

What Your Great-Grandfather Should Have Bought

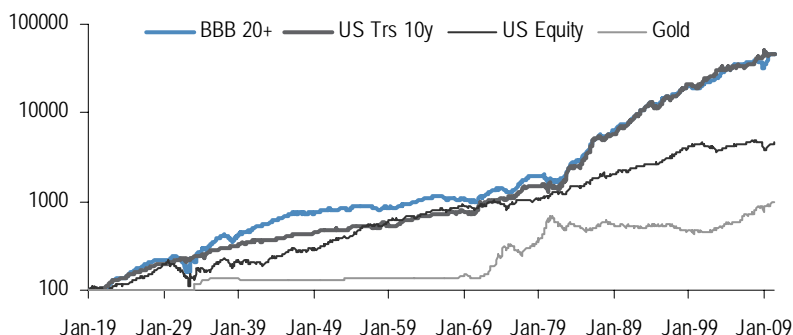
Analysing a Century of Asset Returns

- With markets seemingly in uncharted territory, we look at asset returns over the past century with a focus on the credit market. While most historical analysis spans the past ten to twenty years this note takes a longer term view incorporating data back to 1919.
- Over the past century, corporate credit has outperformed government bonds, equities and gold on a volatility adjusted basis. If we take inflation into account and consider real returns, we find that this outperformance is even more pronounced.
- Although credit has outperformed over the long run, it has not outperformed in all markets. We consider four historic periods of either high inflation (1943 – 1947 and 1977 – 1981) or low inflation/deflation (1928 – 1932 and 1952 – 1956) in order to assess how different assets perform in different inflationary environments. While it's difficult to draw conclusions from only four periods, treasuries tend to perform better in deflationary environments with equities outperforming in inflationary times.
- Looking at credit spreads specifically, our analysis shows that market spreads are correlated with the level of macro uncertainty in the market. We see this with the correlation of credit spreads and equity volatility. Additionally, credit spreads tend to be driven by momentum; a simple moving average algorithmic strategy has paid off over the past century.

This study is the first of a series we intend to do into long term credit returns and provides an overview of our initial results.

Figure 1: Asset Returns over the Century

Total Returns (adjusted for relative volatility) Logarithmic Scale



Source: J.P. Morgan.

See page 13 for analyst certification and important disclosures.

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The Long View

As financial markets remain in uncharted waters, we take a look at the long term history of asset class returns with a focus on the credit market. Over the past 90 years, the annualised return from long-dated credit has been 7%, between 10-year treasuries returns of 5.3% and US equities returns of 9.8% (Table 1). Volatility of returns in credit is similarly between rates and equities at 7.4% annualised. On a volatility adjusted basis, credit has outperformed both equities and gold¹, and has performed inline with rates. This is shown in Figure 1, where we plot a volatility adjusted total return index. (See Appendix I for details on return calculations.)

Another way to look at this is to consider the information ratio of each asset class. This is simply annualised returns divided by the annualised volatility. It tells us our return per unit of risk or volatility. Using data from 1919 until the present day, the information ratio for credit stands at 0.95; with US treasuries slightly lower at 0.94; US equities at 0.53 and gold lagging behind at 0.32. On a volatility adjusted basis, credit has therefore been the most attractive asset over the past century albeit marginally above treasuries.

Table 1: Annualised Returns and Information Ratios

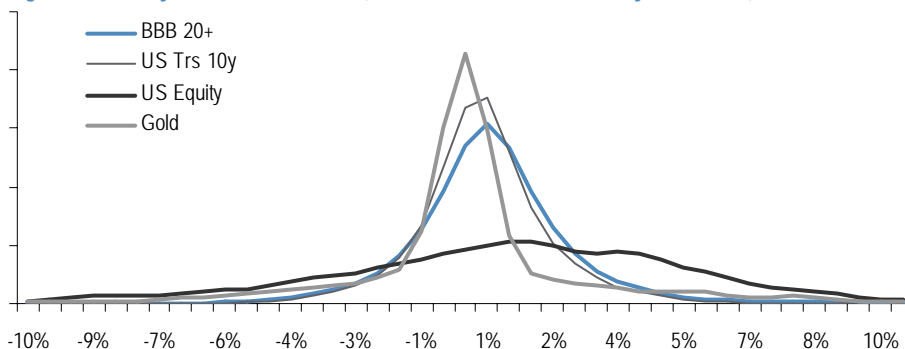
Compounded annual returns: 1919 to Present

