a spouse became obese, the other spouses chance increased by 37%.^{xxxv} People of the same sex had relatively greater influence over each other than those of the opposite sex.^{xxxvi} How is that to show you how powerful influence is?

It is crucial that we remain vigilant at all times as to who we allow around us if we wish to secure a bright and abundant future for ourselves. Sometimes, this means being alone and reading books by thought leaders to keep ourselves moving the right direction. Maybe it means changing the places where we hang out and socialize. Being in proximity is so powerful, and we must make sure those who are in proximity to us are

not doing damage whether it be intentional or not. It can be painful when it is family or a best friend we have had our entire lives, but the world has so many bright, wonder, and intelligent people willing to lift everyone around them up, and it is in our best interest as individuals to focus on surrounding ourselves with those people.

Imagine the people around you are brilliant people when it comes to finance and business. Imagine they are never unmotivated; they are never without high levels of ambition. What would the quality of your life be like? Imagine every time there is a problem or a bump in the road, no one ever mopes around or gets frustrated; they just change gears and make decisions and move forward. What would the quality of your life be like if that was who you were around every day? What would it be like to get text messages from those people? What would it be like to be in contact with those people regularly? What would the quality of your conversations be like? How much would you learn? How much would you grow? What would you be able to achieve? On the flip side of this train of thought, would you ever feel the need to protect yourself? Would you feel like the government is keeping you down? Would you feel attacked and threatened by other people who come near you? Would you feel fearful that your business could fail or that you would lose something? Would you think negative thoughts when you saw others around you succeeding? My guess is that you wouldn't! I believe you would be happier, healthier, stronger, more knowledgeable, wiser, more prepared, more ambitious, more inspired, more motivated, and ready to get out of bed in the morning every day of your life and take the day by the horns and dominate! When we have the wrong people around us, we don't think thoughts that serve us; we think thoughts that hinder and destroy us. When we have the right people around us we think thoughts that change lives. We think thoughts that make our business grow like wildfire. We think thoughts that sow the seeds of success and provide us with an abundant harvest so great we give most of it to charity because we don't feel like we're scarce anymore and we don't feel like we have to be greedy with every penny that we can pick up off the sidewalk. When we are around losers, wannabes, manipulators, excuse-makers,

liars, deceivers, victims, and the insecure, we think and behave just like them. When we are around champions, we think and behave like champions. It is a scientifically proven fact. Choose your people wisely, my friend. Choose business partners wisely. Choose people who make you grow, not shrink.

We Need Other People

Do you know what a mastermind is? A mastermind in a collaborative sense is a group of two or more individuals who come together to share collective knowledge, skills, and insights with the purpose of achieving common goals or solving problems. It is based on the “Mastermind Alliance” from the work of author, Napoleon Hill.^{xxxvii} The thought process is that the combined intelligence of the group surpasses what the individual can achieve on their own. A mastermind is of high value to those who have big ambitions. You spend all of this time learning finance and business, and you familiarize yourself with investing principles, and you develop the critical thinking skills so you can go out and do something bigger than just yourself. You take your knowledge and wisdom, and you go out into the marketplace to provide yourself and your value to those who are looking for you and what you have to offer. We don’t learn all of this material to merely sit in our homes and entertain the idea that one day we will have a multimillion-dollar enterprise with only a single person having any involvement, *ourselves*. It doesn’t work that way. In fact, it will likely fail if we try to do things that way. This is why we need a strong group we can talk to and dream with and work with. We need that environment to thrive. If you were on this planet all by yourself and you were a billionaire, would you call that thriving? Would it have the same meaning? Would you still call yourself “successful”? I personally would not. I feel like it would be pointless, and if it is pointless to do it without anyone else in that situation, it is pointless to do it without anyone else in our current situation where we have access to such wonderful and intelligent and confident people. I also feel this analogy also reinforces that deep inside we *want* to be successful with others, and maybe we even have a need for it.

This is why I say the best thing for the lonely journey down the road less traveled is to actively seek those with whom we can be associated and collaborate and think and grow with. Actively seek those who don't merely dabble but take it to the absolute furthest stretches of their limits. What a life that would be; what amazing creations that would come; what incredible abundance. That's what is promised to us in The Bible, an abundant life.

The thief comes only to steal and kill and destroy; I came that they may have life, and have it abundantly.

-John 10:10

Never stop growing. Never stop seeking out those who are ready and able to grow with you. Never allow those with limited and negative thinking who cannot overcome the biases and insecurities to stand in the way of your successes and rewards for all your hard work and thorough studies. Always pursue the next step in every area of life. The future will be bright for all who do, and the road less traveled will eventually not seem as much so. It will be filled with friends and family and people who love success and personal growth and who will lift you up on high without any reservation; they will be proud of you, who you are, and who you are constantly becoming.

These people *do* exist. They *are* out there. You will begin to attract them to yourself more and more by continuing to read, study, and develop yourself in these crucial areas of life. Who you become... I can't wait to meet who I am becoming. I want nothing more than to meet that person as soon as possible.

Chapter Eighteen

STRESS TESTING

Stress testing is a standard practice when it comes to finance, business, and managing risk. The idea is to take what you build and put it through *hell* and see how it performs. You can stress test one asset, or you can stress test many assets together. You can stress test with portfolio standard deviation. You can stress test with a portfolio expected return calculation. There are many ways to stress test your strategies and portfolios.^{xxxviii} Stress testing with code can mean doing some very complex programming, but I am going to do my best to get you started and give you some idea as to how you might throw random market scenarios at what you have built to see how it performs. The simplest way to do this is to calculate the average return of an asset, the standard deviation, and then add a random return to the data, recalculate, and compare the results to the original output.

My goal here is to get you started doing this, so the simplest way I can think to give you an idea of how this works is to pick a random number between one and one hundred. If the result is greater than fifty, something happens; if the result is less than fifty, something else happens. This is a very simple way to add random chance to what you are doing and measure performance. Stress testing does get complex, as I said before. Generally, what you may see is a stress test of a portfolio where randomization is heavily used in the variables and the stress test is performed over a million or more iterations followed by measuring the results. *How frequently did it lose money, and how much did it lose when and if it did?*

A Simple Introduction

Let's take a look at a simple stress test where we calculate the average return and the standard deviation and then we do it again, but we add a random return to simulate the next year where we do not know what will happen. We will compare the original result with the stress test results to

see the effects. We will be using a new NumPy function to generate a random number withing a range that we provide. I'm going to use negative twenty (-20) and positive twenty (20) so that we can potentially lose or gain when we run the program. I'll write the code, and you code along with me:

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)

random_return = np.random.uniform(-20,20)

asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]

test_avg = np.average(asset_with_random_return)
test_std = np.std(asset_with_random_return)

print("Original Average Return:",avg_return)
print("Original Standard Deviation:",std_return)
print("Test Average Return:",test_avg)
print("Test Standard Deviation:",test_std)
```

I used the `random.uniform` function to choose the random number as you can see. While `random` is self-explanatory, `uniform` means any number at all. It can be a number with seven decimal places. You may also use `random.randint`, but that will limit you to integers such as 1, 2, 3, etc. and you won't have decimals. I personally feel that using `uniform` is better for this kind of program.

When you run this program, you will see the original calculations in the terminal and then the testing results. You will be able to compare just

how much the average return for the asset changed as well as how much the standard deviation changed. You can then make observations. Did the risk increase or decrease? Did the average return increase or decrease?

Measuring the Changes in Return-on-Risk

The metric I like to see is how the return-on-risk changed. Why don't we add a few lines of code to provide the return-on-risk so that we may see that result as well for comparison to the original. I'll write the code for you:

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

random_return = np.random.uniform(-20,20)

asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]

test_avg = np.average(asset_with_random_return)
test_std = np.std(asset_with_random_return)
test_ror = test_avg/test_std

print("Original Average Return:",avg_return)
print("Original Standard Deviation:",std_return)
print("Original Return-on-Risk:",original_ror)
print("Test Average Return:",test_avg)
print("Test Standard Deviation:",test_std)
print("Test Return-on-Risk:",test_ror)
```

Now, when we run the program, we'll be presented with the same things a previously observed, but also with the return-on-risk for the original calculation as well as the return-on-risk for the test calculation. Every time you run this program a different observation can be made. The average return may be changing by only a bit, while the standard deviation changes by a different range, while the return on risk shows significant changes; you may see it go down by fifty percent or so. You can run the program over and over again to see as many different results as you wish, which bring us to the next thought process.

Using a Loop for Multiple Iterations

If we want to run multiple iterations of the test to measure the results, why don't we just loop it since we know how? That's a smart way to think. We can loop it a million times if we want to, but it would take a very long time to read a million test results. How about loop it three times for the sake of example? I'll write the code for your studies:

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

iterations = 3

for i in range(iterations):
    random_return = np.random.uniform(-20,20)
    asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]
    test_avg = np.average(asset_with_random_return)
    test_std = np.std(asset_with_random_return)
    test_ror = test_avg/test_std
    print("Original Average Return:",avg_return)
    print("Original Standard Deviation:",std_return)
    print("Original Return-on-Risk:",original_ror)
    print("Test Average Return:",test_avg)
    print("Test Standard Deviation:",test_std)
    print("Test Return-on-Risk:",test_ror)
```

Now, program will do the stress test three times and print the results for comparison each time it runs. If you wanted to run it ten times, all you would have to do is change iterations from three to ten and run the program. You can do as many iterations as you like.²⁴

²⁴ If you decide to go crazy and do it a million times or something, your computer's performance may suffer. They can only handle so much. You should play with code and be engaged, but I just wanted to warn you that a CPU doesn't have infinite power.

Adjusting Formatting for Result Readability

You can also make your output even nicer and more organized if you wish. It does print a lot of information close together, and the decimals are rather extreme considering we only use two decimal places in business and finance the majority of the time. Let's use the other method of literal strings that we know so that we may apply some formatting to those numbers. We will also include some lines to separate the information a bit and make it easier on the eyes. I'll adjust the code for you on the next page:

```

import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

iterations = 3

for i in range(iterations):
    random_return = np.random.uniform(-20,20)
    asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]
    test_avg = np.average(asset_with_random_return)
    test_std = np.std(asset_with_random_return)
    test_ror = test_avg/test_std
    print("+++++")
    print(f"Original Average Return: {avg_return:.2f}
%")
    print(f"Original Standard Deviation:
{std_return:.2f}%")
    print(f"Original Return-on-Risk: {original_ror}")
    print("-----")
    print(f"Test Average Return: {test_avg:.2f}%")
    print(f"Test Standard Deviation: {test_std:.2f}
%")
    print(f"Test Return-on-Risk: {test_ror:.2f}")

```

I added a few lines to the output with the print function by just using dashes and plus signs; I also switch to the other string format we know and enclosed our variables in curly braces. This gave me an opportunity to use a shorthand way of reformatting the numbers. I added “:.2f” the variables to tell the computer to show me a floating-point number with

only two decimal places, and where appropriate, I added a percent sign to the end of the string to add just a little more detail. When you run the program now, you will see an output in the terminal that is much easier to read and make observations from. Remember, every time you run the program, you will see different results. That is the point of doing this. If you do it a thousand times, will it ever lose money? That's the idea of stress testing.

Portfolio Standard Deviation

We can measure the effects of random returns in the future on the portfolio by using the same principles with the portfolio standard deviation formula. The main difference here will be that we must also write code for the change in the correlation coefficient that will inevitably come with a random return being added to each of the two assets.²⁵ How much does the standard deviation of the whole change? This is what we wish to find out. We are going to use equal weights between the two, but you can increment and change them however you wish once you write your code. I just want to give you some idea of how this code could be written, and then you may do whatever you wish. I'll put the code on the next page where it will fit:

²⁵ We're only going to do this with two assets so this can fit on one page.

