**MINNESOTA STATE BOARD OF INVESTMENT**



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DATE: January 30, 2018

TO: Legislative Reference Library

FROM: Mansco Perry III MP3

**SUBJECT: Investment Consultant Report**

As required by Minnesota Statutes, Section 11A.27, attached is the State Board of Investment's Report on Investment Consultant Activities.

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DATE: January 30, 2018

FROM: State Board of Investment

**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) concluded its investment consulting contract with Callan Associates Inc., Chicago, Illinois on June 30, 2017. The SBI established new 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.

Total fees paid out for Fiscal Year 2017 are displayed below in the table and reflect some overlap in the previous and current consultant contracts.

**Fiscal Year 2017 Fees**

| | |
|---|---|
| Callan Associates Inc. | $450,000.00 |
| Aon Hewitt Investment Consulting Inc. | $ 85,883.00 |
| Pension Consulting Alliance | $ 98,250.00 |

During the period May 1, 2017 through December 31, 2017, AON was involved in the following projects:

- 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.

During the period April 1, 2017 through December 31, 2017, PCA was involved in the following projects:

- Availability to staff to provide perspective, counsel and input on relevant investment related issues.

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

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# Market Environment

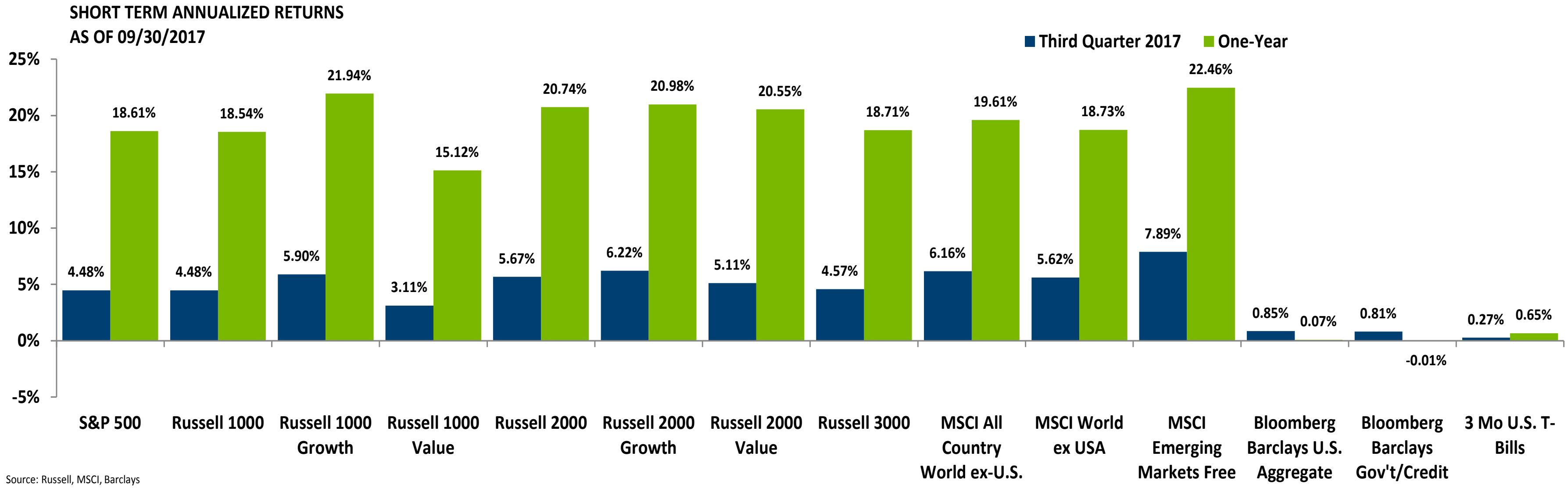
Third Quarter 2017

**Aon Hewitt**
Retirement and Investment

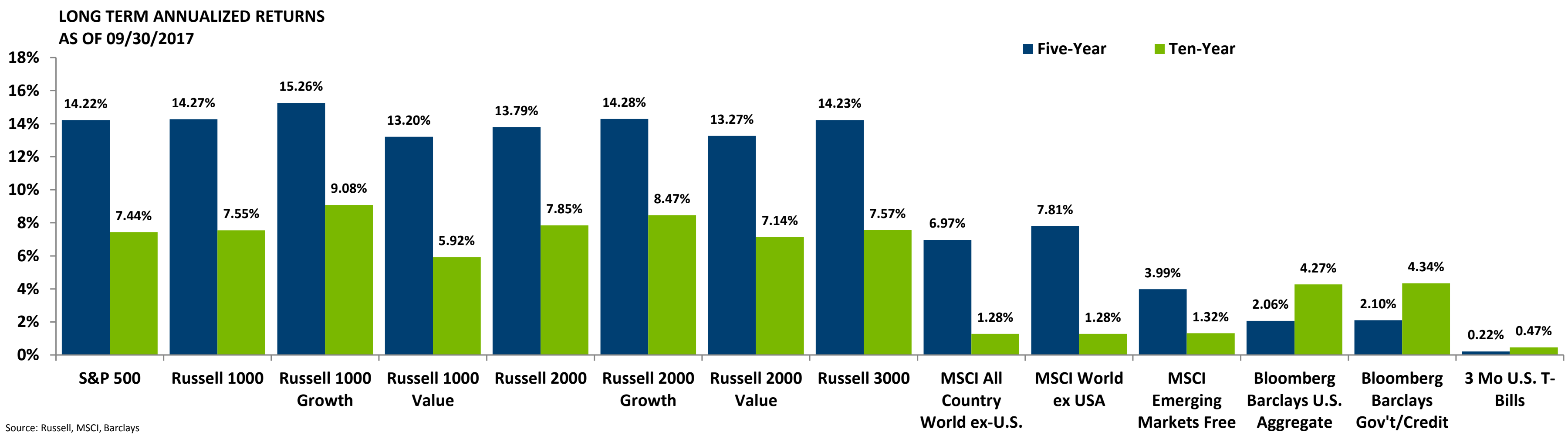


Aon
Empower Results®

# Market Highlights




Source: Russell, MSCI, Barclays




Source: Russell, MSCI, Barclays

# Market Highlights

| Returns of the Major Capital Markets | | | | | |
|---|---|---|---|---|---|
| | | | | | Periods Ending 09/30/2017 |
| | Second Quarter | 1-Year | 3-Year[1] | 5-Year[1] | 10-Year[1] |
| **Domestic Equity** | | | | | |
| S&P 500 | 4.48% | 18.61% | 10.81% | 14.22% | 7.44% |
| Russell 1000 | 4.48% | 18.54% | 10.63% | 14.27% | 7.55% |
| Russell 1000 Growth | 5.90% | 21.94% | 12.69% | 15.26% | 9.08% |
| Russell 1000 Value | 3.11% | 15.12% | 8.53% | 13.20% | 5.92% |
| Russell 2000 | 5.67% | 20.74% | 12.18% | 13.79% | 7.85% |
| Russell 2000 Growth | 6.22% | 20.98% | 12.17% | 14.28% | 8.47% |
| Russell 2000 Value | 5.11% | 20.55% | 12.12% | 13.27% | 7.14% |
| Russell 3000 | 4.57% | 18.71% | 10.74% | 14.23% | 7.57% |
| **International Equity** | | | | | |
| MSCI All Country World ex-U.S. | 6.16% | 19.61% | 4.70% | 6.97% | 1.28% |
| MSCI World ex USA | 5.62% | 18.73% | 4.57% | 7.81% | 1.28% |
| MSCI Emerging Markets Free | 7.89% | 22.46% | 4.90% | 3.99% | 1.32% |
| **Fixed Income** | | | | | |
| Bloomberg Barclays U.S. Aggregate | 0.85% | 0.07% | 2.71% | 2.06% | 4.27% |
| Bloomberg Barclays Gov't/Credit | 0.81% | -0.01% | 2.83% | 2.10% | 4.34% |
| 3 Mo U.S. T-Bills | 0.27% | 0.65% | 0.32% | 0.22% | 0.47% |
| **Inflation** | | | | | |
| CPI-U | 1.06% | 2.23% | 1.23% | 1.30% | 1.68% |

MSCI Indices show net returns.

All other indices show total returns.

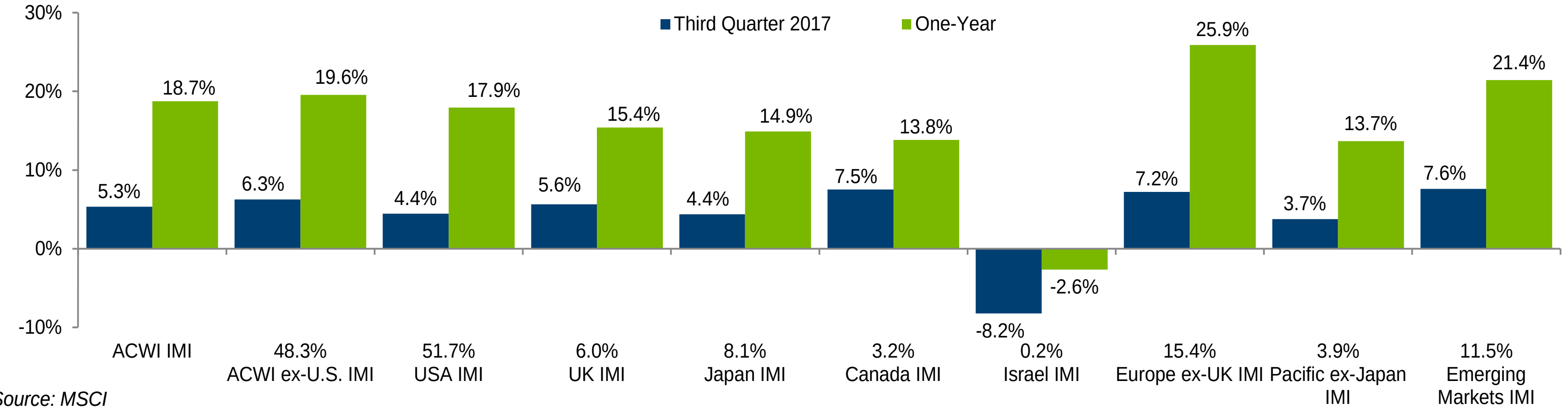
[1] Periods are annualized.



Empower Results®

# Global Equity Markets

**GLOBAL MSCI IMI INDEX RETURNS**
**AS OF 09/30/2017**



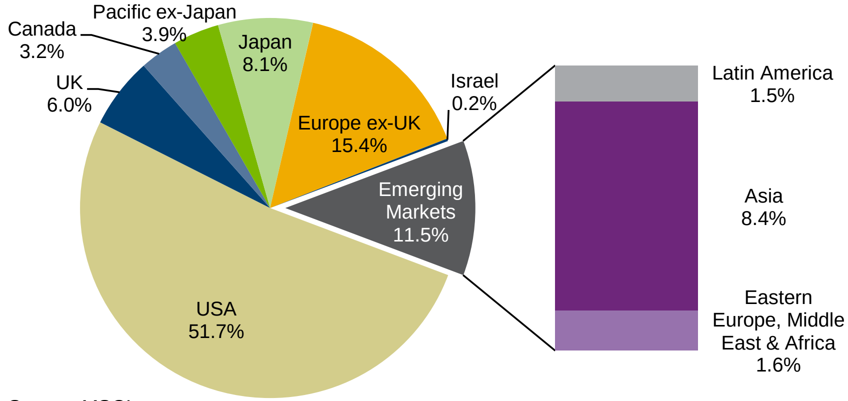

*Source: MSCI*

- Evidence of improving global growth and low inflation continued to sustain the global equity market rally over the last quarter. Moreover, markets were broadly unperturbed by heightened tensions between the U.S. and North Korea. Global equity markets returned 5.3% in Q3 2017 in U.S. dollar terms. The broad weakening of the U.S. dollar (1.7% in trade-weighted terms) led to a lower return of 4.5% in local currency terms.

- All regions shown above generated positive returns with the exception of Israel which moved sharply lower over the quarter. Emerging markets (EM) were once again the strongest performers, returning 7.6% in the third quarter of 2017.

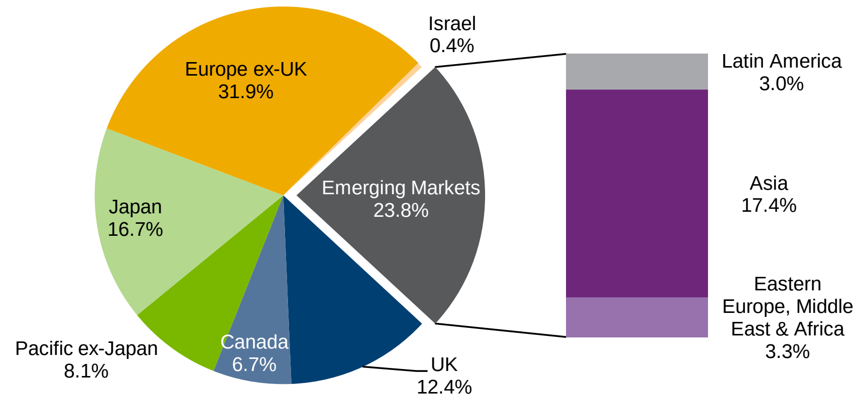
# Global Equity Markets

**MSCI ALL COUNTRY WORLD IMI INDEX**
**GEOGRAPHIC ALLOCATION AS OF 09/30/2017**




*Source: MSCI*

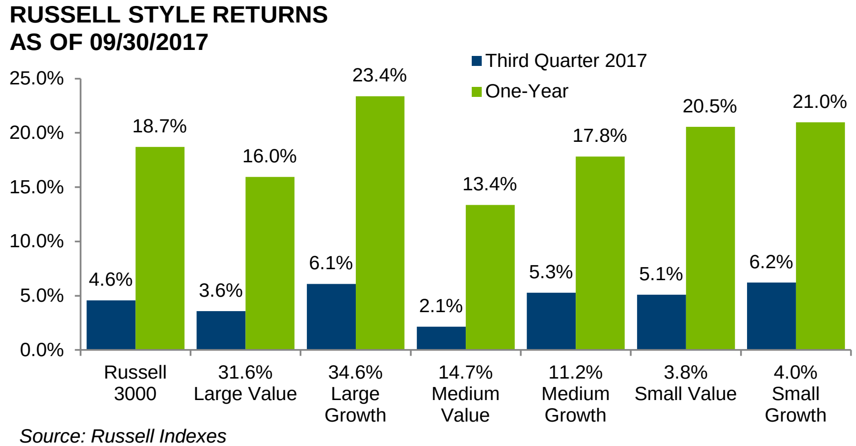
**MSCI ALL COUNTRY WORLD EX-U.S. IMI INDEX**
**GEOGRAPHIC ALLOCATION AS OF 09/30/2017**

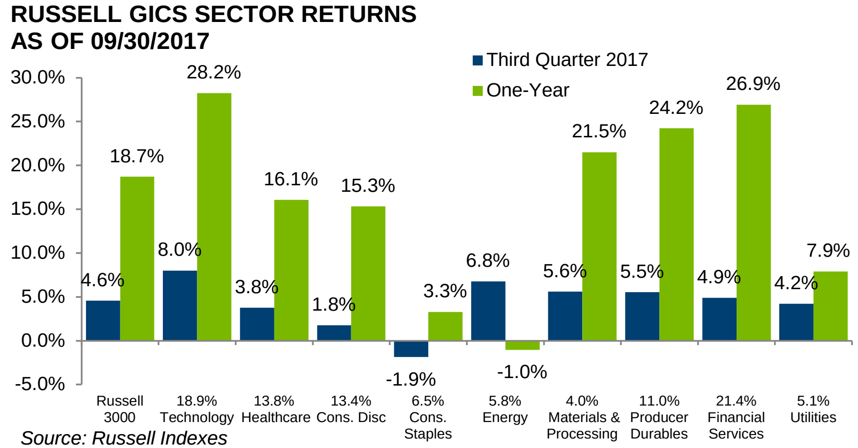



*Source: MSCI*

- 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

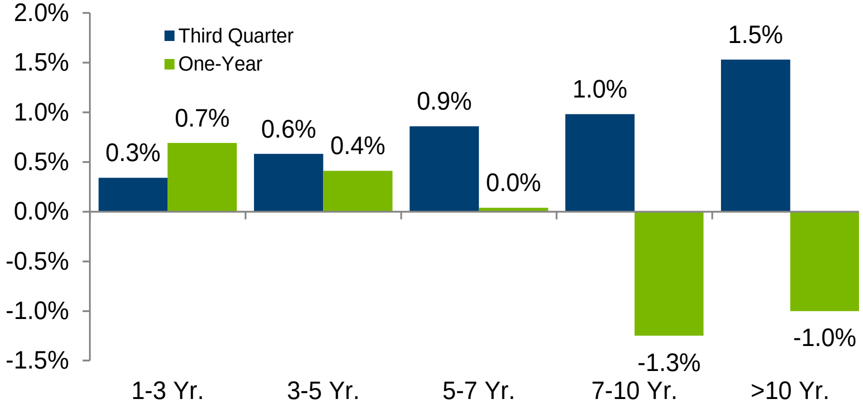



- The Russell 3000 Index returned 4.6% during the third quarter and 18.7% over the one-year period.
- During the third quarter, the technology sector continued to be the strongest performer, posting returns of 8.0%. Consumer staples were the weakest and the only sector which posted negative returns in Q3 2017 by falling 1.9%.
- Performance was positive across the market capitalization spectrum over the quarter. Renewed expectations for U.S. tax reform, announced late in the quarter, provided a boost for small cap stocks which outperformed their large cap peers. However, despite the recent outperformance, small cap stocks still lagged large cap stocks since the start of the year. In general, growth stocks outperformed value stocks.

