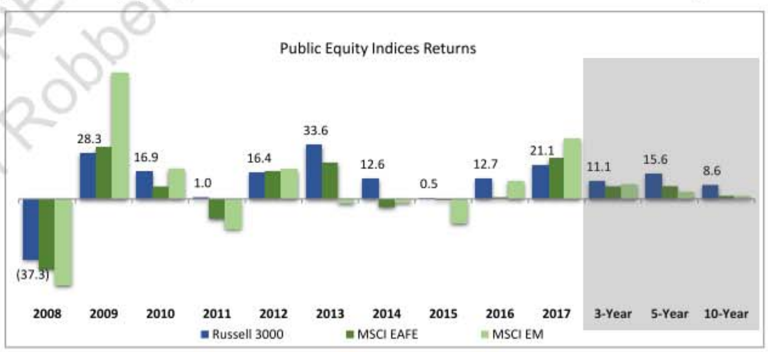
KENTUCKY RETIREMENT SYSTEMS
Investment Division

DATE	June 6, 2018
TO:	Members of the Board of Directors
FROM:	Joe Gilbert, Director of Equity
Subject:	Executive Summary of Public Equity Asset Class Review – 2017 Calendar Year with 1Q18 Performance Updates

The 2017 year was very strong in terms of performance for both domestic and international investors. The first quarter was ushered in by positive expectations surrounding U.S. fiscal policy with the backdrop of broad global economic growth improvement and modest inflation expectations. Elevated domestic markets were supported by the anticipation of pro-growth policies such as tax reform, deregulations amongst some industries, and the possibility of infrastructure spending. The economic environment, primarily in terms of inflation and a strengthening labor market prompted the Federal Open Market Committee to raise rates and signal that future rate hikes would occur during the year. Despite this excitement driving up U.S. equity markets, international markets outperformed largely due to global growth prospects. During the quarter, the U.S. equity market returned nearly 6% (Russell 3000 Index), with large caps and growth names leading the way. International investors experienced quarterly returns of 7% in developed nations and over 11% in the emerging markets. The performance bias to international markets, large caps, and persisted through the calendar year.

In terms of performance, the second quarter was similar to the first quarter, with international markets outperforming the domestic market (+3%). Broadly speaking international developed and emerging markets performed in line with one another (+6%). Global equities continued to rise on the back of improving economic data, particularly regarding inflation, corporate fundamentals, and a continued strengthening in the labor market. This was especially noteworthy as the markets were able to shrug off elevated geopolitical risks, most significantly tensions between the U.S. and North Korea. From prior year, market leadership shifted from bond proxies, those low volatility dividend payers, to securities that demonstrated momentum and growth opportunities. The quarter was marked with performance dispersion amongst sectors and market factors, which created opportunity for stock pickers, and favored those who employed strong growth and cyclical biases.



The third quarter was fairly uneventful, and was much the same as global growth seemed to be in the driver's seat. China's credit rating dropped one position which gave some pause but was easily shook off by market participants. Little came out of the world's central banks, but the U.S. Federal Open Market Committee (FOMC) signaled that a late year hike was likely, but the markets absorbed the news without much reaction. U.S. rates traded down some to 2017 lows on geopolitical issues, but quickly rebounded. Once again, international markets (+6%), led by the emerging countries (+8%), outperformed domestic markets (+5%). However, within the U.S., small caps outpaced their large cap counterparts for the first time during the year.

The final quarter of the calendar year once again saw strong global equity markets due to the continued expectation for synchronized global growth and accommodative central bank polices. U.S. equity markets outpaced their developed international counterparts for the first quarter during the year (+6% vs +4%); however, emerging markets continued their performance dominance posting +7% during the quarter. The quarter was marked by dispersion amongst market caps and styles, with large caps and growth providing outperformance. A modest uptick in inflation caused the 10-year Treasury yield to move up slightly which continued to flatten the curve. The FOMC raised rates for the third time during the year, setting the Federal Funds rate at 1.5%. The improving economy and solid labor market was evidenced for the decision.

Public equity investors experienced a strong year of performance during 2017. The markets maintained a steady climb and never faltered from quarter to quarter. The market was driven at both the macro and micro levels. Anticipation of pro-growth fiscal policies in the U.S. combined with improving global growth seemed to propel markets forward, shrugging off any concerns that might give pause. Opposed to prior year, 2017 was best described as a risk-on market environment, where leadership took root in those securities that promised momentum and growth, rather than those of a defensive, income generating nature. Dispersion in the market space in terms of sector performance and individual earnings responsiveness provided stock pickers an opportunity to outperform passive indices. In general, emerging markets lead the way, followed by developed international markets, and then domestic markets. Large caps outperformed small caps and growth significantly outperformed value.

KRS Portfolios:

Performance Update:
U.S. – 1Q18: -0.7% vs -0.6%; FYTD: 9.9% vs 10.5%; 1YR: 12.8% vs 13.8%; 5YR: 12.3% vs 13.0%
Non-U.S. – 1Q18: 0.2% vs -1.1%; FYTD: 12.9% vs 10.7%; 1YR: 20.0% vs 17.4%; 5YR: 7.3% vs 6.4%
Total Equity – 1Q18: -0.3% vs -0.9%; FYTD: 11.4% vs 10.6%; 1YR: 16.4% vs 15.6%; 5YR: 9.4% vs 9.1%
The total public equity portfolio fell -0.3% during the first quarter of 2018; however, it did provide approximately 60 basis points of downside protection over its benchmark. Stock selection within the Non-U.S. equity portfolio drove relative outperformance. Three of the active mandates not only outperformed their benchmark, but provided positive returns despite the down market. The U.S. portfolio performed relatively in line with its benchmark. Stock selection relative performance was mixed and allocation had little effect on performance. After three quarters of the 2018 fiscal year, the public equity allocation has returned 11.4% versus the 10.6% of its benchmark.

For the calendar year ending December 31, 2017, both the Pension and Insurance KRS Total Public Equity portfolios posted strong positive absolute performance; however, failed to produce positive relative performance. The Pension portfolio posted a return of 24.2% versus 24.7% for the benchmark while the Insurance portfolio gained 24.2% versus 24.7%. Relative performance was driven primarily by manager outperformance in the Non-U.S. Equity asset class (+100bps); combined with a tilt towards international equities which outperformed the U.S. markets by approximately 10% during the period. Unfortunately, these contributors were not able to offset the detractors. The KRS U.S. portfolio trailed its benchmark by approximately 1.8%. To a degree, weak stock selection would appear to be the reason for the relative underperformance; however, closer examination would point to allocation tilts within the asset class were the primarily reason. The U.S. portfolio leans towards value and tilts smaller in terms of market capitalization. During the period value trailed growth by over 16%, and small caps underperformed their large cap counterpart by approximately 7%. In the context of the greater KRS investment portfolios, the Pension Fund benefitted from its overweight to international equities, while the Insurance Fund was aided by its overweight to both U.S. and international equities as these were the best performing asset classes during the period. Over the longer 5-year term, both funds have outperformed the return of their associated benchmarks; with absolute performance of 11.1% annualized. Net performance is summarized in the following table:

Public Equity Performance Review (Returns are Net) – 12/31/17

		1 Year	3 Year	5 Year

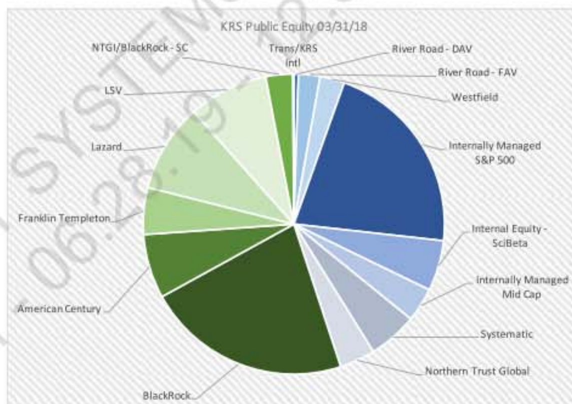
	% Fund	KRS	Index	KRS	Index	KRS	Index
Pension							
U.S. Equity	23.6%	19.3%	21.1%	10.5%	11.1%	14.8%	15.6%
Non-U.S Equity	24.6%	29.3%	28.3%	9.1%	8.4%	8.1%	7.4%
Total Equity	48.2%	24.2%	24.7%	9.5%	9.4%	10.9%	10.7%
Insurance							
U.S. Equity	24.7%	19.3%	21.1%	10.8%	11.1%	15.0%	15.6%
Non-U.S Equity	25.7%	29.2%	28.3%	9.1%	8.4%	7.9%	7.4%
Total Equity	50.4%	24.2%	24.7%	9.7%	9.5%	11.0%	10.7%

 # KRS asset allocation changed as of July 12, 2017 - Pension & Insurance: 17.5% U.S., 17.5% Non-U.S. Prior asset allocation was effective January 1, 2016 - Pension: 25.6% U.S., 25.2% Non-U.S. & Insurance: 26.5% U.S., 26.5% Non-U.S.
Note: Due to the significant shift in allocation, this change will take place over approximately four quarters.

As of December 31, 2017, the Total Public Equity portfolios were valued at $5.95 billion and $2.56 billion for the Pension and Insurance Funds, respectively. Assets were distributed across 10 different asset managers (including KRS staff) and invested in 14 different strategies as shown below.

KENTUCKY RETIREMENT SYSTEMS

As of: 03/31/18	PENSION		INSURANCE	
	MV	%	MV	%
U.S. Equity				
River Road - DAV	27.18	0.49	12.08	0.50
River Road - FAV	127.64	2.31	56.06	2.34
Westfield	145.00	2.63	64.03	2.67
Internally Managed S&P500	1,176.88	21.34	516.26	21.52
Internal Equity - SciBeta	300.38	5.45	135.43	5.65
Internally Managed Mid Cap	201.97	3.66	92.93	3.87
Systematic	291.04	5.28	127.32	5.31
Northern Trust Global	209.86	3.81	90.73	3.78
	$2,479.95	44.97	**$1,094.84**	45.64
	Target	50.00	Target	50.00
Non-U.S. Equity				
BlackRock, Inc	1,213.32	22.00	525.71	21.92
American Century	381.97	6.93	158.88	6.62
Franklin Templeton	278.18	5.04	119.36	4.98
Lazard	524.10	9.50	221.83	9.25
LSV	472.19	8.56	203.62	8.49
Northern Trust Global - SC	159.59	2.89	-	0.00
BlackRock, Inc - SC	-	0.00	72.81	3.04
Transition/KRS Intl	5.72	0.10	1.67	0.07
	$3,035.07	55.03	**$1,303.88**	54.36
	Target	50.00	Target	50.00
Total Public Equity	**$5,515.02**		**$2,398.71**	



The 2014 and 2016 calendar years were marked with significant portfolio structural changes both to the Non-U.S. and U.S. equity portfolios, respectively. The Non-U.S. portfolio was changed to a core-satellite structure that involved terminating a few managers, hiring four external concentrated mandates, and resizing remaining positions. The U.S. portfolio involved exiting three external positions, hiring a new external concentrated strategy, and funding a new core internal portfolio. For 2017, while the portfolios did not experience the same type of wholesale manager/strategy changes of recent years, they underwent several reallocations within the context of the broader KRS investment portfolio.