```

import numpy as np

asset1 = [15,21,23,34,49,12,26,-11,14]
asset2 = [18,31,19,-13,26,17,12,25,31]
randomizer = np.random.uniform(-20,20)
rnd_asset1 = [15,21,23,34,49,12,26,-11,14,randomizer]
rnd_asset2 = [18,31,19,-13,26,17,12,25,31,randomizer]
w1 = 0.5
w2 = 0.5
std1 = np.std(asset1)
std2 = np.std(asset2)
rnd_std1 = np.std(rnd_asset1)
rnd_std2 = np.std(rnd_asset2)

correlation_coefficient = np.corrcoef(asset1,asset2)
[0,-1]
portfolio_standard_deviation = np.sqrt((w1**2 *
std1**2) + (w2**2 * std2**2) +
(2*w1*w2*correlation_coefficient*std1*std2))

rnd_correlation_coefficient =
np.corrcoef(rnd_asset1,rnd_asset2)[0,-1]
rnd_portfolio_standard_deviation = np.sqrt((w1**2 *
rnd_std1**2) + (w2**2 * rnd_std2**2) +
(2*w1*w2*rnd_correlation_coefficient*rnd_std1*rnd_std2
))

print("Original Portfolio Standard
Deviation:",portfolio_standard_deviation)
print("Test Portfolio Standard
Deviation:",rnd_portfolio_standard_deviation)

```

²⁶ Looks like we have reached the limit of what will fit on the page. I made it slightly smaller to make it a bit more readable. Just remember to type the lines of code straight out and do not indent unless it is called for.

We can see that we have added a random return to the end of each data set. This will inevitably change the standard deviation and correlation coefficient in the test set where the random numbers are incorporated. You can see that I have the original std1 and std2 variables, along with the correlation coefficient, and the original portfolio standard deviation. After that, I used the variables with rnd_ at the beginning to calculate the new ones. This will allow you to measure how much the risk profile of the whole has changed. Again, you can loop this as many times as you want.^{x1}

Statistical Significance

Something we must observe as we are doing this is that what we are doing is speculative and based on statistical significance, not financial mathematics. When we begin to speculate on the future, there is no way to know, we can only test multiple times and give the thing we are measuring every chance to fail and see what happens. A full-on stress test may involve doing one million, ten million, or even one hundred million iterations where there is a random chance for a market crash, there is a better chance for a correction, there is always a random chance to lose money, and this logic plays out in every iteration where there is every opportunity for the portfolio to experience twenty market crashes in a row as well as full-on hyperreactive bull markets and everything in between. You would look at every single outcome from every single iteration and measure how many times you lost money and how many times you made money. Your results may say you were profitable fifty-seven percent of the time, and you lost money forty-three percent of the time. As valuable as this knowledge is, I must stress to you again as I have done a few times already that *you cannot predict the market*. If you run your stress test one hundred million times and find that you are nearly always profitable, sure enough mother nature and economics will show you that you didn't take the one hundred million and first possibility, and you lose money in a way you didn't realize you could. There are no guarantees no matter how smart you are or how comprehensive your analysis is. You cannot beat mother nature. She will

checkmate you without remorse and humble you time and time again without a single care in the world as to how much it hurts your pride. If you want to lose all your money, she will take it from you. She will take your money that you invested after hours and hours of deep analysis and research and she will hand it over to some kid who took a wild gamble on no research or work of any sort, because the kid got it right and you got it wrong. Exercise humility when it comes to the subject of finance and business. We do not know what will happen tomorrow, and there is no way figure it out. We can only do the best we can to take every precaution and push forward towards our goals.

Additional Notes:

To add to the point that statistical significance doesn't represent facts, there are principles you learn in Statistics such as "Correlation does not equal causation." What this means is, you may find that there is a strong correlation between how many clouds you can see in the sky and how many cars you can see on the road. That doesn't mean one is causing the other. It is easy during complex analysis to convince ourselves that two unrelated things are related. Stay vigilant.

Chapter Nineteen

DATA ANALYSIS 2.0: CREATING VISUALS

It's time for the next level once again! We have been learning, growing, experimenting, thinking outside the box, developing ourselves on a very high level. We have learned some excellent new skills. It's time to add another. If we are going to be looking at financial and other data and doing all of these calculations and complex analyses trying to make the best decisions for our finances and our business as we possibly can, it's only a matter of time before we need to plot this data and these results on a graph and take a look at them. Your favorite spreadsheet software can do this for you easily and quickly, but we can also use Python. Each one has its advantages and disadvantages. I'm going to cover how to use Python in this chapter to create visual representations of our data and analyses using the Matplotlib library. This will look pretty simple compared to what we have been doing together recently. It'll be a nice break to go back to some basics, but at the same time *mastery* is built on a fundamental level.

You will find that with Python, creating graphs and charts is beyond simple. The only real complexity comes from designing the graph, and you may find that to be the easiest thing you've seen so far. It could be something you are naturally great at. I personally am not one of those people. I do the best I can to make things look as good as possible, but there are some who just have a knack for designing things. I'll share with you the principles that I know and do the best I can to get you started making some excellent visuals for you to share with friends, family, employees, potential partners, and the like.

Creating a Graph with Python

The very first thing we will be learning is how to just plot a line on a graph. It can be a very noisy²⁷ line, or it can be straight as an arrow and

²⁷ It looks like an EKG.

totally linear. We will just mock up some data just as we have been and get right to it. You'll be surprised at just how easy this is. If we want to plot a line on a graph, we need to know how to make the graph in the first place, so let's get that out of the way. We are going to import the Matplotlib library so that we may use its built-in functions. All we want to do right now is make the graph appear. No data just yet. We know the very basics of starting to write some code, so I will just show you how to do this, and I'll assume you understand what you're looking at now:

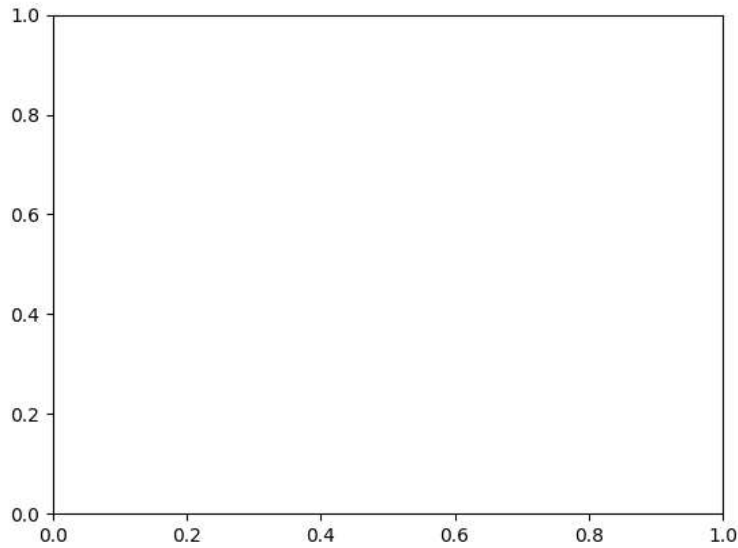
```
import matplotlib.pyplot as plt

plt.figure()
plt.xlabel("")
plt.ylabel("")
plt.show()
```

All we need to do is:

- First, import our library.
 - We are specifically importing matplotlib.pyplot
- Second, we need to create our figure.
 - This is the window that opens that will have our graph.
- Third, we create a blank label for the x-axis.
- Fourth, we create a blank label for the y-axis.
- Finally, we use plt.show() to make the graph appear.

When we run the program, we see this:



Naming Our Axes

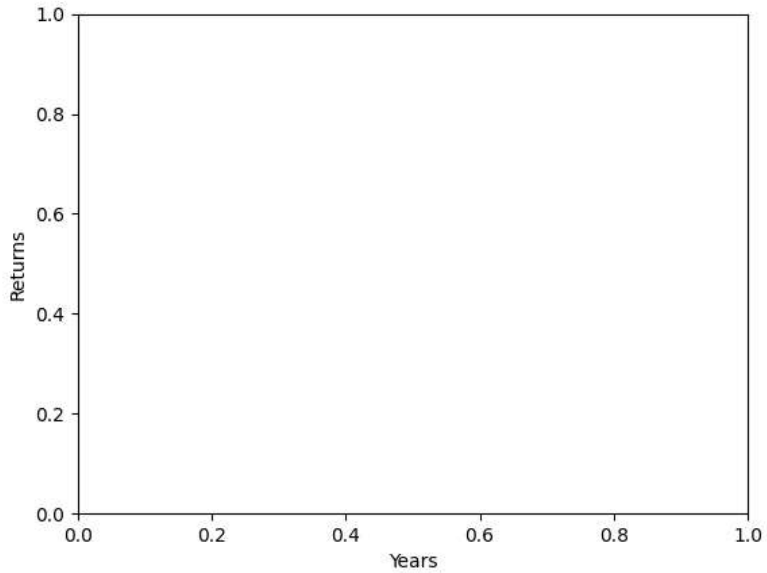
What we see here is the upper-right quadrant of the Cartesian Plane.²⁸ It is totally blank, but if you have gotten this far, you are doing great. Let's go back and add some labels to our axes. You can call yours whatever you want. I'm going to call mine, "Years" and "Returns" as to help us form associations. Here is the updated code:

```
import matplotlib.pyplot as plt

plt.figure()
plt.xlabel("Years")
plt.ylabel("Returns")
plt.show()
```

²⁸ Named after 17th Century French philosopher, mathematician, and scientist René Descartes.

That is simple enough. The graph that pops up will now include the labels on their respective axes and will look like this:



Plotting Your First Line with Python

Now, let's add some data to our graph. We need to declare a list variable and put some mock data in just like we have each time, and then pass that variable as an argument in the plot function to plot it on the plane.

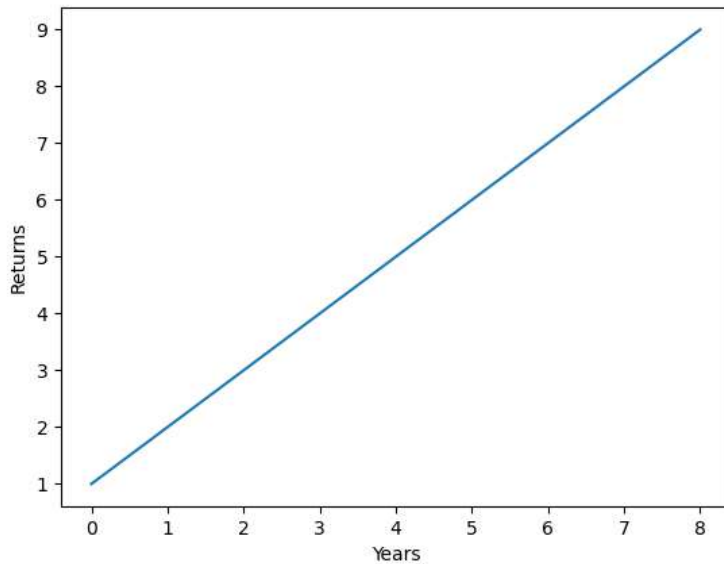
Here is some code to give you an idea of how to do it:

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data)
plt.show()
```

We create our variable to hold our data just like before, we add the plot function from the library, and pass the data variable as an argument. When we run the program, we see this:



Adding a Title to The Graph

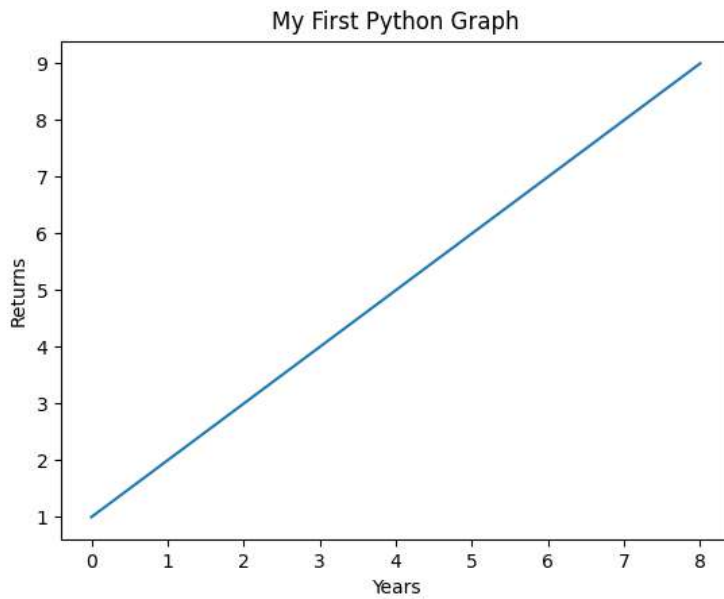
If you are seeing what I am seeing, you're doing great. Since we're here, why don't we add a title to our visualization that we are creating? Here's the code with this change made:

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data)
plt.show()
```

To add our title to our visualization, we added the title function from the library and passed the title we want in string format as an argument. What we get when we do this looks like this:



Looking mighty professional if I do say so myself. I like it! There are more customizations that you can make. When the dialogue pops up with your graph in it, you will see that there is a menu across the top. You change all sorts of things in there; you can also save your graph as an image so that you may keep and use it.

Adding a Legend

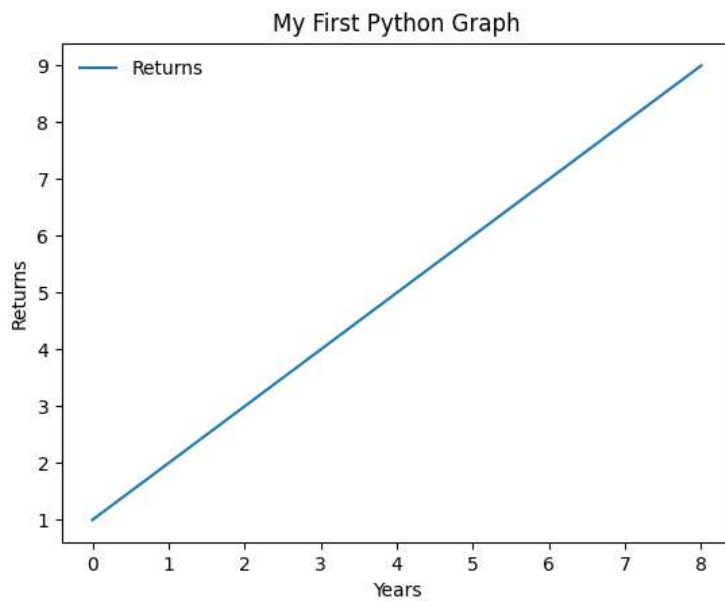
Let's add a legend to our graph. We don't need much more code than what we have:

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data,label="Returns")
plt.legend()
plt.show()
```

We go back to our plot function, and we put a comma after our data variable, because we are adding another argument. We add the argument “label=’Returns’”. After this, we add the legend function from the library to show the legend on the graph. When we run the program, we will see this:



Plotting Multiple Lines

As you can see, we now have a legend in the top left corner of the graph²⁹ telling us what the blue represents. We can also add more lines, as many as we want. We are programming. With code, you have total freedom as long as you have the knowledge to use it. Let's add two more lines. Here's the code for you to study and code along with me:

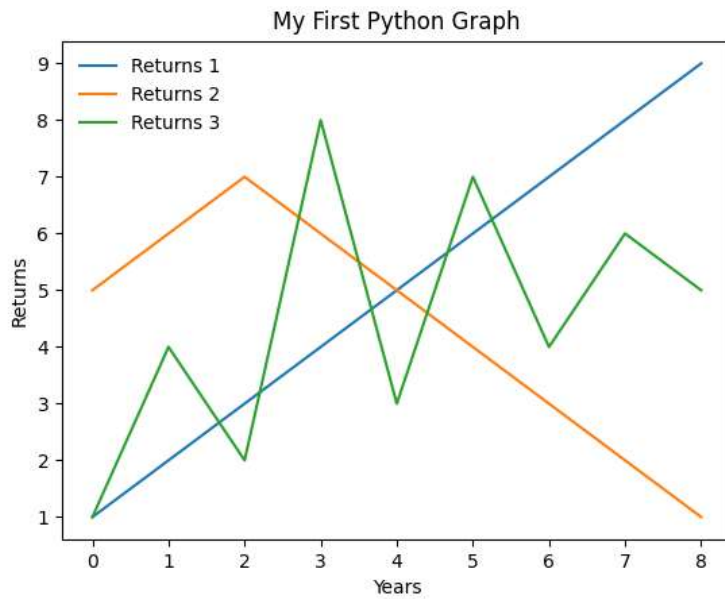
```
import matplotlib.pyplot as plt

data1 = [1,2,3,4,5,6,7,8,9]
data2 = [5,6,7,6,5,4,3,2,1]
data3 = [1,4,2,8,3,7,4,6,5]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data1,label="Returns 1")
plt.plot(data2,label="Returns 2")
plt.plot(data3,label="Returns 3")
plt.legend()
plt.show()
```

To plot more lines, we simply used the plot function each time we want to add another line. When we run the program now, we see this version of the graph:

²⁹ If it is ever in the way of the lines, the legend will move to another location on the graph.



You get the idea. You may add as many as you like.

Plotting a Bar Graph

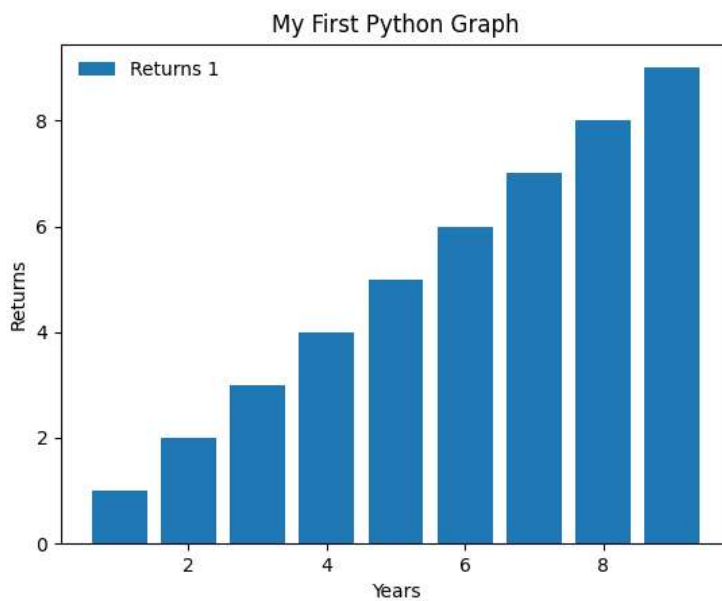
Let's say we have one data set, and we want to use a bar graph instead of a line graph. We can do that. We just need to use the bar function rather than the plot function. Here's some code to give you an idea of what this would look like:

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.bar(data,height=data,label="Returns 1")
plt.legend()
plt.show()
```

You can see that we remove the plot function and use the bar function instead, with three arguments: our data variable, height=data, and the label. The height argument represents the numeric values associated with each bar. Not too bad, right! This is pretty easy. Here is the graph that you will see when you run the program:



If you ever need a bar graph, you know how to make one with Python now! You may find that when doing things such as comparing sales data across different products, such as units sold, you may want to use a bar graph. It will provide a clear visual of what is the best seller at your business; however, you can use whatever you like.

Combining Coding Skills

This is a great time to combine some coding logic with our newfound ability to plot data. We have talked about stress testing and analysis. Let's take the principle of for loops, lists, randomizers, and plotting and plot a random set of data completely from scratch. We will use logic from the get-go. Let's also add another dimension of randomness; we will create a randomizer where we will decide the range to pick a random number from, and then we will use that variable for both arguments in another randomizer so that the range to pick from is also randomized. This should make for a fun coding exercise that produces different results in the data and on the graph every time. Here's some code I wrote to show you how this may look:

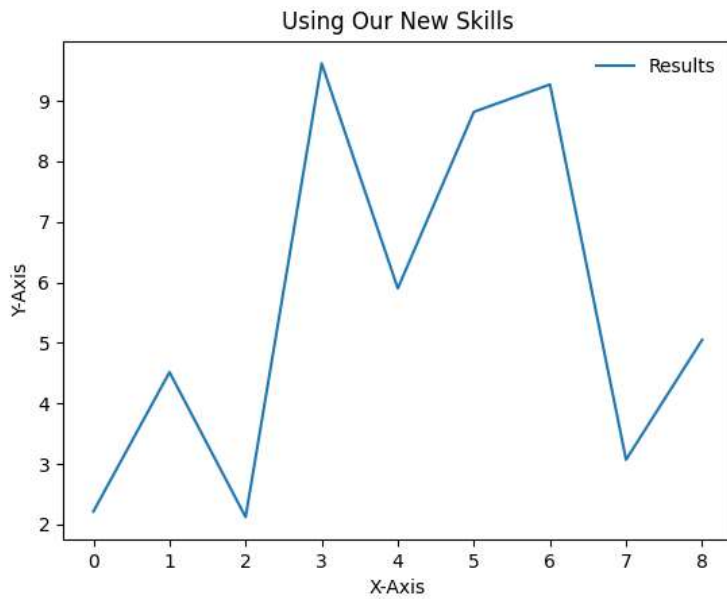
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 9
results = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.legend()
plt.show()
```

You can see how we set the range for our first “randomizer” variable and then used that variable for the range of our “randomizer2” variable. After that, you can see that we took our random number that we finally ended up with and appended it to the list we declared in the beginning which we stored in the variable “results”. We then used the functions from Matplotlib to create a graph and plot the numbers from “results”. We printed the random numbers generated to the terminal as well so that we can read them. Here is the graph I ended up with just to give you an idea of what was produced:



Simplified Moving Average

You can really have a lot of fun with stuff like this. You could calculate the average and append it to a different list in each iteration and then plot both lines. Essentially, what you would have is a simplified moving average like you have possibly seen on a chart for a stock's price action!

You know what? That sounds like fun. Let's do it. I'm going to write the code. Let's have a look:

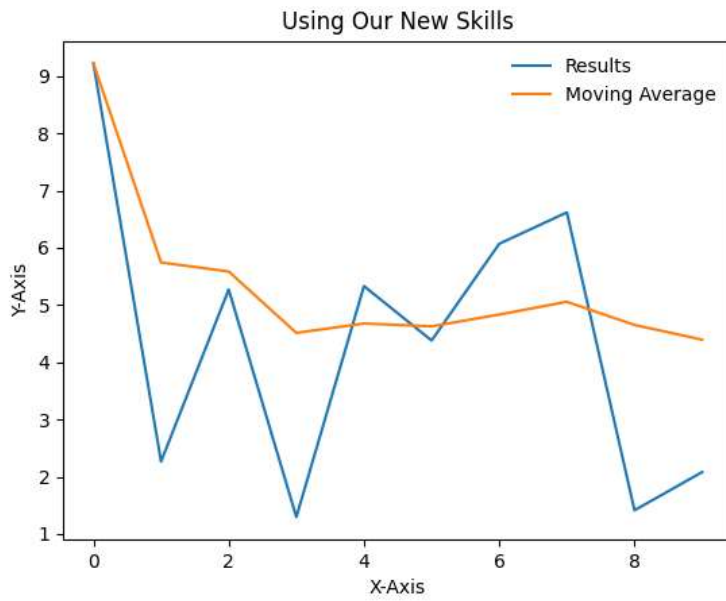
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 10
results = []
moving_avg = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    avg = np.average(results)
    moving_avg.append(avg)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.plot(moving_avg,label="Moving Average")
plt.legend()
plt.show()
```

There you can see that we have used logic to calculate the average of the list stored in the variable “moving_avg” every time a new number is added to it. We then plot both lines using familiar functions from Matplotlib. Here is the graph I ended up with displaying both lines:



I don't know about you, but I think that's pretty cool. I really get into this kind of thing.

Moving Standard Deviation

Let's add the standard deviation doing the exact same thing. Here's the code with this logic added:

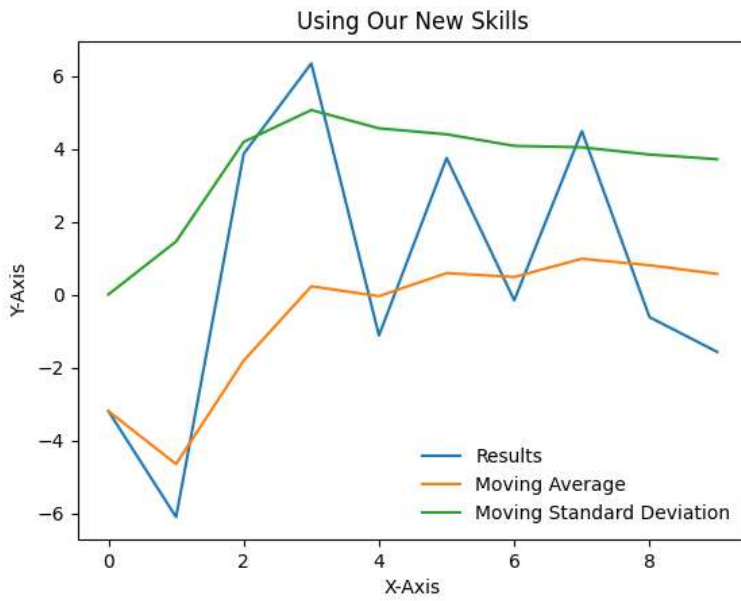
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 10
results = []
moving_avg = []
moving_stdev = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    avg = np.average(results)
    std = np.std(results)
    moving_stdev.append(std)
    moving_avg.append(avg)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.plot(moving_avg,label="Moving Average")
plt.plot(moving_stdev,label="Moving Standard
Deviation")
plt.legend()
plt.show()
```

And here is the graph that I had come up:



Honestly, I have never seen a moving standard deviation used for anything, but I suppose it could show you whether variability is increasing, decreasing, or staying the same over time. If nothing else, it was fun to do it just to practice what we are learning.