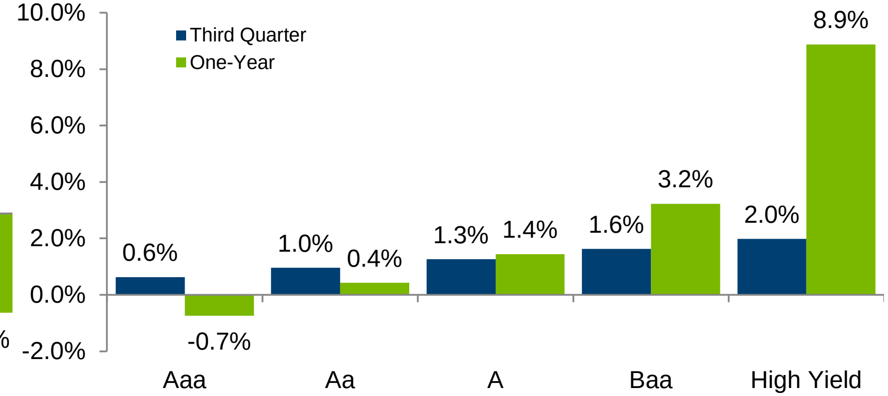
# U.S. Fixed Income Markets

**BLOOMBERG BARCLAYS U.S. AGGREGATE RETURNS BY MATURITY AS OF 9/30/2017**




*Source: Bloomberg Barclays*

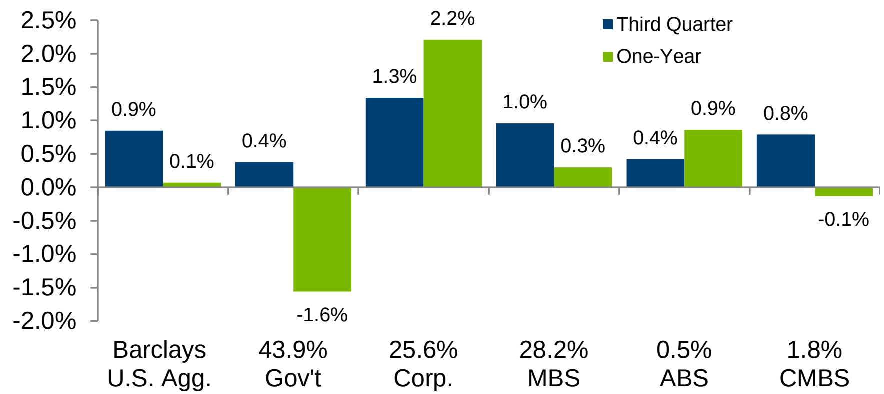
**BLOOMBERG BARCLAYS U.S. AGGREGATE RETURNS BY QUALITY AND HIGH YIELD RETURNS AS OF 9/30/2017**




*Source: Bloomberg Barclays*

- The Bloomberg Barclays U.S. Aggregate Bond Index returned 0.9% in the third quarter. Credit spreads narrowed over the quarter which supported corporate bond returns. Corporate bonds posted the highest return at 1.3%, particularly outperforming government bonds which had the lowest return of only 0.4%.
- High yield bonds outperformed their investment grade bond peers, returning nearly 2.0%.
- Long duration bonds outperformed intermediate and short duration bonds through the quarter.

**BLOOMBERG BARCLAYS U.S. AGGREGATE RETURNS BY SECTOR AS OF 9/30/2017**




*Source: Bloomberg Barclays*



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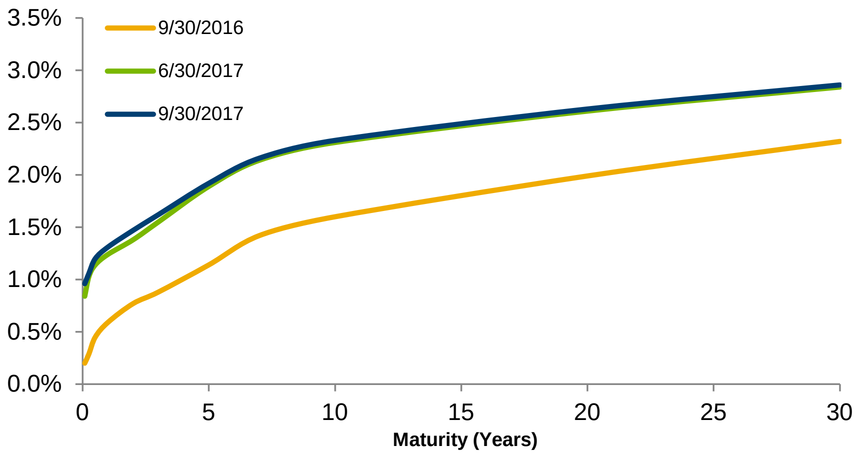
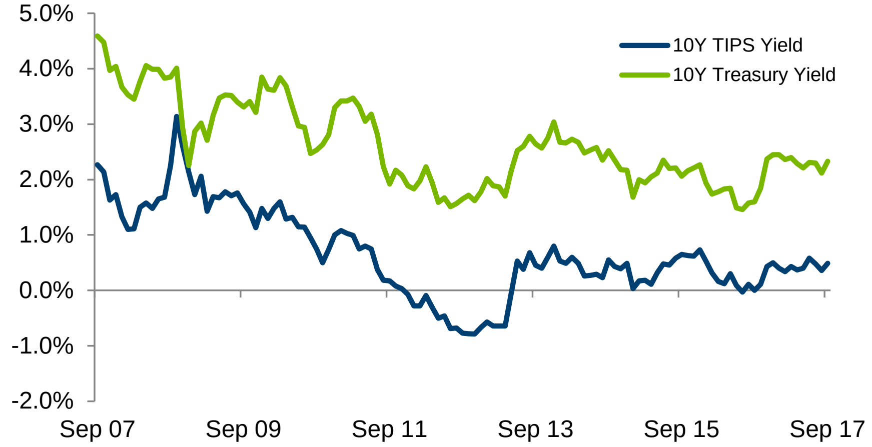
# U.S. Fixed Income Markets

**U.S. TREASURY YIELD CURVE**




*Source: U.S. Department of Treasury*

**U.S. 10-YEAR TREASURY AND TIPS YIELDS**

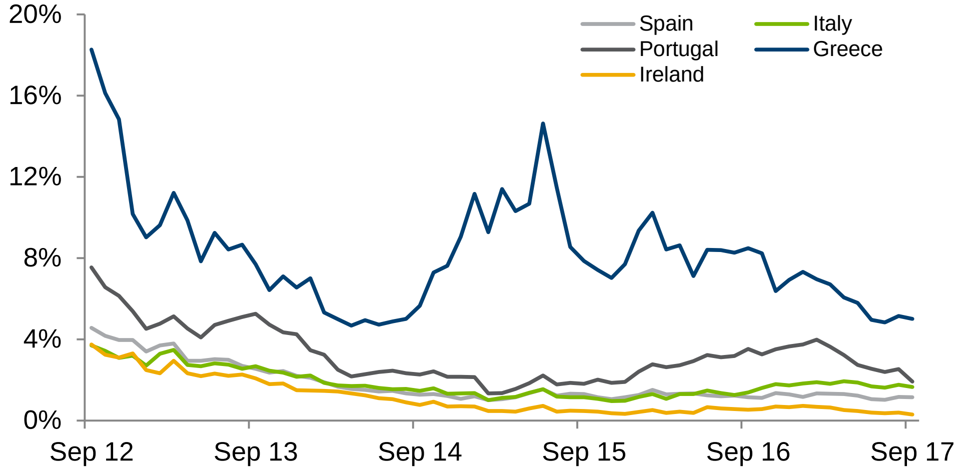



*Source: U.S. Department of Treasury*

- The Treasury yield curve marginally flattened over the quarter, as yields of short maturity bonds inched higher while longer maturity bonds were relatively unchanged.
- The 10-year U.S. Treasury yield ended the quarter at 2.3%, 2 basis points (bps) higher than at the start of the quarter. This was largely driven by higher breakeven inflation which moved 11 bps higher and offset the fall in real yields.
- The 10-year TIPS yield fell by 9 bps over the quarter and ended the period at 0.5%.

# European Fixed Income Markets

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




*Source: DataStream*

- In the Eurozone, bond spreads were mixed across peripheral region. Spain's government bond yields rose by 8 bps with the majority of the increase coming towards the end of the quarter as political instability due to Catalonian Independence referendum grew. Meanwhile, Portuguese government bond yields fell sharply after the rating agency Standard & Poor's raised the nation's credit rating to investment grade from junk status, resulting in the yield on 10 year Portuguese government debt ending 64 bps lower over Q3 2017. Meanwhile, the spread between Greek bonds and German Bunds moved 24 bps higher over the same period.

# Credit Spreads

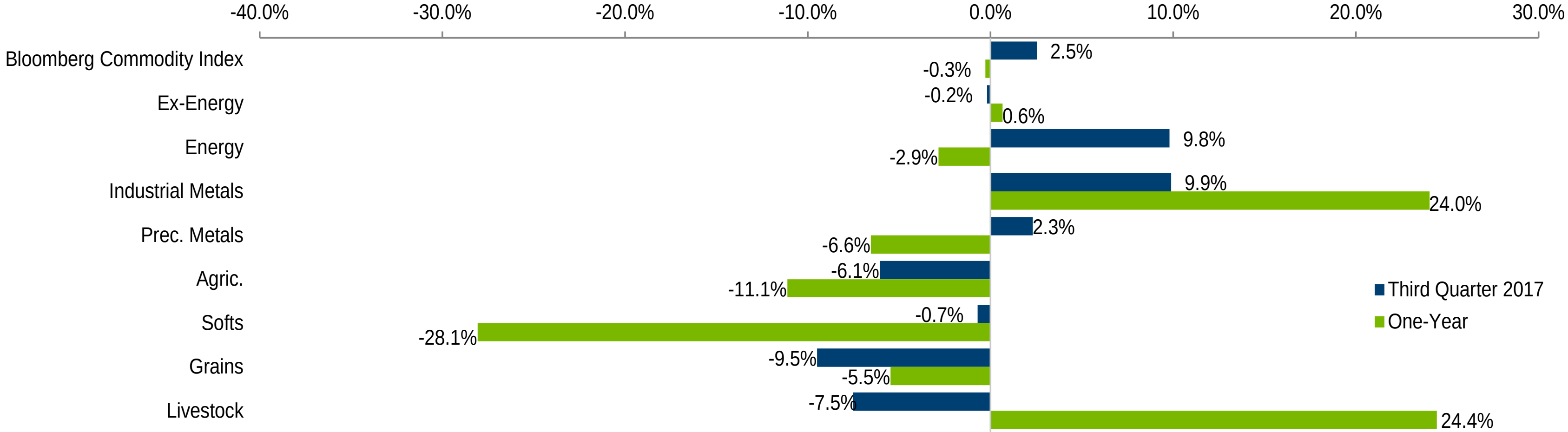
| Spread (bps) | 9/30/2017 | 6/30/2017 | 9/30/2016 | Quarterly Change (bps) | 1-Year Change (bps) |
|---|---|---|---|---|---|
| U.S. Aggregate | 38 | 43 | 47 | -5 | -9 |
| Gov't | 1 | 1 | 1 | 0 | 0 |
| Credit | 96 | 103 | 131 | -7 | -35 |
| Gov't/Credit | 43 | 46 | 59 | -3 | -16 |
| MBS | 22 | 32 | 14 | -10 | 8 |
| CMBS | 71 | 74 | 84 | -3 | -13 |
| ABS | 44 | 46 | 55 | -2 | -11 |
| Corporate | 101 | 109 | 138 | -8 | -37 |
| High Yield | 347 | 364 | 480 | -17 | -133 |
| Global Emerging Markets | 235 | 255 | 299 | -20 | -64 |

*Source: Barclays Live*

- Improved risk appetite and a benign global credit backdrop saw spreads over U.S. Treasuries fall across all areas of the credit market. However, movement in U.S investment grade credit spreads were more muted.
- Global emerging market bond spreads fell by the most over the quarter, narrowing by 20 bps. They were closely followed by high yield bonds, their fellow outperformers in the credit universe this year, which fell by 17 bps.

# Commodities

**COMMODITY RETURNS**
**AS OF 09/30/2017**

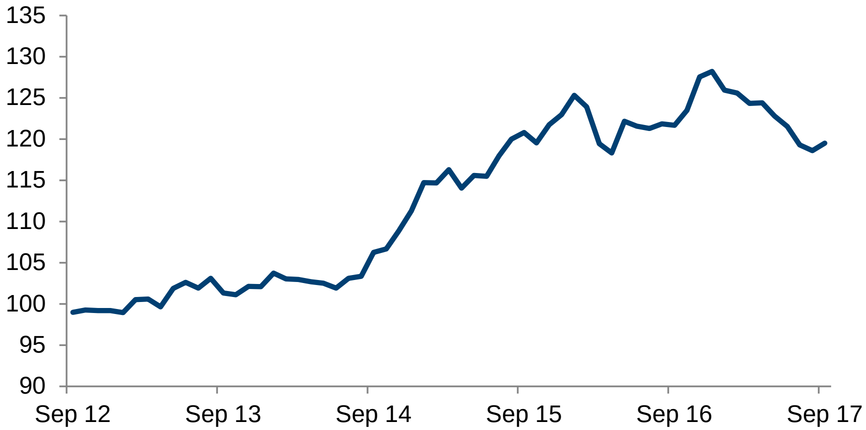



*Source: Bloomberg*

- A strong upturn in commodity prices over the quarter saw the Bloomberg Commodity Index return 2.5%, driven mainly by the rise in crude oil prices.
- Over the quarter, the best performing segment was industrial metals with a return of 9.9%, closely followed by Energy (9.8%). Agriculture remained the laggard with a return of -6.1% which weighed on the overall index return.
- Grains was the worst performing sector over the quarter with a return of -9.5%.

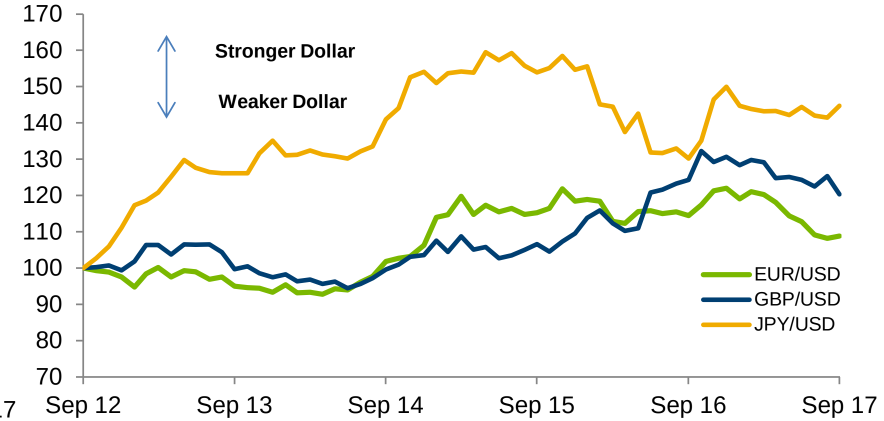
# Currency

TRADE WEIGHTED U.S. DOLLAR INDEX
(1997 = 100)




*Source: Federal Reserve*

U.S. DOLLAR RELATIVE TO EUR, GBP AND JPY
REBASED TO 100 AT 09/30/2012



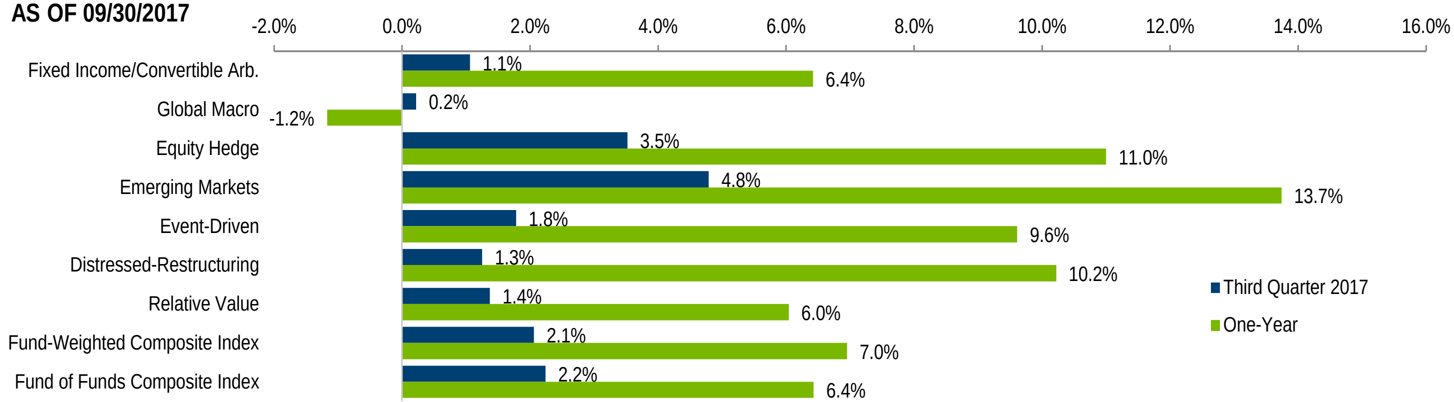

*Source: DataStream*

- The U.S. dollar weakened by 1.7% on a trade-weighted basis over the quarter. Market expectations of a rate hike were lowered after a flurry of disappointing inflation releases, although the U.S. Federal Reserve (Fed) continued to believe that the factors suppressing inflation are transitory.

- The U.S. dollar depreciated against all the major currencies with the exception of the Japanese yen. Bank of England officials indicated UK monetary policy struck a more hawkish tone in September which sent sterling 3.2% higher against the U.S. dollar. Despite a brief period of safe-haven flow activity amid escalating geopolitical tensions in the Korean peninsula, the yen fell by 0.2% against the U.S. dollar. Resilient economic data emanating from the Eurozone supported the euro's 3.5% appreciation against the 'greenback'.

# Hedge Fund Markets Overview

**HEDGE FUND PERFORMANCE**
**AS OF 09/30/2017**

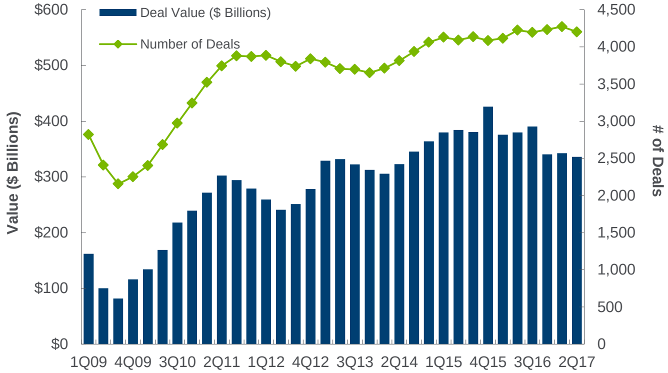



*Note: Latest 5 months of HFR data are estimated by HFR and may change in the future.*
*Source: HFR*

- Hedge fund performance was positive across all strategies in the third quarter.
- The HFRI Fund-Weighted Composite Index and the HFRI Fund of Funds Composite Index produced returns of 2.1% and 2.2%, respectively, during the quarter.
- Emerging market hedge funds continued to be the best performer, posting a return of 4.8% during the third quarter which brought the one-year return to 13.7%.

