MINNESOTA STATE BOARD OF INVESTMENT

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DATE: January 31, 2019

TO: Legislative Reference Library

FROM: Mansco Perry III MP3

SUBJECT: Report on Investment Consultant Activities

The provisions of Minnesota Statutes, Section 11A.27 require the State Board of Investment to file with the Legislative Reference Library a report on investment consultant activities.

The State Board of Investment (SBI) contracts with Aon Hewitt Investment Consulting, Inc. (AON), Chicago, Illinois and Pension Consulting Alliance (PCA), Portland, Oregon. AON serves as the SBI's general consultant and the annual contract fees are $515,000. PCA serves as the SBI's special projects consultant and the contract fees are $285,000 per year.

During the period July 1, 2017 through June 30, 2018, AON and PCA were involved in the following projects:

- The development of the SBI Investment Beliefs reflecting the SBI's investment values, acknowledge its role in supporting the State's broader pension systems, and guide the development of sound investment policies. The Investment Beliefs apply to the Combined Funds and other funds, as appropriate, under the SBI's responsibility.

- Availability to the Board, staff and Investment Advisory Council to provide perspective, counsel and input on relevant investment related issues.

- Periodic background information for evaluating SBI investment managers.

Attached is an example of the work product each has provided.

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In September 2017, the State Board of Investment (SBI) adopted a set of Investment Beliefs for managing the assets of the Combined Funds (those funds utilized to support the defined benefit plans of the State's employees). The primary purpose of these Beliefs is to guide the SBI toward sound investing principles related to investing on behalf of the Combined Funds. In this respect, the Beliefs help provide context for SBI's actions, reflect SBI's investment values, and acknowledge SBI's role in supporting the State's broader retirement systems. When relevant, the SBI also uses these Beliefs as a guide when investing the assets of the other investment programs that it manages, as deemed appropriate.

The SBI is a long-term investor whose primary mission is to maintain the viability of the retirement systems it supports.

When determining an appropriate level of risk that the systems' assets should bear the SBI must reflect the nature of those systems' liabilities and funding policy.

The SBI's strategic allocation policy is the primary determinant of (i) the asset portfolio's long-term investment return and (ii) asset portfolio's risk.

While the SBI can sacrifice some short-term liquidity to pursue a greater long-term return, the investment portfolio's net cash flows and ability to pay benefits on a year-by-year basis are key risk considerations.

Diversification improves the risk-adjusted return profile of the SBI investment portfolio.

Diversification of the SBI investment portfolio takes place across several critical dimensions, such as allocation across global regions and country markets (e.g., U.S. versus Europe, Asia, emerging markets, etc.), allocation among different types of assets (equities, bonds, real estate, etc.), spreading assets across various sectors and industries (e.g., technology, financials, consumer-oriented, etc.), and weighting of different risk factor premiums (e.g., value vs. growth, small companies vs. big companies, carry, illiquidity, etc.). If the correlation (i.e., relationship) among the returns generated by these factors is less than perfect (i.e., less than 1.0), then diversification is beneficial.

There are long-term benefits to SBI managing investment costs.

The equity risk premium is significantly positive over a long-term investment horizon although it can vary over time.

The equity risk premium is also pervasive across several asset classes and its overall exposure should be managed accordingly.

Private market investments have an illiquidity premium that the SBI can capture.

This risk premium can increase the portfolio's long-term compound return and help diversify the portfolio's risk.

It is extremely challenging for a large institutional investor to add significant value over market-representative benchmarks, particularly in the highly-competitive public global equity markets.

Passive management should be utilized when there is low confidence that active management can add value. Active management can have potential to add value where information processing is difficult and challenging, allowing for market inefficiencies that are potentially exploitable.

The SBI benefits significantly when roles and levels of authority are clearly defined and followed.

The role of the members of the State Board of Investment (Board) is to establish investment policies that are in compliance with state statute and guide the ongoing management of the funds. The Board delegates implementation of that policy to the Executive Director/CIO, and exercises oversight with respect to the Executive Director/CIO's implementation activities and the portfolio's active risk level in the context of the portfolio's strategic allocation policy. The Board also ensures adequate resources are available to the SBI staff to perform their work;

The Investment Advisory Council (IAC) key role is advising the Board and Executive Director/CIO on general policy matters and methods to enhance the management of the investment portfolio;

The Executive Director's/CIO's key role is implementing SBI investment policies and setting the portfolio's active risk level in a prudent manner to achieve value-added over policy benchmarks.

Utilizing engagement initiatives to address environmental, social, and governance-related (ESG) issues can lead to positive portfolio and governance outcomes.

In addition to specific engagement strategies the SBI might apply, proxy rights attached to shareholder interests in public companies are also "plan assets" of the SBI and represent a key mechanism for expressing SBI's positions relating to specific ESG issues. By taking a leadership role in promoting responsible corporate governance through the proxy voting process, SBI can contribute significantly to implementing ESG best practices which should, in turn, add long-term value to SBI's investments.

Approved by State Board of Investment

Date: June 14, 2018

Market Environment

Third Quarter 2018

Aon

Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

Aon
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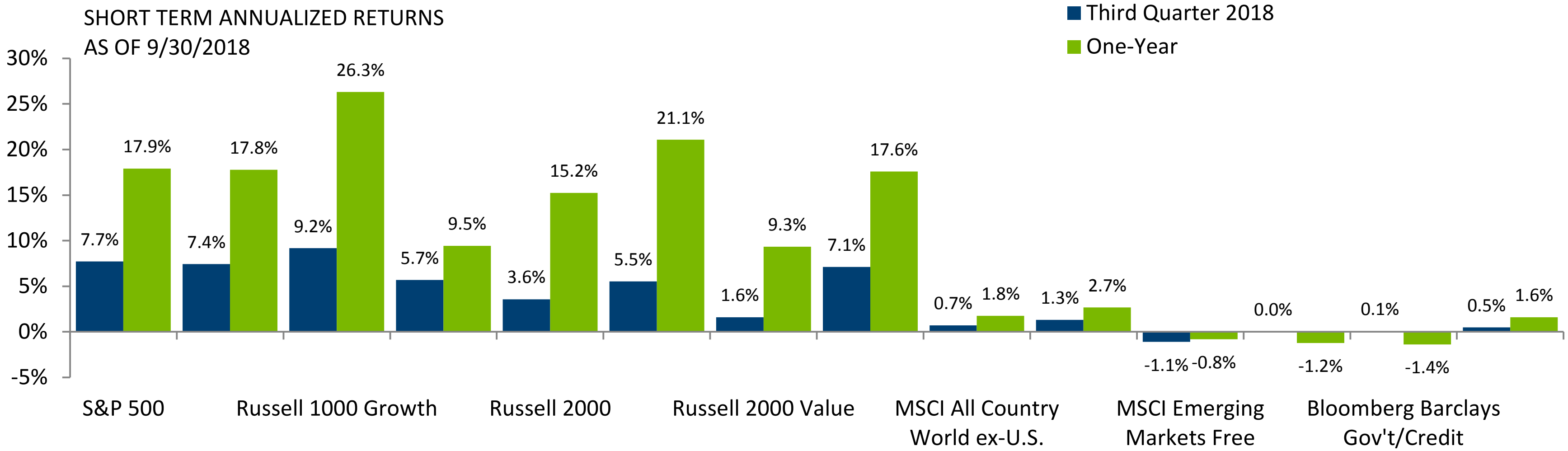
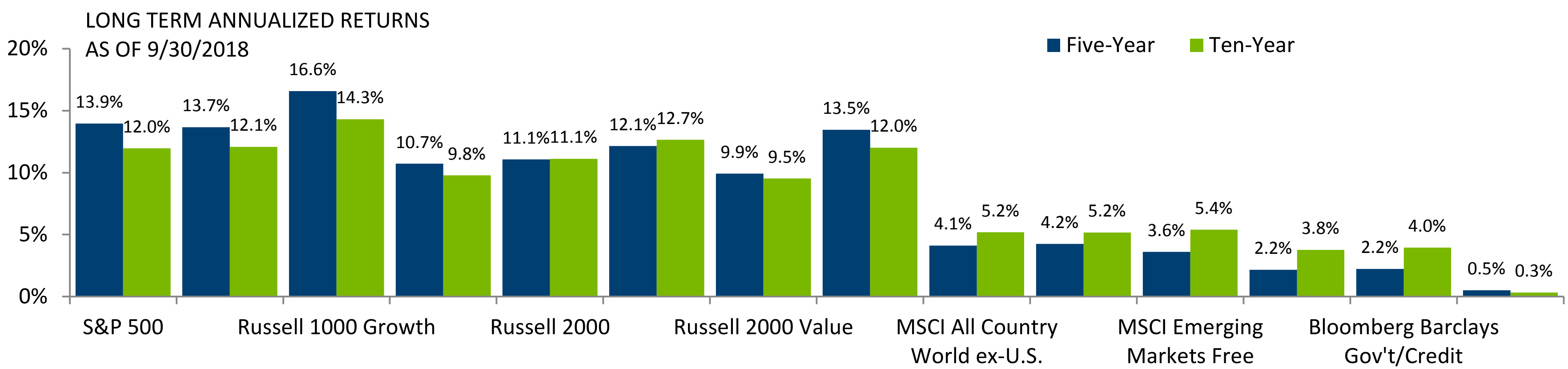
Market Highlights



Source: Russell, MSCI, Barclays



Source: Russell, MSCI, Barclays

Market Highlights

Returns of the Major Capital Markets					
					Periods Ending 9/30/2018
	Third Quarter	**1-Year**	**3-Year[1]**	**5-Year[1]**	**10-Year[1]**
Domestic Equity					
S&P 500	7.7%	17.9%	17.3%	13.9%	12.0%
Russell 1000	7.4%	17.8%	17.1%	13.7%	12.1%
Russell 1000 Growth	9.2%	26.3%	20.6%	16.6%	14.3%
Russell 1000 Value	5.7%	9.5%	13.6%	10.7%	9.8%
Russell 2000	3.6%	15.2%	17.1%	11.1%	11.1%
Russell 2000 Growth	5.5%	21.1%	18.0%	12.1%	12.7%
Russell 2000 Value	1.6%	9.3%	16.1%	9.9%	9.5%
Russell 3000	7.1%	17.6%	17.1%	13.5%	12.0%
International Equity					
MSCI All Country World ex-U.S.	0.7%	1.8%	10.0%	4.1%	5.2%
MSCI World ex USA	1.3%	2.7%	9.3%	4.2%	5.2%
MSCI Emerging Markets Free	-1.1%	-0.8%	12.4%	3.6%	5.4%
Fixed Income					
Bloomberg Barclays U.S. Aggregate	0.0%	-1.2%	1.3%	2.2%	3.8%
Bloomberg Barclays Gov't/Credit	0.1%	-1.4%	1.4%	2.2%	4.0%
3 Mo U.S. T-Bills	0.5%	1.6%	0.8%	0.5%	0.3%
Inflation					
CPI-U	0.5%	2.3%	2.0%	1.5%	1.4%

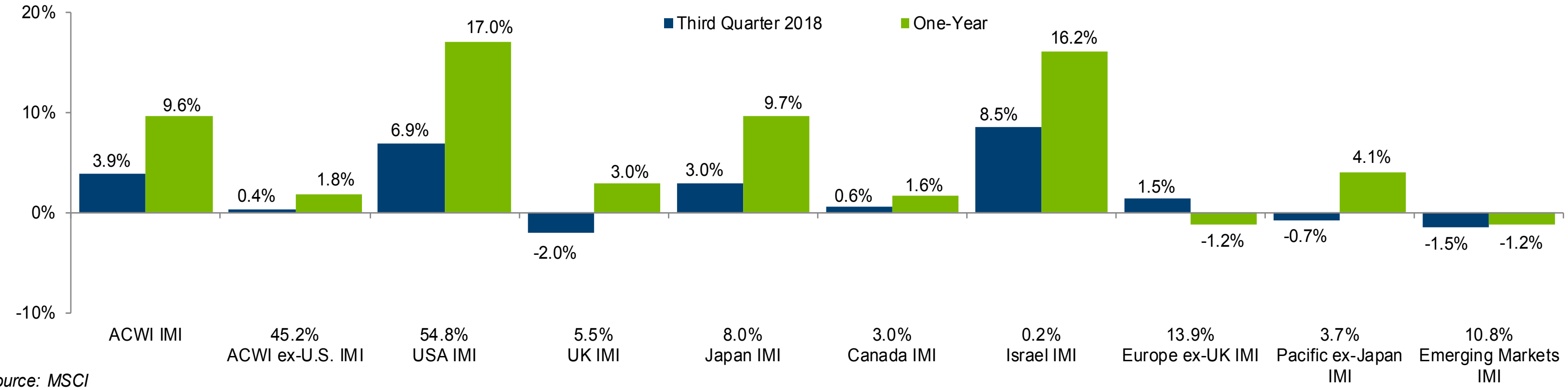
MSCI Indices show net returns.

All other indices show total returns.

[1] Periods are annualized.

Global Equity Markets

GLOBAL MSCI IMI INDEX RETURNS
AS OF 09/30/2018



Source: MSCI

- Trade negotiation developments were keenly watched in Q3 2018. A last-minute compromise in the U.S.-Canada trade negotiations late in the quarter looks set to pave the way for the U.S.-Mexico-Canada (USMCA) agreement to be ratified by all three member governments towards the end of this year. However, U.S.-China trade relations continued to deteriorate. Despite this, global equities returned 3.9% in Q3 2018.
- U.S. equities continued to perform well in Q3 2018. This was supported by encouraging earnings and upbeat US economic data, with real GDP growth hitting 4.2% (year-on-year) and the Institute of Supply Management's (ISM) manufacturing index topping 60 once more in September. The combination of strong U.S. economic performance and robust corporate earnings growth elevated U.S. equity markets to new heights with the S&P 500 index hitting record levels.
- UK equities fell the most over the quarter is U.S. Dollar terms in a quarter where Brexit negotiations became increasingly anxious after several key elements of the UK Government’s so-called “Chequers” plan for Brexit negotiations were rejected by the European Union (EU). European equities only modestly increased with concerns over the Italian budget and European banks’ exposure to Turkey, which was exposed to a currency and debt crisis, weighing on the market.
- Trade war escalations, a strengthening U.S. dollar and concerns over the Chinese economy–all prominent features from the second quarter–were mainstays over Q3 for Emerging Markets (EM) equities. Consequently, EM equities fell 1.5% in U.S. dollar terms over the quarter.

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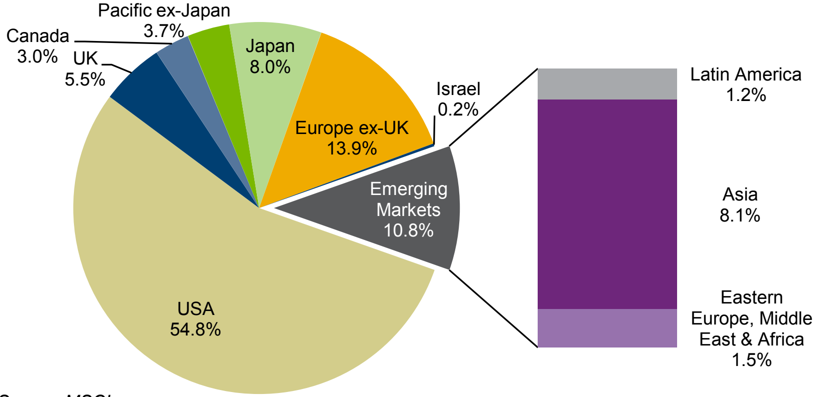
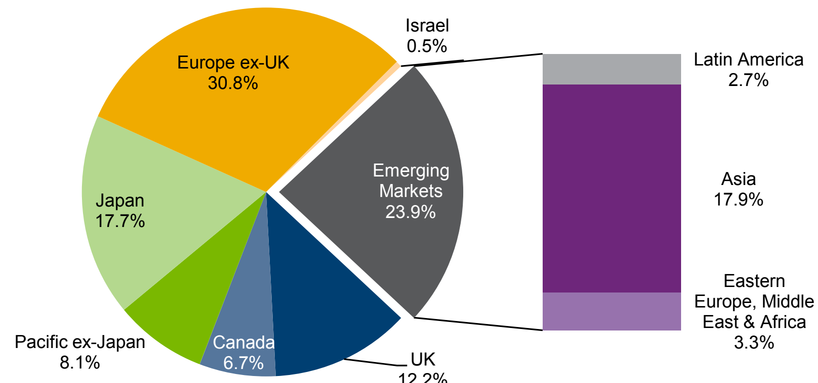
Global Equity Markets

MSCI ALL COUNTRY WORLD IMI INDEX
GEOGRAPHIC ALLOCATION AS OF 09/30/2018



Source: MSCI

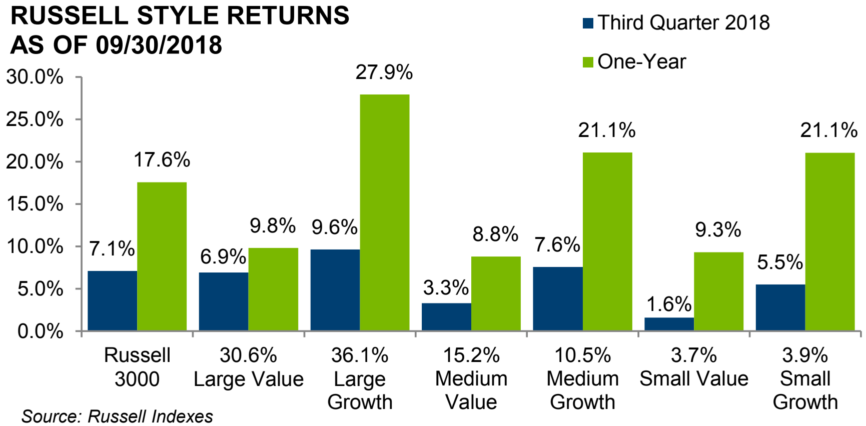
MSCI ALL COUNTRY WORLD EX-U.S. IMI INDEX
GEOGRAPHIC ALLOCATION AS OF 09/30/2018

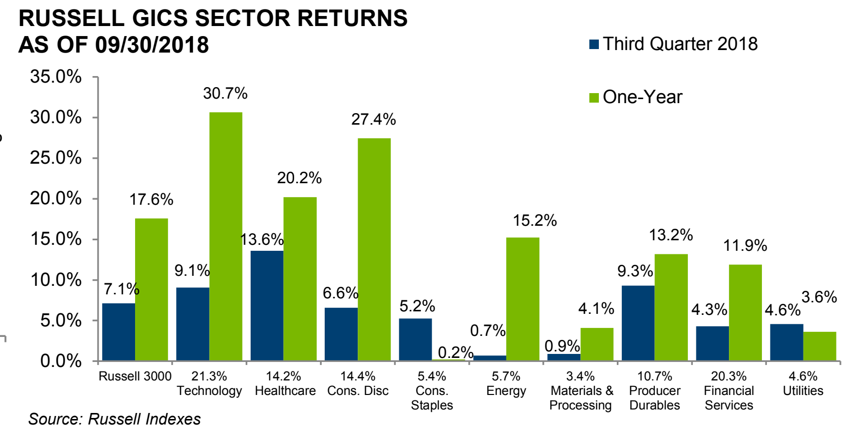


Source: MSCI

- The two exhibits on this slide illustrate the percentage that each country/region represents of the global and international equity markets as measured by the MSCI All Country World IMI Index and the MSCI All Country World ex-U.S. IMI Index, respectively.

U.S. Equity Markets

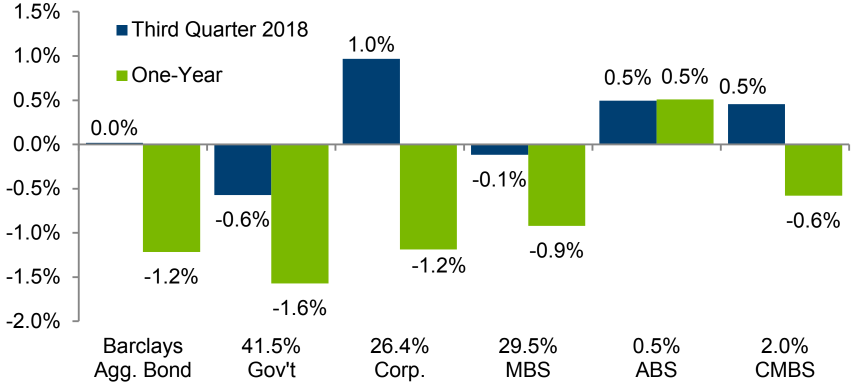




- The Russell 3000 Index returned 7.1% during the third quarter and 17.6% over the one-year period.
- All sectors generated positive returns over the quarter. In particular, Healthcare (13.6%) and Producer Durables (9.3%) were the strongest performing sectors in Q3 2018. The Technology sector continued to perform strongly (9.1%) over the quarter supported by very strong earnings for mega-cap technology stocks, such as Amazon, Apple and Microsoft.
- Performance was positive across the market capitalization spectrum over the quarter. In general, large cap stocks outperformed both medium and small cap stocks over the quarter. Small cap stocks were led lower by poor performance of Financial and Healthcare stocks.
- Growth stocks outperformed their Value counterparts in Q3 2018. Over the last 12 months, Value stocks continued to lag their Growth stock equivalents significantly. The underperformance of Value stocks can be partly attributed to the lower exposure to Technology stocks, which have performed strongly over the last year.