Asset	BBB 20+	US Trs 10y	US Equity	Gold	CPI
Return	7.0%	5.3%	9.8%	4.5%	2.7%
Volatility	7.4%	5.6%	18.6%	14.2%	
Information Ratio	0.95	0.94	0.53	0.32	

Source: J.P. Morgan.

We find that across assets, returns are normally distributed albeit with different characteristics. Figure 2 plots the monthly return distribution for our four asset classes. We notice that as we move up the risk spectrum, the mode of the distribution becomes more positive, but the standard deviation also increases, giving an increased likelihood of both more positive and negative returns. The monthly returns from equities are both more positive and more negative than those of credit and rates.

Figure 2: Monthly Return Distribution (smoothed with kernel-density estimation)



Source: J.P. Morgan.

¹ We note that until 1968 gold was largely pegged to the US dollar, although results post this period show a similar pattern.

Real returns show credit outperforms

Having seen nominal asset returns, we now turn to real returns which paint a slightly different picture. With annual compounded inflation of 2.7% over the period, real returns for credit have been 4.2%, while treasuries have returned 2.5%, equities 6.9% and gold a mere 1.7% (Table 2). Adjusting for inflation, the information ratio for credit tops the table with 0.54, treasuries come in second at 0.41, closely followed by Equities at 0.37 and Gold last again at 0.12. Inflation and volatility adjusted, Credit has therefore been the top performing asset class over the past 90 years.

Table 2: Real Returns and Information Ratios

1919 to Present

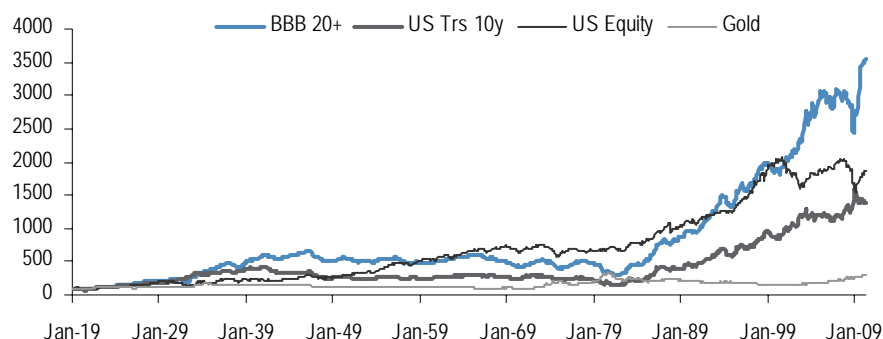
Asset	BBB 20+	US Trs 10y	US Equity	Gold
Return	4.2%	2.5%	6.9%	1.7%
Volatility	7.8%	6.2%	18.7%	14.2%
Information Ratio	0.54	0.41	0.37	0.12

Source: J.P. Morgan.

For each asset class, we can plot the total return series adjusted for both inflation and volatility; this is shown in Figure 3. The outperformance of credit, particularly over the most recent three decades can be seen as can the credit crisis and subsequent recovery.

Figure 3: Real Asset Returns over the Century

Total Returns (adjusted for relative volatility)



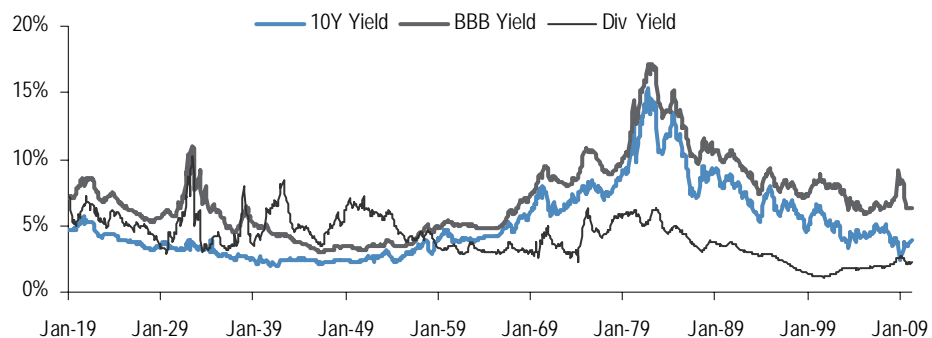
Source: J.P. Morgan.