- Primary actionable activity was driven in response to a newly approved asset allocation by the Investment Committee that called for a reduction in public equities in favor of reallocating funds into credit strategies.
    - In March 2017, staff reduced public equities by 4% in order to rebalance the total portfolio towards target after public equities had experienced an especially strong upward trend since the 4th quarter of 2016. The reduction consisted of:
        - Pension: $330m from U.S. Equity across five mandates (27.3% pre > 24.6% post)
        - Pension: $155m from Non-U.S Equity across 4 mandates (25.8% pre > 25.2% post)

  - Insurance: $145m from U.S. Equity across 4 mandates (29.5% pre > 26.2% post)
  - Insurance: $180m from Non-U.S. Equity across 3 mandates (26.4% pre > 26.4% post)
- In September 2017, staff conducted a 4% reduction as part of the effort to transition the portfolio. The reduction consisted of:
  - Pension: $178m from U.S. Equity including eight mandates (24.0% pre > 22.8% post)
  - Pension: $290m from Non-U.S Equity across 6 mandates (26.1% pre > 24.3% post)
  - Insurance: $76m from U.S. Equity including 6 mandates (25.5% pre > 24.0% post)
  - Insurance: $115m from Non-U.S. Equity across 3 mandates (27.4% pre > 25.4% post)

- An additional U.S. Equity rebalance took place in January 2017, which did not involve resizing the allocation within the context of the entire investment portfolio, but the strategy mix within the asset class itself.
  - The rebalance was consistent with the plan to shift investment dollars away from the more broadly diversified River Road Asset Management Dividend All Cap Value mandate to the more concentrated River Road Asset Management Focused Absolute Value strategy. Also, some funds were reallocated to the Westfield Capital Management All Cap Growth strategy, and the Internally Managed Scientific Beta mandate. The rebalance amounted to $45 million on the pension side and $25 million on the insurance side.
- Staff executed one cross trade during the calendar year. These types of trades do not occur very often but can be very beneficial for the plans involved. For a cross trade to occur, the plans involved must have offsetting relative positions versus their respective approved target allocations. In other words, the act of executing the cross trade is mutually beneficial in terms of rebalancing the plans involved back towards their target allocations for the involved asset classes. These trades are cost saving versus traditional trades in that entry into the market is not necessary to fulfill the trade. This allows the participating plans to avoid explicit commission costs and the implicit costs of market movement that takes places under normal trading conditions.
- Staff renegotiated KRS fees associated with its active international equity management. This was done in concert with investment management agreement extensions in order to maintain fee levels in terms of the effective cost of management (in basis points terms) despite losing scale pricing power as the required equity reduction occurs to adhere to new asset allocation.
- Staff participated in several smaller rebalance trades throughout the fiscal year. These trades had specific goals, rather than just serving as an exposure rebalance. These goals include contributions to investment, cash raises, or possibly any combination of those across plans.

Looking forward, staff expects to begin and continue several projects within the public equity portfolios:

- Staff and consultant have had preliminary discussions regarding the structure of both the U.S. and Non-U.S. equity portfolios.
  - These discussions will focus on whether the portfolios should be structured to evoke strategic views or tilts towards specific regions, factors, styles, and market caps.
  - As part of this structure debate, staff and consultant will evaluate the use of passive versus active strategies and the most appropriate spaces within the context of public equity.
  - Staff and consultant will review current mandates to determine if those already in the portfolio make sense in the context of a new structure and if the sizing of those deemed appropriate are correct.
  - The potential for new strategies will be explored, for instance, the potential of introducing minimal/managed volatility strategies for those plans that are less healthy who may want equity exposure with better downside protection.
- Staff will continue to work with the Chief Investment Officer, Wilshire, and other staff members to implement any necessary portfolio changes, rebalance the portfolios, and meet required cash needs.

Manager Summaries:

<u>*River Road Asset Management*</u>

River Road Asset Management – Dividend All Cap Value Strategy:

Performance Update: 1Q18: -3.3% vs -2.8%; FYTD: 2.9% vs 5.5%; 1YR: 3.1% vs 6.8%; 5YR: 9.6% vs 10.7%
The dividend bias within the portfolio strategy hampered relative performance. Higher yielding quintile stocks, which the strategy overweights, were the biggest market losers during the first quarter of 2018 (top two quintiles were down over -9%). The portfolio underweights the lower yielding quintile stocks (4.5% portfolio exposure versus 39.4% index exposure) which held up much better during the period, and fell just 27 basis points.

River Road Asset Management manages dividend based U.S. All Cap Equity portfolios for both the Pension and Insurance Funds of Kentucky Retirement. The firm, located in Louisville, KY, has managed domestic equity assets for KRS since June 2011. The Dividend All Cap Value (DAV) portfolio is co-managed by Henry Sanders and Thomas Forsha, who have both been with the firm since its inception in 2005. The firm employs an Absolute Value philosophy in management of all of its products that it believes incorporates the most proven and enduring principals of value investing. The philosophy follows four tenets: focus on good companies trading at compelling prices; bottom-up portfolio construction; a focus on less efficient areas of the market; and risk aversion. In sticking with these disciplines, the DAV team attempts to build a portfolio consisting of names that carry a minimum of 2% dividend yield. The strategy utilizes both systematic and dynamic research to develop an investible universe, which is then subjected to fundamental analysis conducted by the team's research analysts. Top-down sector factors are a secondary analysis in the construction process, with the team seeking to create a portfolio that exhibits "dynamic" diversification, across size, sector, structure, and sovereignty. The DAV portfolio will typically consist of 40-65 securities and targets to outperform the index by 2% annualized over a market cycle.

The portfolio underperformed its benchmark, the Russell 3000 Value Index, for the 2017 calendar year by 320 basis points (net of fees), earning 9.99% versus 13.19%. The portfolio's struggles were in significant part due to the structural biases within the strategy. For the year, lower yielding stocks performed better than those with higher yields which was a significant headwind for the portfolio as the mandate could not access those names due to the constraint to hold securities with larger dividend yields. Stock selection was relatively weaker in the mid cap space and in the financial sector. The strategy tends to do better in relative terms in down to moderate markets (0-10%) markets on a 5-year rolling basis, and struggles to keep pace in strong markets (+10%). Since inception, the portfolio has underperformed the index; on a net basis, the strategy has returned 11.66% versus 12.37%.

River Road Asset Management – Focused All Cap Value Strategy:

Performance Update: 1Q18: 0.1% vs -2.8%; FYTD: 4.9% vs 5.5%; 1YR: 8.8% vs 6.8%; ITD: 17.3% vs 12.3%
The strategy outperformed by roughly 290 basis points during the first quarter of 2018. This relative outperformance was primarily driven by stock selection (+230bps); allocation added roughly 60 basis points. More than half of the holdings in the strategy are ranked in the top two quintiles of the firm's conviction profile and the strategy has an average price in terms of a percentage of intrinsic value of 73%, evidencing significant potential upside.

The Focused Absolute Value (FAV) strategy is essentially a best ideas portfolio managed by River Road's analyst team through consensus debate, and sign-off on ideas by Andrew Beck, CEO, and/or James Shircliff, CIO. The team is made up of eight analysts (one of which is non-voting) and is overseen by Alex Brown, the Director of Research at River Road. Ashley Abney, Analyst, serves as the FAV portfolio liaison and serves as lead when interacting with the portfolio managers (Beck & Shircliff) who serve more as risk mitigators rather than stock pickers. However, all recommended strategic trades must be approved by one of the portfolio managers. The FAV strategy is rooted in the absolute value investing approach developed by the firm. The objective of the approach is to provide attractive, sustainable, low volatility returns over the long term, with an emphasis on minimizing downside risk. The goal of the strategy is to outperform the Russell 3000 Value benchmark by a minimum of 200 basis points annually over a market cycle (they have defined it as 3-5 years). The portfolio aims to provide the optimal balance of risk / reward by developing a high conviction portfolio trading at a good discount to value. The FAV strategy is a best ideas portfolio utilizing a customized universe of only those names that are already held within one of the River Road strategies. The result is a portfolio of 20-30 holdings with position sizing heavily influenced on the established conviction level ratings of the investment team (2-10% of the portfolio). The strategy is a high conviction, tactical portfolio that trades at an attractive discount to assessed value. In summary, the strategy starts from an optimized universe and is a firm-wide best ideas portfolio with the best return potential of any of the long-only products offered by the firm.

Like the DAV portfolio, the FAV strategy underperformed the Russell 3000 Value Index, for the calendar year by 167 basis points (net of fees), earning 11.52% versus 13.19%. The portfolio suffered from poor relative performance during the fourth quarter spurred by weak stock selection (-478 bps) causing the relative performance of the strategy to be negative for the year. This marked just the second year of underperformance in the strategy's history which began in 2009. There were a couple of names that really struggled in the portfolio, but their effects were neutralized by the top contributors. The real issue during the quarter was that stock selection weakness was broad based with two-thirds of the securities trailing the index. Like the DAV strategy, the portfolio struggled in the mid cap space. The significant overweight to small caps (25.4% versus 6.4%) was a headwind for the strategy, as small caps underperformed large caps by -582 basis points in the value space. Since inception, the portfolio has outperformed the index; on a net basis, the strategy has returned 20.41% versus 16.72%.

As of December 31, 2017, firm assets under management were approximately $7.7 billion, up from $6.9 billion 18 months ago. The DAV strategy consisted of 67 accounts valued at $2.2 billion at the end of the year, and the FAV strategy had $354 million across 13 accounts. During the calendar year, the firm's DAV strategy gained 11 new client accounts (2 corporate / 9 high net worth) totaling roughly $66 million and lost one sub-advised client worth $160 million due to an asset reallocation. The FAV strategy gained an additional corporate client account with an initial value of $20 million and did not lose any accounts.

The firm's ownership and management structure have remained stable since prior review. Firm staffing has increased over the period from 37 to 41; the investment team specifically has added an associate equity research analyst. Further, a senior equity research analyst has been promoted to associate portfolio manager of the DAV strategy.

Westfield Capital Management

Performance Update: 1Q18: 2.8% vs 1.5%; FYTD: 14.1% vs 15.7%; 1YR: 20.3% vs 21.1%; 5YR: 13.2% vs 15.3%
The portfolio perform well during the first quarter of 2018. The decrease in intra-stock correlations combined with an increased correlation between earnings and stock price movements have provided a good environment for stock pickers in a period of good earnings growth. The portfolio benefited from good stock selection, adding value in seven of the ten sectors. The portfolio manager is optimistic that the strategy will benefit from the environment as valuations become more concerning. The strategy is actually a GARP (growth at a reasonable price) mandate which a valuation component which should be beneficial. In prior recent years the strategy struggled as high flyers such as the "FAANG" stocks were held with little relative to no exposure versus the index.

Westfield Capital Management Company manages growth oriented U.S. All Cap Equity portfolios for both the Pension and Insurance Funds of Kentucky Retirement. The firm has managed domestic equity assets for KRS since June 2011. The firm follows a growth at a reasonable price (GARP) investment style and desires to invest in earnings growth stocks given the conviction that stock prices follow earnings progress and that those stocks offer the best investment opportunities. Further, the firm believes that reasonably priced stocks of companies with accelerating or underappreciated earnings potential are best identified through in-depth, fundamental research. Westfield utilizes a team based approach to managing the All Cap Growth strategy. The firm's 16 member Investment Committee collectively serves as the portfolio manager (PM), placing idea generation and review responsibilities with the Committee members. Thirteen members are sector specialists across all capitalizations, with the remaining three providing a macroeconomic perspective. The portfolio construction process is completely bottom-up, driven by fundamental stock selection. Index composition is not an important consideration in the construction process and benchmark sector and industry weights play a secondary role in a portfolio construction, producing a portfolio that can look materially different than the index. The All Cap Growth portfolio will typically consist of 40-65 securities and targets to outperform the index by 2.5% annualized over a market cycle.

