CFA Institute

THE BEHAVIORAL FINANCIAL ANALYST

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This session from the 2017 CFA Institute Annual Conference covers:

- Behavioral science as pioneered by Kahneman and Tversky is transforming the financial services industry. An emerging group of "behavioral advisers" who recognize that emotions and their resulting cognitive errors can affect client wealth is placing client behavior management at the center of its practice.
- Behavioral science is sweeping aside modern portfolio theory—supporting evidence calls the CAPM and EMH into question. A "behavioral market model" that uses objective, carefully researched behavioral measures is taking shape as a potential alternative.
- Research shows that active equity funds can be evaluated based on behavioral concepts and that specific criteria are predictive of superior performance. By changing the evaluation process, truly active funds can be identified while value-destroying closet indexers can be marginalized.

C. THOMAS HOWARD: We're going to talk about becoming a behavioral financial analyst. I'm a behavioral financial analyst. Now, that doesn't mean that you have to lay your clients on a couch and ask them, "how was your childhood and did your parents treat you OK?" We're going to talk about how you think about the world through the lens of behavior and emotion and how you use that at every stage to make better decisions.

And there's two reasons why we do that. Let's view the markets and investors as they are, rather than as you'd like them to be. And the second is we want to deliver value to our clients. And by switching to a behavioral framework, we are much more likely to be able to do that.

So let's move forward and talk about this particular concept. And first, I'd like to start by talking about — let's see if I've got this right. Oh, it works.

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Let's talk about the behavioral concepts that underlie our discussion today. First, prices are mainly driven by emotional crowds, and not fundamentals. Is that a surprise? Anybody who spends time — and we're equity investors — spends time looking at markets and individual stocks is just dumbstruck by how prices move and then where they end up settling. It is almost always a mystery. And so fundamentals do play some role, but they represent a pretty weak driver of prices and price movements.

So, it's emotional crowds. That's all you see out there, one emotional crowd after another, driving a price one way or they're driving the entire market. So, that's a first basic concept.

Next one — investors are not rational, and markets are not informationally efficient. It's always, at this point — I've been in front of thousands of analysts and advisers. And I ask, how many of you have a rational client? How many of you have a rational client? Raise your hands. Anybody with a rational client? I've done this in front of thousands, and I've gotten six hands.

So, explain to me why we built a theory on an economic agent that doesn't exist. Doesn't that seem rather strange? The second part of this is that markets aren't informationally efficient. And we now have hundreds and hundreds of anomalies that have been academically verified.

In fact, Campbell Harvey is presenting in a room next to me here — just put out a paper. He cataloged over 300. So, how many of those anomalies — we call them something different — do you have to have before you finally say, hey, the markets are not informationally efficient? So, we're going to be real bold and just say they're not efficient.

Emotions are the most important determinant of long-horizon wealth. Unless you're considering emotions and behavior at every stage of working with clients, building portfolios, asset allocation, selecting managers, selecting stocks, selecting markets, you'll underperform. You've got to consider emotions and behavior at every stage.

In fact, that's so important, that everything else we do — correlations, and all that fancy mathematics stuff — is insignificant. It doesn't matter. Now, this is really hurtful to me, because I've got my PhD. And I derived all these equations, and I learned how to do quadratic program — and ah, dah, dah, dah, dah. And I don't use any of it, because emotions and behavior are the most important.

If you ignore those, all that other stuff is just noise. There are hundreds of behavioral price distortions. But that's what we call them — anomalies — that can be used for building superior portfolios.

I don't know how many of you saw Dick Thaler's initial presentation, his discussion with Gene Fama. Remember? He said, Gene — Dick thinks that prices don't reflect the underlying information.

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The second part is you can't earn exceptional returns using public information. And he gave Gene Fama an A-minus. I'm a professor too, so I can grade him.

Gene and I had a little, short exchange — nothing like Dick and Gene do all the time. And I said, hey, Gene, there's lots of evidence out there that people can earn, are good stock pickers. And he said, Tom, Tom, Tom. Read my and Ken French's paper on mutual funds — which I had. I'd read it. I know.

Never did convince him. But Dick Thaler gave him an A-minus. I'll give him a D.

I've looked at the research. The research is overwhelming — and plus, our own experience in managing portfolios. So, these are the behavioral concepts upon which our discussion today is based. Let me just ask. Look through these four concepts.

How many of you believe and accept one or more of these? The official count is unanimous. Well, it's not quite unanimous.

So, we're on our way. We're on our way to thinking of behavior and emotions as a basis for how we build and manage portfolios. Now, you may not feel you're on the way. But all those hands going up — OK. I give you permission to accept these concepts. I give you permission.

Yeah, that and $3.50 gets you a cup of coffee. It used to be a dime.

Now, you're at that stage. I'm at that stage. I move well along on that. The problem is, as we talk with people, they say, yeah. I believe these concepts.

And you obviously do. But what do I do with it? How do I do my job as an analyst or as an adviser? How do I do that, if I believe in these concepts?

And that's what we're going to talk about. We can first go through the ideas of why we are where we are. And then, how do we actually use these concepts to do the job we do?

So, the conclusion is financial markets should be viewed and analyzed using a behavioral lens. And what's so fascinating about this is this is a more stable framework for thinking about markets than assuming that they're efficient or there is arbitrage. Why is that?

Well, let me ask a question. Who of you has changed a behavior recently? Has anybody? A few.

We're very low to change behavior, particularly as groups. So, it turns out to be an incredibly stable framework. So, there's three ongoing transitions that we'll talk about that maybe, you're probably, at some stage, in each one of these.

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First, from modern portfolio theory to behavioral finance. That's at the paradigm level. At the industry level, it's from the cult of emotion to behavioral investing. And at the individual level, it is from a financial analyst to a behavioral financial analyst.

Again, I'm a behavioral financial analyst. I use all of my empirical skills. I look at things very carefully, like I always have. The only difference is it's behavior that's at the base of everything.

So, let's talk about NPT to behavioral finance. Once upon a time, there was NPT. Back in 1743, Bernoulli said, you know how people make decisions? They maximize expected utility. And particularly, the economics profession grabbed onto that. And now, the finance profession has. So, that's the rationality mode. It's been around a long time, hasn't it?

Then Harry Markowitz said, in 1952, we ought to do mean–variance optimization, which is cool, because it's mathematical. And I'm a math guy. I love math.

