Building a Better Deep Value Portfolio
Difficulties Mastered Are Opportunities Won

March 2017

Every investor can remember times when markets seemed truly dislocated and exceptional opportunities were abound — times when extraordinary market forces pushed prices very far from fair value.

Yet the unfortunate reality is that, all too often, market dislocations fail to turn into profitable investments. Many investors find themselves unable to take action; and those who do are often forced out of positions at the worst possible time. So why does this happen? And is there a solution for investors looking to turn regret into profit?

In this paper we describe a “deep value” trading strategy that combines a rigorous quantitative framework with discretionary oversight to address the challenges inherent to opportunistic investing. By taking such an approach, investors can gain access to a unique stream of returns — one that is valuable on both a stand-alone basis as well as in a broader portfolio context.
Introduction

Contrarian strategies that take advantage of deep value trades — extreme dislocations in markets — are somewhat of a holy grail among investors. The idea of earning outsized profits from opportunities created by forced selling and other extraordinary market forces can be alluring. Yet, in practice, opportunistic investing is often near impossible to execute successfully; it is the unfortunate reality that the challenges associated with identifying, entering and sticking through deep value trades prevent investors from taking sufficient advantage of them.

This paper presents a potential solution. We start by defining deep value opportunities, and then describe some of their drivers as well as some of the challenges associated with taking advantage of them. Next, we present a strategy that we think addresses some of those challenges head on. In particular, while often considered the exclusive domain of discretionary investors, we think deep value is best approached by pairing discretionary expertise with a quantitative framework that allows for broad screening of global opportunities and a rigorous approach to risk management. Implementing such a strategy may allow investors to successfully incorporate that elusive opportunistic element into their portfolios.

Introducing Deep Value

In normal market conditions, there is typically a balance between buyers and sellers at what we call a “fair” market price: one where prices trade close to fundamentals.1 Deep value episodes are times when these conditions break down, leading to meaningful divergences and outsized valuation opportunities. This can be in the context of a single security/market — for example, the S&P trading at a very high earnings multiple — or a long/short value strategy that takes long positions in cheap asset versus short positions in rich ones. A quantitative measure of the size of dislocations in a given value strategy is the “value spread” — the spread in valuations between cheap and expensive assets.2 While this is always positive,3 its magnitude can vary meaningfully over time. Exhibit 1 shows historical valuation spreads between cheap and expensive U.S. stocks as an example.

Exhibit 1 | Valuation Spreads Over Time

A deep value strategy would focus on the extremes — only trading when valuation spreads are very wide, which creates the potential for greater profit on convergence.4 Indeed, academic literature has documented a positive historical relationship between the value spread and future returns to value strategies.5

What causes these episodes of deep value? Drivers can vary from instance to instance, but they typically relate to market inefficiencies such as:

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1 Regular value strategies tend to exploit these small dislocations.
2 For directional strategies, the value spread measures the difference between market price and fundamental value of the asset in question.
3 Technically it could be zero if every stock traded at the same valuation multiple, but we haven’t seen an example of that yet, and don’t expect to.
4 Very wide may be defined as greater than two standard deviations, for example.
5 Asness et al. (2002), Cohen et al. (2001), Liew et al. (2017) all document a positive relationship between value spreads and future returns for a value strategy, though Chandra et al. (2015) show that value spreads are less effective at predicting the returns of other investment “styles,” such as defensive. Past performance is not a guarantee of future performance.
as behavioral biases, liquidity constraints and non-profit-maximizing decisions by investors. These reasons are summarized in Exhibit 2 and described in detail in the Appendix.

Exhibit 2 | Deep Value Opportunities Can Occur Because of One (or Some, or All) of the Following

- Forced selling due to redemptions, risk management, leverage, asset/liability mismatch
- Asymmetric demand from hedgers
- Non-profit maximizing buyers of securities (e.g., central banks, government agencies)
- Irrational markets due to emotion/fear/greed
- Overreaction to changing fundamentals
- Regulatory changes and restrictions
- Board-level allocation decisions by asset owners
- Government backstops
- Illiquidity

Challenges to Deep Value Investing

While a strategy focused on the most attractive opportunities has obvious merits, its implementation also creates numerous challenges. To start, investors must have the expertise to monitor and trade a broad range of markets as a prerequisite for accessing a broad set of opportunities. Moreover, even those able to identify deep value trades often struggle with choosing an entry point and the appropriate sizing of positions. And the most challenging aspect of deep value can simply be the willingness to act: investors must have the conviction to invest in challenging markets and time periods; that might mean buying when market consensus is to sell, or holding onto potentially profitable positions when conditions are deteriorating (thereby incurring losses). In other words, because these trades can be difficult and daunting, few investors are well-positioned to take advantage of them.

