

---

# Improving Performance and Risk: An Actionable Guide For the Rest of Us

---

A Brief Non-Math Guide to Quant Techniques for Efficient Investing - Part A\*

Ashish Gupta, PhD

---



\* Live Insights coming soon at [StockQuanta.com](https://StockQuanta.com) / [CoinQuanta.com](https://CoinQuanta.com)

## A High Level View

|                                                    |    |
|----------------------------------------------------|----|
| Power of Quantitative Finance for Your Investments | 4  |
| What is Performance and Returns?                   | 5  |
| Understanding and Measuring Risk                   | 8  |
| An Intuitive Way of Looking At Volatility          | 12 |
| How the Experts Do It: Balancing Reward with Risk  | 14 |
| Putting it all together                            | 18 |

## Mission Statement

---

To democratize Wall Street Investment Technology for mainstream investors and make it super-affordable. So that all mainstream investors can benefit, not just Wall Street Professionals.

## About the Author

---

StockQuanta and CoinQuanta's creator **Ashish Gupta** was a Senior Data Scientist at Google for 6 years for their multi-Billion dollar Conversion Optimization business. He also worked at D.E.Shaw, one of the premier quantitative hedge funds on Wall Street. On both of these fronts, he has been deeply involved with insightful ways of looking at measuring and improving performance in many complex ways for large systems.

He also has a unique experience of witnessing both sides of the investing world: DIY investing as well as professional Wall Street investing, working with a successful quantitative group having billions of dollars under management. His goal is simple: to make this quantitative science available to investors while keeping things simple and useful.

## Why this book?

---

The mainstream investment community uses little to none of the Nobel Prize winning techniques<sup>1</sup> that are a daily occurrence in Wall Street. **These techniques help quantify and manage key issues every investor should care about: Performance Discovery, Risk Reduction and Objective Diversification.**

In the end, it creates an asymmetry for different investors to benefit from innovation and the wealth it creates for the society. Our goal is to also help reduce this expertise gap. This initial version of our essential guide bridges that gap while remaining accessible and practical. If you're a member at StockQuanta, you will receive all subsequent updates.<sup>2</sup>

---

<sup>1</sup> See [Resource 1](#), [Resource 2](#)

<sup>2</sup> I'm also the creator of [StockQuanta.com](#) / [CoinQuanta.com](#), our mission being making these quantitative techniques actionable and accessible to all investors regardless of their sophistication.

# Power of Quantitative Finance for Your Investments

This short guide explains the powerful science of Quantitative Finance in layman terms so that you as an investor can immediately benefit for your own investing. We only cover important and introductory concepts. But even a good understanding of these can change the way you look and evaluate investments, your portfolio for improving Performance, Risk and Diversification.

Both Views and Facts have a place in investing. People invest for different reasons, but we can agree that we do want to make more money, and **in a more predictable manner**, not pure luck. Another thing we all want is to **not lose a lot of money** while trying to engage in this mission. This whole idea has been studied in depth by the field of Quantitative Finance.

Quantitative Finance refers to a huge field prevalent in Wall Street for decades that somehow has been mostly inaccessible for most investors. While Wall Street spends billions of dollars to build systems and expertise that uses Noble Prize winning research to invest and manage their performance and risk, **most of us are left at the mercy of hype and news from TV and Media**. Or many savvy investors use Technical Analysis or Fundamental Analysis to create a forward looking view for themselves and invest based on that.

