

GMO Quarterly Letter



1Q 2016

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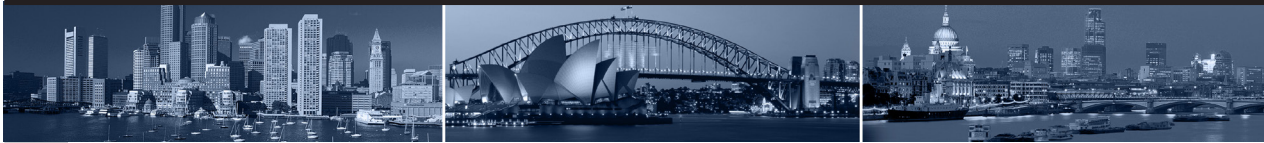
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Keeping the Faith

Ben Inker



Executive Summary

The past five years have been challenging for long-term value-based asset allocation. We do not believe this constitutes a paradigm shift, dooming such strategies in the future. The basic driver for long-term value working historically has been the excessive volatility of asset prices relative to their underlying fundamental cash flows, and recent history does not show any evidence of that changing. Outperforming the markets given that pattern requires either betting that the excessive swings will reverse over time or accurately predicting what those excessive swings will be. The former strategy amounts to long-term value-based investing, while the latter requires outpredicting others as to both what surprises will hit the markets and how the markets will react to them. Our strong preference is to focus on long-term value, despite the inevitable periods of tough performance that strategy will entail.

Introduction

It's no secret that the last half decade has been a rough one for value-based asset allocation. With central bankers pushing interest rates down to unimagined lows, ongoing disappointment from the emerging markets that have looked cheaper than the rest of the world, and the continuing outperformance from the U.S. stock market and growth stocks generally, it's enough to cause even committed long-term value investors to question their faith. Over the past several years, we at GMO have questioned a lot of things, including assumptions that we had held without much question for decades, but we have not wavered in our belief that taking the long-term view in investing is the right path and that in the long run no factor is as important to investment returns as valuations. In this letter, I'm going to talk about some of the reasons we continue to believe this so strongly.

Perhaps the first point to make on why we continue to stick to our beliefs is that this is far from the first period in which the patience of long-term value managers has been tested. A decade ago, we were all told that the great moderation had changed the rules of investing, making it safe to invest in risky assets without the margin of safety that used to be required. Less than a decade before that, we were all told that the internet had changed the rules even more profoundly, making anyone who was prepared to put money into boring REITs or TIPS in return for paltry mid to high single-digit real returns a fool for foregoing the hugely greater potential returns from investing in the loss-making companies that were someday soon to become massively profitable. As GMO's portfolios

were positioned for the opposite in both cases, we got plenty of complaints from clients that we just didn't get it. But the periodic struggles of long-term value investors far pre-date GMO's founding. You can hear the frustration evident in John Maynard Keynes's quote from the *General Theory* back in 1936: "It is the long-term investor, he who most promotes the public interest, who will in practice come in for most criticism."¹ I can't tell you exactly what was going on in Keynes's head when he wrote that, but to me it has all the hallmarks of someone who has just come back from a particularly trying investment committee meeting.

So this is certainly not the first period that has tested the faith of long-term value investors, but the fact that a style of investing has seen problems before is far from a guarantee that it will succeed in the end. While our faith is helped by the fact that this is not our first experience with misbehaving markets, the reason for our belief comes much more from a systematic study of history and the fundamental drivers of asset returns. The evidence is clear that asset prices are much more volatile than can be justified by the underlying fundamentals. This is the basic driver of the long-term returns to value-based asset allocation, and recent history, as painful as it has been for some of our bets, shows every bit as much excess volatility as the more distant past did. A world in which value-based mean reversion will not work in the long run is a low volatility world in which asset prices do not deviate from the slow-moving fundamentals that power financial markets. It is extremely hard for us to justify the last several years of market behavior through that lens, which leaves us confident that our strategy will work in the end.

Value has always been a risky strategy, particularly for those trying to run an investment business. The drivers of mean reversion are not hugely powerful at any given time, meaning asset prices and even the underlying fundamentals can move in unexpected ways for disappointingly long periods. It is a little glib to say that without this risk, it would be difficult for asset prices to get meaningfully out of line in the first place, but the reality is that the only way you can get really exciting opportunities for mean reversion is to have misvalued assets become even more misvalued before they revert to fair value. This is the catch-22 of value-driven investing. Your best opportunities will almost always come just at the time your clients are least interested in hearing from you, and might possibly come at the times when you are most likely to be doubting yourself.

Asset prices are too volatile

So, why do we believe that asset prices are more volatile than they should be? Robert Shiller, the Nobel Prize winning Yale economist who is the source of so much common sense wisdom on financial markets, did a simple but powerful test of this almost 30 years ago in a paper for *Science* magazine.² Shiller noted that while we cannot know the future with any degree of certainty, we have no such limitation when it comes to the past. He looked at U.S. stock market prices and dividends back to the 19th century and came up with a "clairvoyant" fair value estimate for the market based on the actual dividends that were paid over the next 50 years. This analysis, which is reproduced and updated in Exhibit 1, made the following important point.

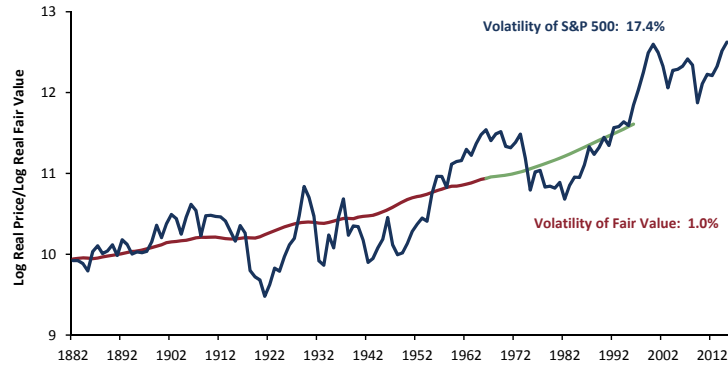
The volatility of U.S. stocks since 1881 has been a little over 17% per year. The volatility of the underlying fair value of the market has been a little over 1% per year. Well over 90% of the volatility of the stock market cannot be explained as a rational response to the changing value of the stream of dividends it embodies. This means that the volatility is due to some combination of changing discount rates applied to those cash flows, and changes to expectations of future dividends that turned out to

¹ John Maynard Keynes, *General Theory of Employment, Interest and Money*, 1936.

² Robert Shiller, "The Volatility of Stock Market Prices," *Science* (January 2, 1987).

be incorrect. It is difficult to determine exactly which has been the driver at any given time, but there doesn't seem to be a lot of evidence for changing discount rates having been a major force. Even in the most extreme overvaluation in U.S. stock market history, the 1999-2000 internet bubble, none of the investors we heard explaining why the stock market was rational to have risen to such giddy heights explained it on the basis that future returns should be lower than history.³

Exhibit 1: S&P Composite Real Price and Clairvoyant Fair Value

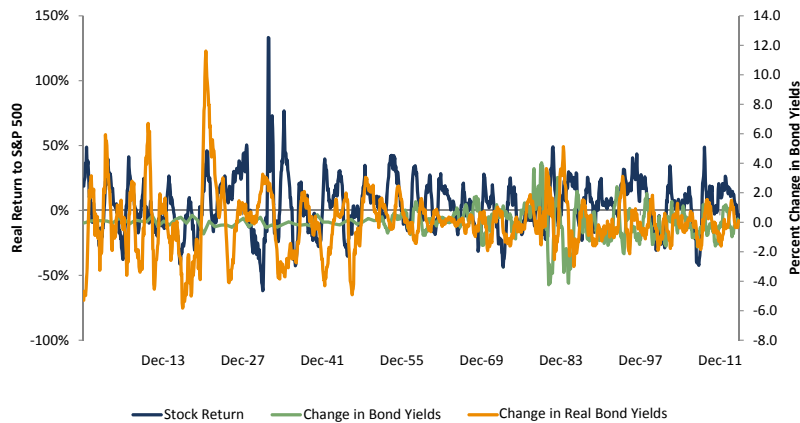


Source: Robert Shiller, GMO; Data from 1900-2016

It's somewhat harder to dismiss the changing discount rate argument as a partial explanation for today's high equity valuations. Unlike 1999, bond yields today are strikingly low, and so if stocks should be priced by demanding a risk premium off of a risk-free rate (an idea that my colleague James Montier, for one, rejects⁴), we could understand why stock valuations might be high today relative to history.