Chapter Twenty

ENTREPRENEURSHIP

Profits are how you make money, not wages.

We have discussed already that it cannot be done alone. There's no chance. We have talked about how we must be very careful who we allow around us. We have discussed the value of education and emotional and cognitive biases. We have even discussed the scientific reason as to why people won't even go as far as to read a book, much less go the extra mile for their careers and future. Now that we understand all of these many facets of finance and business, we come to the subject of entrepreneurship. Entrepreneurship is one of the most coveted things in America today. Everyone wants the personal and financial freedom that comes with being a successful entrepreneur, and many pursue it relentlessly every day. The fact of the matter is that you cannot achieve financial abundance working a job that you hate. You can make a living, but you can never really get ahead. The average person saves money and invests in their retirement and if they're smart enough young enough, and nothing bad ever happens to them, they might get to retire early. This is not acceptable to the entrepreneur.

The cold hard truth is that wages will never be high enough, and there are two reasons why: 1.) Because people will always spend more than they make until their financial future is destroyed or the government raises interest rates to nearly twenty percent again, and 2.) because the math is clear. Anyone with enough intelligence to sit down and learn the things in this book is plenty smart enough to see for themselves that going out and working eight hours a day for twenty dollars an hour is not going to amount to much after taxes, bills, and groceries. You cannot eat healthy and stay in shape and live that way. You always end up having to starve to save money. This is why entrepreneurship is the way forward.

You cannot scale wages, but you can scale a business or something that you can manage yourself. Some people say you can go and get a

commission-only job and you can get paid more for working more, but the reality is that you will surely be immersed in a toxic work environment with lazy do-nothing people trying to make a quick buck at someone else's expense. Those places are filled with "coaches" and "speakers" who get a major chunk of your commissions to "motivate" people right back out the door. This book isn't for me to inject my personal opinions, but I don't feel this is a matter of opinion; I feel confident that entrepreneurship is the only way to secure a real future for oneself.

Partners

Successful entrepreneurs work together. They seek funding. They seek expertise. They seek opportunities. When you meet the person who owns that store or restaurant or what have you, that is how they got where they are; they looked for ways to get there and for people who could help them do it. It has been my experience growing up with the generation that I did that people don't see opportunities in attracting success and power to themselves; they see a loss in what they could gain if they do it all themselves. This is absolutely a cognitive bias that we discussed earlier in this book. People think if they make 15% rather 20%, they lost money! They think this way and when people don't want to waste their time on them, they think it's the government or inflation, or something else keeping them down, which is another bias we discussed. When we're doing great it is because we are great, and when things don't work it is everyone else's fault. You simply must be ready to be a team and not just with your friends who accept devastating flaws as "who you are". You must be surrounded by people who are motivated not just for themselves, but who also want you to learn as well. These people make good partners. The last thing you ever want is a bad business partner; it is just as bad if not worse than a divorce when it finally blows up.

Bad Business Deals

Here's the truth about bad business partners and bad people. You absolutely cannot win with those people. You will never write a contract

good enough to allow you to make a good deal with a bad person. Bad people, people who do not stand a chance in business, love nothing more than going around gossiping and talking about how they have to go to court over their “big business deal they’re in”. You are not scaring bad people with your contract. They *love* it. It’s all about significance and greed with them. You have a “get rich quick scheme.” You know your business is legitimate and you have high integrity, and you have explained that to them, and while you were saying those words to them they heard the words, “get rich quick” and all of sudden they were one of those people on social media pretending to be a prophet. Bad people love bad deals; they will always find a way to make a good deal a disaster for everyone.

I know I’m being very blunt about this topic, but you must understand that we live in the real world, and you can only get so far behind wasting time on the insecure, the unintelligent, and the crazy before there is no hope for you and you will never catch back up. Your ship will have sailed. There’s no formula or skill or anything for that matter that can repair the kind of damage these people do. They walk around being “a real good person” and then one day when you’re in too deep you get a psychotic text message from them showing you their true nature, and you will either be filing bankruptcy or litigating, because there’s no saving it when that happens. Be sure that you understand the laws around your business. Be sure you always consult with an attorney. You need to know some good, intelligent, useful people.

Resources

People are your best resource. You need to have *good* people on your side that you can call, and not just a bunch of friends with no ambition and no skills and habits stronger than they can ever break. As a businessman, it is up to you to hold *yourself* to the very highest standards in every area of your life, so that you may attract the very highest quality people to yourself. You may not always be the leader in the room, but you will always be the leader of your life, and you *must* keep the standards high. Young men learn this about women as they grow and mature. When men are much younger they attract a very different quality

of person to themselves in the opposite sex, and as they get older some of them at least see that quality go up as they mature and become better people. Be the person you want other people to be. Not everyone will, but enough will. You will find in your life that if you walk the walk and stay away from crazy insecure people, you will find that the right number of people will show up. You will meet a handful that you may change the world with, but it all starts with you. If you want the resources, you must become the person who attracts them. You can't take a shortcut and play good ole' boys with the manager at work; you have to take it seriously.

Maybe you can get resources like these wonderful people working a wage job. I don't have an opinion in that area. I wouldn't know at this point in my life. I personally haven't met any, but that doesn't mean no one ever will. I certainly have *one* friend who have worked wage jobs their entire life and they climbed the ladder over time and have secured a good middle-class position for themselves. He's the only one I know though, so I have to assume based on the data that I have that his results are not typical. I don't believe you can go anywhere and *find* these excellent people. I believe you must attract them. They come into your life out of nowhere, and you must be mentally ready for them, because they are not the average person. When they walk into the room, you can feel their presence in that room. You can tell there is something different about them. These people are your greatest resource. Raise the standard. Walk the walk. And prepare yourself for them.

Make A List of Rules

This is something I learned from all of my own studies. Pay attention to the things that hurt in life and learn from them. Make a list of rules that are cardinal sins in your life. Anyone or anything that violates those rules must go. I have rules in my life about drugs, drama, wastefulness, recklessness, relationships, lying, cheating, stealing, sabotaging, investing, saving, running businesses, hiring people, firing people, working with the public, choosing customers, and many more. I don't share them with anyone, and when you make yours, you shouldn't either. When you go around telling people these rules, they will inevitably tailor their communications with you in an attempt to manipulate you.

Making this list of rules is as simple as it sounds. If you touch a hot stove and it burns like hell, make a rule: *NEVER touch a hot stove*. Don't break the rule after you have recorded it. It stands for life. Just like you wouldn't walk into the kitchen right now and lay your hand on that hot element, don't break any of the other rules. Just like there is no excuse for breaking the rule of touching the stove, and you likely find it foolish to break that rule and walk in there and do it, there is no excuse for breaking any of the others; and it is foolish to do it. When you experience any pain at all, whether it be related to your own personal growth, friends, family, business, finance, debt, contracts, hiring, firing, networking, or anything else for that matter, make a rule to live by. This will be your guiding light. This will be your strategy for life. It is based on real data that you have gathered. It is based on real observations that you have made.

Profits, Not Wages

As I mentioned earlier, the path to real success is through profits, not wages. You may be in a situation where you are working for wages right now. We have all done this, and maybe we will all do it again. Personally, if I had the right opportunity pop up, I would take a temporary position for who it may help me become; however, we cannot rely on wages long-term.

Do the math. Let's say you make twenty dollars an hour. You can work just hard enough to not get fired, and you'll make twenty dollars an hour, or you can work yourself absolutely sick and ragged, and you'll make twenty dollars an hour. To me, this is a problem.

Now, let's analyze the entrepreneur side. You can sit and only do enough to get by, and you'll end up working a wage job, or you can get after it and work and learn and develop yourself and meet better people and get access to better opportunities, and you could make more than you would ever need. If you are selling a product for ten dollars that costs you two or three dollars, how many can you sell? What can you do to make that grow? People sit and try to figure out how to make a one hundred percent return on the stock market, but do the math on what I just said... You pay

two or three dollars for something, and you sell it for ten dollars, what is your return? I taught you that math. Think about it.

Here's the thing: *you must be productive*. A fig tree must produce figs. With entrepreneurship, you can scale your business; you can make more sales; you can meet more people; you can make more decisions. You are in control. If you are going to run a business and you want that business to get bigger, you cannot do everything in your power to make sure that it doesn't. You cannot attract excellent people and then run them off by showing them that you don't work hard, or you don't learn or don't care or don't try as hard as you used to. This is high-maintenance stuff. You must produce fruit. You may start a business and it doesn't go well, but at least you were out there doing something. You may start another, and it doesn't go well, but at least you were trying as hard as you possibly could. This effort creates a compounding effect in your life where you are building up momentum to grow exponentially. You are gaining wisdom and experience. You are making more and more rules and refining your strategy for finance and who you allow around you. You cannot just sit high upon your pedestal and expect people to lift you on high. Let me tell you... They're not going to. It doesn't work that way.

Find ways to be more and more productive, for the more you produce, the more service you provide, the more things will start to work out in your favor. An entrepreneur that has achieved any level of success at all can tell you this is true. Productivity is the key.

Chapter Twenty-One

THE FUTURE

“Be not deceived; God is not mocked: for whatsoever a man soweth, that shall he also reap.”

-Galatians 6:7

We cannot predict the future, but we can sow the seeds that we wish would grow. Many make the mistake of walking out into their garden and telling everyone they know how badly they need crops to grow. It happens every day. Far too many make the mistake of wishing something good would grow in their life. The world is filled with so many good people who don't understand this one simple law of nature:

“You reap what you sow.”

We invite our friends over to see our garden that we have neglected, and we allow them to sow seeds for us without ever questioning them. It is only after a moment of clarity and realization, usually preceded by intense pain, that we realize we have let the weeds that we have allowed to grow to get out of control. We find ourselves spending hours and hours and days and weeks and months and years, that we don't have trying to pull out all the weeds just so we can get back to the bare ground and have to start all over again sowing a better crop. What's pitiful is that many people will live their repeating this as a cycle over and over again until their time is up. As popular as it saying it is, many people don't know this simple law of nature.

If you have been one of these people up to this point, it is okay, but do not continue to be this way. Make this moment, right now, with this book in your hand the moment of decision that changes your life. Don't sit looking around saying, “I don't know what to do.” Here's what you do: *sow*. Do good things. Do as many good things as you can. Do as many good things as you can for yourself and for others. Look for good things you can do. Look for excellent people to surround yourself with. Start

looking for them today, now. Don't put it off any longer, for to not sow, is to sow more weeds. We as human beings and businessmen and entrepreneurs have to make a snowball before their can ever be a "snowball effect". We have to look for business partners before we can ever find the one that we are excited to do business with. We have to start reading books before we find *the one* that changes our philosophy and how we view the world. We have to pour all the love that we can into our relationships before we see if we are with the right one. We have to give before we know if we are appreciated. *Start the process!*

Every time you have a positive conversation, you sow a seed. Every time you lift someone else up, you sow a seed. Every time you give an opportunity, you sow a seed. Some people say, "Well gosh! I have to get something for myself before I can go around worrying about everyone else!" Every time you think or say something like that, you sow a seed. "I'm not getting screwed out of my money!" Every time you say or think something like that, you sow a seed. Every time you pick up your phone and scroll endlessly rather than read something of substance, you sow a seed. Every time you put junk in your mouth rather than cook a meal, you sow a seed. Every time you get insecure and push away greatness, you sow a seed. Every time you go out to events and network and work hard to meet the three to five people that will be the ones you change the world with, you sow a seed. Every time you choose to do what is comfortable rather than challenge yourself, you sow a seed. Every time you challenge yourself to grow, you sow a seed... You cannot escape the laws of nature. We are all here on this planet in the same ecosystem and we all have the same laws of nature to abide by.

