

- Rodrigo Gordillo: [00:00:06](#) Welcome to Gestalt University, hosted by the team at ReSolve Asset Management, where evidence inspires confidence. These podcasts will dig deep to uncover investment truths and life hacks you won't find in the mainstream media, covering topics that appeal to left-brained robots, right-brained poets and everyone in between, all with the goal of helping you reach excellence. Welcome to the journey.
- Speaker 2: [00:00:28](#) Mike Philbrick, Adam Butler, Rodrigo Gordillo and Jason Russell are principals of ReSolve Asset Management. Due to industry regulations, they will not discuss any of Resolve's funds on this podcast. All opinions expressed by the principals are solely their own opinion and do not express the opinion of ReSolve Asset Management. This podcast is for information purposes only and should not be relied upon as a basis for investment decisions. For more information, visit investresolve.com.
- Adam Butler: [00:00:54](#) Hello and welcome to the Gestalt University Podcast. I'm your host, Adam Butler, chief investment officer of ReSolve Asset Management. Today's guest produces the [Breaking The Market Blog](#) which exploded onto the scene in spring of last year spewing shrapnel at traditional beliefs about investment objectives and portfolio construction borrowing key concepts from Ed Thorp and the ergodicity economics community, [Matt, who would like to remain anonymous for now](#) builds portfolios that focus on maximizing geometric returns by combining uncorrelated investments with frequent rebalancing and appropriate exposure informed by the Kelly Criteria.
- We dig into how Matt's background in mechanical engineering informs his approach to the problem, why he thinks most investors are upside down in their investment approach and why his strategy of geometric rebalancing may be a compelling strategy for our own markets. We dig deep into portfolio concepts like how he estimates returns and other portfolio inputs, the relative importance of errors of means and covariances, and how to manage portfolio exposures over time.
- We also discuss the principles of ergodicity economics and some broader implications for policy and wealth distribution. I will confess that I was looking forward to this discussion for several months, and I can assure you that it did not disappoint. Please, enjoy my conversation with Matt from Breaking the Market. All right. We're live. How's it going?
- Matt: [00:02:17](#) Good, Adam. Good to talk to you.
- Adam Butler: [00:02:18](#) You said you've done this once before, right? Who else have you conversed to?
- Matt: [00:02:22](#) No, I'm not. No, no. I'm saying there's only one person that I've ever met in person or ever seen face to face that follows me on Twitter, at least. There's other people obviously that read my blog, but most of the people I know do not seem to get

into finance and investing too much which is part of the reason I started the blog because I didn't have too many people to talk to about this stuff or tell me if I was wrong or if I was crazy. I figured start talking on the web and see what people have to say.

- Adam Butler: [00:02:46](#) in the category of careful what you wish for.
- Matt: [00:02:48](#) Yeah. That's right.
- Adam Butler: [00:02:49](#) You got lots of engagement. Who else have you chatted with face to face?
- Matt: [00:02:53](#) You're the first one that I've chatted with face to face.
- Adam Butler: [00:02:55](#) I see. Okay.
- Matt: [00:02:56](#) I have a friend from college who's an investment manager in Virginia. He's about the only one I've really talked to in any kind of detail about this.
- Adam Butler: [00:03:03](#) Got you. I've actually been looking forward to this for quite a while because you exploded onto the Twitter scene. Your first post was just last year, right?
- Matt: [00:03:14](#) Yeah. My first post was March of last year. I didn't join Twitter, I think, until May. I wanted to actually get used to blogging before I tried to get other people to read it because I was afraid I'd be terrible at it for a little while. I wrote a few. It was like, "All right. This is reasonable. I'll tell people about it now."
- Adam Butler: [00:03:30](#) Then, when did you start getting some engagement because I think a few really big bloggers started to tweet about you at some point?
- Matt: [00:03:37](#) In the fall, I started getting engagement. You were actually, I think my, seventh follower which was nice. You were the first professional who followed me. No. I think my first posts that really took hold was the one on stochastic efficiency. That got quite a few people to pay attention to it. Then, come around November, Taylor Pearson retweeted me. Nick Maggiulli retweeted me. That brought a lot more attention into what I was doing. Among others, I'm leaving other people out. I apologize for-
- Adam Butler: [00:04:05](#) Yeah. I know. I mean you've had lots of engagement from some of the Twitterati. Let's go back. I'm very interested to learn because you came to investing as a second or third... I guess, it's not really a career for you, but you didn't start out as an investor. You're not a professional investor as far as I can tell. How did you come at this?
- Matt: [00:04:29](#) I'm an engineer by degree and trade. I guess, I started investing in college when I went to grad school, got a master's in business as well, but take general finance classes, and you get intrigued and thinking what you're doing. I bought a few

stocks, but I gave up on that pretty quick because I think I wanted the money to buy something else. I really got into, I guess, reading and learning more about investing through real estate, not from owning it, but from real estate crash in 2006, '07 and '08. It was intriguing just seeing people I knew buying houses, and it didn't necessarily make a lot of sense to me from a rent perspective, so I started reading a lot of stuff online about real estate.

What made sense from a macro perspective and where the issues were and then when the crash happened, I was like, "All right. This whole thing is actually quite more interesting than I thought." I mean it's a very big problem and challenge. As an engineer, I'm drawn to challenges. I'm drawn to big problems and problem solving. I realized that it just was very intriguing, so I started reading more and more about it learning as much as I could. I got through all sorts of rabbit holes at times. I would get into technical analysis and tweak through it for a while and thought it was good. Then, I was like, "I don't know. This may not work." Fundamental analysis, they would all be fleeting-

- Adam Butler: [00:05:42](#) What kind of engineering are you?
- Matt: [00:05:42](#) Mechanical engineer by degree, but I managed a lot of different kinds of engineers at this point, so I can probably converse in a few different engineering speak if I want to...
- Adam Butler: [00:05:52](#) What industry are you in then?
- Matt: [00:05:53](#) Buildings and facilities.
- Adam Butler: [00:05:55](#) Okay. You went through a few permutations of different investment approaches. Then, I guess at some point, you stumbled on Ed Thorp.
- Matt: [00:06:06](#) No. I actually stumbled on Ed Thorp after I'd come around to some of these ideas. I guess my epiphany-type moment or my thought process on this was I came across the idea of the geometric return. There's the difference between the if you just average every year's return, you don't actually get that. There's plenty of posts about that out there in the world. I started to thinking through that a little bit and thought through the idea that individual stocks also have the same concept, but their geometric return should be quite a bit less than the return of the market itself because the market has a lot less volatility than individual stocks.

I started trying to think through the dynamics of what that was and how that would play out and why. Does that mean then does the market out-produce individual stocks? And is it something to do with the nature of the geometric return? As I'm thinking through that process, I'm realizing that, "Okay. Over time, if you have a portfolio of stocks, the stocks are going to become out of weight." If you start out with an even portfolio, if you give them time, they're going to unbalance themselves. You're going to concentrate wealth in certain areas.

As that process happens, then the standard deviation of portfolio grows. I'm thinking through this and thinking, "Okay. If that's the case, then if I just buy a bunch of stocks and never touch them and leave them alone and just let them be, the whole thing over long periods of time is going to become concentrated in a single stock, and it's going to become more and more like a single stock as opposed to a portfolio stocks." Thinking through that kind of made me think about the idea, "Okay. Why is it then that the actual index does so well compared to individual stocks?" Why does it actually get a higher return? If it's just composed of the same stocks, but it projects at a higher path upward than individual stocks do, and I was like, "Well, the only real difference here is that the components change over time." It's not static, and you're moving your wealth between those components for various, depending on the index you're dealing with different rules.