And then the next pillar, capital asset pricing model. 1964, Bill Sharpe, and Lintner, and Mossin. Bill Sharpe wrote his capital asset pricing model paper at the University of Washington just shortly before I entered the PhD program there. And then, Gene Fama and the efficient market hypothesis.

So, these all came out. And by the 1970s, modern portfolio theory had come into existence. This is when I got my PhD, the late 70s.

And this is what I said. If we drive the capital asset price — you know there's six different ways to derive the capital asset pricing model? We tested it. We looked at it, and I couldn't have been happier, coming out of the PhD program.

I was an engineer. I'm a civil engineer. I'm a quant. And all they said to me is, Tom, you don't have to worry about those messy markets. Here's a set of equations that explain it. And I was absolutely thrilled.

Well, that didn't last very long. 1970, Kahneman and Tversky began to look at rationality and whether people make rational decisions — ah, it's a little simple question. Do people make rational decisions?

And they found out they didn't. In fact, after 40 years of research, their conclusion is worse than we thought. There's almost no rationality.

And what's even more distressing, we can fool people into making decisions that are counter to their best interests. But of course, we in finance go, whoa. The Morgan people have known this for years.

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1973 — Friend and Blume came out, did the first formal test of the capital asset pricing model. It didn't work. When we entered the PhD program, they handed us this paper and said, here's the paper. Find out what's wrong with it.

We've never had any evidence supporting the capital asset pricing model — no evidence whatsoever. Isn't that incredible? I have students from all over the world in my classroom, and I'd ask them, is the capital asset pricing model in your finance books? And they all said yes.

And so, it's at that point I concluded the capital asset pricing model was the worst export of the US ever. Efficient market hypothesis — Sanjoy Basu said, Hey, you know what? Low PE stocks outperform high PE stocks.

Of course, that's devastating. That's public information. Can you calculate a PE ratio? Can you can a bunch of PE ratios? Can you invest in the stocks with the lowest PE ratios, and then can you earn an extra return? And the answer is yes. This was a real problem.

Shortly thereafter, in the early 80s, the small firm came back, Rolf Banz. And then the floodgates open — hundreds and hundreds of those anomalies. And then, in 1981 — Bob Shiller spoke yesterday. He said the volatility of the market can't be explained by changes and fundamentals. In fact, almost none of it can be.

So, that means volatility is emotion. And why should we build portfolios on emotion? Why should we do a risk emotion trade-off?

So all the pillars fell fairly early. Notice, this is over 30 years ago. Now for me, I started reading the literature. I'm an empiricist. So, I was really into the academic literature, all the empirical stuff. It just kept getting worse, and worse, and worse.

So finally, in 1989, I gave up. I said, modern portfolio theory just doesn't make any sense. By the way, it's the same year the Berlin Wall came down, in 1989.

So, that's 30 years ago. I finally decided modern portfolio theory — I'm done with it. Now, what am I moving into? And that's where if we left modern portfolio theory, where would you go?

I'm here to tell you there is life after modern portfolio theory. Meanwhile, in behavioral science, Kahneman, Tversky, and their prospect theory came out in the late 70s. *Irrational Exuberance*, Bob Shiller — from yesterday. *Fooled By Randomness*, Taleb — Nassim Taleb. What we found — and this is one of the first works that Kahneman and Tversky worked on — we can't estimate probabilities very well. We are fooled by randomness.

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Kahneman got the Nobel Prize for economics, recognized that behavioral economics was important. If Amos Tversky would have survived — he died of cancer in the mid 90s — he would have received it, as well. They were just a tremendous team.

Thinking, Fast and Slow — has everybody read this? All right. Absolutely an astounding book. If I were still teaching, I would require it for my classes.

Misbehaving, by Dick Thaler.

And then most recently, Michael Lewis, *The Undoing Project* — this is, I think, an excellent book. I'd recommend it to everybody to read this book, because it does two things. It really does a very nice job of the theory. He spent four to five years writing this book. And then he talks about the relationship between Kahneman and Tversky, which is an interesting story in its own right.

So, behavioral science was coming on strong. So, what are those cognitive errors that we see? First one is myopic loss aversion. We see this all of the time.

What is myopic? And if you're an adviser, you're working with clients — you see it constantly.

So, loss aversion is the idea that we feel worse about losses than we feel good about equivalent gains. A lot of research think it's about 2 to 1. We're loss averse.

The second thing is we cannot think long term. So I go into my classes to teach, and I go up to the front row of my class. I look at some gal in the front row that is about 22. And I'd say, your investment horizon is 80 years, and they get this horror stricken look on their face. They couldn't imagine being 25, let alone 60. But the truth is we have long investment horizons, don't we? All of us do. But we can't think that way.

All your clients say what's happened over the last month, the last quarter, the last year, don't they? And when they do that — and particularly, if they're left to their own devices, they end up making bad decisions. That's why we call it myopic loss aversion.

Interesting study that just came out. Investors who own ETFs versus mutual funds underperform by 300 basis points. Let me say that again. Those investors that own ETFs underperform by 300 basis points. You're saying, how can that be, because they're cheaper? Well, they are cheaper, except it opens up their desire to trade. And so, they hurt their returns.

Next one is social validation. We like to do the same things as everybody else. You can call it herding. We like to do the same thing as everybody else.

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Those are two most powerful cognitive errors. And you working with the clients see it all the time, don't you? If you think about the issues you run into in dealing with clients, you could probably put most of those issues in these two.

Then, there's a whole bunch of others that are just absolutely fascinating. Again, *Thinking Fast and Slow* does a great job of laying out the research over the last 40 years and talking about these kinds of cognitive errors, also referred to as heuristics, shortcuts that are often wrong at making decisions. So Kahneman, Tversky, and others looked at these cognitive errors. And then they turned their attention to professionals.

And it doesn't get very good, at this point. What they found over, and over, and over again, is that simple based rules — rules-based decision making — is superior to the professional judgment. Now, I don't know about you, but I'm a professional. And I'm going, you're kidding me? My professional judgment is worse than some kind of rules?

So, for example, if you get an x-ray, would you prefer to have a radiologist look at it or an algorithm? Turns out the algorithm is better.

If you're choosing candidates for officer schools in the military, would you prefer a simple six question test or a careful evaluation of all the soldiers by an evaluation team? The six question test — and on, and on, and on.