But if a changing discount rate had historically been a significant driver of stock market volatility, we would expect to see some explanatory power for bond rates in explaining changes in stock prices. This connection, at least historically, is almost completely absent, as Exhibit 2 shows.

Exhibit 2: Stock Returns and Changes in Nominal and Real Bond Yields



Source: Robert Shiller; Data from 1900-2016

³ At the time, the Glassman and Hassett "Dow 36,000" piece did make the argument that equity returns should be lower than history, but did so within their argument that the market deserved to trade three times higher than the level at which it was actually trading.

⁴ See, "The Idolatry of Interest Rates, Part 2: Financial Heresy and Potential Utility in an ERP Framework," August 11, 2015. This white paper by James Montier is available at www.gmo.com.

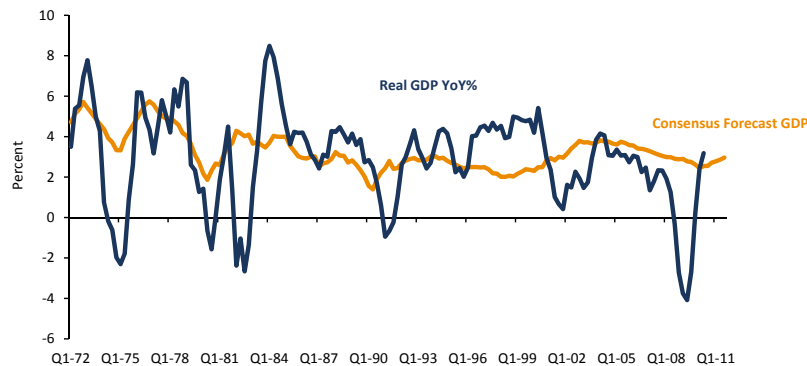
If this chart looks like a complete mess, that's because it is. The R^2 of changes in nominal bond yields to explain stock market returns is 0.02, and for changes in real bond yields it is 0.01, although because the beta on the factor has the wrong sign (higher real bond yields imply positive stock market returns), it's hard to even give credit for that 1% explanatory power. In either case, we cannot explain any meaningful part of the excess volatility of the stock market historically as coming from the piece of the discount rate that can be observed.⁵

Predicting surprises is hard

The fact that markets are more volatile than they need to be certainly doesn't mean you can't try to predict and profit from those "unnecessary" moves. But how do you predict them? To a very significant degree, markets in the short term are driven by "news" – events that would have to be predicted ahead of time to properly guess what the markets will do in the future. This task is complicated by the fact that even given an accurate prediction of news or surprises, which for this purpose are synonymous, predicting the actual response of the market is surprisingly tricky, because the connections between data and events and stock market performance are often unintuitive.

One point to recognize is that predicting news may be possible, but it certainly cannot be done by the median participant, because if the median participant predicted it, it wasn't news in the first place. But the market consensus is generally dreadfully unimaginative in any event. To take a relevant example, probably the most important single piece of macro information that investors would like to know ahead of time is the timing of recessions. Exhibit 3 shows the historical ability of economists to predict recessions in the form of predictions of the following year's GDP growth.

Exhibit 3: U.S. GDP Growth vs. Consensus Forecast



Source: Federal Reserve Bank of Philadelphia

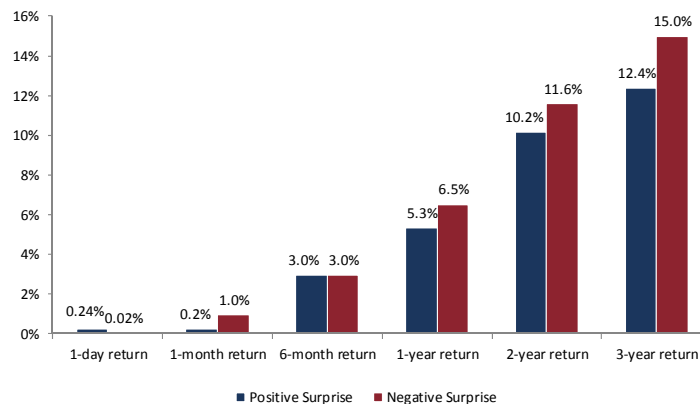
Economists have entirely failed to predict any of the recessions we have had in the time since consensus forecasts were available, and this may actually be an unfairly easy test. In principle, economists could have successfully predicted recessions and had the information be useless for investors because the market had already priced in the probability. But every single recession – and indeed pretty much every surge and dip in GDP growth over the past 40 years – has been poorly predicted by Wall Street economists.

⁵ The other piece of the discount rate for stocks is the equity risk premium part. As this can only be measured by looking at the valuation of stocks and backing out an implied risk premium over bonds (or alternatively ignoring bond yields and just looking at the valuations of stocks), "explaining" the volatility of the market in this fashion amounts to saying "changing stock valuations explain 100% of the change in stock prices that is not justified by changing fundamentals." Tautologically true, but completely consistent with saying that stock prices are hugely more volatile than the underlying fundamentals justify.

Figuring out what to do with surprise

But let's assume that you could actually predict surprise, and in a piece of data widely known to move markets. For this purpose, I'm going to use U.S. payroll data. We get new payroll data every month and we have a record of the consensus forecast going into each release since 1997. So we can see the impact of properly predicting the surprise in payroll data going back almost 20 years. Over a day, the impact is clear. A positive payroll surprise leads to an average return of 0.24% for the day, while a negative surprise gives an average return of only 0.02%. This seems perfectly reasonable, but what is peculiar is what happens over a longer period. We might readily expect that the bulk of the excess return to the data would come out in the day it is announced, but the real world is actually not even that kind. Exhibit 4 shows the one-day, one-month, six-month, one-year, and three-year returns. You can see that for a day, the impact of a surprise on payrolls is material. As the time horizon lengthens, the "importance" of the surprise disappears quickly and then, oddly, actually shifts sign! This is a pretty striking result. The market does indeed rise when we get a positive surprise on payrolls, but as time passes, the news turns out not to actually matter for the true fair value of the stock market, or at least not in the manner traders might have originally assumed.