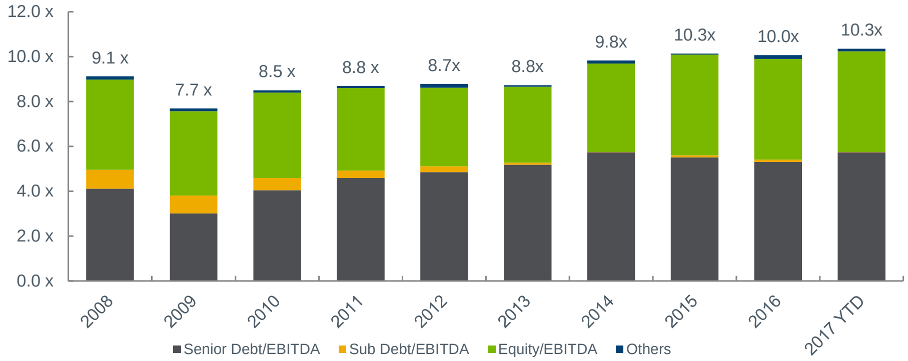
# Private Equity Market Overview – Second Quarter 2017

**LTM Global Private Equity-Backed Buyout Deal Volume**




Source: Preqin

**Purchase Price Multiples – All Transactions Sizes**




Source: S&P

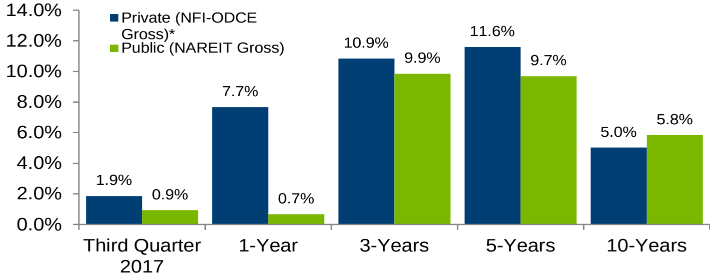
- **Fundraising:** In 2Q 2017, $162.0 billion was raised by 297 funds, which was up 8.7% on a capital basis and 11.2% by number of deals from the prior quarter. Dry powder stood at $1.3 trillion at the end of the quarter, up 3.7% and 31.1% compared to 1Q 2017 and the five year average, respectively [1].
- **Buyout:** Global private equity-backed buyout deals totaled $93.2 billion in 2Q 2017, which was up 67.9% and 7.5% from the prior quarter and five year average, respectively [1]. At the end of 2Q 2017, the average purchase price multiple for all U.S. LBOs was 10.3x EBITDA, up from 10.2x as of the end of 1Q 2017. Large cap middle-market purchase price multiples stood at 10.3x, up compared to both 1Q 2017 and full year 2016 levels of 9.6x and 10.0x, respectively. The weighted average purchase price multiple across all European transaction sizes averaged 10.8x EBITDA on an LTM basis in 2Q 2017, down slightly from 10.9x in 1Q 2017. Purchase prices for transactions of €1.0 billion or more decreased from 11.8x in 1Q 2017 to 11.6x in the second quarter. Transactions between €500.0 million and €1.0 billion were down 0.1x from the end of 1Q 2017, and stood at 11.2x [2]. Globally, exit value totaled $68.7 billion on 417 deals in 2Q 2017 compared to $49.9 billion on 437 deals in the prior quarter [1].
- **Venture:** During the second quarter, 1,152 venture backed transactions totaling $18.4 billion were completed, up on a capital basis from 1Q 2017's total of $14.4 billion across 1,206 deals. This was 44.9% higher than the five-year average of $12.7 billion[3]. Total U.S. venture backed exit activity totaled $10.5 billion across 156 completed transactions in 2Q 2017, down from $14.6 billion across 196 exits in 1Q 2017 [4].
- **Mezzanine:** 10 funds closed on $2.3 billion during the quarter, down from 1Q 2017's total of $3.0 billion raised by 11 funds and the five year quarterly average of $4.7 billion. Estimated dry powder was $50.0 billion at the end of 2Q 2017, down from $51.6 billion in 1Q 2017 [1]. Fundraising activity remains robust with an estimated 66 funds in market targeting $14.3 billion of commitments [1].
- **Distressed Debt:** The LTM U.S. high-yield default rate was 2.2% as of June 2017, which was down from March 2017's LTM rate of 3.9% [5]. Distressed debt and bankruptcy restructuring activity totaled $105.9 billion during the first half of 2017, up 28.0% from 1H 2016. U.S. activity accounted for $55.7 billion in 1H 2017 and was up 123.2% from the same period last year [6].
- **Secondaries:** 10 funds raised $4.2 billion during the second quarter, down from $19.4 billion by nine funds in 1Q 2017 [1]. The average discount rate for all private equity sectors declined 0.2% quarter-over-quarter to 8.1% [7].
- **Infrastructure:** $5.3 billion of capital was raised by 11 funds in 2Q 2017 compared to $30.7 billion of capital closed on by 18 partnerships in 1Q 2017. At the end of the quarter, dry powder stood at $150.2 billion, up from 1Q 2017's record total of $147.0 billion. Infrastructure managers completed 256 deals with an estimated aggregate deal value of $104.0 billion in 2Q 2017 compared to 372 deals totaling $216.9 billion a quarter ago [1].
- **Natural Resources:** During 2Q 2017, eight funds closed on $4.9 billion compared to three funds totaling $0.8 billion in 1Q 2017. Energy and utilities industry managers completed approximately 70 deals totaling an estimated $12.6 billion through 1H 2017, which represents 59.8% of 2016's full year capital deployment [1].

Sources: [1] Preqin [2] Standard & Poors [3] PWC / CB Insights MoneyTree Report [4] PitchBook/NVCA Venture Monitor [5] Fitch Ratings [6] Thomson Reuters [7] UBS

Notes: FY: Fiscal year ended 12/31; YTD: Year to date; LTM: Last twelve months (aka trailing twelve months); PPM: Purchase Price Multiples: Total Purchase Price / EBITDA.

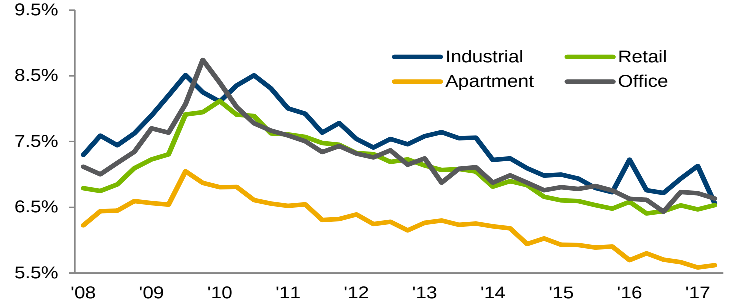
# U.S. Commercial Real Estate Markets

**PRIVATE VS. PUBLIC REAL ESTATE RETURNS AS OF 06/30/2017**




**Third quarter returns are preliminary*
*Sources: NCREIF, NAREIT*

**CAP RATES BY PROPERTY TYPE**




*Sources: RCA, AHIC 6/30/2017*

- **Returns continue to moderate.** The trailing one-year return for U.S. core real estate was 7.7%* in third quarter, down 242 bps from this time last year. While moderating, returns are now back in line with the sector's long run average range of 7.0-9.0%. During the quarter, returns climbed slightly to 1.9%*, up 16 bps over Q2 but 21 bps lower year-on-year and 182 bps lower than 3Q2015. Income is now, and will continue to be, the larger driver of the sector's total return. Continued moderation is expected.
- Property stocks are up 7.3% YTD, globally. In 3Q, global property stocks (FTSE EPRA/NAREIT Developed Index) posted modest gains (1.8%), with positive returns in each of the major regions. Both the Europe (4.9%) and Asia (2.0%) regions outperformed. The U.S. REIT market (FTSE NAREIT Equity REITs Index), while slightly positive (0.9%), underperformed on a relative basis during the quarter and also lags year to date. During the quarter, strong share price gains were seen in the Industrial, Data Center, Net Lease, and Storage sectors, with weakness in the Health Care and Mall sectors. Values for high quality assets have remained relatively stable; however there is a wide disparity in relative valuations within the property sectors, with the overall U.S. REITs market ending the quarter trading at an approximate 2.0% premium. Despite the significant destructive impact of Hurricanes Harvey (Houston) and Irma (Florida) the negative financial impact to the REITs is expected to be minimal. Overall U.S. public REIT exposure is only approximately 3.0% to Houston, 5.0% to Florida and <0.5% to Puerto Rico.
- **Pricing.** The more typical relationship between deal volume and pricing has not moved in unison for almost two years now. While the reason varies by property type, in most cases volume has moved lower while prices have moved higher. This indicates a continuing disconnect between buyers' and sellers' expectations, which has been evident in sales trends since volume peaked in 4Q2015. Cap rates, however, have remained at or near recent lows — that said, there is little expectation of them going lower.
- **Capital flows remain robust.** Private real estate dry powder globally (capital already allocated to new investments) now totals over $240.0bn; and far exceeds the peak of the last recession. The majority of the sector's dry powder sits in opportunistic and value add funds, accounting for 41.0% and 24.0% of the total respectively. Capital flows into U.S. commercial real estate, in particular, remain healthy and have not been disrupted by on-going global events as investors continue to favor the U.S. at this point in cycle due to the maturity and liquidity of U.S. markets.
- **Portfolio structure important**. Overall, real estate fundamentals and pricing are at a mature point in the real estate cycle. Given that, it is important to ensure that risk mitigation strategies are incorporated into all portfolio's structure. Preferred equity, secondaries, and debt structures are important investment considerations that can help mitigate medium term cyclical risks.

Sources: NCREIF, RCA, CBRE-EA, Aon Hewitt
*Indicates preliminary NFI-ODCE data gross of fees

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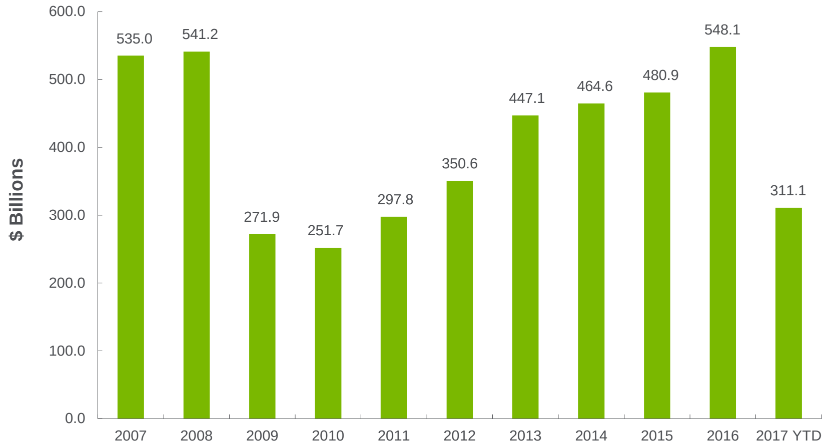
# Appendix A:

# Global Private Equity Market Overview

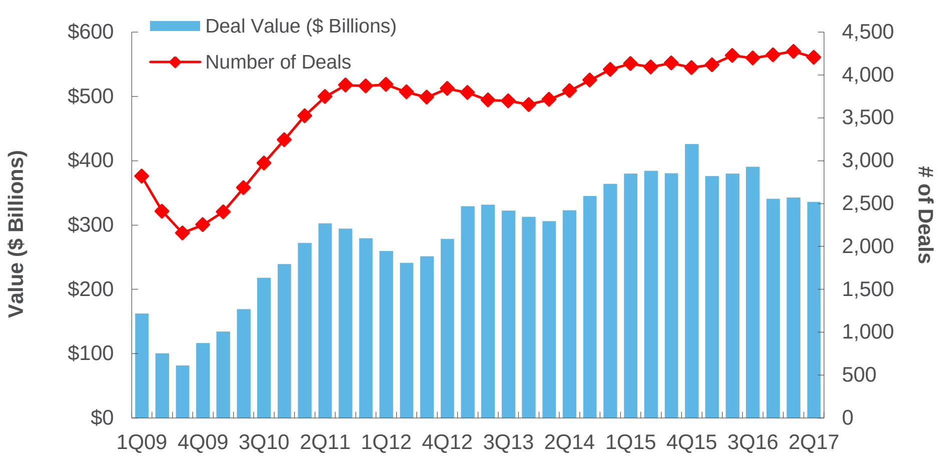
# Private Equity Overview

## Total Funds Raised




Source: Preqin

## LTM Global Private Equity-Backed Buyout Deal Volume




Source: Preqin

Fundraising

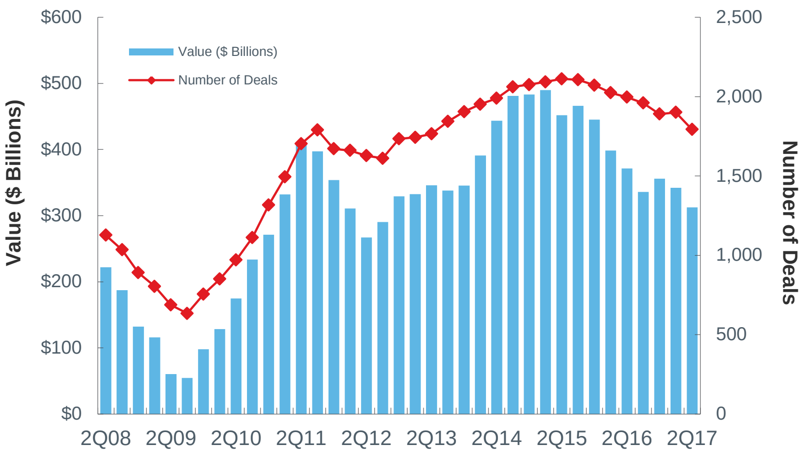
- In 2Q 2017, $162.0 billion was raised by 297 funds, which was up 8.7% on a capital basis and 11.2% by number of deals from the prior quarter [1].
  - The majority of 2Q 2017 capital was raised by funds with target geographies in North America, comprising 57.2% of the quarterly total. Capital targeted for Europe made up 27.6% 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 $1.3 trillion at the end of the quarter, up 3.7% and 31.1% compared to 1Q 2017 and the five year average, respectively [1].

Activity

- On an LTM basis, 4,203 deals were completed for an aggregate deal value of $336.2 billion as of 2Q 2017 compared to 4,274 transactions totaling $342.8 billion as of 1Q 2017 [1].
  - Average deal size was $80.0 million on an LTM basis, down 0.2% and 6.6% from the prior quarter and five year quarterly average level, respectively.
- European LBO transaction volume totaled €12.9 billion in 2Q 2017 and €40.1 billion on an LTM basis, compared to 1Q 2017's quarterly and LTM totals of €13.6 billion and €43.2 billion, respectively. 2Q 2017's total was up 13.2% from the five year quarterly average [3].
- At the end of 2Q 2017, the average purchase price multiple for all U.S. LBOs was 10.3x EBITDA, up from 10.2x as of the end of 1Q 2017 [3].
  - This was 0.8x and 1.2x turns (multiple of EBITDA) above the year-end five and ten year average levels, respectively.
- European multiples were down 0.1x quarter-over-quarter, averaging 10.8x EBITDA for all transaction sizes, with large and medium transactions each running at 12.1x and 11.2x, respectively [3].
- Debt remained broadly available in the U.S.
  - U.S. average leverage levels through 1H 2017 were 5.8x compared to the five and ten year averages of 5.4x and 5.1x, respectively [3].
  - The amount of debt issued supporting new transactions increased compared to 1Q 2017 from 52.4% to 60.4% and remains above the 51.0% average level over the prior five years [3].
  - In Europe, average senior debt/EBITDA through 1H 2017 was 5.1x, down from the 5.6x observed through 1Q 2017. This was also up significantly over the five year and ten year average levels of 4.9x.

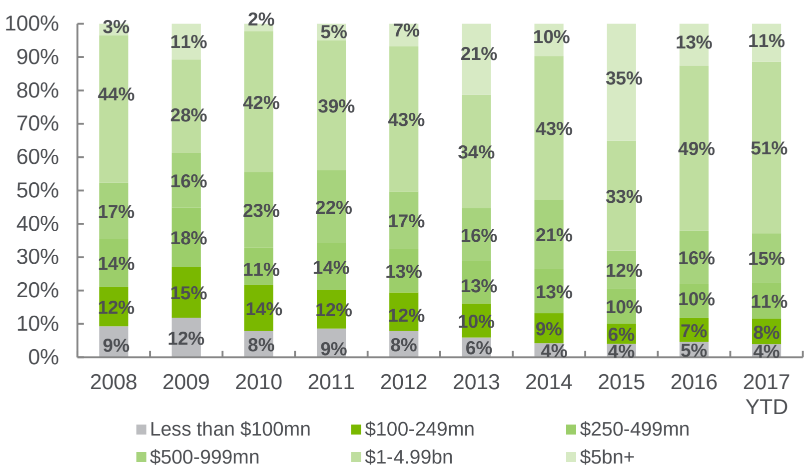
# Buyouts / Corporate Finance

## LTM PE Exit Volume and Value




Source: Preqin

## M&A Deal Value by Deal Size




Source: Preqin

**Fundraising**

- $106.4 billion was closed on by 102 buyout and growth funds in 2Q 2017, compared to $64.2 billion raised by 84 funds the quarter before [1].
  - This was up compared to the five year annual average of $54.2 billion and exceeded the highest quarterly total during that time by 27.9%.
  - CVC Capital Partners Fund VII and Silver Lake Partners V were the largest partnerships raised during the quarter, with final closes totaling €16.0 billion and $15.0 billion, respectively.
- Buyout and growth equity dry powder was estimated at $703.6 billion, which was above the record level of $663.7 billion observed at the end of 1Q 2017 [1].
  - Aside from small cap funds, which decreased 14.6% quarter-over-quarter, buyout dry powder increased across all fund size categories. Mega fund dry powder exhibited the largest increase during the quarter (13.9%), setting a new record mark of $247.0 billion. Large and middle market buyout dry powder finished the quarter up 0.6% and 6.2%, respectively, from 1Q 2017 [1].
  - An estimated 56.2% of buyout dry powder was targeted for North America, while European dry powder comprised 31.1% of the total [1].

**Activity**

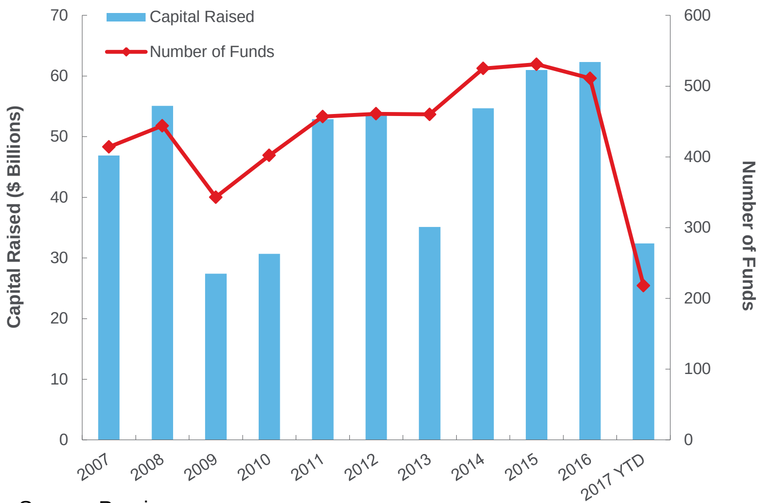
- Global private equity-backed buyout deals totaled $93.2 billion in 2Q 2017, which was up 67.9% and 7.5% from the prior quarter and five year average, respectively [1].
  - 1,052 deals were completed during the quarter, which was down 2.0% from 1Q 2017, but up 5.1% compared to the five year quarterly average.
  - Through 1H 2017, deals valued at $5.0 billion or greater accounted for an estimated 11.4% of total deal value during the quarter compared to 12.6% in 2016 and 35.1% in 2015 [1].
- Entry multiples for all transaction sizes through 1H 2017 stood at 10.3x EBITDA, up from 1Q 2017 (10.2x) [3].
  - Large cap middle-market purchase price multiples stood at 10.3x, up compared to both 1Q 2017 and full year 2016 levels of 9.6x and 10.0x, respectively [3].
  - The weighted average purchase price multiple across all European transaction sizes averaged 10.8x EBITDA on an LTM basis in 2Q 2017, down slightly from 10.9x in 1Q 2017. Purchase prices for transactions of €1.0 billion or more decreased from 11.8x in 1Q 2017 to 11.6x in the second quarter.
  - Transactions between €500.0 million and €1.0 billion were down 0.1x from the end of 1Q 2017, and stood at 11.2x [3].
  - The portion of average purchase prices financed by equity for U.S. deals was 43.6% in 1H 2017, down from 44.0% through 1Q 2017; however, this remained above the five and ten year full year averages of 41.7% and 42.3%, respectively [3].
- Globally, exit value totaled $68.7 billion on 417 deals in 2Q 2017 compared to $49.9 billion on 437 deals in the prior quarter, which had marked the lowest quarterly total since 1Q 2010 [1].