The portfolio provided a strong absolute return during 2017; however, trailed its benchmark by 35 basis points net of fees (29.14% vs 29.59%). The prior year's staples, telecom, and REIT (Real Estate Investment Trust) trade broke down, and in general, earnings drove the market for the calendar year. The strategy provided positive relative performance for the first nine months of the year, but struggled in the last quarter. The primary detractor for the quarter came from stock selection, specifically from the healthcare sector where selection was poor (-159 bps). For the year, stock selection was additive especially in the information technology and consumer discretionary sectors. This positive was partially offset by weaker sector allocation, specifically the overweight position to energy, the only negative performing sector for the year. The result was a slightly positive gross relative return.

As of December 31, 2017, firm assets under management (AUM) were approximately $13.9 billion, up $1 billion from 18 months ago. The strategy employed by KRS had an AUM of $1.8 billion which is consistent with the prior annual review; however, the strategy lost 16 accounts (97 remaining) totaling nearly $140 million in client outflows. The most common reason given for account loss was a client's shift towards passive management.

There have been a couple changes in the ownership of the firm; however, there have been no changes to the management structure since the last review. In January 2018, the revenue sharing agreement with Boston Private Financial Holdings, which was part of the 2009 management buyout, expired. Further, as part of that buyout, a convertible preferred note granted by Lincoln Peak Capital (a private investment firm), was exercised into a minority partnership interest in Westfield. The firm continues to be +95% employee owned and Lincoln Peak has no influence on operations or strategic decisions involving the firm. Partners have signed non-compete and non-solicitation agreements that have terms of either 1 or 2 years (depending on partners) and go into effect on the date that any partnership interests are bought back by the firm. Firm staffing has remained stable, currently at 62; with investment staff numbering 19. This includes the 16 member Investment Committee, two research analysts, and a risk manager.

Internally Managed S&P 500 Index

Performance Update: 1Q18: -0.7% vs -0.8%; FYTD: 10.6% vs 10.6%; 1YR: 14.0% vs 14.0%; 5YR: 13.3% vs 13.3%

The Internally Managed S&P 500 portfolios outperformed their underlying index for the 12-month period ending December 31, 2017. The Pension and Insurance funds posted respective returns of 21.87% and 22.10%, compared to the Index return of 21.83%.

Longer term, both portfolios have provided solid absolute returns, with mixed relative performance depending on the time period reviewed. Over the 5-year period the pension and insurance portfolios have trailed the index return of 15.79% by 7 and 3 basis points, respectively. Since inception, both funds have outperformed the 7.36% return of the benchmark; the pension and insurance funds posting 7.39% and 7.46%, respectively.

Internally Managed Factor Based (Scientific Beta Index)

Performance Update: 1Q18: 0.3% vs -0.8%; FYTD: 9.7% vs 10.6%; 1YR: 13.3% vs 14.0%; ITD: 14.1% vs 16.4%
The strategy provided both positive absolute and relative returns during the quarter due to the strong performance of the momentum factor. Additionally, the portfolio was benefitted by being smaller in market cap (mid cap factor). Further, all factor portfolios outperformed their cap weighted counterparts.

Scientific Beta's U.S. Multi-Beta Multi-Strategy Index takes smart beta strategies to another level in that it utilizes multiple factor exposures and multiple weighting schemes. Different factors and even weighting methodologies perform well in some market environments, but not in others, which creates the need to diversify across these spectrums in order to help ensure participation in all market environments. The multi-beta strategy tilts the portfolio towards four risk factors: low volatility, value, mid-cap, and momentum. For this particular product, the index creator, utilizing the S&P500, essentially builds four separate portfolios geared to the risk factors previously mentioned. More specifically, 250 names are selected that tilt towards the factor desired. For example, the 250 names that are selling at the best valuation based on book-to-market ratios are selected for the value sleeve; the smallest 250 names based on market capitalization are utilized to create a "mid cap" portfolio, and so on. Once the constituents of the four 250 name portfolios are determined the weighting of each must be determined. As previously stated, weighting schemes can come in and out of favor, so the index uses five separate methodologies: maximum de-concentration (equally weighted), diversified risk (risk-parity, each constituent is weighted in a manner that they provide and equal amount of risk to the portfolio), maximum decorrelation, efficient minimum volatility, and efficient maximum Sharpe Ratio. Each of the four portfolios are weighted under each methodology creating five separate portfolios for each factor. Simply utilizing one factor to build a portfolio could potentially result in improved performance evidence by a better Sharpe Ratio. However, performance can be even further improved by applying the multi-strategy weighting scheme employed by the strategy to each factor, which could result in improved returns, lower volatility, and greater Sharpe ratios. Scientific Beta takes this one step further, where each of the four newly created portfolios that have been equally weighted across five separate allocating schemes are then combined to create one final multi-factor multi-strategy index portfolio. This is done through equal-weighting and results in performance that is relatively similar to the factor portfolios, with slightly less volatility, yielding a similar Sharpe Ratio. However, the probability of outperformance should increase and tracking error decline. The resulting index is comprised of roughly 490 of the S&P 500 names; however, the "effective" 100-110 securities of the S&P 500 (number of securities actually driving performance) increases to approximately 320 primarily due to the weighting schemes employed. Ultimately, the index should provide better returns, with less risk due to greater effective diversification.

The Internally Managed Scientific Beta portfolio underperformed the S&P 500 Index for the 12-month period ending December 31, 2017, returning 19.23% compared to the benchmark return of 21.83%. The portfolio's relative underperformance (versus the S&P 500) was structural in nature. Two of the factor tilts that served as significant headwinds were the overweight to value and mid-caps (lower end of the S&P 500 in terms of market cap). This is evidenced by the actual performance experienced in the market during the period; growth outperformed value by 1655 basis points in the large cap space, and large caps outperformed mid-caps by 317 basis points in the core style bucket. In addition, the strategy has a beta of approximately 0.80 and is more defensive in nature so it has trouble keeping pace in strong markets (+10%). Another market factor that hampered relative performance was the driver of performance became narrower during the calendar year and more diversified strategies had trouble keeping up with the market as they held lower concentrations of those drivers. Since inception (06/30/16), the portfolio has returned 16.40% versus the 19.95% of the S&P 500.

Systematic Financial Management

Performance Update: 1Q18: -3.3% vs -2.5%; FYTD: 10.7% vs 5.1%; 1YR: 10.4% vs 6.5%; 5YR: 9.8% vs 11.1%
The strategy underperformed during the first quarter of 2018 due primarily to weaker stock selection. Allocation decisions had little effect on relative performance; however, the overweight position to the material sector was a headwind as the space was impacted by tariff concerns.

Systematic Financial Management manages a value oriented U.S. Mid Cap portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm, located in Teaneck, NJ, has managed domestic equity assets for KRS since June 2012. The Mid Cap Value portfolio is led by Ronald Mushock, who has served as lead portfolio manager of the strategy since its inception in 2000. Mr. Mushock is supported by a team of quantitative-, sector-, or generalist-based research analysts. The firm's investment philosophy is predicated on a belief that investing in companies with a combination of attractive valuations and a positive earnings catalyst will generate superior long-term results. The investment process is centered on fundamental bottom-up research that is conducted on a focused list of stocks identified through proprietary screening models. The Mid Cap Value portfolio will typically consist of 60-80 of the firm's best ideas and targets to outperform the index by 2% annualized over a market cycle.

The strategy outperformed the Russell Midcap Value Index for the 2017 calendar year returning a net 15.67% versus 13.34%. The environment seemed to become more conducive to the strategy during the period as earnings became more highly correlated to stock performance and rising rates produced opportunities. The strategy struggled in 2011, 2012, and 2014 when the correlation between 12-months earnings per share change and index performance correlation was 0.2. Pre- and post this time period the correlation was at 0.73 and 0.87. This points to a positive environment for active managers who focus on earnings such as Systematic. For the year, stock selection was strong which added 180 basis points over the index primarily from the consumer discretionary, materials, and information technology sectors. Sector allocation was also additive (+80 bps), particularly the almost 5% overweight to information technology which was the best performing sector for the year. The strategy has provided strong absolute returns since inception, but has trailed its benchmark, returning an annualized net 13.79% versus 15.23%. Long-term performance has been disappointing and has been greatly affected by weak relative performance that occurred in 2014 (-900 bps). During the period, earnings did not seem to be a factor, while maximizing income and minimizing risk was the only way to have outperformed. This is counter to what conventional wisdom would point to given the strong upward performance of the market over the past several years. In that environment, one would think in order to outperform, one would need to become more pro-cyclical, take on more risk, and de-emphasize income, and that was wrong thing to do.

As of December 31, 2017, firm assets under management were approximately $5.3 billion, which was down from $7.6 billion 18 months ago with client accounts dropping from 136 to 115. The strategy employed by KRS had an AUM of $1.3 billion, down from $2.4 billion, with clients falling from 33 to 25. The firm's and strategy's AUM are currently at the lowest they've been since 2009 and 2010, respectively. Clients who have left the strategy/firm gave a variety of reasons, the most common being performance and reallocation of assets. Specifically, the mid-cap value strategy AUM has been on the downtick since 2014. The strategy experienced significant AUM growth from 2008 to 2014, from $1.1 billion to $5.3 billion. As stated above, relative performance in 2014 was poor causing some of the mandates during that growth period to print negative relative performance for the 3- and 5-year annualized returns. This appears to have been a catalyst for investors leaving as 2015 and 2016 experienced outflows of a combined $3.6 billion. The firm contends that despite a lower AUM, it is still profitable as the firm used to operate on a lower asset base that was primarily large cap oriented, thus less income generative, with a similar employment level. The firm stated that if asset levels dropped to $3-3.5 billion there would be concern; however, a free-cash-flow oriented small cap strategy was gathering assets, and overall firm net outflows have stabilized.

The firm's ownership and management structure have remained stable since being recommended to the Investment Committee in June 2012. Firm staffing has declined over the period from 38 to 33; three of these were back office, the head trader retired (another trader who has worked in the department for over 20 years was promoted), and one analyst left the firm for personal reasons in January 2017.

<u>*Internally Managed Midcap Index*</u>

Performance Update: 1Q18: -0.6% vs -0.8%; FYTD: 9.2% vs 8.8%; 1YR: 11.3% vs 11.0%; ITD: 10.7% vs 10.7%

The Internally Managed Russell Midcap portfolios were funded for both the Pension and Insurance Funds on August 1, 2014 in response to a manager termination. During the 2017 calendar year, the portfolios performed well both in absolute and relative terms. The pension portfolio returned 16.40% versus the index return of 16.24%, while the insurance portfolio earned 16.48% against the same index. Since inception, the portfolios have performed relatively well over their short history, with the Pension and Insurance Funds gaining 11.74% and 11.90%, respectively, versus the Russell Midcap Index return of 11.74%.

<u>*Northern Trust Global Investments*</u>

U.S. Small Cap Performance Update: 1Q18: 0.0% vs -0.1%; FYTD: 9.2% vs 9.1%; 1YR: 11.9% vs 11.8%; 5YR: 12.2% vs 11.5%

Non-U.S. Small Cap Performance Update: 1Q18: 0.3% vs -0.4%; FYTD: 14.0% vs 13.5%; 1YR: 20.8% vs 20.6%; 5YR: 9.0% vs 8.6%

Northern Trust Global Investments (NTGI) manages an enhanced Small Cap U.S. Equity portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm has managed domestic equity assets for KRS dating back to October of 1999. The Structured Small Cap strategy is led by Bob Bergson, who has served as lead Portfolio Manager since the strategy's inception in 1994 and is supported by a deep team of analysts and traders. The portfolio utilizes a quantitative, risk controlled, method to create a broad and diversified portfolio of small and micro-cap stocks, with the intention of constructing a portfolio that emulates the risk characteristics of the Russell 2000 Index. By expanding the small cap universe to include micro caps, the strategy has the ability to capture more of the small cap premium. In addition, the product essentially utilizes the concept of the old adage that "sometimes the best investment is the one you don't make". The strategy employs two separate multi-factor models with the ultimate goal of avoiding value traps and those companies with unsustainable growth projections. The models ultimately generate an "exclude" or "do not buy list", with the remaining securities optimized to create the portfolio. The resulting portfolio may hold more than 3,500 securities, with the typical individual holding representing less than 0.50% of the total portfolio. The expected annual turnover for the Structured Small Cap product is 10-15% and the strategy seeks to outperform the benchmark over a market cycle by 2%.