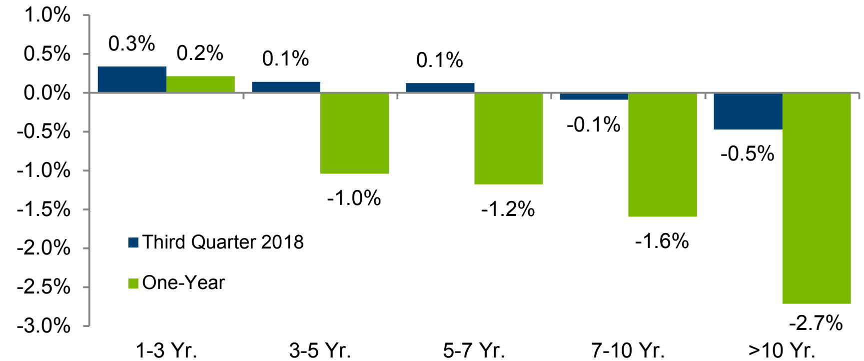
U.S. Fixed Income Markets

BLOOMBERG BARCLAYS AGGREGATE RETURNS BY SECTOR AS OF 09/30/2018



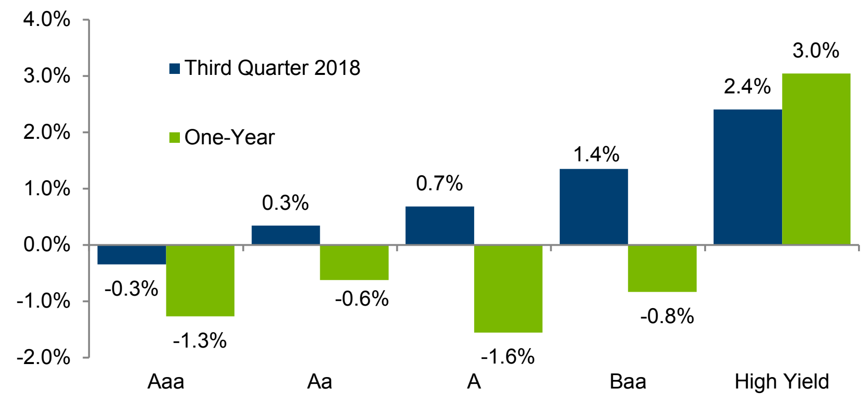
Source: FactSet

BLOOMBERG BARCLAYS AGGREGATE RETURNS BY MATURITY AS OF 09/30/2018



Source: FactSet

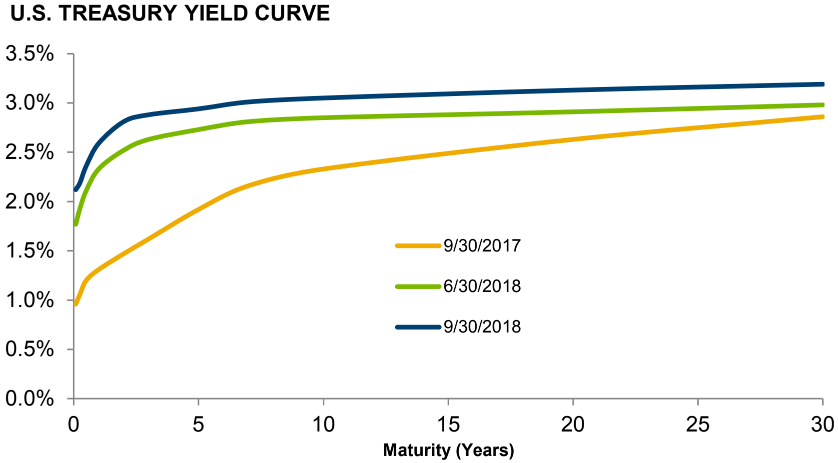
BLOOMBERG BARCLAYS U.S. AGGREGATE RETURNS BY QUALITY AND HIGH YIELD RETURNS AS OF 09/30/2018



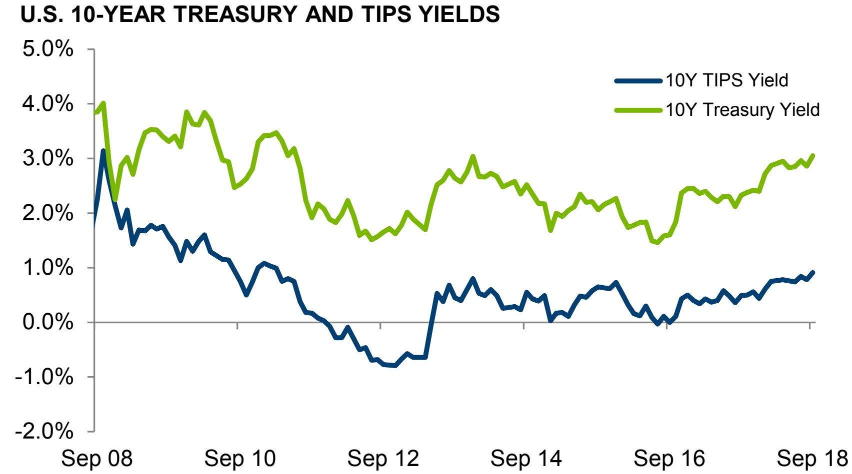
Source: FactSet

- The Bloomberg Barclays U.S. Aggregate Bond Index remained flat in the third quarter. Investment grade corporate bonds was the best performer over the quarter at 1.0% whilst government bonds was the worst performer at -0.6%.
- Performance was positive across all credit qualities, with the exception of AAA bonds which fell 0.3%, as spreads tightened over the quarter. High yield bonds returned the most at 2.4%. In investment grade bonds, Baa bonds were the major outperformer with a return of 1.4%.
- Short maturity bonds outperformed intermediate and long maturity bonds over the quarter. Short maturity bonds returned 0.3% while long maturity bonds fell 0.5% in Q3 2018.

U.S. Fixed Income Markets



Source: U.S. Department of Treasury



Source: U.S. Department of Treasury

- The yield curve flattened over the quarter with yields rising across maturities. The spread between the 10-year and 2-year U.S. Treasury yield narrowed to 24bps from 33bps. This flattening is very likely signalling bond market caution on economic growth prospects once the U.S. tax stimulus has flowed through.
- The US Federal Reserve (Fed) continued to tighten monetary policy, increasing the federal funds rate by 25bps to a range of 2.0-2.25%. While this rate hike now puts U.S. monetary policy above the Fed's preferred measure of inflation, the core Personal Consumption Expenditure price index, for the first time since the financial crisis, the real Fed funds rate (see chart below) is still very low historically and still broadly accommodative.
- The recent move in U.S. nominal government bond yields has primarily been driven by real yields, rather than market-implied expectations of future inflation. The 10-year U.S. treasury yield rose by 20bps to 3.05% with 18bps attributable to the increase in the duration-equivalent TIPS yield.

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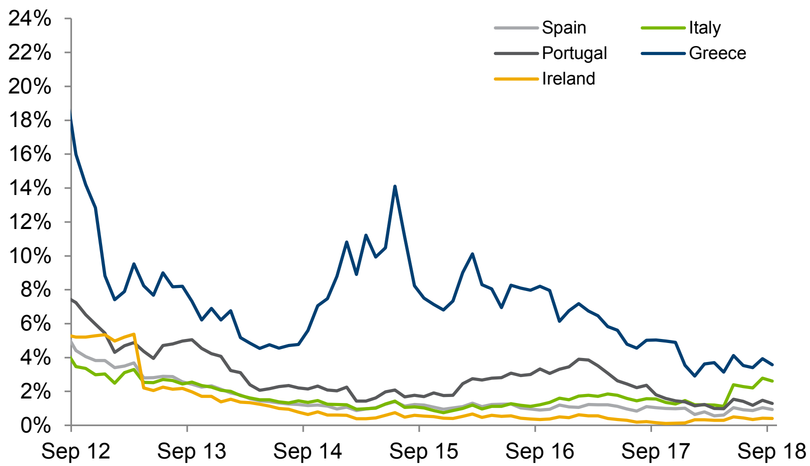
European Fixed Income Markets

EUROZONE PERIPHERAL BOND SPREADS (10-YEAR SPREADS OVER GERMAN BUNDS)



Source: Factset

- Changes in bond spreads over 10-year German bunds were mixed across the eurozone. The European Central Bank (ECB) reiterated its expectations that any tightening to conventional monetary policy would only take place in the second half of 2019. We are, however, drawing nearer to the end of quantitative easing in the Eurozone which could ease downward pressure on bond yields that has prevailed for several years and potentially remove support for risk assets.
- Italian bond yields rose by 49bps to 3.18%, as the country's populist coalition agreed a budget with a fiscal deficit of 2.4%, significantly higher than finance minister Giovanni Tria's preferred target of a 1.6% deficit. The spread between Italian 10-year government bonds and German bunds widened by 32bps. Spanish government bond yields rose by 19bps to 1.51% over the quarter.
- Greek government bond yields rose by 20bps to 4.14% as the ECB confirmed it would stop providing liquidity to Greek banks, by accepting Greek government bonds as collateral, after Greece's bail-out deal. Over the quarter, the S&P improved its credit rating for Greece to positive from stable.

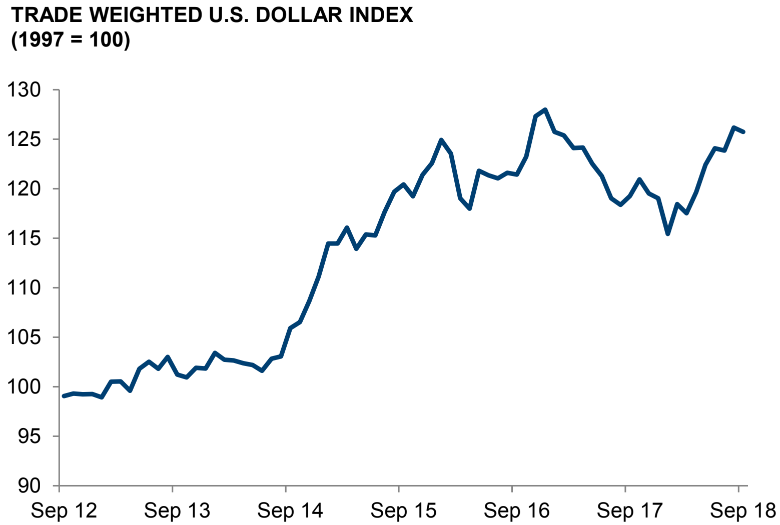
Credit Spreads

Spread (bps)	9/30/2018	6/30/2018	9/30/2017	Quarterly Change (bps)	1-Year Change (bps)
U.S. Aggregate	39	44	38	-5	1
Gov't	0	0	1	0	-1
Credit	100	116	96	-16	4
Gov't/Credit	43	50	43	-7	0
MBS	28	28	22	0	6
CMBS	60	70	71	-10	-11
ABS	38	47	44	-9	-6
Corporate	106	123	101	-17	5
High Yield	316	363	347	-47	-31
Global Emerging Markets	273	288	235	-15	38

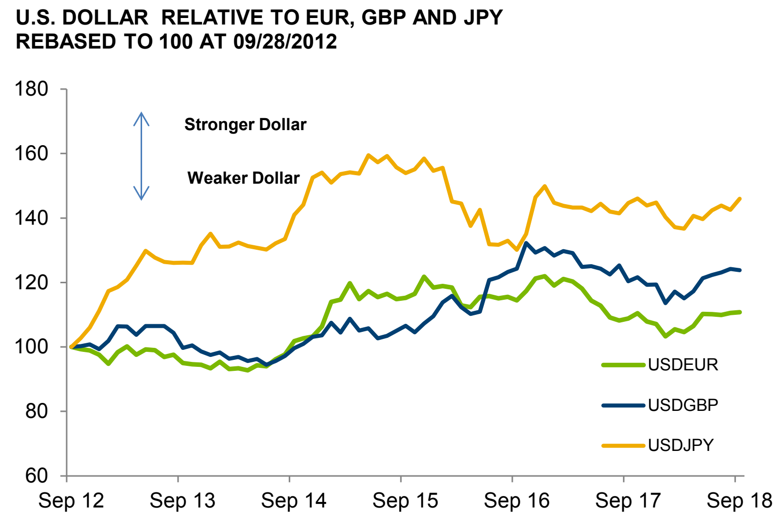
Source: Barclays Live

- Credit spreads whipsawed over the third quarter, as initial narrowing over July was offset by spreads blowing out in August, before contracting again in September. Overall, spreads were down over the three months supporting credit market outperformance over government bonds.
- U.S. Corporate bond spreads and Government/Credit bond spreads narrowed by 17bps and 7bps, respectively.
- The strong relative performance of high yield bonds persisted; spreads on the Bloomberg Barclays US High Yield Index dropped by 47bps to 316bps, and primarily drove the 2.4% quarterly return. High yield also benefitted from lower interest rate sensitivity relative to the broader credit index.

Currency



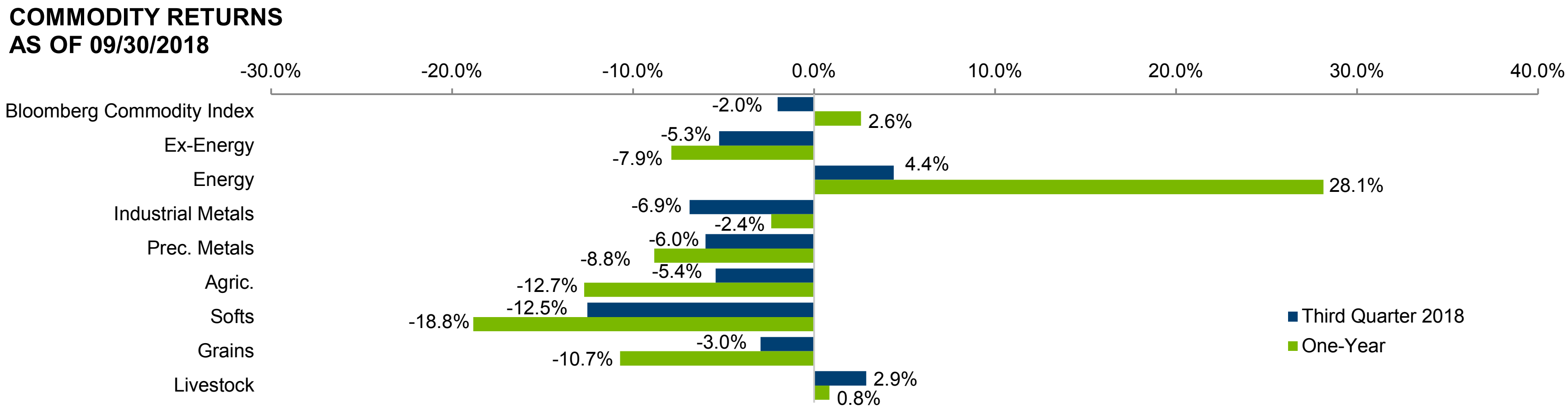
Source: Federal Reserve



Source: Factset

- The U.S. dollar continued on an upward trend albeit to a lesser extent compared to the previous two quarters as it rose 1.3% on a trade-weighted basis over the quarter. Tightening U.S. monetary policy and strong economic fundamentals led the U.S. dollar higher.
- The U.S. dollar appreciated against all the major currencies. Brexit uncertainty in the UK, Italian budget uncertainty in the Eurozone and widening interest rate differentials with the Bank of Japan (BoJ) contributed to the strong U.S. dollar performance. During the quarter, the BoJ loosened its yield curve control policy; the yield on 10-year Japanese government bonds will now be able to fluctuate by 0.2% around zero, up from the previous range of 0.1%.
- The Canadian dollar performed strongly against a wide range of currencies, most notably against the Japanese yen (an appreciation of 4.4% in Q3 2018). Uncertainty surrounding the future of the Canadian economy was allayed late in the quarter as concessions were made with the late save in the form of the USMCA agreement.

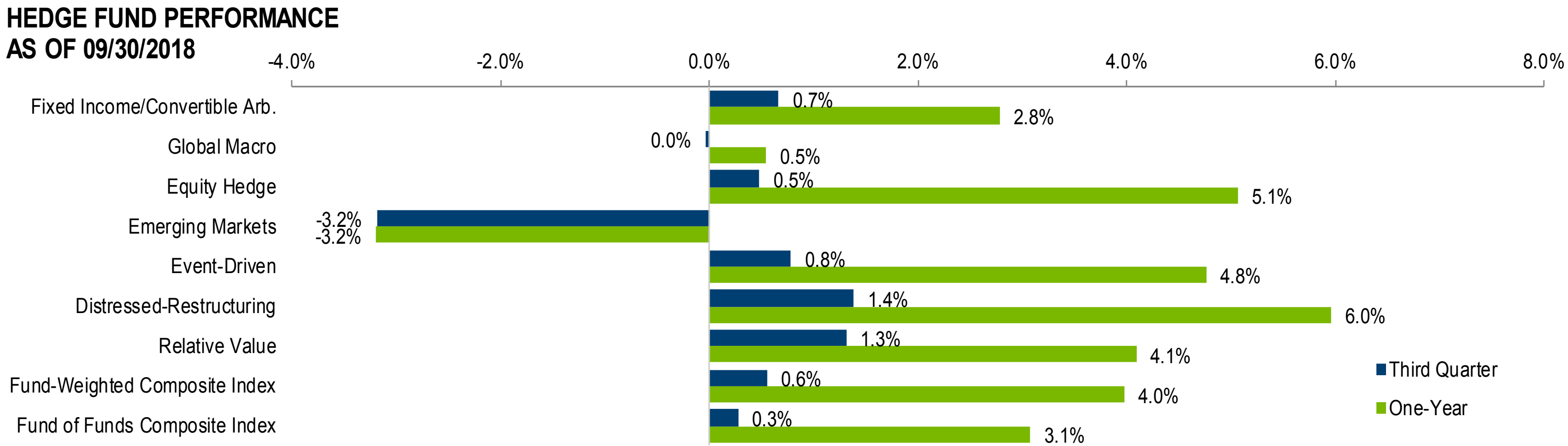
Commodities



Source: Bloomberg
Note: Softs and Grains are part of the wider Agriculture sector

- The Bloomberg Commodity Index returned -2.0% during a weak quarter for commodities.
- Energy was the best performing sector over the quarter with a return of 4.4%. The uncertainty of the impact on U.S. sanctions against Iran and OPEC's response, helped send Brent crude oil prices higher. However, the glut of U.S. crude oil supplies dragged down the price of WTI crude oil to US$73.16/bbl – the price spread relative to Brent crude oil widened to just under US$10/bbl.
- Other than Energy, the other notable increase was Livestock, which rose by 2.9% in Q3 2018.
- Meanwhile, agriculture and industrial metal commodities, which are more impacted by global trade uncertainty, detracted from the overall index return. Industrial metals (-6.9%) were particularly affected with the price of copper dropping by 7.0% over the quarter to US$6,180/bbl.
- The detrimental impact of a stronger U.S. dollar on commodities was noticeable in other markets with declines in Softs, Grains, and Precious Metals.

Hedge Fund Markets Overview

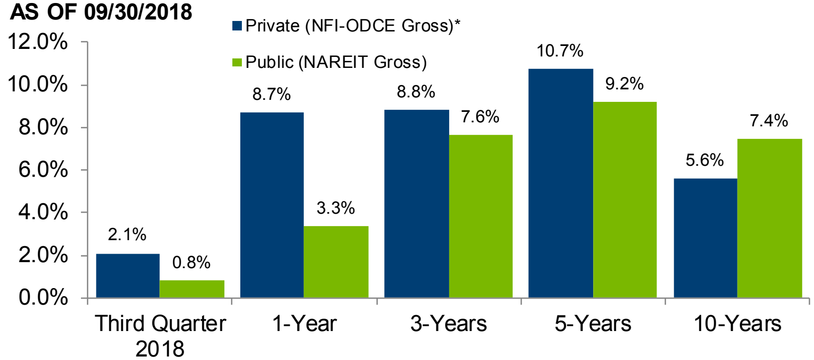


Note: Latest 5 months of HFR data are estimated by HFR and may change in the future.
Source: HFR

- Hedge fund performance was positive across all strategies (except for Emerging Markets) in the third quarter. Distressed-Restructuring and Relative Value were the best performers with a return of 1.4% and 1.3% respectively whilst Emerging Market hedge funds continued to be the worst performer with a return of -3.2%.
- July performance was positive across most strategies with Relative Value and Equity Hedge leading the way. August performance was led by Macro hedge funds, snapping a 3-month decline. Driven by currency exposure, Macro sub-strategy performance was led by quantitative, trend-following CTA strategies. September strategy performance was led by Relative Value funds mainly due to Sovereign bond and Asset Backed exposures.
- HFRI Fund-Weighted Composite Index and the HFRI Fund of Funds Composite Index produced returns of 0.6% and 0.3% respectively.