**Opportunity**

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

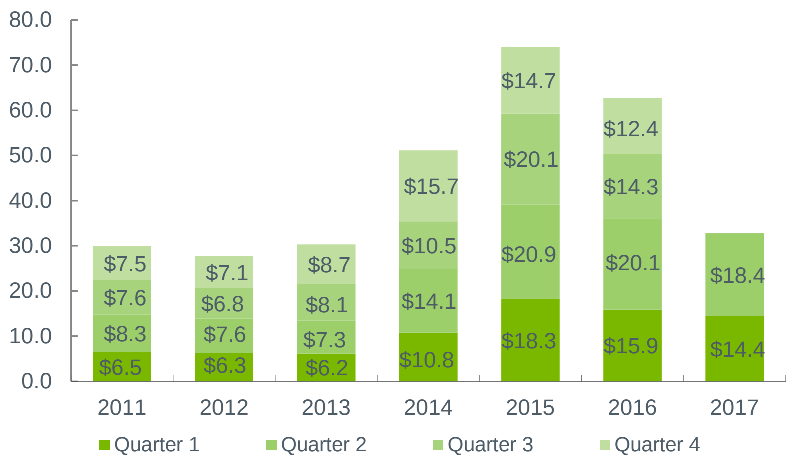
# Venture Capital

## Venture Capital Fundraising




Source: Preqin

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




Source: PwC/CB Insights Report

**Fundraising**

- $18.2 billion of capital was raised by 110 funds in 2Q 2017, up from the prior quarter's total of $14.2 billion by 108 managers [1].
  - 2Q 2017 capital raised was up 37.6% compared to the five year quarterly level, despite being down on a number of funds basis (-11.8%).
  - New Enterprise Associates 16 was the largest fund raised during the quarter, closing on $3.3 billion.
- The average fund size raised during the quarter was approximately $177.0 million, which was above both the prior quarter and five year quarterly average of $146.0 million and $126.1 million, respectively. The vast majority of funds in market are seeking commitments of $200.0 million or less [1].
- Dry powder was estimated at $177.2 billion at the end of 2Q 2017, which was down from 1Q 2017's total of $178.5 billion. This was 48.9% higher than the five year average [1].

**Activity**

- During the second quarter, 1,152 venture backed transactions totaling $18.4 billion were completed, up on a capital basis from 1Q 2017's total of $14.4 billion across 1,206 deals. This was 44.9% higher than the five year average of $12.7 billion [7].
  - Globally, the number of unicorns, or companies with valuations of $1.0 billion or more, increased from 14 in 1Q 2017 to 16 in 2Q 2017. This marked the highest number observed since 3Q 2015 [14].
- Median pre-money valuations increased across all transaction stages. Series D+ transactions exhibited the largest increase (150.0%). Series, A, B, and Series C transactions were up 57.2%, 33.8%, and 13.1%, respectively [9].
- Total U.S. venture backed exit activity totaled $10.5 billion across 156 completed transactions in 2Q 2017, down on a capital basis from $14.6 billion in 1Q 2017 [8].
  - There were 18 venture-backed initial public offerings during the quarter, which was up from seven in 1Q 2017. However, on a capital basis, IPOs raised just $1.8 billion, down 56.0% quarter-over-quarter [16].
  - The number of M&A transactions totaled 142 deals in 2Q 2017, representing a decrease of 12.9% quarter-over-quarter [16].

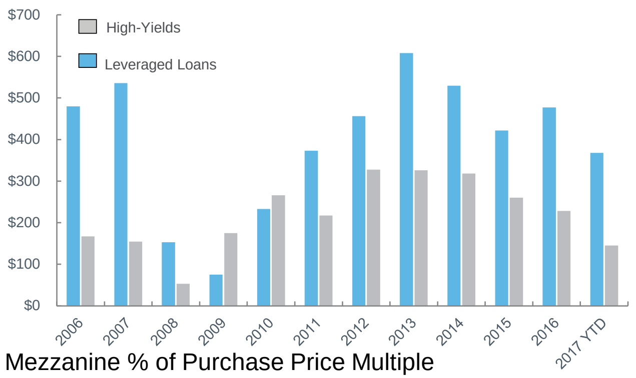
**Opportunity**

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

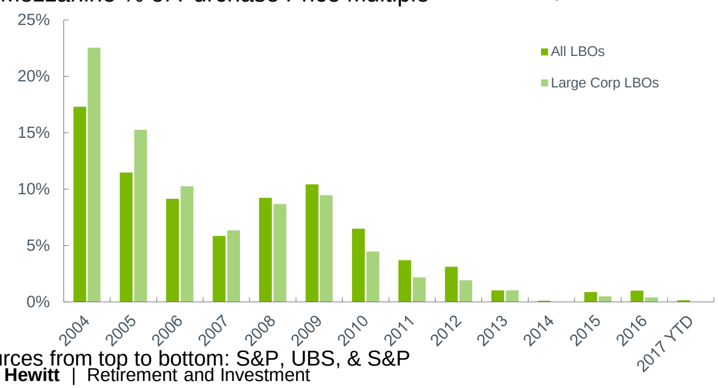
# Leveraged Loans & Mezzanine

Average Leverage by Deal Size


Debt Issuance ($ Billions)




Mezzanine % of Purchase Price Multiple




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

**<u>Leveraged Loans</u>**

**Fundraising**

- New CLO issuance totaled $48.1 billion during the quarter, up compared to 1Q 2017's total of $15.9 billion [2].
- High-yield debt issuance totaled $62.2 billion in 2Q 2017, down from $82.7 billion in 1Q 2017 [2].
- Mutual fund net inflows stood at $11.4 billion through the end of 2Q 2017, compared to net outflows of $11.4 billion as of 1Q 2017 [2].

**Activity**

- Leverage for all LBO transactions ended the quarter at 5.9x, compared to 5.6x at 1Q 2017 and continues to be comprised almost entirely of senior debt. The average leverage level for large cap LBOs was 5.9x during the quarter, up from 5.7x in 1Q 2017 [3].
- New leveraged loan issuances in 2Q totaled $166.0 billion, down from the prior quarter's total of $202.0 billion. 1H 2017 leverage loan issuances represent 77.1% of 2016's full year total [2].
- 59.8% of new leveraged loans were used to support M&A and growth activity during the first half of the year, up from 51.7% through 1Q 2017. This was above the prior five year average of 50.2% [3].
- European leveraged loan issuance decreased by 11.0% quarter-over-quarter to €18.0 billion [3].
  - This was above the five year and ten year average levels of €11.7 billion and €10.9 billion, respectively.
- Leveraged loan spreads for B rated issues narrowed quarter-over-quarter, ending 2Q 2017 at L+409 bps compared to L+428 bps at 1Q 2017. BB- index spreads decreased to L+260 bps from L+270 bps during the quarter [2].

**Opportunity**

- Funds with the ability to source deals directly and the capacity to scale for large transactions
- Funds with an extensive track record and experience through prior credit cycles

**<u>Mezzanine</u>**

**Fundraising**

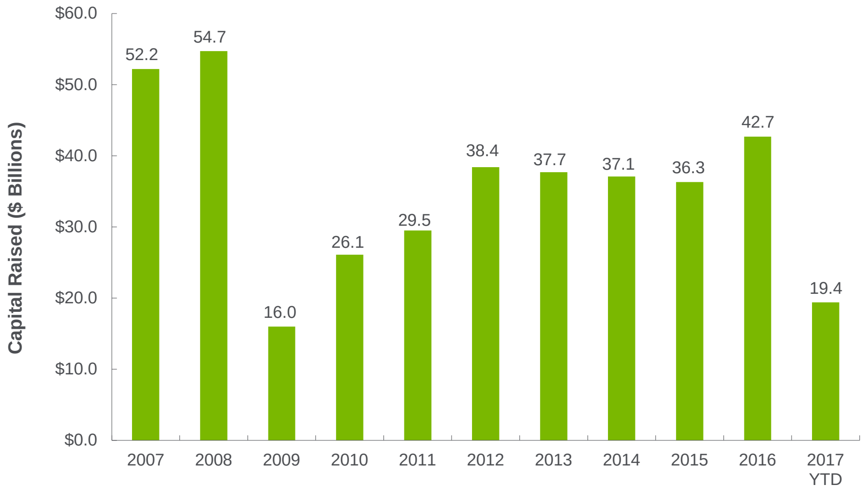
- 10 funds closed on $2.3 billion during the quarter, down from 1Q 2017's total of $3.0 billion raised by 11 funds and the five year quarterly average of $4.7 billion [1].
- Estimated dry powder was $50.0 billion at the end of 2Q 2017, down from $51.6 billion in 1Q 2017 [1].
- Fundraising activity remains robust with an estimated 66 funds in market targeting $14.3 billion of commitments [1].

**Opportunity**

- Funds with the capacity to scale for large sponsored deals

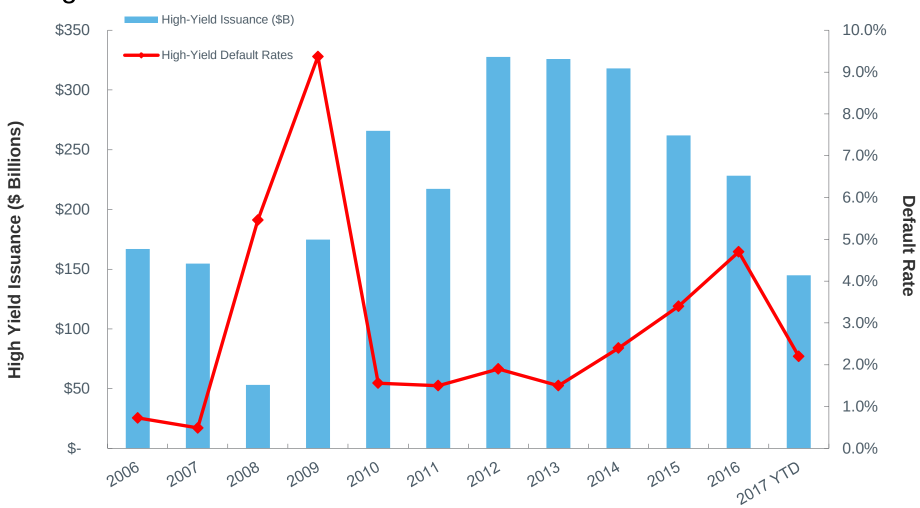
# Distressed Private Markets

## Distressed Debt, Turnaround, & Special Situations Fundraising




Source: Thomson Reuters

## High-Yield Bond Volume vs Default Rates




Source: UBS & Fitch Ratings

**Fundraising**

- During the quarter, $9.6 billion was raised by nine funds compared to $9.8 billion raised by nine funds in 1Q 2017 [1].
  - This was flat compared to the five year quarterly average.
  - Cerberus Institutional Partners VI was the largest partnership raised during the quarter, closing on $4.0 billion.
- Dry powder was estimated at $103.1 billion at the end 2Q 2017, which was up 5.4% from 1Q 2017, but down 8.1% from 2015's record year end level. This remained above the five year quarterly average level of $88.5 billion.
- Roughly 101 funds were in the market at the end of 2Q 2017, seeking an aggregate $76.9 billion in capital commitments [1].
  - Distressed debt managers were targeting the most capital, seeking an aggregate $44.1 billion.
  - 3G Special Situations Fund V was the largest fund in market with a target fund size of $10.0 billion.

**Activity**

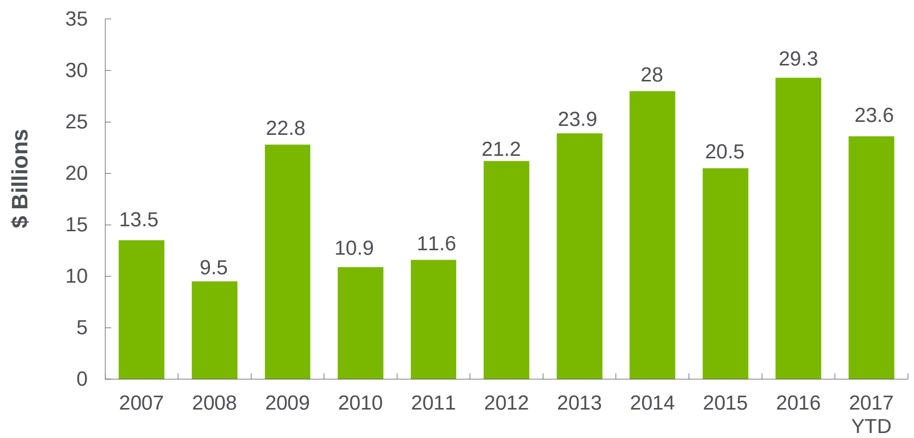
- Distressed debt and bankruptcy restructuring activity totaled $105.9 billion during the first half of 2017, up 28.0% from 1H 2016 [5].
  - U.S. activity accounted for $55.7 billion in 1H 2017 and was up 123.2% from the same period last year [5].
- The LTM U.S. high-yield default rate was 2.2% as of June 2017, which was down from March 2017's LTM rate of 3.9% [6].
- Credit spreads are now modestly expensive, and yields are also low. Expect continued volatility caused by oil and equity market gyrations. The impact of rising interest rates is becoming more and more pertinent, and further positive returns driven by valuations will be limited [4].
- Increasing 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 capable of performing operational turnarounds
- Funds with the flexibility to invest globally

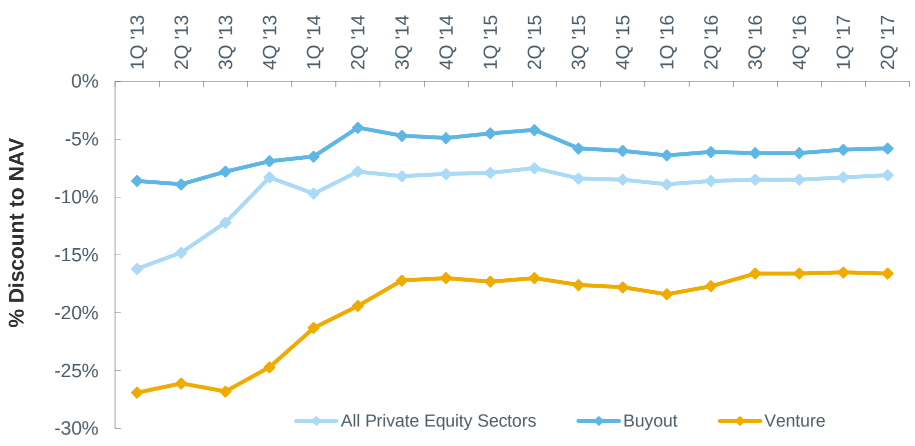
# Secondaries

## Secondary Fundraising




Source: Preqin

## Secondary Pricing




Source: UBS

**Fundraising**

- 10 funds raised $4.2 billion during the second quarter, down from $19.4 billion by nine funds in 1Q 2017 [1].
  - 1H 2017's total capital raised represents 80.5% of 2016's full year total.
  - Hamilton Lane Secondary Fund IV was the largest fund raised during the quarter, closing on $1.9 billion [1].
- At the beginning of 2017, dry powder was estimated at a record $71.0 billion, which was 22.4% above 3Q 2016's prior record level [2]. The top 15 secondary buyers are estimated to command more than 75.0% of the market's capital reserves. A further inflow of dry powder can be expected given that nine of the top 20 purchasers are currently fundraising [2].
- At the end of 2Q 2017, there were an estimated 45 secondary and direct secondary funds in market, targeting approximately $26.8 billion. Goldman Sach's Vintage Fund VII was the largest fund in the market targeting $5.0 billion [1].

**Activity**

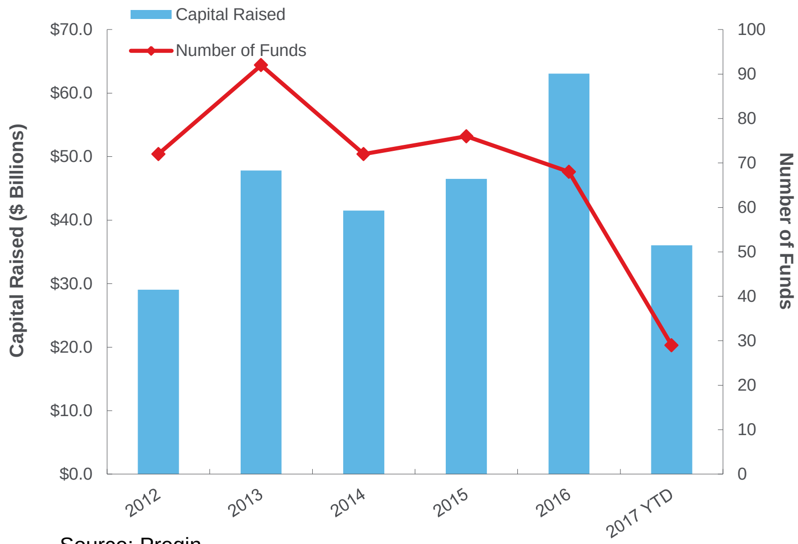
- More than 900 potential buyers and 750 potential sellers of secondary interests have been identified [1].
  - Secondary funds were the most active buyers in 1H 2017, accounting for 78.6% of total purchases [13].
  - Fund of funds managers and public pension funds represent the largest proportion of potential sellers at 13.0% and 12.0%, respectively.
- In 1H 2017, private equity transaction volume totaled $24.3 billion, representing an increase of 58.8% from the level observed during 1H 2016. 71.6% of deal volume was traditional LP positions and the remainder were secondary direct transactions [13].
  - Leveraged buyout funds continued to be the most purchased private equity funds during 1H 2017, representing 79.0% on a capital basis[13].
  - The secondary market for infrastructure interests has shown growth [2].
- The average discount rate for all private equity sectors declined 0.2% quarter-over-quarter to 8.1%. The average buyout pricing discount decreased 0.1% during the year, ending the quarter at 5.8% [2].
- Pricing is expected to remain attractive given the strong competitive market dynamics and the widening supply/demand imbalance driven by the continued growth of dry powder [2].

