



## Quantitative Equities

# 'Equity price movements are mainly driven by behavior, not risk'

- Factors that exist in equity markets are also present in virtual asset markets
- Anecdotes of mispricing provide evidence of behavioral biases
- Machine learning techniques can help pinpoint genuine factors

**We interviewed Remco Zwinkels on his work in the field of behavioral finance, touching on topics including virtual asset markets, GameStop, machine learning and sustainability.**

**In one of your recent papers,<sup>1</sup> you draw parallels between stock markets and a virtual asset market (FIFA 19 Ultimate Team online transfer market). Can you tell us about this and what your main findings were?**

"This is an exciting topic for me, because one of the problems in asset pricing research is that you never really know what drives the results. You have two camps: the neoclassical one, that says everything is related to risk, and the behavioral one – of which I am a proponent – which says it might be partly related to risk, but it could also be linked to human behavior. These two camps are very difficult to disentangle."

<sup>1</sup> Montone, M., and Zwinkels, C.J., April 2021, "Risk, return and sentiment in a virtual asset market", working paper, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3787339](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3787339).

"But I think we found a way to do that through a quasi-natural experiment, whereby we used the online transfer market in the FIFA 19 video game. Here, the quality or fundamentals of these players are known and fixed. That means there is no fundamental newsflow. So, if you were to compare it to the stock market, prices in the latter move either because of fundamental news or because of

**Interview**  
**For professional investors**  
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**Remco Zwinkels**  
Professor of International Finance at Vrije Universiteit Amsterdam

His main research interest lies in the field of behavioral finance, in particular expectation formation. He won the SBE Senior Teaching award in 2020 and is one of the founders and organizers of the Research in Behavioral Finance Conference (RBFC).

whatever craziness of the market. Like Elon Musk tweeting, for instance.”

“In this virtual market, the fundamentals are constant, and you know that every price move stems from the behavior of individuals because, by definition, there is no news. So that's one great characteristic of this market. Also, it's very similar to an equity market in terms of structure and players.”

## ‘Significant portions of equity price movements are mainly driven by behavior, not risk’

“First of all, it's huge. Literally billions of transactions take place in this market. It's also not just teenagers who play the online game. We have some insight on the demographics. Sure, the average gamer is a bit younger than the average equity market participant, but it's not that far off. The majority of players are male and college-educated, which is similar to what we see in equity markets. The trading process is also similar as it has a limit-order book, for example. It's very advanced.”

“What we find in this setting is that the return dynamics in the FIFA market are similar to what we see in equity markets. In equity markets, there are several prominent factors, and we find these exact same factors in the FIFA market. For example, there is a size premium, whereby players with a smaller market value have higher expected returns. Then there is the book-to-market factor. We can calculate a book value or a fundamental value for players and we do see that there is mean reversion towards this figure over time. We also find momentum and mean reversion patterns. We see reversals in the returns of players that did well in the previous week. But if we look back further, we can also see patterns of momentum.”

“So, these are all very similar characteristics to equity markets. And now we know that the FIFA market is purely driven by behavior, not fundamentals. So, if we can compare it to an equity market, then it could imply that significant portions of equity price movements are mainly driven by behavior, not risk.”

**With respect to the equity market, do you see factors or anomalies as more behavioral or do other explanations hold more ground here?**

“Well, the fact that we also find these factors to be so important in this virtual market really points towards a more behavioral explanation. I don't know yet exactly which biases and heuristics are the drivers. However, if this also happens in the FIFA market, then, apparently it is something that is deeply ingrained in human behavior or market participant behavior. If the same patterns emerge, well, then apparently it's the same underlying behavior.”

“I think this is also important for investment practitioners. Because if you have a better understanding of what is driving these anomalies or factors, then, it's also easier to use them. If you are sure that there is no underlying risk factor, then to a certain extent, you could say it is a free lunch.”

**Inefficiencies do exist in the market and we see examples of these strange cases. In one of your studies,<sup>2</sup> you also looked at the case of Royal Imtech in 2014, where the price was clearly disconnected from fundamentals. What do you think these anecdotes can teach us about market efficiency?**

“These are typically very stark examples, or say deviations from efficiency. In our paper, we point towards an 800% mispricing. Of course, this is an extreme anecdote. But if these things can happen, then, I think it also says something about everyday market behavior. If there are individual instances with such huge mispricing, then it cannot be the case that there is no mispricing elsewhere.”

“Again, it remains very difficult to disentangle mispricing from rational pricing. These anecdotes are useful because they represent examples where we are sure that it is mispricing. That's why I think they are important, because they are so clearly identifiable.”

