

Study shows new real-time method for identifying stock bubbles like GameStop's

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If a stock market can be viewed as the nervous system of a nation's economy, then few things can agitate that system's nerves the way a stock bubble can. The recent roller-coaster adventures of the GameStop stock price are a case in point, with the anxiety registering not just on Wall Street but also on Capitol Hill.

The danger of a steep increase in a [stock price](#) lies largely in not knowing what it's really about. Is the increase based on the underlying asset's true value? Or is it merely a big fat bubble bound to pop and cause an economic mess?

In [a new working paper](#), Johns Hopkins Carey Business School Associate Professor Nicola Fusari and two co-authors propose a new method for determining—in real-time—whether a spike in a [stock](#) price is in fact a bubble. They based the method on the options written on a stock during trading.

Fusari, an expert on theoretical and empirical asset pricing, discusses the study and its findings in the following Q&A. The paper, "Testing for Asset Price

Bubbles using Options Data," was written by Fusari, Robert Jarrow of Cornell University, and Sujan Lamichhane, a post-doctoral fellow in finance at the Johns Hopkins Carey Business School.

What defines a stock bubble?

This is a very important question because different people might have different notions of what constitutes a bubble. The academic view is to define a bubble as the difference between the price of an asset and its fundamental value.

From this definition, one can already see where the problem lies when trying to detect a bubble. While the price of a stock is something that we can observe on the market and we can all agree upon, we do not observe the fundamental value of a stock. As such, any method used to identify bubbles needs to find a way to estimate the stock's fundamental value.

One analogy, in a different context, might help to clarify the distinction between price and fundamental value. This example comes from Robert Jarrow, one of the co-authors of the paper along with Sujan Lamichhane: Consider a piece of modern art. One could think of the fundamental value as the price that we would be willing to pay for obtaining its intrinsic value; to hang it on the wall and enjoy looking at it. However, the price that one pays might be different from the fundamental value if the art is bought with the hope of re-selling it sometime in the future at a possible higher price.

Similarly, the fundamental value of a stock is the value that we would get from buying and holding the stock indefinitely for the sake of obtaining its future dividend payouts. Put differently, the fundamental value is the value today of the stock's future cash flows (i.e., the price paid if one holds the asset indefinitely after the purchase). Thus, a bubble reflects the idea that investors might purchase a stock not to hold it indefinitely but rather

because they hope to resell it at a higher price sometime in the future, regardless of the firm's fundamentals.

Has there previously been a prevalent method for identifying stock bubbles? And why is your proposed method—using options data—an improvement?

Traditional approaches to detect stock price bubbles rely on historical data. Past [prices](#) are used to estimate the fundamental value of an asset. A bubble is then identified by the difference (if any) between the price observed in the market and the estimated fundamental value. The drawback of this approach is that it relies on past prices to estimate bubbles. However, bubbles are forward-looking objects in nature, as they hinge on investors' expectations about the future evolution of the stock price. In this respect, past prices might have little to do with future prices.

Our approach is different as we try to detect a price bubble on a given day by only using data available in [real-time](#), on that very same day. We do so by focusing on the prices of options written on a stock, instead of the price of the stock itself. Options, both puts and calls, are financial contracts whose price directly depends on the future price of the underlying stock. In particular, we can look at purchasing a call option as a bet on the upside potential of a stock and at purchasing a put option as a bet on the downside of the stock.

For example, if one believes that the price of GameStop will increase in the future, instead of buying a share of GameStop one can buy a call option on GameStop. Vice versa, if one thinks the GameStop price will fall in the future, one can buy a put option. This is usually done because options are cheaper, albeit riskier, than the stock itself. Hence, given their forward-looking nature, options are natural instruments, we argue, that one should use when trying to detect and quantify a bubble (if one is present). Since the option market as a whole has witnessed a tremendous growth over the past decade, our approach directly leverages the expectations that investors embed into option prices through their trading.

A further advantage of our method is how it estimates the fundamental value of the stock. In the traditional approach, the fundamental value of the stock needs to be estimated separately. This is done by assuming a specific financial model over which there is usually little consensus. Our approach, on the other hand, directly uses options, and this allows us to implicitly account for the fundamental value, without having to actually compute it. This overcomes an important drawback of the traditional approach, thereby making our method easily applicable.

Why did you decide to focus in your paper on Amazon and Facebook?

We focused on them for two reasons. First, both firms have highly liquid stocks and options with high interest among many investors. This is crucial for us, because reliable option prices are the sole input required to implement our methodology.