**Opportunity**

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

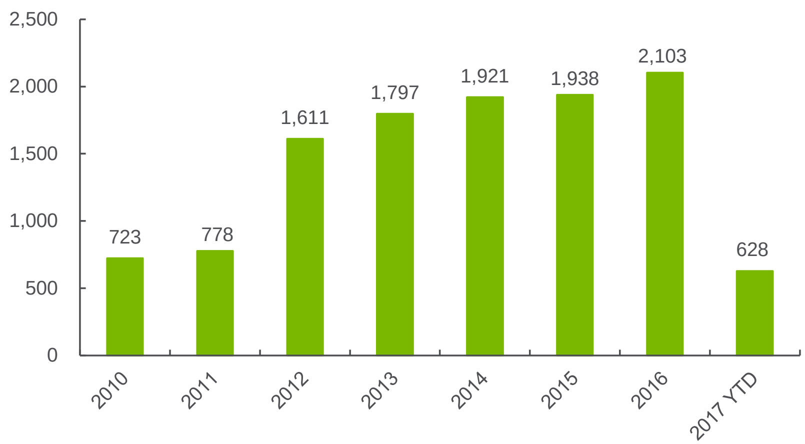
# Infrastructure

## Global Infrastructure Fundraising




Source: Preqin

## Number of Deals Completed




Source: Preqin

**Fundraising**

- $5.3 billion of capital was raised by 11 funds in 2Q 2017 compared to $30.7 billion of capital closed on by 18 partnerships in 1Q 2017 [1].
  - Funds raised during 1H 2017 averaged 106.9% of their target size, which was up from the five year average level of 95.8% [1].
  - iCON Infrastructure Partners IV was the largest fund raised during the quarter, closing on €1.2 billion [1].
- As of the end of 2Q 2017, there were an estimated 171 funds in the market seeking roughly $149.0 billion, up from $102.3 billion sought by 168 managers a quarter ago [1].
  - Funds focused on infrastructure assets in North America were targeting an estimated $75.1 billion in capital, followed by Europe focused funds, which were targeting approximately $39.8 billion [1].
  - Blackstone Infrastructure was the largest fund in the market as of the end of 2Q 2017, targeting $40.0 billion of commitments. If successfully raised, this would be considerably higher than the record $15.8 billion mark set by Global Infrastructure Partners III in 1Q 2017.
- At the end of the quarter, dry powder stood at $150.2 billion, up from 1Q 2017's record total of $147.0 billion [1].
  - Funds with commitments of $2.0 billion or more hold an estimated 47.4% of the dry powder.
  - 44.3% of the dry powder was targeted for North America, compared to 33.1% for Europe and 22.6% for Asia and the rest of the world [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**

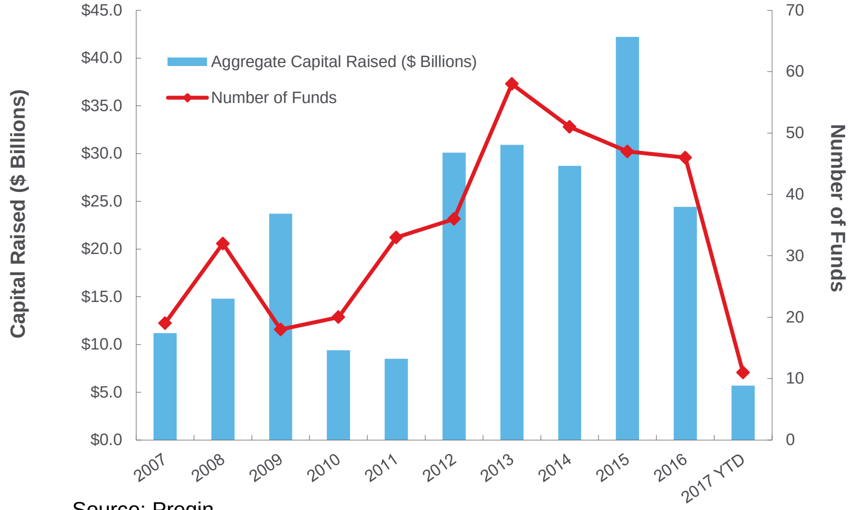
- Infrastructure managers completed 256 deals with an estimated aggregate deal value of $104.0 billion in 2Q 2017 compared to 372 deals totaling $216.9 billion a quarter ago. The average deal value during the quarter was $406.3 million, down compared to 1Q 2017's average of $583.1 million, but above the prior five year average of $374.2 million [1].
  - Europe accounted for 51.2% of the deals in 2Q 2017, while 28.9% and 9.4% of deals were transacted in North America and Asia, respectively [1].
  - Energy was the dominant industry during the quarter with 78.5% of transactions, followed by the transportation sector, which accounted for 10.5% of the quarter's deals [1].

**Opportunity**

- Greenfield infrastructure is less competitive and offers a premium for managers willing to take on construction risk

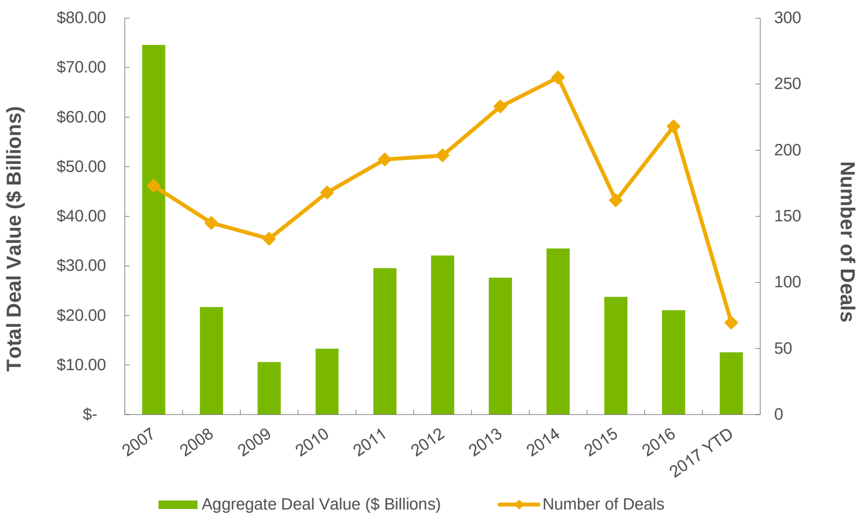
# Natural Resources

## Natural Resources Fundraising




Source: Preqin

## Energy & Utilities Deal Activity




Source: Preqin

Fundraising

- During 2Q 2017, eight funds closed on $4.9 billion compared to three funds totaling $0.8 billion in 1Q 2017 [1].
  - Energy & Minerals Group Fund IV and Denham Oil and Gas Fund accounted for 69.0% of the capital raised during the quarter, closing on $2.4 billion and $1.0 billion, respectively.
- At the end of 2Q 2017, there were roughly 96 funds in the market targeting an estimated $47.6 billion in capital, compared to 102 funds seeking an estimated $54.2 billion in 1Q 2017 [1].
  - Six managers accounted for 49.6% of the total capital being raised.
  - EnCap Energy Capital Fund XI was seeking the most capital with a target fund size of $6.5 billion.
- Dry powder was estimated at $74.0 billion at the end of 2Q 2017, which was up 2.4% from 1Q 2017's level, but remains below the record level of $77.4 billion observed in 3Q 2016 [1].

Activity

- Energy and utilities industry managers completed approximately 70 deals totaling an estimated $12.6 billion through 1H 2017, which represents 59.8% of 2016's full year capital deployment [1].
- Crude oil prices decreased during the quarter.
  - WTI crude oil prices decreased 8.4% during the quarter to $45.18/bbl [11].
  - Brent crude oil prices ended the quarter at $46.37/bbl, down 10.1% from 1Q 2017 [11].
- Natural gas prices (Henry Hub) increased by 3.5% during the second quarter, ending at $2.98 per MMBtu [11].
- A total of 940 crude oil and natural gas rotary rigs were in operation in the U.S. at the end of 1Q 2017, up 14.1% from the prior quarter [15].
  - Crude oil rigs represented 80.4% of the total rigs in operation. 48.9% of the 756 active oil rigs were in the Permian basin.
  - 24.5% and 21.7% of natural gas rigs at the end of 2Q 2017 were operating in the Marcellus and Haynesville basins, respectively.
- The price of iron ore (Tianjin Port) ended the quarter at $57.86 per dry metric ton, down 33.6% 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

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# Appendix B:

# Real Estate Market Update

# U.S. Real Estate Market Update – Q2 2017

The commercial real estate cycle is very mature and nearing the top of its expansionary phase. Highlights from the quarter included:

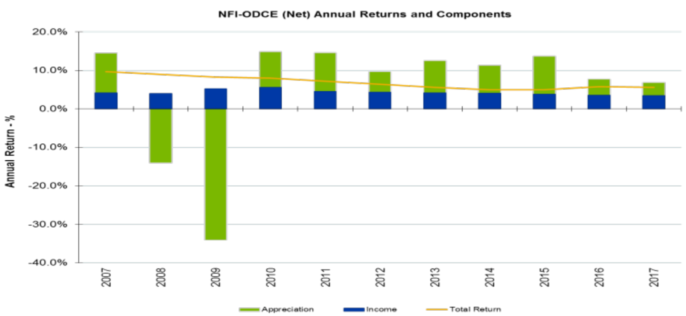
- *Return momentum continued to wane*.
  - The NFI-ODCE returned 1.7% (gross of fees) this quarter, roughly in line with 1Q2017 but 43 bps lower YOY, and 164 bps lower than 2Q2015. Income was the main driver of returns, registering 1.08% versus appreciation at 0.6%. The trailing one-year return of 7.87% for this Core index remained in-line with the sector's long-run average range of 7-9%. Continued moderation of returns is expected.
  - Returns in *non Core* legacy funds continued to perform generally in line with expectations as completed strategies still find eager buyers in the Core investment segment. That said, sales activity is slowing, thus exit risk continued to rise for this segment.
  - U.S. REITs gained 1.5% during the quarter (FTSE NAREIT Equity REIT Index) after a strong June, up 2.2% . While REIT returns were positive (+2.7%) in the first half of 2017, the sector underperformed the broader market as the S&P 500 returned 9.3% during the same time period. REIT returns continued their broad divergence at the sector level as property types with stronger fundamentals (industrial & data centers) outperformed those with weaker fundamentals (retail). U.S. REITs are trading towards the middle of their five-year historical range relative to their underlying property net asset value. Heightened volatility is expected to continue.
- *Fundamentals healthy but moderating*: Vacancy held fairly steady across core property types in second quarter, driven by no significant changes in new supply and demand trends. Industrial continued to outperform on a relative basis across the core property types; with Apartments underperforming. Rent growth, while still healthy in all core property types except Apartments, continued to demonstrate a waning in momentum; with more downside risk than upside potential medium term.
- *Investors hunt for yield*: Transaction volume in second quarter continued to demonstrate an elevated level of pricing uncertainty as a disconnect between buyers' and sellers' expectations remained present. That said, investors still paid handsomely for well located properties in primary markets; helping to keep cap rates sticky and low. Search for yield continued to be a key driver of sales activity across all property types.
- *Portfolio structure important*. Overall, real estate fundamentals and pricing remain at a mature point in the cycle. Given that, it is important to ensure that risk mitigation strategies are incorporated into the portfolio's structure. Preferred equity and debt structures are important investment considerations that can help mitigate medium term cyclical risks.

The following charts provide an update on select current market stats:

Sources: Aon Hewitt, CBRE EA, RCA, NCREIF, Moody's

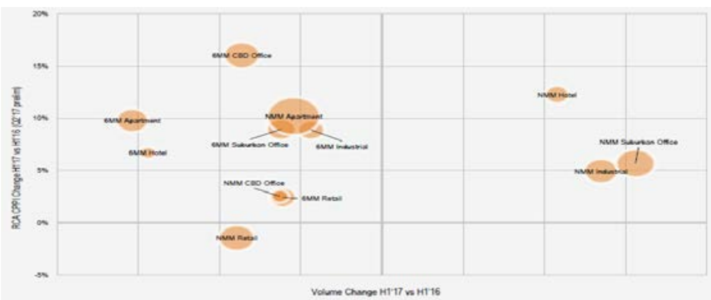
# Current Market Factors

NFI-ODCE (NET) 4-QTR ROLLING RETURNS WITH COMPONENTS
AS OF 6/30/2017 (SOURCE: NCREIF AON HEWITT )



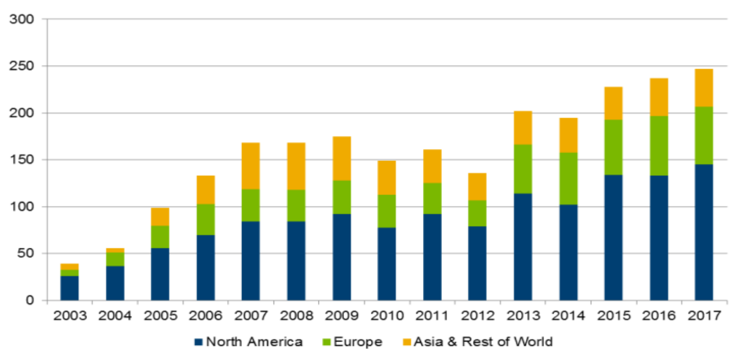

- Sector returns continue to moderate from recent peak rebound rates; and currently stand squarely in the long run range for the asset class.
- Income is now, and will continue to be, the larger driver of the sector's total return. Cap rates remain sticky , however; and while at or near recent lows, there is little expectation of going lower.
- Continued moderation of returns is expected at this mature point in the real estate cycle as growth in appreciation is limited medium term.

MARKET MOMENTUM BY PROPERTY TYPE
AS OF 6/30/2017 (SOURCE: RCA)




- A disconnect between buyers' and sellers' expectations has been evident in sales trends since volume peaked in 4Q2015.
- The more typical relationship between deal volume and pricing has not moved in unison for almost two years now. While the reason varies by property type, in most cases volume has moved lower while prices have moved higher.
- YOY transaction volume for the first half of the 2017 fell in every property type except Industrial and Suburban Office. Declines in Apartments (-17%) and Retail (-16%) led YTD.

DRY POWDER BY REGION
AS OF 6/30/2017 (SOURCE: PREQIN, AON HEWITT)




- Private real estate dry powder now totals $246bn, slightly surpassing its previous peak of $237bn in 2016 and far exceeding the peak of the last recession.
- The majority of the sector's dry powder sits in opportunistic and value add funds, accounting for 41% and 24% of the total respectively.
- Overall, capital flows into U.S. commercial real estate have not been disrupted by on-going global events as investors continue to favor the U.S. at this point in cycle due to the maturity and liquidity of U.S. primary markets.

# U.S. Real Estate Market Outlook

A mature real estate cycle, at a time when the economic outlook is also expected to moderate, presents additional challenges that create the need for closer monitoring and increased attention to new capital deployment.

Factors to consider in 2017 and beyond include:

- The U.S. real estate cycle is very mature; and thus presents more downside risk than upside potential medium term
  - Portfolio construction is critical at this point in the cycle. Appropriate risk mitigation measures should be a staple in all investment portfolios today
  - New investments will likely be required to ride out a cyclical downturn
- Core recovery is fully valued or more. Returns are expected to continue to moderate
  - Returns will be driven by income generation. Important to focus on underwriting assumptions, especially rent growth expectations and exit cap rates, as well as new supply impacts and levels of non core activity
- Non-Core investing is past its cyclical sweet spot
  - Tactical opportunities still exist, though return expectations are lower today than the past few years
  - Preferred equity and debt structures are important to incorporate now to help mitigate medium term cyclical risks
  - Focus on use of leverage and managers' proven ability to execute on expected strategy in down markets
- Fundamentals to more broadly moderate; increased downside volatility in pricing will likely follow
  - Demand is expected to slow across most property types, albeit still modestly in 2017; while new supply is expected to rise slightly
  - Prepare portfolio for downward pressure on rent growth and eventually pricing
- Heightened economic and political uncertainty adds to investment risk
  - Increases risk to real estate investors due to potential changes in interest rates, trade agreements, demand patterns, and the like. Uncertainty creates the potential for higher volatility
  - While current solid sector fundamentals and robust capital flows into the US will help offset some of these risks, real estate will not be immune to global events
  - Important to prepare portfolios for downside volatility

Sources: Aon Hewitt, CBRE EA, RCA, NCREIF, Moody's

# 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

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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PCA PENSION CONSULTING ALLIANCE