Yield and Dividends

Asset returns can be divided into capital appreciation and yield or income. While equity returns are usually a mixture of the two, fixed income returns are primarily yield based. The average yield for long dated credit has been 7.11%, while for rates it stands at 5.05%; these are close to the long term historical returns of 7.0% and 5.3%.

An interesting feature of the second half of the 20th century as well as the start of the 21st century has been the decline in dividend yields and the increase in government bond and credit yields. As corporates increased their balance sheet thereby taking on more debt they also paid out less in dividends to investors. Figure 4 shows the historical 10y Treasury yield, the BBB corporate yield as well as the S&P dividend yield. A clear trend of increasing bond yields and declining equity yields emerges over the time period. The current yields across credit, rates and equities (6.25%, 3.85% and 2.26%) are below their long term historical averages (7.11%, 5.12% and 4.09%).

Figure 4: Yields and Dividends



Source: J.P. Morgan.

Returns in Inflationary and Deflationary Environments

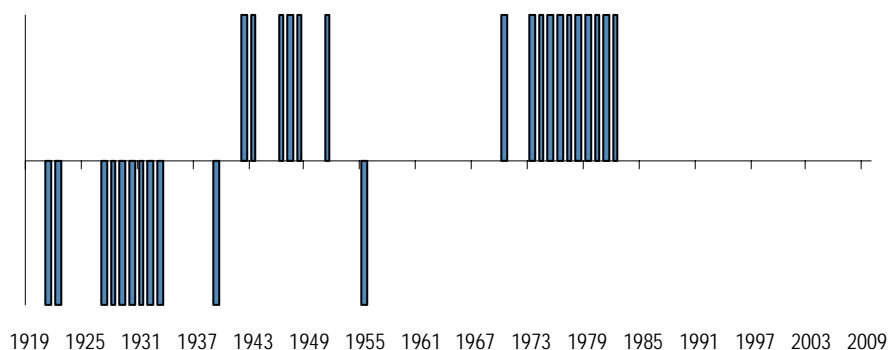
Having considered asset returns over the past century, we turn to analysing the returns over particular time periods, particularly those of high and low inflation. The periods we analyse are:

1. **1928 – 1932:** The Great Depression of the late 1920s saw deflation set in culminating in 1932 when deflation hit 10%.
2. **1943 – 1947:** The end of WW2 saw inflation pick up as the economy boomed.
3. **1952 – 1956:** High inflation at the beginning of the 1950s together with the end of the Korean war and restrictive monetary policy saw inflation remain low for a number of years.
4. **1977 – 1981:** Government spending and high oil prices pushed inflation to 13% annually.

In Figure 5 we plot periods of high and low inflation (defined as one standard deviation away from average inflation). In what follows we discuss these periods in more detail and consider asset price returns in each one.

Figure 5: Inflation and Deflation

Positive indicates high inflation, negative is low inflation



Source: J.P. Morgan.

1) 1928 – 1932

The late 1920s was a period of sustained deflation; from 1928 until 1932, annual deflation was almost 7% as output and prices fell. During this period, US treasuries returned 4% annually, credit lost 1% and equities were down over 15% annually (Table 3). Deflation over the period saw positive real returns from all asset classes except equities, which lost 9.4% each year and were also highly volatile over the period. Increasing dividend yields towards the end of the period partially offset the low returns (Figure 6).