But, in effectively that that's keeping the weighting somewhat balanced. And so thinking through that, I was like, "All right. Well, this is interesting. Is that part of the reason that stock indexes actually worked really well?" Is it a lot of the reason is just because they're rebalanced every so often? Does that actually provide extra return or, I guess, alpha, you could say. I just started poking into that to see if it was legitimate. It seemed like it was. I've got a blog post about this. Why does market investing work? That's where I started with this. I've never seen anybody discuss that concept or think through that concept that stock markets work not just diversification, but you have to rebalance that diversification that if you just leave it diversified and not touch it, it's going dissolve.

When I was thinking through that, I was like, "All right. Well, is there a way I can do anything with that? Is there a way that you could actually acknowledge that that's true and design a strategy that maybe doesn't just use a random stocks, but uses the whole gamut of investment stuff out there in the world to build a portfolio that works around that same concept?"

Asset Classes

Adam Butler:

[00:09:03](#)

That's when you went into the asset classes?

Matt:

[00:09:06](#)

That's when I was like, "All right." So then, exactly. My thought process there was, "Okay. If I'm trying to do this, if the goal is to maximize the geometric or compound return, then I need to keep standard deviation low and tight." The best way to do that is find uncorrelated assets or negatively correlated assets. The problem I see with a lot of investing is that there's just a lot of assets that are quite correlated with each other especially in times of crisis.

If you're holding, a lot of people think that they have a nicely diversified portfolio, but when you get down to it, is it really that diversified when it really matters? And a lot of assets become fairly correlated. Now, obviously, gold and long-term bonds can also become fairly correlated at times too. There's no perfect answer here, but

if you're just going to look in a big picture, I figured that was the first two places to start.

I said, "All right. Let's just put together a portfolio that just has those three."

Adam Butler: [00:10:03](#) Was that, when you were looking at Harry Browne's Permanent Portfolio concept at all there or did you arise-

Matt: [00:10:10](#) It wasn't conscious at the time. I'd read about Harry Browne's Permanent Portfolio. I wasn't like, "Oh, this should be Harry Browne's Permanent Portfolio." It was more just picking asset classes. I poked around real estate like REITs to see, poked around currencies. I poked around a handful of other things just to think are these really uncorrelated? Do they work?

Part of me too, I mean if I was a professional, I would probably do more than three, but I'm not. I don't have so much time on my hands. I can only get so complicated with this. I'd really love to look into some options or tail hedging or some of the fancy things, but that's probably beyond my bandwidth to really get too deep into that at the moment.

Geometric Rebalancing

Adam Butler: [00:10:43](#) Okay. Let's jump into exactly what this is that you've landed on, this geometric rebalancing concept.

Matt: [00:10:50](#) Okay. The goal is twofold. It's to keep the diversification, the effective diversification high and the standard deviation of the whole portfolio as low as we can, not as low as we can because I'm not trying to do a minimum variance portfolio. I'm just trying to still trade off a little bit on the return side, so I'm open to taking some risk if I think it's going to pay off, but to keep it low as we can so that for anybody that... Assume most of your audience is going to understand this but-

Adam Butler: [00:11:20](#) Be as technical as you. My audience tends to skew pretty technically.

Matt: [00:11:24](#) But for those that aren't on top of it, the arithmetic return which is the average that most people are used to dealing with always can be higher than the geometric return. The geometric return comes off of volatility drag. If you go 10% up and you go 10% down, most people think right away that's flat, but in a compounding world like the stock market is 10% up and the 10% down. If you're multiplying it together ends up down 1%.

The goal is to keep those up and down, up and down, up and down tight as low as possible because 35% up and 35% down is down around 10%. It's much worse. The wider your up and downs happen, the worse your returns are going to be. I felt like the goal is to try and keep the portfolio balanced to keep as little volatility on the portfolio as possible, but still have it position to get return when it's going up.

Then, the second side of the coin was I said, "Okay. If there's a rebalancing premium like I was talking about with the market indexes, I'd like to rebalance as often as I can." Fees obviously get in the way of that, but I should try and rebalance all the time. That concept for people that may know was a bit like Shannon's Demon which is there's a lot of that going on, on what I'm trying to accomplish Claude Shannon came up with, but they never tried to implement because he thought fees were a problem.

Adam Butler: [00:12:42](#) When you're optimizing the portfolio, are you explicitly incorporating a term to maximize the rebalancing bonus or does that come naturally from the way that the portfolio is formed and the fact that you're forming portfolios from structurally uncorrelated assets?

Matt: [00:13:02](#) I think it comes naturally. I'm trying to pick a portfolio that would not exactly maximize the geometric term but maximize it with a bunch of protection and error for the fact that I don't exactly know that the inputs are correct. There's flaws and all that stuff.

Adam Butler: [00:13:16](#) So, maximizing the geometric return, I think that's something to pause on because that confused me for a time because the optimal Kelly Portfolio is the maximum Sharpe ratio portfolio.

Matt: [00:13:29](#) If you leverage, it is. Yes.

Adam Butler: [00:13:31](#) If you don't leverage it, you're finding the match geometric mean portfolio. You're forming a geometric mean frontier.

Matt: [00:13:41](#) Yes.

Adam Butler: [00:13:41](#) And you're just simply solving for the portfolio that maximizes the expected geometric mean of the portfolio.

Matt: [00:13:50](#) Yeah. I've got a lot of charts on my blog with little bar charts that show two assets and how they correlate with each other. Yes, what you just said is exactly what those charts do. They solve for the peak of a geometric return frontier. I don't acknowledge that yet. I will. That's coming, but at the moment, I try to keep that a little bit... I didn't want to confuse people with too much geometric mean frontiers. I was just trying to show similar to a gambling structure of just if you're going to maximize returns, there's one answer. That's this is how you would solve it.

I'm in the middle of writing a bunch of posts right now about why real life doesn't necessarily mean you go for the peak that the errors in your measurements and the errors in your forecasts actually mean that you're better off aiming left of the peak more conservatively, and how you do that

Return Estimates

Adam Butler: [00:14:32](#) Yes. I want to dig... Yeah. I'd love to dig more into that. We've spent a lot of time on that as well whether through some sort of multivariate resampling or bootstrap resampling or something like that to get a better estimate of the tails of the distribution, and it does change the shape of the frontier. But in order to form a true frontier, you need some kind of return estimate. I'm wondering you did go into some of this and sort of an illustrative article. It seemed like you use the earnings yield for stocks and the current, I guess, constant maturity yield for bonds to inform that. Is that how you think about the problem in general?

Matt: [00:15:18](#) Yeah. For right now, it is. I did go back into my earlier years of just looking at trying to learn what I could about markets. I did a lot of just testing to see how fast you could do to figure out actual returns or what it would take to learn different parts of things you would need for portfolio construction be it covariance or standard deviation or returns. And returns from what I could tell were almost impossible to find. You need to just way too much data and, at that point, what are you learning because if you have to go back multiple years to feel comfortable with it, a lot has changed. And the data from years ago doesn't really matter.

Because of that, I didn't feel like there was any reasonable way for me to come up with a price-type estimation that could be trusted from off of returns alone. Some of this goes back to looking at just economic indicators from the real estate time. I had poked around a lot of different ideas of how do you use macroeconomic stuff to figure out a projection of the market which is going to be absolutely terrible over short term. I fully acknowledge that.

