
INSIGHTS

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TOIL AND TROUBLE, DON'T GET BURNED SHORTING BUBBLES

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Bubbles are among the most puzzling and controversial phenomena of financial markets. Although rare, their cumulative impact on both investor returns and the broader economy can be great. One particular question that has motivated research is why shrewd short sellers don't prevent excessive price increases.

The “limits to arbitrage” idea argues that correcting inefficient market prices is neither easy, cheap nor riskless. The “rational bubble” literature identifies situations in which being long the bubble is a better trade than being short, even if investors know for certain the bubble will pop. And there is a theory that bubbles only inflate after the shorts have suffered significant losses.

We examine the “short subprime” trade from 2005 to 2008 to evaluate these and other explanations. We argue that the short subprime trades had more risk than is commonly appreciated. We discuss how the opaque and illiquid nature of subprime mortgages deterred some investors from purchasing CDS contracts and note that other investors assessed the risk of counterparty failure, government intervention and unknown time horizon to be sufficient enough not to purchase CDS contracts.

In addition, we describe how factors such as performance convexity and credit convexity made the subprime short more profitable than most ex-ante calculations suggested. We also outline why the subprime short trade was ineffective at reining in the subprime bubble and how buying subprime after the crisis was an equally, if not more, attractive trade that potentially did more to mitigate the harm of the bubble. Looking back at the last major bubble with a decade of hindsight yields insights that might be helpful to market participants and policy makers thinking about future bubbles.



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1 Introduction

In 2010 Michael Lewis published a terrific account of the subprime crisis and those who bet against it in his best-selling book *The Big Short*, which was subsequently turned into a film of the same name. Greg Zuckerman's book *The Greatest Trade Ever* profiles traders who made similar bets with a particular focus on John Paulson. Both books offer excellent accounts of the subprime mortgage crises and the traders who profited from it.

In the decade since the crisis, as more information has become available and more participants were willing to share their thoughts, several interesting questions have developed. The first thing to notice is that many well-known traders such as George Soros and David Tepper made fortunes purchasing subprime mortgage securities. Another interesting point is that the traders who profited spectacularly from the subprime crises have, with a few exceptions, not fared particularly well in the subsequent decade¹.

This paper examines the subprime mortgage crises with ten years of hindsight, a terrific benefit not available to the traders or those writing about the crises in its immediate aftermath. After analyzing the data and speaking with traders who actively researched subprime mortgages we highlight latent risks that were associated with shorting subprime mortgages. These latent risks help explain why many smart, informed traders decided not to short subprime mortgages or favored alternative trade structures such as shorting correlated securities or exploiting opportunities in the aftermath of the bubble. These trades offered similar payouts with potentially less risk.

We examine some of the literature around bubbles and how it applies to the subprime mortgages crises in 2008. We develop a model based on the

calculations of multiple investors who analyzed subprime mortgages in the lead up to the 2008 financial crises. We also detail how trade structuring is an often overlooked aspect of portfolio management relative to forecasting and valuation. Finally, we discuss implications for regulators and traders to consider going forward.

Unfortunately, neither we nor other researchers have been able to construct comprehensive or rigorous accounts of the full range of subprime-inspired trading from 2005 to 2008. Our analysis relies on conversations or popular press accounts and in some cases we were not able to independently verify the accuracy of the trading history or data.

The following section provides a literature review of bubbles. We follow with a simple model that offers payoff scenarios for shorting subprime mortgages. We then describe some of the latent risks to shorting subprime mortgages, the payoffs from the trades and why it was so appealing. We then discuss the role of trading in mitigating bubbles, before offering concluding thoughts for takeaway and future research.

2 Literature Review

Financial markets have a long and colorful history of bubbles, where prices for goods and assets overshoot any reasonable measure of fundamental value and offer little chance for positive future returns. Examples of this include the famous Dutch Tulip episode in the 17th century, US railroads in the mid 1800's and most recently the US housing market in the mid oughts.