Exhibit 4: Impact of Payroll Surprise on S&P 500 Return



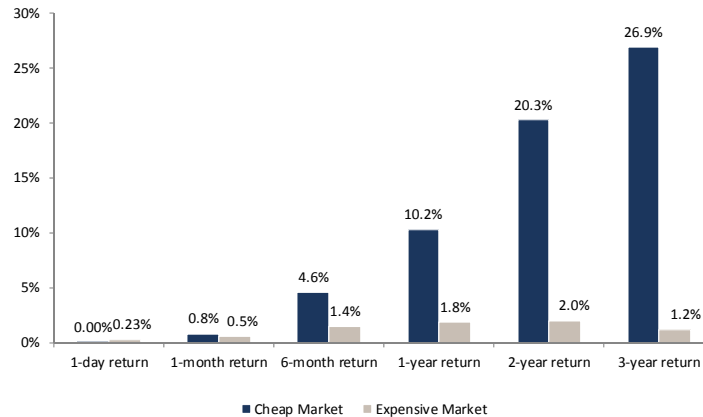
Source: Bloomberg, Datastream, GMO; Data from 1997-2016

It's a little hard to explain the one-month and six-month data consistently – why would the impact of surprise be negative over the first month and then positive over the next five? But the pattern over one to three years certainly suggests that, all else equal, you'd rather own the stock market in the few years after a disappointment in employment than after a positive surprise. Does this mean that investors should sell when the payroll data surprises to the upside? Probably not. It's not a particularly huge effect and there are many possible reasons why it could have wound up looking odd. But it does mean that if you are planning to make money by predicting payroll data better than the other guy, you'd better be quick about it, because there is no actual evidence that strong payroll data actually increases the value of the stock market in any lasting way.

The lasting power of value

By way of contrast, Exhibit 5 shows the impact of the market being cheaper than average or more expensive than average on the day of the payroll announcement over the same time period.

Exhibit 5: Impact of Starting Valuation on S&P 500 Return



Source: Bloomberg, Datastream, GMO; Data from 1997-2016

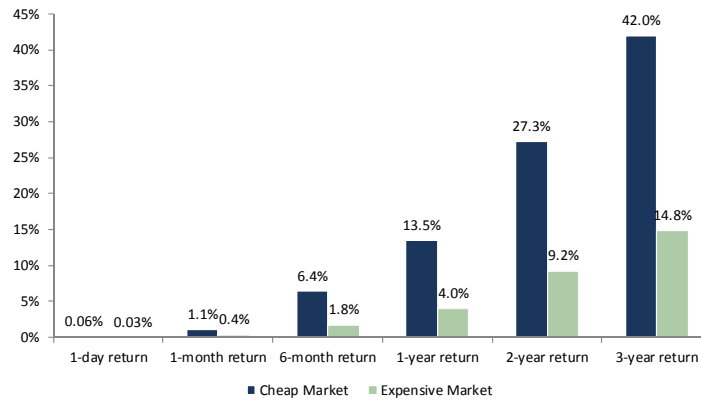
Note: The cheapness or expensiveness of the market is determined by the Cyclically Adjusted Price/Earnings (CAPE) ratio, otherwise known as Shiller P/E.

This chart again starts on the day payrolls are going to be announced. For that single day, the performance of the market seems to actually be negatively correlated with cheapness. On that first Friday of the month, being expensive means that the market rises 23 basis points, whereas if it is cheap, it is flat.⁶ But as the time horizon lengthens, the importance of valuation rises more and more. There are actually a couple of problems with Exhibit 5, which I don't love, but for the sake of complete comparability with Exhibit 4 I used it anyway. One problem is that it's actually a reasonably small sample of data – a total of 232 events in which we had payroll announcements since 1997. The other is that all of the dates were Fridays, in fact the first Friday of the month (with a couple of exceptions for holidays). As it turns out, "Payroll Friday" has been a pretty good day for the S&P 500, with an average return of 12 basis points, or 35% annualized. Given that the actual return for the S&P 500 since December 31, 1996 was 7.4% annualized, which is an average of three basis points per day, it turns out payroll Fridays weren't ordinary days. To see the basic power of value, it would be better to use all days, and over a longer period. Exhibit 6 shows the value effect for all days going back as far as we have daily prices for the S&P 500, which is the end of 1963.

⁶ This isn't actually inconsistent with the returns on the payroll surprise chart even though the average return looks a few basis points lower than on Exhibit 4. As it turns out, since 1997, there have been a few more negative payroll surprises than positive surprises.

Exhibit 6: Impact of Starting Valuation on S&P 500 Return

All days since December 31, 1963



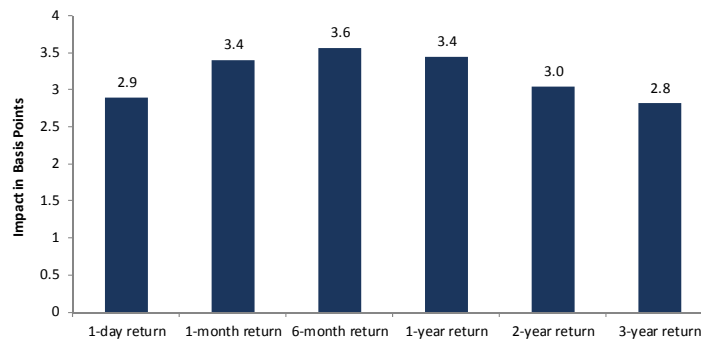
Source: Datastream, GMO; Data from 1964-2016

Note: The cheapness or expensiveness of the market is determined by the Cyclically Adjusted Price/Earnings (CAPE) ratio, otherwise known as Shiller P/E.

It's a striking exhibit. Over one day, being cheap earns you an average 6-basis-point return versus 3 basis points for an expensive market. But, as the time horizon lengthens, the advantage for cheap markets grows. Actually, it's even a little cooler than that.⁷ If we look at the daily impact of having started cheap versus expensive over the various time horizons, we get the following in Exhibit 7.

Exhibit 7: Daily Impact of Starting Valuation on S&P 500 Return

All days since December 31, 1963



Source: Datastream, GMO; Data from 1964-2016

Over a given day, the impact of being cheap versus expensive is small – just under 3 basis points. But it persists. The importance of having been cheap on the first day of the period is also around 3 basis points per day for the next month, and this is more or less the same as it is over the next six months, one year, two years, and three years.⁸ Value has been referred to as the gravitational pull of the financial markets, and with good reason. Gravity is far and away the weakest of the four fundamental forces of nature, but it is unique in that it always acts in the same direction and does so over arbitrarily

⁷ Cooler for value nerds at least. Possibly, the following exhibit will give you less of an “ooh” shiver than it did me.

⁸ This exhibit shows the “cheating” impact of valuation, in that the definition of cheap versus expensive is defined over the entire time period, not history to date. If you did the “no cheat” version, the daily impact does shrink a bit over time, from a maximum of 3.7 basis points on day one, to 2.5 basis points over the next year, to 2 basis points over two years, and 1.7 basis points over three years.

large distances.⁹ For markets, the impact of value is small over a single day – since 1964, being cheap led to a positive 0.015 standard deviation event above average in that day – but as the number of days grows, the impact becomes more and more material.

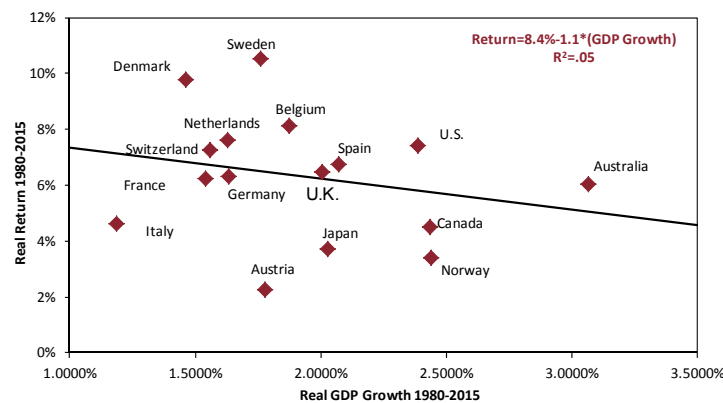
And this is the basic virtue of taking a long time horizon. If you want to make money over a day, by all means try to predict the payrolls number. If you do it better than everyone else, you can make far more in that day than you ever could with value. But predicting surprises is hard. Most people who attempt it will fail. And the funny thing history teaches us is that most things that seem important at a given time – who wins an election, what this quarter’s or year’s earnings turn out to be, whether there is a recession or not – dissipate in importance over time if they ever truly mattered in the first place.