The NTGI Structured Small Cap portfolio outperformed its benchmark, the Russell 2000 Index, for the twelve-month period ending December 31, 2017, providing 32 basis points of positive relative performance (14.97% versus 14.65%). Relative outperformance was driven in part by both stock selection, specifically in the micro-cap space, and allocation decisions. The strategy had an overweight position to the industrial, information technology, material, and consumer discretionary sectors which were the strongest performing sectors during the calendar year. Having minimal exposure to stocks ranked on its "no buy list" versus the index hampered the portfolio's relative performance as those names returned nearly 26% during the period. Overweighting micro-caps had little effect on the portfolio during the year. The strategy has continued to provide above benchmark results for all measured trailing periods. Since inception (10/01/99), the portfolio's net annualized return has been 10.41% versus 8.70% from the index.

NTGI manages Developed and Emerging Market passive small cap portfolios for the pension portfolio of KRS. The firm began managing Non-US small cap assets for KRS in 2008. The Developed and Emerging Small Cap Index funds are both managed by Northern Trust's Global Equity Index Team, which consists of 18 investment professionals. The firm employs a team approach to portfolio management and both strategies seek to replicate the benchmark's risk and return characteristics. NTGI utilizes a customized quantitative approach, Intelligent Indexing®, to construct portfolios that are replicated where appropriate and sampled where sensible to mitigate costs and the erosion of value. The goal is to maximize liquidity and minimize market impact, under the umbrella of a multi-dimensional risk management tool that tightly constrains exposure at the security, sector, and country levels. Both the Developed and Emerging Index funds seek full replication from a risk/reward perspective, with tracking error primarily due to tax consideration and securities lending.

International small cap stocks gained 31.65% during the 2017 calendar year, while the NTGI Broad International Small Cap portfolio (Pension only) trailed by 35 basis points. Despite producing strong absolute returns, the strategy was not able to able to provide positive relative value. Stock selection was a slight issue at both the international developed and emerging market levels. Since inception (12/01/08), the portfolio has provided an annualized net return of 14.11% versus the index return of 14.52%.

At the end of 2017, firm AUM stood at $1.2 trillion, which was a significant increase from 18 months ago ($906.2 billion). The strategies employed by KRS remained stable and did not experience any gains or losses in number of clients, except for the addition of one new client to the international developed small cap product.

<u>*American Century Investments*</u>

Performance Update: 1Q18: 3.1% vs -1.1%; FYTD: 20.4% vs 10.6%; 1YR: 30.2% vs 17.3%; ITD: 5.9% vs 3.8%

The first quarter of 2018 continued the synchronized global growth and low inflation environment that the prior quarter enjoyed. The recent market environment has been good for the strategy as earnings have been driving market growth for the past several quarters opposed to multiple expansion for several years before. Relative outperformance was almost entirely driven by stock selection (+400bps). Emerging markets continue to be a points of interest for the manager as fundamentals continue to improve and earnings are accelerating faster than in developed countries.

American Century manages a concentrated Non-U.S. Equity Growth portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm began managing assets for the Systems beginning July 2014. The investment management team responsible for the portfolio employed by KRS consists of a set of co-portfolio managers, Rajesh Gandhi and Jim Gendelman, several analysts, and a senior quantitative analyst who monitors risks within the portfolio. The strategy is focused on bottom-up fundamental stock analysis, which focuses on positive trends in growth rates and fundamental improvement. The team believes that accelerating growth in earnings and revenues is more highly correlated to stock price, opposed to simply an absolute level of growth. The firm further believes markets are slow to recognize inflection points in trends, which provides opportunities to generate excess returns. The team attempts to invest in the early stage of the growth cycle (steepest part of the curve) and hopes to benefit from multiple expansion as the market reprices companies. The goal or objective of the investment process is to outperform the Index over a full market cycle (3-5 years) by 3-4% before fees, with an expected tracking error between 6% and 8%.

The portfolios outperformed their primary benchmark, the Morgan Stanley Capital International All Country World Ex-U.S. Index (MSCI ACWI Ex-U.S.), for the twelve-month period ending December 31, 2017 and outpaced the index by 673 basis points (34.70% versus 27.97%). The calendar year was marked by synchronized global growth with regards to earnings. During the year, the market began to differentiate between individual stocks based on fundamentals such as earnings and growth, which is a positive for active management. The strategy performs well in this type of environment as it places a heavy emphasize on changes in earnings growth rates. From an attribution perspective, the strategy primarily benefitted from strong stock selection, primarily within the information technology, industrial, and consumer sectors. Allocation selection had a slightly negative effect in terms of relative performance and currency effects were negative. Since inception (07/01/14), the portfolio has returned a net 5.36% versus its benchmark's return of 4.36%.

As of December 31, 2017, firm assets under management were approximately $173.3 billion which was a significant increase from 18 months ago ($149.7 billion). Over the same period the number of accounts increased from 141 to 164. The strategy employed by KRS saw a net out flow of investment dollars of approximately $289 million (ignoring market fluctuations) during the 2017 calendar year. Staffing remained stable during the period and there were no changes to the firm's ownership structure.

<u>*Franklin Templeton*</u>

Performance Update: 1Q18: 2.3% vs -1.1%; FYTD: 19.4% vs 10.6%; 1YR: 26.5% vs 17.3%; ITD: 8.2% vs 3.8%
The strategy performed well during the first quarter of 2018 with stock selection providing the majority of relative outperformance. In addition to good selection within the financial and healthcare sectors, emerging market positions were additive. Allocation decisions had little impact on relative performance (slightly positive) despite significant exposure discrepancies compared with the index.

Franklin Templeton manages a concentrated Non-U.S. Equity Growth portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm began managing assets for KRS beginning July 2014. The Franklin Global Equity Team is led by Coleen Barbeau and John Remmert who oversee the strategy employed by KRS. More specifically, the Franklin Non-U.S. Equity portfolio is managed by John Remmert and Don Huber, CFA. The two portfolio managers are supported by a team of nine investment professionals. The strategy is focused on bottom-up fundamental stock analysis, which the firm believes has the potential to produce outperformance over a full market by building a concentrated portfolio of high quality sustainable growth companies. The result is a 40 name equally weighted portfolio that utilizes a contrarian rebalance technique to maintain proper sizing. The goal or objective of the investment process is to outperform the Index over a full market cycle (3-5 years) with a 5-8% tracking error.

The portfolios outperformed their primary benchmark, the MSCI ACWI Ex-US, for the twelve-month period ending December 31, 2017 and returned 38.38%% versus 27.97% from the index. The strategy benefitted from its growth style bias throughout the year as the global growth scenario looked better than it had in the previous few years. The strategy benefited both from security selection and asset allocation. Stock selection was particularly strong in the information technology, material, and industrial sectors. The overweight to the information technology sector was also a tailwind for the portfolio. Since inception (06/30/14), the portfolio has provided an annualized net return of 8.07% versus the index return of 4.36%.

At the end of 2017, firm assets stood at $753.8 billion, up from the declined from $732.1 billion 18 months prior. Assets and clients have remained stable since the prior review, with the team running $3.4 billion across 15 accounts. Clients can choose to have the team manage versus the MSCI EAFE Index or, as in the case of KRS, against the MSCI ACWI Ex-US Index. Staffing across the firm has increased to nearly 9,300 employees (up from 8,900), but the investment team managing the strategy employed by KRS remained stable with no changes.

Lazard Asset Management

Performance Update: 1Q18: 1.6% vs -1.1%; FYTD: 14.4% vs 10.6%; 1YR: 22.6% vs 17.3%; ITD: 5.3% vs 3.8% International corporate profits continued to be strong; however, concerns surrounding higher long-term rates and potential trade wars sparked market volatility to the downside. Despite the market sell-off the last couple months of the first quarter, the strategy was able to remain positive. Stock selection was the primary driver of relative outperformance both at the sector (+300bps) and the country (+280bps) levels. Allocation decisions were a slight headwind during the period.

Lazard manages a concentrated Non-U.S. Equity Relative Value portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm began managing assets for KRS beginning July 2014. The strategy is managed by a team of four portfolio managers (Mark Little, Michael Bennett, Robin Jones, and John Reinsberg) who are supported by 50+ firm-wide equity analysts. All decisions regarding holdings are team-based; however, if a consensus cannot be reached, Mark Little is the final decision maker. The team believes the sustainability and direction of financial productivity will direct an investment's return. However, a tradeoff must be struck between productivity and the valuation of a security. Further, the team asserts financial markets will misjudge certain factors which creates opportunities such as incorrectly underwriting the implications of a structural change and anticipating how long a company can sustain or improve returns. They believe investors put too much focus on short-term news flows creating mispricings. The goal or objective of the investment process is to outperform the Index over a full market cycle by 3% before fees.

The portfolios outperformed their primary benchmark, the MSCI ACWI Ex-U.S., for the twelve-month period ending December 31, 2017. The portfolio gained a net 28.30% versus the index return of 27.97%. Performance was driven by the developed side of the portfolio, specifically by strong stock selection within the information technology, financial, industrial, and consumer staple sectors. Sector allocation hampered relative performance due to a high cash allocation within the portfolio. The net attribution of the developed sided of the portfolio was a positive relative performance of 370 basis points. However, the emerging market portion of the portfolio significantly detracted from relative performance due to both stock selection and sector allocation. Since inception (07/01/14), the portfolio has provided a net 87 basis points of relative outperformance, returning 5.23% versus 4.36% on an annual basis.

Firm assets ended 2017 at $222.4 billion, up from $173.9 billion 18 months ago. The strategy utilized by KRS is currently closed; assets within the strategy increased to $15.8 billion due to market forces despite a slight net outflow of roughly $1.2 billion. The number of client accounts within the strategy remained stable.

LSV Asset Management

Performance Update: 1Q18: -1.1% vs -1.1%; FYTD: 8.9% vs 10.6%; 1YR: 14.7% vs 17.3%; ITD: 3.9% vs 3.8%

The strategy performed relatively well during the quarter and the previous 12-months given the significant style headwind it faced as a deep value mandate (1YR: MSCI ACWI Ex-U.S. 16.5% versus MSCI ACWI Ex-U.S. Value 13.3%). Relative performance for the quarter can be summed up by just a few short bullet points: 1) the overweight to emerging markets was helpful, 2) the value style bias was a hindrance, and 3) being smaller in terms of market cap was beneficial as this segment held up relatively better.

LSV manages a concentrated Non-U.S. Equity Value portfolio (deep value) for both the Pension and Insurance Funds of Kentucky Retirement. The firm began managing assets for the Systems beginning July 2014. One investment team is responsible for all firm strategies. Key investment professionals include Josef Lakonishok, Menno Vermeulen, Puneet Mansharamani, Greg Sleight, Guy Lakonishok, and Jason Karceski; who, together, are responsible for portfolio management and ongoing research pertaining to the quantitative model used by the firm. The team also includes a Director of Research, two academic advisors, and several quantitative analysts. The strategy utilizes a quantitative approach consisting of a stock ranking procedure and an optimization process. Stocks are ranked simultaneously on several variables to determine an overall expected return. Ranking is based on traditional value measures and past performance (contrarian perspective) accounting for 75% of the model's influence, and momentum factors (near-term potential) account for 25% of the model's influence. The strategy seeks to buy the top ranked stocks from each country that have higher expected returns. An optimizer is then used to help build a portfolio and control for risk. The goal or objective of the investment process is to outperform the index over a full market cycle by 4% before fees, with a tracking error of 6-8%.