Table 3: Nominal Annualised Total Returns (1928-1932)

Asset	BBB 20+	US Trs 10y	US Equity	Gold	CPI
Return	-0.8%	3.9%	-15.5%	0.1%	-6.7%
Volatility	21.0%	4.1%	35.1%	12.2%	
Information Ratio	-0.04	0.93	-0.44	0.00	

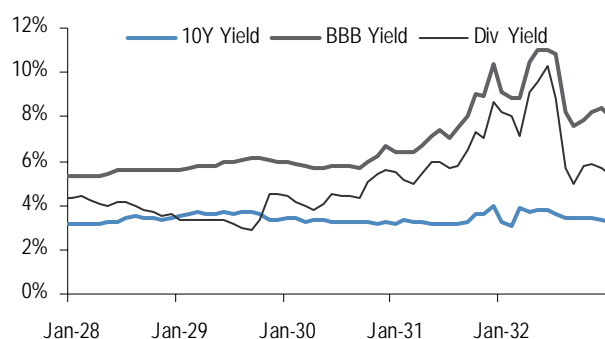
Source: J.P. Morgan.

Table 4: Real Annualised Total Returns (1928-1932)

Asset	BBB 20+	US Trs 10y	US Equity	Gold
Return	6.4%	11.3%	-9.4%	7.3%
Volatility	23.4%	7.8%	32.6%	9.9%
Information Ratio	0.27	1.45	-0.29	0.74

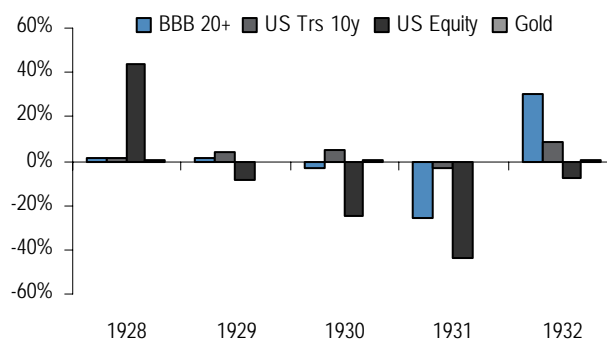
Source: J.P. Morgan

Figure 6: Asset Yields



Source: J.P. Morgan.

Figure 7: Annual Returns



Source: J.P. Morgan.

2) 1943 – 1947

The final years of the Second World War saw inflation pick up to an annualised level of 8.5%. Such rampant inflation saw positive returns across all asset classes with equities outperforming (18.3% annual return). In real terms however, only equity returns were positive (9.1%) with treasuries showing the worst performance (-4.9%). We note that gold was largely pegged to the dollar over this period.

Table 5: Nominal Annualised Total Returns (1943-1947)

Asset	BBB 20+	US Trs 10y	US Equity	Gold	CPI
Return	6.6%	3.2%	18.3%	0.6%	8.5%
Volatility	4.7%	1.1%	16.9%	1.1%	
Information Ratio	1.39	2.95	1.08	0.55	

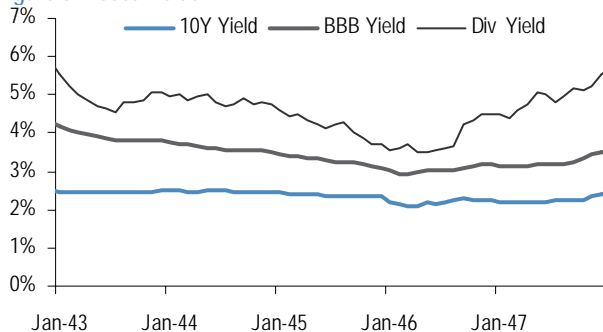
Source: J.P. Morgan.

Table 6: Real Annualised Total Returns (1943-1947)

Asset	BBB 20+	US Trs 10y	US Equity	Gold
Return	-1.8%	-4.9%	9.1%	-7.2%
Volatility	9.3%	6.0%	21.0%	6.2%
Information Ratio	-0.19	-0.80	0.43	-1.16

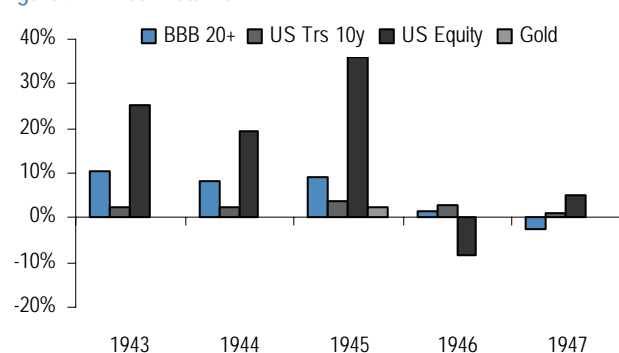
Source: J.P. Morgan

Figure 8: Asset Yields



Source: J.P. Morgan.