In theory, we expect that longer-term investors may have a natural edge when it comes to opportunistic investing; they should by definition be able to tolerate more volatility and short-term losses in the pursuit of long-term gains. However, the reality is that even longer-term investors can be faced with short-term liquidity needs or changes in risk appetite. For example, during the events of 2008, some endowments and pension plans — prototypical long-term investors — were forced to sell into unreceptive markets due to cash flow requirements (e.g., capital calls from private commitments). And even in the absence of such explicit liquidity constraints, crisis events can cause long-term investors to lose their nerve, de-risk and act as if they are more short-term.

More generally, many investors also face operational frictions (such as board approvals) for these types of capital allocations, which can hold up the process and result in missed opportunities. Even if an investor has the conviction to stay the course, boards or capital providers — seeing cheap assets getting cheaper — may not. It is unsurprising that some of the root causes of deep value opportunities coincide with reasons why many investors are unable to take advantage of them; the silver lining is that these trades are even more compelling for those who can.

How to Take Advantage of Deep Value?

We believe that to address some of the aforementioned challenges, a deep value strategy should use a combination of quantitative insights and discretionary expertise. In particular, it should incorporate three crucial components: first, the broad expertise needed to build a diversified portfolio; second, careful risk management, including “dry powder” for periods when dislocations increase; and finally, the

6 Ilmanen (2011).
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conviction required to stick with it, even when the going gets tough. The combination of these three components — rather than each in isolation — helps address the challenges associated with deep value investing.

To demonstrate how these components might work together in practice, we construct a historical simulation of a deep value trading strategy, what we call the Simplified Deep Value Strategy (“the Strategy”). The Strategy consists of extreme valuation trades, defined as those with value spreads greater than two standard deviations above historical averages, across a broad range of markets. We now turn to a discussion of that Strategy and its components.

Broad Expertise

Deep value opportunities tend to be rare in individual markets, which means it is crucial to screen broadly. This allows access to a much greater opportunity set and ensures that the portfolio benefits from deep value trades across time and market environments. By contrast, consider the opposite approach: single-market timing, or attempting to call turning points at extremes in a single market. Not only would such an approach rarely yield any trades - perhaps one or two per decade — but even when trades are found, resulting portfolios would be heavily concentrated. This would leave investors exposed to idiosyncratic moves, and the possibility of extreme losses if the dislocation worsened before it normalized.

In the Simplified Deep Value Strategy, we build a hypothetical diversified portfolio of opportunistic trades by looking for dislocations (two standard deviation events) in quantitative valuation metrics across 11 different asset allocation and stock selection strategies. Quantitative valuation metrics allow an investor to process large sets of data across many asset classes and geographies in the search of dislocations. Examples of such metrics are book-to-price ratios in equities, or real exchange rates in currencies.

In practice, when evaluating deep value opportunities across markets, we think it’s important to combine both quantitative and qualitative insights. Consider a company facing an accounting scandal — this company may see an extreme reduction in stock price that may not be immediately reflected in its quantitative fundamental metric, such as book value. A purely quantitative screen would suggest a long position, in what is in reality a “value trap.” In-depth discretionary evaluation of opportunities identified by quantitative screens plays the important role of differentiating true opportunities from mis-measured valuation signals. This qualitative filtering is especially important for deep value portfolios as there are fewer holdings and the focus is on assets experiencing large dislocations; this is in contrast to a quantitative strategy that takes advantage of small dislocations across a large numbers of securities.

Dry Powder

Another important component of deep value investing is prudent portfolio construction and risk management that reserves “dry powder” for periods of stress. This means (1) sizing individual trades small enough, especially at first, so that you can hold onto trades (and even add to them) if conditions worsen, and (2) take less risk at the portfolio level during normal or quiet times, so that risk can be increased during periods of broad dislocations.

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7 For a more thorough discussion of this strategy, please see Liew et al. (2017).
8 Asness et al. (2016).
9 Asset allocation strategies include pairs trading and relative value trading in Developed Currencies, Emerging Currencies, Global Equity Indices, U.S. Equity Indices, Emerging Equity Indices, Government Bond Futures and Interest Rate Futures. Stock selection strategies include within-industry and broad universe stock selection in Europe, Japan, the U.S., and the U.K. For a full list of valuation signals, please see Appendix B.
10 Another approach to avoiding value traps is to incorporate other systematic investment themes, like quality.
 Practically, prudent use of dry powder means not being forced to sell at the wrong times — it allows investors to profit from, rather than cause, deep value opportunities. Consider the tech bubble. While it may seem obvious in retrospect that tech stocks were overvalued, few investors profited from the bubble bursting, and many suffered losses. Part of the difficulty was the strength of the price rise: those who went short early on in any kind of meaningful size were forced out of positions by losses. Exhibit 3 looks at dislocations back to 1990 and shows that extreme dislocations have tended to occur in clusters; the Tech Bubble and Global Financial Crisis were notable in terms of the number of potential trades. It’s important to note that opportunities can also exist during normal market conditions, but they tend to be less prevalent, more idiosyncratic and therefore more difficult to uncover.