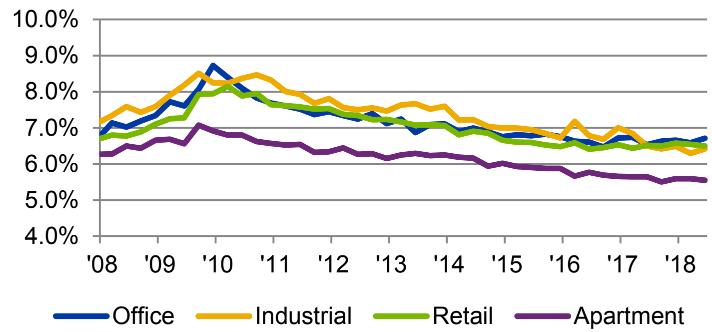
U.S. Commercial Real Estate Markets

PRIVATE VS. PUBLIC REAL ESTATE RETURNS
AS OF 09/30/2018



**Second quarter returns are preliminary*
Sources: NCREIF. Factset

CAP RATES BY SECTOR
SOURCE: RCA, AON HEWITT 6/30/2018



- U.S. Core real estate returned 2.09%* over the third quarter, equating to 8.7% total gross return year-over-year, with 4.3% made up of income. Net income growth is expected to be the larger driver of the total return going forward given the current point of the real estate cycle.
- After posting positive gains early in the quarter, global property stocks (FTSE EPRA/NAREIT Developed Index) ended Q3 with a slight loss (-0.2%) and are up 4.6% for the trailing year. U.S. REITs led the way with a marginal gain of 0.8%, as both the Europe and Asia/Pacific regions fell during the quarter. Although positive for the quarter, the U.S. REIT market (FTSE NAREIT Equity REITs Index) suffered the biggest loss in September among the major asset classes, down 2.5% compared with a 7.6% return for S&P 500. The Federal Reserve lifted short-term interest rates during the month which sparked investor concerns over the future performance of REITs. This marked the first monthly setback for US securitized real estate since February. The 10-year U.S. Treasury bond yield stood at 3.1% as of quarter end, compared to the U.S. REIT dividend yield of 4.2%. Transaction market volume and pricing remains healthy across property types.
- According to RCA, through August 2018, the U.S. property market has experienced price growth of 7.7% year-over-year across major sectors. Further, transaction volume is up 46% over the same period, primarily driven by large portfolio deals and foreign capital sources.
- Real Estate fundamentals remain healthy, but valuations across real estate and other asset classes are rich. Return expectations have normalized , with go forward expectations in line with historical norms. Rising interest rates have led to asset value correction fears across various asset classes; within real estate, investors can mitigate these risks by shifting preference to investments that can participate and benefit from economic growth, with downside protection offered by current income. Aon prefers investments that offer relatively strong rental income growth, or value-add potential with near-term income generation potential.
- It is critical to identify sub-sector and sub-market driven themes in the current environment; Unlike the last 6-7 year period, as assets are no longer trading at deep discounts to replacement value. Real estate investments should seek levers of NOI growth that are not predicated on continued market uplift. For example, an investment thesis can focus towards sectors benefiting from secular changes (e.g. Industrial and e-commerce), acquiring in-place rents below current market terms, and improving operational efficiency.

*Indicates preliminary NFI-ODCE data gross of fees

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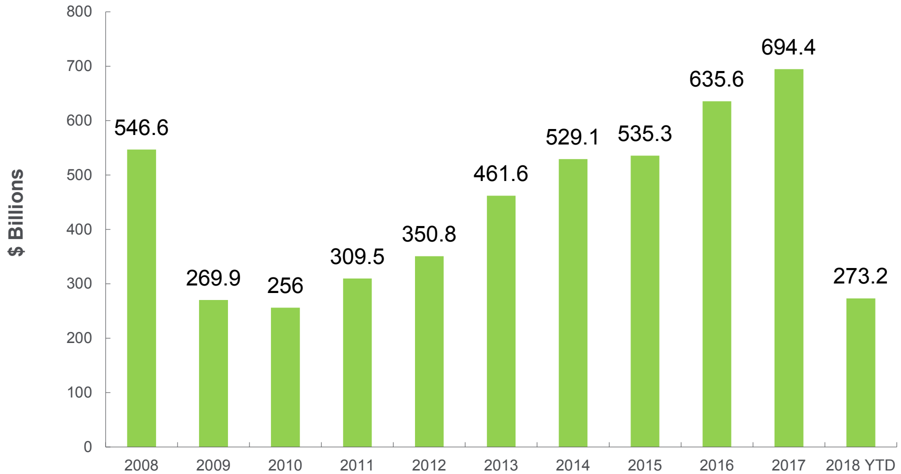
Appendix A:

Global Private Equity Market Overview

2Q 2018

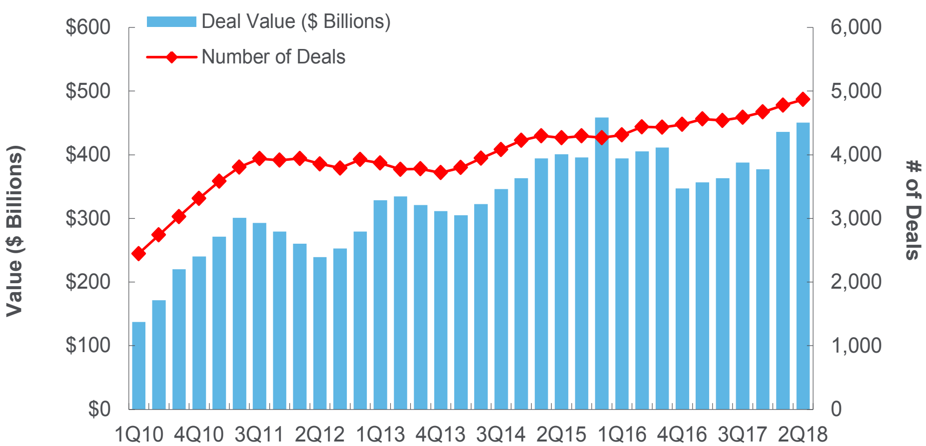
Private Equity Overview

Total Funds Raised



Source: Preqin

LTM Global Private Equity-Backed Buyout Deal Volume



Source: Preqin

Fundraising

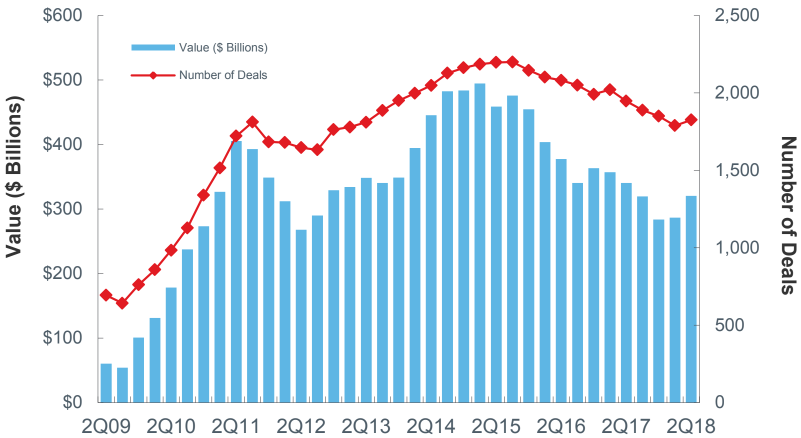
- In 2Q 2018, $147.8 billion was raised by 343 funds, which was up 17.1% on a capital basis and 3.9% by number of funds from the prior quarter.[1] However, this marks a decline of 29.3% and 20.2% by number of funds and by capital raised, respectively, over Q2 2017.
  - About half of 2Q 2018 capital was raised by funds with target geographies in North America, comprising 61.2% of the quarterly total. Capital targeted for Europe made up 25.5% of the total funds raised during the quarter, while the remainder was attributable to managers targeting Asia and other parts of the world.[1]
- Dry powder stood at $1.72 trillion at the end of the quarter, up 7.2% and 26.8% compared to year-end 2017 and the five year average, respectively.[1]

Activity

- On an LTM basis, 4,867 deals were completed for an aggregate deal value of $450.4 billion as of 2Q 2018 compared to 4,538 transactions totaling $363.1 billion as of Q2 2017.[1]
  - Average deal size was $92.5 million on an LTM basis, up 1.5% and 6.2% from the prior quarter and the five-year quarterly average level, respectively.
- European LBO transaction volume totaled €40.1 billion through 2Q 2018 and €86.9 billion on an LTM basis, compared to 2Q 2017’s quarterly and 2017 full year totals of €18.0 billion and €78.6 billion, respectively. 2Q 2018’s total was up 51.5% from the five-year quarterly average.[3]
- At the end of 2Q 2018, the average purchase price multiple for all U.S. LBOs was 9.8x EBITDA, down from 10.2x as of the end of Q1 2018. However, we do not believe this to be a trend as multiples as of 07/31/2018 were marked at 10.3x.[3]
  - This was 0.1x lower than the five-year year-end average and 0.6x turns (multiple of EBITDA) above the ten-year year-end average level.
- European multiples were up 0.4x quarter-over-quarter, averaging 10.8x EBITDA for all transaction sizes, with large and medium transactions each running at 11.7x and 10.8x, respectively.[3]
  - In Europe, the average senior debt/EBITDA level through 2Q 2018 was 5.5x, slightly higher than the 5.4x observed in full year 2017. This was also higher than the five-year and ten-year average levels of 5.1x and 4.8x, respectively.
- Debt remained broadly available in the U.S.
  - U.S. average leverage levels in 2Q 2018 were 5.5x compared to the five and ten year averages of 5.6x and 5.1x, respectively.[3]
  - The amount of debt issued supporting new transactions increased compared to year-end 2017 from 60.3% to 60.6% and remains above the 55.5% five-year average level.[3]

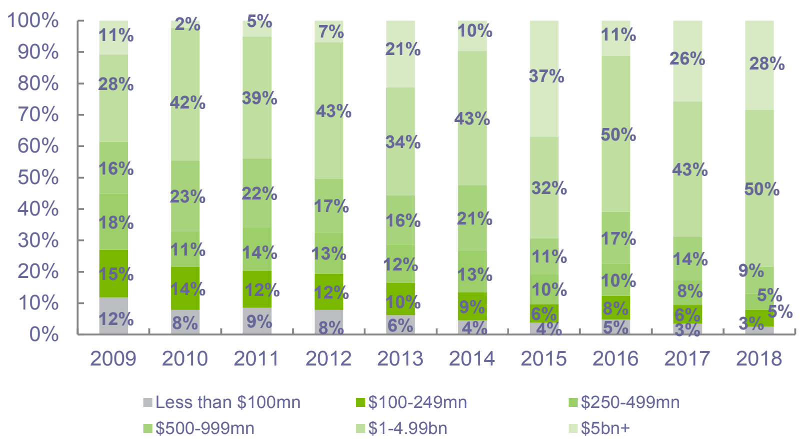
Buyouts / Corporate Finance

LTM PE Exit Volume and Value



Source: Preqin

M&A Deal Value by Deal Size



Source: Preqin

Fundraising

- $58.5 billion was closed on by 82 buyout and growth funds in 2Q 2018, compared to $63.4 billion raised by 95 funds the quarter before.[1]
  - This was down compared to the five-year quarterly average of $71.6 billion.
  - Carlyle Asia Partners V was the largest partnership raised during the quarter, having raised $6.6 billion at final close.
- Buyout and growth equity dry powder was estimated at $798.6 billion, which was above the record level of $752.9 billion observed at year-end 2017 and was substantially higher than the five-year average level of $608.8 billion. However, this was lower than the $824.9 billion of dry powder observed in Q1 2018.[1]
  - Dry powder for mega, large, and mid cap funds decreased 5.5%, 5.7%, and 1.5% quarter-over-quarter, respectively, while small cap funds saw a slight increase of 0.5%. Mega fund dry powder finished the quarter up 3.4% from year end 2017.[1]
  - An estimated 53.8% of buyout dry powder was targeted for North America, while 31.3% was targeted for Europe.[1]

Activity

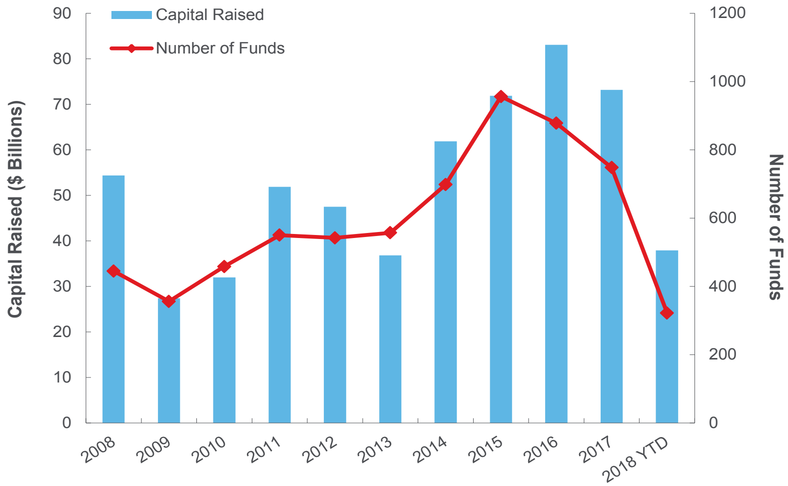
- Global private equity-backed buyout deals totaled $129.3 billion in 2Q 2018, which was up 5.8% and 33.2% from the prior quarter and five year average, respectively.[1]
  - 1,271 deals were completed during the quarter, which was up 3.8% from 1Q 2018 and an increase of 15.3% compared to the five-year quarterly average.
  - Deals valued at $5.0 billion or greater accounted for an estimated 28.4% of total deal value during the quarter compared to 25.7% in 2017 and 11.3% in 2016.[1]
- Entry multiples for all transaction sizes in 2Q 2018 stood at 9.8x EBITDA, down from year-end 2017 (10.6x). We do not believe this to be a trend, however, as 07/31/2018 data shows multiples returning to 10.3x EBITDA.[3]
  - Large cap U.S. purchase price multiples stood at 9.8x, down compared to a full year 2017 level of 10.4x.[3]
  - The weighted average purchase price multiple across all European transaction sizes averaged 10.8x EBITDA in 2Q 2018, up from 10.5x at the end of Q1 2018. Purchase prices for transactions of €1.0 billion or more increased from 11.3x at Q1 2018 to 11.6x in 2Q 2018.[3]
  - Transactions between €500.0 million and €1.0 billion were up 0.4x from the end of 1Q 2018, and stood at 10.8x.[3]
  - The portion of average purchase prices financed by equity for U.S. deals was 42.5% in 2Q 2018, down from 45.7% at year-end 2017; this remained lower than the five and ten-year full year averages of 42.8% and 43.3%, respectively.[3]
- Buyout exit value totaled $117.4 billion during the quarter, significantly higher than the $64.1 billion exit value seen in 1Q 2018. This was primarily driven by trade sales ($58.7 billion) and through sales to GPs ($33.7 billion).[1]

Opportunity

- Operationally focused managers targeting the middle and large markets with expertise in multiple sectors.

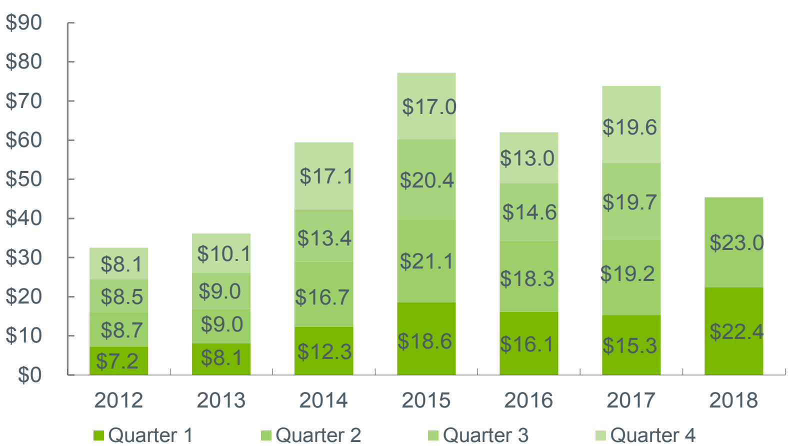
Venture Capital

Venture Capital Fundraising



Source: Preqin

U.S. Venture Capital Investments by Quarter ($B)



Source: PwC/CB Insights Report

Fundraising

- $25.4 billion of capital closed in 2Q 2018, up from the prior quarter and 2Q 2017 totals of $12.5 billion and $20.9 billion, respectively.[1]
  - 177 funds closed during the quarter, up 22.1% from the prior quarter but down 9.1% from the five year quarterly average.[1]
  - Sequoia Capital Global Growth Fund III was the largest fund raised during the quarter, closing on $6.0 billion in its first close.[16]
- The average fund size raised during the quarter was approximately $156.0 million, which was higher than both the prior quarter and five year quarterly average of $107.0 million and $109.6 million, respectively. The majority of funds in market are seeking commitments of $200.0 million or less.[1]
- Dry powder was estimated at $210.0 billion at the end of 2Q 2018, which was up from 1Q 2018's total of $200.9 billion. This was 54.5% higher than the five year average. An estimated 49.8% of dry powder was targeted for North America, followed by approximately 32.7% earmarked for Asia.[1]

Activity

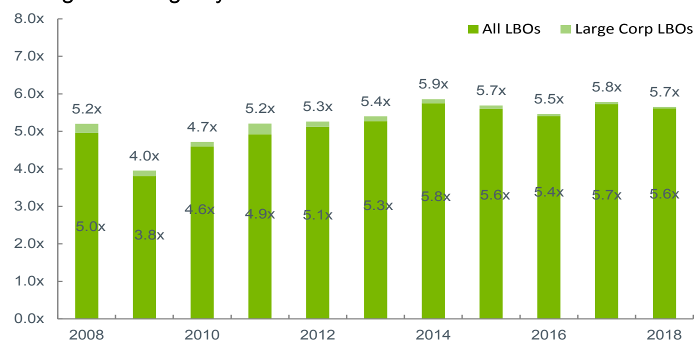
- During the first quarter, 1,416 venture backed transactions totaling $23.0 billion were completed, up from 1Q 2018's total value of $22.4 billion for 1,297 deals completed. This was the strongest quarter on a capital investment basis in the last five years, and marks the fourth consecutive quarter of $19.5 billion or more invested into venture-backed companies.[7]
  - The number of unicorns in the U.S., or companies with valuations of $1.0 billion or more, increased dramatically by 7 in 2Q 2018.[7]
- Median pre-money valuations increased across Series B and C financings, but dipped in Series A and Series D+ transactions during Q2. Seed stage pre-money valuations were flat quarter-over-quarter. Series C and Series B increased by 52.8% and 13.7%, respectively, to valuations of $137.5 million and $73.9 million, respectively. Series D+ deal valuations were down 20.0% quarter-over-quarter and are currently valued at $216.0 million. Series A pre-money valuations decreased by 12.8% quarter-over-quarter, ending at $20.5 million.[9]
- Total U.S. venture backed exit activity totaled $12.9 billion across 201 completed transactions in 2Q 2018, down on a capital basis from $15.7 billion in 1Q 2018.[8]
  - There were 28 venture-backed initial public offerings during the quarter, nearly double the 15 completed in 1Q 2018.[8]
  - The number of M&A transactions totaled 134 deals in 2Q 2018, representing a decrease of 17.8% from 1Q 2018.[8]

Opportunity

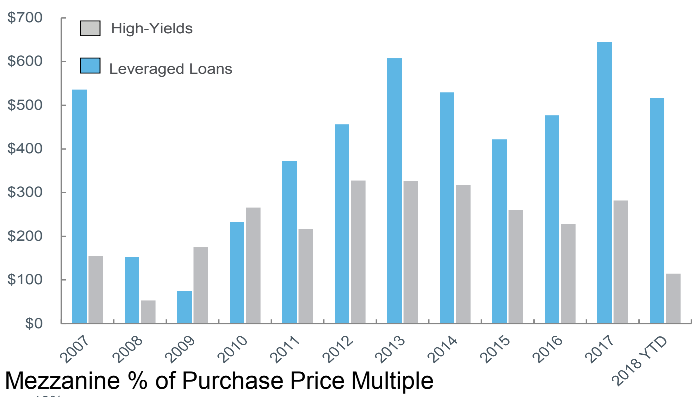
- Early stage continues to be attractive, although we are monitoring valuation increases.
- Smaller end of growth equity.
- Technology sector.