Figure 9: Annual Returns



Source: J.P. Morgan.

3) 1952 – 1956

The recession of 1953 followed the high inflation years of the early 1950s. The end of the Korean war and restrictive monetary policy saw low annual inflation of only 1% between 1952 and 1956 – well below the average rate of 2.9% for the century. Such low inflation was a positive for equities both in nominal and real terms (Table 7 and Table 8). While credit returned 1.4% and rates 1.5% annually over the period, equities saw over 25% annual return. Much of this return came in the period between 1954 and 1955 (Figure 11).

Table 7: Nominal Annualised Total Returns (1952 - 1957)

Asset	BBB 20+	US Trs 10y	US Equity	Gold	CPI
Return	1.4%	1.5%	25.8%	0.2%	1.0%
Volatility	5.4%	3.9%	25.6%	0.4%	
Information Ratio	0.25	0.39	1.01	0.49	

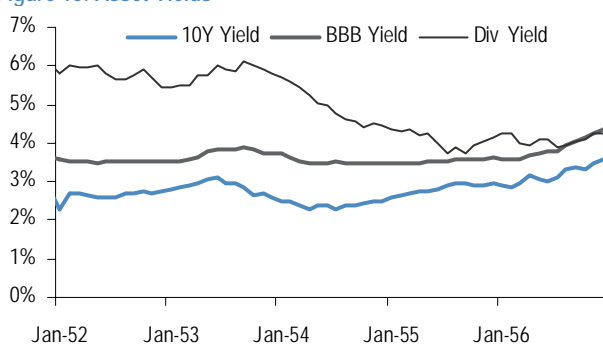
Source: J.P. Morgan.

Table 8: Real Annualised Total Returns (1952 - 1957)

Asset	BBB 20+	US Trs 10y	US Equity	Gold
Return	0.3%	0.5%	24.6%	-0.8%
Volatility	6.9%	4.1%	27.0%	1.9%
Information Ratio	0.05	0.12	0.91	-0.43

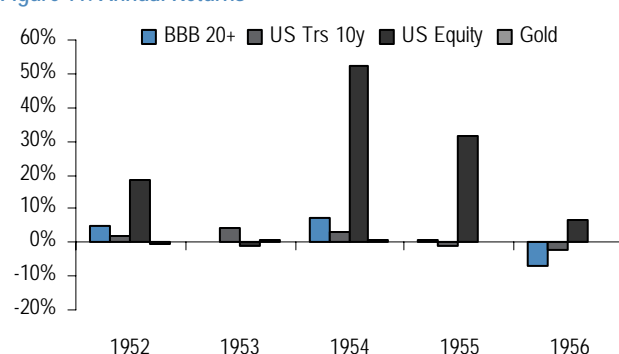
Source: J.P. Morgan.

Figure 10: Asset Yields



Source: J.P. Morgan.

Figure 11: Annual Returns



Source: J.P. Morgan.

4) 1977 – 1981

The late 1970s saw inflation pick up to an annual rate of almost 13% as government spending and rising oil pushed up prices. Again equities outperformed both rates and credit although gold proved to be the best performing asset. Despite the 10% annual return from equities, high inflation meant that real returns were actually negative over the period.

While dividend yields remained largely flat over the period, credit and rate yields rose progressively as investors turned away from fixed income assets given the high inflation and negative real returns.