In the Simplified Deep Value Strategy, new trades are sized to target a low level of risk at inception and positions are then held in all trades until convergence happens — even if losses occur in the interim. In fact, if losses lead to widening dislocations (often the case), the process actually increases rather than decreases positions in response. At the sample portfolio level, risk is proportional to the number of opportunities available. That is, the Strategy tends to operate with lower levels of risk in more “normal” market conditions; that way, it can actually increase risk in periods of broad market dislocation.

Conviction

Last, the conviction and courage to know you’re doing the right thing — however difficult it may be — is essential to the long-term profitability of this type of investing. Even if an individual investor has the expertise required to identify opportunities and the capital ready to deploy, they may not be willing to take action — particularly in challenging market environments. Moreover, those who act must then be prepared to hold on to (or add to) trades that experience adverse moves; painful short-term losses can often lead investors to preemptively abandon course, potentially selling positions that could eventually be profitable.

In other words, while it is straightforward to describe the rules of and simulate a deep value trading strategy, it can be challenging to actually implement it in practice. Buying when others are selling can be a daunting proposition — one that is easier said than done. It is important for investors to put themselves in a position to be able to act “long-term” during tough times, by effectively locking in the required conviction ahead of time.

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11 When a two standard deviation (STD) event is first observed in a strategy, a trade is added to the portfolio. Thereafter, positioning is increased if the STD event increases by 1 (e.g., moves from 2 to 3), and decreased when the STD event decreases by 1 (e.g., moves from 4 to 3). When the STD event decreases below 1, the trade is removed entirely. Total risk is controlled at the portfolio level.
This can mean having a pre-approved plan for opportunistic contrarian trading, or pre-funding a strategic allocation to a dedicated deep value Strategy.

**Historical Performance of Deep Value**

To examine the efficacy of this approach, we can look at Exhibit 4, which shows the returns to the Strategy. As described, the Strategy screens across a diverse set of value signals, and takes small initial positions in those exceeding two standard deviations from historical means. Positions are held until dislocations converge, and increased if they further widen beforehand. Portfolio risk is proportional to the number of available opportunities.\(^{12}\) It is important to note that the potential positive impact of discretionary oversight is not reflected in these numbers, but we believe the results still provide useful insight on the potential returns and risk profile of such a strategy. From our simulation we see that the Strategy was profitable historically, earning an average 10% returns per year for the period shown, with a realized Sharpe ratio of roughly 1.1. Notably, the time profile of the accrual of these returns is highly episodic. While the Strategy is profitable in most periods, returns are somewhat concentrated in sub-periods when dislocations were particularly pronounced. Intuitively, this also corresponds to the periods in which the Strategy targeted the greatest amount of risk.

**Exhibit 4 | Episodic Accrual of Returns**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Hypothetical Simplified Deep Value Strategy</strong></td>
<td></td>
</tr>
<tr>
<td>Annual Average Excess Return</td>
<td>10.2%</td>
</tr>
<tr>
<td>Volatility</td>
<td>9.0%</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Source: AQR and AQR Data library. Returns are gross of transaction costs. Sharpe ratios are computed in excess of LIBOR. See the description of the Strategy in Appendix B for more details. For illustrative purposes only and not representative of a portfolio that AQR currently manages. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back.

\(^{12}\) For more details on strategy construction, please see Appendix B.
Finally, Exhibits 5 shows how an approach like this may fit within a broader portfolio context. Part A shows the potential diversification benefits of the Strategy to other traditional and alternative investments: it is relatively uncorrelated with equities, bonds and commodities, as well as a broad hedge fund index. Unsurprisingly, amongst hedge funds, it is mildly correlated to relative value strategies, while negatively correlated to systematic macro indices that tend to take a trend following approach. The Strategy also provides positive alpha to both traditional and alternative investments.\textsuperscript{13}

Part B shows the benefit of adding the Simplified Deep Value Strategy to an existing diversified portfolio (50% equities, 30% bonds and 10% each commodities and hedge funds). Marginal allocations to the Strategy have the effect of increasing average returns and decreasing portfolio volatility, leading to an overall improvement in Sharpe ratio.