In football — how often should you punt on fourth down? Very infrequently. Should you ever draft somebody in the first round of the NFL draft? No. Should you trust your scouts on a baseball team or run a series of statistical analysis? Statistical analysis. That's how deep the cognitive errors go. Even for us and other professionals that are educated and highly trained, we can't get around those cognitive errors.

So, how about the cult of emotion to behavioral investing? First, what's a cult of emotion? Well, it turns out we're so embedded in it, that we don't even know we're there.

So, here's a couple of clients. And any time a client comes in to an adviser, this is the way they look. They've got this big wad of anxiety up there, and they've got all these things swimming around about their investing. And what about if I die? What about if I lose my job? How am I going to retire? How am I going to pay for the kid's education? I got all this anxiety.

And in particular, they read everything about what's happening out there and how the market moves.

Call this guy the cult enforcer. So when the cult enforcer talks to a client, this is what he or she says. I know you're afraid, and you should be afraid. So I will not invest you in products that will stir up these fears.

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That's the cult of emotion. Does that sound familiar? We see it all the time, don't we? So what's the making of a cult enforcer?

MPT tools — volatility is risk, diversification, tracking error. Volatility is not risk; it's emotion.

Now, if you want to manage emotion for your clients, that's one thing. But don't call it risk. So, I see it all the time in the industry. Risk management — cross it out. Emotion management. Let's call it for what it is — emotion management. That changes the way you think about it, doesn't it? Diversification is a comfort blanket.

There's very few situations where diversification makes sense. Now, what I'm talking about here is your long-term growth portfolio. I'm not talking about the short-term liquidity, your dividend, your income payments. I'm talking about the long-term growth. And we'll talk about how we put this all together.

Diversification rarely makes sense. There's a few situations where it does.

And tracking error — this one is the bizarrest of all. We created this. Unbelievable. Anyway, we'll talk about that later.

Business risk — now, this is where it really gets dicey for you in a firm, because we know investors are emotional. And if things don't go well, they pull their money out.

So, emotional risk by the investors gets turned into business risk for the company. And that's real. But let's not call it an investment risk.

It's business risk for you, as a firm. And that's fine. We worry about that too, as a firm.

And then regulation — suitability. You know the suitability requirements? The question is, how afraid are you? Are you really afraid, just kind of afraid, or not very afraid at all?

So, we'll build a portfolio for you, based on your fears. And then there's grievances. That's the bane of the US. Anything that somebody can sue on, they will. And this is obviously something that happens.

So here's a standard risk–return framework — standard risk–return framework. So, you go from low risk to high risk, and then from low return to high return. See this everywhere.

But when we look at it — and the way we quote, "measure risk," it's really emotional comfort versus return. If you want to deliver low emotional [INAUDIBLE] through your investments, you get low returns. One of the things we're going to talk about is separating those and having

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the adviser deal and create the emotional comfort so that we, as investment managers, can deliver tremendous returns.

And so, that's what we see. So, this is really what we're dealing with, emotion versus return. And then we end up with the cult of emotion. So, this is that adviser that says, you're afraid. I know you're afraid. I'm not going to deliver a portfolio that stirs up your emotions, and that's where you end up.

Notice the upper bound is 10%, which is the long-term return of the stock market. For capital portfolios, we almost always put things other than stocks in there. And we're guaranteed to underperform.

How many of you have clients that are 100% equities in their capital growth portfolio? Got a few. Good.

What we're looking for is behavioral investing. And there's two key players in all of this — two key players in this. They're called the behavioral financial adviser and the behavioral financial analysts.

And we'll talk about what those look like. Just to give you some perspective, based on the research, good behavioral financial advisers add about 300 basis points to the performance of their client returns. On the investment management side, we can add about 300 basis points and excess returns, as a behavioral financial analyst.

The combination of those two — the 300s — gives you 600 basis points. That's almost a doubling of the base return that you can earn, if you don't do those things. That's the reason we look at the markets this particular way and our jobs in this particular way.

So, let's talk about a behavioral financial adviser. Advisers are leading the industry transition in this regard. We see it all over. All the big firms have added behavioral finance units, and so this is moving very strongly in the advisory industry, versus behavioral finance. In other words, your framework is all behavioral finance. We actually have become convinced that advisers should, number one, get their degree in psychology, and number two, teach in the finance [INAUDIBLE], which is really hurtful, as an ex-finance professor.

But there's very little you have to know in finance to do a good job. You need to know a lot in terms of psychology. Needs-based planning — we'll talk about that here in the next slide. It's an absolutely critical step in this process.

Be an emotional coach. In fact, the advisers we talk to — in particular, one — spent over half of their time being an emotional coach. Now, that's a problem, because a lot of people get into

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being an adviser, because they invest their own money. And then somebody, could you invest their money? So, they really like to manage money. But the good ones are emotional coaches.

And long-term perspective — oh, this is so critical. We have long investors. And again, we're talking about the capital portfolio.

So this is, in particular, the portfolio side, the side that we're focused on. So, we're breaking it down into three buckets. Prior to this, the adviser's taking care of the insurance needs and the tax planning — all the other issues.

So, that client walks in with all this bundle of anxiety. The good advisers spend time unwrapping that bundle and meeting those particular needs — your insurance needs, your tax planning, your estate, and dah, dah, dah, dah, dah. And now, we come down to the investing side.

Liquidity — how much money you need in a bank to feel comfortable? Well, put that in a bank. Put it in a money market.

No matter what happens to the market, it's there. We get rid of that anxiety. Income — if you need income out of your portfolio, let's do three to five years. Let's make sure that we've got that.

And we think dividend equity is the best way to do this. Dividends have the advantage of paying higher yields. And it grows over time.

And length of retirement or whatever you're trying to fund is a big issue, if inflation happens to pick up. And then your growth portfolio — and here, it's expected returns. I want to produce as much wealth as I possibly can. And we're going to talk about active equity here.

So, this is the portfolio that I've been talking about up to this point. And we'll continue to focus on it, as we go through our discussion. So, how about the behavioral financial analyst — in particular, the gatekeeper part of this?

And gatekeeper, we put here. But those are typically the people that decide what gets onto a platform. But a consultant would be in this category. Or a CFA® that works for an adviser and builds portfolios for them of other managers would fit into this category.

Behavioral finance again — that's the foundation. We discard MPT tools. We don't use past performance. We don't use a Sharpe ratio. We don't use tracking error, and we don't use [INAUDIBLE] drift.

And you're sitting there thinking, wait a minute. My toolbox is empty. We're interested in manager behavior strategy, consistency, conviction, and expected returns.