“Important” data often doesn’t matter

One of the most striking demonstrations of the tendency of seemingly important data not to matter is the relationship – or lack thereof – between equity returns and GDP growth, which we have mentioned before. Exhibit 8 shows the relationship between GDP growth and stock market returns for the developed markets from 1980-2015.

Investors all over the world “know” that GDP growth is an important determinant of stock market returns. Generally speaking, the complaint by investors is the difficulty of predicting GDP growth in time to invest accordingly. But the analysis below sidesteps that problem as it assumes complete clairvoyance. It answers the question as to how you could use the information of perfect foreknowledge of GDP growth across the developed world over the last 35 years to make money in the stock market.

Exhibit 8: GDP Growth and Stock Market Returns for the Developed Markets

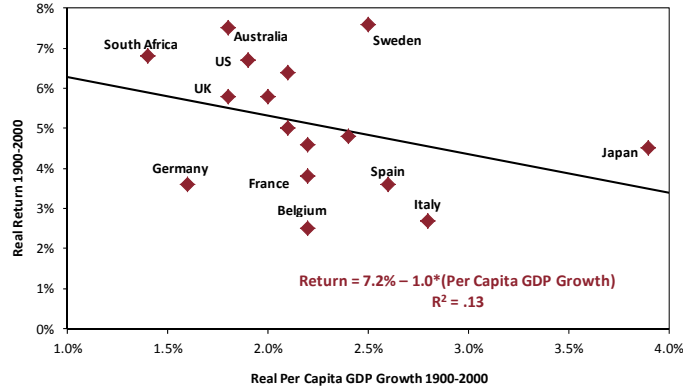


Source: GMO, Datastream, MSCI; Data from 1980-2015

And the answer is that you could indeed have used the knowledge to make money, although not in the expected way. The *lowest* growth quartile of countries outperformed the *highest* growth by 2% per year, enough to make a dollar invested worth 85% more in the slow growers than the fast growers. This pattern is not unique to this particular time period. On the longest run of history we have for a wide group of countries, the Dimson, Marsh, Staunton dataset from 1900, we see the same pattern (although the data they kept is GDP per capita instead of total GDP). This is shown in Exhibit 9.

⁹ Okay, I have to admit this isn’t strictly true. Because gravity propagates at the speed of light, the distance over which gravity can influence objects is limited by their distance and the age of the universe, so two objects on opposite sides of the visible universe are too far apart to have any gravitational impact on each other. This is almost certainly a case of taking an analogy too far, so I’ll stop now.

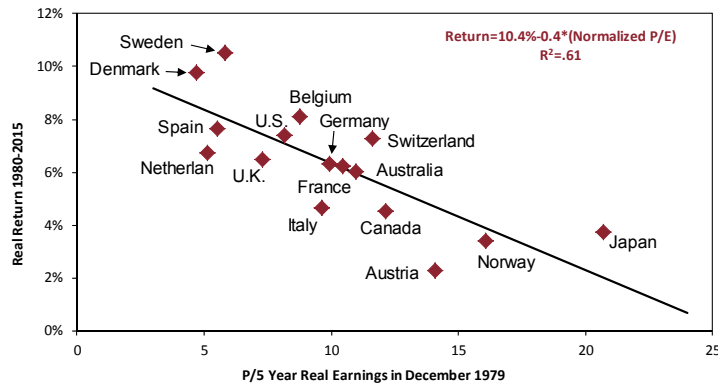
Exhibit 9: Long-Term Stock Market Returns vs. GDP, 1900-2000



Source: Dimson, Marsh, and Staunton, Triumph of the Optimists

Again, over the last century or so, knowing which countries would have grown fastest was not actually useless for predicting returns, but properly utilizing your extraordinary foreknowledge required the unintuitive step of systematically buying the countries that would grow the slowest. Was there any information that would have been useful to know over the period? Yes. For the clairvoyant investor, it definitely seems to be the case that knowing which countries would be invaded or suffer a civil war was a plus in the long run, but, at least since 1980, there was a piece of information knowable to even the non-clairvoyant among us that would have been extremely helpful in predicting future returns. Exhibit 10 shows the relationship between starting valuation – in the form of a cyclically-adjusted earnings figure – and returns over the next 35 years.

Exhibit 10: Starting Valuation and Returns over the next 35 Years



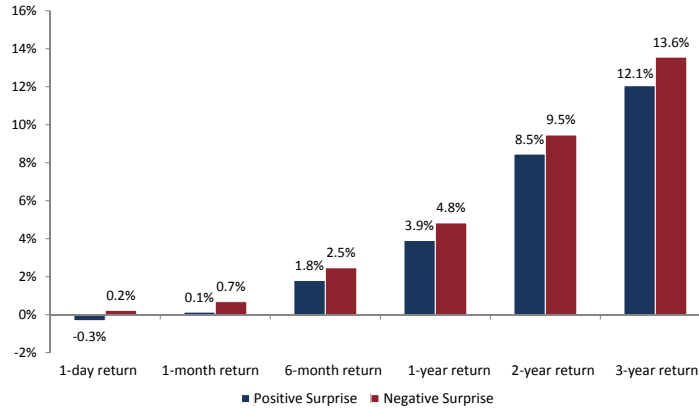
Source: GMO, Datastream, MSCI; Data from 1980-2015

The correlation was a stunning -78%, and the benefit to that knowledge was profound. The cheapest quarter of countries outperformed the most expensive quarter by an enormous 5.1% per year for 35 years. A dollar split among those countries would have turned to 26.4 dollars in real terms, while a dollar invested in the expensive countries would have grown to only 4.9 dollars. And that is from information that was actually readily knowable at the time, no clairvoyance needed.

Time horizon for bond investors

The short-term importance of “surprise” in the bond markets is every bit as important as in stock markets, if not more so. But the unyielding¹⁰ mathematics of bond returns also means that as the time horizon lengthens, the importance of starting yields rises inexorably. Exhibit 11 shows the impact of payroll surprise on the Barclays Capital 7-10 Year U.S. Treasury Bond index.

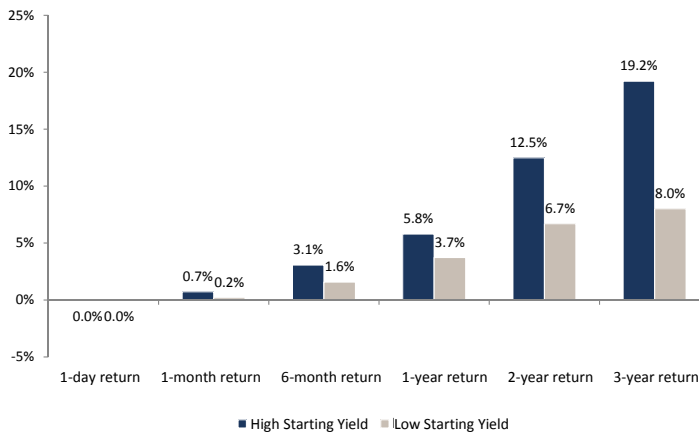
Exhibit 11: Impact of Payroll Surprise on Treasury Bond Returns



Source: Bloomberg, Datastream, Barclays, GMO; Data from 1998-2016

Successfully predicting payroll surprise has meant a 0.5% swing in the one-day return of Treasury notes, which is pretty extraordinary given the low volatility of the bond market. And, unlike in equities, the importance of the surprise hasn’t switched signs over time. On the other hand, bonds are called “fixed income” for a reason. As the time horizon lengthens, the importance of the starting yield of the bond becomes overwhelming, as it must, as we can see in Exhibit 12.