The portfolios underperformed their primary benchmark, the MSCI ACWI Ex-U.S. Index, for the twelve-month period ending December 31, 2017, gaining a net return of 25.60% versus 27.97%. On the surface this would appear to be significant underperformance; however, the portfolio has a significant deep value bent which created a significant headwind. The value style benchmark trailed the core index by approximately 450 bps during the calendar year. The attribution from sector allocation was mixed when viewed from a country perspective versus a sector perspective. Stock selection hampered relative performance specifically when viewed from a country perspective and less so when viewed from a sector perspective. Stock selection was primarily driven by not holding some of the more growth names found in the core index, such as some Chinese information technology companies, that do not fit the strategy's philosophy. Since inception (06/30/14), the strategy has managed to add a net 10 bps annually over the core benchmark (4.46% versus 4.36%), despite value being a headwind in 2014, 2015, and 2017.

As of December 31, 2017, firm AUM were approximately $118.4 billion, up significantly from 18 months ago, which was $87.7 billion. The strategy employed by KRS currently had an AUM of $1.3 billion with net inflows of $167 million during 2017. Staffing has remained stable at the firm, with the only staffing change to the investment team being the addition of another quantitative analyst. There have been no changes to the ownership structure of the firm.

BlackRock, Inc

BlackRock manages a broad market passive ACWI Ex-US index portfolio for both the Pension and Insurance Funds of Kentucky Retirement. The firm began managing developed market assets for KRS in 2005 and transitioned to an All Country Ex-US Index mandate in June 2008. Blackrock's MSCI ACWI Ex-U.S. Superfund is designed to fully replicate both the developed and emerging market portions of the MSCI ACWI Ex-U.S. Blackrock utilizes a "fund-of-country fund" approach, building a portfolio of individually managed country funds, each market cap weighted to fully replicate the specific country index. The result is a portfolio of approximately 1,800 - 2,000 securities invested across 45 countries.

The portfolio outperformed the MSCI ACWI Ex-US for the fiscal year, returning 27.60% versus 27.19%. The majority of the relative outperformance was due to tax advantage versus the benchmark, which is calculated using an average (and higher than KRS actual) tax withholding rate and security lending. In the longer-term, the portfolio has added incremental relative value over the index since its inception, which added 22 basis points annually (8.29% versus 8.07%).

BlackRock also manages Developed and Emerging Market passive small cap portfolios for the Insurance portfolio of Kentucky Retirement. The firm began managing Non-US small cap assets for KRS in 2013. A team of nearly 100 researchers, portfolio managers, strategists, and traders manage the strategies employed by KRS. The International Small Cap portfolio is essentially a bolt on portfolio in that it is a combination of three small cap strategies portfolios; EAFE Small Cap, Canada Small Cap, and Emerging Markets Small Cap. BlackRock strives to construct portfolios that deliver a high level of diversification, closely track the appropriate benchmark, provide low turnover, and minimal transaction costs. The firm utilizes full replication, with tracking error primarily due to tax consideration and securities lending. The strategy slightly outpaced the MSCI ACWI ex US Small Cap Net Index during the calendar year, gaining 31.89% versus 31.65%. Since inception (07/01/13), the portfolio has provided an annualized 11.40% versus the index return of 10.76%.

Firm assets continued to grow, and as of the end of 2017, stood at $6.3 trillion. The strategy AUM employed by KRS ended the calendar year at $42.3 billion and having 126 client accounts. The firm employed just over 13,500 at the end of the period, consisting of nearly 2,100 investment professionals.

Conclusion:

In general during the 2017 calendar year, public equity investors were rewarded with strong double digit returns. In particular, international markets gained approximately 28.3% (MSCI ACWI Ex-U.S.) with emerging markets outpacing their developed market counterparts. The U.S. market returned 21.1% (Russell 3000) during the period, with large caps gaining approximately 21.8% versus the 14.6% of small caps. Investor's risk-on appetite, bolstered by global growth and solid corporate earnings, was the primary driver of performance. The KRS Total Public Equity portfolios earned 24.2% during the year, trailing the benchmark by approximately 50 basis points. Relative performance was driven primarily by manager outperformance in the Non-U.S. Equity asset class, combined with a tilt towards international equities. These positives could not overcome the value and smaller market cap exposure tilts within the U.S. portfolio that proved to hamper relative performance during the year. At the individual manager level, the fiscal year was rather uneventful from an organizational standpoint as only a few firms experienced any material changes. From a performance standpoint, results were mixed with about half of the actively managed strategies adding value over their respective indices during the year.

Staff and Wilshire will continue to monitor managers for either organizational or performance concerns and will promptly notify the committee if it is believed action should be taken.

Public Equity

Annual Review

June 2018

INTRO

Common Stock

- Security that conveys ownership in a company
- Equity position in the ownership structure (bottom of the capital stack)
- Not backed by assets such as the collateral nature enjoyed by creditors / bond investors
- A claim on the future earnings / growth of the company

Return / Risk

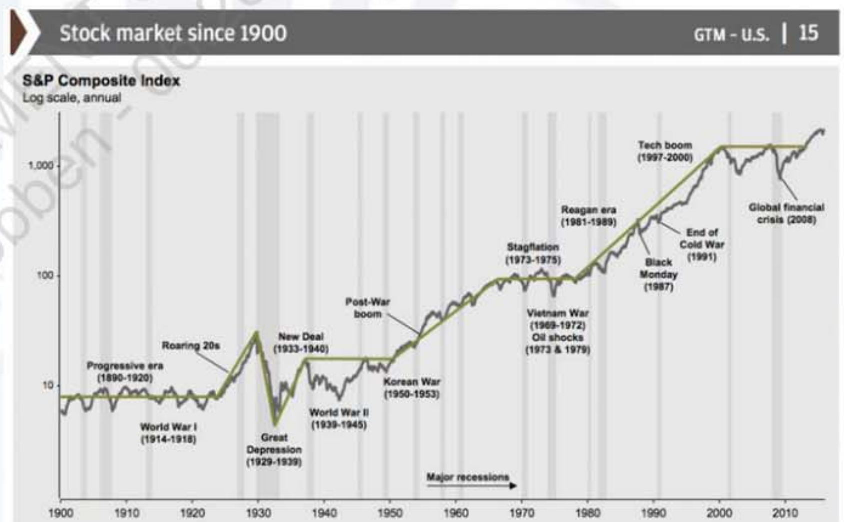
- Considered more risky than other securities higher in the capital stack – last to be paid in the event of liquidation
- Returns more volatile in nature
- Greater expected return for compensation of greater risk

Why Invest?

- Modest income through dividends
- Capital appreciation (growth potential)
  - Multiple expansion
  - Increased earnings

How much?

- Determined by several factors
  - Risk appetite
  - Investment horizon
  - Cash flow needs



Source: FactSet, NBER, Robert Shiller, J.P. Morgan Asset Management.
Data shown in log scale to best illustrate long-term index patterns.

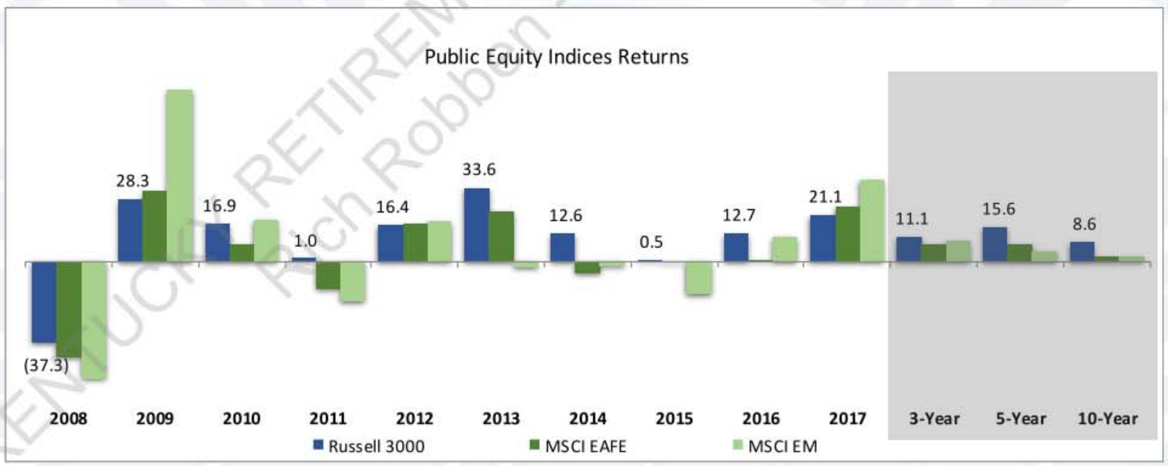
SUMMARY

CY2017 strong year of performance

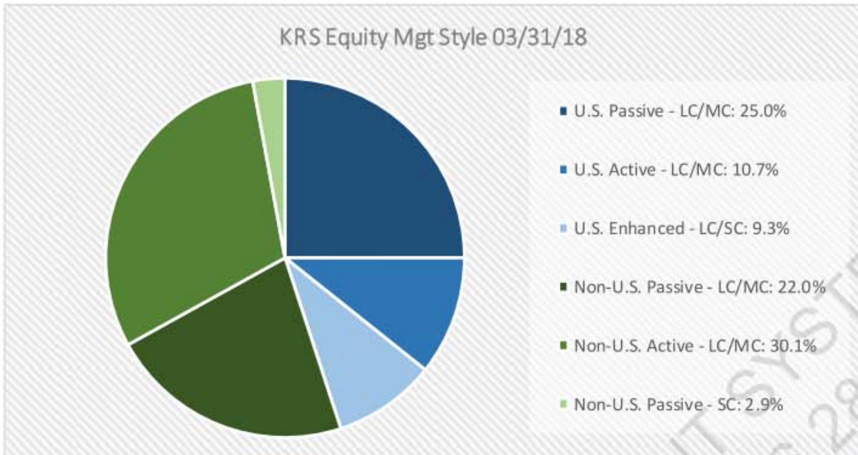
- Markets maintained a steady climb & never faltered from quarter to quarter
- Driven at both macro and micro levels
    - Anticipation of pro-growth fiscal policies in U.S.
    - Improving global growth
    - Risk-on market environment
        - Leadership provided by securities that promised momentum & growth
        - Dispersion in the market space in terms of sector performance & individual earnings responsiveness
- Emerging markets (+37.3% MSCI EM) led the way, followed by developed international markets (25.0% MSCI EAFE), and then domestic markets (21.1% R3000)
- Large caps outperformed small caps; and growth outpaced value

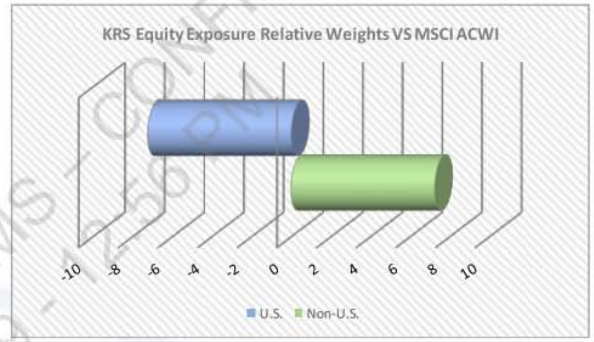
1Q2018 weak performance across domestic and international markets