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That's what's important in building long-horizon wealth. Let's take a look at the buy-side analysts, the people that actually make the investment decision, make the recommendation, stock picking, bonds, whatever — again, behavioral finance — careful empirical research. Maybe it's big data, like we do, or it's going to visit companies and doing very careful fundamental analysis, that so many analysts do.

Were looking for something that's measurable and persistent. We pursue that strategy — consistent, high-conviction investment process. Consistent high conviction — and it's rules-based portfolio management, so that when we make decisions on buying and selling, it's all rules based. No judgment.

No judgment — rules based. And again, that comes out of the Kahneman and Tversky research on professionals. So here, we're back to the emotion versus return, the cult of emotion. From an investment standpoint, the cult of emotion has created the closet indexing factory. The industry has been successful.

Two things have been incredibly successful. Mutual funds, incredibly successful — $13 trillion, maybe even more than that now. And then, turning active equity into closet indexers were incredibly successful doing that. How many of you worked in the closet indexing factory? You don't have to raise your hands. How many of you work in the closet indexing factory? How many of you use the Sharpe ratio, ask managers to manage volatility and drawdown, ask some not to have high tracking error, not to have style drift? Those are all the tools of the workers in the closet indexing factory.

And by the way, you've been incredibly successful, because 70% or 80% of the active equity funds are closet indexers. Instead, what we'd like to do is to move up here. Again, it really is a two-part process, because the adviser has to get the clients to the point where they can tolerate volatility, draw down on other things in their growth portfolios. And then, we can deliver it, as managers.

And again, that's 300 basis points from the behavioral financial adviser, 300 basis points from the buy-side analysts and the gatekeeper. So there's three groups here — advisers, working with clients, getting them, taking care of their anxieties, so they can build long-term growth portfolios. There's active equity managers that are truly active, and then the industry folks that don't ask the managers to do things they shouldn't be doing.

Truly active management is what we're looking for. Now, part of that is to recalibrate how we think about volatility, risk, and the cost of emotions.

This is one of my favorite slides. You see it all the time, don't you? This is investing $10,000 in 1950 in the S&P 500, in Treasury bonds, and Treasury bills. This is over a 60-year period, 65-year period. It seems like a long time. But in fact, our investment horizons are very long.

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If you invested $10,000 in the S&P 500 in 1950, you would end up with $9 million at the end of last year — $9 million. If you invested $10,000 in Treasury bonds, you would end up with $422,000. And if you invested in Treasury bills, you ended up with $167,000. Absolutely stunning.

A number of important observations here: If you're going to build long-term wealth, how much should you put in equities? 100%. Is there an argument for anything less?

Now, if you can come up and tell me of an asset class that has a higher expected return than stocks, then that's one thing. But why would I invest in bonds and bills to build long-term wealth?

Now, if I want to provide emotional comfort, I will. Maybe you need to do that. But let's not fool ourselves. That's not a risk. Risk is leaving $8.5 million on the table. That's risk. It's not the volatility, those jags there. That's not risk. That's emotion. Leaving $8.5 million on the table is risk.

I don't know about you, but I want to be wealthy. I want to be as wealthy as I can be, and I want my clients to be wealthy. And if I can get them to control their emotions, I can make them wealthy.

Building superior portfolios is straightforward, but emotionally difficult. So, what's your portfolio strategy here? Invest 100% on the stock market, and never take it out. That's about as simple as it gets. No alternatives, no bonds, no Treasury bills.

I'll be honest with you. Investing is simple. It's simple: If I want to build long-term wealth, I just put 100% in the stock market and forget it. What's the riskiest investment you can make for building long-term wealth? Treasury bills.

Treasury bills are incredibly risky. Do you say that to your clients? We're viewing the world through the lens of behavior. And when you do that, lots of things change.

Now, that was a mountain chart. But indeed, that's just one realization. This is what actually happened. I'm sampling from this distribution on each year. And it turns out the returns are not correlated from year to year. So, it really is a random draw from this distribution. I don't know about you, but I love this distribution, don't you?

Look at this. 55, 65, 75. 55% of the days are positive, 65% of the month, 75% of the years. I like those odds. Can you tell me any other place you get those kind of odds? Any other place?

If I were a casino owner and got these odds, I go, wow. This would just be — and I don't have to do anything. I just sit there and keep drawing. Draw.

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Really simple. Now, how about the last nine years? 2007 — and there's 2008. Why did I put that in big red? Because when your clients — I'm sure you don't do it. But when your clients come talk to you, they ask about 2008, don't they? Why did they do that? They do it, because of loss aversion.

It's an emotional event, and they remember. Focusing on 2008 for your portfolio management decision is an emotional decision. It's 1 out of 95 events up here.

By the way, you see the big positives are bigger than the big negatives. I love this distribution, and I'm just going to keep sampling out of this forever. Boom, boom, boom, boom.

Now, notice the advantage of this approach is there's no stories. There's no — those big jags that happened with the dot-com bubble burst and 2008. Now, you notice that after 2008, we have 09, 10, 11, 12, 13, 14, 15, 16 — eight years positive.

This bull market is second only to the 1990s. But people don't like this bull market, do they? Do you guys like this bull market? I think it's wonderful. For some reason, we love the 90s, and we hate this one. Why is that?

That's emotions. If you are making your investment decisions based on emotions, you are under-performing. You can guarantee it.

So, diversification. People like to buy like — well, this has been around for a very long time, and it shows that in a stock portfolio, all you need is 20 stocks. You don't need any more than that. That gives you almost all the benefits of diversification to reduce volatility for the portfolio.

So, stop at 20, right? I'm sure none of you have portfolios that have over 20 stocks. If you ever talk to an active equity manager, mutual funds, something like that, and you're looking at their mutual fund, and you ask the manager off to the side — maybe you've been drinking, have a couple glasses of wine at dinner. And you say, hey, if you were managing your own portfolio, and buying stocks, how many would you hold?

What's the answer you get? 10 to 15. I've done it. Any number of times, and you have 10 or 15.

So, why do we hold over 100 in a mutual fund? Of course, if you look at it over longer periods of time, this happens to be our 10-stock pure portfolio that we manage. Just crazy one-year returns — minus 53 to a positive 133.

That's pretty scary. But when you go to 10-year, what do you see? Wow. Look at this, 13% average return. Your minimum return is 9.4, 17.8.