Leveraged Loans & Mezzanine

Average Leverage by Deal Size



Debt Issuance ($ Billions)



Mezzanine % of Purchase Price Multiple

Sources from top to bottom: S&P, UBS, & S&P

Leveraged Loans

Fundraising

- New CLO issuance totaled $66.7 billion throughout the first six months of 2018, up 27% compared to 2Q 2017's six month total.[5]
- High-yield debt issuance totaled $51.7 billion in 2Q 2018, down from $62.8 billion in 1Q 2018.[2]
- Mutual fund net inflows stood at $8.6 billion at the end of 2Q 2018, which continues the 19-week inflow streak to $7.9 billion.[2]

Activity

- The average leverage level for large cap LBOs was 5.7x during the quarter, down from 5.8x seen at year-end 2017. Leverage for all LBO transactions ended the quarter at 5.6x, compared to 5.7x at year-end 2017 and continues to be comprised primarily of senior debt. Subordinated debt levels remained at 0.0x during the quarter.[3]
- New leveraged loan issuances in 2Q totaled $349.0 billion, up from the prior quarter's total of $167.0 billion. This represents 80.0% of 2017's full year total.[2]
- 60.6% of new leveraged loans were used to support M&A and growth activity during the quarter, up from 56.9% during Q1 2018 and above the prior five year average of 54.8%.[3]
- European leveraged loan issuance decreased by 7.0% quarter-over-quarter to €22.4 billion.[3]
  - However, this was significantly above the five-year and ten-year average levels of €14.5 billion and €10.5 billion, respectively.
- Leveraged loan spreads for B rated issues widened by 25 bps quarter-over-quarter, ending 2Q 2018 at 5.40%. BB index spreads increased slightly by 16 bps ending the quarter at 6.59%.[2]
- With the supply side of the US Leveraged Loan market remaining strong, issuers are starting to see pushback on both pricing and terms. [2]
- Despite solid loan issuance, the predominance of covenant-lite loans coupled with a general trend of loosening loan terms continue to raise questions about expected recovery rates in a downturn. [2]

Opportunity

- Funds with the ability to originate deals directly and the ability to scale for larger transactions.
- Funds focused on the highest quality opportunities and structuring deals in the highest part of the capital structure.

Mezzanine

Fundraising

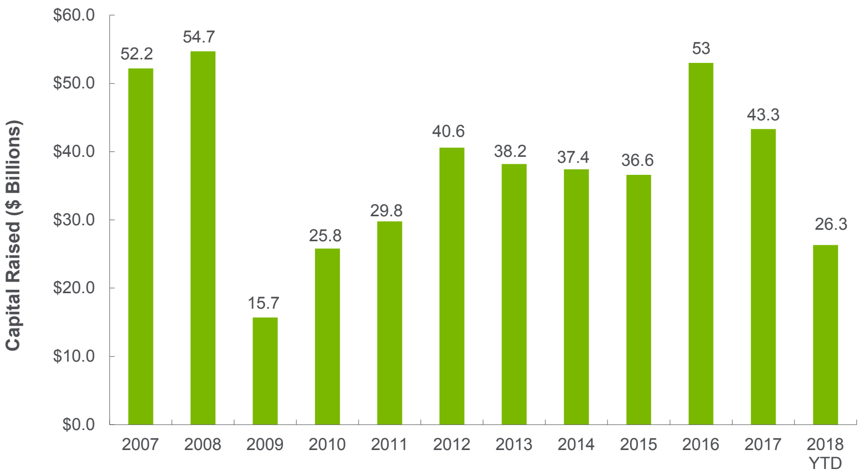
- Eight funds closed on $15.3 billion during the quarter, up from 1Q 2018's total of $5.8 billion raised by eighteen funds and the five year quarterly average of $4.9 billion.[1]
- Estimated dry powder was $45.5 billion at the end of 2Q 2018, down by $4.9 billion from 4Q 2017 and lower than the $53.1 billion high seen at year-end 2016.[1]
- Fundraising remains robust with an estimated 76 funds in market targeting $30.6 billion of commitments.[1]

Opportunity

- Subordinated debt continues to evaporate in the US middle-market space to the benefit of the unitranche offering. [2]
- Demand for subordinated debt remains in the larger end of the market.

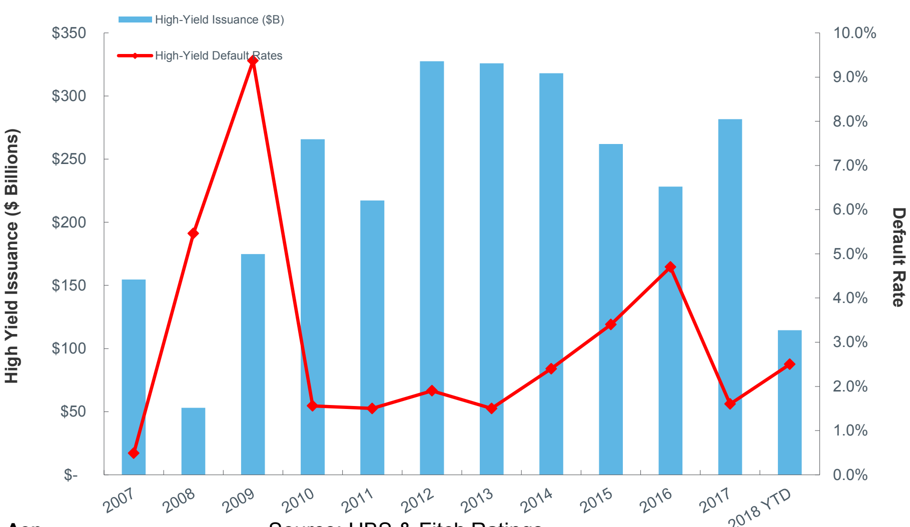
Distressed Private Markets

Distressed Debt, Turnaround, & Special Situations Fundraising



Source: Thomson Reuters

High-Yield Bond Volume vs Default Rates



Source: UBS & Fitch Ratings

Fundraising

- During the quarter, $17.9 billion was raised by 12 funds, significantly higher than the $8.4 billion raised during 1Q 2018. This was the largest amount raised since Q4 2016.[1]
  - This was above the five-year quarterly average of $10.5 billion.
  - GSO Capital Solutions Fund III was the largest partnership raised during the quarter, closing on $7.4 billion to invest in distressed debt.
- Dry powder was estimated at $117.7 billion at the end 2Q 2018, which was up 12.2% from 4Q 2017. This remained above the five-year annual average level of $97.5 billion.[1]
- Roughly 109 funds were in the market at the end of 2Q 2018, seeking an aggregate $63.6 billion in capital commitments.[1]
  - Fortress Investment Group V and GSO Energy Select Opportunities Fund II were the largest funds in market seeking $5.0 billion of capital, each.

Activity

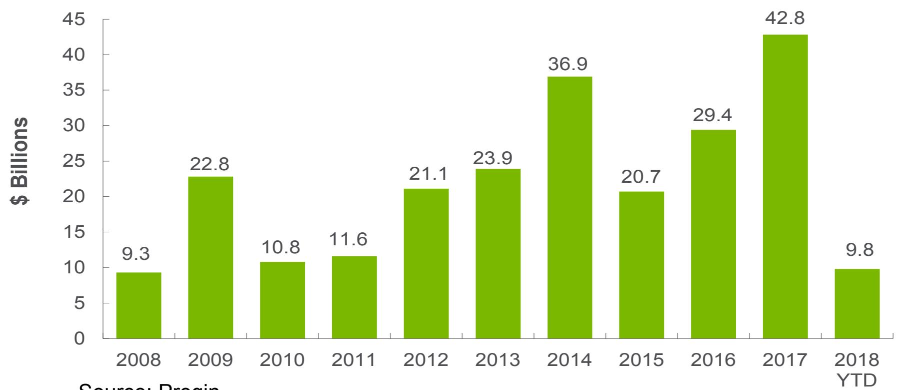
- The TTM U.S. high-yield default rate was 2.5% as of June 2018, which was down from March 2018's LTM rate of 2.7%.[6]
- Default rates are at an all-time low and appear to be headed lower as easy access to credit keeps companies from defaulting. However, the amount of junk-rated paper issued in the U.S. over the past few years suggests something may give in the near term.
- The credit risk environment remains benign, but the impact of rising interest rates is becoming more and more pertinent, and further positive returns driven by multiple expansion will be limited.[4]
- The ECB recently announced plans to end its stimulus program by the end of 2018, while holding interest rates level for at least a year if the European economy remains resilient. Similar to the US, Europe has experienced a spike in loan issuance over the past several years that could lead to distressed opportunities should the economy falter.
- Consistently high purchase prices and elevated levels of leverage may result in an increase in distressed opportunities looking out over the next two to three years, or sooner if there is a stall in the economy.

Opportunity

- Funds focused on niche opportunities where the manager has the ability to quickly move on opportunities as they arise.
- Funds with the ability to perform operational turnarounds.

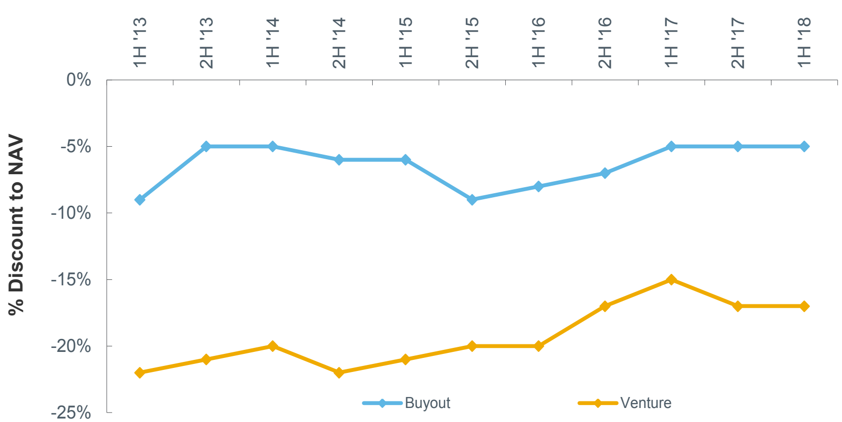
Secondaries

Secondary Fundraising



Source: Preqin

Secondary Pricing



Source: Evercore

Fundraising

- Twelve funds raised $3.1 billion during the second quarter, down from $6.7 billion raised by ten funds in 1Q 2018 and lower than the $6.6 billion raised in 2Q 2017.[1]
  - 2Q 2018's aggregate capital raised represents 7.2% of 2017's full year total.
  - Montana Capital Partners' Annual Secondary Program Fund IV was the largest fund raised during the quarter, closing on $982.1 million.[1]
- As of 2Q 2018, dry powder was estimated to be at $64.0 billion, which was lower 4Q 2017's level of 77.0 billion[17]. The top 14 secondary buyers are estimated to command more than 80.0% of the market's capital reserves. The top 20 buyers are estimated to hold more than 90.0% of the market's dry powder.[17]
- At the end of 2Q 2018, there were an estimated 41 secondary and direct secondary funds in market, targeting approximately $49.2 billion. Lexington Capital Partners IX and Ardian's ASF VIII were the largest funds in the market, each targeting $12.0 billion.[1]
  - Over 61.5% of secondary funds are targeting North America and seek 48.1% of capital being raised.

Activity

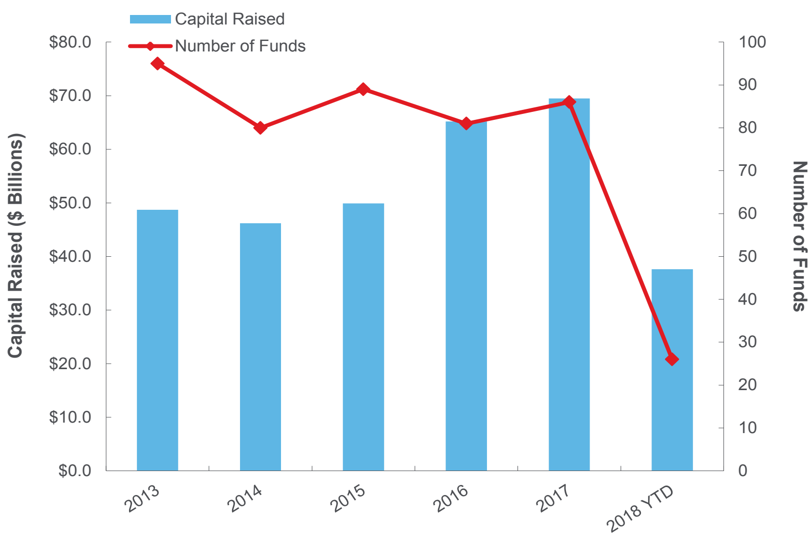
- More than 900 potential buyers and nearly 886 potential sellers of secondary interests have been identified.[1]
  - Banks represent the largest proportion of potential sellers at 20.0%.
- Transaction and fund leverage and deferred payment structures continue to be prevalent and are used as a means to improve pricing in an increasingly competitive environment.[17]
- 81.0% of 2018 year-to-date secondary transactions have occurred within private equity (with the rest in real estate and infrastructure). The average buyout pricing discount ended at 5.0% for 2Q 2018, while venture ended at a discount of 17.0%.[17]
- Pricing is expected to remain attractive for sellers given the continued high levels of dry powder and competition for secondary transactions.[17]

Opportunity

- Funds that are able to execute complex and structured transactions.
- Niche strategies.
- Fund restructurings.

Infrastructure

Global Infrastructure Fundraising



Source: Preqin

Number of Deals Completed

Source: Preqin

Fundraising

- $24.7 billion of capital was raised by 17 funds in 2Q 2018 compared to $10.3 billion of capital closed on by 22 partnerships in 2Q 2017.[1]
  - Funds raised during the quarter averaged 125.2% of their target size, which was up from 119.8% in Q1 2018.[1]
  - ISQ Global Infrastructure Fund held its final close on $6.5 billion and was the largest fund closed during Q2 2018.[1]
- As of the end of 2Q 2018, there were an estimated 180 funds in the market seeking roughly $126.7 billion.[1]
  - Funds focused on infrastructure assets in the U.S. were targeting an estimated $52.1 billion in capital, while European focused funds were targeting approximately $39.7 billion.[1] The remainder of capital targets Asia and the rest of the world.
  - KKR Global Infrastructure Investors III was the largest fund in the market as of the end of 2Q 2018, targeting $7.0 billion.
- At the end of the quarter, dry powder stood at an estimated $161.0 billion, up from Q1 2018 at $160.0 billion.[1] Based on fund classifications by Preqin, an estimated 49.3% of the dry powder was held by in Mega Funds (funds with commitments of $2.0 billion or more), compared to 20.1% for Large Funds ($1.0 billion to $1.9 billion in size) and 15.7% for Medium Funds ($500.0 million to 999.9 million in size).[1]
- Concerns surrounding the relative availability and pricing of assets remain. Fundraising continues to be very competitive given the number of funds and aggregate target level of funds in market. Investor appetite for the asset class persists despite the record levels of dry powder and increased investment activity from strategic and corporate buyers as well as institutional investors.

Activity

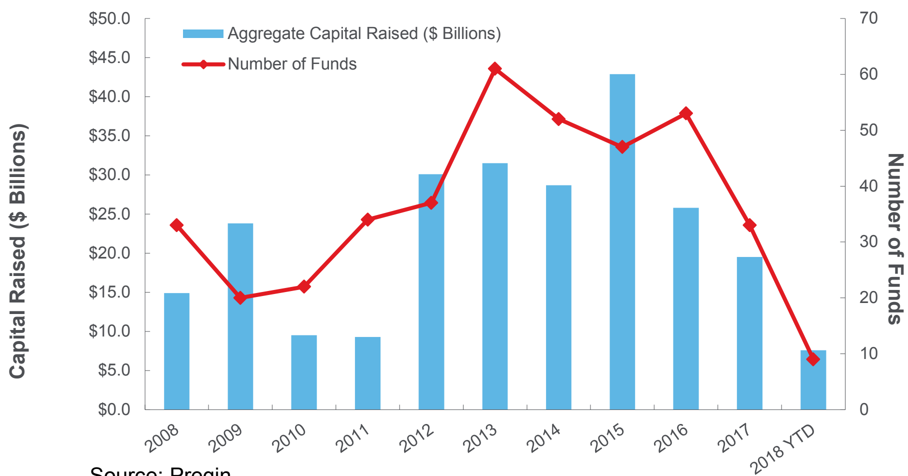
- Infrastructure managers completed 569 deals with an estimated aggregate deal value of $209.4 billion in 2Q 2018 compared to 630 deals totaling $249.8 billion a quarter ago[1]. The average deal value during the quarter was $410.8 million, down compared to the five-year average of $422.0 million.
  - North America accounted for 35.1% of the deals in 2Q 2018, while 31.5% and 15.1% of deals were transacted in Europe and Asia, respectively.[1]
  - Renewable energy was the dominant industry during the quarter with 57.5% of transactions, followed by the utilities sector, which accounted for 13.9% of the quarter's deals. Energy accounted for 10.9% of transactions.[1]

Opportunity

- Greenfield infrastructure is less competitive and offers a premium for managers willing to take on construction risk.
- Mid-market and core-plus brownfield infrastructure is relatively less competitive and may offer better relative value to investors.

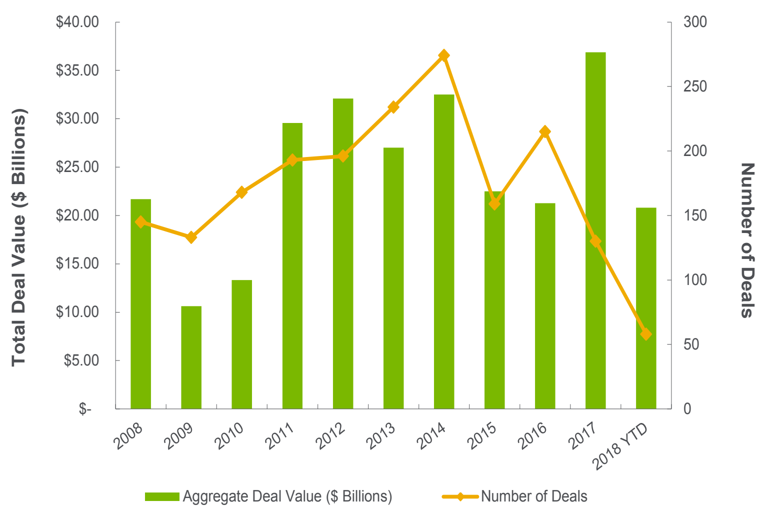
Natural Resources

Natural Resources Fundraising



Source: Preqin

Energy & Utilities Deal Activity



Source: Preqin

Fundraising

- During 2Q 2018, six funds closed on $2.3 billion compared to 11 funds totaling $7.9 billion in 1Q 2018.[1]
- At the end of 2Q 2018, there were roughly 288 funds in the market targeting an estimated $145.2 billion in capital, compared to 258 funds seeking an estimated $130.8 billion in 1Q 2018.[1]
  - Energy Capital Partners IV was seeking the most capital with a target fund size of $6.0 billion.
- Dry powder was estimated at $62.9 billion at the end of 2Q 2018, which was down 2.2% from 1Q 2018's level, and remains below the record level of $78.5 billion observed in 4Q 2016.[1]

Activity

- Energy and utilities industry managers completed 35 deals totaling a reported $12.0 billion in 2Q 2018, up 52.2% and 36.4% over 1Q 2018's total deal activity and total deal value, respectively.
- Crude oil prices increased during the quarter.
  - WTI crude oil prices increased 8.2% during the quarter to $67.87/bbl.[11]
  - Brent crude oil prices ended the quarter at $74.41/bbl, up 12.7% from 1Q 2018.[11]
- Natural gas prices (Henry Hub) increased by 10.4% during the first quarter, ending at $2.97 per MMBtu.[11]
- A total of 1,047 crude oil and natural gas rotary rigs were in operation in the U.S. at the end of 2Q 2018, up 5.7% from the prior quarter. Crude oil rigs represented 81.9% of the total rigs in operation.[15]
- The price of iron ore (Tianjin Port) ended the second quarter at $65.04 per dry metric ton, down 9.0% quarter-over-quarter.[12]

Opportunity

- Acquire and exploit existing oil and gas strategies preferred over early stage exploration in core U.S. and Canadian basins.
- Select midstream opportunities.

Notes

1. Preqin
2. UBS
3. Standard & Poor's
4. Aon Hewitt Investment Consulting
5. Thomson Reuters
6. Fitch Ratings
7. PriceWaterhouseCoopers/National Venture Capital Association MoneyTree Report
8. PitchBook/National Venture Capital Association Venture Monitor
9. Cooley Venture Financing Report
10. Federal Reserve
11. U.S. Energy Information Administration
12. Bloomberg
13. Setter Capital Volume Report: Secondary Market FY 2016
14. KPMG and CB Insights
15. Baker Hughes
16. Dow Jones Venture Capital Report
17. Evercore

Notes:
FY: Fiscal year ended 12/31
YTD: Year to date
YE: Year end
LTM: Last twelve months (aka trailing twelve months or TTM)
PPM: Purchase Price Multiples: Total Purchase Price / EBITDA
/bbl: Price per barrel
MMBtu: Price per million British thermal units

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Appendix B:

Real Estate Market Update

2Q 2018

United States Real Estate Market Update (2Q18)

General

- The S&P 500 produced a gross total return of 3.4% during the Quarter, as markets rebounded from tightening monetary policy and trade war rhetoric on the back of strong economic data. The MSCI US REIT index produced a return of 10.1%. REITS outperformed the broader equities market for the Quarter, but continue to lag by 10.8% over the TTM period. Consumer Sentiment declined slightly during the Quarter to 98.2.

- Macro indicators for U.S. real estate continue to be positive; GDP grew at an annualized rate of 2.8% in the Second Quarter and headline CPI rose by 2.7% YoY, above the Fed's 2% target. As of Quarter-end, the economy has now experienced 93 consecutive months of job growth. The Federal Reserve has continued to tighten their policy, and, in June 2018, raised base rates to 1.75-2.0%. In 2018, consensus expectations have increased to four rate hikes.