I mean my own projections had no idea that the market was going to go up 40% over the last two months or whatever. Totally missed that move, but big picture is, hopefully, that it's close enough to getting those kind of returns. Yeah. What I put on the blog which is not exactly what I use my own strategy, but was earnings yield along the lines that earnings yield is probably roughly what you're going to receive over time and plays back to the geometric mean concepts, so earnings yield is what you're going to receive over time. If you add ... variance to that, that would put you in a neighborhood of where the return for the asset should be.

Adam Butler: [00:16:44](#) I wanted to dig into that a little bit. It's interesting how you approach this. You explicitly did not add back the volatility of the index, but rather the volatility of individual stocks because, really, the estimator you're using earnings yield is its own time series. It's different than the time series of prices. You've got the distribution of the growth in earnings yield or not the growth, but the time series of earnings yield.

I guess you're just using the stock prices as a proxy for that because the variance of stock prices, that earnings yield is the current earnings divided by essentially price or market cap, but let's say price.

- Matt: [00:17:29](#) Sure.
- Adam Butler: [00:17:31](#) Earnings are fairly stable and so the vast majority of the variance is derived from movements of price, but you didn't use the variance of the index. You use the average variance of the index constituents. Walk through that.
- Matt: [00:17:48](#) This is the theme that pops up through my blog is that the stock index is not the same as the stocks themselves that it's not going to have the same properties, and it's not going to behave the same way. The index is a portfolio of other stocks. I mean in the way, it's just man-made. It's just what we come up with to describe and track what's going on in the market, **but the real action is actually at the stock level.**
- If you step back and say, "Okay. We have this index," and like I said at the beginning, I think that the market index works partially because it's diversified into itself and that it is able to shrink most of the time, not all the time. You have your high volatility times. It doesn't really shrink volatility much, but it's able to shrink volatility which helps its long-term growth through the geometric return. If the arithmetic mean of an index is roughly the average of all its constituent's arithmetic means and the PE ratio or EP ratio is also that same situation, if you're going to look at an average stock, the average stock's arithmetic return is going to be roughly 4% higher than its earnings yield.
- I've poked back through history to kind of check that, and that seems to be generally speaking the case. **I mean the earnings yield is somewhere around, what is it, one over 15 or one over 16 over time, somewhere in that neighborhood which turns out to be about six or 6-1/2%, somewhere in there. You had 4% to it, and it gets you in the ballpark.**
- Adam Butler: [00:19:12](#) Yes. I mean it's a weird thing because the actual earnings, so if you think about it as like a distribution of cash flows, that's what you're pricing in with the earnings yield. That's eventually those cash flows are going to be paid out as dividends or as share buybacks and/or there's some terminal value of the stock when you sell it. I guess the earnings themselves, they probably don't have that level of if the distributions came out without volatility like you just had 5% distribution per year, then, **I guess, the implication is the earnings yield has zero volatility or the earnings the distributions themselves have zero volatility.**
- Matt: [00:19:55](#) No. That's a fair point. The earnings themselves have volatility. And so, how does that play into the mix? Yeah. I think it's a cleaner example when you look at it at bonds where the treasury bonds, you know you're going to get a coupon every month. The value of the security may change, but the value-
- Adam Butler: [00:20:10](#) Actually, that's a really good example. With the treasury bond, for example, there's no ambiguity or variability in the coupons. In other words, there is no standard

deviation in the coupons. If that's your expected return, then, why are we adding back the half the variance?

Matt: [00:20:31](#)

With bonds?

Adam Butler: [00:20:32](#)

Yeah. We're using bonds

Matt: [00:20:35](#)

Let's talk about through bonds because I cover that. If you're going to have a bond and you're expecting to get 3% coupons, 3% yield over 10 years and then at the end of it, you're going to get your principal back, over that time, of course, the value of that bond is going to go up and down because interest rates are going to move all over the place. Now, the end value that you're going to get to doesn't make a bit of difference because you're going to ultimately walk away with \$130 or whatever that comes out to be, somewhere around there. But you know that growth is effectively known upfront, if you hold her all the way through.

The issue, however, though is if you look at the price, if you were to take that security and price it over that 10 years, it's going to jump. It's going to go up and down all over the place. If the security goes up and then down and then up and you end up back flat, if you go back and look at the actual returns for that product over that time, they're going to be higher. You could do this. You could just go take TLT. I mean we're at lows right now. It's a bit hard to find that you have to go back in time.

But if you go find a decently long period of time, it starts at one interest rate yield and ends at the other interest rate yield. You flatlined your yield percentage, but if you actually look at the arithmetic return over that time, it's higher than the yield because of the fact that there's volatility in the return of in the price as it goes through time.

Adam Butler: [00:21:48](#)

I'm buying that you're buying a yield to maturity. The yield of maturity is on a continuous contract. You're buying a yield to maturity. The yield to maturity is an expected geometric return, but the security is going to fluctuate through time. Therefore, the arithmetic mean of that security is higher than the geometric mean definitionally, so you're just adding back half the variance to move from the geometric mean, expected from the yield to maturity at each point in time to get to your arithmetic mean. Then, that goes into your optimization.

Matt: [00:22:23](#)

Right. And all I care about is the short-term period. I'm only concerned about the return until I rebalance. It doesn't really matter to me that my return over 10 years is actually fairly well-known. I'm just worried about my return over the next week or the next month or whatever my rebalance period is. In that case, it's actually going to be higher than the geometric return. That's that input.

Adam Butler: [00:22:42](#)

Why is it going to be higher than the geometric return?

- Matt: [00:22:45](#) Because there's volatility in it. Because there's volatility, the arithmetic mean will be higher than the geometric-
- Adam Butler: [00:22:50](#) Oh, I'm sorry. The arithmetic return will always be higher than the geometric return over the-
- Matt: [00:22:53](#) The inputs into the geometric curve we were talking about earlier is arithmetic return, not geometric.
- Adam Butler: [00:22:59](#) Right. Absolutely. Got it. Okay. I was wondering how you think about gold. How do you set in an expected return for gold?
- Matt: [00:23:07](#) That's one of the biggest questions I get. I don't have a really good answer. I think if I did, that would be great because I've not found anybody that has any a real good way to estimate that. My estimate, that's one of the weaker places of the entire strategy. I will fully admit that. It's based more on monetary growth that's just where I think that it makes sense. It's got all sorts of errors in it. It can go for a long period of time being absolutely horrible. It seems to be reasonably good over a long time stretches, but it certainly makes mistakes at times. I have done a lot of talking ...
- Adam Butler: [00:23:37](#) Okay. But you're using some kind of M1, M2 proxy type.
- Matt: [00:23:40](#) Yeah. ... around those ideas.
- Adam Butler: [00:23:42](#) Macro variable.
- Matt: [00:23:43](#) I've thought about a lot of things. I thought about just giving it something over the risk-free rate saying that it was like inflation plus the risk-free rate or something like that. One interesting thing, this strategy has been the same for a little while, but since joining Twitter and writing the blog, after I've reached out and heard from a lot of people, I've learned a lot more. One of the things I'm going to get into shortly with my own strategy is trying to figure out how to turn into a bit of an ensemble since I have multiple concepts of what makes sense. I have trouble figuring out which one. Getting gold return is perfect example. Which one is the best choice?
- I didn't know anything about ensembles when I started this. I didn't think that actually made sense the first time I heard you or Corey or anybody else talking about it. The more I learned about them, I was like, "All right. This is actually pretty smart." And so, I'm going to try and incorporate that in so. Future, I'm going to try and come up with anything that I had that I thought made somewhat sense. I'm going to try and figure out a way to ensemble it into a future strategy.
- Adam Butler: [00:24:34](#) Okay. The geometric balancing as it stands has US equities 30-year bonds and gold and cash.