**Conclusion**

There are potentially large benefits to deep value investing, but these can be challenging to harvest; we have observed many periods of meaningful deep value opportunities, but few investors have been able to profit from them.

We believe that committing ahead of time to a dedicated deep value strategy, that marries a quantitative framework with discretionary oversight, can help investors meet these challenges. Doing so can provide valuable diversification benefits for many portfolios, and may even provide that idiosyncratic source of return that many investors hope to find from manager “alpha.”

\textsuperscript{13} While not shown here, the Strategy is also lowly correlated and adds alpha to regular value strategies, such as Fama-French’s HML approach; see Liew et al. (2017) for a more comprehensive discussion of this. It is also worth mentioning that the results shown here are specific to timing value only and only at extremes; Asness et al. (2017) discuss the impact of value timing (not only at extremes) for other styles, and find that value timing of other factors is, generally, a weak addition for long-term investors holding well-diversified factors, including value.
Appendix A | Why Do Deep Value Opportunities Exist?

Liquidity Crises

Liquidity crises evolve through a feedback mechanism where losses, increased margin requirements, and increased volatility reinforce each other.¹⁴

This is consistent with what happened in the Global Financial Crisis of 2008, when there were a number of structural dislocations, representing exceptional value opportunities, across a wide range of markets. One compelling example occurred in the convertible bond market in the second half of 2008. A panic in the levered market caused overnight financing to dry up. As a result, convertible bonds had cheapened to the point where they were attractive to hold on an un-levered basis (relative to equities). This dislocation was so significant that convertible bonds were selling at the greatest discount to fair value in 23 years.¹⁵

Exhibit A1 shows that in 2007, the discount of converts to their theoretical value started to widen. However, rather than converging back to fair value, the widening continued and accelerated in 2008; by November 2008, they sold at a 10.9% discount relative to their theoretical values. This means that investors who were able to purchase bonds at these very “cheap” levels could earn outsized profits if the extreme dislocation between market prices and fair values converged. Indeed, the sample study also shows what was seen roughly one year later, prices had converged closer to fair value and were trading at a more normal discount level of 2.8%. Those who entered the trade too early, or at too large of a size may have struggled to hold the position as the dislocation widened.

Exhibit A1 | Dislocated Markets Can Create Opportunities

Hypothetical Median Discount of Convertible Bonds to Their Theoretical Values
January 2007-December 2011

Source: AQR/CNH proprietary models. For illustrative purposes only and not representative of a portfolio that AQR currently manages. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back.

¹⁴ Pedersen (2009), Brunnermeier and Pedersen (2009).
¹⁵ According to AQR/CNH proprietary dataset of U.S. convertible bonds of publicly-traded issuers dating back to 1985, containing more than 700,000 data points.
Irrational Markets

Opportunities can result from excessive euphoria. Irrational shifts in investor sentiment can lead to bubbles and overvaluations, as well as crashes and market undervaluations. The tech bubble was a blow to the efficient market concept that “prices fully reflect all available information.” The tech bubble wasn’t just a cross-sectional “micro” efficiency phenomenon (value versus growth within the stock market), but the whole market itself was priced at extremely high levels (versus any measure of fundamentals). Many investors are familiar with the fact that tech stocks were very expensive, but it is less well known that the tech bubble created meaningful dislocations across industries, even in sectors unrelated to technology. Simply put, the opportunity set for deep value was rich.

Asymmetric Demand/Supply

Outside of broad market dislocations, deep value opportunities can result from a persistent imbalance between “natural buyers” and “natural sellers” in a particular market. In many industries, asset-liability mismatches often require hedging with very specific securities, which can create a source of natural buyers. An imbalance occurs when there is a lack of natural sellers to take the other side.

A clear example of this has occurred in the variance swap market. Variable-annuity plans typically have a payout structure that is heavily tied to equity markets; they are therefore highly vulnerable to large moves in equity markets. One way that they typically hedge this risk is by purchasing variance swaps. However, a lack of natural sellers in this market (very few market participants are positioned to profit from periods of higher variance) means that variance swaps typically trade at a premium to fair value. Because banks can be unwilling to execute these transactions due to margin requirements and mark-to-

Exhibit A2 | Asymmetric Demand Can Create Opportunities

10-Year Rolling Realized S&P 500 Volatility, Daily Frequency
January 1946–January 2011

Source: AQR analysis based on broker estimates. For illustrative purposes only. Please read important disclosures at the end of this document.