Table 9: Nominal Annualised Total Returns (1977 - 1981)

Asset	BBB 20+	US Trs 10y	US Equity	Gold	CPI
Return	0.7%	1.8%	10.6%	33.6%	12.7%
Volatility	17.8%	16.5%	14.6%	55.3%	
Information Ratio	0.04	0.11	0.73	0.61	

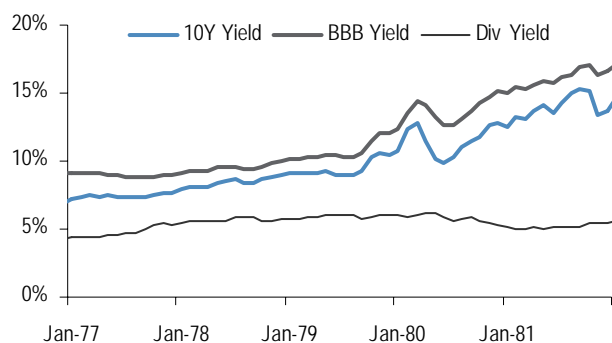
Source: J.P. Morgan.

Table 10: Real Annualised Total Returns (1977 - 1981)

Asset	BBB 20+	US Trs 10y	US Equity	Gold
Return	-10.7%	-9.7%	-1.9%	18.5%
Volatility	20.1%	18.8%	13.1%	47.1%
Information Ratio	-0.53	-0.52	-0.14	0.39

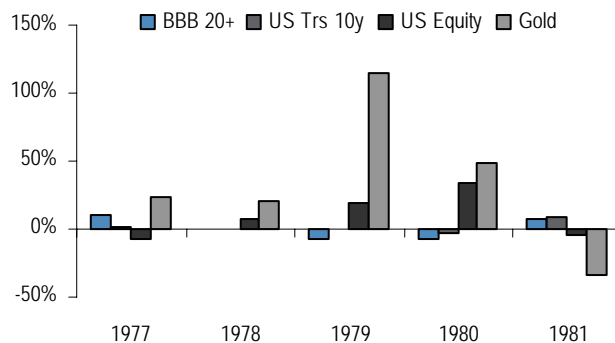
Source: J.P. Morgan.

Figure 12: Asset Yields



Source: J.P. Morgan.

Figure 13: Annual Returns



Source: J.P. Morgan.

Historical Credit Spreads

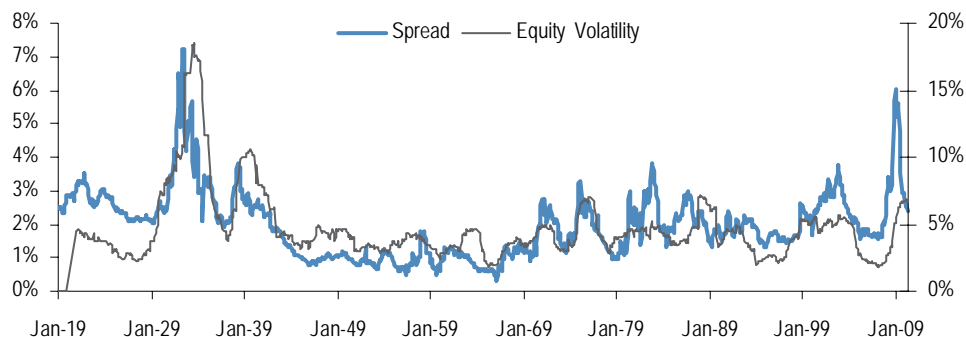
So far we have focused on total returns and all-in yields in order to compare different asset classes. However, many dedicated credit investors see the asset class more as a spread product and aim to capture the additional yield of credit over risk free rates. Figure 14 shows the historical spread level for long dated credit above treasuries. Spreads today of 240bp are marginally above the historical average level of 200bp over the past century. The recent credit crisis saw spreads reach their maximum level of 600bp almost as high as the 800bp they reached in the Great Depression.

Long Term Drivers of Credit Spreads

What are the drivers of credit spreads? We see spreads as an indication of uncertainty and volatility; as economic uncertainty increases, spreads rise. We find that credit spreads are correlated with Equity price volatility, an indication of macro uncertainty. In Figure 14 we plot historical credit spreads against historical equity price volatility. The two series move closely together as we would expect. This relationship has been explored many times in the past, most notably in the Merton Credit-Equity model, which sees credit spreads as an option premium on a company's assets. We intend to look more closely at this relationship in a future note.

Figure 14: BBB Credit Spreads

LHS: Spread (%); RHS: Realised Volatility (%)



Source: J.P. Morgan.