Matt: [00:24:45](#)

Yes.

Adam Butler: [00:24:46](#)

Are you incorporating the cash into the portfolio directly in the optimization or is that optimal Kelly leverage question that comes after? You do them both in one step. I know, right? It's really just the inverse of the covariance matrix times the expected return vector gives you, in fact, your weights and also your total leverage, but doesn't work so well. That works well if you're willing to leverage, but it doesn't work in the no-leverage constrained version. I'm just wondering how do you separate those two if you do.

Using Leverage

Matt: [00:25:20](#)

Yeah, I do. I may rebuild it so that it's more one action, but right now, it's pick the portfolio off the assets and then figure out if I want to scale it. There's two versions of this. There's a leveraged version to where I'm openly on board with levering it which I have not talked about much on the blog. I've referenced it once or twice, but I'd rather just deal with these publicly talking about the non-levered version because I think it's a better place to start thinking about the topic, but the leveraged version has to think a lot more about how much do you borrow and win. It's a lot more thinking about that with the portfolio construction, but the unlevered version usually picks the portfolio and then decides if it wants to scale back and add leverage... or sorry, add cash.

Cash comes in for two reasons. One, it sometimes does it. It's got to be pretty wild market, but it will sometimes do it just off of the idea of this will actually help you return.

Adam Butler: [00:26:07](#)

You're thinking about it from a portfolio standpoint. What's the optimal Kelly of the portfolio? Are you looking at the individual assets?

Matt: [00:26:13](#)

No. From the actual portfolio, from the Kelly portfolio. ... too. I do have that one post where it's got the two assets in cash. I'd cut a corner because I didn't want to deal with the complexity of correlation and how that messes with the way it goes, but it generally covers the concept. If you take the formulas that I posted on that, yeah, it's actually saying, "If the market is extremely volatile and cash is reasonably close to where we think the expected returns with some of these assets are, it'll pull it in based off of the Kelly perspective."

The second reason though is it'll pull it in because if it thinks that the whole portfolio is just too risky or it's too close to the peak, I've put things in there to add cash just to kind of pull off of it to make it safer. It did that some in March. March was a bit of both because it was so wild that it was actually thinking it was smarter to have cash in the first place. Then, it got more aggressive in the cash just because the world was so choppy. I don't feel like I want to deal with big draw downs.

Adam Butler: [00:27:09](#)

Did the cash come in before the big drop?

- Matt: [00:27:12](#) My portfolio, I think, called cash, some cash not all cash, it never was all cash, but I think it was 20, 30% cash on the 27th or 28th of February.
- Adam Butler: [00:27:25](#) Okay. So after the vol began to pick up.
- Matt: [00:27:26](#) Yeah. It experienced the decent bit of the first down. Then, the second down, it still experienced it. It didn't escape it, but it got up to 60% cash at one point. The last third of, it was a lot calmer.
- Adam Butler: [00:27:38](#) How do you deal with the leverage? I think it's a little easier with unleveraged version because you add cash as you need it, but you never borrow to lever up, but I mean the optimal Kelly leverage can get really extreme at times.
- Matt: [00:27:54](#) Yeah.
- Adam Butler: [00:27:55](#) I'm just saying like if you're using your former portfolio based on the current yield of all your different instruments and then you find the optimal Kelly leverage, that can be well above 10, 15, 20 times. So, I'm just wondering-
- Matt: [00:28:08](#) Yeah. Easy. No. I don't dream of going up there though. No. I just allow leverage. I'm not pushing up the curve up towards the peak. I've had a few posts. I didn't like leverage. I used to think it was annoying and scary, but once I came around to the idea, and I think Rodrigo brought this up on your talk last week that stocks themselves were levered already. You just own the S&P 500 and you think you're not losing leverage, but you are. Someone just took the leverage out for you.

Once I grasped that concept, I was like, "All right. Well, what's the big deal about levering up 20%? If I've gone through the process of building a good strong robust portfolio, what's the big problem with that? I become okay with the idea, but I say this. You got to be careful because people can think they've got a good strong portfolio and you put too much leverage on it and it'll ruin everything. It may be good most of the time, but leverage makes volatility drag way worse. It makes what I call error drag way worse just it exemplifies all the errors in your projections. When I say like, "I'm not very good at projecting gold," which I'm not, that error of whatever a mistake I made if I lever it, I mean I'm just making my error and multiplying it.

Really, I mean in practice and mind you, I've never put huge amounts of leverage on this portfolio. I even stopped last summer because business may keep me away from actually being able to rebalance this thing as frequently as I wanted to or being able to change it midweek if it called for an adjustment. I just capped it. I think the portfolio actually posted the leverage back test for I just wouldn't let it go more than three times up. I just said, "This is your cap. You're not going more than three leverage, three levered up." But I do. Let's just say that the portfolio calls for three leverage. It won't go there. It'll back off. It would never let itself go

up to the peak because of the fear of mistakes and the errors and just the unknown. It's about the future.

Adam Butler: [00:29:50](#) So, say more of error drag because I think you're starting to get there in your current blog series.

Matt: [00:29:56](#) I posted on that yesterday. I don't know if you - yesterday afternoon.

Adam Butler: [00:29:59](#) Was it yesterday? I think I read something about it. Is that your Tiger Woods post?

Matt: [00:30:05](#) Yeah. That's the one.

Adam Butler: [00:30:06](#) Right. Okay. Let's get into that for me.

Error Drag

Matt: [00:30:10](#) I'd spent a lot of my time dealing almost from a gambling perspective, but just a specific like you know the return, you know the standard deviation, you know the correlation. Then, this is where you invest. And, of course, that's not true in real life. Question then becomes what effect does that have if you don't actually know and you just think you're going to be in the region of being correct on your estimate, what happens when it actually is 10% below what you thought it would be? What happens when it's 10% worse than you thought it would be? How does that affect the portfolio?

The interesting thing is just from a pure standard deviation perspective just to keep it straightforward. If you've overestimated the portfolio or overestimated the standard deviation so the world is calmer than you think, your portfolio is probably going to end up doing better than you thought in the first place because calmness of the market, this is all other things being equal obviously, but just keep everything else equal, it's going to end up doing better which is obviously good. This is a good error, but if the portfolio... If the world ends up being more volatile than you expected if it's more volatile than projections for future volatility we're calling for, then the portfolio is going to do far worse because the volatility drag will be much higher, and you'll get your returns pulled down. This isn't meant to be like over a day or something.

You got to have time to see this play out. The interesting thing though is that those two, the gains when the errors go in your favor and the losses when the errors go against you are not equal, they are worse on the bad errors. The bad errors harm you more often. Because of that, it actually means that you're better off aiming left of the peak in reality because the more you aim left of the peak, the tighter the error dispersion, the pain from the error becomes. So it becomes more similar, more equal.

You take less expected return knowing the consequences of the errors are going to be tighter. This means that the peak is actually higher. In the example I gave, I said, "You could go from a 38, 62% portfolio of bonds and stocks." This was just generic example, but if you assume that you only had 10% of your errors to be 10% off, you were better off being 5% conservative and being 43% in bonds.