How bubbles form, whether they can be identified ex-ante and what to do about them is a source of contention and debate among both academics and practitioners. Noble Laureate Eugene Fama denies the very existence of bubbles (2014), while fellow Nobel Laureate Robert Shiller (2017),

claims that using fundamental values and market narratives can provide some guidance for avoiding highly frothy markets.

Bubbles have been studied in the financial literature and shown to occur most often when uncertainty around new technologies or opportunities is very high. In his highly influential book, “Manias, Panics and Crashes”, Charles Kindleberger identified four contributing factors to nearly every bubble: cheap money, a build-up of debt, increased valuations and a strong narrative.

Smith, Suchanek, and Williams (1988) claim that investors with similar valuation frameworks will sometimes overpay for assets due to their differing views on other investors behavior. This work formalized Keynes’s famous beauty contest analogy. Greenwood and Schleifer (2013) use surveys to show that investors exhibit a recency effect, often over extrapolating recent performance and driving prices too low, or more often, too high. Research by Dilip and Brunnermeier (2014) argue that bubbles that involve credit or excessive lending tend to have a greater negative impact for the broader economy than equity-based bubbles.

For most investors, financial market bubbles only reveal themselves in hindsight; forecasting bubbles has a checkered history at best, although academics and practitioners keep trying. Jarrow (2017) develops a martingale approach for detecting asset price bubbles in advance. Sornette et al (2018) use volatility to forecast financial dislocations. Shiller (2017) attempts to identify financial bubbles by quantifying narratives in the popular press. Although these methods have promising backtests, only time will tell how well they work to predict new asset bubbles.

One of the most influential working papers in finance was Cliff Asness (2000), “Bubble Logic:

Or, How to Learn to Stop Worrying and Love the Bull.” This analyzed the technology bubble from the opposite of our perspective—the motivations and effect on markets of bubble profiteers rather than of shorts betting on a crash. But it deals with our topic directly in a meta-sense since it was written at the height of the bubble, before the crash, by a good trader who would profit handsomely both in the crash and in the rising market that followed it. It illustrates what good traders think about when prices get unsustainably high.

This paper compliments the research on bubbles by showing that even a clairvoyant investor who can accurately identify bubbles might have difficulty profiting from that knowledge and that the straightforward trade of shorting the bubble asset may not be the best way of using information. This has implications for the role of profit-seeking traders in influencing the path of bubbles. Arnott (2018) comes to a similar conclusion in arguing that it is often tricky to profit from bubbles. We examine the approaches used by investors who profited from the most recent bubble (US subprime housing) and show that the most celebrated expression of that trade, shorting subprime CDS, had many inherent flaws and was successful due to the confluence of several fortuitous events. Some investors, constructed less fragile ways to profit from a potential problem in the subprime mortgage market.

3 The Short Subprime Trade

In the mid-2000s a few investors began to notice that subprime mortgages in the United States were being securitized and sold in structures where the ratings and prices were disconnected from the asset quality and default risk. Many investment managers and traders surmised that these securities were likely to suffer significant defaults. A small group of investors decided to short these

subprime mortgage securities by buying credit default swaps, a form of insurance, on the pools of underlying subprime mortgages. The thesis for shorting subprime mortgages paid off as default rates on many of these pools soared in 2007 and 2008 and the CDS contracts provided a significant payout, often on the order of 10 times the amount risked, for those who purchased them.

However there were many under appreciated risks to shorting subprime mortgages, that made the trade less than a layup. Moreover, given the same thesis on subprime mortgages, there were alternative trades available that offered attractive payouts. We interviewed several investors who evaluated the short subprime mortgage trade and decided not to purchase CDS contracts and present some of their reasoning below.