Exhibit 12: Impact of Starting Yield on Treasury Bond Returns



Source: Bloomberg, Datastream, Barclays, GMO; Data from 1998-2016

It is universally understood (I hope) that a 10-year Treasury note yielding 1.84% held for 10 years will give a return pretty close to 1.84%.¹¹ It is not quite so widely known that the rate of return of a dynamic

¹⁰ Sorry, couldn’t resist.

¹¹ The primary uncertainty comes in the rate of return that will be earned on the coupons earned along the way.

portfolio of such bonds – a “constant maturity strategy” – is also pretty well fixed for certain time horizons. To take the Barclays U.S. Aggregate Bond index (Agg) as an example of a dynamic portfolio, with a duration of a little over five years and a current yield of 2.17%, the range of possible returns over the next seven years is not very wide. We are not guaranteed to get 2.17%, but the return if the yield were to gradually drop to zero over that period would be about 2.9% per year, and if the yield were to gradually double, it would be about 1.5% per year. No matter what happens to yields over the next seven years, returns are going to be something pretty close to 2.17% on the Agg. There is simply no way for it to give a return close to the 7.7% the index has returned on average since its inception in 1975.¹² A significant part of the reason why valuation has mattered so much for equities over the years is because valuations have been mean reverting. Yield is far and away the crucial factor for returns on high quality bonds, whether or not yields mean revert.

In the short run, any bond, including the negative yielding ones common in Europe and Japan at the moment, can give a significantly positive return due to news that causes yields to fall further. In the longer run, a 10-year Japanese government bond yielding -0.09% is going to wind up giving a return of around -0.09%, no matter what surprises the Bank of Japan unveils to the markets. While there are investment problems that a return of -0.09% can help solve, there aren't many of them. Given how many government bonds are trading at similar yields, this puts much global government debt in the odd position of being potentially an interesting short-term speculation, but close to useless for long-term investors.¹³

Conclusion

So, why should anyone keep the faith as a long-term value investor? It is not enough to say that the alternatives are worse, because one possible alternative is to go passive and stop playing the game. We hold fast to our faith because, while the performance of value has been lousy over the last few years, there is little or no evidence that this is due to the markets somehow becoming more efficient. The performance of risk assets in the first quarter of the year, with global stocks falling 11% in the first six weeks only to turn around to rise 13% in the next six, has all of the hallmarks of a market obsessed with short-term surprises, not efficiently discounting the pretty stable stream of cash flows that most asset classes actually give. Efficient markets would show little volatility because the underlying fundamentals are stable. Today's markets, whatever else they may be, are clearly not efficient in that sense. Hyperactive central bankers and jumpy investors unable to decide between reaching for yield or running for safety may be a significant annoyance for long-term value investors, but we should not forget that their actions also create the very opportunities that such investors need to outperform in the long run.

¹² To achieve a return of 7.7% for the index over the next seven years, yields would have to fall to approximately negative 17% at the end of the period, ignoring roll and convexity effects. While recent history has shown that negative interest rates are indeed possible, -17% really does seem to be well lower than can be imagined.

¹³ The bonds are guaranteed to give little or no return in nominal terms. In the event that inflation runs significantly below zero over the next decade, the return above inflation could well be positive, but it is worth noting that neither inflation swaps nor economists' forecasts imply that investors actually believe that inflation will turn out to be negative.

Disclaimer: The views expressed are the views of Ben Inker through the period ending May 2016, and are subject to change at any time based on market and other conditions. This is not an offer or solicitation for the purchase or sale of any security and should not be construed as such. References to specific securities and issuers are for illustrative purposes only and are not intended to be, and should not be interpreted as, recommendations to purchase or sell such securities.

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Part I: Always Cry Over Spilt Milk (An Admission of a Past Mistake on Resources)

Jeremy Grantham



Introduction

Six months ago I wrote a 30-page, 24-exhibit paper, which I finally realized would have a strong appeal to six or seven strategists and no one else. So, here is the summary – written last year but postponed to run after other more timely subjects – which is long enough for admitting errors.

Summary

- The only thing that really matters in asset allocation is sidestepping some of the pain when the rare, great bubbles break. At other times, traditional diversification will usually be good enough.
- The defining events at GMO were avoiding some or much of the pain associated with the three great bubbles of the last 100 years: the U.S. housing and finance bubble of 2008, the U.S. tech bubble of 2000, and the Japanese equity bubble of 1989. Exhibit 1 shows the last of these: the best example of an extreme outlier that nevertheless turned out to be an epic bubble rather than a paradigm shift.

Exhibit 1: Japan: The Ultimate Mean-Reverting Cycle

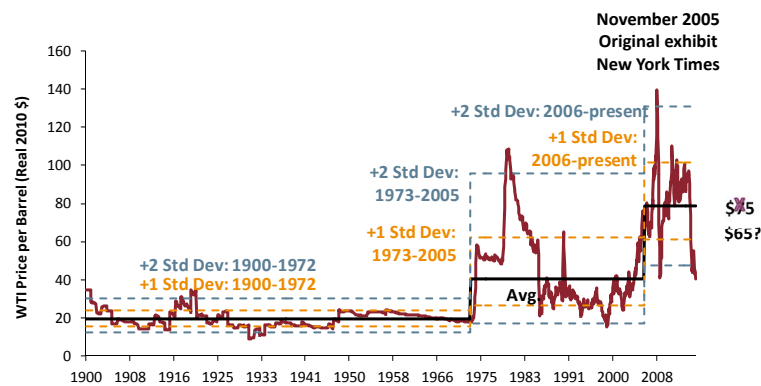


As of 9/30/12

Source: Datastream, MSCI, GMO

- Giant bubbles are easy to spot statistically but hard to call from a career risk perspective. It is easy to be early, and being early may lose you your job, your clients, and your credibility.
- The fear is always, “Are these new high prices permanent? Is it a paradigm shift?”
- Every major bull event is called a paradigm shift but they almost never exist. Almost never. But not never, ever.
- In 1999 we presented 28 major bubbles of the past and were able to call the score: Mean Reversion, 28; Paradigm Shift, Nil!
- To rub it in, near the 2000 peak I challenged audiences – perhaps 2000 professionals in total – to find a bubble that had not fully broken. There was not a single offer.
- I appreciated the irony, therefore, when in 2005 I offered oil as the first important paradigm shift.
- Oil by 1979 had spiked to over \$100 a barrel in today’s currency. Against the previous 100-year trend of \$16 that was over a 1 in 1 billion long shot (see Exhibit 2).

Exhibit 2: Oil – the Original Paradigm Shift



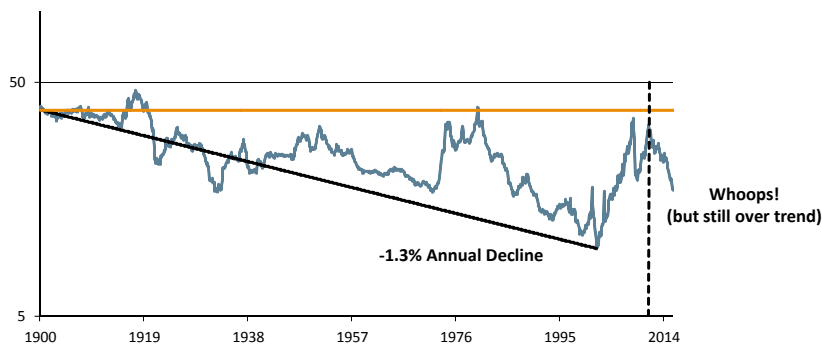
As of 9/30/15
Source: GMO, Global Financial Data, EIA

- I said in my 2011 paper on resources: “When I see odds of over 1 in 1 million,” – I inadvertently understated – “I don’t believe the data unless it is ours, and then I don’t believe the trend.”
- This 1 in 1 billion 1979 event was caused by the newly effective cartel, OPEC. The response of oil prices could not have been caused by any mixture of pre-existing factors. It was therefore a paradigm shift. But cartels can end. This produces a special case of paradigm shift: likely to last as long as the new factor, in this case OPEC, stays effective.
- After 1999 the costs of finding new oil started to rise very rapidly. By today, in my opinion, the price needed to support the development of new oil reserves has risen to at least \$65 a barrel. This rise from \$16 (in today’s currency) constitutes a second paradigm shift in oil. Less is found each year in smaller fields and is more difficult and costly to extract.