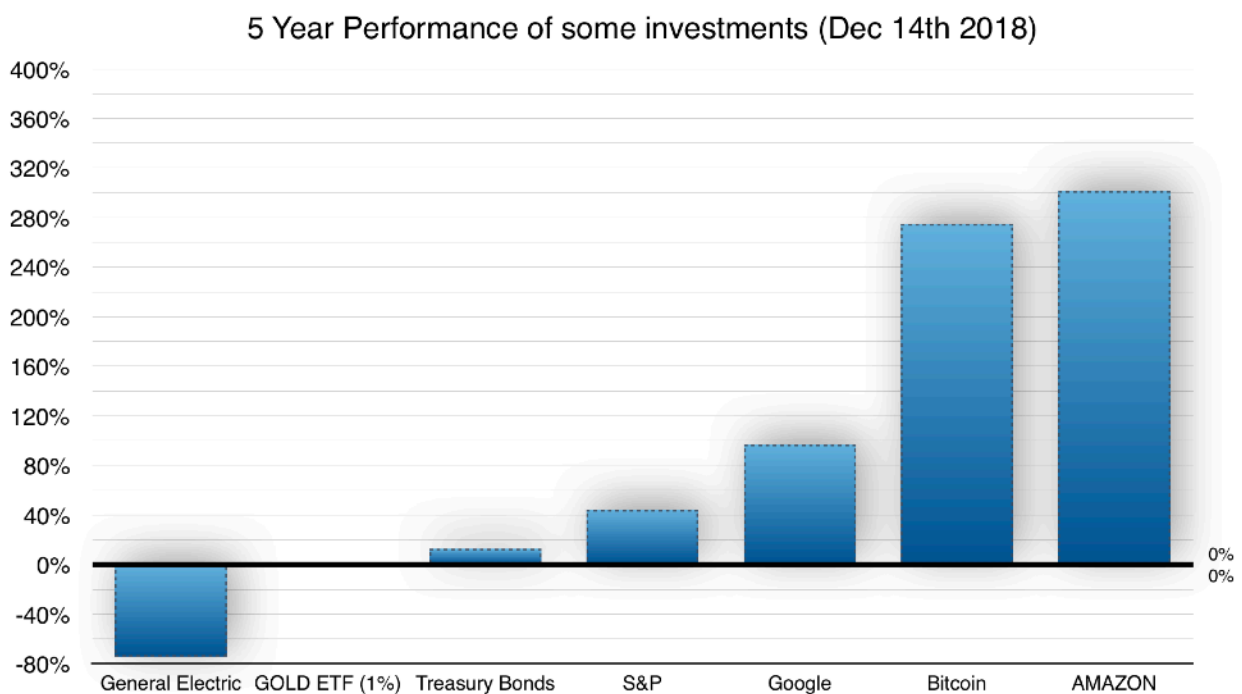
Quantitative Finance provides a concrete way of looking at **Performance, Risk and Diversification**. It can sit on top of any investing style that you prefer and save you from making many mistakes + increase the likelihood of healthy performance. Most investors outside Wall Street just look at raw performance (Up by X% or down by Y%!), and don't know how to manage or even measure risk + diversification. Even with a good set of hypotheses, this can result in pretty random performance.

For you the investor, you don't need to understand the math to benefit from the insights. Just like many of us drive cars without fully knowing how the internals work, we can benefit from the insights of Quantitative Finance without knowing statistics or advanced math. Surprisingly, most of expertise associated with Quantitative Finance is highly concentrated. This book (and associated ventures) brings important essentials from this field to everyone.

# What is Performance and Returns?

The rawest measure (but flawed as we shall see later) of performance is the percentage difference between the latest price and a historical price. Since everyone understands this, we won't cover this in more detail in isolation. However, the key thing to note is that this is just one available measure that most investors succumb to since it's the simplest. But simplest doesn't always mean the best.

Here is an example performance chart of some stocks, treasury bonds, Gold and Bitcoin over the last 5 years (from Dec 2018). One may note that some assets like Bitcoin or Amazon provided extremely high performance. Even then, investors don't pour all their money into these assets relative to other investments (assuming we can't predict future performance for other stocks too). Why is that the case? This is where Risk (due to many factors) obviously comes in, as we will discuss later.



# Returns

Return is an important concept to understand Risk and other important concepts. This is a common term used to denote the performance of a particular time period. For example daily return means the change in price over the previous day. We can combine multiple such returns over a time period to get the final return or performance.

The example below shows performance over time if we get 10% returns per year: we will go from \$100 to \$177.5 over 7 years, due to compound interest. (instead of  $7 * 10\% = +\$70$ )



Daily Returns are commonly used to denote returns day over day. When we accumulate all of them, we can get a series of returns. For example we can denote a week's worth of returns as  $[+1\%, -2\%, 1.3\%, 1.5\%, -2.1\%, -0.5\%, 0.8\%]$ .

There is hard to detect a pattern in most such series and there is a sense of “uncertainty” about the nature of returns. This leads to our next concept.

# Understanding and Measuring Risk

We all have an intuitive idea of what risk means: we associate risk with loss. Another way of looking at Risk is the amount of uncertainty of future returns, which we can get some idea of from the past returns. Casinos pose a very high risk for most since the odds of winning can be highly random. Investing in a Savings Account is low risk (close to zero) because the return is guaranteed and backed by institutions in a stable country.

Interestingly, this uncertainty can be expressed using the field of statistics using concepts like **Volatility**. **Volatility refers to the bumpiness or fluctuations in returns**. It is also termed as Standard Deviation of Returns if you are familiar with High School statistics. It is a basic measure of risk, which while not perfect, can still give us a good relative sense of risk for different investments.