4 A Model for Shorting Subprime Mortgages

One example model for shorting subprime mortgages drawn from conversation with a trader at a large global macro hedge fund, who considered shorting subprime mortgages in 2006 is presented below in Exhibit 1. There are a few interesting things to observe. The cost of carry depending on what securities were shorted ranged from 1.5% to 8%. This particular trader developed scenarios for subprime tightening to a zero spread over treasuries, tightening by half, remaining the same and selling off by 15 to 30 points.

It should be stressed that this is just one subjective and stylized view of the probabilities and payouts. We'll discuss later how the payouts actually turned out to be much higher in some cases. The trader who developed this back-of-the-envelope model decided, that although the expected value of the trade was very attractive, they didn't have the requisite knowledge of the market and the securities to make the trade.

The stylized scenario analysis was as follows:

Subprime Payoff Structure

	Probability	PnL in Event	Expected Value
Tightens to Zero	10%	-6%	-0.6%
Tightens by half	40%	-3%	-1.2%
Unchanged	0%	20%	0%
Sells off 15-30pts	50%	22.5%	12.5%
Expected Value			10.7%

Exhibit 1: Payoff scenarios for subprime mortgages.

4.1 Latent risks

The first risk many investors worried about was timing. Buying CDS in 2005, was essentially betting against subprime mortgages issued in 2004, of which 12% eventually defaulted. If an investor had waited, bets against 2005 vintage subprime defaulted at a rate of 30% and 2006 vintage subprime defaulted at a rate of 60%. The question isn't only whether a trade is good today, but whether it will be better tomorrow.

In fact, history shows that many good trades are put on after things have turned. It's never safe to bet that a bubble won't last longer or go higher than any rational calculation suggests. Waiting until an asset has fallen, say, 10% from its peak, means an entry point 10% below the peak. Entering a trade as soon as you can be convinced there is a bubble, might mean entering at a better level, however it carries far more risk, because you may not be able to afford to maintain your bet as long as necessary or your analysis could be wrong and there ultimately isn't a crash.

A related timing risk, that was unknown a priori, was when subprime defaults would begin to increase. The majority of CDS contracts had a term of five years, but that was too long for most traders and investors to hold the trade given the cost of carry. This is in contrast to an election,

merger or shorter term options where the date with destiny is known. Some investors thought the bubble could persist past reasonable expectations due the incentives that subprime originators and banks that securitized the mortgages had in keeping the machine operating. As one trader observed, “there were huge players buying more and more subprime mortgages every month. The spread seemed to be tightening in a deterministic manner.”

Another concern for some traders was the potential for government intervention to shore up subprime, either to prevent foreclosures or to support banks or both. This is politically appealing—politicians help a lot of voters directly, and avoid the problems of disintegrating neighborhoods and eroding local property tax bases; plus dodge the uncertainty coming from bank failures (there is a downside as well, public disgust at bail outs).

The complexity of subprime securities also dissuaded some investors from shorting subprime mortgages. After multiple due diligence conversations one investor came to believe that bankers and rating agencies didn’t understand the securities and that this opacity could lead to either benign or malevolent mispricings that would be difficult to overcome.

Perhaps the least appealing feature of this trade was the negative carry. Traders had to pay CDS premiums every month (or quarter) to keep the trade in place. The context of the mid-2000s is important for understanding why the subprime trades were unappealing. For traders that tend to be long convexity (vega) and short time decay (theta), the mid-2000s were brutal as implied and realized volatility fell month after month. By 2005 and 2006, traders that had been long volatility had suffered losses and shorting subprime mortgages appeared like a more expensive, less liquid way to be long volatility.

The final risk to these trades is they were achieved with credit default swaps, which are illiquid, OTC instruments. This makes it expensive and difficult to dynamically manage the trade after inception. But a bigger problem is that payments depend on dealer marks rather than objective market events. As it happened, long after it was clear the trades would be profitable if held to final settlement, the dealers set unrealistic marks that required the short subprime traders to send in more money, rather than to collect their winnings to date. This could have blown up the traders and saved the dealers from paying off. Moreover, these OTC instruments carried significant counterparty risk. If the investment thesis is correct, you’re expecting to be paid by entities that may well be bankrupt in that scenario.