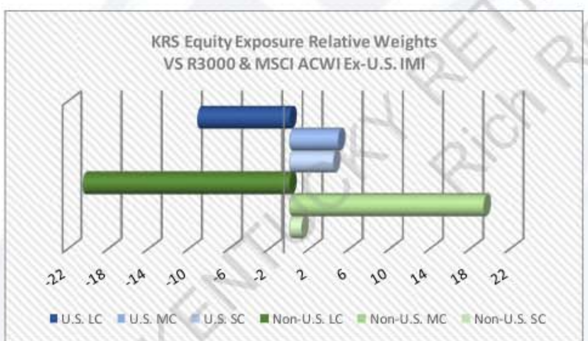
- Market volatility jumped sharply during the quarter
- Significant sell-off in late February & March – fears of rising rates & tariffs potentially leading to trade wars
- U.S. markets held up better than Non-U.S.; growth outpaced value, small caps outperformed large caps

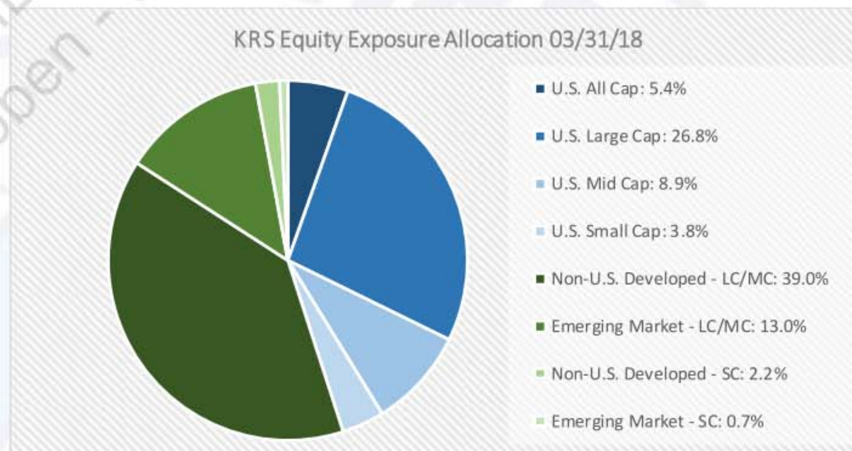


MARCH 31, 2018 POSITIONING



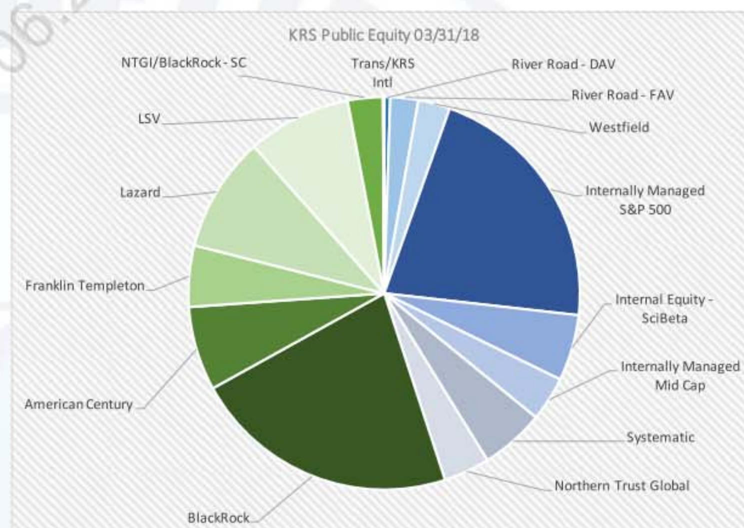






March 31, 2018 Manager Allocation

As of: 03/31/18	PENSION		INSURANCE	
	MV	%	MV	%
U.S. Equity				
River Road - DAV	27.18	0.49	12.08	0.50
River Road - FAV	127.64	2.31	56.06	2.34
Westfield	145.00	2.63	64.03	2.67
Internally Managed S&P500	1,176.88	21.34	516.26	21.52
Internal Equity - SciBeta	300.38	5.45	135.43	5.65
Internally Managed Mid Cap	201.97	3.66	92.93	3.87
Systematic	291.04	5.28	127.32	5.31
Northern Trust Global	209.86	3.81	90.73	3.78
	$2,479.95	44.97	**$1,094.84**	45.64
	Target	50.00	Target	50.00
Non-U.S. Equity				
BlackRock, Inc	1,213.32	22.00	525.71	21.92
American Century	381.97	6.93	158.88	6.62
Franklin Templeton	278.18	5.04	119.36	4.98
Lazard	524.10	9.50	221.83	9.25
LSV	472.19	8.56	203.62	8.49
Northern Trust Global - SC	159.59	2.89	-	0.00
BlackRock, Inc - SC	-	0.00	72.81	3.04
Transition/KRS Intl	5.72	0.10	1.67	0.07
	$3,035.07	55.03	**$1,303.88**	54.36
	Target	50.00	Target	50.00
Total Public Equity	**$5,515.02**		**$2,398.71**	



PERFORMANCE SUMMARY

KENTUCKY RETIREMENT SYSTEMS - PENSION FUND - NET RETURNS - 03/31/18													
			Fiscal YTD		1 Year		3 Years		5 Years		10 Years		Annualized
Structure	Market Value	% of Total	KRS	Benchmark	KRS	Benchmark	KRS	Benchmark	KRS	Benchmark	KRS	Benchmark	Fees
US PUBLIC	**2,480,003,011.21**	**20.15**	**9.89**	**10.48**	**12.80**	**13.81**	**9.45**	**10.22**	**12.26**	**13.03**	**9.34**	**9.72**	**0.12%**
RIVER ROAD DAV	27,175,035.61	0.22	2.90	5.45	3.12	6.81	7.07	7.87	9.61	10.71			0.60%
RIVER ROAD FAV	127,639,562.61	1.04	4.85	5.45	8.76	6.81							0.29%
WESTFIELD CAPITAL	145,002,052.63	1.18	14.11	15.68	20.30	21.06	8.25	12.57	13.20	15.32			0.56%
S&P 500 INDEX	1,176,884,083.90	9.56	10.64	10.58	13.97	13.99	10.73	10.78	13.25	13.31	9.79	9.76	
SCIENTIFIC BETA	300,380,480.72	2.44	9.66	10.58	13.30	13.99							0.06%
INTERNAL US MID CAP	201,965,639.51	1.64	9.19	8.83	11.33	10.97	8.97	8.96					
SYSTEMATIC	291,043,478.54	2.36	10.70	5.07	10.42	6.50	7.26	7.23	9.75	11.11			0.39%
NTGI STRUCTURED	209,862,549.37	1.71	9.19	9.11	11.91	11.79	8.82	8.39	12.21	11.47	11.06	9.84	0.14%
TRANSITION ACCOUNT	50,128.32												
EQUITY NON US	**3,035,065,839.12**	**24.66**	**12.89**	**10.73**	**19.97**	**17.43**	**7.94**	**6.79**	**7.34**	**6.44**	**3.87**	**3.32**	**0.29%**
BLACKROCK ACWI EX	1,213,320,528.90	9.86	10.10	10.16	16.58	16.53	6.44	6.18	6.10	5.89			0.06%
AMERICAN CENTURY INVESTMENTS	381,966,994.06	3.10	20.37	10.62	30.24	17.25	8.20	6.74					0.41%
FRANKLIN TEMPLETON	278,176,997.44	2.26	19.43	10.62	26.50	17.25	11.64	6.74					0.40%
LAZARD ASSET MANAGEMENT	524,104,292.79	4.26	14.40	10.62	22.64	17.25	7.68	6.74					0.47%
LSV ASSET MANAGEMENT	472,189,185.29	3.84	8.90	10.62	14.66	17.25	6.51	6.74					0.61%
NTGI INTL SM CAP	159,587,624.29	1.30	14.03	13.52	20.83	20.60	10.68	10.40	8.99	8.57			0.10%
NON-US TRANSITION ACCOUNT	5,720,216.35												
PUBLIC EQUITY	**5,515,068,850.33**	**44.81**	**11.43**	**10.62**	**16.42**	**15.62**	**8.47**	**8.16**	**9.39**	**9.14**	**6.54**	**6.17**	**0.21%**

1 YR Total Equity Relative Outperformance: +80bps (16.4% vs 15.6%)

- Driven by Non-U.S. equity allocation (+254bps)
    - Stock selection: 3 of 4 active mandates outpaced index
    - Overweight Non-U.S. which has outperformed the U.S. markets by roughly 3.5% over the past 12-months
- U.S. equity allocation (-101bps)
    - Less about stock selection and more about allocation tilts
        - Value lean (-14.3%: value vs growth) and smaller capitalization tilt (-2.2%: small vs large cap)

RECENT ACTIVITY

Significant Portfolio / Structural Changes in 2014 & 2016 Calendar Years

- Non-U.S. portfolio changed to a core-satellite structure (4 new mandates)
- U.S. portfolio experienced 3 manger exits, addition of a concentrated mandate, & new internal core portfolio

2017 was not marked with wholesale manager / strategy changes but several reallocations

- Asset allocation called for a significant reduction in public equities – 4% reductions in March & September 2017
- Additional reductions have occurred in February, March, & May 2018

Renegotiated fees with active international equity mandates

- Maintain the same effective cost of management despite losing scale pricing power

		Public Equity as of 03/31/18 Pre-Trade						Public Equity as of 04/06/18 Post-Trade		
Public Equity Target Effective:	01/01/16	9/17: 4%	09/30/17	2/18: 2.35% US	02/28/18	3/18: 2.35%	03/31/18			
US	25.60%	2.75%	22.85%	2.35%	20.50%	1.00%	19.50%			
NonUS	25.20%	1.25%	23.95%	0.00%	23.95%	0.65%	23.30%			
PENSION										
Structure	Account	Actual MV (mils)	Actual (%)	Target MV (mils)	Target (%)	Over / Under (mils)	Diff	Post MV (mils)	Post (%)	Post Trade Allocation Diff (%)
TOTAL FUND	KR2G00000000	12,307.010	100.00	12,307.01	100.00	-	-	12,254.229	100.00	-
US PUBLIC	KR2G11000000	2,480.003	20.15	2,399.87	19.50	80.14	0.65	2,375.517	19.39	(0.11)
All Cap		299.817	12.09	311.98	13.00	(12.17)	(0.91)	309.425	13.03	0.03
RIVER ROAD - DAV	KR2F10070002	27.175	9.06	24.33	7.80	2.84	1.26	25.051	8.10	0.30
RIVER ROAD - FAV	KR2F10120002	127.640	42.57	137.90	44.20	(10.26)	(1.63)	136.827	44.22	0.02
WESTFIELD	KR2F10060002	145.002	48.36	149.75	48.00	(4.75)	0.36	147.547	47.68	(0.32)
Cap Based		1,687.127	68.03	1,655.91	69.00	31.22	(0.97)	1,631.964	68.70	(0.30)
S&P 500 INDEX	KR2F19020002	1,176.884	69.76	1,129.33	68.20	47.55	1.56	1,104.156	67.66	(0.54)
INTERNAL EQUITY (SCIBETA	KR2F10110002	300.380	17.80	327.87	19.80	(27.49)	(2.00)	319.488	19.58	(0.22)
NTGI STRUCTURED	KR2F10020002	209.863	12.44	198.71	12.00	11.15	0.44	208.320	12.76	0.76
Mid Cap		493.009	19.88	431.98	18.00	61.03	1.88	434.128	18.28	0.28
Internal US Mid Cap	KR2F10100002	201.966	40.97	151.19	35.00	50.77	5.97	154.111	35.50	0.50
SYSTEMATIC	KR2F10030002	291.043	59.03	280.78	65.00	10.26	(5.97)	280.017	64.50	(0.50)
TRANSITION ACCOUNT	KR2F19010002	0.050								
EQUITY NON US	KR2G20000000	3,032.141	24.64	2,867.53	23.30	164.61	1.34	2,856.110	23.31	0.01
BLACKROCK ACWI EX	KR2F20030002	1,213.321	40.02	1,147.01	40.00	66.31	0.02	1,146.895	40.16	0.16
AMERICAN CENTURY	KR2F20050002	381.967	12.60	387.12	13.50	(5.15)	(0.90)	383.194	13.42	(0.08)
FRANKLIN TEMPLETON	KR2F20060002	278.177	9.17	292.49	10.20	(14.31)	(1.03)	275.779	9.66	(0.54)
LAZARD	KR2F20080002	524.104	17.28	516.16	18.00	7.95	(0.72)	509.664	17.84	(0.16)
LSV	KR2F20070002	472.189	15.57	438.73	15.30	33.46	0.27	433.416	15.18	(0.12)
NTGI INTL SM CAP	KR2F20040002	159.588	5.26	86.03	3.00	73.56	2.26	104.386	3.65	0.65
NON-US TRANSITION	KR2F29010002	2.795	0.09	-	-	2.80	0.09	2.776	-	-
PUBLIC EQUITY	KR2G10000000	5,512.144	44.79	5,267.400	42.80	244.74	1.99	5,231.627	42.69	(0.11)