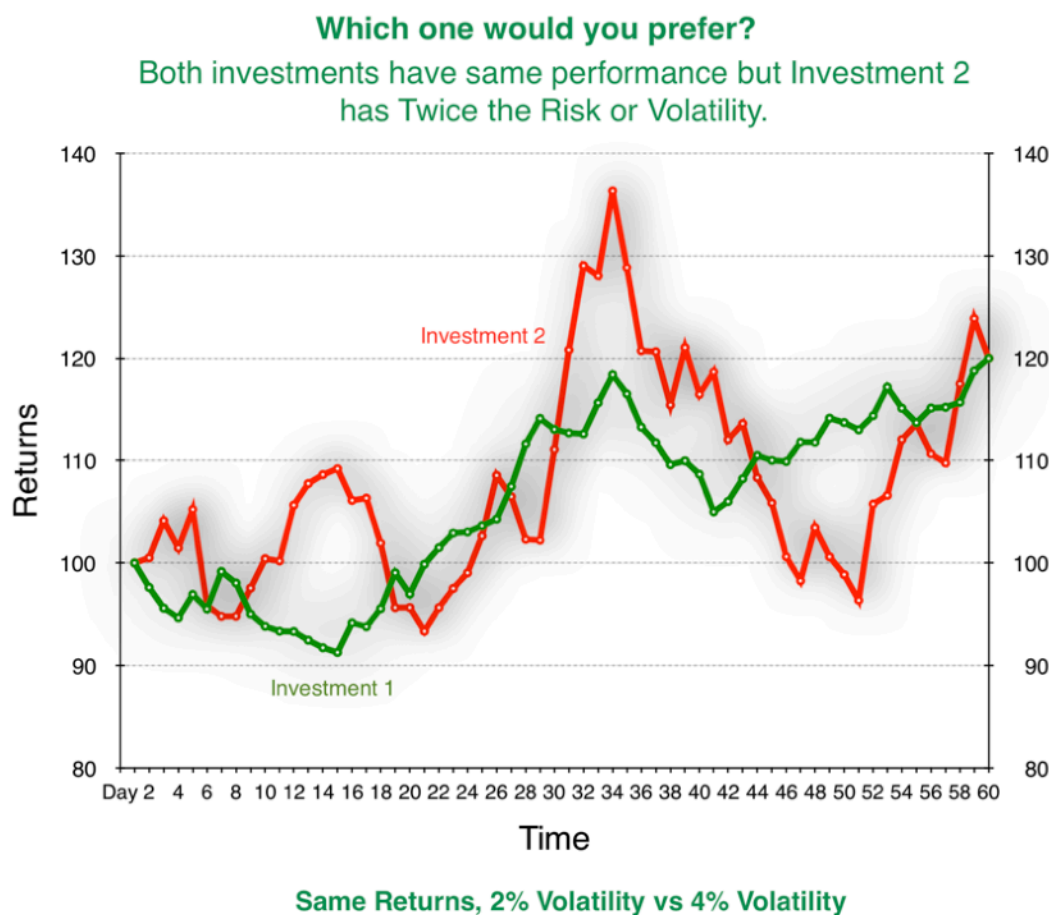
In general, higher the volatility, more the fluctuation or uncertainty in returns. Investors should prefer lower volatility to higher volatility, unless the performance is exceedingly high for the more volatile asset which we illustrate in the next Chapter.

## Example

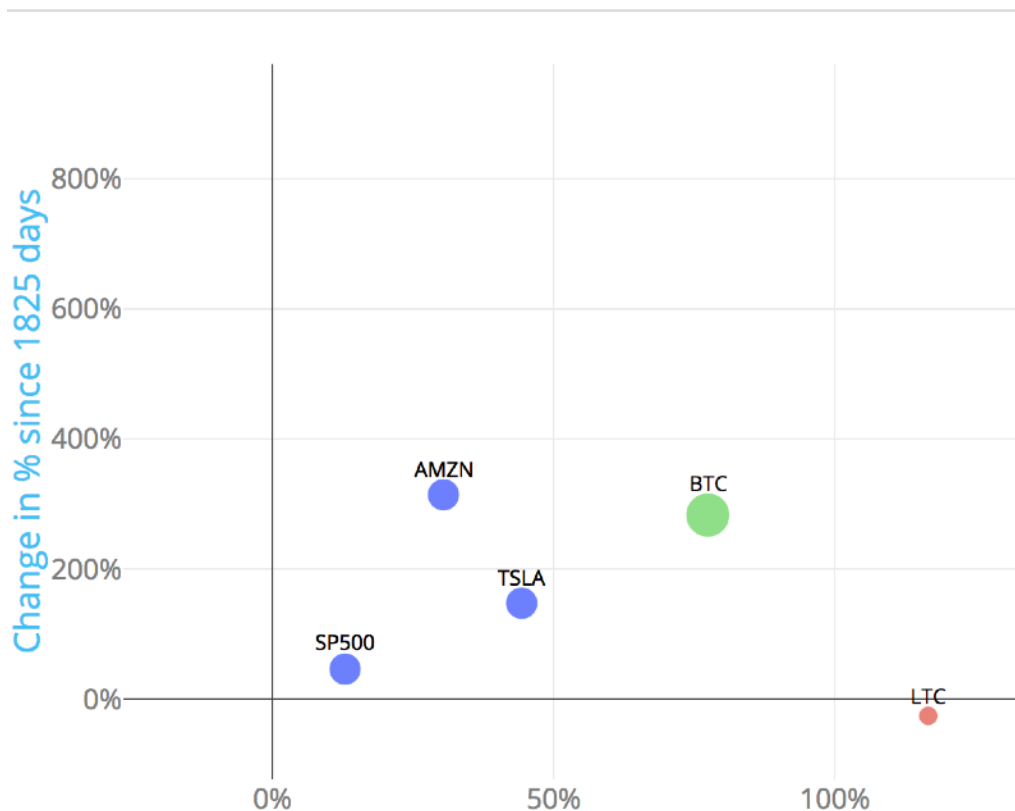
The following example shows two investments that have exactly the same performance, but very different returns and volatility. Note that this is possible: for the same performance, we can have an endless number of return combinations. Think about the implications of that. Many investors don't.