Commercial Real Estate

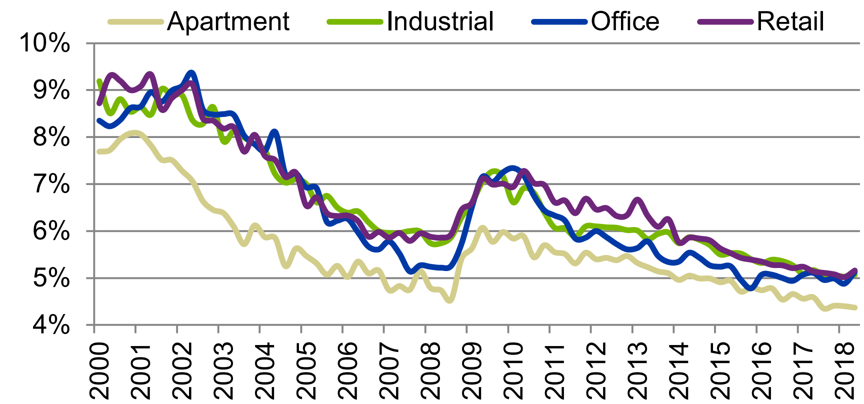
- Private Real Estate Market values have remained flat for another quarter. Transaction cap rates (5.49%) contracted 16 bps on average during the Second Quarter of 2018. At the same time, current valuation cap rates were primarily flat across property sectors, with the exception of office and retail cap rates expanding 25 bps and 14 bps, respectively.

- NOI growth by sector continued to deviate during the Quarter, with retail NOI growth continuing to lag other sectors. Positive momentum continued in the industrial sector, benefiting from e-commerce and global trade growth. The sector experienced 8.3% NOI Growth over the last year.

- In the First Quarter of 2018, $32bn of aggregate capital was raised by US Real Estate Funds. To date in 2018, Private Equity Real Estate Funds have raised $78.5bn.

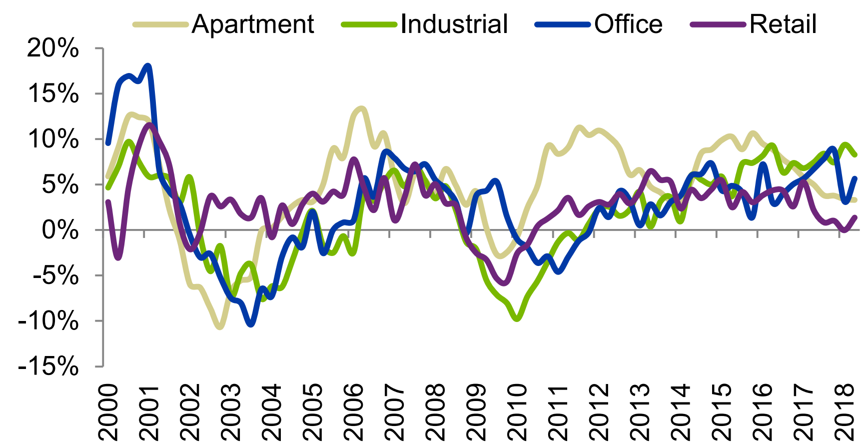
- 10 year treasury bond yields expanded 12 bps to 2.86% during the quarter and, subsequent to quarter end have essentially remained flat. A combination of expansionary fiscal policy and tightening monetary policy have led to increasing short-term interest rates and a flattening yield curve.

Current Value Cap Rates by Property Type



Source: NCREIF

4 Qtr Rolling NOI Growth



Source: NCREIF

Sources: Bureau of Economic Analysis, U.S. Census Bureau, Federal Reserve Board, NCREIF, Cushman and Wakefield, Real Capital Analytics, Bloomberg LP., Preqin, University of Michigan, Green Street

United States Property Matrix (2Q18)

TOWNSEND® GROUP
an Aon company

INDUSTRIAL

- As of 2Q18, industrial properties returned 3.6% and outperformed the NPI by 179 bps.
- Net absorption increased to 64.1 million sqft in 2Q18, up 4.9% from the second quarter of 2017. Net absorption as a % of inventory was 1.9%.
- Transaction volumes reached $30.5 billion, marking a 20% year-over-year increase. Large-scale portfolio sales are expected make 2018 the largest overall historic year in terms of total activity.
- New deliveries were 48.9 million sqft for the quarter, with the active pipeline increasing by 3.0% quarter-over-quarter to 239.1 million sqft.
- Vacancy remained stable quarter-over-quarter at 4.8% continuing to be at an all-time historic low. Strong demand has pushed asking rents up 6.2% year-over-year.

MULTIFAMILY

- The apartment sector delivered a 1.5% return during the Quarter, underperforming the NPI by 27 bps.
- Sales volumes decreased 4.8% compared to the second quarter of 2017, totaling $32.6 billion. The drop in volume was due to a 52.2% reduction in portfolio transactions. Transaction volume is 10.2% higher on an annualized basis.
- Primary market transaction activity represented 42.5% of activity, down from 43.0% in 2017. The decrease is a result of the continued growth of capital flows into secondary and tertiary markets with a combined share increasing from 43.3% to 57.5%.
- Private investors continue to dominate the investment activity accounting for 62.5% of transactions whereas REITs have seen their proportion of transaction activity fall to 6%, less than half of their share four years ago.
- Annual rent growth rose to 2.4% percent during the second quarter of 2018, a 10 bps increase after three quarters of no change. Vacancy increased a modest 7 bps over the 12-month period ending 2Q18.

OFFICE

- The office sector returned 1.5% in 2Q18, 27 bps below the NPI return over the period.
- Occupancy growth increased with net absorption totaling 12.9 million sqft. Although net absorption improved in the second quarter, it is expected to be one-third lower in 2018 than in 2017.
- Total vacancy rose by 10 bps to 14.9% quarter-over-quarter due to the rising deliveries. Class A CBD vacancy declined by 30 bps to 11.6%, while vacancy in Class A suburban office increased 30 bps to 16.9%.
- Construction activity has remained strong with 27.4 million square feet delivered in the first two quarters and 36 million square feet to be delivered by year's end. In 2019, the office market will continue to see top-quality space delivered as 57.4 million square feet of deliveries is scheduled for completion.
- Asking rents increased 2.3% to $33.82/sqft. This was driven by suburban rent growth of 3.7%, while CBD remained virtually unchanged. Concession packages continue to increase leading to an overall decline in effective rents.

RETAIL

- As of 1Q18, the retail sector delivered a quarterly return of 1.3%, performing 49 bps below the NPI.
- Transaction volumes for the first half of 2018 declined 3.6% year-over-year to $28.7 billion. REIT acquisition activity declined 17.9% year-over-year, remaining net sellers and divesting both non-strategic and underperforming assets.
- Despite the continued announcement of store closures, 12-month rental growth was 5.4%, largely driven by grocery-anchored centers.
- Average cap rates remain at 4.3%. Premier assets continue to trade aggressively, driven by foreign demand, while mall and lifestyle centers struggle to agree on terms.
- Vacancy declined to 4.5%, a compression of 10 bps compared to the first quarter of 2018. Investors are starting to apply more stringent underwriting standards and evaluating shopping center tenants more cautiously.

Sources: Real Capital Analytics, Bloomberg LP, Green Street, US Census Bureau, NCREIF, Jones Lang LaSalle, REIS, Cushman and Wakefield

Global Real Estate Market Update (2Q18)

TOWNSEND® GROUP
an Aon company

GLOBAL

- Global investment activity during 2Q 2018 totaled $173 billion, representing a 10% increase as compared to 2Q 2017 levels. Total first half 2018 activity was $341 billion, a 13% increase from first half 2017 and the highest first half volume since 2007. Investors' demand for real estate has remained strong, with a growing number increasing their real estate allocations due to its defensive nature and steady income returns. Further, shifting demographics and technological trends are driving an increased demand for the logistics and alternatives sectors. 2018 global investment commercial real estate volumes are projected to approximately match 2017 volumes of $715 billion. London held the top global investment position for the quarter, followed by New York and Hong Kong in second and third place, respectively.

Direct Commercial Real Estate Investment - Regional Volumes, 2017 - 2018

$ US Billions	Q1 2018	Q2 2018	% Change Q1 18 - Q2 18	Q2 2017	% Change Q2 17 - Q2 18	H1 2017	H1 2018	% Change H1 17 - H1 18
Americas	69	63	-9%	64	-2%	122	132	8%
EMEA	61	67	10%	61	10%	117	128	9%
Asia Pacific	39	42	8%	33	27%	63	81	29%
Total	169	172	2%	158	9%	302	341	13%

Source: Jones Lang LaSalle, July 2018

EUROPE

- European investment totaled $67.5 billion in 2Q 2018, an 11% increase from the prior quarter. First half 2018 volumes totaled $128.1 billion, marking the highest half-year volumes recorded in the current cycle. 2Q 2018 volumes were up from 2017 volumes in the UK, Germany, and France by 21%, 30%, and 114%, respectively. The Benelux countries saw mixed performance during the quarter, with the Nordics' volume down 17% and Southern Europe volumes down 28%. While Central and Eastern Europe's 2Q 2018 volumes declined by 22%, the region's strong first quarter enabled it to still show positive investment growth for the first half 2018. Exchange rates continued to affect European investment volumes as relative dollar weaknesses have driven up the level of investing.

ASIA

- Asia Pacific saw strong y/y performance, with volumes increasing 26% and reaching $41.7 billion during 2Q 2018. First half 2018 activity totaled $81.0 billion, a 29% increase y/y and the highest level on record. The growth was largely driven by the following: a 17% y/y increase in Australia, a 234% y/y increase in Hong Kong, a 155% y/y increase in New Zealand, a 108% y/y increase in South Korea, and a 231% y/y increase in Taiwan. However, China and Japan overall saw a decrease in total first half 2018 volumes, with 47% and 14% decreases, respectively. Specifically, Tokyo accounted for only 46% of Japanese transaction volumes this quarter, with most of the activity coming from smaller surrounding cities. Australian investment volumes totaled $5.7 billion in 2Q 2018, a 17% y/y increase. Cross-border investment activity accounted for 27% of total transaction volumes.

Global Outlook - GDP (Real) Growth % pa, 2017-2019

	2017	2018	2019
Global	**3.7**	**3.8**	**3.6**
Asia Pacific	**5.5**	**5.5**	**5.2**
Australia	2.2	2.8	2.5
China	6.9	6.4	6.1
India	6.2	7.5	7.1
Japan	1.7	1.2	1.1
North America	**2.0**	**2.5**	**2.4**
US	2.3	3.0	2.3
MENA*	**1.8**	**2.9**	**3.2**
European Union	**3.1**	**2.4**	**2.0**
France	2.3	1.7	1.6
Germany	2.5	2.0	1.8
UK	1.7	1.3	1.4

*Middle East North Africa

Source: Jones Lang LaSalle (Oxford Economics), July 2018

Sources: Jones Lang LaSalle Research, Bloomberg LP

PCA INVESTMENT MARKET RISK METRICS

Monthly Report

November 2018
(as of 10/31/18)

Takeaways

- October was a challenging month across the board, with broad U.S. equity markets down nearly 7% as geopolitical fears and interest rates both picked up as we head into November. Other asset types and regions were more challenged, with MLPs and Emerging Markets equity producing negative returns in the high single digits.

- Implied equity market volatility (i.e., VIX) spent the majority of October above its long-term average level of 19.3, ending the month at 21.2.

- PCA's U.S. Market sentiment indicator (page 4) switched to neutral (**gray**) as the year-over-year changes in bond spreads dipped into negative territory. Holding the bond spread indicator constant, it would require an ~-7% U.S. equity decline in November or ~-3% decline through year end to turn the indicator to red.

- U.S. Treasury interest rates increased by roughly 10-20 basis points across the yield curve during October. The yield curve is currently fairly flat, with the spread between 30-year and 3-month U.S. Treasury yields at 1.1% as of month-end.

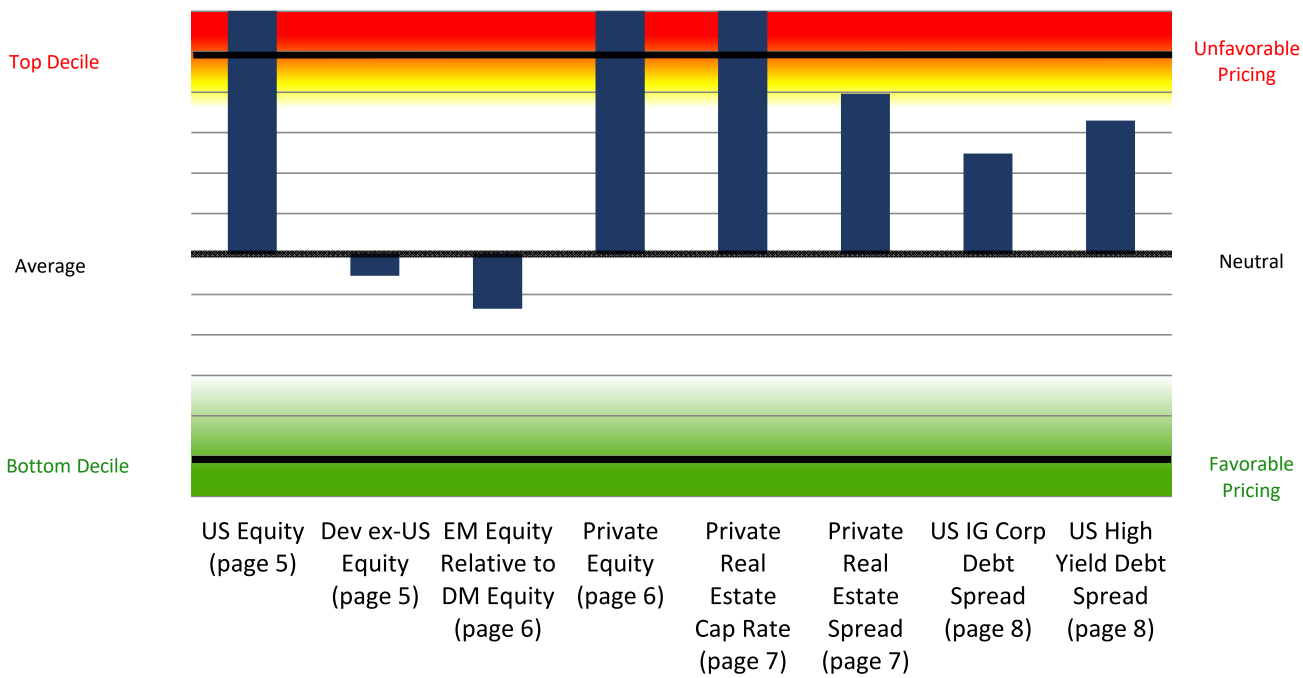
- Non-U.S. Developed and Emerging Markets equity valuations are currently below their long-term averages, and still remain cheap relative to U.S. levels.

- The global economic system is in the early stages of a transition. This change is from an environment of easy monetary policy, strong asset returns, and robust growth to a period of tighter monetary policy, heightened return uncertainty, and more disparate and challenging growth. Monitoring this transition will be crucial to institutional portfolio management.

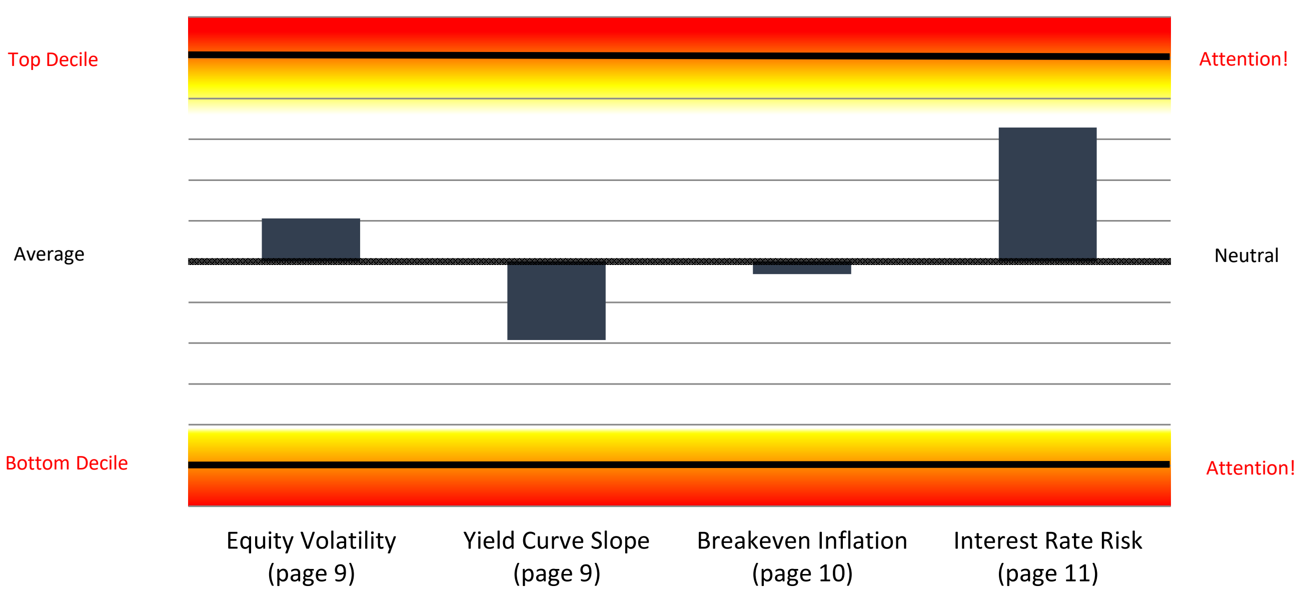
[1] See Appendix for the rationale for selection and calculation methodology used for the risk metrics.

Risk Overview

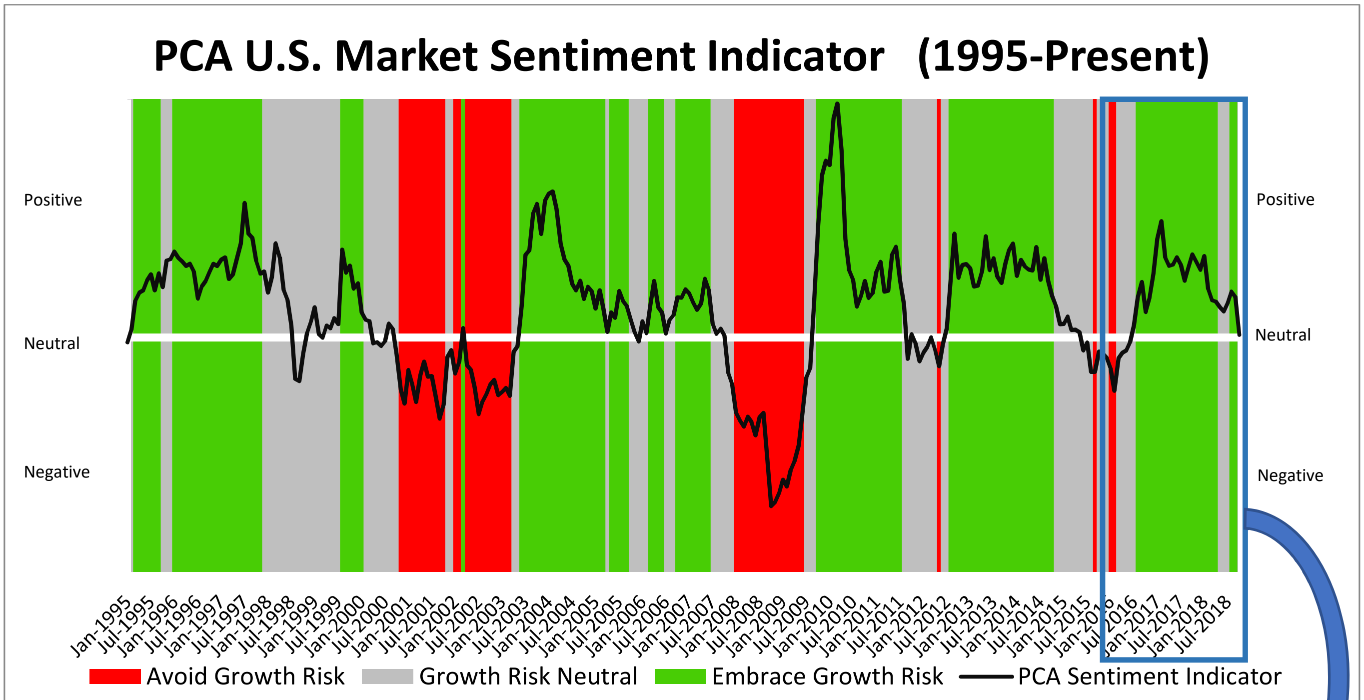
Valuation Metrics versus Historical Range
A Measure of Risk