Sow the right seeds. Educate yourself. Find a business partner with whom you can work together and take your financial futures to heights you have never seen. Read something of substance every single day. Don't read trash on your phone. Turn the phone off for a few hours every day. Don't entertain the idea that every sound it makes is important; that's an absurdity. It's almost hilarious to think that. *Find* ways to grow.

I *challenge* you right now to read 100 books in the next twelve months; and before you ask, yes, I have... and I'll do it again too. I love it. I'm past those early stages where it's all struggle and little reward. I'm to the

point of those other people who *love* to find a great book and learn something new. I'm to the point that I *love* to question my beliefs and put my theories to the test rather than hide from the truth. It doesn't make me insecure anymore. I've graduated from that way of thinking. I'm beyond that now. You can be too. All you have to do is *start sowing*. Just start doing it. Don't worry about perfection. Don't waste time on trying to impress people. Don't waste mental resources on the same ole' people who don't show up and haven't for years. Don't call them anymore.

Make Today The First Day

Make today the first day of your future. You now have the knowledge and the skills to do things that you never did before. You can now speak the language of money and business on a whole new level that maybe wasn't reachable for you previously. Today, right now, this moment is the very best time to make a move. Sow at least one seed for your future right now. Everyone has time. Everyone has the chance to do this. Sow just one this instant and begin the process.

Before We Go

In our final moments together in this book, I want to share one final thing with you. I want to talk about being associated verses being disassociated. These two states ultimately control everything and my hope is that if I can make you aware of it, you'll be able overcome it.

Think about this with me. Imagine you have a vacation planned and you leave tomorrow. A friend or family member or someone comes to you with some insignificant get-together social gathering and wants you to come. *Do you push your vacation back for it?* No, right? You wouldn't do that.

Now, imagine you are planning a trip somewhere special in five years, and a friend or family member comes to you with some insignificant thing that's happening around the same time. *Do you push your vacation back?* It's different, isn't it? You might just do it now.

The reason for this change of heart in the situation is when your goal is close to you, you are far more associated with it than when it is far away. You are “married to it”, so to speak; however, when it is years away, you are more disassociated from your goal, and it’s easier to delay it or move it around. You don’t care as much about it as you do when it’s right in front of your face.

If you want to achieve any level of success, you must keep your long-term goals close to you. You must hold them close to your heart. You must take time every day to close your eyes and place yourself there and experience it mentally as much as you can. You must train yourself to hear the sounds, feel the touches and textures, smell the air, and see the sights around you vividly. You *must* keep the long-term goal close. You *must* stay totally associated with it, or I can guarantee you, it will slip away from you like it does everyone else. If you have an hour to sit and just be there, spend an hour doing that. Don’t disassociate yourself from your dream. Don’t let friends distract you with going out drinking and socializing. Don’t go. Stay home and work on that dream.

You can pay now and play later, or you can play now and pay later. The interest compounds at a very high rate and mother nature *will* come to collect what’s due. Decide well, my friend.

I hope you have enjoyed reading, and I cannot put into words how grateful I am that you gave it a chance. The opportunity to share what I have learned up to this point with you is something that I cherish. I hope that I have been able to over deliver to you and provide value beyond measure. It is my goal and mission with this book to spread financial literacy and financial and business acumen to those who wish to learn it.

I started this project with one goal in mind: *serve on the highest level*. I hope I have been able to do that for you in every possible way. I sincerely thank you from the bottom of my heart for your time and attention. Good luck on your journey, my dear friend. God Bless.



Chris Woodward

Visionary Business Leader, Investor, Philanthropist, and Business Strategist

Chris Woodward is a visionary business leader, investor, philanthropist, and business strategist. With a foundation rooted in data analysis, regression models, and programming proficiency in Python and C#, Chris embarks on a dynamic journey marked by diversity and innovation.

Boasting an impressive eighteen-year background in music and entertainment, Chris brings a unique blend of creativity and precision to all his ventures. His expertise spans stock trading, business strategy, and real estate investment, forming a robust skill set that transcends conventional boundaries. Driven by an entrepreneurial spirit, Chris actively pursues personal growth and intellectual excellence. His ventures are underpinned by a multidimensional approach, combining technological, analytical, and professional skills. This approach ensures that every move is calculated, and each venture strategically positioned for success.

Chris's goals extend beyond personal gain, reflecting his commitment to making a meaningful impact on the world. His mission to feed one million people exemplifies his dedication to creating lasting positive change.

“Each day is a new opportunity to give, to create, and to grow. Do it for who you will become for the people you love and cherish most.”

-Chris Woodward

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Notes

ⁱ (Investopedia, n.d.)

ⁱⁱ (Investopedia, n.d.)

ⁱⁱⁱ (SEC explanation of Pattern Day Trader, n.d.)

^{iv} (High-Frequency Trading (HFT) Definition, n.d.)

^v (Yuen, 2012)

^{vi} (Yuen, 2012)

^{vii} (Yuen, 2012)

^{viii} (Yuen, 2012)

^{ix} (Yuen, 2012)

^x There are three irrational systems of thinking in this. 1.) Risk-Aversion, and 2.) Cognitive Framing. We can go watch a boring old guy tell us that we need to raise our standards and read more books and take classes and go work for someone for free for the opportunity to learn how to balance the books, or we can click the bright and colorful thumbnail and watch the young kid with a trendy haircut talk about things he read on a search engine ten minutes before he hit record while hip and cool music plays in the background. 3.) Next thing you know, this kid has convinced us we can make a 9,999% return on a \$100 stock that's "going to the moon! <insert rocket emoji>".

^{xi} Some people like to tempt fate and engage in shenanigans to try and hide profits from the tax man, but even if you were going to engage in such practices there is still only two ways to do it, 1.) Lie, or 2.) Don't make any money. If you are not lying about your losses, then you are not making any money.

^{xii} When doing calculations like this, be consistent in how you enter the terms. When you calculate standard deviation and see 0.18 for example, you want to either put 0.18 or 18 as in 18% into the equation. Whichever

you choose, use that format throughout the equation. Do not mix and match.

^{xiii} (Cuneiform - Ancient History Encyclopedia, n.d.)

^{xiv}

(Cuneiform - Ancient History Encyclopedia, n.d.)

^{xv} (Cuneiform - Ancient History Encyclopedia, n.d.)

^{xvi} This is not so useful for the average individual as there is a pattern day trader rule in place where the account must contain and remain above \$25,000 no matter what.

^{xvii} (Algorithmic Trading, n.d.)

^{xviii} (Algorithmic Trading, n.d.)

^{xix} (Algorithmic Trading, n.d.)

^{xx} I am in no way associated with Microsoft. I just really believe Visual Studio Code is the best one for it. It has a built-in terminal, which is nice. There are many other IDE's, but I personally have found that Microsoft's products are the best for this. I never had much success using the others I tried.

^{xxi} You will learn in good time that when we are coding there are different kinds of numbers such as integers, floats, and a few others. With Python, you don't need to worry about that too much until you have to worry about it. Python is designed to making coding as user-friendly as possible from what I can tell.

^{xxii} I am absolutely not a great coder. I can do what I need to do with it and that's about it. My code is only for me, so I don't worry about how pretty it is as much as I should, but I had an online mentor at a big tech company who told me that when that's where I was with coding; he said I was coding at about a graduate level. He and the others were wonderful. I had an endless supply of questions and terrible broken

programs I had written. They were all very patient and kind to me. I learned a lot from them.

xxiii (Cunningham & Stanovich, 1998)

xxiv (Cunningham & Stanovich, 1998)

xxv (Cunningham & Stanovich, 1998)

xxvi (Cunningham & Stanovich, 1998)

xxvii (Cunningham & Stanovich, 1998)

xxviii (Cunningham & Stanovich, 1998)

xxix (Cunningham & Stanovich, 1998)

xxx (Cunningham & Stanovich, 1998)

xxxi (Cunningham & Stanovich, 1998)

xxxii (Cunningham & Stanovich, 1998)

xxxiii (Christakis & Fowler, 2007)

xxxiv (Christakis & Fowler, 2007)

xxxv (Christakis & Fowler, 2007)

xxxvi (Christakis & Fowler, 2007)

xxxvii (Hill, 1937)

xxxviii Something closely related to this is “back testing” which I am not covering in this book. Back testing is where you build a stock trading strategy with an algorithm, and you use market data to start one hundred years ago and put your portfolio through the last one hundred years of the market. Doing this will show you how your strategy would have

performed during The Great Depression, Black Monday, The Financial Crisis of 2009, 2020, etc. It will also tell you how much money you would have made or lost. This is purely speculative when you do it this way, but back testing also applies to portfolios and that's why I bring it up. After you do all of your analysis and build a portfolio optimized to the very best of your knowledge and abilities, you can put the portfolio through the same process and see how it performs. There have been portfolios that have survived this kind of testing and only ever lost money a few times. I am not including it in the book, because I do not know enough about it to teach it to you. To the best of my knowledge, you do this with trading software from your broker if they offer the feature. I encourage you to continue your education as always if this is something you wish to learn how to do.

^{xxxix} `Asset_with_random_return` got indented due to lack of space. Don't indent that when you are typing your code.

^{xl} Since we have hit the limit of what we can do on one page, I will leave looping this to you. You know how to do it at this point. You've come a very long way.

Code References

Your First Python Program

```
print("This is my first program!")
```

Strings

```
print("This is my first program!")  
print("I have never done this before.")  
print("Coding is great!")  
print("Learning new things is how we grow.")
```

Strings Expanded

```
print("This is my first program!","I have never done  
this before.,"Coding is great!","Learning new things  
is how we grow.")
```

Math with Python

```
print(2+2)
```

Math with Python Expanded

```
print(2+2*45/37-45*347+615/8*0.06457+467578/15)
```

Multiple Arguments

```
print("2+2=",2+2)
```

Variables

```
variable = 2  
print(2+variable)
```

Variables Expanded

```
bicycle = 3  
trumpet = 2  
print(bicycle+trumpet)
```

Expected Value Calculation with Python

```
reward = 1000  
reward_probability = 0.3  
penalty = 1000  
penalty_probability = 0.7  
  
expected_value_calculation =  
(reward*reward_probability)-  
(penalty*penalty_probability)  
print(expected_value_calculation)
```

Expected Value with a Nicer Output

```
reward = 1000
reward_probability = 0.3
penalty = 1000
penalty_probability = 0.7

expected_value_calculation =
(reward*reward_probability)-
(penalty*penalty_probability)

print("The expected value of this is decision
is:",expected_value_calculation)
```

Expected Value with More Than One Outcome

```
reward1 = 1000
reward1_probability = 0.15
reward2 = 500
reward2_probability = 0.25
penalty1 = 1000
penalty1_probability = 0.5
penalty2 = 2000
penalty2_probability = 0.1

expected_value_calculation =
(reward1*reward1_probability)+
(reward2*reward2_probability)-
(penalty1*penalty1_probability)+
(penalty2*penalty2_probability)

print("The expected value of this is decision
is:",expected_value_calculation)
```

A List Variable

```
data = [1,2,3,4,5,6,7,8,9,10]
```

Importing NumPy

```
import numpy as np
```

Calculating The Mean

```
import numpy as np  
  
data = [1,2,3,4,5,6,7,8,9,10]  
  
avg = np.average(data)  
  
print(avg)
```

Portfolio Expected Return

```
import numpy as np

asset1 = [23,29,24,18,32,26,11,25]
asset2 = [15,21,16,24,19,23,29,22]
asset3 = [34,18,26,24,15,31,28,24]

avg_rtrn1 = np.average(asset1)
avg_rtrn2 = np.average(asset2)
avg_rtrn3 = np.average(asset3)

w1 = 0.50
w2 = 0.25
w3 = 0.25

portfolio_ER = (avg_rtrn1*w1)+(avg_rtrn2*w2)+
              (avg_rtrn3*w3)

print("The portfolio's expected return
is:",portfolio_ER)
```