If you look at the price evolution and its bumpiness, **Investment 2** is much more volatile than **Investment 1** (in fact, twice as much, though that can't be readily seen from a chart). In general, investors would prefer Investment 1 if you only want to invest in one. But there is room for both investments as long

as we allocate our money accordingly. One approach to invest is to balance allocation according to risk and performance. In this case, since **Investment 2** has twice the volatility but same performance, one may choose to allocate half the amount as in **Investment 1** as a rough heuristic. This is a starting point. However other factors can come into play including your fundamental views and reward/risk profiles which we will discuss in the next Chapter.



Volatility is one of the most important concepts you can understand in investing. You don't need to understand how it is computed, but an intuitive sense of volatility can help you look at different investments in a new way. To further cement this highly useful risk measurement, the chart and table below shows example volatilities of different investments over the last 5 years year.



Volatility of different assets varies wildly. (over 5 years, on Dec 14, 2018)

| Investment                | Volatility |
|---------------------------|------------|
| S&P 500                   | 12.9%      |
| Amazon                    | 30.4%      |
| Tesla                     | 44.3%      |
| Bitcoin (Cryptocurrency)  | 77%        |
| Litecoin (Cryptocurrency) | 116%       |

Volatility of different assets varies wildly. (over 5 years, on Dec 14, 2018)

As you can see, volatilities can vary widely, indicating how much uncertainty varies for different assets and across asset types. They can even go above 100%. In fact there is no upper limit to Volatility though it can never be infinity.

Cryptocurrencies show remarkably higher levels of volatilities compared to stocks - which follows public intuition. We recommend that you memorize some of these volatilities, so you have a frame of reference in mind when you look at volatilities of different assets for your investing. S&P's long term average volatility is especially useful when comparing all the other assets. During the 2008 financial crisis, this volatility reached up to 43%.<sup>3</sup>

How can you get a better sense of volatility that is intuitive and easy to remember? Next chapter is devoted to that.

---

<sup>3</sup> [Research Report \(PDF\)](#)

# An Intuitive Way of Looking At Volatility

We spent a fair bit of time looking at **Volatility** since it underlies so much of our understanding of Risk. It's a basic measure of risk in Wall Street, yet in the mainstream, it is often completely missed. One reason we think is the cause is that it is not readily computed by most investors in their head. Which is a shame, because it can be calculated by computers easily. This section gives an intuitive understanding, so it doesn't feel arcane and becomes a standard part of your investing toolkit and vocabulary.

Let's say an investment returns 5% on average per year. Does it mean it always returns 5% per year? That's not necessarily true. Sometimes it may return 3%, other years it may return 7%, and so on so that its average turns out to be 5%.

**This fluctuation around the average is the Volatility.** An annual volatility of 40% can be seen as returns varying by as much as 40% year over year (as a rough estimate, since actual math varies). If one year, an investment returns 5%, the next year it may return 3% (a difference of 40%), another year 7% and so on. Note that this is approximate, and in reality the returns can go beyond this in either direction.



Volatility of 40% can indicate returns vary by 2% in either direction (If the average return is 5%). This is a highly likely estimate and returns can also vary more, so be careful.

So when we say volatility is X%, an intuitive way of taking this information is that the return per year can vary by X% from the normal or average return year over year. This is a rough way of looking at it.

Bitcoin has a long term volatility of around 80% so far (when measured over 5 years). This means the year to year returns can vary by 80%! This is something that is borne out by the recent market movements in late 2018 as Bitcoin's value has literally crashed by 80% since the beginning of the year!

**Volatility is most useful when comparing different investments.** This can help you decide if you want to allocate less money to more volatile investment depending on the difference. In fact, a **Risk Balanced Approach** (that isn't dictated by greed but more balanced returns) calls for balancing your investments based on their perceived risk. Volatility is not a perfect measure (we will see more later), but it's a great risk measure to always look at and inform your decisions. It can help you find lower volatility investments or allocate money differently if you have already made up your mind about what to invest in.