US Active | US Enhanced | US Passive | NonUS Active | NonUS Passive | Temporary River Road Allocation: DAV 15.0 / FAV 85.0 | Temporary Internal Allocation: SciBeta 22.5 / SP500 77.5

PLANS / RECOMMENDATIONS

Staff & consultant have had preliminary discussions regarding the portfolio structure

- Should portfolios be structured to evoke strategic views / tilts
- Evaluate the use of passive versus active strategies
- Review current mandates to determine appropriateness & sizing (in context of new structure)
- Potential new strategies
    - Dedicated emerging market mandate
    - Low/managed volatility strategies for less healthy plans

Recommendations

No recommendations at this time. Both staff & consultant will continue to monitor external managers for organization/staffing/performance/fit purposes and will notify the Investment Committee if it is believed that an action is required.

Kentucky Retirement Systems

Real Return Review 2018

Andy Kiehl - Director of Investments

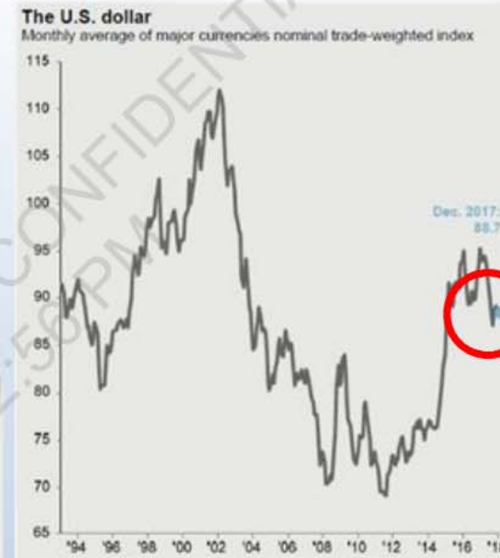
Real Assets

2

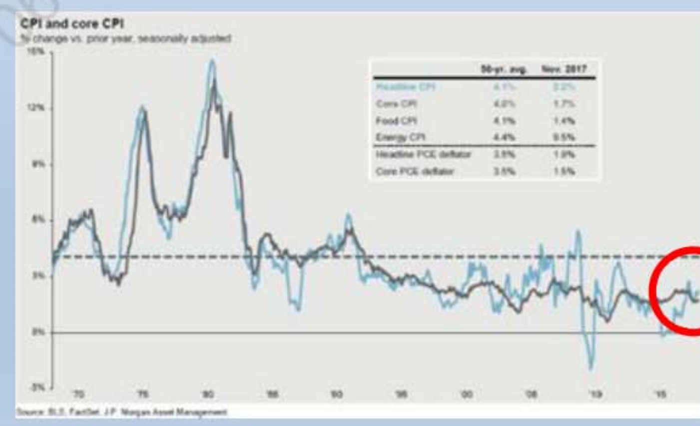
Drivers of Real Return?

- CPI determined to stay low ?
- Oil – lower, longer ?
- Dollar strength – Fed raise?
- Full employment ?

	50-yr. avg.	Nov. 2017
Headline CPI	4.1%	2.2%
Core CPI	4.0%	1.7%
Food CPI	4.1%	1.4%
Energy CPI	4.4%	9.5%



	Average (1958-2017)	12/31/2017
Nominal yields	6.09%	2.40%
Real yields	2.38%	0.69%
Inflation	3.71%	1.71%



3

Why Real Assets?

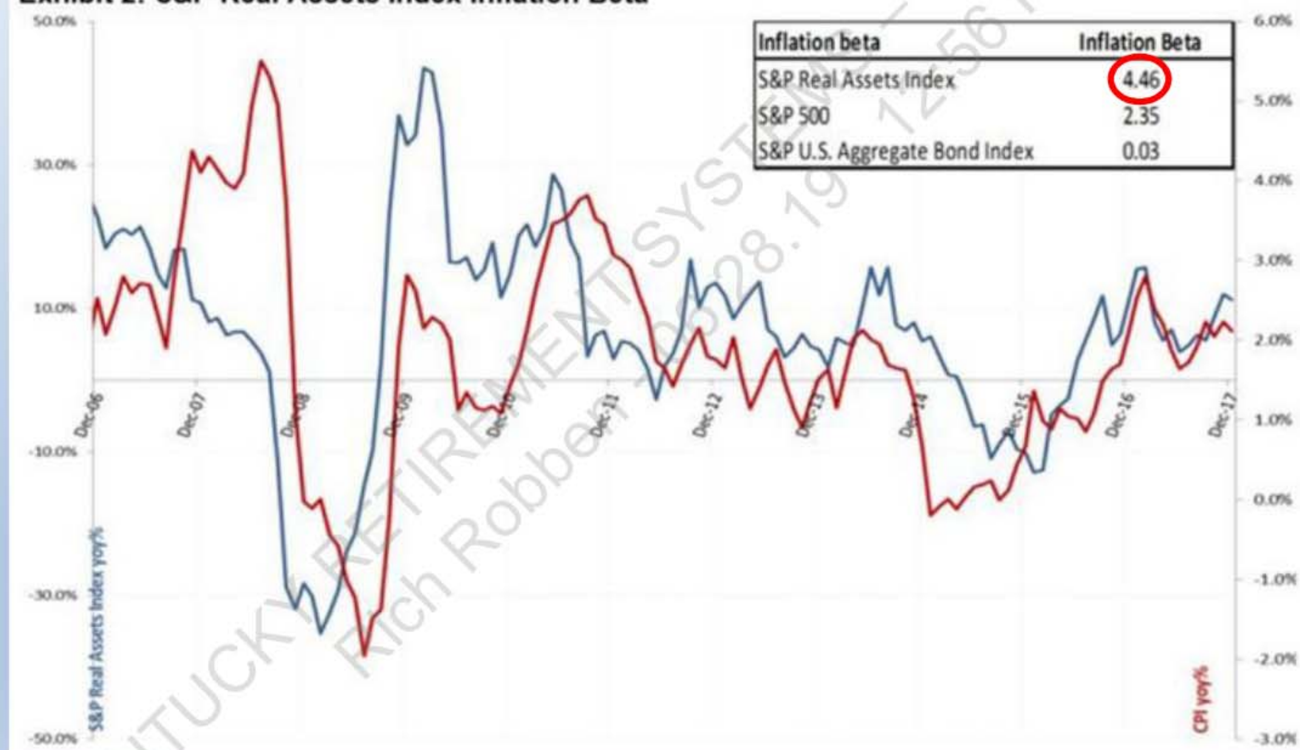
Correlation Matrix

	US Equity	Non-US Equity	Core Fixed Income	High Yield / Credit	Real Estate	Hedge Funds	Real Return	Private Equity	Cash
Expected Return - 10-Year (%)	6.25	6.45	3.55	4.95	6.90	4.75	5.75	8.75	1.75
Expected Risk (%)	17.00	18.75	5.15	10.00	14.00	4.60	7.75	28.00	1.25
Correlations									
US Equity	1.00								
Non-US Equity	0.83	1.00							
Core Fixed Income	0.28	0.09	1.00						
High Yield / Credit Fixed Income	0.54	0.45	0.25	1.00					
Real Estate	0.54	0.47	0.19	0.57	1.00				
Hedge Funds	0.43	0.55	0.08	0.58	0.32	1.00			
Real Return	0.44	0.51	0.30	0.55	0.64	0.50	1.00		
Private Equity	0.74	0.67	0.31	0.34	0.51	0.42	0.46	1.00	
Cash	-0.05	-0.08	0.19	-0.10	-0.05	0.07	0.04	0.00	1.00

Why Real Assets?

"WHEN" (and "IF") inflation comes…

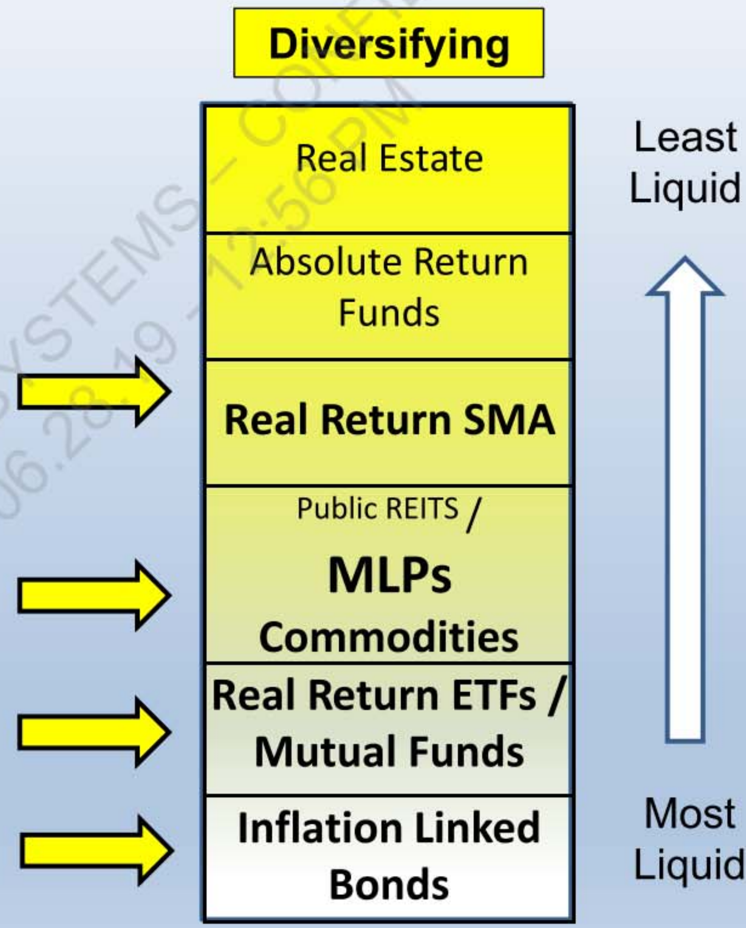
Exhibit 2: S&P Real Assets Index Inflation Beta