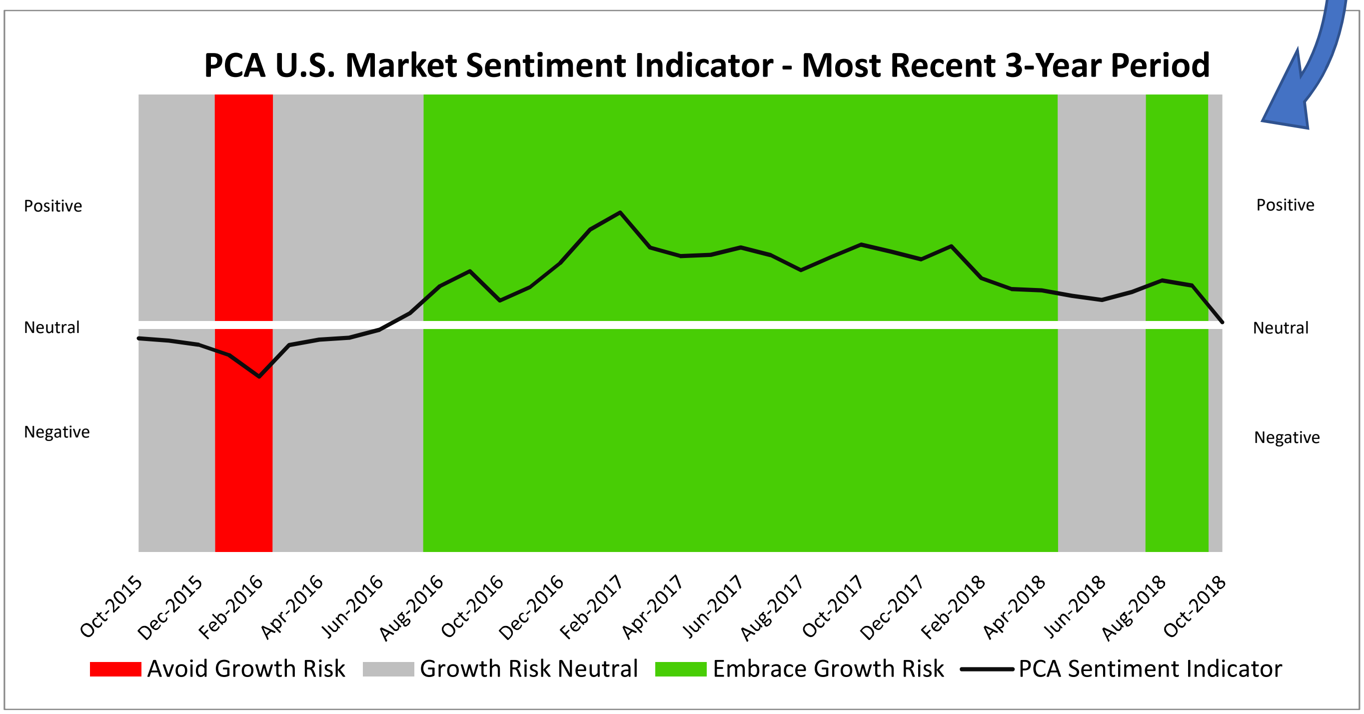


Other Important Metrics within their Historical Ranges
Pay Attention to Extreme Readings



U.S. Market Sentiment





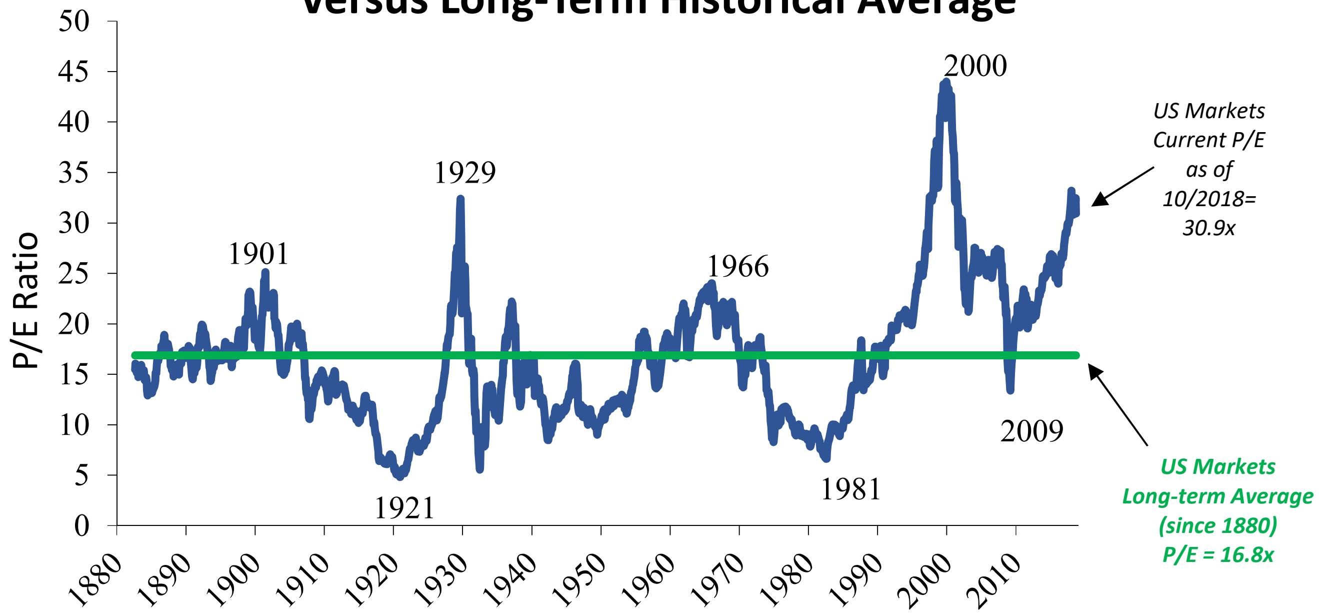
Information Behind Current Sentiment Reading

Bond Spread Momentum Trailing-Twelve Months	Negative	
Equity Return Momentum Trailing-Twelve Months	Positive	
Agreement Between Bond Spread and Equity Spread Momentum Measures?	Disagree	

Growth Risk Visibility (Current Overall Sentiment)	**Neutral**	

Developed Public Equity Markets

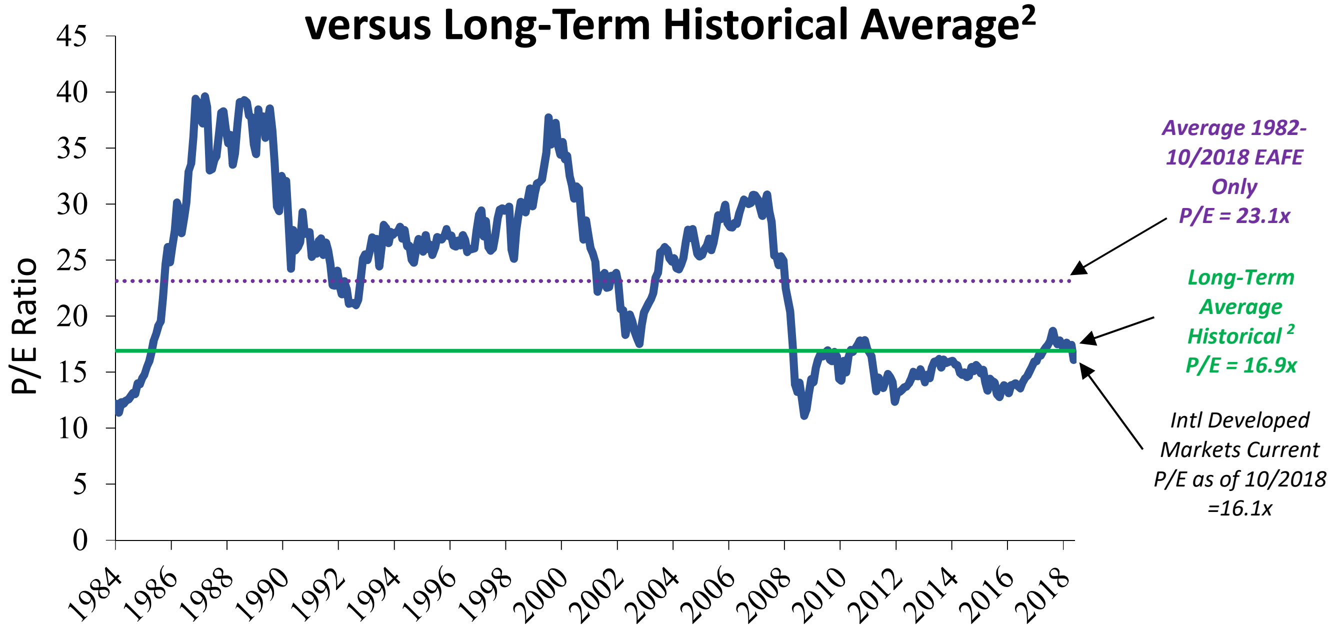
U.S. Equity Market P/E Ratio[1] versus Long-Term Historical Average



[1] P/E ratio is a Shiller P/E-10 based on 10 year real S&P 500 earnings over S&P 500 index level.

(Please note the difference in time scales)

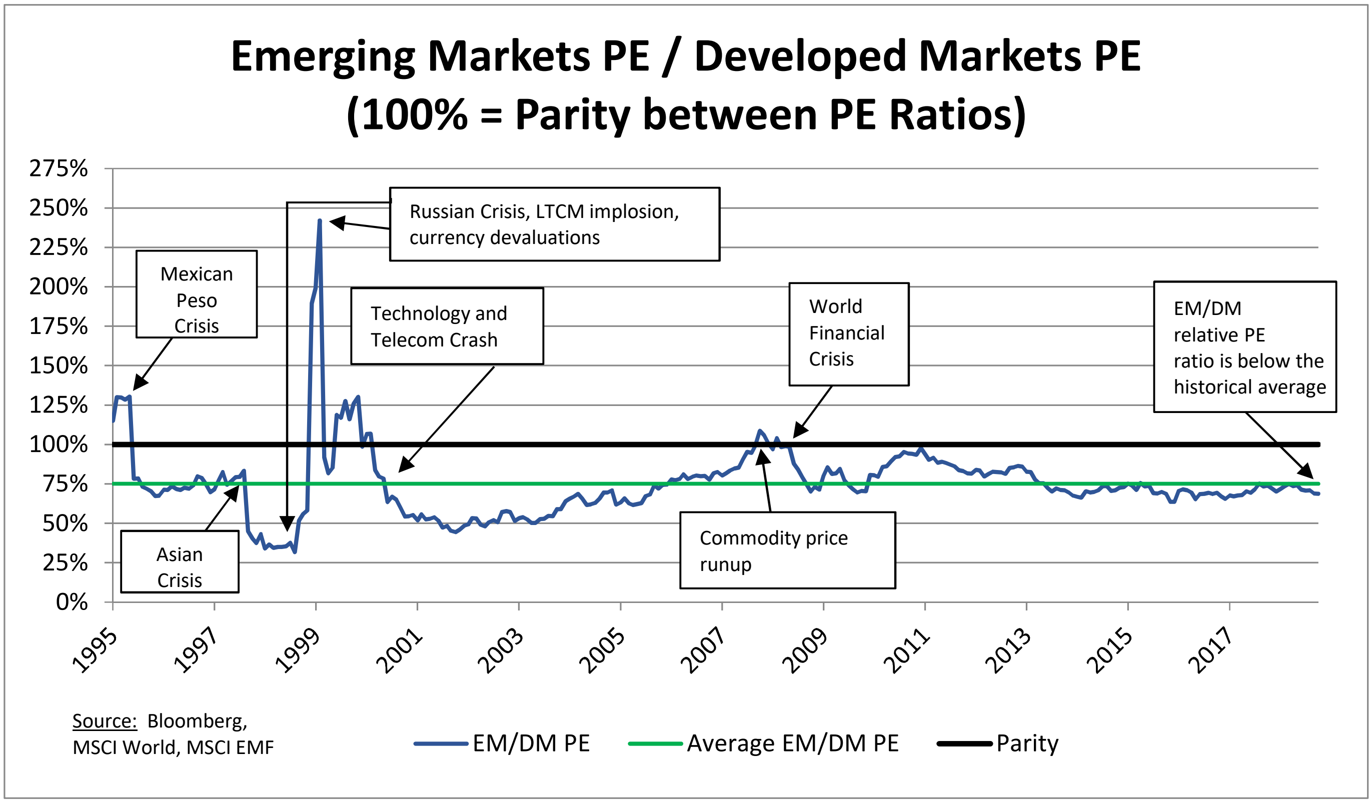
Developed ex-U.S. Equity Market P/E Ratio[1] versus Long-Term Historical Average[2]



[1] P/E ratio is a Shiller P/E-10 based on 10 year real MSCI EAFE earnings over EAFE index level.

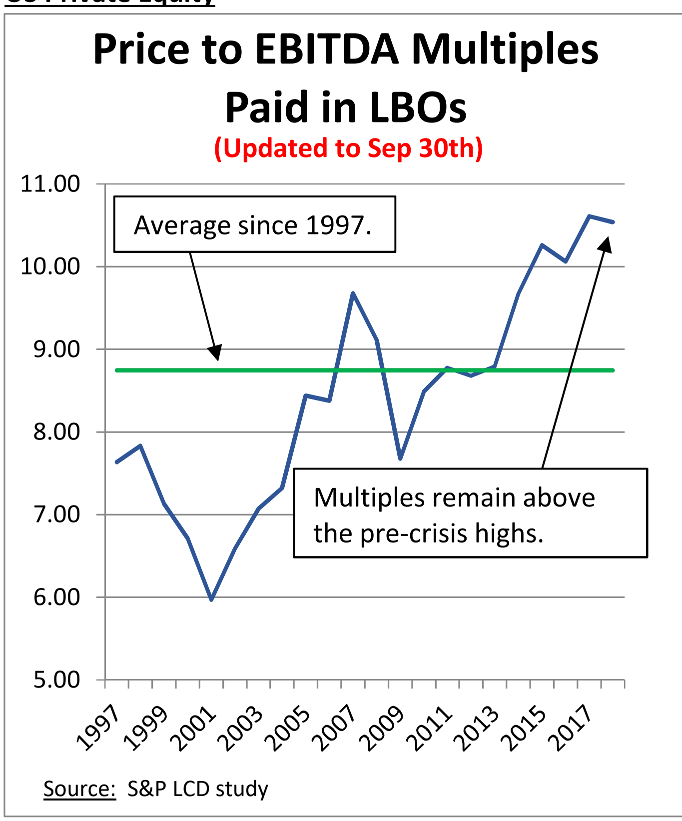
[2] To calculate the LT historical average, from 1881 to 1982 U.S. data is used as developed market proxy. From 1982 to present, actual developed ex-US market data (MSCI EAFE) is used.

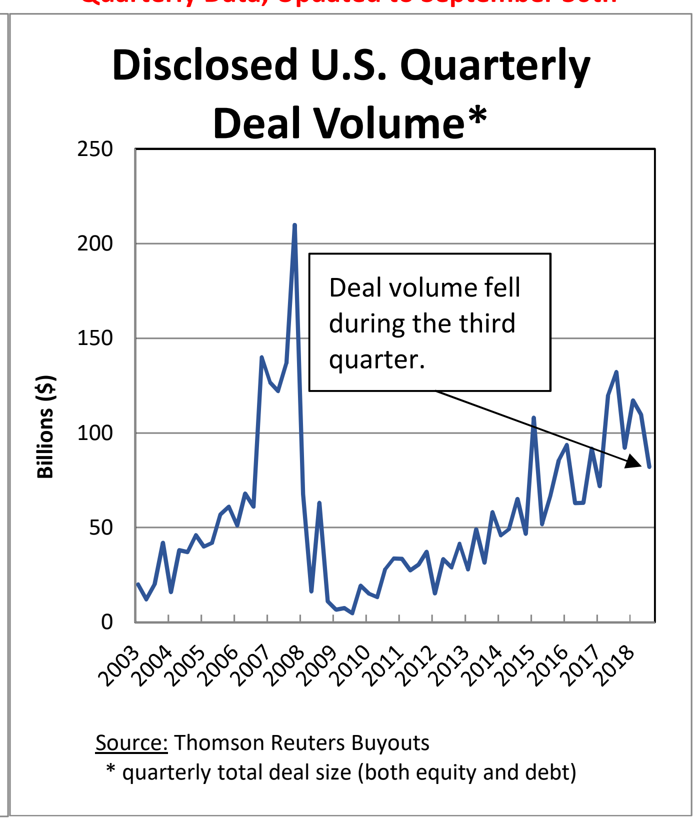
Emerging Market Public Equity Markets



US Private Equity

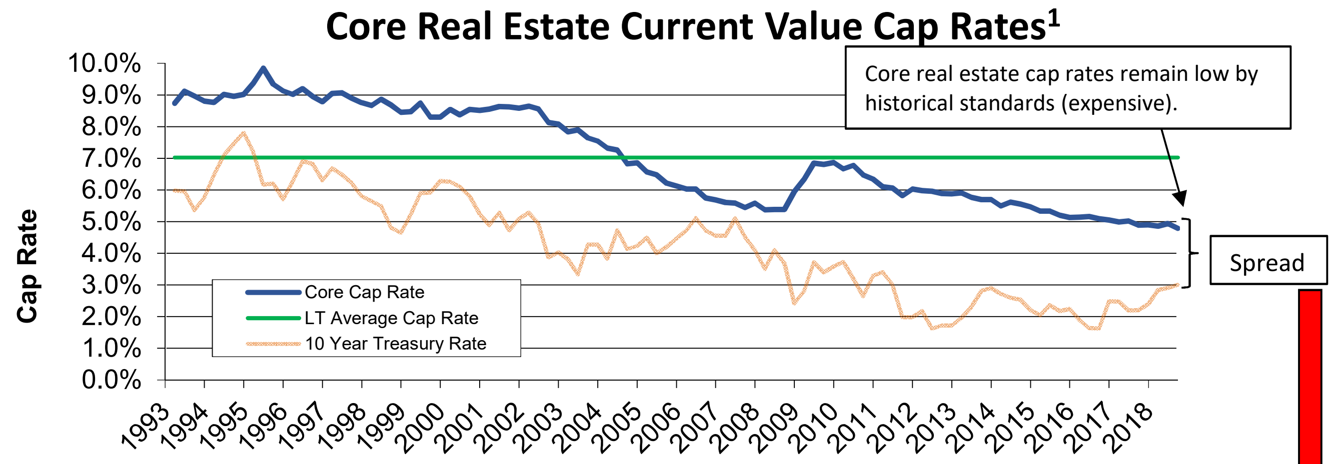
Quarterly Data, Updated to September 30th



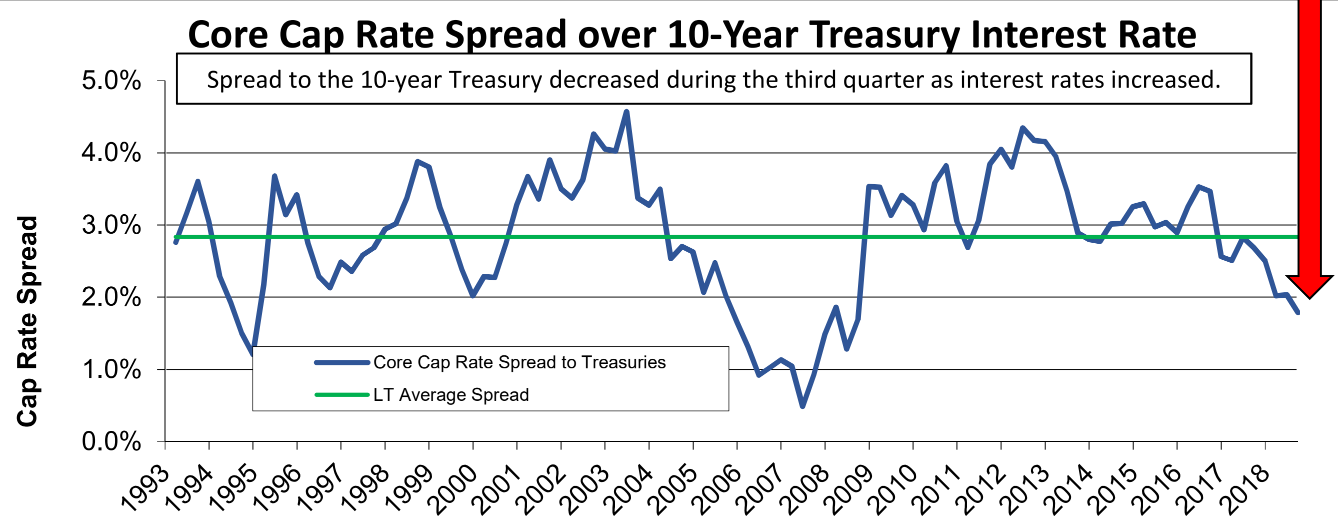


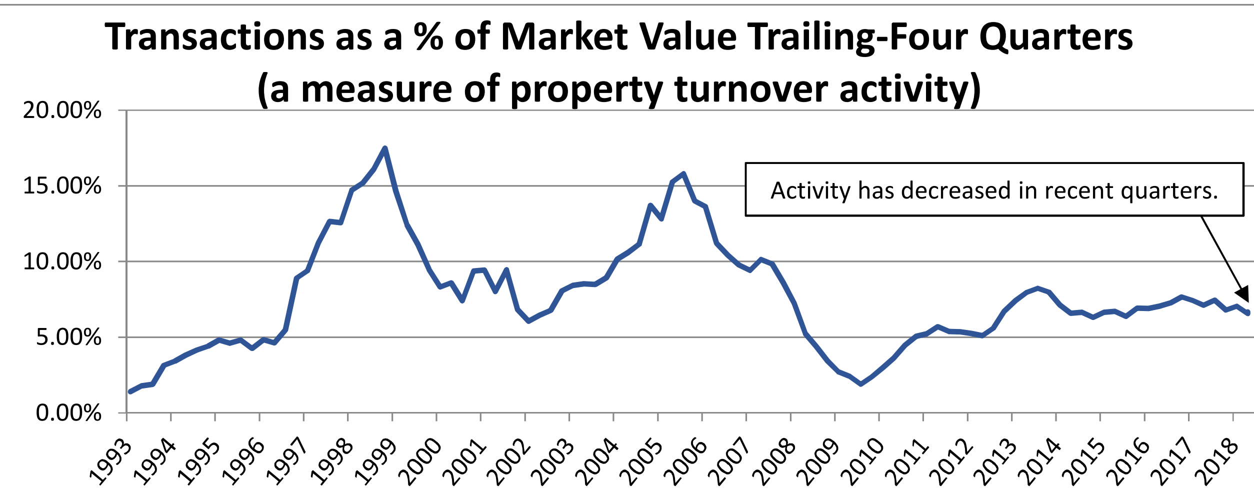
Private Real Estate

Quarterly Data, Updated to September 30th.