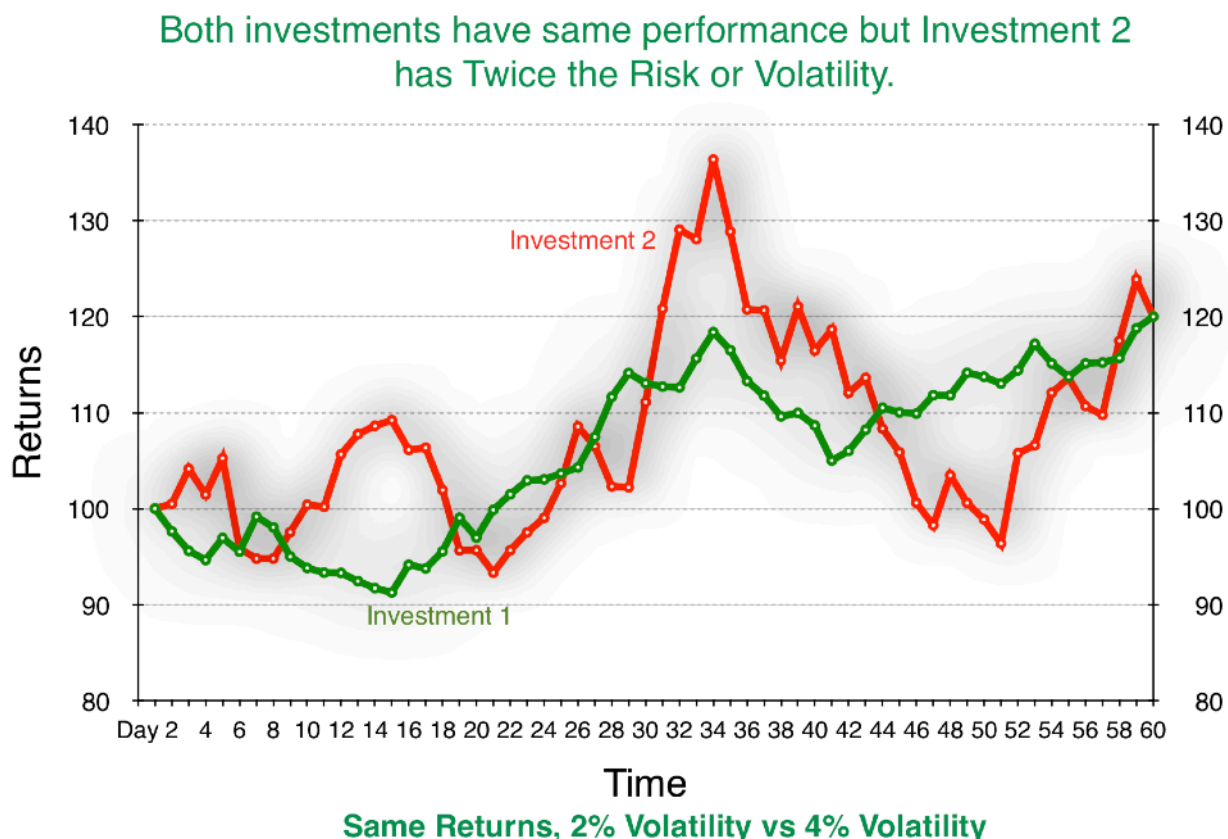
# How the Experts Do It: Balancing Reward with Risk

Every investor should aim for good performance or reward, with low risk. How can we combine these two goals in one number? Reward/Risk does exactly that. By putting Reward on the top and Risk (measured by volatility) at the bottom, it combines them in one number. **A high reward/risk is a good goal for any investor.**

Since volatility or Risk is at the bottom of Reward/Risk, a lower volatility leads to higher Reward/Risk. Similarly, a higher performance leads to higher Reward/Risk.

## Example 1

In the following example (which we also discussed in the Chapter on Risk), both investments have the same performance over 60 days. However, their volatility differs by 2x. **In this case, Investment 1's Reward/Risk is about twice that of Investment 2, which follows intuition. Most**