Illiquid instruments make it difficult to adjust your trade size as positions become more or less attractive, and more or less volatile. Most important, the delay in getting paid when you win can prevent you from taking advantage of the rebound after the crash, which is often a better opportunity than shorting the bubble. The AAAABX.HE index lost 70% from 2005 - 2009, but gained 120% from 2009–2013.

In summary the latent risks to the buying CDS on subprime mortgages were as follows:

- Timing
- Government Intervention
- Security Complexity
- Negative Carry
- Illiquidity
- Counterparty

We have no way of knowing how many of these risks traders who purchased CDS protection on subprime mortgages assessed and deemed not important enough to dissuade them from doing the trade. For instance, perhaps those who shorted subprime assumed (correctly in hindsight) that the

government wouldn't be able to bail out homeowners directly or that they didn't care about counterparty risk on the grounds that a collapsing banking system would eliminate everyone equally. We only point out these risks as a way of highlighting that many well informed, sophisticated investors had rational reasons for not shorting subprime mortgages. These risks also help explain why those who did purchase the securities realized outsized returns.

4.2 *The appeal of shorting subprime mortgages*

Before analyzing the short subprime returns, it pays to ask why shorting subprime mortgages seems appealing to people who are not professional traders. One reason is the size of the economic collapse from 2007–2009. Professional traders evaluate trades based on dollars won or lost, but most people are interested in trades based on their connections to large news events. Betting against subprime directly, given the huge impact of subprime on the global financial system and the economy, is more glamorous than more complex indirect boring bets such as buying options on 2-year treasuries.

Even more appealing is that these trades made money with relatively little capital risked. Tens of millions bet to win hundreds of millions or billions. This is the same reason that non-professional gamblers are observed to be more likely to bet on long shots, for example a horse paying 30 to 1 with a 10% chance of winning a race and less likely to bet on a horse paying track minimum 1.2 to 1 with a 90% chance of winning. We note that these two gambles are equally attractive opportunities from an expected value perspective.

The key is that the longshot bet has 25 times the standard deviation of the favorite bet, \$9 versus

\$0.36. So you can get the same volatility betting \$25 on the favorite as \$1 on the longshot. Either way you are paid \$30 if you win, either way your standard deviation is \$9 per bet. However the longshot bet is positively skewed. You usually lose a small amount (\$1) and occasionally win a large amount (\$29). The favorite bet has negative skew. You usually win a small amount (\$5) and occasionally lose a large amount (\$25).

All else equal, nonprofessional investors and gamblers prefer trades and bets with positive skewness. Professional investors making many trades know that skewness dissipates and the return distribution from a large number of independent trades depends only on the means and standard deviations of the trades. Skewness dissipates as you do multiple trades. The longshot and favorite bets have identical effects on long-term outcomes. This bias likely explains the empirical observation that betting the favorite in horse races has less expected loss than betting longshots.

4.3 *Short subprime payoffs*

Although most of the concerns associated with shorting subprime turned out to be well founded, the trade still worked out for many of the investors who bought CDS. Timing and negative carry were certainly an issue as some traders who shorted subprime were forced to pull out early as they either ran short of funds or gave in to investor pressure as almost happened to Michael Burry. This was especially the case for those who identified the trade early as two years of negative carry without resolution was too difficult for most to stomach.

The government did almost rain on the short seller parade, and in fact Congress passed several bills intended to work in that direction, but the programs were half-hearted and turned out to be ineffective. Instead the government shored

up banks directly and took over FNMA and FHLMC, in a way that left subprime mortgage investors facing losses and those who shorted subprime mortgages with windfall gains. And the counterparty risk from banks was also certainly present with the failure of Lehman and near failure of other banks and insurance companies like AIG.