- Adam Butler: [00:32:12](#) That was 10 percentage points, right? I think you were using-
- Matt: [00:32:16](#) Yeah. It was 10%.
- Adam Butler: [00:32:17](#) ... 20%, 10%.
- Matt: [00:32:18](#) Right. Exactly. It was saying that you expected the future to be 20% volatile and ended up being 30% volatile which to me is not unreasonable at all. That mistake happens far worse than that happens all the time. Just that example alone, it said, "Be 5% more conservative on your allocation on the lower vol allocation." And in reality because of that, you actually make ... return.
- Adam Butler: [00:32:40](#) Right. Just remind me both stocks and bonds were 10% more volatile than expected.
- Matt: [00:32:46](#) Yeah. I keep them both up. The whole thing to me is actually that's where a lot of this gets really interesting because the frontend of the portfolio construction is not... There's some counterintuitive things to what I think I've done, but mathematically, I feel like a lot of it's... Geometric return is a known concept by a lot of people. Like you said, the geometric frontier is not commonly used. I'm actually surprised. I don't see it talked about that often. It's not a new concept. What really gets interesting is when you start trying to figure out how do you deal with implementing this in real life and dealing with the errors and dealing with risk tolerances which I haven't really gotten into yet.
- But the whole idea of, okay, you're at the peak, but peaks flat. So if you just move a little to the left, is it worth giving up a smidge of return for cutting your volatility down and where do you actually find that trade-off? That's where this stuff gets really interesting from a portfolio construction perspective of how do you do that? That's where the future is-

Ergodicity Economics

- Adam Butler: [00:33:33](#) I agree, and I think that's a real curiosity in the whole movement towards ergodicity economics where at least my understanding is that they reject the idea of utility, in general, and that the only thing that matters is the expected value, and the expected value is the long-term geometric mean. It seems to me like that can't be the only thing that matters especially given finite horizons and individual preferences. I don't know. What do you make it up?

- Matt: [00:34:01](#) Yeah. I've gotten a lot of discussions with people on that. I agree. I don't like utility theories. I do think that that's not the right place to start. I would have rather they started with geometric return which is from a utility perspective of natural log utility and then worked from there as far as risk aversion came from as opposed to starting off linear utility and setting your risk averse from that point.
- When you look at the real world, it does seem that people still sometimes, they have their instance really pull off. I mean even myself, I'm not investing at the top. I'm not investing at the top because of the errors. I'm not investing at the top because I think it still pull off a little further because I'm willing to give up a little bit of risk... a little bit of return for a lot less volatility.
- Adam Butler: [00:34:40](#) Assume a strategy has a 0.5 Sharpe, and I mean, the back test shows almost 0.9 in the levers version over one. Assume it has 0.5 Sharpe, the Kelly optimal leverage on that would be well above three, four, five.
- Matt: [00:34:59](#) The Kelly optimal leverage would be levered up to 0.5 standard deviation
- Adam Butler: [00:35:04](#) Clearly, that's not where you're running the strategy. It's not I think where most people would run the strategy. But I mean that's where you would run the strategy if the objective was to maximize wealth, and you didn't really care about intermediate drawdowns. If nobody actually acts to maximize long-term wealth, then surely, there must be a flaw in the whole idea that people don't act in pursuit of some sort of utility function.
- Matt: [00:35:33](#) Yeah. I don't think I totally follow you there, but I-
- Adam Butler: [00:35:36](#) Nobody actually invests with max with optimal Kelly.
- Matt: [00:35:39](#) Sure.
- Adam Butler: [00:35:40](#) Optimal Kelly says, "I'm willing to tolerate a 99.9% drawdown because that is how I'm going to maximize my long-term wealth." And even if you reduce your expected Sharpe ratio, reduce your expected return, dramatically nobody invested half Kelly. Very, very few people invested their full wealth at quarter Kelly. Given that that's true-
- Matt: [00:36:05](#) I don't know. I think there are people that invest for full wealth at quarter Kelly. I think there's people invest their full wealth at half Kelly.
- Adam Butler: [00:36:10](#) That's fine, but the vast majority don't. There are certainly people that do.
- Matt: [00:36:14](#) I'm going to slightly disagree with you on that. Yeah. On the stochastic efficiency posts that I had, it effectively said that individual stocks are full Kelly that their return over the risk-free rate is dead-on equal to their variance. If you look at the

S&P 500 from that perspective, S&P 500 is generally around a Kelly of calls for a Kelly of two historically rounding, but that's about what it is.

If you have people that are just saying, "I'm just going to buy the S&P 500 and let it be," and that's my investing strategy and there's plenty of people that that's their investing strategy, just buy the S&P 500 and move on, they're investing half Kelly. If, if you were just-

Adam Butler: [00:36:49](#) That's fine, but they've also neglected all of the other dimensions of Kelly. They're not pursuing the max Sharpe portfolio.

Matt: [00:37:00](#) Oh yeah. I agree with you on that.

Adam Butler: [00:37:02](#) They're not maximizing diversification. They're investing in half Kelly on theoretically profoundly inefficient portfolio.

Matt: [00:37:11](#) I agree with that. I'm just saying if you actually look at their risk with the risk that they're putting themselves through by just buying that, they have chosen to invest in about a half Kelly situation. In my opinion, they should be diversified more with other stuff, but I think there's a lot of people that if you buy just pure stock portfolio, you're generally running around a half Kelly situation.

Adam Butler: [00:37:29](#) Yeah. No. That's a fair point. I just think like for a diversified portfolio half Kelly, you would lever five, 10, 20 times. There's very, very few people.

Matt: [00:37:40](#) Yes. I think my strategy if you were to full Kelly, it is somewhere on 10 on average. I mean, obviously, there's times it's higher and there are times, it's lower in that. But it's somewhere around 10. Yeah. I mean, would I lever at five times to half Kelly? No, I wouldn't. But I do think that the whole errors matter here because if you make a big mistake with leverage, the big difference to me with leverage is leverage opens up that gives you chance for total negative wealth.

I mean you can owe something on the backend. If there's no leverage, theoretically, you're never going to own anything. You might lose everything, but you're never going to own anything. And the ability to go negative, it just changes the calculus of it a little bit. You have to be a lot more concerned with where your bottom end of your distributions are going to be and where you're going to go.

Adam Butler: [00:38:22](#) Well, I mean even at half Kelly, your expected drawdown is much, much, much lower and/or smaller.

Matt: [00:38:28](#) Oh, extremely. Extremely lower.

Adam Butler: [00:38:30](#) Than, the expected drawdown from full Kelly, right? Even half Kelly, really, if you're making conservative assumptions and you're running at half Kelly, then your

chance of going bankrupt or having negative wealth are vanishingly small and yet still almost nobody runs at that level of leverage, that level of exposure.

Matt: [00:38:50](#)

Right. Anybody that's building a diverse portfolio generally doesn't push it up there. I agree. I mean there's something to be said to though is whenever you're going to use the money matters and this is the infinite part of that I think we pulled off, but Kelly assumes you're just going to let this stuff run and you're going to let it run for long enough that you're going to see the whole world. You're going to see the whole distribution, the ups and downs, and you're going to get it, and you're going to get to the end. That's not necessarily life.

I mean if you invest and then you get laid off and you realize, "You know what? I'm retiring now," and I thought I was working 10 years longer, you need that money now. I think everybody knows in the back of their head that they might have invested it. It's hopefully not going to be used for a while, but that's not necessarily the case.

In a retirement situation, it changes it a lot more. Drawdowns become way more important if you're retiring because if you pull too deep, you don't have to pull your money out to live for a couple of years and it stays down, you've totally changed the entire trajectory of the portfolio. I think that plays into the whole idea why you

Economics and Finite Time

Adam Butler: [00:39:40](#)

But how does organized economics account for finite time? What's recommended?