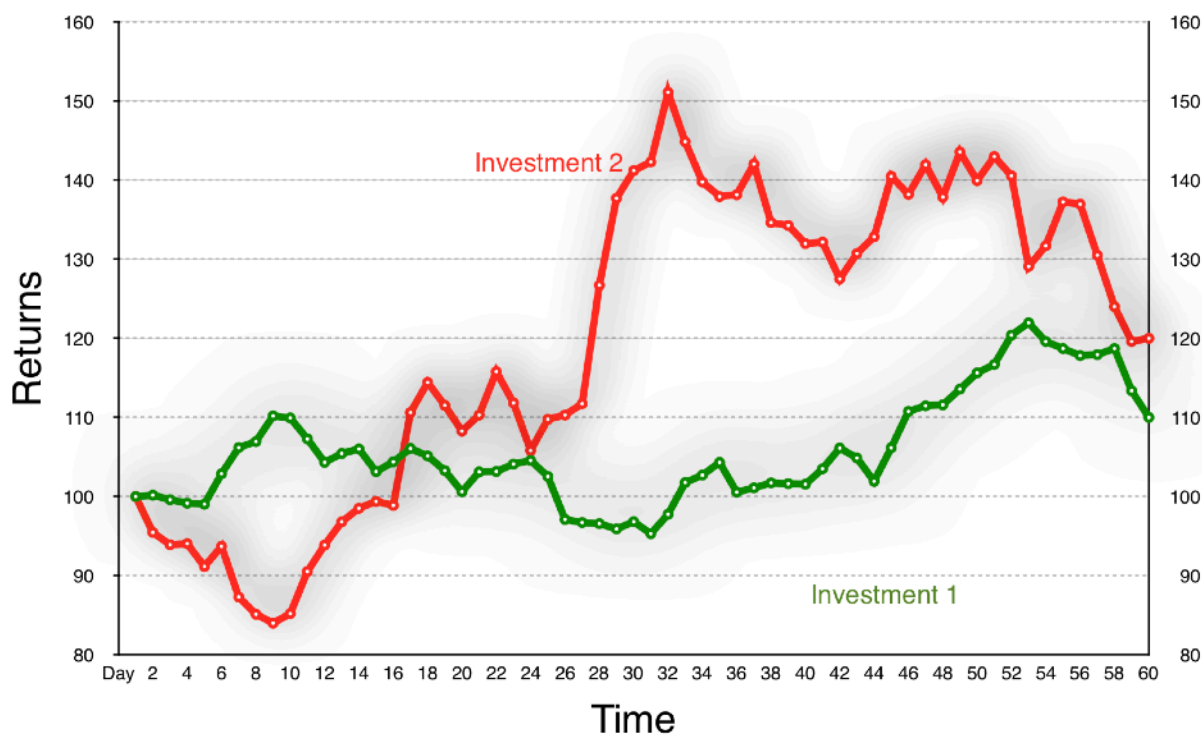
**investors completely miss this part if they only look at performance.** However, as seen here, their Reward/Risk is very different!

In fact, Reward/Risk is standard vocabulary on Wall Street. Another term for it is the **Sharpe Ratio**. It is not perfect, but vastly better than just looking at raw performance which has zero information about Risk!

## Example 2

The illustration below shows an example of two investments where Investment 2 has twice the performance of Investment 1 (20% vs 10% returns over 60 days). However Investment 2 is also twice as volatile. So in the end they offer the same reward/risk!.

Reward/Risk is the same even if  
Investment 2 offers twice the returns.



20% vs 10% Returns, Same Reward/Risk

**This illustrates how investors can be at a severe disadvantage by only looking at performance but not the reward/risk profile.** Greed can dictate Investment 2 as the one to go for, while a Reward/Risk ratio gives you a fair way of looking at performance that takes a basic definition of Risk into account (Volatility).

Just a simple change of looking at Reward/Risk rather than raw performance can change the way you invest tremendously. This can help you find new good investments that otherwise might fly under the radar, or evaluate if the risk is worth it for investments in your own portfolio. If high volatility investments (from the last Chapter), don't offer high enough Reward/Risk compared to other investments, your decisions might tilt.

### **Sample List of Reward/Risk**

The following tables show the Reward/Risk of multiple assets, along with their raw performance (for 5 years). **A striking result here is that the reward/risk of different assets can be quite different than their performance.**

For example, Bitcoin returned vastly more than S&P 500. But S&P 500 still has a Reward/Risk of almost twice! This illustrates how different performance becomes when looking at Reward/Risk and not just performance. It can protect any investor from a lot of greed driven decisions and allocate their money appropriately.

| Investment               | Raw Performance | Reward/Risk |
|--------------------------|-----------------|-------------|
| S&P 500                  | 46.4%           | 0.59        |
| Tesla                    | 147.7%          | 0.41        |
| Amazon                   | 314.3%          | 0.94        |
| Bitcoin (Cryptocurrency) | 283.2%          | 0.34        |
| Ripple (Cryptocurrency)  | 909% (!)        | 0.31        |

Raw Performance compared to Reward/Risk for wildly varying assets.  
(over 5 years, on Dec 14, 2018)

### ***A note on duration***

In general, Reward/Risk ratios of greater than 1.0 are rare, as seen above. A reward/risk ratio of 1.0 can very roughly be construed as earning \$1 for every dollar put at risk. One should prefer Reward/Risk ratios computed over the medium to long term (3 months to last 10 years) rather than short term, as they tend to be unreliable. For example, looking at Reward/Risk for one week is not useful given how varied one week can be over the next. However, as time expands, reward/risk becomes more representative of the investment.

### ***A note on math***

Note that the Reward/Risk ratio isn't simply the final performance divided by the volatility. The actual math is a bit nuanced, and we skip that from this book.<sup>4</sup> However don't make the mistake of computing it yourself by simply dividing final returns by volatility. Always trust a properly computed source like [StockQuanta.com](http://StockQuanta.com) or [CoinQuanta.com](http://CoinQuanta.com).