For Loop

```
vegetables = ["corn", "broccoli", "cauliflower"]

for vegetable in vegetables:
    print(vegetable)
```

For Loop Expanded

```
numbers = [1,2,3,4,5]

for number in numbers:
    print(number)
```

Discount Cash-Flow Analysis

```
investment = 100
discount_rate = 0.1
years = [1,2,3,4,5]
annual_income = 10
cash_flows = []

for year in years:
    cf = annual_income / (1 + discount_rate)**year
    cash_flows.append(cf)

print(cash_flows)
```

Discount Cash-Flow Analysis Using The Range() Function

```
investment = 100
discount_rate = 0.1
years = range(1,6)
annual_income = 10
cash_flows = []

for year in years:
    cf = annual_income / (1 + discount_rate)**year
    cash_flows.append(cf)

print(cash_flows)
```

The Sum() Function

```
numbers = [12,51,654,32,15,65,89]

solution = sum(numbers)

print(solution)
```

Variance()

```
import numpy as np

numbers = [12,51,32,15,65,89]

variance = np.var(numbers)

print(variance)
```

Covariance()

```
import numpy as np

numbers = [12,51,654,32,15,65,89]
more_numbers = [21,54,98,15,54,12]

covariance = np.cov(numbers,more_numbers)

print(covariance)
```

Correlation Matrix

```
import numpy as np

data_set = np.array([[1,2,3,4,5,6,7,8,9,10],
                    [10,9,8,7,6,5,4,3,2,1]])

correlation_matrix = np.corrcoef(data_set)

print(correlation_matrix)
```

Correlation Coefficient (Single Value)

```
import numpy as np

data_set = np.array([[1,2,3,4,5,6,7,8,9,10],
                    [10,9,8,7,6,5,4,3,2,1]])

correlation_matrix = np.corrcoef(data_set)

print(correlation_matrix)
```

Correlation Coefficient Code Without 2D Array

```
import numpy as np

data1 = [1,2,3,4,5,6,7,8,9,10]
data2 = [10,9,8,7,6,5,4,3,2,1]

correlation_matrix = np.corrcoef(data1,data2)

print("Correlation Matrix:")
print(correlation_matrix)
```

Correlation Coefficient Code Without 2D Array (Single Value)

```
import numpy as np

data1 = [1,2,3,4,5,6,7,8,9,10]
data2 = [10,9,8,7,6,5,4,3,2,1]

correlation_matrix = np.corrcoef(data1,data2)[0,-1]

print("Correlation Matrix:")
print(correlation_matrix)
```

Correlation Matrix with Multiple Data Sets

```
import numpy as np

asset1 = [1,2,3,4,5,6,7,8,9,10]
asset2 = [10,9,8,7,6,5,4,3,2,1]
asset3 = [14,15,14,21,25,12,16,21,23,14]
asset4 = [8,5,4,2,9,1,3,7,5,8]
asset5 = [1,9,5,7,3,4,6,2,8,4]

data =
np.array([asset1,asset2,asset3,asset4,asset5])

correlation_matrix = np.corrcoef(data)

print("Correlation Matrix:")
print(correlation_matrix)
```

Standard Deviation – std()

```
import numpy as np

asset_a = [23,31,28,24,18,23]

standard_deviation = np.std(asset_a)

print(standard_deviation)
```

Comprehensive Analysis with Python

```
import numpy as np

asset1 = [1,2,3,4,5,6,7,8,9,10]
asset2 = [10,9,8,7,6,5,4,3,2,1]
asset3 = [8,5,4,2,9,1,3,7,5,8]

data = np.array([asset1,asset2,asset3])

correlation_matrix = np.corrcoef(data)
covariance_matrix = np.cov(data)

var1 = np.var(asset1)
var2 = np.var(asset2)
var3 = np.var(asset3)

stdev1 = np.std(asset1)
stdev2 = np.std(asset2)
stdev3 = np.std(asset3)

print("Correlation Matrix:")
print(correlation_matrix,"\n")
print("Covariance Matrix:")
print(covariance_matrix,"\n")
print("Asset 1:")
print("Variance:",var1)
print("Standard Deviation:",stdev1)
print("Asset 2:")
print("Variance:",var2)
print("Standard Deviation:",stdev2)
print("Asset 3:")
print("Variance:",var3)
print("Standard Deviation:",stdev3)
```

If-Statements

```
import numpy as np

numberA = 10

numberB = 5

if numberB < numberA:
    print("numberB is less")
```

If-Else

```
import numpy as np

numberA = 10

numberB = 5

if numberB < numberA:
    print("numberB is less")
else:
    print("numberA is less")
```

Portfolio Logic

```
import numpy as np

mylimit = 23

asset1_returns = [12, 15, -6, 23, 8, 10]
asset2_returns = [23, 27, 31, 20, -14, 17]
asset3_returns = [12, 15, 21, 19, 13.5, 11]

asset1_std = np.std(asset1_returns)
asset2_std = np.std(asset2_returns)
asset3_std = np.std(asset3_returns)

portfolio = []

if asset1_std <= mylimit:
    portfolio.append(f"Asset 1: {asset1_std}")

if asset2_std <= mylimit:
    portfolio.append(f"Asset 2: {asset2_std}")

if asset3_std <= mylimit:
    portfolio.append(f"Asset 3: {asset3_std}")

print(portfolio)
```

Literal Strings

```
age = 35

print("Age:", age)
print(f"Age: {age}")
```

Functions As Arguments

```
import numpy as np

data1 = [1,3,5,7,9,11]
data2 = [3,6,9,12,15]

print("data1 standard deviation:",np.std(data1))
print("data2 standard deviation:",np.std(data2))

print(f"data1 standard deviation: {np.std(data1)}")
print(f"data2 standard deviation: {np.std(data2)}")
```

While Loop

```
number = 1

while number < 20:
    print("Number:",number)
    number += 1
```

While Loop with Altered Operator

```
number = 1

while number <= 20:
    print("Number:",number)
    number += 1
```

Compound Interest Calculation

```
number = 1

while number <= 20:
    print("Number:", number)
    number += 1
```

Compound Interest Interest Calculation with Simplified Code

```
our_money = 100
interest = 0.1
years = 1

while years <= 10:
    our_money += (our_money * interest)
    print("Year:", years)
    print("Money:", our_money)
    years += 1
```

Portfolio Standard Deviation

```
import numpy as np

asset1 = [15,21,23,34,49,12,26,-11,14]
asset2 = [18,31,19,-13,26,17,12,25,31]

w1 = 0.5
w2 = 0.5

std1 = np.std(asset1)
std2 = np.std(asset2)

correlation_coefficient = np.corrcoef(asset1,asset2)
[0,-1]

portfolio_standard_deviation =
np.sqrt((w1**2 * std1**2) + (w2**2 * std2**2) +
(2*w1*w2*correlation_coefficient*std1*std2))

print("Asset 1 Standard Deviation:",std1)
print("Asset 2 Standard Deviation:",std2)
print("Portfolio Standard
Deviation:",portfolio_standard_deviation)
```

Simple Stress Test Example

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)

random_return = np.random.uniform(-20,20)

asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]

test_avg = np.average(asset_with_random_return)
test_std = np.std(asset_with_random_return)

print("Original Average Return:",avg_return)
print("Original Standard Deviation:",std_return)
print("Test Average Return:",test_avg)
print("Test Standard Deviation:",test_std)
```

Measuring Changes in Return-on-Risk

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

random_return = np.random.uniform(-20,20)

asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]

test_avg = np.average(asset_with_random_return)
test_std = np.std(asset_with_random_return)
test_ror = test_avg/test_std

print("Original Average Return:",avg_return)
print("Original Standard Deviation:",std_return)
print("Original Return-on-Risk:",original_ror)
print("Test Average Return:",test_avg)
print("Test Standard Deviation:",test_std)
print("Test Return-on-Risk:",test_ror)
```

Expanded With a For Loop

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

iterations = 3

for i in range(iterations):
    random_return = np.random.uniform(-20,20)
    asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]
    test_avg = np.average(asset_with_random_return)
    test_std = np.std(asset_with_random_return)
    test_ror = test_avg/test_std
    print("Original Average Return:",avg_return)
    print("Original Standard Deviation:",std_return)
    print("Original Return-on-Risk:",original_ror)
    print("Test Average Return:",test_avg)
    print("Test Standard Deviation:",test_std)
    print("Test Return-on-Risk:" test_ror)
```

Formatting Adjusted for Readability

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

iterations = 3

for i in range(iterations):
    random_return = np.random.uniform(-20,20)
    asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]
    test_avg = np.average(asset_with_random_return)
    test_std = np.std(asset_with_random_return)
    test_ror = test_avg/test_std
    print("+++++")
    print(f"Original Average Return: {avg_return:.2f}
%")
    print(f"Original Standard Deviation:
{std_return:.2f}%")
    print(f"Original Return-on-Risk: {original_ror}")
    print("-----")
    print(f"Test Average Return: {test_avg:.2f}%")
    print(f"Test Standard Deviation: {test_std:.2f}
%")
    print(f"Test Return-on-Risk: {test_ror:.2f}")
```

Portfolio Standard Deviation Stress Test

```
import numpy as np

asset = [12,21,9,23,33,20,19,12]

avg_return = np.average(asset)
std_return = np.std(asset)
original_ror = avg_return/std_return

iterations = 3

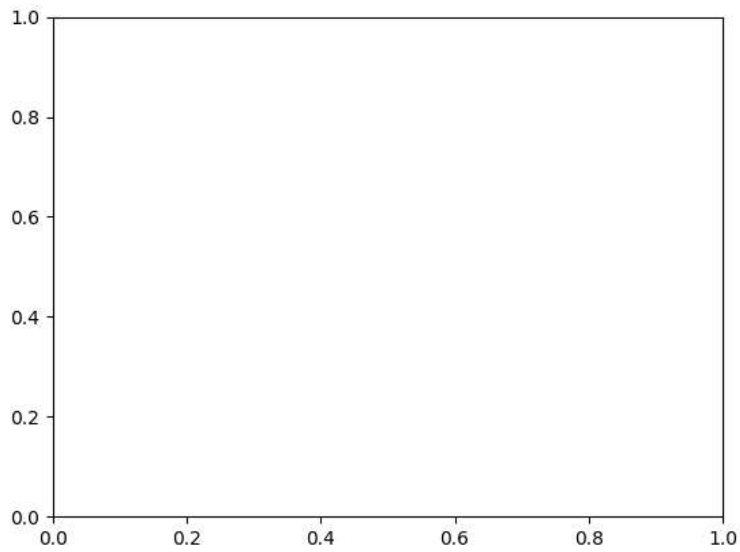
for i in range(iterations):
    random_return = np.random.uniform(-20,20)
    asset_with_random_return =
[12,21,9,23,33,20,19,12,random_return]
    test_avg = np.average(asset_with_random_return)
    test_std = np.std(asset_with_random_return)
    test_ror = test_avg/test_std
    print("+++++")
    print(f"Original Average Return: {avg_return:.2f}
%")
    print(f"Original Standard Deviation:
{std_return:.2f}%")
    print(f"Original Return-on-Risk: {original_ror}")
    print("-----")
    print(f"Test Average Return: {test_avg:.2f}%")
    print(f"Test Standard Deviation: {test_std:.2f}
%")
    print(f"Test Return-on-Risk: {test_ror:.2f}")
```

Creating a Graph With Python

```
import matplotlib.pyplot as plt

plt.figure()
plt.xlabel("")
plt.ylabel("")
plt.show()
```