The subprime short trade likely worked out better than most of the traders who did the trade expected for a number of reasons. An interview with Scott Simon who was head of the mortgage desk at PIMCO during the crises, highlighted a few drivers. The first reason is what Mr. Simon refers to as “performance convexity”². Once subprime mortgages began defaulting there were very few accounts that could buy the securities and almost everyone was forced to sell them. Mr. Simon recalls: “At PIMCO we had very liberal guidelines and most of our accounts still couldn’t buy subprime mortgages that had been downgraded, even at incredibly attractive prices.” Moreover, the complexity of the securities and lack of data meant that even investors who had the ability to invest often didn’t. As performance of subprime mortgages suffered, ratings agencies raced to make up for their previously lax ratings. The combination of these factors drove losses to compound in a non-linear fashion once a certain level of defaults had been breached.

The securities also had related feature Mr Simon and PIMCO referred to as “credit convexity”, which meant that once a certain level on the securities was breached, that the higher level tranches experienced non-linear losses. Another attractive feature of these securities for some investors was that they were able to select the securities that were included in the pool that they purchased insurance on. This practice likely meant that the risk/return profile highlighted below was far more attractive for these deals.

5 Alternative Trades

For those who identified subprime mortgages as a likely problem for the economy and understood the inherent dangers of shorting subprime there were several alternative ways to profit. One alternative trade was reportedly pursued by Magnetar Capital in Chicago. Magnetar did not cooperate with the media, so their story has not been widely told. Magnetar reportedly employed a strategy whereby they purchased the riskiest equity tranche in many CDOs which often offered double digit returns. They used this positive carry to pay for protection on the AAA tranches that most investors assumed were safe.³ Magnetar appreciated that the correlation between the safest AAA tranche and the lowest quality equity tranche would be close to one in a crisis due to the way these securities were constructed. This structure gave the trade a positive carry profile, eliminating the worry over timing. It also reduced the risk of government intervention as a bailout that eliminated payouts on the AAA protection would likely have produced gains, or at least prevented losses, in the equity tranches.

For a stylized example, not intended to represent any specific trade done by Magnetar or any other entity, consider a \$1 billion collateral pool that supports \$800 million AAA obligations, \$185 million lower-rated obligations and \$15 million equity. The equity piece (sometimes called “toxic waste”) might promise 20%, \$3 million per year, if there are no pool losses. It might cost \$1 million per year to buy credit protection on the AAA tranche. As long as losses are normal, this strategy produces steady positive returns (positive carry) and a handsome eventual return. In a mortgage crash, the insurance on the AAA piece might pay off \$100 million or more, far more than your \$15 million investment.

Your risk, of course, is a moderate decline in real estate prices and borrower credit that wipes out

your equity without touching the AAA piece, so the insurance you purchased does not pay off. In this scenario the "short subprime" trade of buying protection on BBB tranches might still be a winner. So the equity-plus-AAA-protection structure gives you positive carry and the chance to profit if nothing happens, in exchange for needing a bigger crash for a big win.

Perhaps the safest way to profit from the subprime mortgage meltdown was the time-honored method of picking up the pieces at the bottom. George Soros and his Chief Investment Officer Keith Anderson smelled opportunity and hired two ex-Salomon Brothers mortgage experts, Mason Haupt and Howie Rubin. Over the course of the next five years the Haupt-Rubin team reportedly made returns in excess of 30% annualized on roughly a billion dollars of capital⁴.

Across the country in Newport Beach, the mortgage team at PIMCO, led by Dan Ivascyn seized on the same idea. Ivascyn bet heavily on subprime, by some accounts allocating over 50% of his Income Fund to the once shunned securities. From 2009 through 2018 the Income Fund grew from \$223 million to \$121 billion, with annualized performance of roughly 12%. That track record and asset growth helped Ivascyn gain power and eventually become CIO of PIMCO in 2015.