# PCA INVESTMENT MARKET RISK METRICS

## Monthly Report

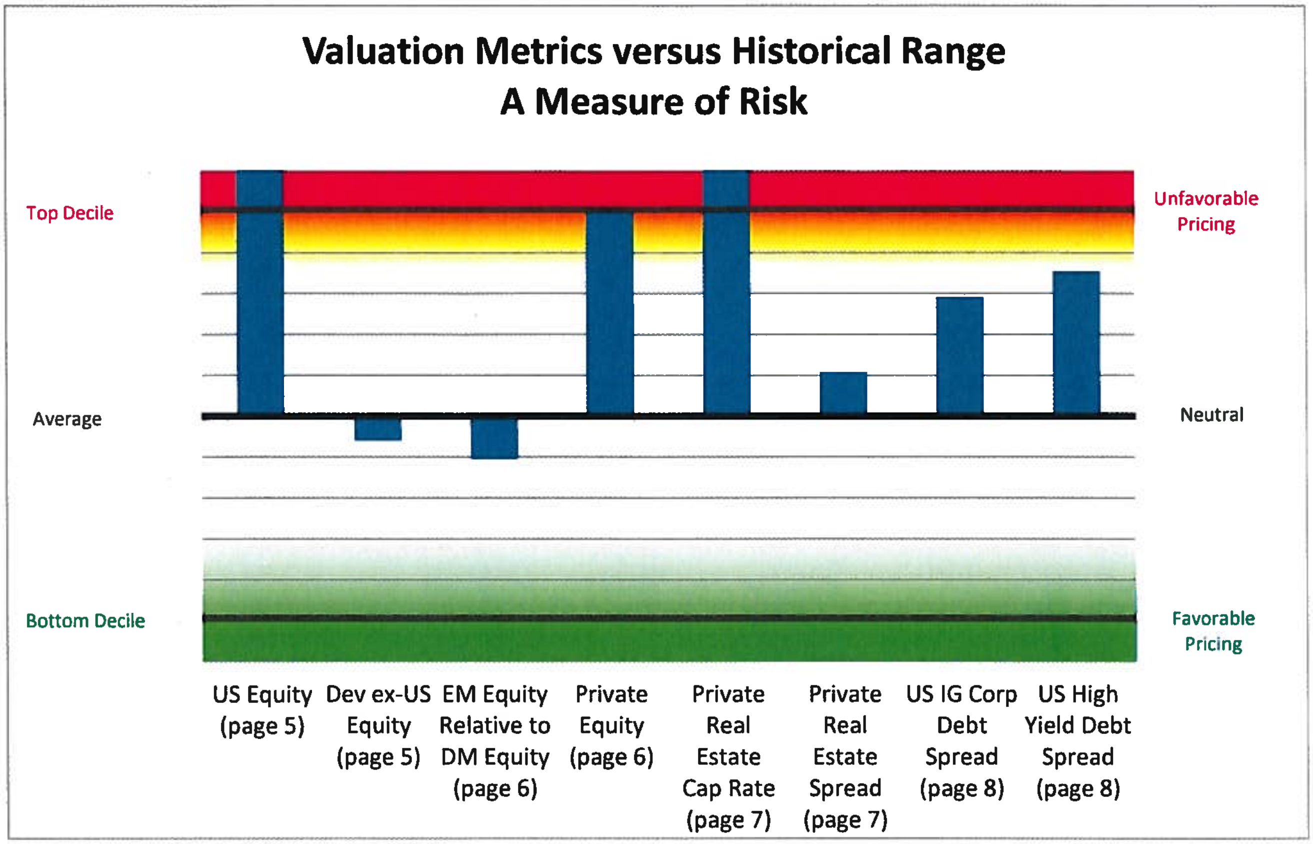
June 2017

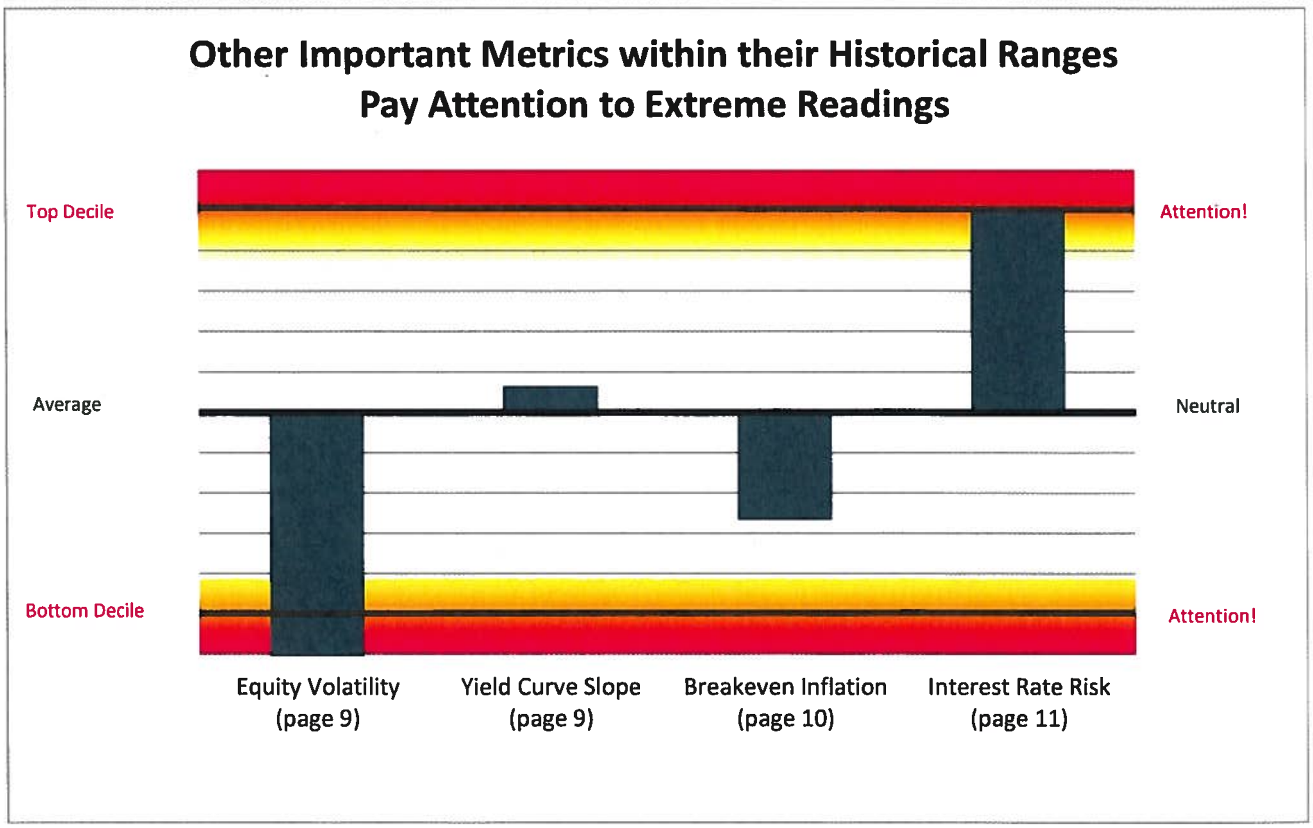
# Takeaways

- Equity volatility measure (VIX) ended the month at extremely low levels, lowest since the global financial crisis, after a brief inter-month spike on political events.
- U.S. public equity valuations (based on normalized price/earnings ratios, page 5) rose and remain at levels only surpassed in the late 1990's tech bubble and 1929.
- Non-U.S. developed and emerging market equity valuations rose as well, but remain historically cheap relative to their own histories, and relative to U.S. levels, even after recent rallies.
- Credit spreads remain tight (risk seeking) in both investment grade and high yield markets, and are tightening further.
- The 10-year Treasury interest rate recently moved back down, leading to spreads between the cap rate on core real estate and the 10-year Treasury rate (a measure of valuation), to widen slightly to average levels.
- The yield curve flattened (short term rates increased and long term rates stayed the same or fell, page 9) in anticipation of further rate increases by the Federal Reserve.
- Inflation indicators remain well behaved. Commodity prices are at decade lows. (page 10) Breakeven inflation levels remain stable, recently moving down below 2% again.
- PCA's sentiment indicator (page 4) remains positive. The sentiment indicator remains solidly **green**.

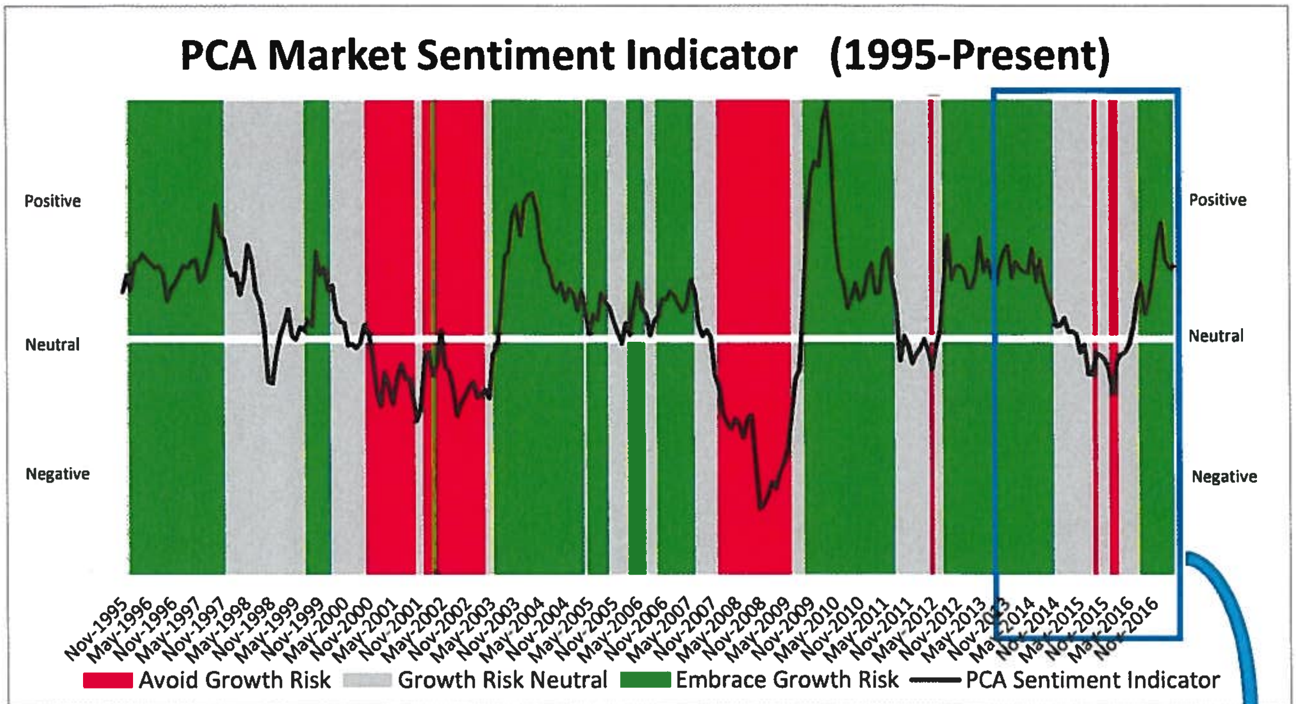
[1]See Appendix for the rationale for selection and calculation methodology used for the risk metrics.

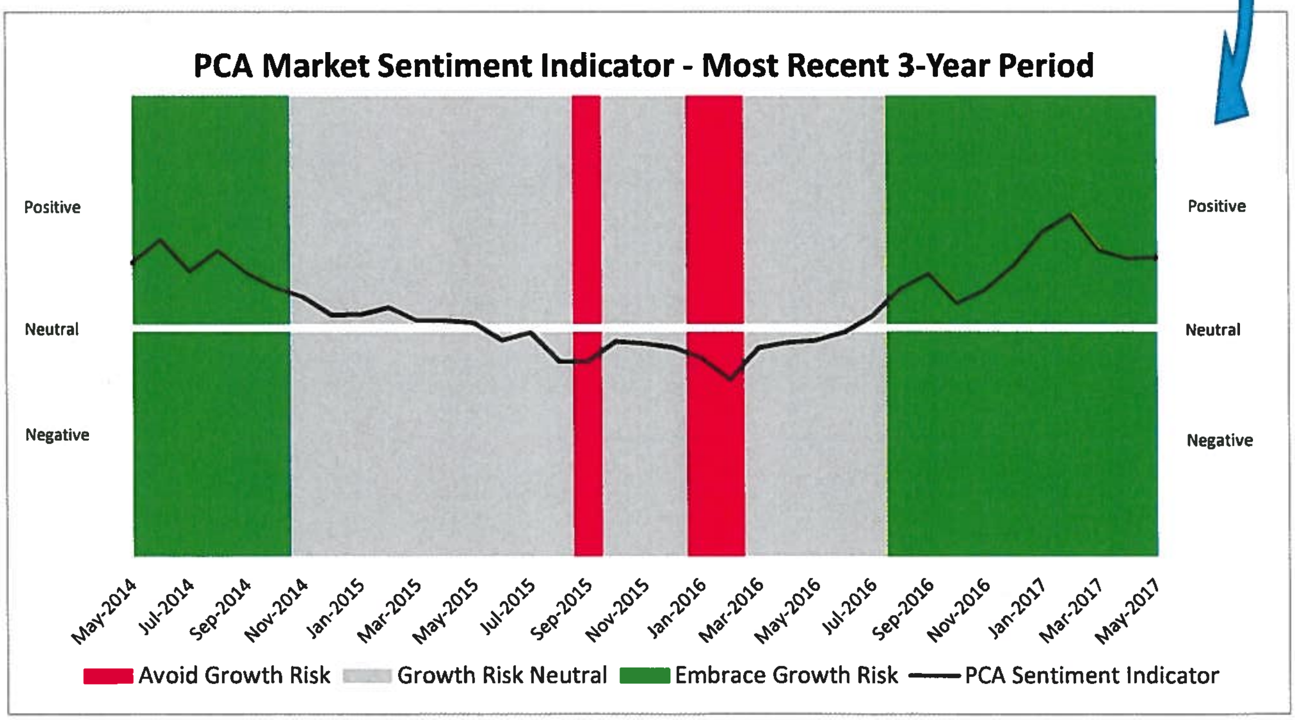
## Risk Overview



## Market Sentiment

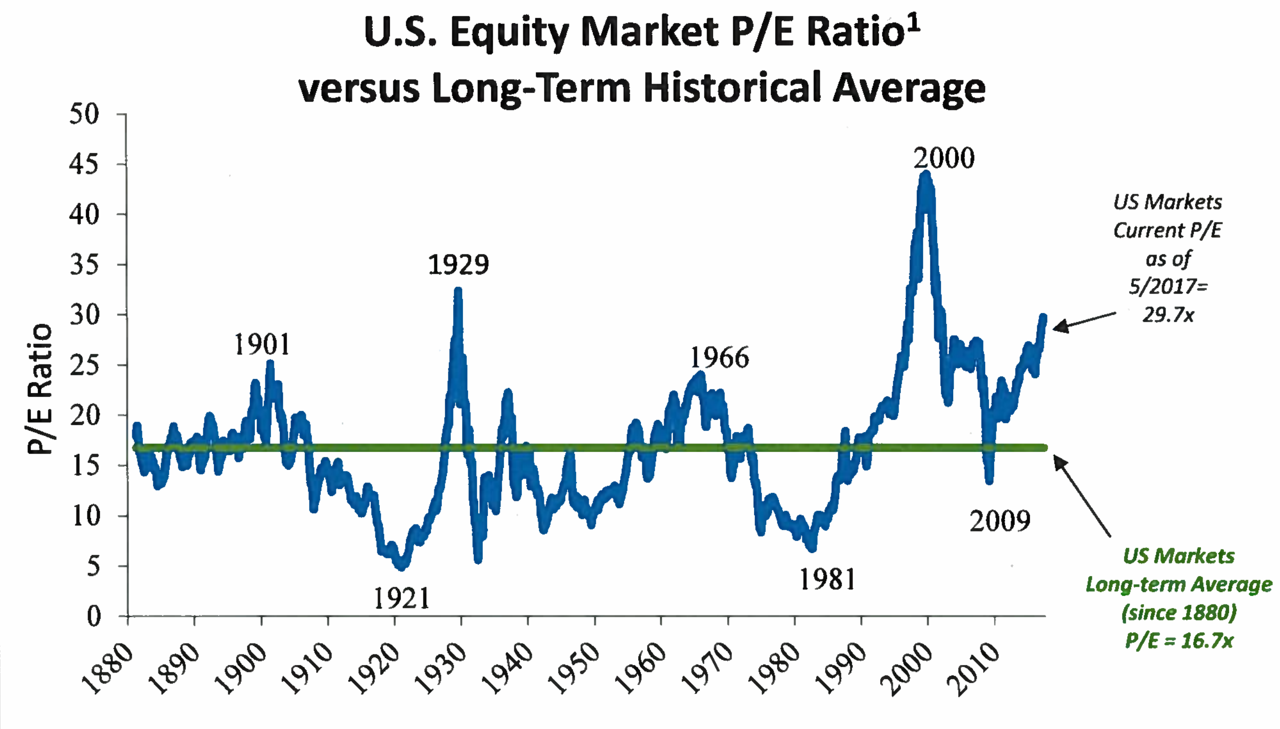



## Information Behind Current Sentiment Reading

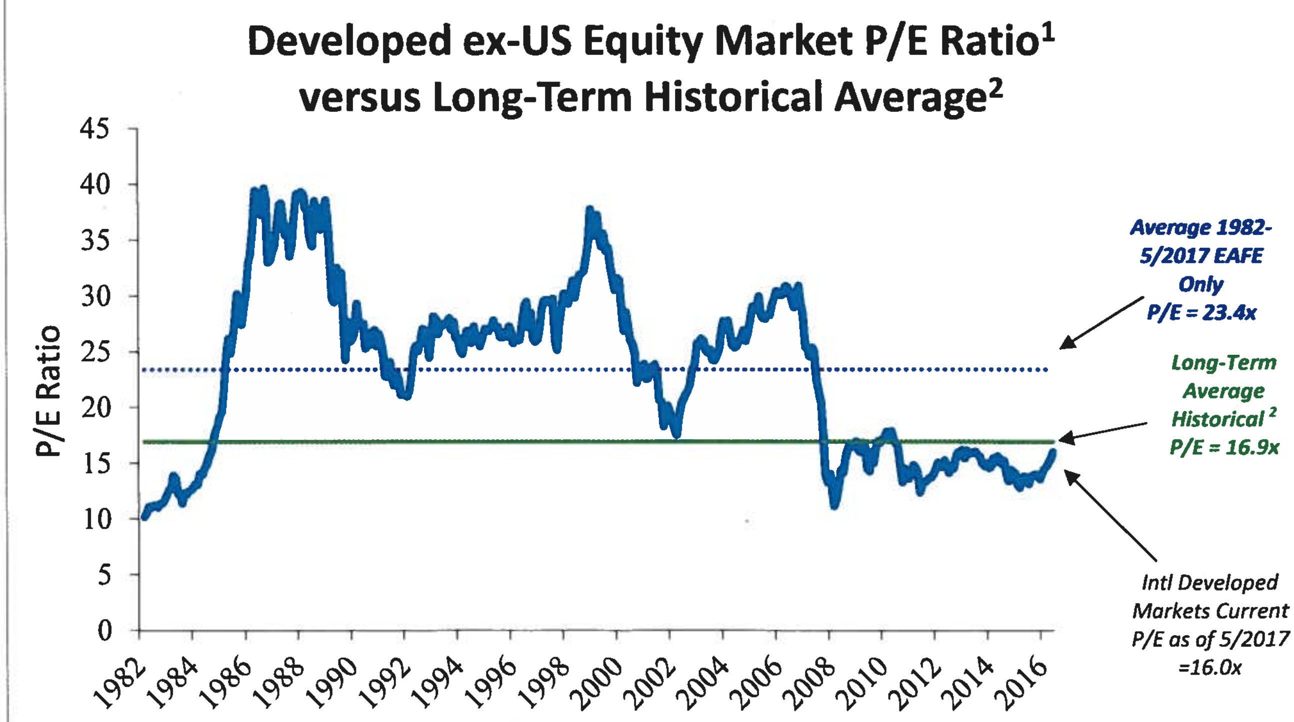
| | | |
|---|---|---|
| Bond Spread Momentum Trailing-Twelve Months | Positive | |
| Equity Return Momentum Trailing-Twelve Months | Positive | |
| Agreement Between Bond Spread and Equity Spread Momentum Measures? | Agree | |
| **Growth Risk Visibility (Current Overall Sentiment)** | **Positive** | |

## Developed Public Equity Markets




[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.