---

<sup>4</sup> See this [Resource](#) for those who are inclined towards more details (PDF)

# Putting it all together

Part A provides an easy to understand exploration of a common measure of Risk and the idea of Reward/Risk. This is the gateway for looking at Performance and Risk in a new light. Note that this isn't everything, and Part B<sup>5</sup> will go into more detail about some more important concepts about risk and objective diversification.

Some key takeaways are:

1. **Changing the way you look at investments day to day:** Investors can start looking at these measures when exploring the stock market or their portfolio, not just raw performance. Being aware of the return uncertainty (Volatility) and Reward/Risk can help you see all investments in a new light. Sadly, since these aren't computed using *back of the envelope* calculations, it can be hard to compare performance, risk and reward/risk easily across a large number of investments in a straight-forward and quick manner. <sup>6</sup>
2. **Using a Risk Balanced Approach, not a Risk-Blind Approach:** This **recent article** by Charles Schwab highlights an important fact - paying careful attention to volatility can reduce losses and boost returns. When you see an Investment A giving very high raw returns over a certain period it can attract media attention and hype. Most media has no grasp of risk either. It can be alluring to put a lot of capital in it. However, a Risk Balanced Approach involves allocating your money based on its Risk and Reward/Risk attributes, not just raw performance. <sup>7</sup>

This can save you from making some serious mistakes. **Not understanding this has resulted in many folks invest their entire**

---

<sup>5</sup> Due for release in January 2019.

<sup>6</sup> See the next section and the whole reason behind StockQuanta/CoinQuanta.

<sup>7</sup> Plus two more important attributes: Crash Risk and Diversification, to be covered in the complete version.

**wealth in cryptocurrencies or very risky stocks, and end up losing most of it!**<sup>8</sup> While it's certainly okay to invest or speculate in new forms of investments as you choose, an objective grasp of risk can lead to very different and responsible allocations of your wealth.

I'll be adding some custom results in the coming editions that highlight this fact using many more case studies. This consideration works for any style of investing.

3. **New Investments:** Looking at Reward/Risk and Risk is a more sober way of searching for new and trending investments over short or long term within your preferred segment of investments (e.g. technology or agriculture). Chasing raw performance is always a dangerous game and combining a sober performance/risk approach with a fundamental sense acts a solid platform for investing.
4. **Your Existing portfolio:** It's common for investors to not be aware of the risk exposure they have. Just because a company is well known or has been around for a while doesn't mean it's safe or less volatile. It's common to expose oneself to very high potential losses. Looking at Risk and Reward/Risk can help you re-allocate your money wisely.

The point isn't to not take risk, but to be aware of it. There is hardly any investing without taking risk but not managing it can sometimes quickly turn into a milder or full blown form of gambling.

The full version of this book will include some more important recommendations pertaining to avoiding high losses (called Crash or Tail Risk) and ensuring Diversification using simple and objective means.

---

<sup>8</sup> See [Article](#), [Article 2](#), [Article 3](#), [Article 4](#) (Tesla), [Article 5](#) for risk-blind investing examples.

## Appendix: About [StockQuanta.com](https://stockquanta.com)

**StockQuanta** is a computational and data science platform to make sense of the market that provides all the benefits of Quantitative Techniques that Wall Street uses on a daily basis. Market is a huge space to explore - 1000s of investments with a lot of varying characteristics. At least from the purely quantitative angle, the variation in performance, risk and their diversifying contribution is huge. With so much going on, investors can't be blamed for sticking to any biases. It's almost impossible to research any of this in a sane manner.

StockQuanta cuts down the noise and clutter and helps investors quickly identify strong performance, lower risk and good diversification, among different segments of their choice. It overlays over your investment style and provides an additional lens. It's not a replacement but an important and complementary view of the entire market or any set of existing investments.

One of the goals is to also make Important Wall Street quantitative concepts quick, simple to use and actionable. These are important issues - most investors don't have the patience to spend hours creating their own spreadsheets to aid their investing.

## Appendix: About The Full Version

The complete version of the guide will be available by end of December 2018. While Part A provides an important and a non-math introduction to risk and risk aware performance that you can already use in your investing, the full book will go further continue this same theme and explain three important concepts to round up everything provided by [StockQuanta.com](http://StockQuanta.com) and [CoinQuanta.com](http://CoinQuanta.com):

### 1. Market Crash Risk

How investors can lose a LOT of money when they ignore this.

### 2. Understanding Diversification and Correlation

Just having multiple investments doesn't mean diversification.

### 3. A Risk Balanced Approach to Investing:

How looking at only raw measures of performance can bias your portfolios towards higher risk and potential losses and what to do about it.

If you're a member of [StockQuanta.com](http://StockQuanta.com), you will be informed of its release.