For those that didn't want to deal with the complexity of subprime mortgages, buying the stock of large commercial banks offered an alternative on the same theme. David Tepper purchased shares of Citi and Bank of America near the bottom, helping his Appaloosa fund return 120% in 2009 on \$12 billion in capital.

Others choose to buy securities that would rise in value during an economic downturn, but that were highly liquid and traded on exchanges. Ray Dalio at Bridgewater and Jeff Talpins at Element

Capital are rumored to have purchased futures or options on government bonds that would rise in value if the Fed aggressively cut interest rates. Many on Wall Street believe that Element purchased Eurodollar options in 2007 that helped his firm generate returns of 26.4% in 2007 and 34.9% in 2008⁵. Talpins has posted annualized returns north of 20%, without a single losing year in the decade that followed⁶. And simply being long volatility in equity markets, fixed income or currency markets paid off nicely for many traders.

The key to these trades is that they removed some of the subprime trade risks such as counterparty, illiquidity, timing and negative carry. By using more liquid instruments, waiting for the crisis to materialize or constructing more nuanced expressions these traders removed most of the risks inherent in purchasing CDS contracts on subprime mortgages. The collection of people that did these trades: George Soros, David Tepper and the team at PIMCO are investors with long-term track records. They made their money quietly, in sensible trades over several years and were also able to put large amounts of capital to work.

A final note to consider is that some alternative trades that didn't remove any of the main risks did offer higher payouts for lower carry costs. Although no one could have known it at the time, shorting Lehman credit, Bear Sterns credit and Greece offered significantly higher returns per unit of capital. Lehman CDS traded at 28bps, Bear Sterns at 30bps and AIG at 22bps prior to the crises.

6 Track Record of Subprime Short Traders

One of the curious things about the traders that shorted subprime mortgages is that they have had mixed results in the past decade. Greg

Lippmann has been the most successful of the group. He reportedly made \$1.5 billion for his employer Deutsche Bank, before leaving to co-found hedge-fund LibreMax Capital, which has reportedly grown to nearly \$3 billion in assets. Lippman is one of the few people to make money both on the short side and the long side of the trade, showing flexibility and an appreciation for the value of structured mortgage credit.

The other traders who shorted subprime mortgages have had mixed results. Michael Burry probably made his investors and himself handsome returns shorting subprime starting in 2005. His hedge fund closed, later reopening and as of 2019 has \$343 million in assets under management⁷. Steve Eisman left to start his own fund, which closed after two years, and now works with his parents managing capital for wealthy clients. Ben Hockett reportedly made \$80 million for himself and investors at Cornwall Capital and is now retired.

John Paulson and Kyle Bass suffered a series of losses and client defections. Both Paulson and Bass seem to have been swept up with looking for other bubbles. Bass has predicted collapses everywhere from Japan to Europe to Hong Kong that have not yet materialized⁸. Paulson has lost money on a variety of positions over the years and recently converted his firm into a family office.⁹

None of this should be taken as criticism of the short subprime traders, who have pursued their own careers for their own reasons, and are all successful people. We merely point out that the track record of those who shorted subprime mortgages has been spotty in the following decade, while those who opted for alternative structures that perhaps took into account other risks have fared better and produced better long-term track records.

7 Why Don't Short Sellers Prevent Bubbles?

We don't propose to answer this question in general, just to investigate the differences between the subprime short trades and some of subsequent trades where investors purchased subprime. In principle, if enough money had been brought to shorting subprime mortgages, the price of insuring subprime securities would have risen, causing the price of subprime securities to fall, reducing issuance of subprime mortgages. This would have reduced the size of the bubble both in terms of amount of assets and peak prices, and therefore reduced investor losses in the crash and the associated damage to financial institutions and the real economy.

There are several reasons this didn't happen, which include the following:

- One-off illiquid trades rarely stop momentum
- Regulations and rating methodologies were accommodative
- Bubbles are often complex and expensive to short limiting the investor pool willing to short them.