Trading Strategies

Algorithmic strategies involve buying and selling assets based on signals generated from the market. One of the simplest momentum strategies is based on the short term and long term moving averages. If the difference between these is positive, it indicates that momentum is positive and the asset will continue to rise; the converse also holds true – if the short term average is below the long term average, momentum is negative and the asset will fall.

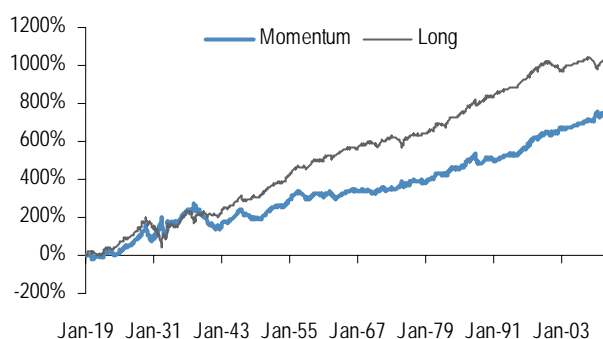
We find that for most assets, a simple moving average approach to momentum has not performed well over our long period; for most assets long-only strategies have outperformed. Figure 15 compares an outright long risk strategy in equities with a momentum based strategy; the long-only strategy has outperformed. For a credit spread based strategies however, we find that a momentum strategy has performed

better than outright long strategy. In Figure 16 we show a total return index for a long-only investment in credit spreads as well as a long-short momentum based strategy. Over the century the strategy has outperformed which leads us to believe that credit momentum is a persistent source of alpha in the market.

This corroborates much of the work we have done on algorithmic strategies in credit (see [Credit Market Technical Indicators : Strategies for Rules based on Algorithmic Investors](#), Doctor and Zhang).

Figure 15: Equity Momentum

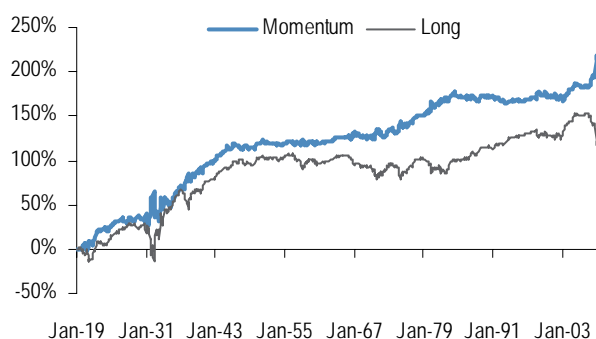
Return Index



Source: J.P. Morgan.

Figure 16: Credit Momentum

Return Index



Source: J.P. Morgan.

Appendix I: Data Sources and Pricing

For each asset class we have created total return indices in order to analyse the performance over the century. Below we discuss the source of the data as well as our calculation of returns. Much of the data we use is available from the Federal Reserve.

Credit (Long dated Baa Bonds)

Our credit returns are based on historical yields for long dated USD bonds rated Baa by Moody's; the monthly data is available from the FED. We use this data as it provides the longest history of yields we are aware of. Using these yields we calculate the duration of a par bond and then the monthly total return as the monthly change in yield times duration plus the coupon (Equation 1). Once we have a monthly return series we are able to build a total return index (Figure 17).

In order to account for default and index rolls (the Baa index will be biased to excluding bonds which are downgraded each month), we assume a monthly adjustment of -4bp. We believe this is fair based on the difference between our calculation of monthly returns from yields and actual monthly returns on the J.P. Morgan JULI index. The monthly rebalancing is likely to ensure that nothing "jumps to default", however, since the average BBB default rate over the past 30 years has been 0.2% annually, we would only expect to lose 1bp per month assuming a 40% recovery. (Monthly loss = $[60\% \times 0.2\%]/12$.) We make no adjustment for the positive impact of bonds being upgraded.