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A long investment horizon is so critical. And we have long investment horizons. I'm 69 years old. I know I look good. I look younger than that. But I'm 69 years old. I think I have a 50-year investment horizon. Thirty life expectancy was myself and my lovely wife, who is sitting in the back row there. And 20 years for trust and foundation. I've got a 50-year investment horizon.

I look around at you, you guys probably only have, what? 50? 40? 30-, 40-, 50-, 60-year investment horizons? I don't know about you, but I want to be wealthy. And I want my clients to be as wealthy as they can be.

So, behavioral investing — short-term volatility and drawdown along with tracking error are emotional residuals of successful active management. Build superior portfolios that are straightforward but emotionally challenging. So, are there risks out there?

There are risks. So, if you're looking at individual stocks — and Jason Voss and I are together, doing this series on active equity renaissance. And Jason was a fundamental analyst with a company.

And what he would do to figure out risk, Jason, is you'd look at it very carefully — look at all the different dimensions. And you assess the risk. And I think that's exactly what we have to do on individual stocks. Beta doesn't tell us anything — none of those other things. You've got to know the company.

So, if I want to know the risk of the company, I've really got to dig into work. And Jason, it would take you a very long time to figure that out. I think that's where we are.

In terms of portfolio risk, the chance of underperformance is that $8.5 million you've left on the table, because you invested in bonds. That's the true risk. I don't know about you, but I want that $8.5 million.

And in terms of foundational risk, market, or economic failure. And here in the United States, we're spoiled. We have the longest stretch of our economy operating and markets operating.

But you look around the world, and economies and markets have failed on a pretty regular basis. So, there is some risk there, that foundational risk. So, we've talked about the impact.

And in terms of measures, avoid price and short-term volatility-based measures. Neither want to work, because they're both driven by emotions. You can't pick out the risk from the emotions.

So, throw away all your measures based on price and volatility. And of course, you're saying, wait a minute. That's all our data.

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But they don't work. So, what are the costs of emotions? In other words, if I let emotions make my decision, how much does it cost in a portfolio?

So, here's T-bills versus the S&P 500. And of course, people don't like the S&P 500, because it's volatile. They'll pull out. If you've got out of the S&P — even during this period, this is a 20-year period, going back to 1997. You've got a 500 basis point advantage over Treasury bills.

That's about the estimate that Jeremy Siegel provided yesterday — 500 basis points. All you had to do was stay in the stock market. Well, this was a wild time, right? We just had the dot-com bubble and 2008. The best funds — strategy, consistency, conviction. We have actually Athena, very explicit measures of that. But another 200 basis points.

But why don't people invest in this tracking error? Hey, this fund underperformed for a year. Hey, this fund underperformed for two years. Hey, this poor fund underperformed for three years. Can't hardly help yourself. And Dick Thaler did a great job on the intervention. Remember, he had this presentation?

Well, I've seen this study. And pension plans do this all the time. If you underperform for three years, we fire you. And the next year, the manager does great. And the ones you hired do worse. Part of that is the mean-reversion process.

The best stocks — this is really fascinating.... Even the best funds buy a whole bunch of stocks they shouldn't. But you call them away. We are able to do that at Athena. We find out we end up with another 500 basis points — unbelievable.

How many people here are buy-side analysts? Could you stand up, if you're a buy-side analyst? Buy-side analysts, stand up.

Let's applaud them.

[APPLAUSE]

Jason, you didn't stand up. OK. Emeritus buy-side analysts. These are the stars of the industry. We need to do everything we can to recognize — and there it is.

If you let buy-side analysts do what they do best, which is stock picking, and not ask them to do a bunch of other things, they'll do really well for you. Not everybody — there's a variation. But a vast majority will.

And then leverage. This is our global, tactical portfolio, where we look at behaviors, deep behavioral currents. And we use leverage in this portfolio.

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And you get 19%. And we've done it. So, the difference between Treasury bills and the best markets is 17% — unbelievable.

But we've done it. Building superior portfolios is straightforward but emotionally challenging. We talk about the five big emotional triggers.

Number one, volatility. Drawdown, tracking error, concentration, and leverage. How many of you disqualify managers for one of those five? I know a bunch of you do, because we've been disqualified. Volatility, drawdown, tracking error, concentration, and leverage.

If you use any of those five things, describe your portfolio. The vast majority of the industry will not invest in them. So, here's the potential wealth gain. Here's the cult of emotion.

If you invest in bonds, you invest in $1 million over 30 years, you end up with about $3 million. I'm being generous, and giving it a 4% return. If you invest in a stock, $17 million.

You've left $14 million on the table. This is what's incredible. If you can generate a 400 basis point alpha, you end up with $50 million, rather than $17 million.

The power of compounding and the power of high-conviction positions. So, what's the tool kit look like for the behavioral financial analyst?

So, here we are. Index returns — I'm talking about equity markets building long-term capital wealth — 10%. That's what it's historically been. Actually, it's been better than that. But let's just use 10%.

That smart beta is a little bit better. We refer to smart beta as poor man's active management. Now, it's there, but then truly active, and then behavioral.

And so this is what we're looking at — the research. Truly active managers outperform — the best known is the R-squared study of Amihud and Goyenko. "Best Ideas," Randy Cohen, showed that they outperform best ideas.

It identified a priori, before the fact, outperform. And then, the work that we've done was strategy and consistency outperform. So 4% to 6%. Stockpicking skill — the research is in.

Wermers — the average stock held by a mutual fund has an alpha of 130 basis points. It's got to be it, doesn't it, because the average active fund has about a zero alpha. So, that means their stock picking skill must be, on average, 130 basis points, because the fees are 130 basis points.

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Berk and Green — 80% of funds display skill. Cohen, Polk, and Silli — best ideas outperform by 6%. Pomorski, save 6%. Wermers — holdings predict returns up to 12 months into the future. Frey and Herbst — buy-side recommendations outperform.

This study was interesting, because they had buy-side, sell-side, and portfolio managers. Buy-side were the best. Sell-side were next. The poorest were portfolio managers.

Oh. And of course portfolio managers, unless your buy-side and portfolio are the same person — but portfolio managers are making decisions not on fundamental information or their analysis, but other considerations. In some ways, this may be the most important slide in the presentation.

This is what we took as all of the active equity managers over a very long time, except this is January 2001 through September 2014. And we looked at their relative holdings, relative weights, and we ranked them. So, the highest relative weight was their best idea, next, and next. If you increase your investment in your 10 best ideas, you increase your alpha by 6 basis points. 1% increase.