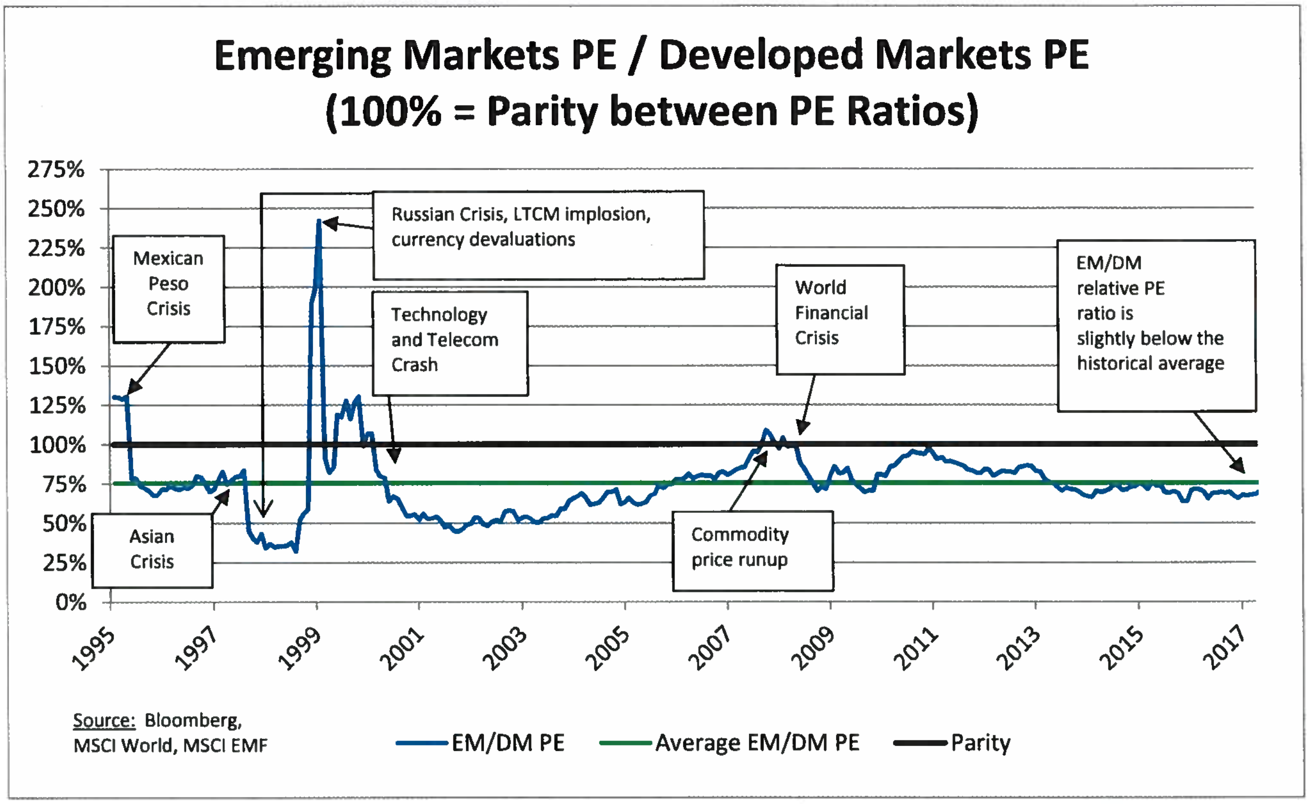
(Please note the difference in time scales)




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

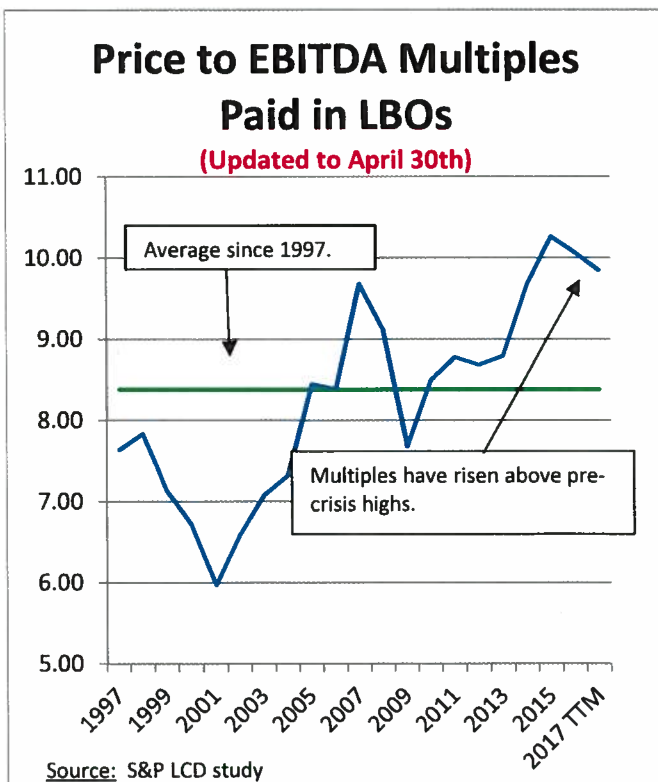
[2] To calculate the LT historical average, from 1881 to 1982 U.S. data is used as developed market proxy. From 1982 to present, actual developed ex-US market data (MSCI EAFE) is used.

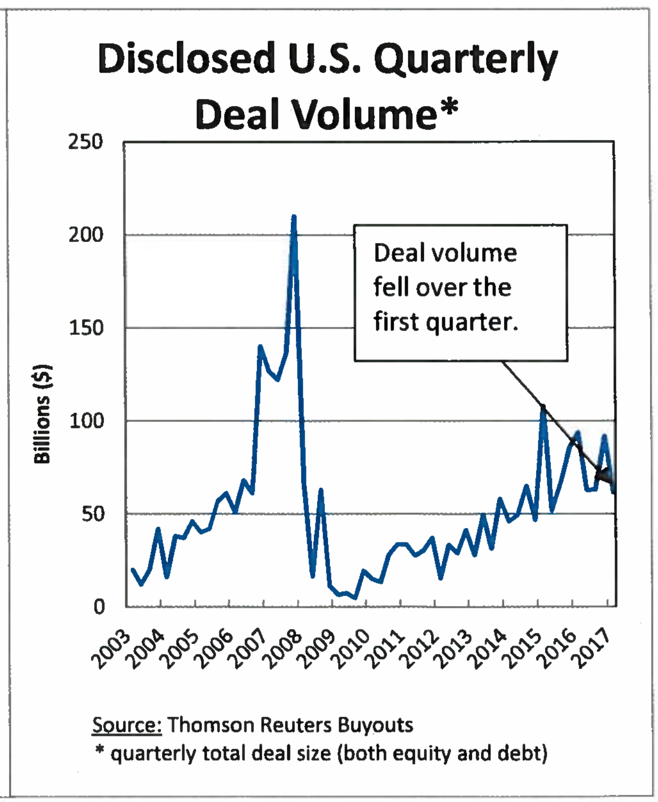
## Emerging Market Public Equity Markets




## US Private Equity

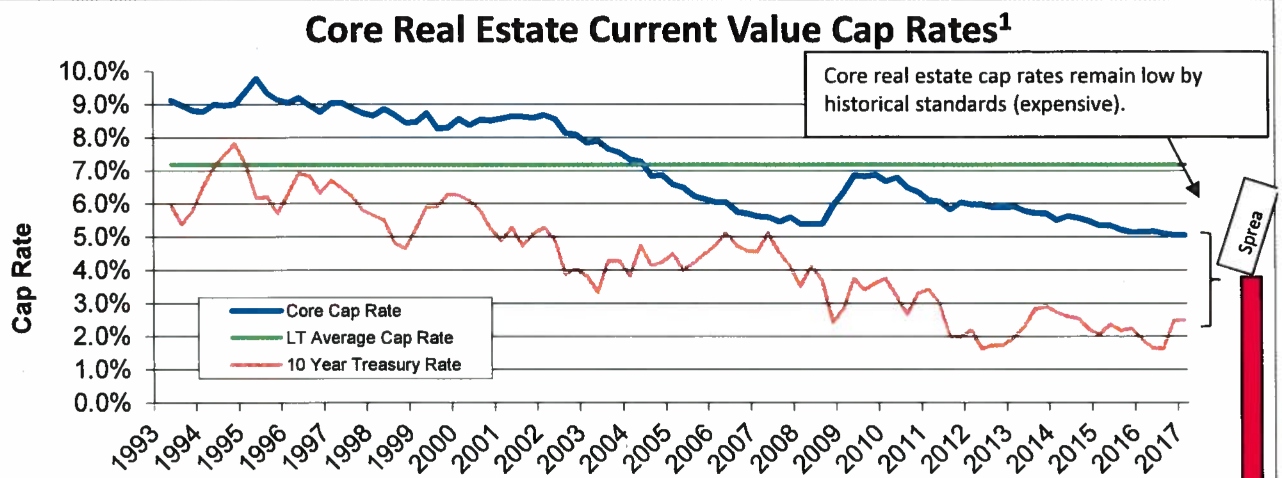
**Quarterly Data, Updated to Mar. 31st.**



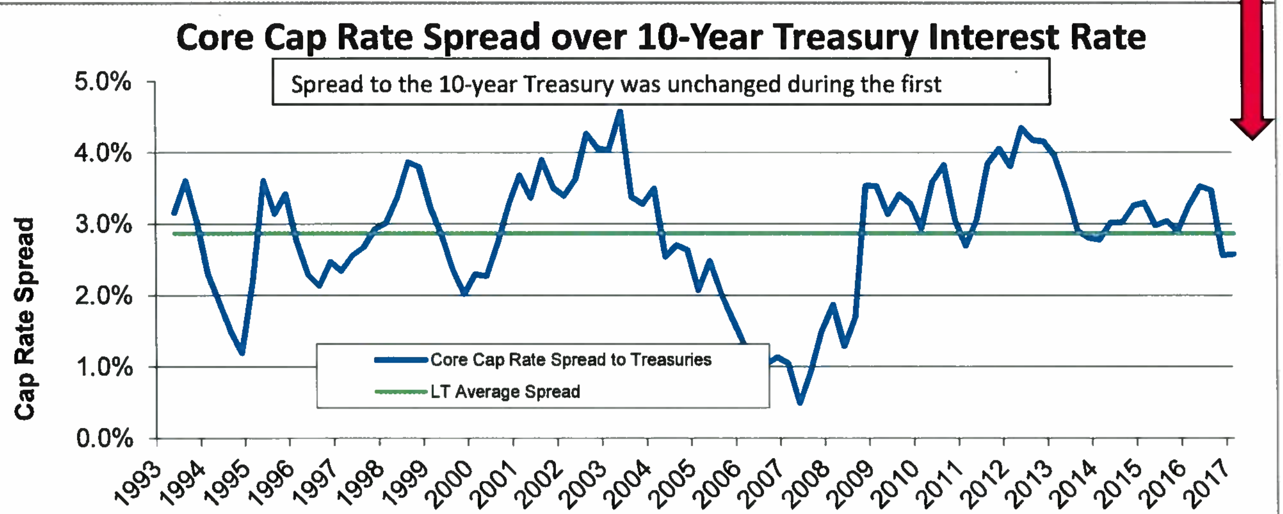



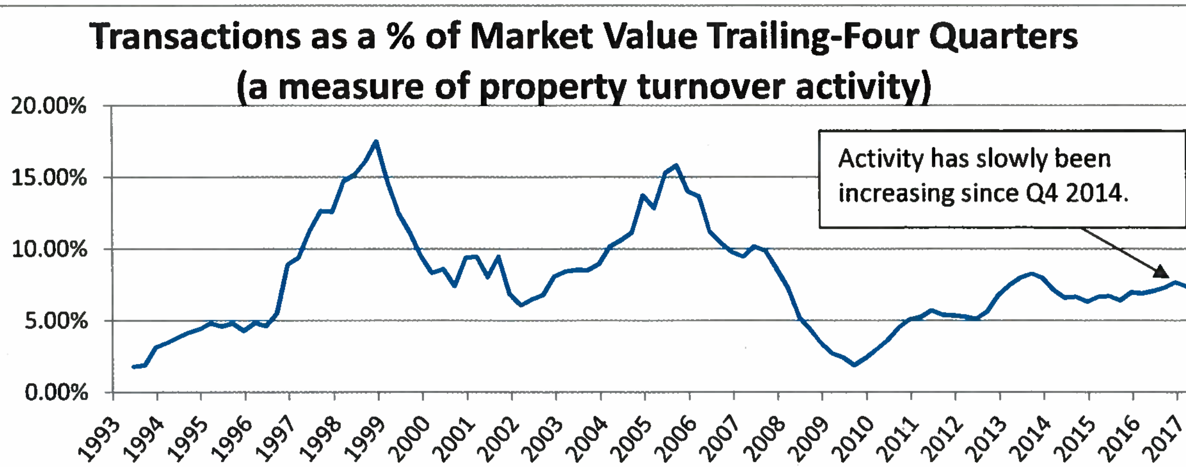
## Private Real Estate Markets

**Quarterly Data, Updated to Mar. 31st.**



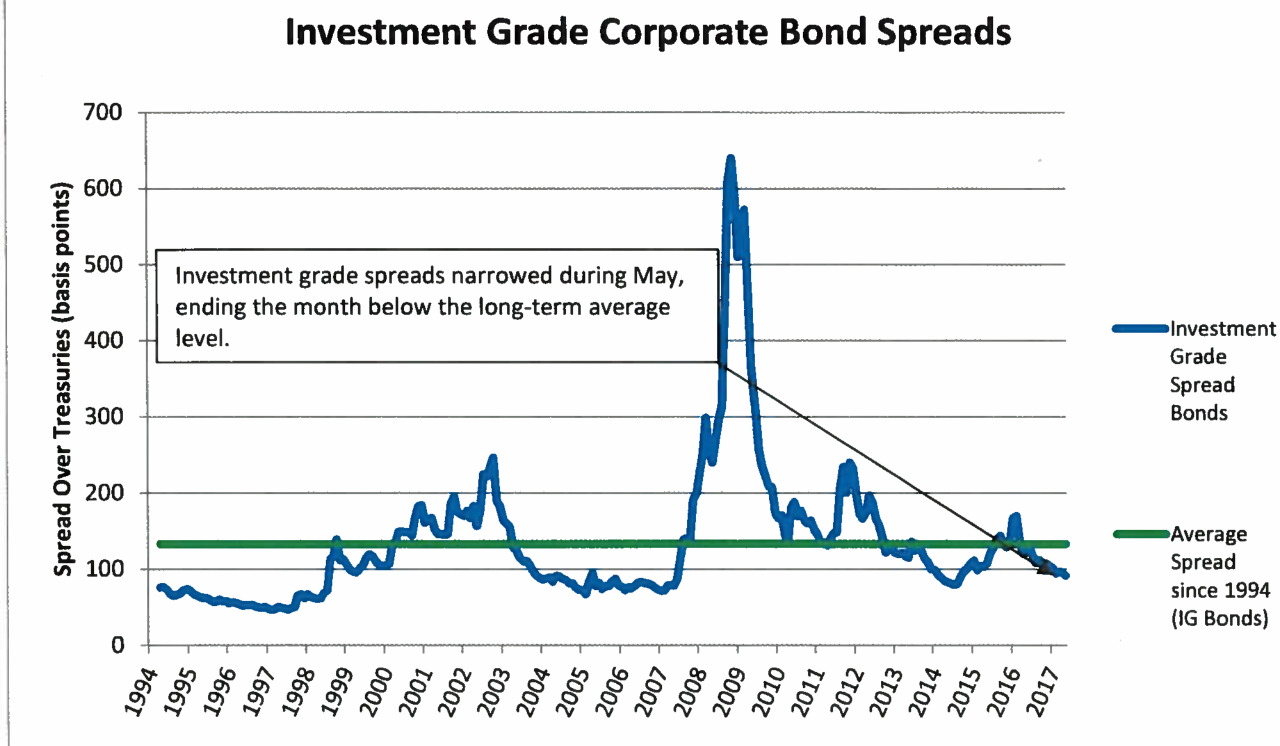

Sources: NCRIEF, www.ustreas.gov [1]A cap rate is the current annual income of the property divided by an estimate of the current value of the property . It is the current yield of the property. Low cap rates indicate high valuations.



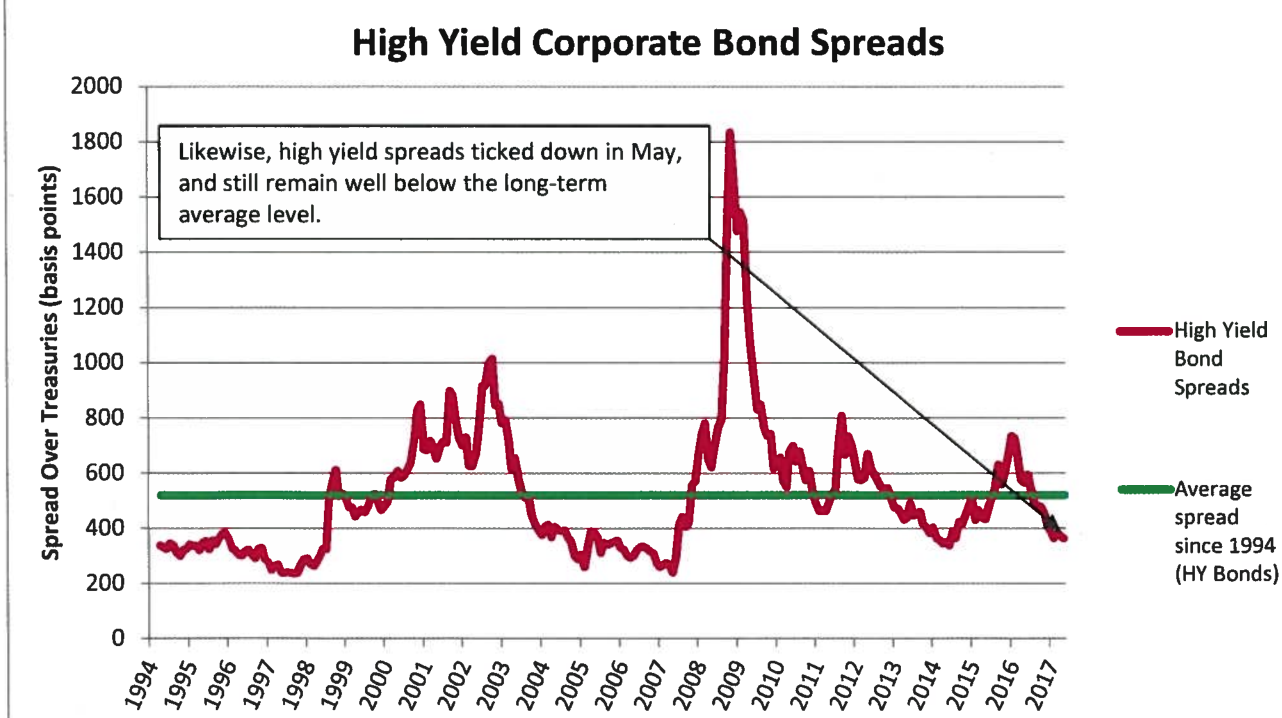




Source: NCREIF, PCA calculation

## Credit Markets US Fixed Income

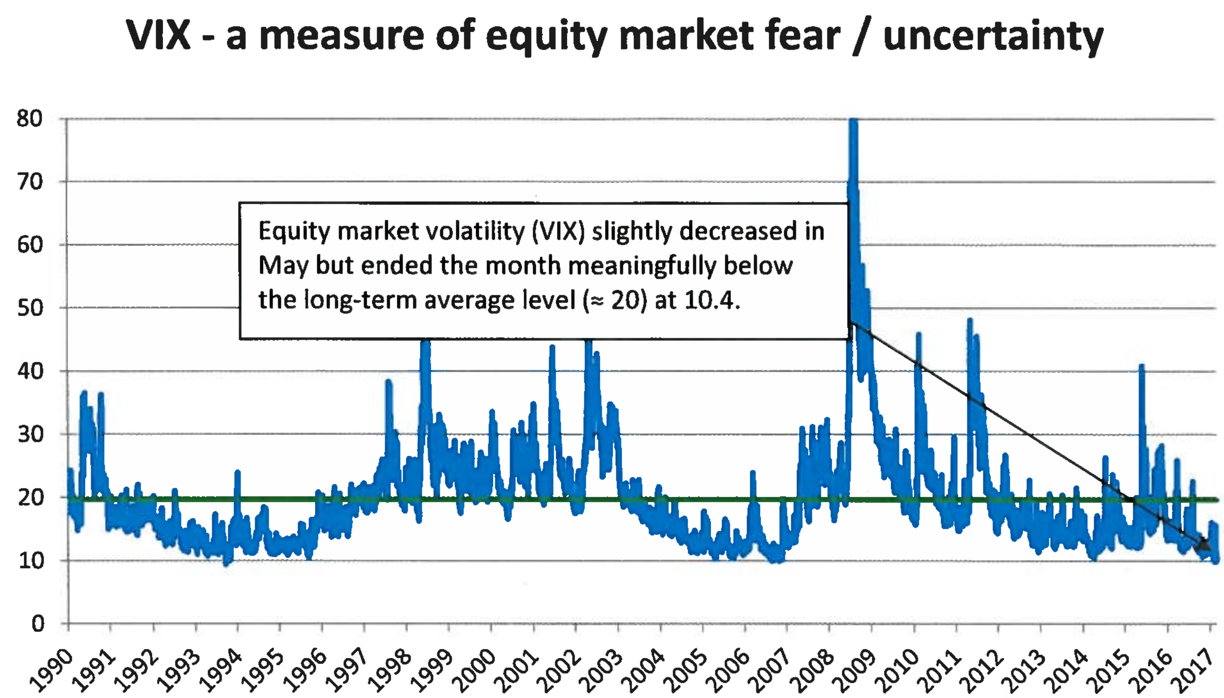



Source: LehmanLive: Barclays Capital US Corporate Investment Grade Index Intermediate Component.