Matt: [00:39:46](#)

I don't think they really do that well, to be honest. I've never spoken any of those guys running the stuff over the London Mathematical Laboratory, but they do have some interesting stuff on finite time. They've got some discussions about how stuff can curve through time. Portfolio's going to be expected to go up and roll over and curve downwards, but no. I don't think they say a whole lot about predictions of where people should go through time. I am hoping they go a little bit down that path.

I've looked into that some. I do think it's extremely interesting to try and figure out where to go. The weird thing though is you can even make a case there over short periods of time. You'd almost rather be more aggressive in a way because the arithmetic return is much more likely to happen if you're just doing it over a short period of time. The expected nature of the geometric return requires time for it to be true. If you're only doing something over one period, your expected return is the arithmetic return which is higher. In that case, then the whole utility constant makes some sense, but-

Adam Butler: [00:40:39](#) Well, if you're only doing it over one period, then there is no distribution. There is just one single path.

Matt: [00:40:45](#) There is, but if you're standing here saying, "I'm only going to invest for tomorrow," then it's just one. You're likely to get a higher rate. You should expect the return of about the arithmetic return of a higher return, but if you're expecting to go back and forth and experience volatility drag, then you should expect the geometric return.

Geometric Rebalancing

Adam Butler: [00:41:03](#) Okay. Well, there's something interesting there, but I'm going to move off because I'm super curious about the degree to which the performance of the geometric rebalancing strategy is dependent on reasonably good return estimates versus just the diversification and rebalancing properties of the portfolio. In other words, if you use weaker return estimates, do you still get most of the benefits? I asked because, for example, we spent a lot of time talking about risk parity and-

Matt: [00:41:36](#) You're agnostic on that, right?

Adam Butler: [00:41:38](#) Yeah. It's not really that you're agnostic so much as you sort of... You assume that-

Matt: [00:41:41](#) There's a difference ...

Adam Butler: [00:41:43](#) You assume that returns are proportional to risks, right?

Matt: [00:41:45](#) Either equal Sharpe or equal return.

Adam Butler: [00:41:50](#) So, equal Sharpe if the markets are uncorrelated. Risk parity is mean variance optimal and, therefore, is Kelly optimal when expected return is proportional to volatility or proportional to expected risk. I just took a bit of a detour and said, "Well, what if I just use that as a way to form the optimal Kelly portfolio?" max Sharpe framework, it was great. In a max geometric return framework, I always just ended up with a single asset. That way, that sort of more naive way to try to express a relationship between risk and return or drive a return estimate did not play well with maximizing geometric return.

I'm just wondering. I also experimented with just using earnings yield on equities that futures carry between the front and back on gold future and the euro-dollar yield and like a couple of things and use those. That certainly got much, much closer to what you have shown in your blog, but how I tweaked those still made a difference. Then optimal leverage that was derived from that set up was on average 10 or 15 times which was just absurd. I'm just curious how much experimentation did you go through in order to define return estimates that played well in the back tests?

Matt: [00:43:32](#)

So, two things. I did some back tests to figure things out, but generally speaking, what I'm trading is close to the first effort that I threw out there. As I talked about like, "I don't know how to deal with gold, so I came up with some ideas," I mean even with equities, it's hard. I don't know why.

I came up with a handful of different ideas of what to do. I said, "All right. What's likely the best?" If I had to pick based on what I know about macroeconomics and whatever, which one would I say is probably the best? So, I picked it, and I ran with it. I said, "All right. That's pretty good. I like that. That's nice." I left that then I said, "Let's try some of these others." I threw them in there to see what would play out with it.

They were in the same neighborhood. Some are better. I could have put Sharpe ratios better than what I've got. I figured that my first gut feeling was the other one and it was good. I didn't want to just pick something because the Sharpe was better on the back test. I stuck with my first gut feeling. To answer your question directly, I do think it matters. I don't think it matters a lot... Well, I think that picking the individual choice for the return as long as it's reasonable isn't that important over the long-term, but the long term is probably many, many, many years.

When it comes to risk parity type portfolios, I liked them. I totally understand the concepts for why they're set up. I like the idea of inverse variance portfolios. I like the idea of inverse volatility portfolios, maximum diversification. They all make sense. The thing is, like, I think you said, there's an assumption buried into every one of those about returns that they're equal or co-equal or equal risk return or there's some assumption in there.

I've never liked those assumptions. I've always thought that they weren't perfect. The idea that everything has equal return, I feel like, well, I mean generally speaking more risk gives you more return over time. Then equal Sharpe, I've never totally bought off on that. I get the idea, and I think it's a pretty good starting point, but because of some of my dichotomy with the stock market and stocks are not the same thing, to me, I'm not really sure that a long-term treasury bond should have the same Sharpe as the stock market index. It's already a portfolio.

It's like you have a single security versus a portfolio. To me, it's a fine starting place. I actually think it's reasonably true over long term also, but short term, I think that things get off. I think I'm better off trying to come up with something that's maybe a little bit better than that assumption. That's where I'm at. I do think it matters a little bit, but I don't think it matters as much as some people think as long as you're in the ballpark because if you just look at the geometric formulas for creating a geometric frontier, you're squaring volatility. You're not technically squaring... I guess you're squaring covariance, aren't you? I don't know.

Either way, the look of it, I feel like those variables actually affect the portfolio more than returned that if I'm off by returns by two or 3%, it's not the same as if

I'm off. That would be a 20% error, I guess. It's not the same as if I'm off by standard deviation by 20%. The impact of the portfolio is far larger if you made a mistake on the standard deviation to me. That's the way I see the situation.

Adam Butler: [00:46:44](#)

It would be a really good post for you to go back and look at Chopra and Ziemba 1993 where they showed that the errors and means are depending on your risk tolerance. The risk tolerance you're using to express the optimal portfolio weights can be 50 times larger than the impact of errors and covariances, but that's in weight space. It's not in mean-variance space. There's some nuance there, but I'm thinking if you need for you to go back and look sort of different return estimates and how that impacts the constitution of the portfolio through time or the performance through time and what that error term looks like.

Prosperity Strategies

But on that note, I was curious about... I'm actually writing a fairly involved article right now on how to evaluate prosperity strategies. One of the things that I'm trying to drill into is that how you form the portfolio will have an impact on the average portfolio constitution over time. For example, inverse variance weighted portfolios have an extremely high long-term average weight in bonds, and bonds have had a very high Sharpe ratio over the full history of our simulation.

And so portfolios that have a larger strategic allocation to bonds have a higher average long-term Sharpe ratio in sample over our evaluation horizon, but we shouldn't derive too much information from that because, of course, we know, A, that current bond yields are very small relative to where they were at the beginning of the simulation and so we know that the forward returns on bonds are lower. And also, the purpose of the risk parity portfolio is to be resilient to any of the major economic regimes.

I know that that's the stated purpose of the permanent portfolio from Harry Browne. I'm assuming that is one of the reasons why you've chosen that asset class universe that cash and gold and stocks and bonds because you want to have assets that are designed to be resilient in any of the major economic regimes, but sometimes, you can't tell from the simulation exactly how resilient the way you're constructing the portfolio from these different investments is actually making it resilient to the economic regimes.

I'm just wondering how much of the risk and return from your method, the geometric rebalancing method is derived from stocks versus bonds versus gold and/or have you done any experimentation to see how the portfolio performs in different economic regimes, for example, when the inflation over the past 12 months is higher than inflation over the past 36 months which might represent an inflation surprise or GDP growth over the past 12 months is higher or lower than what it's been over the last 36 months which might represent a growth surprise. I think that'd be also another really interesting way to look at it.