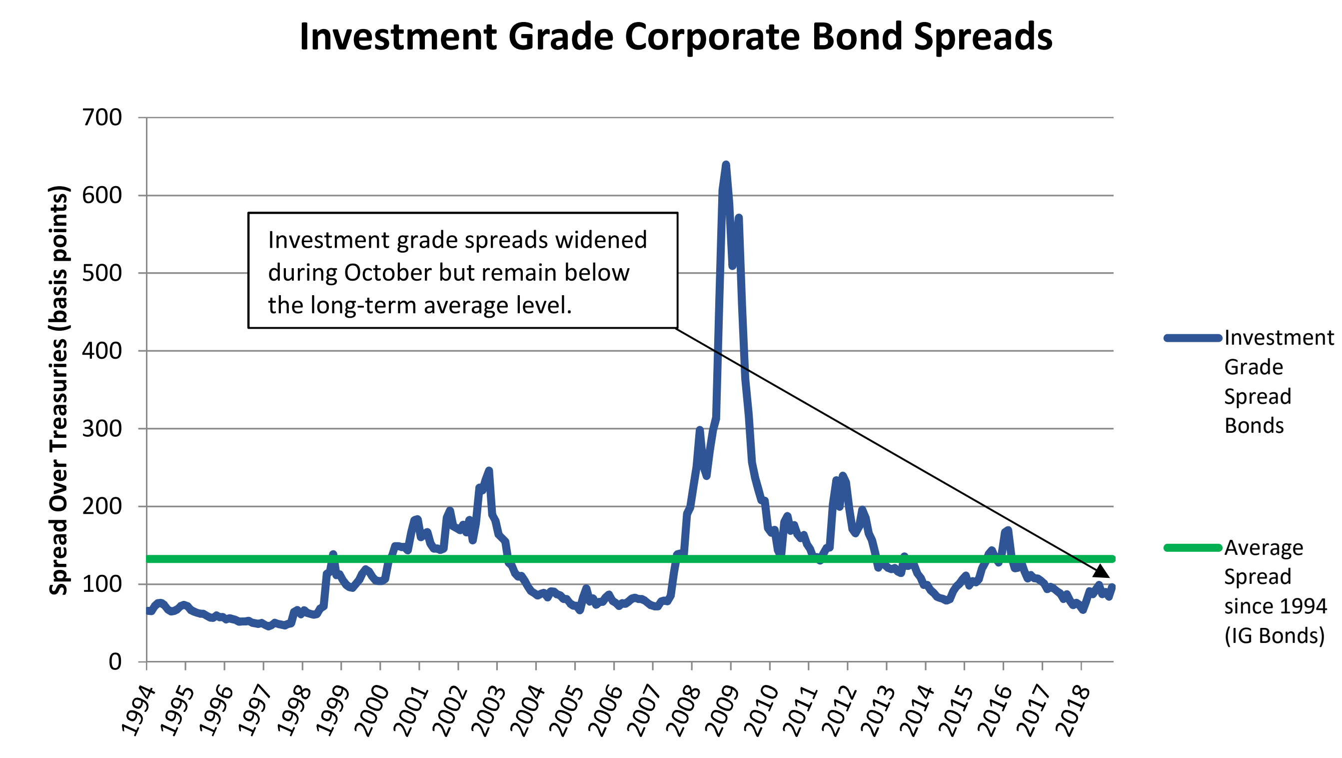
Sources: NCRIEF, www.ustreas.gov [1]A cap rate is the current annual income of the property divided by an estimate of the current value of the property . It is the current yield of the property. Low cap rates indicate high valuations.



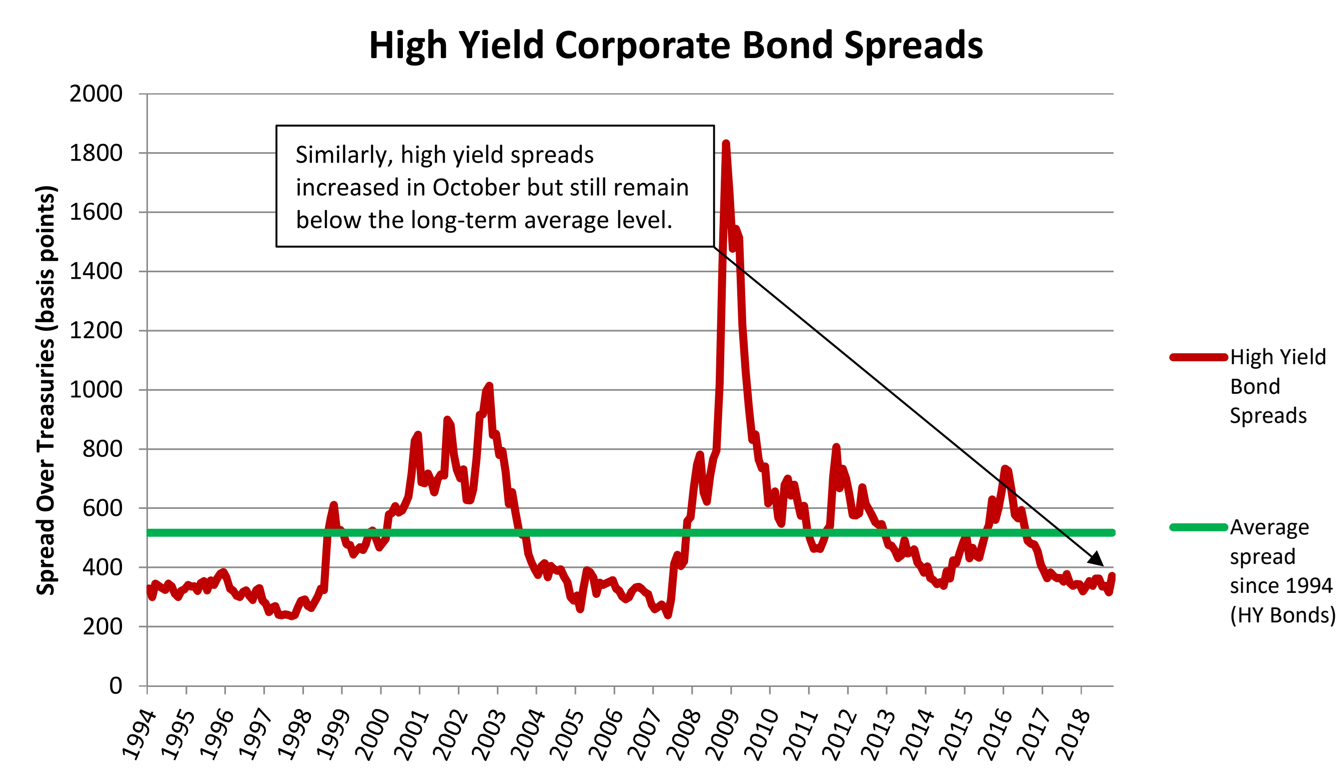


Source: NCREIF, PCA calculation

Credit Market US Fixed Income

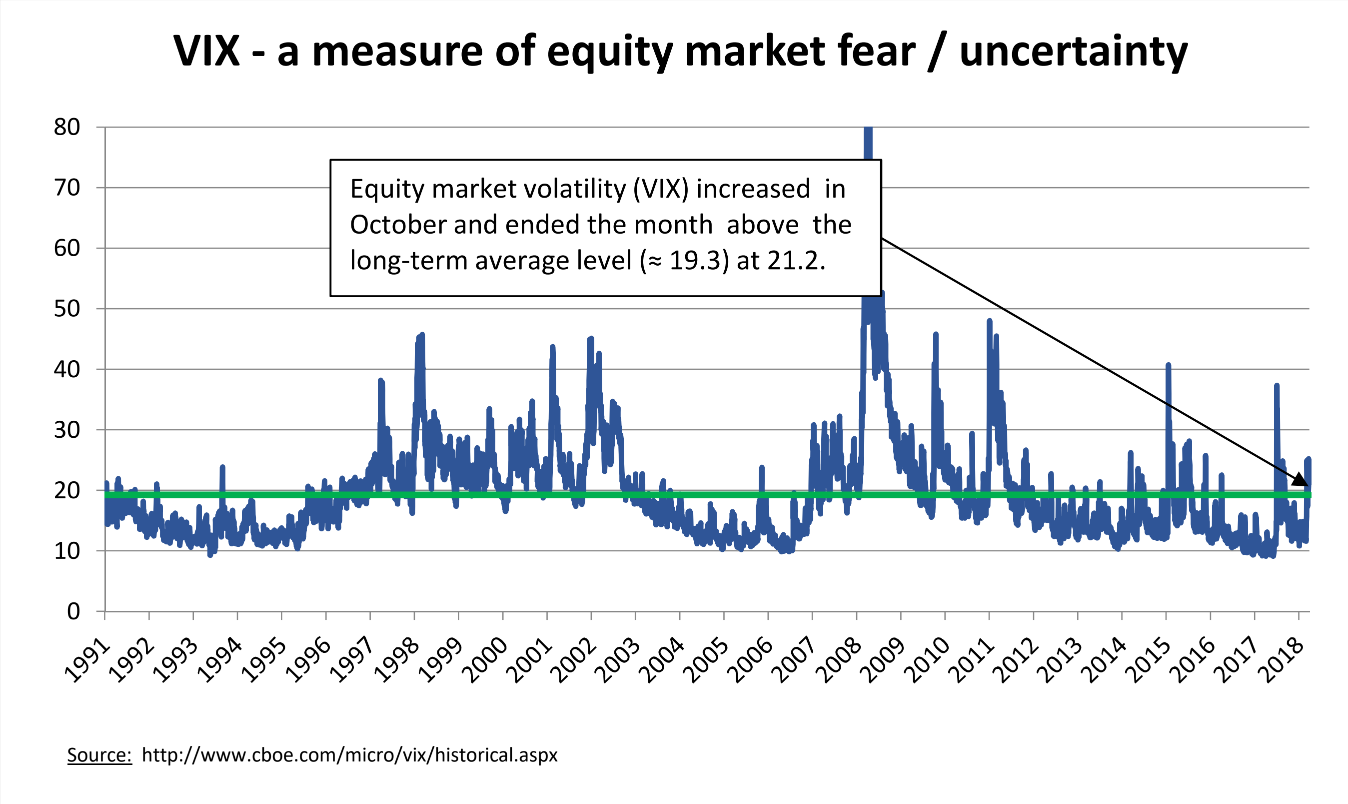


Source: LehmanLive: Barclays Capital US Corporate Investment Grade Index Intermediate Component.

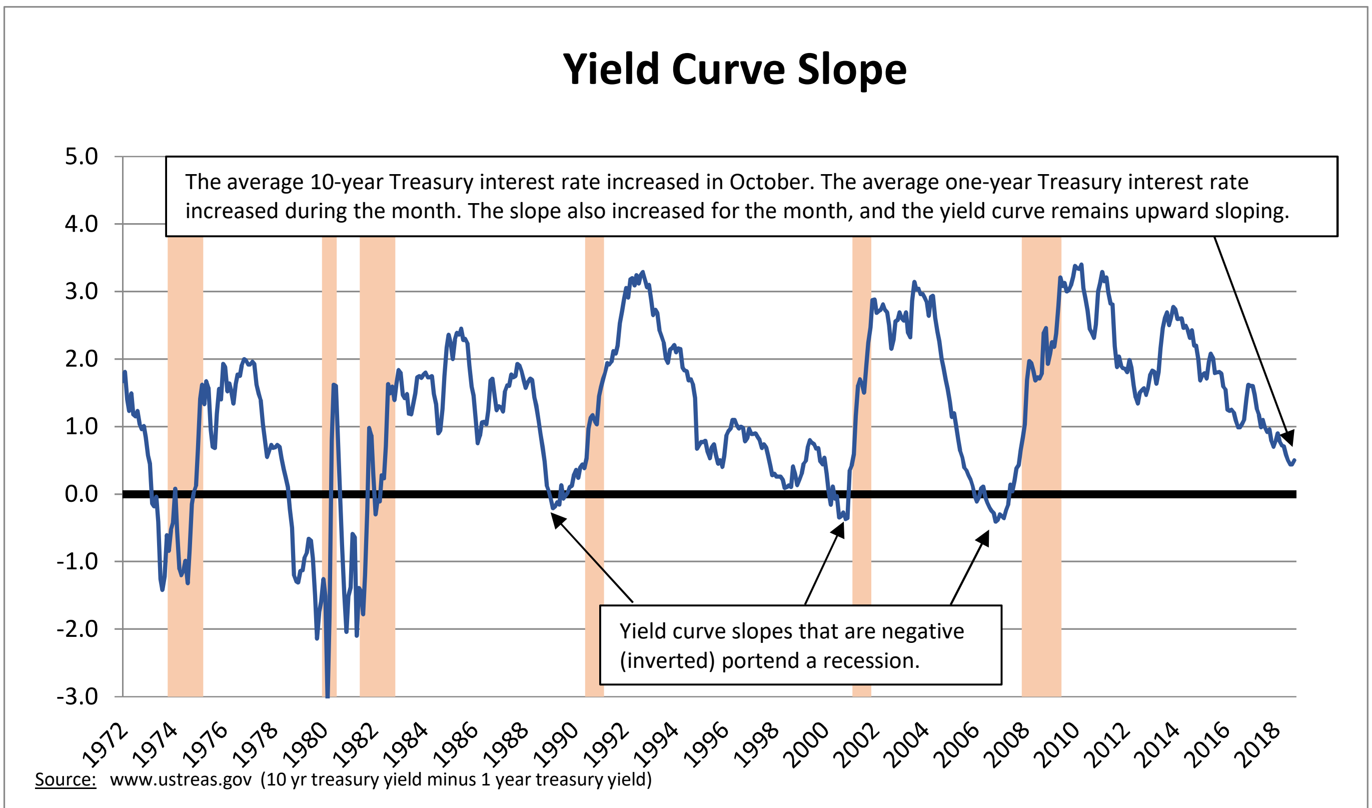


Source: LehmanLive: Barclays Capital U.S. Corporate High Yield Index.

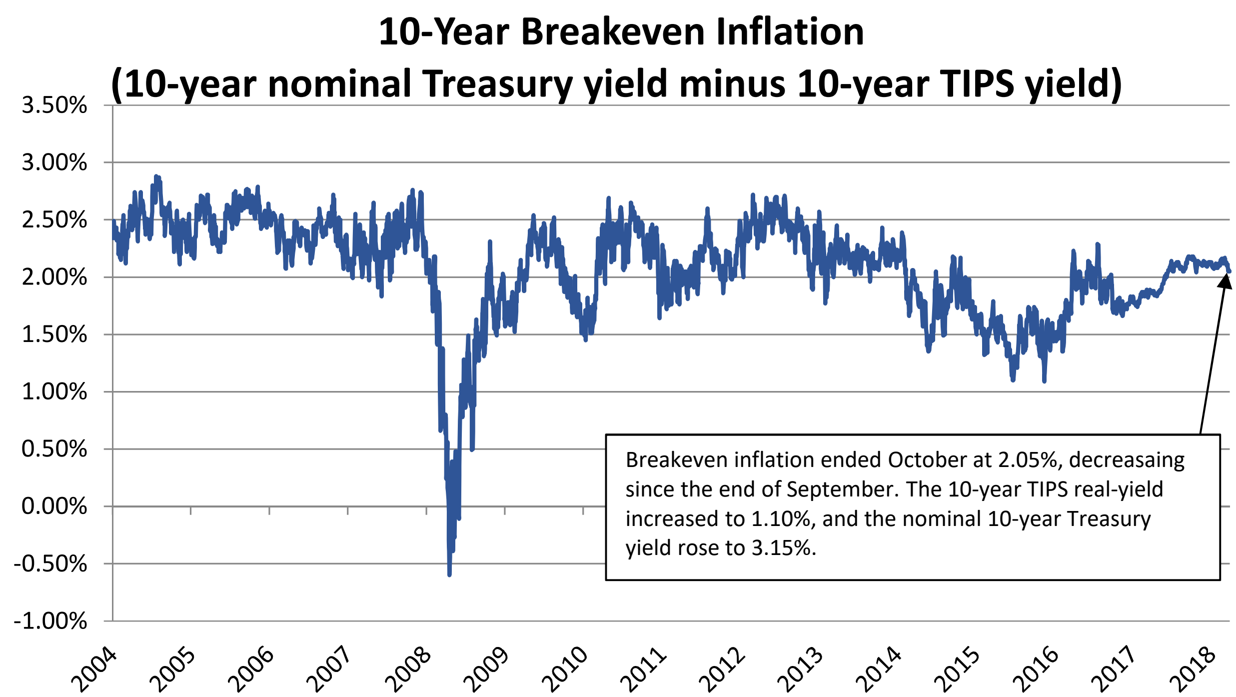
Other Market Metrics



(Please note the difference in time scales)

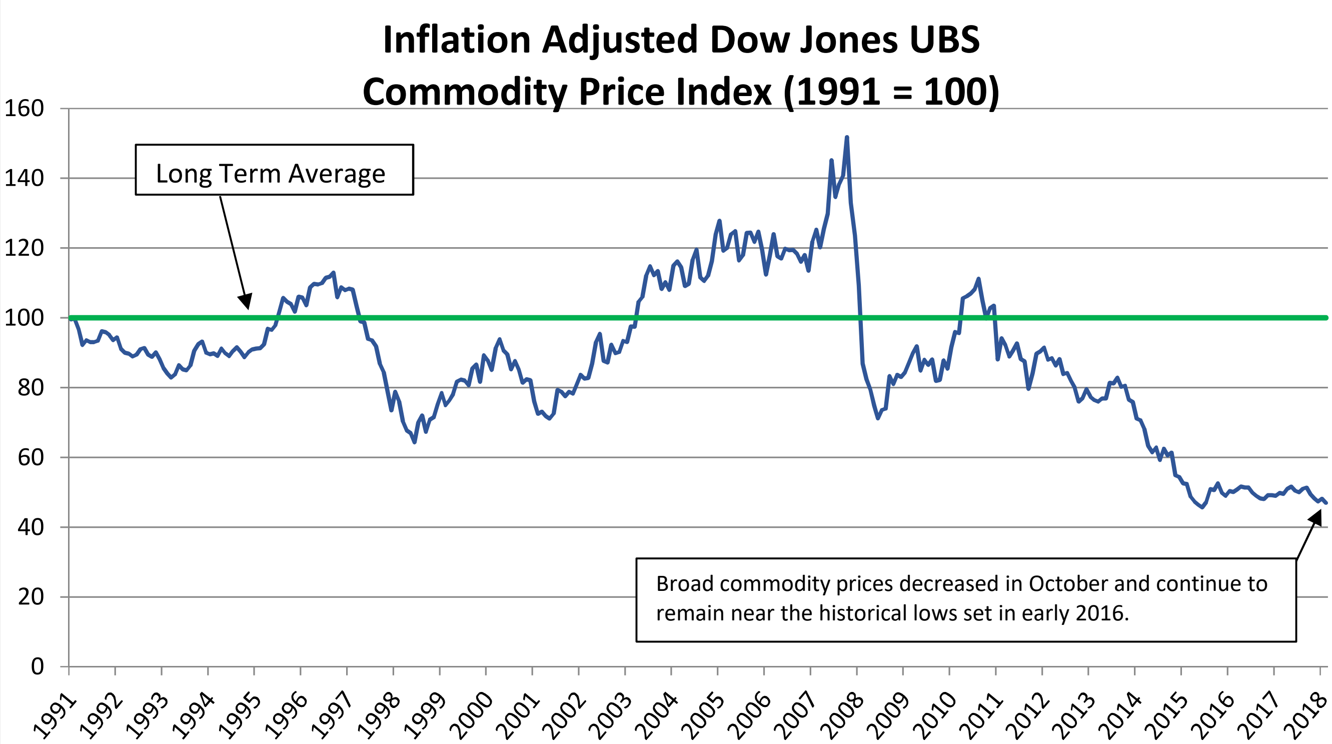


Measures of Inflation Expectations



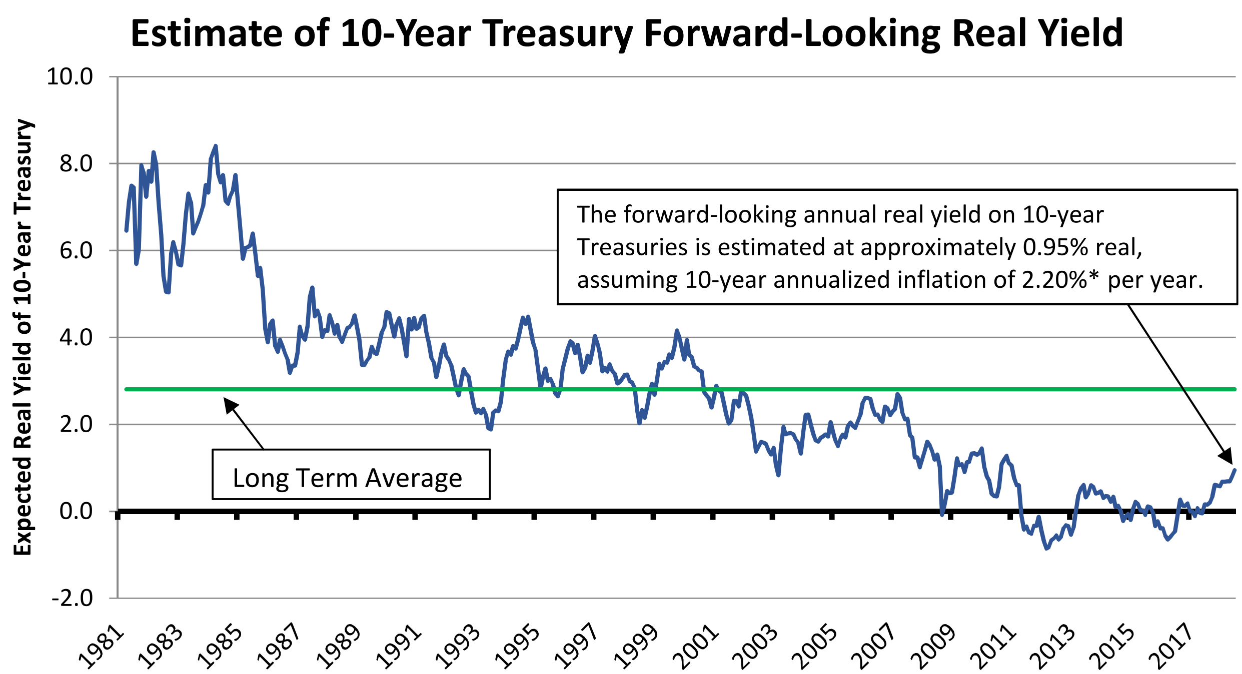
Source: www.ustreas.gov

(Please note the difference in time scales)