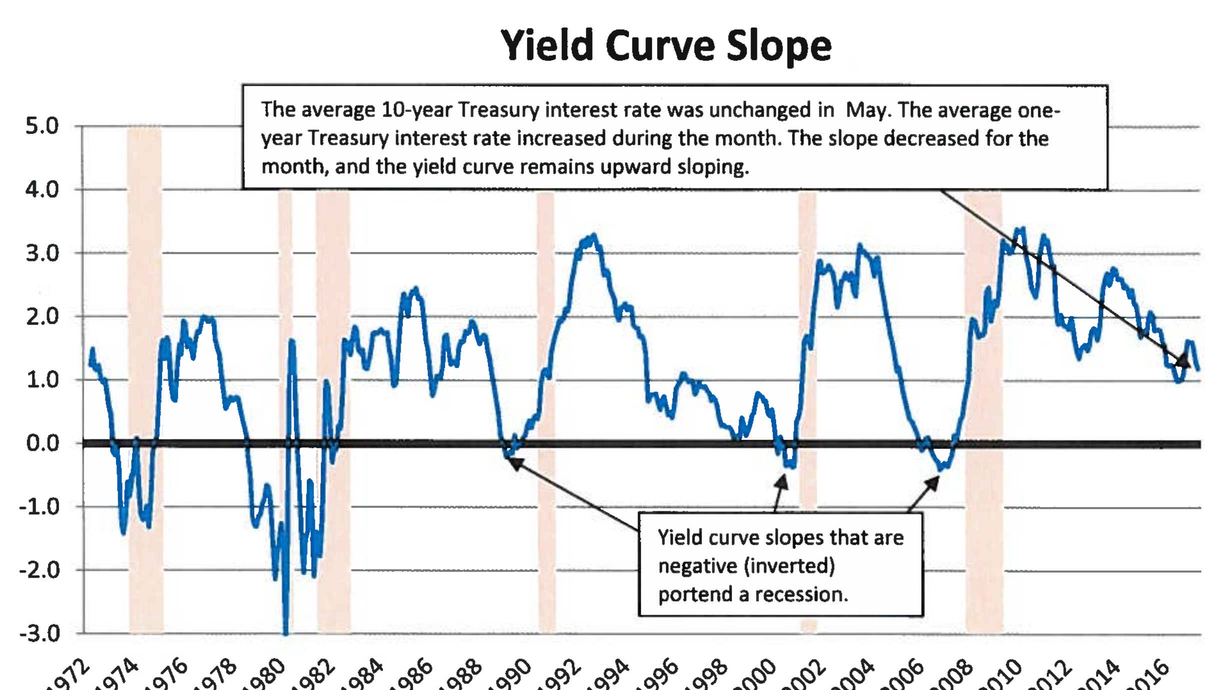



Source: LehmanLive: Barclays Capital U.S. Corporate High Yield Index.

## Other Market Metrics

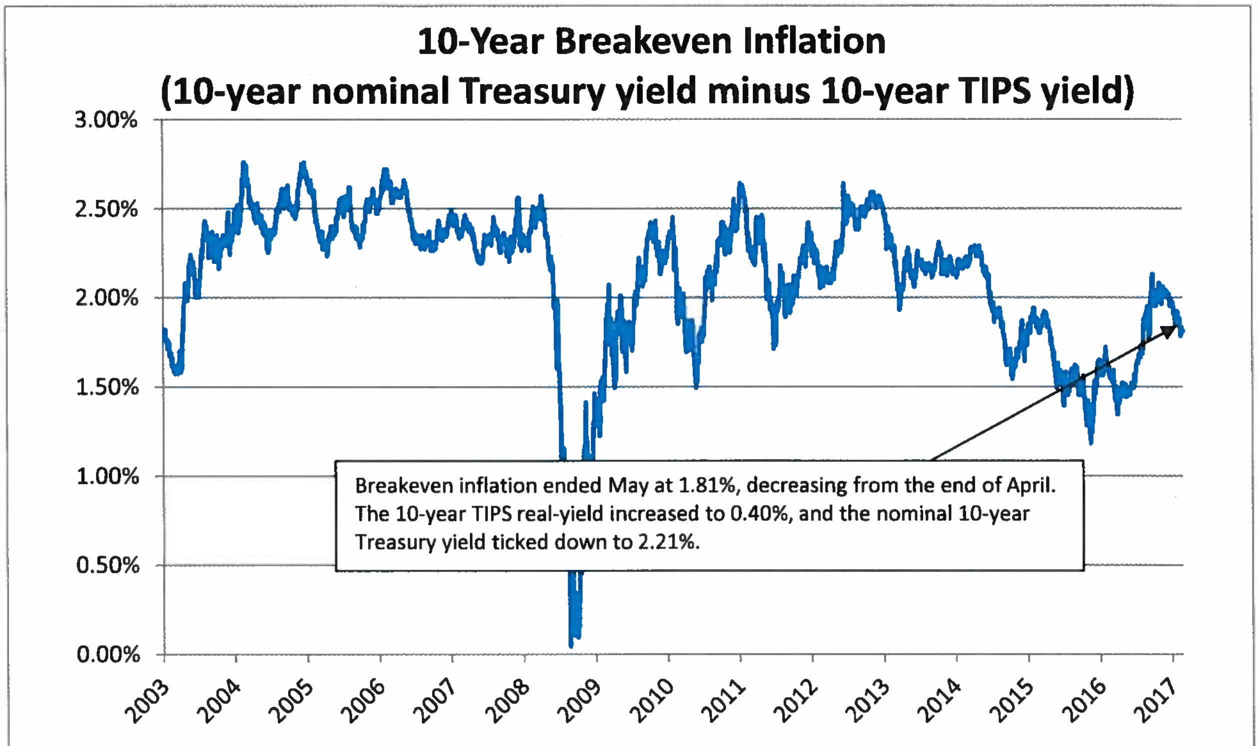



Source: http://www.cboe.com/micro/vix/historical.aspx



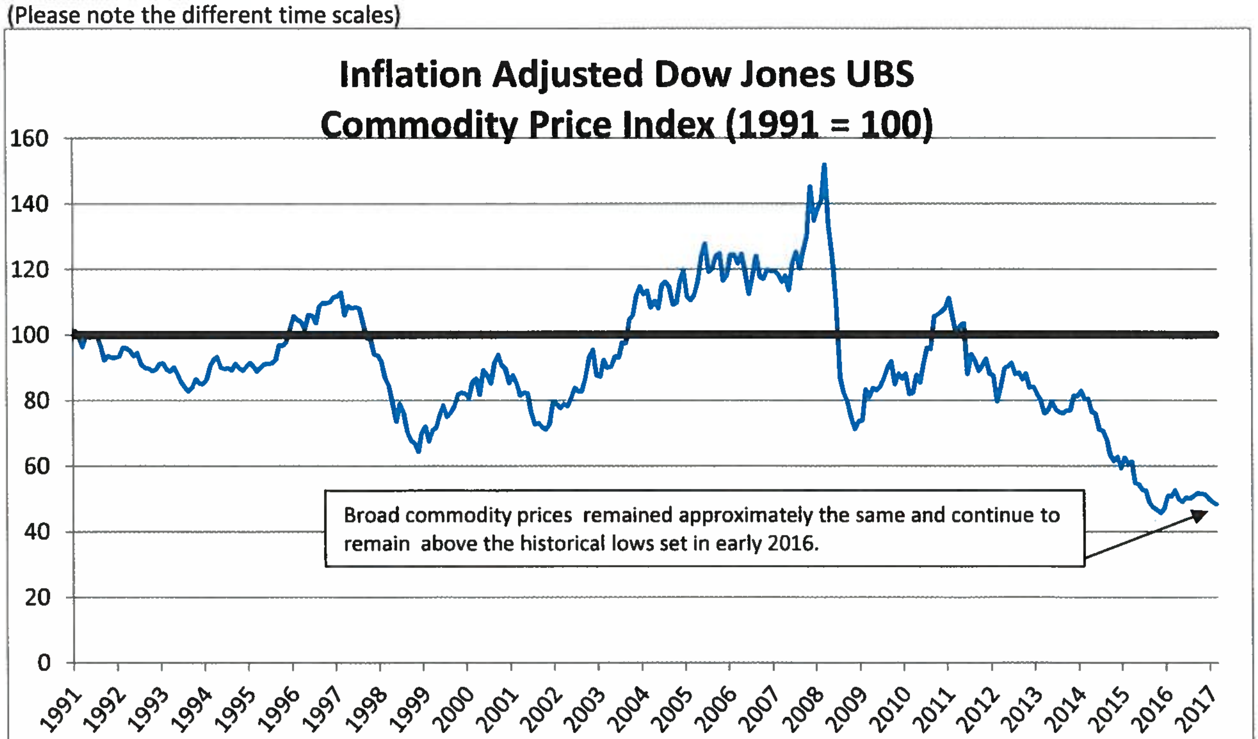

Source: www.ustreas.gov (10 yr treasury yield minus 1 year treasury yield)

## Measures of Inflation Expectations



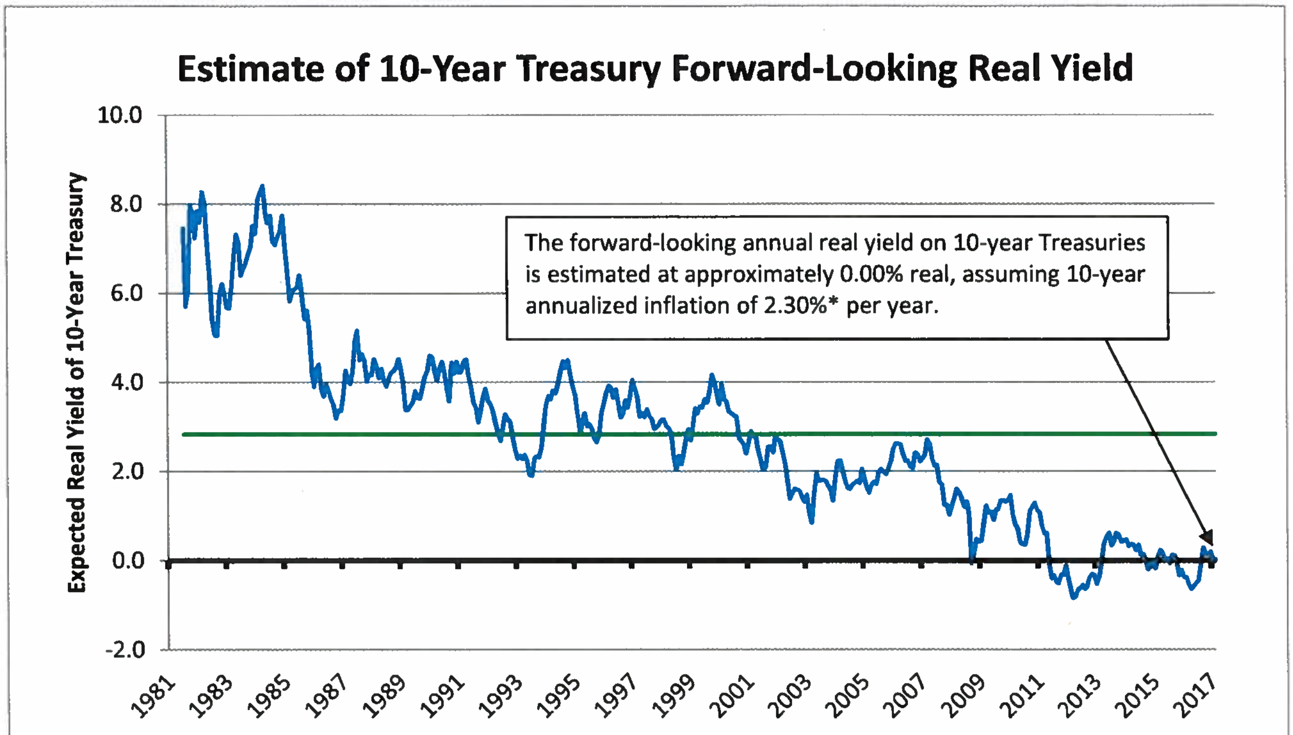

Source: www.ustreas.gov

(Please note the different time scales)

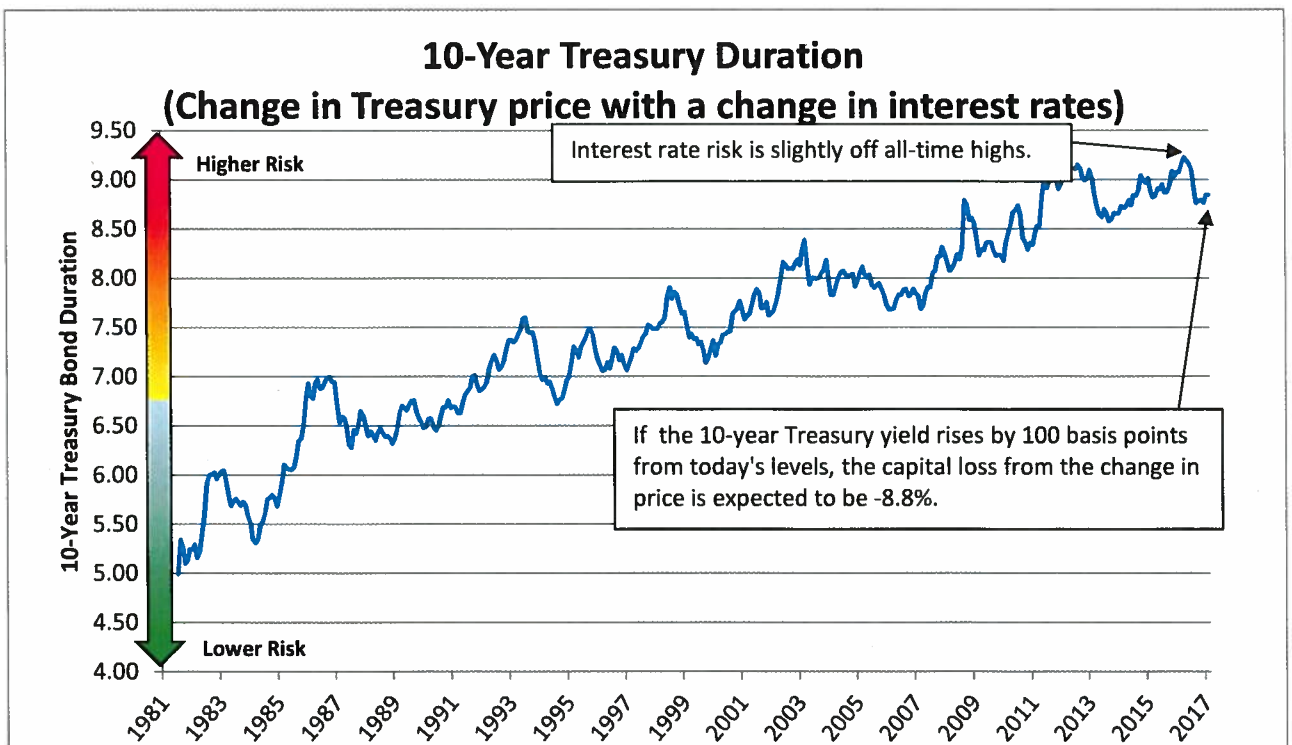



Source: Bloomberg Commodity Index, St. Louis Fed for US CPI all urban consumers.

## 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.**

***John Linder, CFA, CPA***
***Neil Rue, CFA***

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:

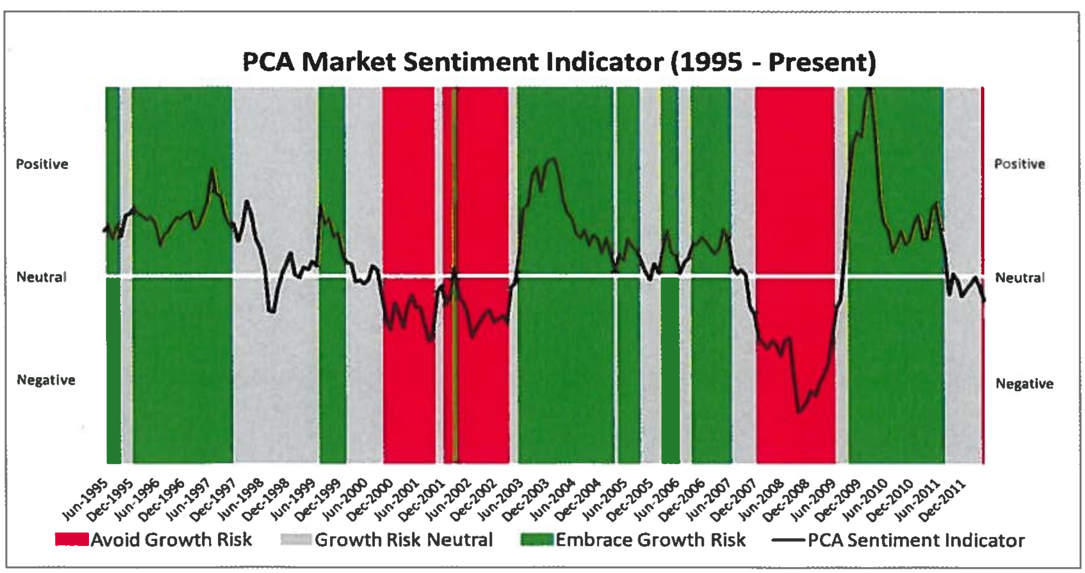
**What is the PCA Market Sentiment Indicator (PMSI)?**

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