**Do you think the trend of increased retail investor participation will generally contribute more towards market efficiency or inefficiency?**

“It's a good question. I guess there are several trends. In the past year and a half, you have seen a huge increase in retail investing. This also came hand-in-hand with the huge growth in tracker funds or ETFs. So, in that sense, it doesn't really matter that much. But if there is an increasing

<sup>2</sup> Van den Assem, M. J., Van Dolder, D., Zwinkels, C.J., and Schauten, M. B. J., October 2020, “Can the market divide and

multiply? A case of 807 percent mispricing”, Review of Behavioral Finance.

number of individuals who trade single names, then my gut feeling is that it would be detrimental to efficiency.”

“Overall, you could probably say that retail investors are less sophisticated than institutional investors. So, there is room for more inefficiency. And maybe if these instances are random, well then on average they might cancel each other out. But with Reddit’s WallStreetBets, you have a platform that can coordinate retail flows. So, this could create pressures that could lead to market inefficiencies. But honestly, I wonder if this is a long-term trend or whether it is related to the Covid-19 situation.”

“I think one of the reasons this happened is that many people were bored at home and the stock market is very entertaining. Lots of people also had excess cash because of government support. They also had less opportunities to spend the money. So, on average, savings rates increased significantly. Therefore, there was both the opportunity and possibility to invest more. Hopefully, we are now moving on from this Covid-19 situation. With people now expected to spend more money elsewhere again, and also with interest rates potentially rising, it could mean that retail participation could go down again.”

## ‘Machine learning techniques allow you to better pinpoint which factors are important’

**Can retail investor participation permanently disrupt the market? For instance, GameStop is still trading at an elevated market cap which is not really reasonable in the eyes of many investors.**

“Honestly, I believe GameStop is an exception for several reasons. In this case, retail flows converged towards one particular company. I don’t necessarily see this phenomenon as something that is permanent or could happen repeatedly. So, it is also surprising that its share price has remained high for so long. Indeed, I would have expected it to drop by much more at this point. I guess there are reasons why it hasn’t. But I wouldn’t go as far as to say that this is disruptive for the market in general. I doubt it.”

**In terms of recent research in behavioral finance, are we seeing more evidence that asset pricing factors are a result of mispricing? Also, what excites you in terms of recent or future research in this area?**

“What I see happening a lot is the introduction of machine learning into asset pricing, especially with respect to factors. There are hundreds of factors that have been identified, some better than others, I guess. But of course, that does trigger the question: is this really true? Maybe we’re picking up the same things. Is there time variation or country variation in factors? So, I think an exciting development is that machine learning techniques allow you to better pinpoint which factors are important, at which point in time, and whether they are picking up the same thing or not. I think it’s a great development.”

“Also, behavioral finance proponents were viewed as being negative in the past. Maybe there was some truth in that, because the school of thought only pointed out things that went wrong without really explaining them. On the other hand, researchers that looked into individual behavior, typically experiments showing individual choice behavior, also came up with alternative explanations, like prospect theory, for example. Another point of criticism on behavioral finance was that there is a huge number of biases. And whenever you find something that goes wrong in equity markets, you can just pick a bias and connect it to the issue. So, there’s always a bias that fits your anomaly.”

“What I think is great is that this is improving of late. The profession is making progress and really finding the driving mechanisms of anomalies. To give you an example, more and more papers are coming out that show that prospect theory has an effect on asset pricing on the preferences side. Even more recently, we see that expectation formation is being included into asset pricing, like trend extrapolation. These experimental studies show that when people form expectations about future returns, they just look at the recent past. That’s a very strong human reaction. Researchers are now really incorporating trend extrapolation into asset pricing in mainstream finance literature.”

“So, you are seeing the development of a proper alternative to the efficient market hypothesis. This progress is filtering out this big bag of biases to pinpoint the few that are important to asset pricing in general.”

**Do you think there are any interesting links between sustainable investing and behavioral finance?**

“It's a very broad area and lots of exciting things are indeed happening. Earlier, we talked about the neoclassical approach to investing, where you purely look at risk-return considerations, as well as the alternative approach, where you invest for other reasons. I guess in terms of sustainable investing, you could probably also place it in the category of other reasons, at least in my reading of the literature.”

“There doesn't seem to be a strong real effect on performance, at least not in the short run. But maybe in the long run there will be, if you look purely at sustainability. That would imply that if you increase the sustainability profile of your portfolio, then you do it for other reasons. But the big question that remains, which is very important, is: how do you measure sustainability? I'm currently working with a PhD student, who is employed at Robeco, to find a market-based measure of CO<sub>2</sub> emissions. This seems to be growing into a very promising new line of research.”

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