- If we were running out of low-cost oil, I asked myself in 2011, why should we not run out of other finite resources? That everything finite runs out is known by everyone except madmen and economists (said Kenneth Boulding). Also, China uses a much larger fraction of total global minerals than it does of oil.
- So, predisposed to see signs of finite resources running out, I saw in 2011 a set of remarkable resource statistics. The most extreme among them, iron ore, was measured as a 1 in 2.2 million possibility. This data made me believe that China's growth together with increases in world population was causing us to be facing "peak everything."
- And my report to that effect got many multiples of hits than a typical quarterly letter, so, I must have been right!
- But, alas, I was fooled – along with all of the CEOs of the miners – by China. The four-sigma event in mineral prices did not occur because those resources were running out. Not yet. Although there are suggestions in the data (see Exhibit 3) that we are running low on some low-cost resources: Even in the current truly sensational glut, the 34 equal-weighted index is only two-thirds of the way back to the old trend. I would guess, though, that in explaining the price behavior of commodities for the last 15 years I would only allocate a weighting of 20% or so to elements of paradigm shift.

Exhibit 3: "Time To Wake Up"

34 Commodity Index
(January 1900 = 38)



As of 12/31/15

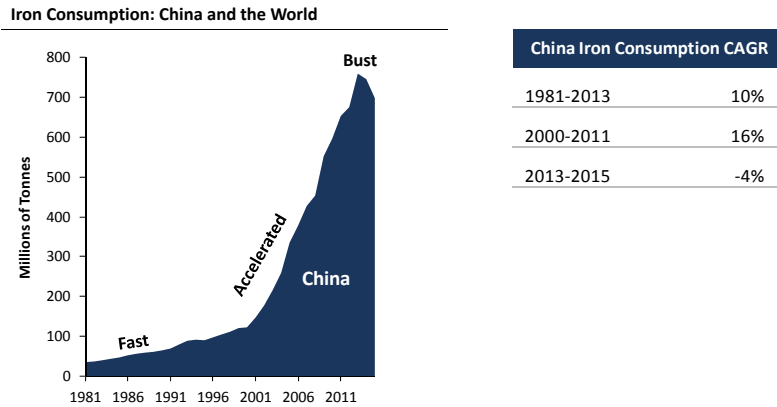
Source: Global Financial Data, World Bank, GMO calculations

Note: A technical improvement has been made to the original index: rice and potash in, pepper out, increasing the number of commodities from 33 to 34.

- Nor was the bubble in minerals caused predominantly by massive speculation, momentum, and skullduggery in my opinion, although those components, as was suggested at the time by Frank Veneroso (a financial consultant), had considerably more impact than I had then thought. I would still give these factors only a 20% weight in explaining our current glut and future outlook.
- No, China was the dominant 60% input: the sheer magnitude and the long 30-year duration of its growth surge; the remarkable late acceleration in growth rate; and, finally, the abrupt cessation of growth. Taken together, these developments constituted the four-sigma event.

- I had warned of trouble if China slowed its growth for demand for minerals quickly. They did far worse than that. They absolutely stopped growing at all (see Exhibit 4). I completely missed the possibility of such an extreme outcome.

Exhibit 4: China's Hyper-growth Stops Dead



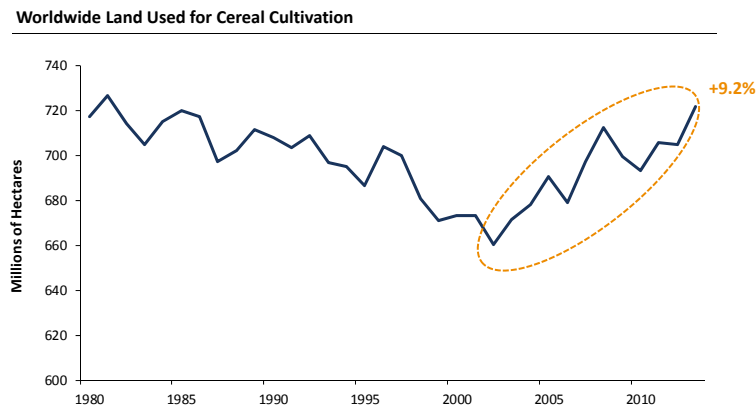
Source: Worldsteel, China Customs

Steel production is used as a proxy for iron consumption. For the China figures steel exports are subtracted in order to reflect only iron used to manufacture steel for the domestic market.

- By the time China's growth in demand for metals (and coal) stopped dead, the miners had spent an unprecedented \$1.25 trillion in expansion to keep up, helped in their efforts by several earlier years of record profits.
- Due to long time lags (of up to seven years), new capacity will be coming online for two or three more years despite the current glut.
- If China's GDP growth were to average a reasonably strong 4% a year for the next 10 years, its GDP will rise by 48%.
- If China simultaneously succeeds in lowering its share of capital spending to GDP to 32% in 10 years from today's 47% – which is its intention – then the need for growth in capital-spending-type resources will be about nil ($47\% \times 100 = 47$ goes to $32\% \times 148 = 47$).
- There is therefore unlikely to be a quick or dramatic recovery in demand for metals. Stock prices, on the other hand, from these beaten-down levels (of late 2015) are much harder to predict.
- My suggestion of a positive intermediate-term (10-year) outlook for mining resources therefore seems to have been a major error, especially for iron ore and bauxite.
- How could I make such an error? I had thought that a 2.2 million to 1 possibility for iron ore must imply a new trend. Although this may usually be a valid assumption for such extreme outliers, it is obviously not universally so. For example, the land under the Emperor's Palace really did have a market value equal to the state of California. Yet it spent the next 26 years declining, with all Japanese land values, back to normal: a classic looking paradigm shift that, like iron ore, turned out to be a mean-reverting bubble after all. In bubble history it appears no fixed rule works 100% of the time.

- I could and should have made good money playing against the bubble in minerals, as we did playing against the three other major asset bubbles of the last 20 years. This event in metals indeed turned out to be not the second important paradigm shift, as I thought, but the fourth great bubble of the last 100 years!
- The best I can say in my defense is that I gave a good warning of the possible risks in my original report: “If China stumbles or if the weather is better than expected, a probability I would put at, say, 80%, then commodity prices will decline a lot. But if both events occur together, it will very probably break the market *en masse*. Not unlike the financial collapse.” And this is indeed what happened. I had thought it probable that short-term prices would decline, possible that both negatives would occur together, but highly unlikely that they would both be as extreme, as turned out to be the case.
- Food, which also featured in the 2011 report, is quite different. It faces long-term intractable problems that I believe will threaten political stability around the world, deep into the future. (A belief shared, apparently, by the U.S. Intelligence Community.¹) Food is in a comparable situation to metals, though, in that it faces a short-term glut. But for very different reasons.
- Almost four years of terrible growing weather and ensuing shortages and buying panics had pushed grain prices so high that an unprecedented quantity of extra land was brought into use, some of which had not been used for decades, if ever (see Exhibit 5).