If you increase by 10%, it's 60, and so forth. The next 10 — if you increase it by 1%, you increase your return alpha by 2.3%. And if you increase your waiting to 30, and 20, and lower, you hurt your performance.

So, think of a mutual fund. The top 20 relative weights generate all the alpha. All of that other 80, to 100, to 120 stocks hurt alpha.

Why do we do that? Do you go to any other place and ask for advice and have them give you their worst ideas? Is there any example of that?

Yet, when you buy a mutual fund, that's what you do. Give me your 80 worst ideas. Now those of you that are buy-side analysts know exactly what I'm speaking, and probably many of the others — you guys know this.

Why don't we do it? I didn't say it was going to be easy. So, what are the desirable characteristics?

So, what are the desirable characteristics of funds? Number one, less than $1 billion, if you're going to be truly active. In fact, I'm a strong believer that once you reach $1 billion, you have to turn yourself into an index fund.

That's popular. And the reason being — and I've done the research of my own portfolios, and we've done it broadly across all — once you get over $1 billion, it's really tough to execute your strategy. Those of you that are buy-side analysts managing, you know of what I speak. R-squared between 60 and 80.

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Don't track a benchmark. Don't track a benchmark. How can you beat a benchmark, if you track it?

High-conviction positions. I only want your 20 best ideas. Don't give me your bad ideas. Give me your 20 best ideas.

High style drift. One of the worst things foisted on the industry is a style grid. So, those buy-side analysts that stood up and we applauded, if you go to them and ask them, how do you manage money? And they'll say, well, I look at these things — maybe five things, maybe three — something like that.

And almost none of them will be PE or market capitalization. Here's how we manage money. High active share, portfolio drag. And that's something we've come up with, but it's really a combination of the things above. And there's an explicit measure.

So, you've got all these great stock pickers picking stocks. And then the fund says, OK. We're going to benchmark track. We're going to overdiversify. We're going to grow big. We convert from performing to distribution. And there's got to be a balance in there. We need distribution.

I don't know about you, but I want to deliver value to my clients. I want to deliver value to my clients. In short, avoid closet indexers, which is about 70% or 80% of the industry, from what we can tell.

There's a study where we looked at indexes, the average fund, and truly active. Fees are a little bit higher for a truly active, but their alpha is 330 basis points. The truly active funds — the one-strategy, consistency, conviction are the ones that don't benchmark track, they don't overdiversify, and they don't asset bloat — do well.

This happens to be our portfolios, our peer, our dividend, and our global tactical in the Athena. And of course, at this point, everybody says, "oh, Tom, you're just trying to sell your products."

Well, I went years as an academic walking around and talking about some things. And they said, "oh, Tom, it's just theory. You haven't done it." So folks, now I've done it.

So, not only have I done the research, but we actually manage money. Behavioral factors — management confidence, analyst confidence, credit confidence. So, this is our particular factors that we look at.

Here's equity manager confidence and holdings. And this is macro-level crowd behavior. All of them behavioral — all behavioral factors. This is our managed equity, which is three portfolios. We launched this, what, in 2011?

Generate about 300 basis points alpha, which is about what we see with truly active managers. So, we've done it.

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So, making the transition. Really, just four simple steps. Are you ready? Discard modern portfolio theory. Two, leave the cult of emotion. Three, dismantle the closet indexing factory. And four, become a behavioral financial analyst.

Now, that's easy, isn't it? Of course, it's very hard. And that's essentially the path I followed over the last 30 years.

So, one of the specific things we look at again is needs [INAUDIBLE] is incredibly important. Again, you've got to get your clients to the point where in a growth portfolio, those emotional residuals don't get them off the plan. Have them stick with the plan.

In terms of building that truly active part, I look at five or so truly active strategies. Let them do what they do. Don't impose restrictions on them.

All I want you to do is make me money. Can you do that? And analysts can. Buy-side analysts can.

Make the transition. We're going to leave the closet indexing factory. We're going to stop using style boxes. We're not going to worry about low style drift.

We're not going to expect high R-squared. We don't want low tracking error. Volatility is risk. We're not going to do that, and we're not going to use the Sharpe ratio.

That's a ratio of long-term return to short-term emotion. To be a truly active equity manager, a truly active equity, you would start using these strategy, consistency, conviction. I expect a return. True risk — not emotions.

We talked about true risk. High tracking error. Low R-squared. High style drift. High active share, and then portfolio drag index, which is something we're putting together.

Well, wasn't that easy? So, why go through this? Why make this transition?

Number one, on the adviser side, the robos. Unless you can deliver value to our clients — and we think most of that is through emotional counseling and planning — the robo advisers are going to displace you. On the active equities side, unless we get truly active, then investors are figuring it out. They're not going to pay for closet indexers. The funds are flowing out of closet indexers and into index funds.

I happened to be at dinner last night with Jack Bogle as a speaker's dinner, talking with him. And what he reminded me — and I used his case when I taught, that when he went out and requested the first index fund, the SEC rejected it, because it says, you have to charge fees. Did you know that?

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So, he had to argue with them. No, we're going to do low fees, and we're just going to track an index. And then he had eight years of outflows, because it was the small-firm effect. That's about the only time it's been there.

So, from being truly active — that is our goal, as active equity manager. So you've got a choice. You can be a commodity provider and sell more Vanguard than the next person, or you could be a truly active manager and deliver value to your clients. And that's why we talk about this. OK?

Good. Thank you very much.

[APPLAUSE]

RON RIMKUS, CFA: All right, Tom. Well, we've got plenty of questions rolling in here.

C. THOMAS HOWARD: Just so long as you don't storm the stage.

RON RIMKUS, CFA: OK. All right. The first one. Historically, Wall Street analysts are correct fewer than 15% of the time, according to a study. What determines that poor forecasting result?

C. THOMAS HOWARD: So let's talk about different levels of analysts. The buy-side analysts, the research is pretty convincing. They're very good at stock picking.

And in our own portfolios, our picks work out about 60% of the time. And so I'm suspecting that's the way most buy-side analysts are. The sell-side analysts — actually, their recommendations are quite good too.

I don't know that particular study, but the studies I've seen show that they are very good at what they do. And that's because the market is a behavioral market. And emotions drive prices, and there's all kinds of opportunities.