## Appendix: About the Author

The author has been a math and computer science geek since a very early age. He started his finance journey after joining the acclaimed hedge fund D.E.Shaw soon after he graduated with a PhD in Computer Science from Northwestern University. He was also a senior Tech Lead and Data Scientist at Google for their multi-billion dollar Conversion Optimization platform. On both of these fronts, he has been deeply involved with devising new ways of measuring and improving performance in many complex ways for large systems.

He also has a unique experience of witnessing both sides of the investing world: DIY investing as well as professional Wall Street investing, having worked with a successful quantitative group having billions of dollars under management. He has also spent a lot of time with personal investing in many different kinds of asset classes (stocks, ETFs, passive, angel, real estate, options, volatility and many others). Being keenly aware of the differences in ways both sides manage and invest their money, he is often surprised by the lack of more sophisticated science and techniques by the mainstream (even the more savvy ones) investors. His goal is to make this quantitative science available to investors while keeping things simple and useful. Just like you don't need to know internals of a car to drive, you can benefit from all the amazing Nobel Prize winning concepts, without having a PhD in Math or Finance.

You can reach the author at [ash@stockquanta.com](mailto:ash@stockquanta.com)

## Disclaimer

### NO FINANCIAL ADVICE

The entire contents of this book, as well as any associated websites (media), are provided for educational, informational, and entertainment purposes only. We (the author, editors and publishers) are not securities brokers/dealers and we are not financial advisers, analysts or planners. We are neither licensed nor qualified to provide investment advice. The information contained within this book is not an offer to buy or sell securities. Nothing within these pages or on associated websites takes into account the particular investment objectives, financial situations, or needs of individuals, therefore should not be construed as a personal recommendation. WE ARE NOT SOLICITING ANY ACTION.

**DO YOUR OWN DUE DILIGENCE** The information provided is not intended as a complete source of information on any particular company, investment, asset or market. An individual should never make investment decisions based solely on information contained within our book or associated media (or any book or website, for that matter). Readers should assume that **ALL INFORMATION PROVIDED REGARDING COMPANIES, INVESTMENTS, ASSETS OR MARKETS IS NOT TRUSTWORTHY UNLESS VERIFIED BY THEIR OWN INDEPENDENT RESEARCH.**

### INVESTING IN SECURITIES IS HIGH RISK

Any individual who chooses to invest in any securities should do so with caution. Investing in securities is speculative and carries a high degree of risk; you may lose some or all of the money that is invested, and if you engage in margin transactions your loss may exceed the amount invested. Before acting on any analysis, advice, trade triggers or recommendations, investors should consider whether the

### PAST PERFORMANCE NO GUARANTEE

Trading results can never be guaranteed. You should be suspicious of anyone who promises you guaranteed results. The information provided in this book and associated media regarding the past performance of any security or strategy is only representative of historical conditions in the marketplace, and is not to be construed as a guarantee that such conditions will exist in the future or that such performance will be achieved in the future. The price and value of investments referred to in this book and associated media, and the income from them may go down as well as up, and investors may realize losses on any investments. Past performance is no guarantee of future results. Future returns are not guaranteed, and a loss of original capital may occur. **ONLY INVEST WITH MONEY THAT YOU CAN AFFORD TO LOSE.**

## RELIABILITY OF DATA

The contents of this book and any associated media -- text, graphics, links and other materials -- are based on public information that we consider reliable, but we do not represent that it is accurate or complete, and it should not be relied on as such. This book and associated media may contain inaccuracies, typographical errors and other errors. All information and materials are provided on an “as is” and “as available” basis, without warranty or condition of any kind either expressed or implied. The author does not warrant the quality, accuracy, reliability, adequacy or completeness of any of such information and material, and expressly disclaims any liability for errors or omissions in such information and material.

Opinions expressed herein are the author’s opinions as of the date of publication of those opinions, and may or may not be updated.

## NO WARRANTIES

This book does not guarantee or warrant the quality, accuracy, completeness, timeliness, appropriateness or suitability of the information or of any product or services referenced. The author assumes no obligation to update the information or advise on further developments concerning topics mentioned.

This book may contain links to Internet sites. Such links are provided for reference only and were independently developed by parties other than the author. We are not responsible for the contents of any such linked sites and do not assume any responsibility for the accuracy or appropriateness of the information contained at such sites. The inclusion of any link does not imply endorsement by the author of the site. Use of any such linked site is at the user's own risk.

## CONSENT AND AGREEMENT

Please be advised that your continued use of this book or the information provided herein or with any associated media shall indicate your consent and agreement to these terms.

## Appendix: Revisions

*Current Version: 0.1*

*Last Updated: Dec 2018*

This guide will be undergoing many revisions to help you best manage your performance, risk and diversification. If you are a member of [StockQuanta.com](https://stockquanta.com) or [CoinQuanta.com](https://coinquanta.com), you should receive updates automatically. Also keep a watch on our blog at [blog.stockquanta.com](https://blog.stockquanta.com) where we will consistently publish articles to illustrate, education and sometimes entertain.