Equation 1: Monthly Credit Returns

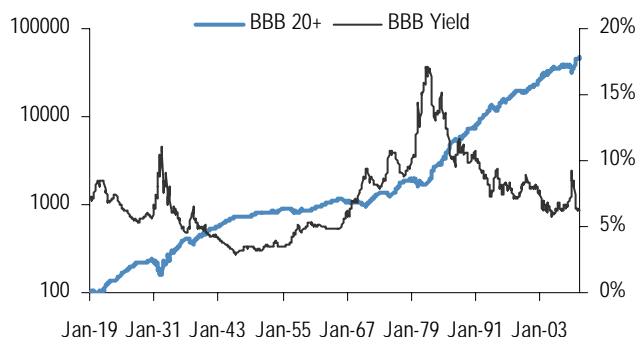
$$\text{Return}(t-1, t) = (\text{Yield}(t-1) - \text{Yield}(t)) \times \text{Duration} + \text{Yield}(t-1) \times \frac{1}{12} - 4bp$$

Rates (10-year treasuries)

Our rates returns are based on 10-year treasury data also available from the FED website. We calculate the monthly returns in the same way that we do for the credit although we make no adjustments for default and rating transition.

Figure 17: Credit Total Returns and Yields

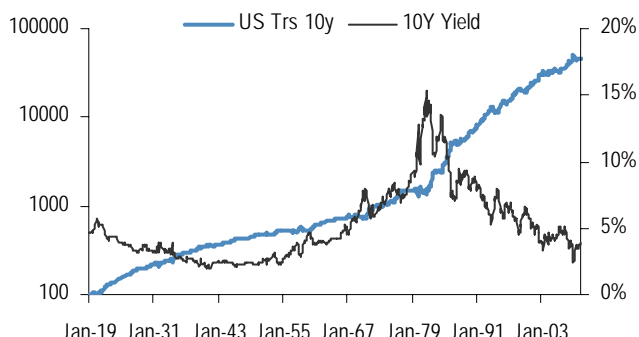
LHS: Return Index (log scale); RHS: Yield (5)



Source: J.P. Morgan; Federal Reserve; Moody's

Figure 18: Rates Total Returns and Yields

LHS: Return Index (log scale); RHS: Yield (5)



Source: Morgan; Federal Reserve

Equities (S&P)

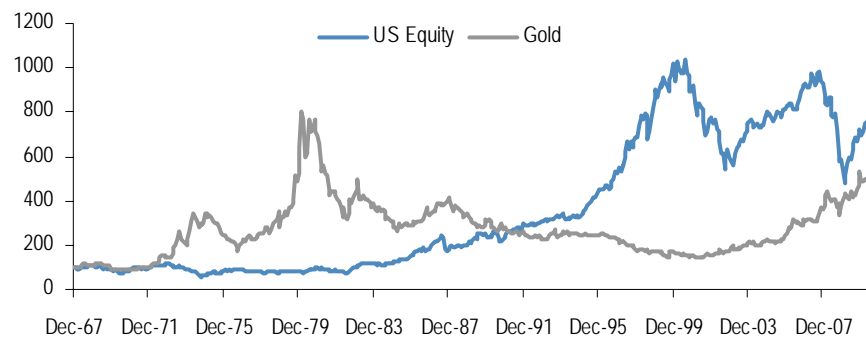
Our equity returns are based on the total returns of S&P500 since its introduction in 1957 and the S&P90 prior to this. The data is also available from the Federal Reserve and Bloomberg. We include dividends paid in the index in order to calculate the monthly total return of the index. Our equity data therefore reflects the total return from an investment in the index.

Gold

Our gold price data comes from Bloomberg and is based on the historical gold fixing price. Until 1968 the US Dollar was pegged to gold first in the gold standard and after World War II in the Bretton Woods system. Since 1968, gold has returned 400% inflation adjusted, while Equities have returned 650% (Figure 19).

Figure 19: Equities versus Gold Inflation Adjusted

Total Returns



Source: J.P. Morgan.

Inflation (CPI)

Our inflation index comes from the US Department of Labour. Using the monthly Consumer Price Index, we calculate the monthly inflation rate which we use to adjust our asset monthly returns in order to calculate real returns ().

Equation 2: Inflation Adjusted Returns

$$\text{Real Return}(t-1, t) = \frac{(1 + \text{Nominal Return}(t-1, t))}{CPI(t)/CPI(t-1)}$$

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