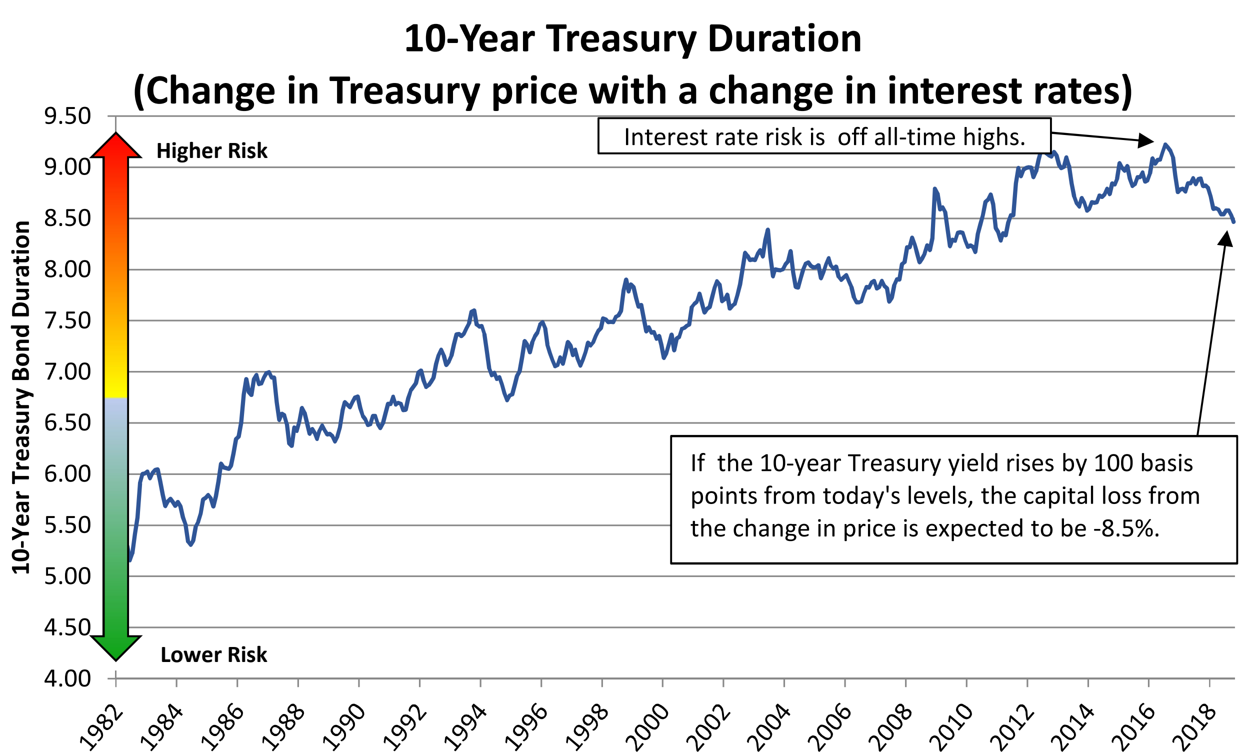


Source: Bloomberg Commodity Index, St. Louis Fed for US CPI all urban consumers.

Measures of U.S. Treasury Interest Rate Risk



Sources: www.ustreas.gov for 10-year constant maturity rates
*Federal Reserve Bank of Philadelphia survey of professional forecasts for inflation estimates



Source: www.ustreas.gov for 10-year constant maturity rates, calculation of duration

Appendix

Appendix

METRIC DESCRIPTION, RATIONALE FOR SELECTION AND CALCULATION METHODOLOGY

US Equity Markets:
Metric: P/E ratio = Price / "Normalized" earnings for the S&P 500 Index

To represent the price of US equity markets, we have chosen the S&P 500 index. This index has the longest published history of price, is well known, and also has reliable, long-term, published quarterly earnings. The price=P of the P/E ratio is the current price of the market index (the average daily price of the most recent full month for the S&P 500 index). Equity markets are very volatile. Prices fluctuate significantly during normal times and extremely during periods of market stress or euphoria. Therefore, developing a measure of earnings power (E) which is stable is vitally important, if the measure is to provide insight. While equity prices can and do double, or get cut in half, real earnings power does not change nearly as much. Therefore, we have selected a well known measure of real, stable earnings power developed by Yale Professor Robert Shiller known as the Shiller E-10. The calculation of E-10 is simply the average real annual earnings over the past 10 years. Over 10 years, the earnings shenanigans and boom and bust levels of earnings tend to even out (and often times get restated). Therefore, this earnings statistic gives a reasonably stable, slow-to-change estimate of average real earnings power for the index. Professor Shiller's data and calculation of the E-10 are available on his website at http://www.econ.yale.edu/~shiller/data.htm. We have used his data as the base for our calculations. Details of the theoretical justification behind the measure can be found in his book *Irrational Exuberance* [Princeton University Press 2000, Broadway Books 2001, 2nd ed., 2005].

Developed Equity Markets Excluding the US:
Metric: P/E ratio = Price / "Normalized" earnings for the MSCI EAFE Index

To represent the price of non-US developed equity markets, we have chosen the MSCI EAFE index. This index has the longest published history of price for non-US developed equities. The price=P of the P/E ratio is the current price of the market index (the average daily price of the most recent full month for the MSCI EAFE index). The price level of this index is available starting in December 1969. Again, for the reasons described above, we elected to use the Shiller E-10 as our measure of earnings (E). Since 12/1972, a monthly price earnings ratio is available from MSCI. Using this quoted ratio, we have backed out the implied trailing-twelve month earnings of the EAFE index for each month from 12/1972 to the present. These annualized earnings are then inflation adjusted using CPI-U to represent real earnings in US dollar terms for each time period. The Shiller E-10 for the EAFE index (10 year average real earnings) is calculated in the same manner as detailed above.

However, we do not believe that the pricing and earnings history of the EAFE markets are long enough to be a reliable representation of pricing history for developed market equities outside of the US. Therefore, in constructing the Long-Term Average Historical P/E for developed ex-US equities for comparison purposes, we have elected to use the US equity market as a developed market proxy, from 1881 to 1982. This lowers the Long-Term Average Historical P/E considerably. We believe this methodology provides a more realistic historical comparison for a market with a relatively short history.

Appendix

METRIC DESCRIPTION, RATIONALE FOR SELECTION AND CALCULATION METHODOLOGY

Emerging Market Equity Markets:
Metric: Ratio of Emerging Market P/E Ratio to Developed Market P/E Ratio

To represent the Emerging Markets P/E Ratio, we have chosen the MSCI Emerging Market Free Index, which has P/E data back to January 1995 on Bloomberg. To represent the Developed Markets PE Ratio, we have chosen the MSCI World Index, which also has data back to January 1995 on Bloomberg. Although there are issues with published, single time period P/E ratios, in which the denominator effect can cause large movements, we feel that the information contained in such movements will alert investors to market activity that they will want to interpret.

US Private Equity Markets:
Metrics: S&P LCD Average EBITDA Multiples Paid in LBOs and US Quarterly Deal Volume

The Average Purchase Price to EBITDA multiples paid in LBOs is published quarterly by S&P in their LCD study. This is the total price paid (both equity and debt) over the trailing-twelve month EBITDA (earnings before interest, taxes, depreciation and amortization) as calculated by S&P LCD. This is the relevant, high-level pricing metric that private equity managers use in assessing deals. Data is published monthly.

US quarterly deal volume for private equity is the total deal volume in $ billions (both equity and debt) reported in the quarter by Thomson Reuters Buyouts. This metric gives a measure of the level of activity in the market. Data is published quarterly.

U.S Private Real Estate Markets:
Metrics: US Cap Rates, Cap Rate Spreads, and Transactions as a % of Market Value

Real estate cap rates are a measure of the price paid in the market to acquire properties versus their annualized income generation before financing costs (NOI=net operating income). The data, published by NCREIF, describes completed and leased properties (core) on an unleveraged basis. We chose to use current value cap rates. These are capitalization rates from properties that were revalued during the quarter. This data relies on estimates of value and therefore tends to be lagging (estimated prices are slower to rise and slower to fall than transaction prices). The data is published quarterly.

Spreads between the cap rate (described above) and the 10-year nominal Treasury yield, indicate a measure of the cost of properties versus a current measure of the cost of financing.

Transactions as a % of Market Value Trailing-Four Quarters is a measure of property turnover activity in the NCREIF Universe. This quarterly metric is a measure of activity in the market.

Credit Markets US Fixed Income:
Metric: Spreads

The absolute level of spreads over treasuries and spread trends (widening / narrowing) are good indicators of credit risk in the fixed income markets. Spreads incorporate estimates of future default, but can also be driven by technical dislocations in the fixed income markets. Abnormally narrow spreads (relative to historical levels) indicate higher levels of valuation risk, wide spreads indicate lower levels of valuation risk and / or elevated default fears. Investment grade bond spreads are represented by the Barclays Capital US Corporate Investment Grade Index Intermediate Component. The high yield corporate bond spreads are represented by the Barclays Capital US Corporate High Yield Index.

Appendix

METRIC DESCRIPTION, RATIONALE FOR SELECTION AND CALCULATION METHODOLOGY

Measure of Equity Market Fear / Uncertainty
Metric: VIX – Measure of implied option volatility for U.S. equity markets

The VIX is a key measure of near-term volatility conveyed by implied volatility of S&P 500 index option prices. VIX increases with uncertainty and fear. Stocks and the VIX are negatively correlated. Volatility tends to spike when equity markets fall.

Measure of Monetary Policy
Metric: Yield Curve Slope

We calculate the yield curve slope as the 10 year treasury yield minus the 1 year treasury yield. When the yield curve slope is zero or negative, this is a signal to pay attention. A negative yield curve slope signals lower rates in the future, caused by a contraction in economic activity. Recessions are typically preceded by an inverted (negatively sloped) yield curve. A very steep yield curve (2 or greater) indicates a large difference between shorter-term interest rates (the 1 year rate) and longer-term rates (the 10 year rate). This can signal expansion in economic activity in the future, or merely higher future interest rates.

Measures of US Inflation Expectations
Metrics: Breakeven Inflation and Inflation Adjusted Commodity Prices

Inflation is a very important indicator impacting all assets and financial instruments. Breakeven inflation is calculated as the 10 year nominal treasury yield minus the 10 year real yield on US TIPS (treasury inflation protected securities). Abnormally low long-term inflation expectations are indicative of deflationary fears. A rapid rise in breakeven inflation indicates an acceleration in inflationary expectations as market participants sell nominal treasuries and buy TIPs. If breakeven inflation continues to rise quarter over quarter, this is a signal of inflationary worries rising, which may cause Fed action and / or dollar decline.

Commodity price movement (above the rate of inflation) is an indication of anticipated inflation caused by real global economic activity putting pressure on resource prices. We calculate this metric by adjusted in the Dow Jones UBS Commodity Index (formerly Dow Jones AIG Commodity Index) by US CPI-U. While rising commodity prices will not necessarily translate to higher US inflation, higher US inflation will likely show up in higher commodity prices, particularly if world economic activity is robust.

These two measures of anticipated inflation can, and often are, conflicting.

Measures of US Treasury Bond Interest Rate Risk
Metrics: 10-Year Treasury Forward-Looking Real Yield and 10-Year Treasury Duration

The expected annualized real yield of the 10 year U.S. Treasury Bond is a measure of valuation risk for U.S. Treasuries. A low real yield means investors will accept a low rate of expected return for the certainly of receiving their nominal cash flows. PCA estimates the expected annualized real yield by subtracting an estimate of expected 10 year inflation (produced by the Survey of Professional Forecasters as collected by the Federal Reserve Bank of Philadelphia), from the 10 year Treasury constant maturity interest rate.

Duration for the 10-Year Treasury Bond is calculated based on the current yield and a price of 100. This is a measure of expected percentage movements in the price of the bond based on small movements in percentage yield. We make no attempt to account for convexity.

Definition of "extreme" metric readings

A metric reading is defined as "extreme" if the metric reading is in the top or bottom decile of its historical readings. These "extreme" reading should cause the reader to pay attention. These metrics have reverted toward their mean values in the past.

PCA Market Sentiment Indicator

Explanation, Construction and Q&A

By:

Pension Consulting Alliance, LLC.

PCA has created the PCA Market Sentiment Indicator (PMSI) to complement our valuation-focused PCA Investment Market Risk Metrics. This measure of sentiment is meant to capture significant and persistent shifts in long-lived market trends of economic growth risk, either towards a risk-seeking trend or a risk-aversion trend.

This paper explores:

- What is the PCA Market Sentiment Indicator (PMSI)?
- How do I read the indicator graph?
- How is the PCA Market Sentiment Indicator (PMSI) constructed?
- What do changes in the indicator mean?

PCA Market Sentiment Indicator

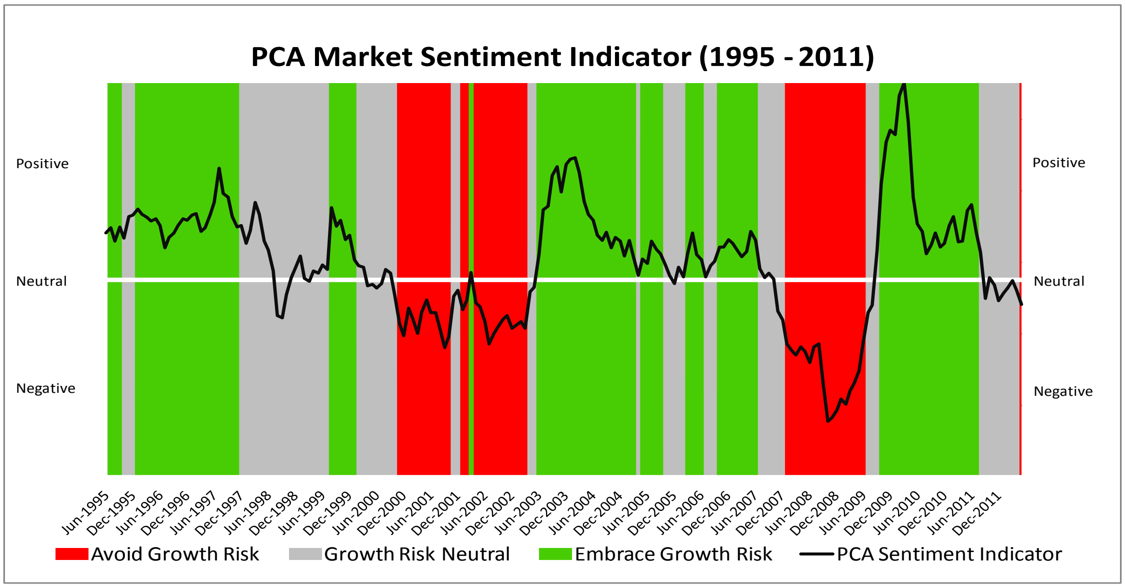
PCA has created a market sentiment indicator for monthly publication (the PMSI – see below) to complement PCA's Investment Market Risk Metrics.

PCA's Investment Market Risk Metrics, which rely significantly on standard market measures of relative valuation, often provide valid early signals of increasing long-term risk levels in the global investment markets. However, as is the case with numerous valuation measures, the Risk Metrics may convey such risk concerns long before a market corrections take place. The PMSI helps to address this early-warning bias by measuring whether the markets are beginning to acknowledge key Risk Metrics trends, and / or indicating non-valuation based concerns. Once the PMSI indicates that the market sentiment has shifted, it is our belief that investors should consider significant action, particularly if confirmed by the Risk Metrics. Importantly, PCA believes the Risk Metrics and PMSI should always be used in conjunction with one another and never in isolation. The questions and answers below highlight and discuss the basic underpinnings of the PCA PMSI:

What is the PCA Market Sentiment Indicator (PMSI)?
The PMSI is a measure meant to gauge the market's sentiment regarding economic growth risk. Growth risk cuts across most financial assets, and is the largest risk exposure that most portfolios bear. The PMSI takes into account the momentum (trend over time, positive or negative) of the economic growth risk exposure of publicly traded stocks and bonds, as a signal of the future direction of growth risk returns; either positive (risk seeking market sentiment), or negative (risk averse market sentiment).

How do I read the PCA Market Sentiment Indicator (PMSI) graph?
Simply put, the PMSI is a color coded indicator that signals the market's sentiment regarding economic growth risk. It is read left to right chronologically. A green indicator on the PMSI indicates that the market's sentiment towards growth risk is positive. A gray indicator indicates that the market's sentiment towards growth risk is neutral or inconclusive. A red indicator indicates that the market's sentiment towards growth risk is negative. The black line on the graph is the level of the PMSI. The degree of the signal above or below the neutral reading is an indication the signal's current strength.

Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.



PCA Market Sentiment Indicator

How is the PCA Market Sentiment Indicator (PMSI) Constructed?

The PMSI is constructed from two sub-elements representing investor sentiment in stocks and bonds:

1. Stock return momentum: Return momentum for the S&P 500 Equity Index (trailing 12-months)
2. Bond yield spread momentum: Momentum of bond yield spreads (excess of the measured bond yield over the identical duration U.S. Treasury bond yield) for corporate bonds (trailing 12-months) for both investment grade bonds (75% weight) and high yield bonds (25% weight). The scale of this measure is adjusted to match that of the stock return momentum measure.

The black line reading on the graph is calculated as the average of the stock return momentum measure and the bonds spread momentum measure. The color reading on the graph is determined as follows:

1. If both stock return momentum and bond spread momentum are positive = GREEN (positive)
2. If one of the momentum indicators is positive, and the other negative = GRAY (inconclusive)
3. If both stock return momentum and bond spread momentum are negative = RED (negative)

What does the PCA Market Sentiment Indicator (PMSI) mean? Why might it be useful?

There is strong evidence that time series momentum is significant and persistent. In particular, across an extensive array of asset classes, the sign of the trailing 12-month return (positive or negative) is indicative of future returns (positive or negative) over the next 12 month period. The PMSI is constructed to measure this momentum in stocks and corporate bond spreads. A reading of green or red is agreement of both the equity and bond measures, indicating that it is likely that this trend (positive or negative) will continue over the next 12 months. When the measures disagree, the indicator turns gray. A gray reading does not necessarily mean a new trend is occurring, as the indicator may move back to green, or into the red from there. The level of the reading (black line) and the number of months at the red or green reading, gives the user additional information on which to form an opinion, and potentially take action.

[i] Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.

[ii] "Time Series Momentum" Moskowitz, Ooi, Pedersen, August 2010
http://pages.stern.nyu.edu/~lpederse/papers/TimeSeriesMomentum.pdf