Exhibit 5: Unprecedented Increase in Cultivated Land



Source: UN Food and Agriculture Organization

- The weather then changed to be very favorable for grain for almost three years (although, not so for almonds, etc., in California).
- I had warned that an abrupt change to favorable weather following the increased land use would cause us to “drown in grain, rather than rain.” This was a good warning of the risk but does not mean that I expected such an abrupt shift, only that it was possible.

¹ Office of the Director of National Intelligence, “Global Food Security Assessment,” October 2015.

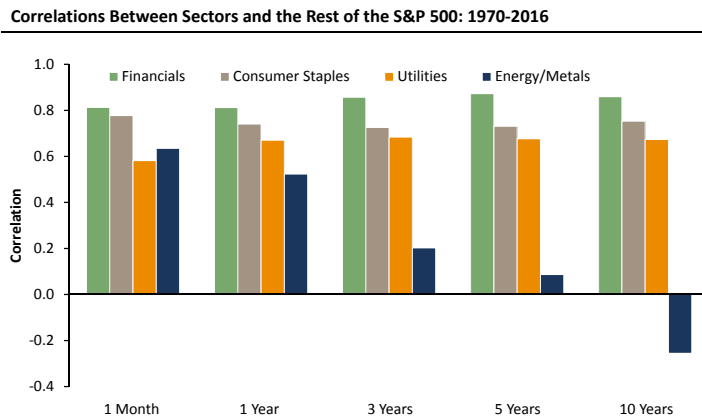
- In spite of the current glut, the lack of a safety margin in grain continues, however, as the longer-term negatives remain:
 - Steady declines in productivity gains
 - Water, erosion, and pest problems
 - Increased meat eating (which is grain-intensive)
 - Continued global population growth at over 1.25% a year
- Oil is indeed the real McCoy, a true paradigm shift. But it too faces a short-term glut caused by U.S. fracking.
 - U.S. fracking oil is a small resource, under one and one-half years of global consumption. It will soon run off and show the underlying implacable rising costs of finding ever-diminishing pools of new oil.
 - Existing oil wells deplete faster than they used to because enhanced technologies squeeze more into the early years. Over 5 million barrels a day out of a global total of 95 a year now needs to be replaced every year. Half a new Saudi Arabia!
 - Today's draconian cutbacks in exploration almost guarantee another sharp price spike in the next two to four years.
 - But beyond a five-year recovery for oil prices and oil stocks, there lurks a third paradigm shift: the terra incognita of electric, self-driving vehicles; cheap electric storage; climate change; and carbon taxes. Taken together, this shift to alternative fuels is likely to cause oil's final paradigm shift!

Investment advice²

- Oil stocks should do well over the next five years, perhaps regaining much of their losses. But, after 5 years, prospects are more questionable, and, beyond 10 years, much worse.
- Mineral resource stocks are unlikely to regain their losses, but from current very low prices they will probably outperform based on historical parallels following similar major crashes. But the next two years will be very risky because of the continued new excess capacity coming online so I strongly recommend averaging in over one and one-half to two years.
- These mining stocks, though, have several distinct portfolio advantages:
 - They are typically hated, for good reason, and therefore sell more cheaply than the market and have, consequently, a slight long-term performance edge.
 - They are the only group that over 10-year holding periods has a negative correlation with the balance of the portfolio (and a very low correlation over 5 years). (See Exhibit 6.)
 - They have proven to beat the market handsomely when unexpected inflation occurs. This is a critical portfolio advantage.

² As always, my personal opinions.

Exhibit 6: Resource Equities Have Delivered Equity-Like Returns with Low Correlations with the Rest of the Equity Market



As of 3/31/16

Source: S&P, MSCI, CRSP, GMO

- Farmland is likely to outperform most other assets. It is still my first choice for long-term investing.
- Forestry should perform above aggregate portfolio averages and be less volatile than equities.

Lessons learned

1. There are very, very few paradigm shifts compared to natural investment bubbles that fully break. I, more than most investors, should have known. Even some of the rare, extraordinary outliers can prove to be mean-reverting bubbles eventually.
2. If you are going to make errors at least cover your tail! I did give a clear warning of the risks.

Conclusion, or, sticking it up the reader's nose

- I do not believe that the current distress in commodities is caused by the workings of some super cycle, some decadal cosmic force, as some observers have been tempted to say.
- I believe we are seeing three quite different and coincidental forces in three distinct commodity groups.
 1. Grains, dragged down by a vigorous response to prior bad weather and panic scarcity that resulted in 9% more arable land being planted, coupled with a change to favorable weather for three seasons.
 2. Metals and coal, buried by an unparalleled, abrupt change in Chinese demand from double-digit to negative from a base that was 25% to 50% of global demand for each material.
 3. Oil, glutted by the surge of U.S. fracking and the strange gamble by Saudi Arabia.³

Each of these three price collapses would have occurred without the other two. (The usual interactions, such as oil prices or the cost of farming and mining, were very minor in the context of the major influences mentioned.)

³ See "The Oil Glut, Saudi Decisions, and the Uniqueness of U.S. Fracking," GMO Quarterly Letter, 4Q 2014.

Part II: Updates

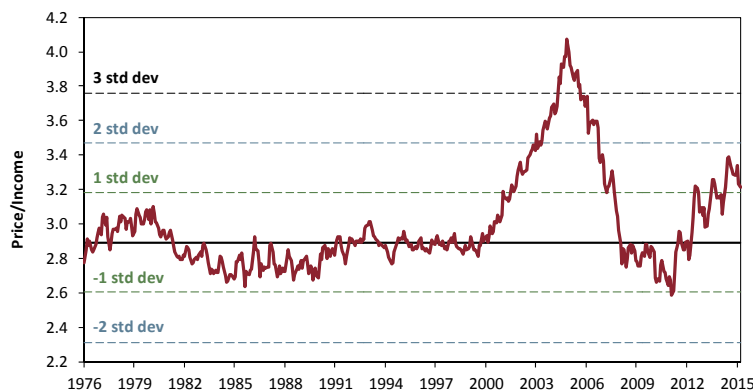
Equity Markets

The tone of the market commentators back in January, when I was writing my last quarterly letter, seemed much too pessimistic on global stock markets, particularly the U.S. market, and I said so.

This relative optimism was an unusual position for me and the snapback in these markets has validated, to a modest degree, my thinking at the time. I still believe the following: 1) that we did not then, and do not today, have the necessary conditions to say that today's world has a bubble in any of the most important asset classes; 2) that we are unlikely, given the beliefs and practices of the U.S. Fed, to end this cycle without a bubble in the U.S. equity market or, perish the thought, in a repeat of the U.S. housing bubble; 3) the threshold for a bubble level for the U.S. market is about 2300 on the S&P 500, about 10% above current levels, and would normally require a substantially more bullish tone on the part of both individual and institutional investors; 4) it continues to seem unlikely to me that this current equity cycle will top out before the election and perhaps it will last considerably longer; and 5) the U.S. housing market, although well below 2006 highs, is nonetheless approaching a one and one-half-sigma level based on its previous history. Given the intensity of the pain we felt so recently, we might expect that such a bubble would be psychologically impossible, but the data in Exhibit 1 speaks for itself. This is a classic echo bubble – i.e., driven partly by the feeling that the substantially higher prices in 2006 (with its three-sigma bubble) somehow justify today's merely one and one-half-sigma prices. Prices have been rising rapidly recently and at this rate will reach one and three-quarters-sigma this summer. Thus, unlikely as it may sound, in 12 to 24 months U.S. house prices – much more dangerous than inflated stock prices in my opinion – might beat the U.S. equity market in the race to cause the next financial crisis.

Exhibit 1: U.S. House Prices Getting Carried Away?