Second, both are tech firms whose prices have almost doubled from 2014 to 2018, which is the period for the data sample that we investigate. So, we wanted to see whether such a large price increase was primarily due to a bubble or whether it was justified based on the company fundamentals.

Our evidence is largely consistent with the idea that the overall price trends of the stocks (Amazon and Facebook) and market indexes (S&P 500 and NASDAQ) that we have analyzed (with the exception of GameStop) were sustained by fundamentals. However, we did find short-lived bubble episodes when market prices temporarily deviated from fundamental values. We found that these deviations are more likely to occur when trading activity is particularly high and before earning announcements (in the cases of Amazon and Facebook).

Can you explain how your estimation procedure and statistical test work?

As I mentioned before, options allow investors to take a bet on the future price of a stock. Now, if a stock is affected by a bubble, intuitively one might expect that the price of call and put options should be somehow affected by it, since option prices

depend on the future price of the stock itself.

Indeed, our theory says that if a stock has a bubble, the prices of calls and puts written on that stock react to the bubble in different ways. While the prices of puts (which we can think of as instruments that allow investors to bet on the decline of the stock price) are not affected by a bubble, the prices of calls (which allow investors to bet on a possible stock price increase) are inflated by a bubble. We exploit this differential impact of a bubble on calls and puts to identify and estimate the magnitude of a bubble in the underlying stock price.

When you say a bubble, such as the one with GameStop, can be detected in real time, what kind of time frame do you mean exactly? Must a minimal amount of time elapse before you can declare that a bubble is occurring?

We believe this shows the strength of our proposed approach. It is relatively easy to deem an episode of price run-up as a bubble after the fact, as in the dot-com bubble of the late 1990s or the more recent case of GameStop. Looking back at the dot-com bubble, it is now apparent that it was indeed a bubble. However, things look different when we are in the midst of them. Our method is designed to detect a bubble without having to wait for the bubble to burst, and, as mentioned before, without having to rely on historical data that might not reflect investors' most current expectations.

This is what we have done in the case of GameStop. Simply using option data available in December, our methods reveal the existence of a significant price bubble on GameStop starting in the second half of December, about a month before it became widely recognized. We also find that the magnitude of that bubble increases throughout January, before bursting on February 4.

Are bubbles more typically associated with a certain type of company?

Our theory is general in that it does not specify whether we should see bubbles associated with a particular company or industry. What matters for the existence of a bubble are the resale motives of the investors—i.e., the dominant motive that drives

investors to buy into an asset is to simply hold it temporarily with the intent of reselling it later for a higher price without caring too much about the firm's fundamental value.

So, if the investors are very optimistic about the prospects of certain firms, we might expect to see episodes of bubbles in their stocks. And we have generally seen such investor exuberance for very young firms and technology companies, given their perceived potential for enormous growth.

This interpretation is also, in part, confirmed by our findings. We find that Amazon and Facebook show more frequent and large bubbles compared to large stock indexes such as the S&P500 and the NASDAQ. Since large indexes consist of many stocks, the impact of a bubble in a few individual stocks can get dampened by opposing price movement from other stocks. Consequently, we expect to see less frequent and lower-magnitude bubbles. However, the dot-com bubble is still fresh in our memory, so this interpretation has some exceptions whenever a large majority of stocks have bubbles.

You say that your new method will be of value to policymakers and investors. How so?

A bubble is of concern for both policymakers and investors. Capital markets, like the [stock market](#), help channel funds to the investment opportunities with the highest value. However, the presence of bubbles could imply some degree of inefficiency in the otherwise well-functioning markets, because bubbles exist when an asset's price deviates from its fundamental value.

Further, widespread price bubbles could generate financial instability, as was the case with the collapse of the housing-price bubble in the United States and the consequent financial crisis of 2007-2009. Thus, policy makers might be interested in identifying a bubble; they might want to prevent it in the first place, or they might want to attenuate its effects, in case it is already in place.

For investors, a bubble is like a lighted match: We know that ultimately the match will burn someone's hands, and it is advisable to avoid this situation.

Therefore, the ability to identify the bubble early on can help investors make better decisions when it comes to choosing which stocks to put in their portfolios and help avoid potentially large future losses, especially when the prices are possibly disconnected from firms' fundamentals.

More information: Nicola Fusari et al. Testing for Asset Price Bubbles using Options Data, *SSRN Electronic Journal* (2020). [DOI: 10.2139/ssrn.3670999](https://doi.org/10.2139/ssrn.3670999)

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