And if you're disciplined, you can identify those opportunities. And that's what buy-side analysts do. And they do it in hundreds of different ways.

RON RIMKUS, CFA: Where does portfolio turnover fit into your framework?

C. THOMAS HOWARD: What's that?

RON RIMKUS, CFA: Where does portfolio turnover fit into your framework? What level?

C. THOMAS HOWARD: The typical active equity managers turnover about every year. In our pure portfolio, which is valuation [INAUDIBLE], we hold stocks about 18 months. So, that's

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kind of — and we see that across the strategy that turns over the most is something called market conditions, which is basically timing the markets.

The longest one is valuation, which is 18 months. So, they hold 13 to 14 months, on average. This is what we see as a turnover.

When I say active, it's not trying to time short term. It's taking active bets on stocks — specific stocks. Probably wasn't very clear on that.

RON RIMKUS, CFA: Will the new religion of indexing create more opportunities for truly active, in your opinion?

C. THOMAS HOWARD: Yeah. If indexing gets to be a big enough share, then I'm thrilled. And the rest of the buy-side analysts here are just — yeah, right.

But you've got to remember that the stock markets are $42 trillion in market capitalization. If you look at index funds and ETFs, that's $4 trillion. And that's only 10% of the market.

So, we're nowhere close to having any kind of significant impact, I can tell. But if all you guys want to go to indexing, and I'll stay active, then that's fine.

RON RIMKUS, CFA: What is going to happen with behavioral finance with the new trends like algorithmic trading and automated stock picking?

C. THOMAS HOWARD: Well, the behavioral finance — again, the basic idea of behavioral finance is we need to consider emotions, behavior, whatever you say. In terms of investing, we're trying to identify behavioral price distortions. And as long as behaviors… people don't change their behavior, and we don't see much evidence of that, that is going to continue to work.

Now, at some point, we keep waiting for arbitrage, right? Hey — through that door, here comes the arbitrage. And we've been waiting for 40 years for that to happen, and it hasn't happened.

We've got anomalies that have lasted 100 years. And they're still there. Amazing.

Now, if people get rational — what do you suppose the chances of that happening? If they get rational, and then these things disappear, or if all of a sudden, the arbitrageurs get to be much more important than they are — arbitrage works very well when you can create a risk — a synthetic T-bill. You can arbitrage that.

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But any kind of risky arbitrage, which is what the stock market is — it just doesn't work. People don't hang around long enough. They don't have a long enough time horizon. Even the hedge funds are that way.

So, these opportunities are going to persist, as far as I can tell, for as long as there's humans in the financial markets.

RON RIMKUS, CFA: All right. You touched on this one, but I'm going to ask it anyway. It's a little bit more direct.

If more advisers do behavioral investing, doesn't long-term expected return moderate, since excess returns would be absorbed?

C. THOMAS HOWARD: If everybody gets to be rational, yes. That's right. But there is still a large chunk of investors. They call them independent investors.

And you know what independent investors mean? I want to underperform. And there's a big chunk like that. And you can talk to them all you want, but they're not going to get an adviser.

So we think everybody should have an adviser and a very good adviser. You've got to have a good adviser, one that really does the planning, works from an emotional coaching standpoint, gets you to look long term. And if everybody does that, then yeah. My job is done.

What's the chances of that happening?

RON RIMKUS, CFA: Earlier, you showed one of the slides that showed a professional judgment. And all kinds of different fields are tainted by behavioral issues. So, this question is how is professional judgment of buy-side analysts better than rule-based or quant portfolios?

Professional judgment is wrong everywhere, except in stock picking.

C. THOMAS HOWARD: That's a good question. The research shows that they are very good at what they do, and they are able to pick out. But certainly, that's something you keep looking at, don't you? But the research says that they're able to do that. Now, it's very careful, thorough analysis. And so, it ends up actually working.

But that's a very good question. So, we'll keep looking at that one.

RON RIMKUS, CFA: OK. So, what produces the better returns? Getting clients to stay the course in index funds or trying to maximize return and risk, the client not staying on course?

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C. THOMAS HOWARD: Yeah. That's really interesting. So, can you get every client to stay in their seat? Can you get every client to stay in your seat? And the answer is, of course, no. There are some that are just so nervous and terrified, they're just not going to do that.

But we think it's about 300 basis points on each side. So, if I can get clients to stay their course in building long-term wealth, then that's worth about 300 basis points from an adviser's standpoint, because left to their own devices, typically, they'll shoot themselves in the foot. Now if I could do that, plus I can then add active equity, if I think I understand the question correctly, then that's a bonus.

But the first step is absolutely essential. Get your clients not to make emotional decisions.

RON RIMKUS, CFA: All right. This process appears to have an anchoring bias that the return distribution of the last three decades will continue into the future.

C. THOMAS HOWARD: We think the distribution over the last 200 years will continue. So, if you go back 200 years, we get basically the same returns. We go back to 1803. We've got data back to 1803.

The two drivers of stock returns — our first, economic growth. So, will economic growth continue? And the second is that you have people — and this is what Dick Thaler coined, the term myopic loss aversion — that they will pull out of the market when it starts going down. And because of that, you end up with an emotion premium of about 5% in the stock market.

So, you have 5% that's driven by economic growth, earnings growth. And then you've got 5%, that emotional premium. So, as long as those two things persist, we would expect the stock market to continue to produce the returns.

How about if I told you over the next decade, we're going to go into the greatest depression we've ever seen? Gross domestic product dropping by 25%, employment at 25%. The following decade, we would be in the worst world war we've ever seen, with half of the world's capacity destroyed, 70 million people killed. Would you invest in the stock market? Of course, what I've just described is the 1930s and 1940s.

If you invested in 1930 and sold in 1950, what rate of return did you earn? 11%. So almost everything we see, in terms of the economy right now and all those discussions, really doesn't have an impact. And I've done the research. Lots of other people have done the research, and it just isn't there. It's emotional crowds.

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But the two underlying drivers of economic growth: absolutely, the economy has to continue to grow, and that people are still going to be emotional and they're going to make emotional decisions. If those two things persist, then we would expect the stock market to do well, over time.

RON RIMKUS, CFA: How much less sticky were your clients in your managed equity strategy that started in 2014 and/or 2015, versus other periods?

C. THOMAS HOWARD: So, what was that again?

RON RIMKUS, CFA: How much less sticky were your clients and your managed equity strategy that started in 2014 and/or 2015, versus other periods?