Matt: [00:49:42](#) I totally agree with everything you said. I'm using the 30-year bond for the portfolio mostly because it acts as a levered 10-year bond. It's generally speaking about twice the movement and twice the return of the 10-year bond. I have done this entire portfolio and ran back tests on it using the 10-year bond back into the early '70, '71 I guess with gold. Then, I've thrown a gold out and taking it back into the 60s just to see how it handles back in those times. It certainly is worse.

The high interest rate environment with rising yields is not a fun one for getting good Sharpe ratios out of it. I felt like it's still performed as I would hope. I mean like I said, the tailwind we've gotten from falling yields is awesome over the last 40 years. We're not going to see anything like that for probably another 40 years. It definitely would be worse from what happens and when inflation kicks up. It's not going to be as easy to go through. But I hope somewhat, like you said, as the gold can handle some of the other side. I don't know. Gold may not always roll up inflation. I think we think it does, but it could easily not. It has in the past, so we're hoping it does again.

Adam Butler: [00:50:45](#) Also, I think that you're not really... I mean you're explicitly benchmarking it against US equities or perhaps a US 60/40 portfolio which definitionally is designed to perform much worse in inflationary stagnation scenarios or even in deflationary scenarios. And so, really, when compared with other common options, the geometric rebalancing portfolio is designed to be more diversified and has the opportunity to gain exposure to markets that are fundamentally designed to thrive in very different economic environments in a way that traditional portfolios are not. I think you can lean into that argument.

Matt: [00:51:23](#) Right. I try and sample the market a lot. I mean I have what most people consider would be short timeframes that I'm pulling data out of for correlation and standard deviation. I am willing to change it every single day. It's built right now that I'm running to do it every week, but I mean if the market moves fast enough, I'll move it because I don't want it that far out of whack. I honestly think that matters a lot because if you're using long-term predictions of these things, the market can change pretty quick.

Quite frankly, the data from more than a year ago doesn't really matter about... I mean it doesn't tell you anything about today. In some kind of environment like that where we started getting inflation and the essence correlation with each other starts changing and the volatility moves, the hope is that I'm monitoring the market enough that I start to pick up on those differences and realize the portfolio can't be a standard portfolio that we're dealing with.

Adam Butler: [00:52:09](#) There's nothing really in the design of the portfolio that would lead you to believe that there are any systemic biases like in the way that, for example, an inverse variance weighted portfolio is obviously going to be massively over weighted to bonds. There's nothing in the design of the geometric ... portfolio.

- Matt: [00:52:25](#) No.
- Adam Butler: [00:52:27](#) ... systematic bias.
- Matt: [00:52:28](#) Yeah. As far as like types of portfolios, I think it's been 100% stocks once, not for very long, but it can go aggressively stocks. It can dump them pretty much entirely. It can be way high bonds. It'll move all over the place. It's not biased towards any of... I think the biggest underlying assumption in the whole thing is that correlation and standard deviation are somewhat predictable. They are persistent. If that blows up, yeah, my strategy is no good. I mean that's the basic assumption is that they're somewhat there and that the macro views for returns are close enough to keep you in the right area.
- Adam Butler: [00:53:05](#) You should explore using dynamic control mechanism where you introduce an overlay function that is determining whether your covariance estimates, you're getting good covariance estimates from your estimator. If you aren't, then you know what the bias is and you can adjust for the bias dynamically. As an engineer, I think you'd really take to that.
- Matt: [00:53:27](#) That is an area I really want to get into. There's a lot of areas I want to get into, but having an actual engineering job and a family, there's something so much time I have to poke at. I think that there's lower hanging fruit than that right now, but I mean that's apropos to the Tiger Woods post that I'm just talking about. Knowing where things are changing and how fast they're changing and how off you are, is huge.
- Adam Butler: [00:53:45](#) It's huge information.
- Matt: [00:53:45](#) Yeah. And it can make you... You're talking about not wanting to lever up to the high level perspective. If you really believe and you can get good tight information coming into your system, you can be a lot more aggressive if you think it's legitimate. I wouldn't phrase it exactly like you did, but I think that that's probably...

Factor Investing

- Adam Butler: [00:54:00](#) Further to explore. I'm curious, you've had fairly strong views on factor investing in general, commenting specifically on momentum, but what are your general views on that? Feel free to speak candidly.
- Matt: [00:54:16](#) Yeah. I think factor investing is... I mean, obviously, the data is there. You can see it. I feel like that it's focused very much on the arithmetic returns. I feel like I've seen some of the bigger people comment on that once before. They say they thought it was fine because you're just going to throw them into a portfolio and then rebalance that portfolio every now and then, so it doesn't matter, but to me, the geometric return shows itself reasonably fast.

So unless you're rebalancing the portfolio pretty quickly, you're not going to get the full experience of the factors. I just think it's interesting when you look, and I've read more about momentum than anything else spend a lot more time looking a moment than anything else because I wondered. I think it was very useful, but haven't been sold yet, but when you look at papers on momentum that find that the more often you rebalance, you get a better return. I've just never seen them paper acknowledge that that's actually what you should expect. That's not surprising. That's not necessarily the momentum is fading. It is just literally what would happen when you're rebalancing a random return stream more often. You would see a higher returns.

I think that some of that you can find out in some of the other factors also that if you go back and you find that you've got these good weekly returns or daily returns on these things and then people implement them and, of course, you can't necessarily take a portfolio of 50 stocks and rebalance it every week. Your transaction fees would be through the roof, so nobody implements it that way. They implement it with a longer term outlook and the different setup. Then, of course, the implementation comes in.

And is it really much better than investing in the market once it's been implemented that way? Well, it's hard to tell. I think that that's where some of the reason why people have academic papers that look real good on factors on paper, but then when you implement them and you don't necessarily rebalance them that often and you don't really know what's really coming out of the driver of some of this stuff that it doesn't play off as well. If I had time, I'd love to look into factors a little bit in internal correlations because I feel like that that's... When you look at momentum, I feel like that you'd have to understand the internal correlation of the stocks if they are predictable.

I feel like if you're tracking that and you get momentum... If you get correlation internally moving against you in a position that's not good for the geometric return of the portfolio, then you could make adjustments and change things. Then, you're harvesting the momentum on the good times, but then when you see correlations start to move against you, you take actions so that you don't get the momentum crashes. I guess that's what people call them when they just drop out from under you.

Adam Butler: [00:56:30](#)

Well, I mean I can tell you from our own work going back to the 1960s, rebalancing the portfolio about 1/12th of the portfolio every month. In other words, a sort of annual rebalancing, but tranching so that 1/12th of that is rebalanced every month that a momentum portfolio that emphasizes stocks with high momentum while maximizing the Sharpe ratio. So really, you're maximizing the momentum characteristic of the portfolio while simultaneously minimizing volatility does substantially better than just an equal weight portfolio of high momentum stocks.

When you view it through an efficiency lens, so the Sharpe ratio of that is 50 to 65% higher than just ... version, so accounting for some of that diversification is certainly beneficial, but I think it would be worthwhile to perform some kind of decomposition, a la kind of Bernstein where you back out the rebalancing bonus and then see what the incremental improvement from just identifying momentum as a characteristic is how accretive that is to the portfolio relative to the rebalancing bonus. I think that's a really good question.

Okay. That's fair. Shifting gears a little bit because you have posted on some of Ole Peterson's sort of economic or wealth distribution papers. Is that an area... I would be keen to go into that. I'm very interested and passionate about it.