Median House Price/Median Family Income



As of 4/30/16

Source: National Association of Realtors, U.S. Census Bureau, GMO

In the meantime, however, we continue to have the typical equity overpricing that has characterized the great majority of time since the Greenspan regime introduced the policy of generally pushing down on short-term rates. At current prices it is very close to impossible for the mass of pension funds or other institutions to realize longer-term targets of 5% a year, let alone 7%. A 60% stock/40% bond portfolio would be lucky to deliver 3% even if we were to lock in current high P/Es and above-normal margins. Prudent managers will just have to grin and bear it. The worst argument is always

that extra risk has to be taken because the need to deliver higher returns is desperate. The market does not care what your targets are! And, in any case, there is a very wobbly relationship between risk and return, as the 50-year underperformance of high-risk equities to lower-risk equities attests. (And this underperformance applies to a varied definition of risk: Table 1 shows the gap between the top and bottom 20% in the U.S. equity market for volatility, beta, and fundamental quality – stability of high return and low debt.) My point over the last two years has been to emphasize how long and painful the grinning and bearing can be, and I firmly believe that investors should be prepared for considerably more pain (of overpriced assets becoming yet more overpriced) without throwing in the towel 1999-style at the worst time possible time.

Table 1: Risk – in Isolation – Does Not Pay a Premium

<i>Portfolio/Quintile</i>	Average Yearly Return (1964-2016)	
	Low	High
Beta	10.6%	9.0%
Volatility	10.4%	8.6%
Junk	10.8%	8.9%

As of 05/04/16

Source: Beta returns were generated from Fama/French portfolios. Quality/junk portfolios and volatility portfolios were generated using GMO's methodology. All portfolios are market-cap-weighted.

Oil

As with stock prices, I am encouraged by the rise in oil prices since my unusual bullishness of last quarter. My belief remains that a multi-year clearing price for oil would be the cost of finding a material amount of new oil. This appears to be about \$65 a barrel today, and costs are drifting steadily higher as the cheapest old oil is pumped. My guess is that the price of oil will indeed be as high as \$100 a barrel again within five years and, perversely, I feel encouraged by the growing host of longer-term pessimists. Much as I would love as an environmentalist to have oil for transportation almost disappear in 10 years, it simply isn't going to happen. However, there will be dramatic technological improvements in non-oil based transportation well before 10 years is out, and after 10 years... well, the oil companies will wish they had taken Ted Levitt's advice in 1960 in his then groundbreaking "Marketing Myopia" article and defined themselves as energy and chemical companies and not defended their narrower definition of "oil companies."

New technologies for energy and transportation

The new discoveries and engineering insights in these fields keep coming. The Grantham Foundation's attraction to venture capital, described last quarter, plays conveniently into this and we are investing 20% of our total capital in "mission-driven" projects, mainly in venture capital. One investment is aiming at doubling the power-to-weight ratio of lithium ion batteries and another at a 200-second charge time for some types of lithium ion. Vehicle development we see includes ultra-light and ultra-streamlined electric-powered people movers, suitable for commuting and shopping in developed countries, and as a first cheap yet state-of-the-art vehicle everywhere, very fast and with a long range. (Better make hay soon, Tesla!) But, you never know. And venture investing is particularly full of disappointments. So, just in case, I am one of the 400,000 preorders for the \$35,000 Tesla Model 3, likely to be the cheapest electric car per mile of range at least for a while. The mission component on some of our investments is so on target that even if they fail they represent attempts that will have

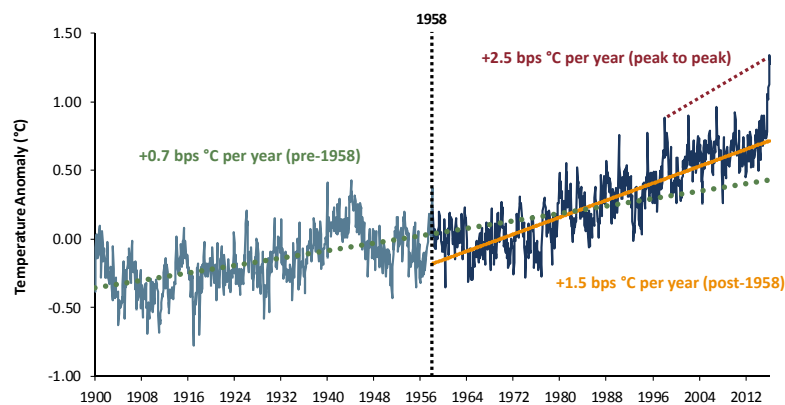
deserved some of our non-profit making grants. As it is, we hope that at least one of the several game-changing projects driving these CO2-reducing technologies forward will simultaneously make our foundation a fortune!

Global warming accelerates: “so much for the pause”

Because 1998 was an outlier warm year due to a large El Niño effect in the Pacific, many subsequent years, including 2013, had lower global temperatures and led some to believe, or claim to believe, that global warming had ceased. But it turned out to be, after all, just another series like that of the S&P 500 in real terms with a little steady signal often obscured by a very great deal of noise. As it turned out, the below-trend 2013 was followed immediately by a modest new record in 2014. And then came the real test as a new powerful El Niño started to build up in 2015. Ten of the twelve months of 2015 set new all-time records, an unheard of event, and 2015 in total became a monster, not only the warmest year in recent millennia but by a record increment. Yet, the early months of 2016, still under the influence of what had become one of the most powerful El Niño effects, showed temperature increases that were even more remarkable.

This current El Niño has accelerated underlying warming caused by increasing CO2 – as all El Niños do – but this time the combined effect has been far ahead of scientific forecasts that in general remain dangerously conservative. January 2016 was the hottest January ever on the NASA series and by a new record amount. It was a full 0.22 degrees Celsius above the previous high for January. Then February became the new shocker, washing away that record by being 0.33 degrees Celsius above the previous February record. Most recently, March was once again the warmest ever March, although not quite by a record amount (see Exhibit 2). The exhibit makes the scary point clear: global temperature is not just increasing, but accelerating. The average increase from 1900 to 1958 was about 0.007 degrees Celsius per year. From 1958 to 2015 it doubled to 0.015 degrees Celsius per year, and from February 1998 to February 2016 it rose by an average of 0.025 degrees Celsius per year! Time is truly running out.

Exhibit 2: Global Temperatures on the Rise and Accelerating



As of 4/30/16
Source: NASA Goddard Institute for Space Studies

Sadly, it has become obvious that the recent talk in Paris of limiting warming to 1.5 degrees Celsius is toast, as it were. And the dreaded 2 degrees Celsius is highly unlikely to be the limit of our warming. If you line up the previous El Niño outlier of 1998 with this March 2016 El Niño (as we might do in lining up bull market highs) it gives an idea of when 2 degrees Celsius might first be broached in a future El Niño effect: just 17 years! Meanwhile, the most obvious effect to watch for in destabilizing

weather patterns is an increase in record breaking, intense rainfall, such as occurred last month in Houston. Three inches an hour¹ fell and kept falling hour after hour, delivering four months' average rain in under 24 hours (unprecedented without a major hurricane), flooding major parts of the city under several feet of water.

Let me just make the point here that those who still think climate problems are off topic and not a major economic and financial issue are dead wrong. Dealing with the increasing damage from climate extremes and, just as important, the growing economic potential in activities to overcome it will increasingly dominate entrepreneurial efforts in future decades. As investors we should try to be prepared for this.

¹ One inch per hour is usually considered a "deluge."

Disclaimer: The views expressed are the views of Jeremy Grantham through the period ending May 2016, and are subject to change at any time based on market and other conditions. This is not an offer or solicitation for the purchase or sale of any security and should not be construed as such. References to specific securities and issuers are for illustrative purposes only and are not intended to be, and should not be interpreted as, recommendations to purchase or sell such securities.

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