The Resulting Image

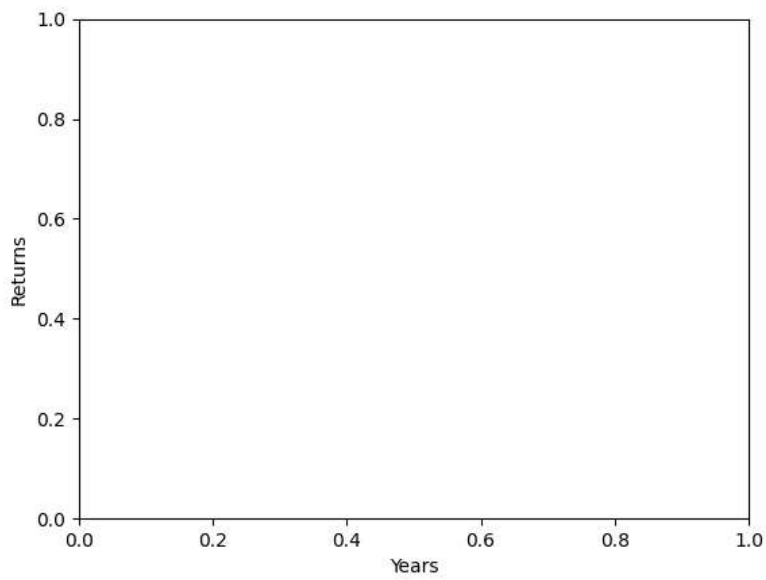


Naming Our Axes

```
import matplotlib.pyplot as plt

plt.figure()
plt.xlabel("Years")
plt.ylabel("Returns")
plt.show()
```

The Resulting Image



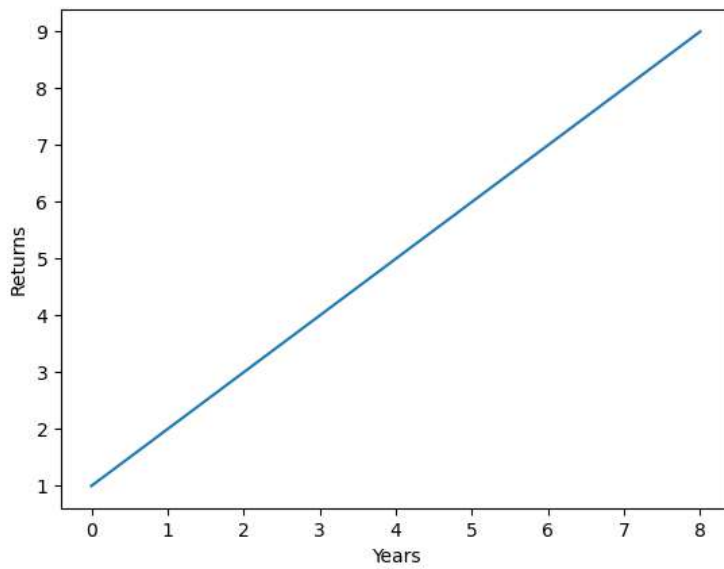
Plotting Your First Line

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data)
plt.show()
```

The Resulting Image



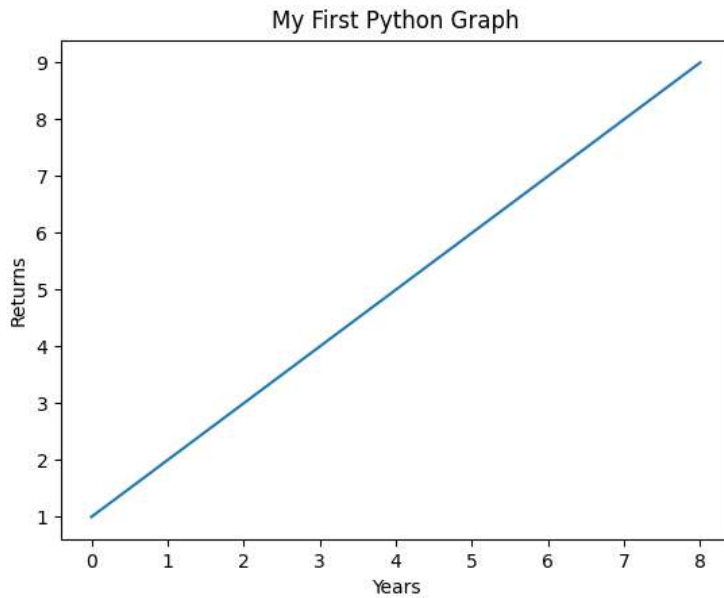
Adding A Title To Our Graph

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data)
plt.show()
```

The Resulting Image



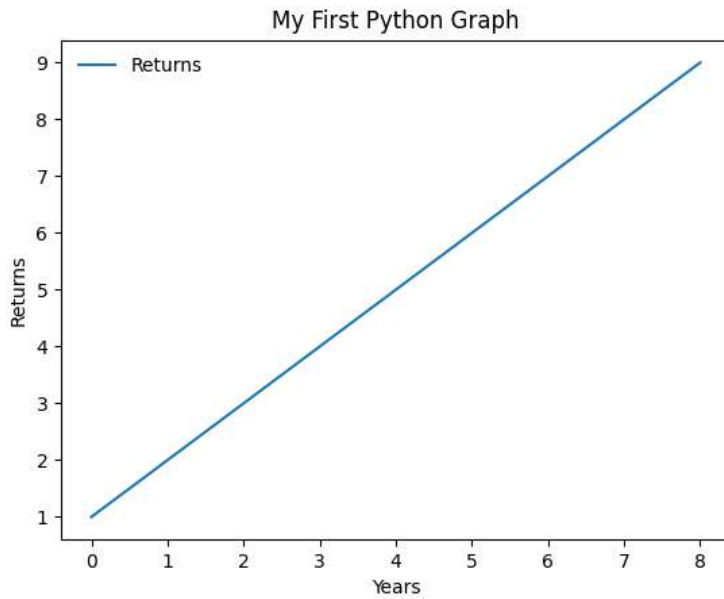
Adding A Legend

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data, label="Returns")
plt.legend()
plt.show()
```

The Resulting Image



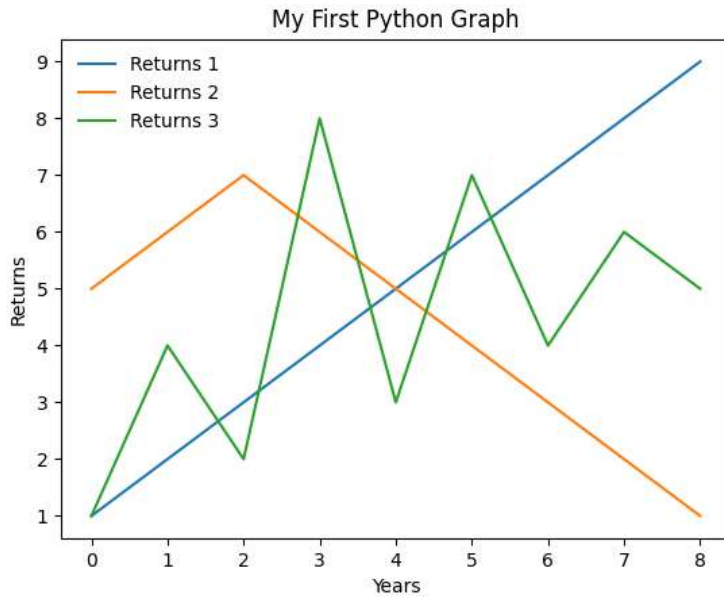
Plotting Multiple Lines

```
import matplotlib.pyplot as plt

data1 = [1,2,3,4,5,6,7,8,9]
data2 = [5,6,7,6,5,4,3,2,1]
data3 = [1,4,2,8,3,7,4,6,5]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.plot(data1,label="Returns 1")
plt.plot(data2,label="Returns 2")
plt.plot(data3,label="Returns 3")
plt.legend()
plt.show()
```

The Resulting Image

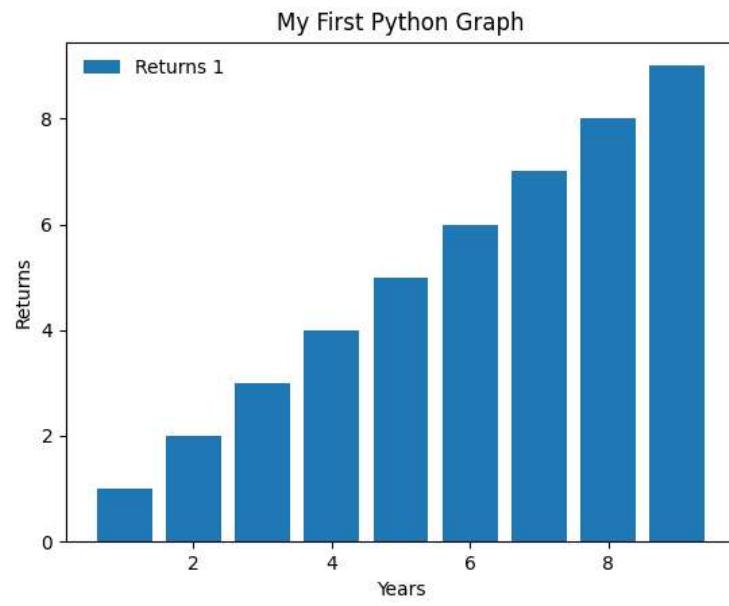
**Plotting a Bar Graph**

```
import matplotlib.pyplot as plt

data = [1,2,3,4,5,6,7,8,9]

plt.figure()
plt.title("My First Python Graph")
plt.xlabel("Years")
plt.ylabel("Returns")
plt.bar(data,height=data,label="Returns 1")
plt.legend()
plt.show()
```

The Resulting Image



Combining Coding Skills

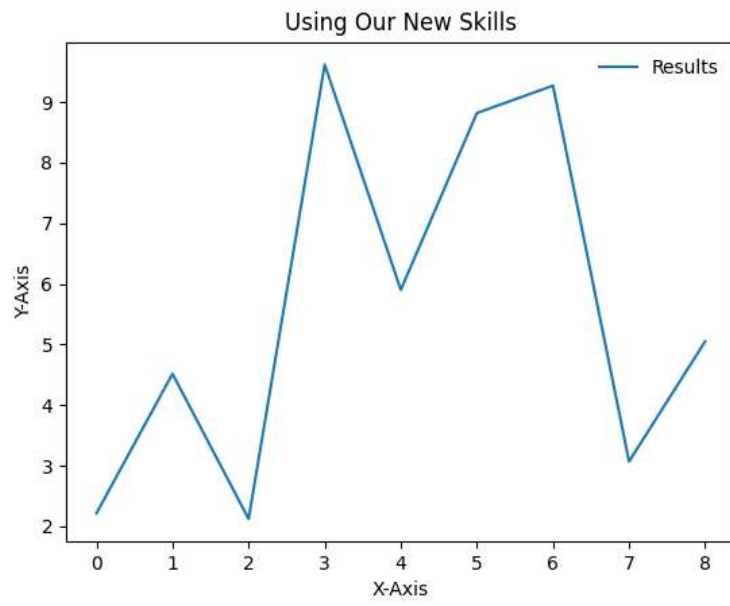
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 9
results = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.legend()
plt.show()
```