Wealth Distribution

Matt: [00:57:59](#) Sure. Yeah. I think you retweeted my one from about three weeks ago on that. This is just really a think piece not very political. I don't know a whole lot about wealth distribution actually. If you have a random system with compound growth and over time unchecked all wealth will cluster into one single entity, so what that means is you're going to get wealth inequality. You're going to get the rich getting richer and the poor effectively staying the same. And after more and more time, you're going to be the rich are going to be more rich. It's not because of anything more than randomness. It's just the nature of just random returns.

Adam Butler: [00:58:34](#) Let's invert it slightly because I think what we can safely say is that even if every participant or every agent in the market has an equal a priori productive capacity, in other words, there's equal merit to their product, they have equal talent an equal effort, even if that's true, the wealth distribution will converge to the point where a single person or a single agent will own all the wealth in the economy, and everyone else will have asymptotic wealth to zero even if everything else the starting point is equal. It doesn't mean that it is equal in reality, but this is true even if it is equal. And I think that's the huge profound mind-blowing takeaway from some of this research.

Matt: [00:59:24](#) Right. Ole Peters has done some stuff on that. What's interesting is if you look at the wealth distribution in the world today, it is kind of roughly distributed the same as it would be if it was pure randomness. Now, I'm not trying to say it is pure randomness. I'm just saying it looks like it could be. It's hard to distinguish skill from randomness in that front. If you just look at it from that perspective, then tying back into my whole idea of portfolio construction from a society perspective just like in a portfolio perspective concentrating your wealth into one single asset and not being diversified is not generally speaking a good idea. It could be just fine of the short-run but long-run, your growth rate's going to be poor.

If you're looking at it from society perspective, you come up with the same kind of concept. There's a wonderful video called the Farmers Fable which talks through this

Adam Butler: [01:00:15](#)

I was hoping you were going to

Matt: [01:00:16](#)

Two-person perspective, but if you're sharing the wealth, if effectively you don't allow the wealth to become unequal and one side takes it all, the compound growth rate of the whole system, the society together grows at a faster rate if everybody has got equal wealth. The first time I realized that, I was like, "Well, that's really kind of interesting." It actually explains a little bit why when you're just looking at like tax structure and things like that, it can make sense to actually pull more money off of high income people and distribute it back down through whatever programs or giving it back to the poor. There's mathematical justification for all that, and you can show that society as a whole will grow better because of that.

Now, this is once again just a straw man kind of model of the world. The world's a lot more complicated than that in reality, but I think it's really intriguing to think through that process because it's not what's intuitive like the intuitive thing is that the people in the path-

Adam Butler: [01:01:07](#)

Wealth accrues to those who have more merit.

Matt: [01:01:10](#)

Right. I find the really interesting thing is even if the world has people with more skill at doing good things for the world which would be closer to my actual view of the world, people like Steve Jobs do wonderful things and create products that help everybody, and I'd very much like it if they can create Apple and do their thing even in that world, the wealth still has to be pulled back down to everyone or else, it just accrues to one person and that doesn't end up working out well in the long run if it's not distributed.

Just like my portfolio construction concepts, say, try and spread the wealth not dead on evenly. I mean I'm making picks, but at least keep it together, and you spread it out so that it grows the compound growth of the entire portfolio. In doing so, I'm constantly selling off the winners and moving the money back if you just look at the actual function of it. I'm constantly selling off stocks in a normal environment selling off stocks and buying and transferring that money back to other assets. If society would work through the same mathematical functions, should kind of be structured with the same concept of pulling wealth back down from the top back towards the ones that aren't as lucky.

To me, the easiest way to think of it is if you got really lucky on the upside, some of that luck needs to be passed out of those that get really unlucky on the downside. You're really balancing luck. You get what your skill is. You get what you keep which you earned, but if there was luck involved and how you implement that, I don't know.

Adam Butler: [01:02:30](#)

No. You trickle down resources to those who then have an opportunity to get lucky, or it's some combination of effort and luck. Luck acts as a force multiplier

on talent or effort or the combination of talent or effort. And if all of the wealth is concentrated in a small number of hands, then you don't get the opportunity for that force multiplier to work in the random population at large. There are other people with merit and with talent and who are willing to put in the effort and are going to make to innovate and create capital formation, and those people don't get a chance because all of the wealth, therefore, the force multiplier on luck is concentrated in a small number of hands.

I think that's a balance that we probably should think more about how to do a better job at striking. And if we could do it properly, I think the really counterintuitive part which you've highlighted is we do that properly. We actually get a higher growth rate in the economy, so it's not like you're sacrificing economic growth in order to have a fairer society. You get both the fairer society and faster economic growth in aggregate at the same time. It's one plus one equals three.

Matt: [01:03:46](#) In theory, even the rich have a higher growth rate under that world which is not what you would expect, but like everyone grows faster if you're sharing and cooperating. The whole post was about ode to cooperation. It was about effectively if we all cooperate and work together, you're going to end up the whole society and even individually ends up better in the long run.

Adam Butler: [01:04:05](#) Yeah, 100%. Well, this has been fantastic. We're about an hour a quarter. So, let's put a pin in it and hopefully we can circle up for a round two at some point in the next few months.

Matt: [01:04:16](#) Yeah, definitely. Now, this has been fun.

Adam Butler: [01:04:18](#) What are you working on now? What do you figure is the low-hanging fruit for, I guess, you've got one more article in your series coming up. You want to give us a-

Matt: [01:04:25](#) You're talking about, with the errors and things?

Adam Butler: [01:04:28](#) No. Well, that was post two, right? Wasn't it a two-part series?

Peak is Flat

Matt: [01:04:31](#) Yeah. No. I think it's going to be four part. I'm still deciding. I actually wrote that whole post as one series and decided there was too much and I couldn't dump that much on people at once, so I broke it up. No. The next one's going to talk a little bit about the peak and the fact that it's actually flat. Theoretically, you shouldn't be investing somewhere that you can invest at a lower return. Then, I'll leave

Adam Butler: [01:04:50](#) Or lower risk.

Matt: [01:04:51](#) Yeah. Right. How far do you go left? What do you accept? Then, the other one's going to be talking about foundationally half Kelly, but I'm going to break it off of

an engineering concept of stress and strain and materials and how they have an arc that looks a lot like actually a Kelly curve, and you get up near the yield and elasticity points, and it'll break. And when you're designing something like that, you want no part of approaching that. You're building in a factor of safety to break off at that point. And how you decide what that factor of safety is so that you actually build a system that's not going to collapse on itself. It's still tying that into the concept of portfolio construction like you would from an engineering side.

- Adam Butler: [01:05:25](#) Fantastic. That sounds like... Yeah. I'm looking forward that. That's great. All right. Well, Matt, thanks again. I know we'll carry this conversation on through Twitter and hopefully get a chance to do this again live.
- Matt: [01:05:37](#) It's been a lot of fun.
- Adam Butler: [01:05:37](#) Yeah. For me too.
- Matt: [01:05:39](#) Thank you.
- Adam Butler: [01:05:39](#) All right. Well, enjoy your evening and chat soon.
- Matt: [01:05:42](#) Yup. Thanks.
- Rodrigo Gordillo: [01:05:44](#) Thank you for listening to the Gestalt University Podcast. You will find all the information we highlighted in this episode in the show notes at investresolve.com/blog. You can also learn more about ReSolve's approach to investing by going to our website and research blog at investresolve.com where you will find over 200 articles that cover a wide array of important topics in the area of investing. We also encourage you to engage with the whole team on Twitter by searching the handle [@investresolve](https://twitter.com/investresolve) and hitting the follow button.

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