C. THOMAS HOWARD: Yeah. We did lose some clients during that summer. We tend to lose clients — you're not going to like this answer — when they hire a CFA. In fact, we generally don't go to an adviser that has a CFA on staff. Isn't that something?

[LAUGHTER]

We are truly active managers. We have drawdown. We have volatility. We have tracking error. We use leverage of time. We have high conviction positions. And we've found that a firm with a CFA doesn't like that.

Food for thought. By the way, I like you guys.

[LAUGHTER]

RON RIMKUS, CFA: What would a conversation/debate look like with a major consultant, like Callan?

C. THOMAS HOWARD: We'd never talk to them. They would never consider us. They are part of the cult of emotion, and they're cult enforcers.

RON RIMKUS, CFA: OK.

C. THOMAS HOWARD: I was at a dinner with the head of Callan. Is he in the room today? No, I'm serious.

They are the cult enforcers. The consultants are the cult enforcers. And the things we do to make money, they don't like. That's just a fact of life.

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RON RIMKUS, CFA: Why is a liquid dividend strategy superior to illiquid alternative structures, such as private debt?

C. THOMAS HOWARD: I don't know anything really about private debt, so I can answer that. We happen to think dividends are very attractive, because you can get high yields, and they grow over time. But there's other alternatives — MLPs, and maybe the debt.

But I don't know much about the debt market, so I really can't answer that question. But we really like high-yield returns. By the way, that's one of those 100-year anomalies. High-yield stocks produce higher returns over the long haul.

Jeremy Signal shows that. So, it's a really nice strategy, we think.

RON RIMKUS, CFA: All right. This question's a little bit longer. It runs on the front and the back of the card:

My team and I are responsible for managing over $200 billion in retirement assets. How is it that diversification isn't necessary, and 20 stocks are enough? Obviously, that's not possible. Nor is it consistent with the CFA Program curriculum.

C. THOMAS HOWARD: Hire 200 truly active managers. I'm serious. Don't go to a manager and ask him to manage $50 billion, because they can't do it and earn superior returns.

Or you index it. But hire truly active managers. And hire a whole bunch of them. And there's whole bunch of them out there.

RON RIMKUS, CFA: You seem to define the stock market as the S&P 500. How do you feel about non-US equity? Do you include it in your portfolio?

C. THOMAS HOWARD: Yeah. We do look at what — non-US?

RON RIMKUS, CFA: Mhm.

C. THOMAS HOWARD: Yeah. We definitely look at that. And it's part of our global tactical portfolio. We do that. Yeah.

Yeah. We're very interested in equities other than the US.

RON RIMKUS, CFA: This is a compelling question here. You presented data for the US equity market. What do you tell a Japanese investor who invested his wealth in Japanese equities at the end of the 1980s?

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C. THOMAS HOWARD: Yeah. That's not a good story, is it?

[LAUGHTER]

Yeah. That's not a good story. That particular bubble — of course, we know. And in the late 80s, when we were all around.

That really was a very big bubble. And then their economy didn't grow enough to grow out of it. So, yeah. That's a situation.

Yeah. That's a good point. What's that? Right.

As I said, we've been very fortunate in this country, because we have the longest history of an economy and of the markets. But if you look around the world, it doesn't always work out. In fact, often, it fails.

RON RIMKUS, CFA: You talked about a focus on 2008 being an emotional discussion. What is, however, your view on tail-risk management in the context of the business cycle that is fear of coming to an end of life… I'm sorry, an end of cycle?

C. THOMAS HOWARD: We love tail risk. And the reason we love tail risk is because the positive tails are bigger than the negative tails. We make all our money on those positive tails.

And now, if I could figure out a strategy to get rid of the negative tails and keep the positive, I'd be glad to do it. But I haven't figured that out. Has somebody figured this out?

My experience is if you get rid of the negative tail, you get rid of the positive tails too. And that's where you make your money. The residual of truly active management are drawdowns, and volatility, and tracking error. That's it.

Those are all emotional events. And I'd like to make as much money as I can, so I'm going to try to convince you — and we've got clients and advisers that are accepting of that. And the result is we build portfolios that are very successful.

RON RIMKUS, CFA: You stated that you like your odds in stocks. What about when the odds are against you more than normal, such as with high valuation?

C. THOMAS HOWARD: We track the stock market through our market barometers. And there are times when stocks are not attractive in that. And we do go to cash.

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But that's only about 20% of the time. The rest of time, we stay in it. In terms of valuation, if I'm doing individual stocks, yes. That's something we would consider in building individual stock portfolios.

RON RIMKUS, CFA: Is there any change in behavioral approach to the portfolio for a client at or near retirement who cannot withstand a substantial draw down?

C. THOMAS HOWARD: Traditional retirement is not an important investment event. Now, when I came out of college, I went to work for Procter and Gamble — and gold-plated company. And the expectation was that you'd worked for Procter and Gamble for 30 years. And you would retire, receive your pension, and then you'd die 10 years later.

None of those things are true. I retire from the university when I'm 65. I've got a 50-year investment horizon still. That's hardly any different than when I was in school, when I was a faculty member.

So, why should I look at things differently? Now, I do have to have income out of it. But this whole idea that you completely change your investment strategy at retirement has never really made much sense to me.

You know what's the most consistent predictor of running out of money in an investment in a retirement fund? The percentage of bonds held. The higher their percentage, the more likely they are to run out of money. Anyway, again, we look at it in terms of planning model. Let's make sure you have the liquidity you need.

Let's make sure you have three to five years worth of income locked in. And then everything else is growth. And we think, yeah. The stocks are the best way to do that.

RON RIMKUS, CFA: Last question. What role, if any, does technical analysis play in your process?

C. THOMAS HOWARD: Technical analysis is essentially a behavioral approach. And you're trying to figure out short term what the market's going to do and trade that way. I've not seen much evidence that that works very well.

Our approach is if we have an idea, we research it carefully. If we think it works, we build a strategy and instruments. And then we manage it with rules based.

And I've looked at a lot of research on technical analysis, and I haven't found much that's very encouraging. Now, I'm sure there's people sitting in this audience that are very good at it. But I have not seen the research to encourage me to do that.

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But if I could, I would. I'm open to those things. I used to say you could never make money on active management. I said that for 30 years.

I also said you couldn't time the market. I told my students for 30 years, didn't I, George? Remind you to speak your words softly, for someday, you may have to eat them. Thank you very much.

[APPLAUSE]

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