16 Fama (1970); Asness and Liew (2014).
17 Asness and Liew (2014).
18 It can also create a source of natural sellers too.
market concerns, the premium can be driven to extreme levels; this is what was seen in January 2011 when implied volatility was at 34.7%, higher than realized volatility in almost any 10-year period since 1946, as shown in Exhibit A2. This divergence meant that variance swaps were extremely expensive relative to their history, which created a potential profit opportunity for investors to sell variance swaps. Those who were able to trade against variable annuity demand pressure could have meaningfully profited, as variance swaps eventually reverted to more fairly priced levels.

**Board Level Allocation Decisions**

Individuals and groups (particularly committees) have a strong tendency to rely on three- to five-year performance evaluation horizons. As a result, they often buy the last three to five years’ winners and sell multiyear laggards. This multiyear return chasing can be explained by the human tendency to extrapolate (one of the strongest behavioral biases).\(^\text{19}\) The result is that multiyear winners tend to become overpriced and multiyear losers underpriced,\(^\text{20}\) helping to explain the existence of both regular and deep value opportunities.

In addition, the structure of organizations is such that they are subject to peer risk. Peer risk can trigger peer chasing, or buying whatever is popular among peer institutions. Even if an institutional investor is not naturally a return chaser, if they face peer risk and peers chase returns, then they may also be forced do so. This type of herding behavior might be one of the worst kinds, since collectively these investors and their peers could be large enough to push market prices away from fair values;\(^\text{21}\) and possibly very far from fair values.

**Non-Profit-Maximizing Market Participants**

Extreme mispricing can also occur because non-profit-maximizing market participants exist, such as when governments and central banks intervene in markets. For instance, government agencies or central banks may buy securities not because they are undervalued, but rather to pursue a specific policy goal, such as an inflation target. Monetary policy programs, such as quantitative easing, can drive prices away from fair value. And price pressure can be further exacerbated by the fact that few participants are willing to position themselves against these large institutions. When markets are distorted by a participant buying without regard for any notion of value (and possibly trying to push prices away from fair value) it can cause inefficiencies and potential deep value opportunities.\(^\text{22}\)

**Appendix B | Description of Simplified Deep Value Strategy**

The Simplified Deep Value Strategy simulation describes historical returns to a purely systematic strategy attempting to exploit historical deep value dislocations in sub-strategies across 11 asset classes and regions. In each sub-strategy we divide the universe into subsets (by industry for stock selection, and by pairs of assets in other strategies). The length of historical sample (varies due to data availability), valuation factor used, and number of subsets in each sub-strategy are listed in the table below.

Within each subset and time period, we sort assets according to the relevant valuation metric as of that

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\(^{19}\) De Bondt and Thaler (1985); AQR Capital Management (2014a).

\(^{20}\) Asness and Liew (2014); Asness (2009).

\(^{21}\) AQR Capital Management (2014a).

\(^{22}\) Brunnermeier and Pedersen (2009); Mitchell and Pulvino (2011).
date, and form a portfolio that is long the top 1/3 and short the bottom 1/3. Portfolios are capitalization-weighted in stock selection sub-strategies, and equal-weighted in other sub-strategies. We then compute the valuation spread of the portfolio by comparing the average valuation of the long portfolio to the short portfolio, and compute an expanding z-score of this valuation spread. We finally create a combined portfolio consisting of only those subsets, across all asset classes and regions, in which the z-score exceeds two (“included subsets”). In this portfolio, each included subset is scaled to target a fixed level of risk, and there is an additional risk cap at the portfolio level (all included subsets are scaled down proportionally if this cap is hit).

This process is repeated in each time period, with component subset portfolios being removed when z-scores decline below two, and additional subsets added if their z-scores exceed two. Positions also increase in existing component subset portfolios if z-scores increase beyond three or four. Sub-strategies are scaled to have an equal risk contribution from asset allocation and stock selection strategies. Returns are measured on a monthly basis.

Description of Strategies and Valuation Signals in Simplified Deep Value Simulation

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</thead>
<tbody>
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<tr>
<td>Emerging Currencies</td>
<td>1/1/1996</td>
<td>Real Exchange Rate</td>
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<td>Book-to-Price Ratio</td>
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<td>Japan Stock Selection</td>
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References


Biographies

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David is a senior member of AQR's Global Asset Allocation team and a portfolio manager for AQR's Global Macro strategy. In these roles, he provides economic research into macro themes, market dislocations and structural changes across asset classes. Prior to AQR, David was a partner and the head of discretionary macro trading at Third Wave Global Investors. Before that he was a director at Citigroup and a principal and head trader at Harbor Street Capital Management. David earned a B.A. in history from Amherst College and an M.B.A. from Columbia Business School.

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The white papers discussed herein can be provided upon request.