Expanding on the above points, a one-off trade that does not kill momentum when it is made, is unlikely to have much influence on the overall course of events. Once the market absorbs it, you would expect trading to go on pretty much as if it hadn't occurred. It generally represents all the capital the trader is likely to allocate to this trade, and it's illiquid so it can't be easily removed. It becomes a constant that doesn't affect other people's decisions. It does create additional virtual subprime mortgages, which might slightly reduce the price people are willing to pay for new mortgages, but as a negligible fraction of total subprime (including virtual subprime created with synthetic CDOs), that isn't going to be a large effect compared to total bubble appreciation.

One particular reason short sellers were ineffective in slowing the subprime mortgage bubble is that regulations and rating methodologies worked together to create an almost endless pool of buyers. The subprime mortgage pools were treated well from a regulatory perspective and promised higher yields at apparently lower risk than comparable assets. Given the demand from investors, mortgage originators and banks that securitized the mortgages, there were strong incentives to continue production.

Finally, bubbles are complex. Even today people disagree about the relative contributions of factors such as poor subprime underwriting standards, overpriced houses, fraud, overleveraged financial institutions, excessive trust in rating agencies, faulty financial engineering, perverse regulations; to name just a few of the popular explanations. Bubbles can be expensive and difficult to fight with short positions as discussed above and in the limits of arbitrage literature. Likewise, it can sometimes make sense to participate in the bubble as the rational bubble literature has argued. In any event, we shouldn't look to financial traders to predict long-term economic trends. Traders do not have crystal balls. Their role is to improve the path we take to get to the future.

8 Conclusion

As we write this analysis in the first quarter of 2021, financial market pundits are calling bubbles in everything from cryptocurrencies and TSLA to SPACs, high-end real estate and, most recently, stocks hyped on Reddit. We don't take a stand on whether any of these represent bubbles, we merely hope to argue that profiting from bubbles is often quite challenging.

Betting against subprime mortgages worked, but it was somewhat of a Goldilocks trade¹⁰: it required default rates to get high enough to generate profits on your insurance, but low enough

that the banking system survived to pay you and that the government didn't help out borrowers at your expense.

Most financial pundits and many investors focus their attention on what will happen next, assuming a person with tomorrow's newspaper today could easily profit. The reality is that structuring good trades is often every bit as difficult as forecasting. This is particularly true if a trade is contingent on a crisis materializing, when pricing is less reliable, liquidity dries up and contractual obligations are sometimes not honored. In these instances, trade construction is everything. Even if an asset price bubble can be confidently identified ex-ante (no easy task), making money from the bubble is perhaps equally challenging.

The subprime mortgage bubble provides a perfect lens for studying bubbles and trade construction. We think this work has several important take-aways. Policy makers might want to take on board the idea that bubbles can form, precisely because they are so difficult for investors to lean against. The limits of arbitrage literature should be given, in our view, more consideration in thinking about asset bubbles. Market participants should consider placing more emphasis on trade construction, particularly when betting against bubbles. Taking account of time horizon, liquidity, sizing and carry become much more important when trading against a bubble. Moreover, alternative trades such as waiting for the crash and then buying assets at bargain prices might in some cases be better risk-adjusted trades and do more to mitigate the harm of the bubble.

Notes

- ¹ John Paulson and Kyle Bass are two prominent examples.
- ² Information obtained through a private interview with Mr. Simon.
- ³ April 2010 Propublica article.

- ⁴ Return information obtained through private conversations with former Soros Fund Management employees.
- ⁵ HSBC Hedge Fund Return Summary. Trade information discussed with former investors, employees or counterparties.
- ⁶ Dec 2018 WSJ article.
- ⁷ August 2019 Bloomberg article.
- ⁸ Other losses came from his misadventure in the Nickle market. See Kyle Bass' Big Nickle Bet. Moneyness Blog.
- ⁹ 2018 WSJ article.
- ¹⁰ A trade where just the right conditions are required for it to be profitable.

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