The Resulting Image



Simplified Moving Average

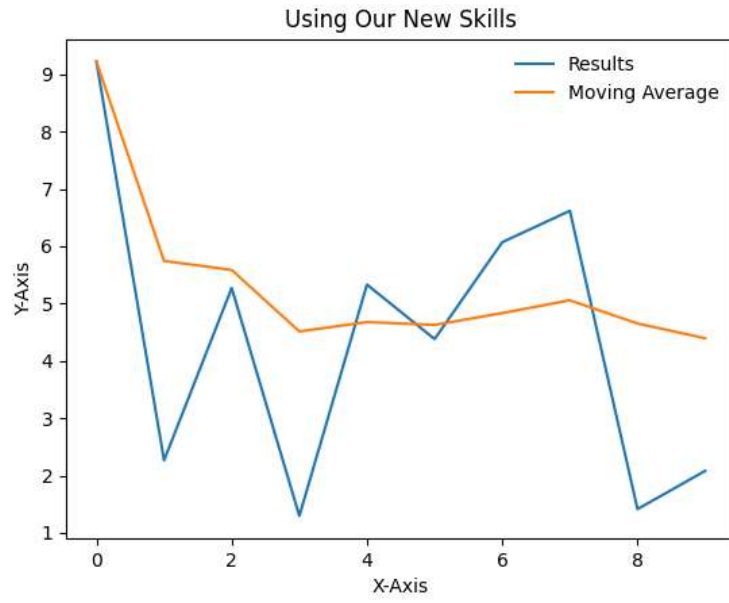
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 10
results = []
moving_avg = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    avg = np.average(results)
    moving_avg.append(avg)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.plot(moving_avg,label="Moving Average")
plt.legend()
plt.show()
```

The Resulting Image



Moving Standard Deviation

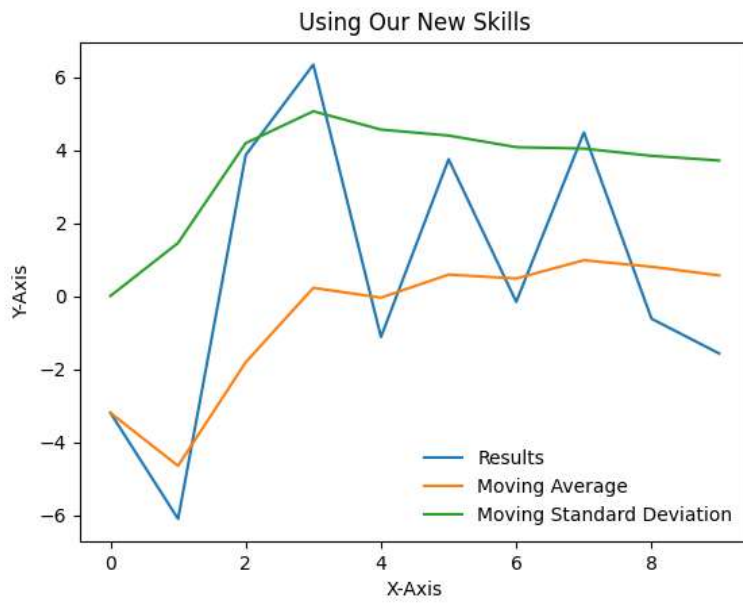
```
import numpy as np
import matplotlib.pyplot as plt

iterations= 10
results = []
moving_avg = []
moving_stdev = []

for i in range(iterations):
    randomizer = np.random.uniform(1,10)
    randomizer2 = np.random.uniform(-
randomizer,randomizer)
    results.append(randomizer2)
    avg = np.average(results)
    std = np.std(results)
    moving_stdev.append(std)
    moving_avg.append(avg)
    print(randomizer)

plt.figure()
plt.title("Using Our New Skills")
plt.xlabel("X-Axis")
plt.ylabel("Y-Axis")
plt.plot(results,label="Results")
plt.plot(moving_avg,label="Moving Average")
plt.plot(moving_stdev,label="Moving Standard
Deviation")
plt.legend()
```

The Resulting Image



Formula References

Expected Value

$$EV = (R * Rp) - (P_1 * P w_1) - (P_2 * P w_2)$$

Linear Equation

$$y = mx + b$$

Monthly Interest

$$Interest = \frac{(Balance * Annual Interest Rate)}{12}$$

Owner's Equity

$$Owner's Equity = Capital Contribution + Net Income - Withdrawals$$

The Accounting Equation

$$Assets = Liabilities + Owner's Equity$$

Standard Deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (X_i - \mu)^2}{N}}$$

Variance

$$\sigma^2 = \frac{\sum_{i=1}^N (X_i - \mu)^2}{N}$$

Covariance

$$\text{cov}(X, Y) = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{N}$$

Correlation Coefficient

$$r = \frac{\sum_{i=1}^N (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^N (X_i - \bar{X})^2 \times \sum_{i=1}^N (Y_i - \bar{Y})^2}}$$

Portfolio Expected Return

$$\text{Expected Return} = \sum_{i=1}^N (\text{AvgReturn } n_i \times \text{Allocation } n_i)$$

Beta

$$\beta = \frac{\text{Cov}(\text{AssetReturns}, \text{MarketReturns})}{\text{Variance of Market Returns}}$$

Alpha

$$\alpha = \text{ActualReturn} - (\text{RiskFreeRate} + \beta(\text{Market Return} - \text{RiskFreeRate}))$$

Earnings Per Share

$$\text{EPS} = \frac{\text{Net Income} - \text{Dividends on Preferred Stock}}{\text{Weighted Average Number of Outstanding Shares}}$$

Weighted Average Number of Shares Outstanding

$$n = \frac{((x \times z) + (y \times z))}{2}$$

Price to Earnings Ratio

$$\text{Price to Earnings Ratio} = \frac{\text{Stock Price}}{\text{Earnings Per Share}}$$

Price to Book Ratio

$$\text{Price to Book Ratio} = \frac{\text{Market Price per Share}}{\text{Book Value per Share}}$$

Book Value Per Share

$$\text{Book Value Per Share} = \frac{(\text{Assets} - \text{Liabilities})}{\text{Shares Outstanding}}$$

Compound Annual Growth Rate

$$\text{CAGR} = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{N}} - 1$$

Discount Cash Flow

$$\text{DCF} = \sum_{i=1}^N \text{Cash Flow} / (1 + \text{Discount Rate})^i$$

Net Present Value of Cash Flows

$$NPVCFs = \sum \text{ of Discounted Cash Flows} - \text{Initial investment}$$

Free Cash Flow

$$\text{Free Cash Flow} = \text{Cash Flow } \uparrow \text{ Operating Activities} - \text{CapEx} \frac{\uparrow}{(1 + \text{Discount } R)}$$

Intrinsic Value (small business)

$$\text{Total Value} = NPVCFs + \text{Tangible Assets} + \text{NonTangible Assets} - \text{Liabilities.}$$

Future Contract Price

$$\text{Future Contract Price} = \text{Tick Value} \times \text{Number of Units}$$

Contribution Margin

$$\text{Contribution Margin} = \text{Revenue} - \text{Variable Costs}$$

Contribution Margin Percentage

$$\text{Contribution Margin \%} = \frac{\text{Contribution Margin}}{\text{Revenue}}$$

Percent of Total Revenue

$$\% \text{ of Total Revenue} = \frac{\text{Product Revenue}}{\text{Total Revenue}}$$

Adjusting for Inflation: The Hard Way

$$\text{Difference} = \text{New Value} - \text{Old Value}$$

$$\text{Percent Increase (decimal)} = \frac{\text{Difference}}{\text{Old Value}}$$

$$AP = (CP \times \text{Percent Increase (decimal)}) + CP$$

Adjusting for Inflation: The Easy Way

$$\text{Adjusted Price} = \frac{\text{Current Price}}{\text{Old Index Value}} \times \text{New Index Value}$$

Portfolio Standard Deviation (Two Assets)

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2}$$

Portfolio Standard Deviation (Four Assets)

$$\sigma_p = \sqrt{\begin{aligned} &w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + w_4^2 \sigma_4^2 \\ &+ 2 w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2 + 2 w_1 w_3 \rho_{1,3} \sigma_1 \sigma_3 \\ &+ 2 w_1 w_4 \rho_{1,4} \sigma_1 \sigma_4 + 2 w_2 w_3 \rho_{2,3} \sigma_2 \sigma_3 \\ &+ 2 w_2 w_4 \rho_{2,4} \sigma_2 \sigma_4 + 2 w_3 w_4 \rho_{3,4} \sigma_3 \sigma_4 \end{aligned}}$$

Return-on-Risk

$$\text{Return on Risk} = \frac{\text{Return}}{\text{Risk}}$$

Glossary of Important Terms

Acumen – Keeness and depth of perception, discernment, or discrimination, especially in practical matters related to business and finance. It involves the ability to make sound judgments, strategic decisions, and insightful evaluations based on a profound understanding of market dynamics, financial principles, and the complexities inherent in business environments. Business and financial acumen encompass a blend of knowledge, analytical skills, and practical wisdom, enabling individuals to navigate challenges, identify opportunities, and contribute to the effective management and success of enterprises.

Actual Return – The realized or factual gain or loss on an investment, expressed as a percentage or absolute value, taking into account all relevant factors, including capital appreciation or depreciation, income generated (such as dividends or interest), and associated costs or fees.

Annuity – A numerical value used in financial calculations to determine the present value of a series of equal cash flows over a specific period, typically at a constant interest rate.

Alpha – A measure of an investment's performance relative to a benchmark, such as an index.

Arbitrage – The practice of exploiting price differences for the same asset in different markets.

Associated – The connection or relationship between words, phrases, or concepts based on their co-occurrence or semantic relevance within a given context.

Beta – Beta is a measure of a financial asset's volatility in relation to the market as a whole. It quantifies the asset's sensitivity to market movements, especially in comparison to a benchmark index.

Compound Interest – Interest calculated on the initial principal and also on the accumulated interest from previous periods.

Correlation – A quantitative measure of the degree to which two variables exhibit a linear relationship.

Covariance – A statistical metric that quantifies the degree of simultaneous variation between two variables.

Coupon Rate – The fixed annual interest rate expressed as a percentage of the face value of a bond.

Depreciation – The accounting method used to allocate the cost of a tangible asset over its useful life.

Disassociated – The lack of connection or relationship between words, phrases, or concepts. When elements are disassociated, there is a minimal or no observed correlation or semantic relevance between them within a given context.

Diversification – A risk management strategy that involves spreading investments across different assets or types of investments to reduce overall risk.

Dividend Yield – A financial ratio that expresses the annual dividend income of an investment as a percentage of its current market price per share. It provides insight into the income generated by an investment relative to its market value.

Equity – Ownership interest in a company, representing a claim on the company's assets and earnings.

Expected Return – The anticipated gain or loss on an investment, calculated based on the probability-weighted average of all possible returns.

Hedging – A risk management strategy that involves taking offsetting positions to reduce or mitigate the potential losses from adverse price movements in financial instruments.

Indexing – ¹Refers to the practice of adjusting rent or other expenses based on changes in a specific economic indicator, such as the Consumer Price Index (CPI). ²An investment strategy that involves tracking and replicating the performance of a specific market index, such as the S&P 500.

Leverage – Using borrowed capital or financial instruments to amplify the potential return of an investment. It magnifies both gains and losses, and it is commonly used in financial transactions to increase the size of investment positions.

Liquidity Ratio – A financial metric that assesses a company's ability to meet its short-term obligations with its most liquid assets.

Liquidity – The degree to which an asset or security can be quickly bought or sold in the market without affecting its price.

Market Capitalization (Market Cap) – The total value of a company's outstanding shares of stock, calculated by multiplying the share price by the number of shares.

Net Present Value (NPV) – A financial metric that calculates the present value of an investment's expected cash inflows and outflows, discounted at a specific rate.

Opportunity Cost – The potential value of the next best alternative forgone when a decision is made.

Perpetuity – ¹Refers to a financial instrument or a series of cash flows that continues indefinitely. It has no fixed maturity date. The value of a perpetuity is often calculated as a constant annual cash flow divided by a discount rate. ²In business context, refers to a series of cash flow that will continue indefinitely.

Portfolio Standard Deviation – A measure of the overall risk or volatility of a portfolio of investments.

P/E Ratio (Price-to-Earnings Ratio) – A financial metric that compares a company's current stock price to its earnings per share (EPS).

P/B Ratio (Price-to-Book Ratio) – A financial metric that compares a company's market value (its stock price) to its book value (total assets minus total liabilities).

Quantitative Easing – A monetary policy tool used by central banks to stimulate the economy by purchasing financial assets, typically government bonds, from the market. This is done to encourage lending.

Reframing - A cognitive strategy that involves changing the way an issue or situation is presented or perceived.

Return on Risk – A financial metric that evaluates the efficiency of an investment by measuring the return generated relative to the level of risk undertaken. It is calculated by dividing the expected return on an investment by its associated risk, providing insight into the risk-adjusted performance.

Securities Exchange Commission (SEC) – A U.S. government agency responsible for regulating and overseeing the securities industry, including securities exchanges, securities brokers and dealers, investment advisors, and mutual funds.

Standard Deviation – A statistical measure of the amount of variation or dispersion in a set of values.

Strategy – A plan of action designed to achieve specific goals or objectives.

Variance – A statistical measure that quantifies the degree of spread or dispersion of a set of values around their mean.

Yield – The income generated by an investment, typically expressed as a percentage of its market value. It can take various forms, such as interest on bonds, dividends on stocks, or rental income from real estate.

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