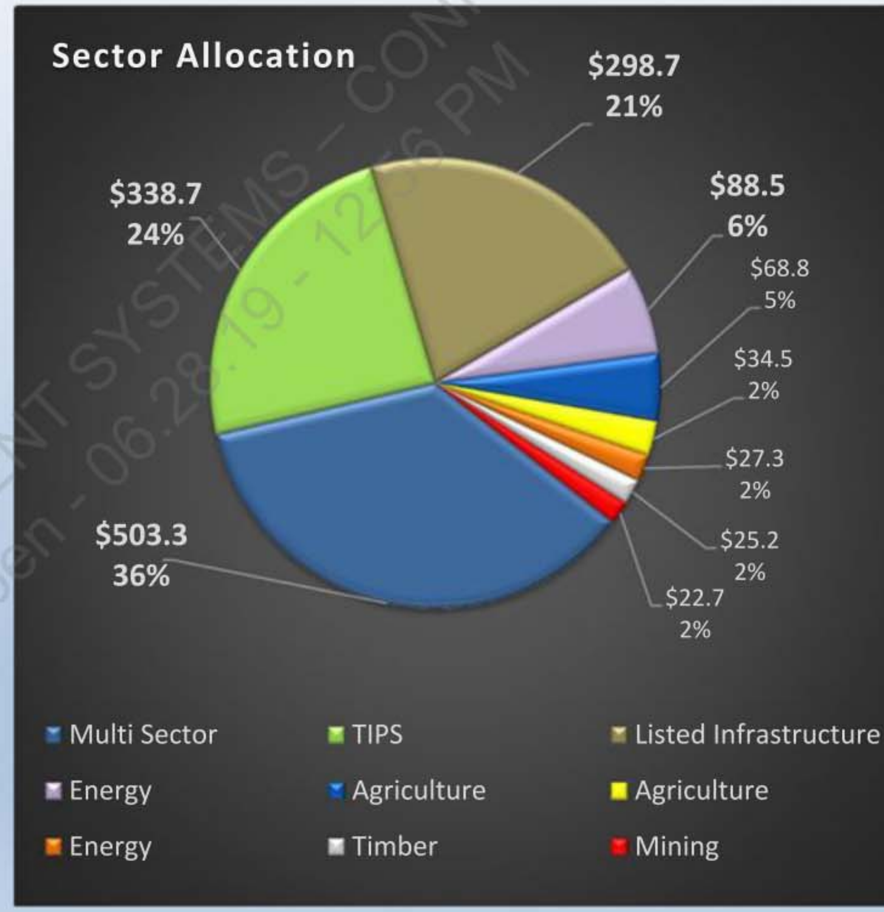
5

Investment Vehicles

- Many more sources for liquid exposure than in Real Estate
- Infrastructure, Agriculture, Mining, Timber all long-dated strategies that require illiquid investment vehicles.
- KRS has utilized co-mingled investment strategies and listed securities to get liquid exposure.
- KRS does not currently directly own Real assets (farmland, infrastructure, etc).
- KRS does not currently directly co-invest.



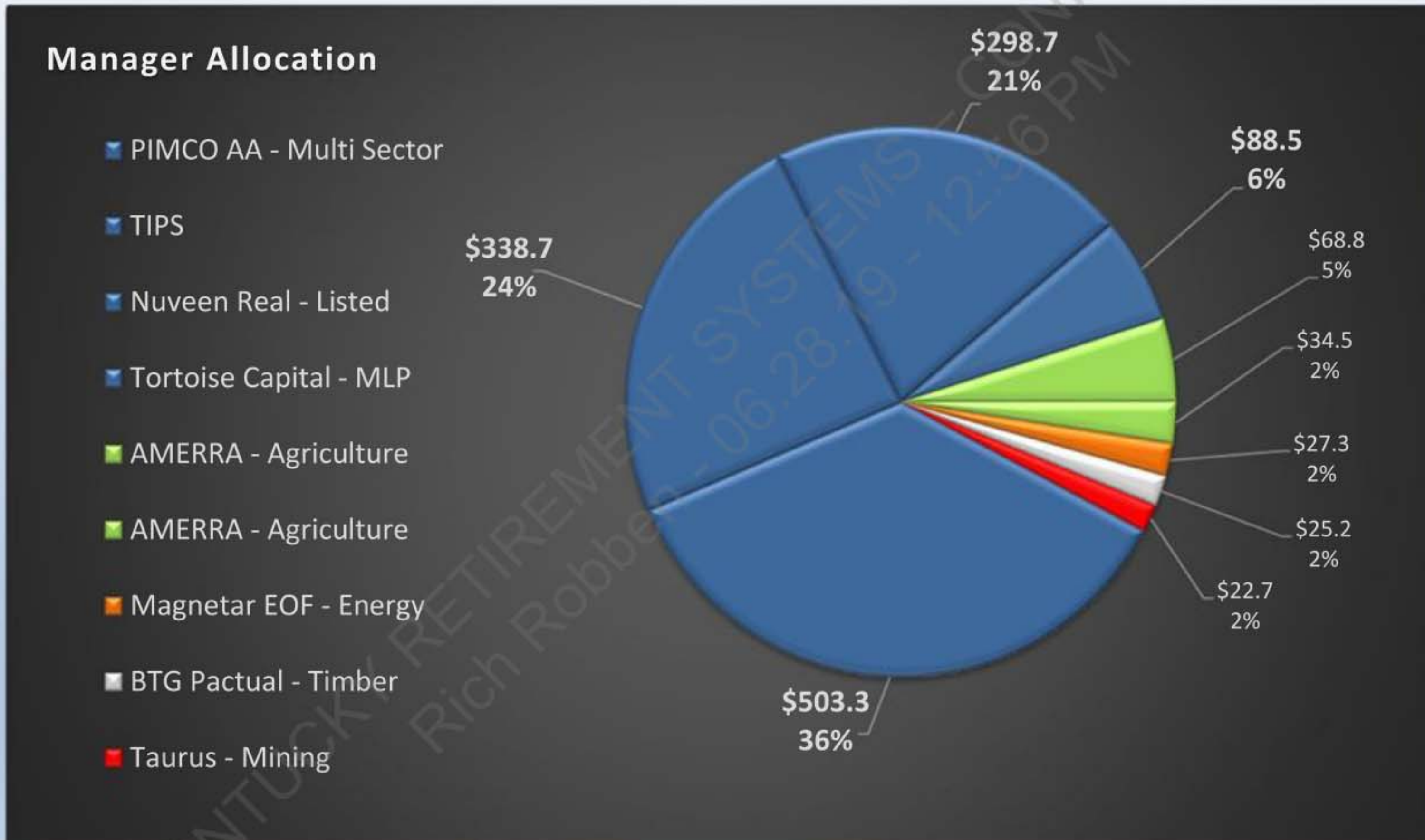
KRS Investment Program



- Approximately $1,407MM
  8% of plan assets.
- 87% Liquid

7

KRS Investment Managers



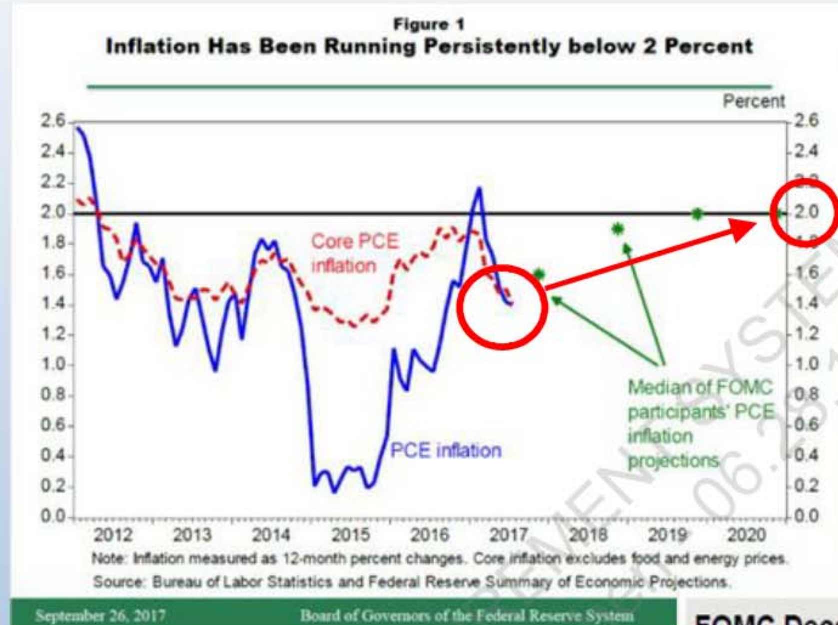
8

KRS Investment Managers

Manager	Inception	FYTD	1 Year	3 Years	5 Years	10 Years	ITD	Fee
PIMCO	2011	6.8%	8.79%	5.71%	3.58%		5.39%	.875% / yr.
TIPS	2002	.68%	.29%	1.54%	.12%	2.94%	4.89%	0%
Nuveen	2015	.97%	4.13%	4.64%			4.43%	.68% / yr
Tortoise Capital	2009	-12.12%	-16.97%	-8.92%	-.64%		10.45%	.30% w 20% over BM
AMERRA Agri Hldg	2015	-3.86%	-5.58%				-1.08%	2% w 20% pref 8%
AMERRA Agri Fund II	2012	-2.45%	-1.39%	4.66%	5.86%		4.64%	1.5% w 20% pref 6%
Magnetar MTP EOF II	2015	4.35%	8.30%				1.85%	1.5% w 20% pref 6%
BTG Pactual	2014	-3.85%	.20%	-7.77%			-10.14%	1.5% w 20% pref 9%
Taurus Mine	2015	4.24%	6.63%	14.27%			14.27%	1.5% w 20% pref 8%
KRS Pension	2011	1.74%	2.39%	3.27%	1.80%		3.81%	
KRS Insurance	2011	1.79%	2.46%	3.09%	1.57%		3.54%	

** Returns through 3/2018*

Looking forward…



When and "IF". . . ?

FOMC December 2017 forecasts

Percent

	2017	2018	2019	2020	Long run
Change in real GDP, 4Q to 4Q	2.5	2.5	2.1	2.0	1.8
Unemployment rate, 4Q	4.1	3.9	3.9	4.0	4.6
PCE inflation, 4Q to 4Q	1.7	1.9	2.0	2.0	2.0

Kentucky Retirement Systems

Real Estate Review 2018

Andy Kiehl - Director of Investments

1

Commercial RE Market

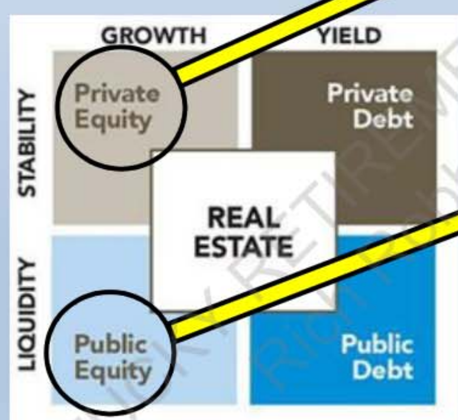
Large market by size, but liquidity is not readily available.

Commercial RE Market

	Core	Value Added	Opportunistic
Definition	Stabilized, leased properties. Income producing with limited risk.	Core property types with an identifiable deficiency that can be corrected and converted to core.	Similar to Value-Added investments but with greater risk characteristics such as distressed assets, development, land and international properties
Occupancy	80%+	N/A	N/A
Markets	Primary/Domestic	Primary/Secondary	Primary/Secondary Tertiary Domestic and International
Leverage	50%	Up to 65%	Up to 70%
Income Returns as a % of Total Return	70%	40-60%	0-50%
Development	None	Modest <25%	Significant development potential

Investment Vehicles

- Real Estate is not liquid due to nature of assets
- GP/LP (Private) fund construct is generally 7-10 years in length with little cash flow.
- KRS does not currently directly own assets
- KRS does not currently directly co-invest
- KRS does not have an allocation to REITs- high correlation to public equity



Diversifying

Real Estate
Absolute Return Funds
Real Return SMA
Public REITS / MLPs / Commodities
Real Return ETFs / Mutual Funds
Inflation Linked Bonds

Least Liquid

Most Liquid

* In 2017, KRS made the determination that RE Debt belonged in the Fixed Income/Credit allocation.

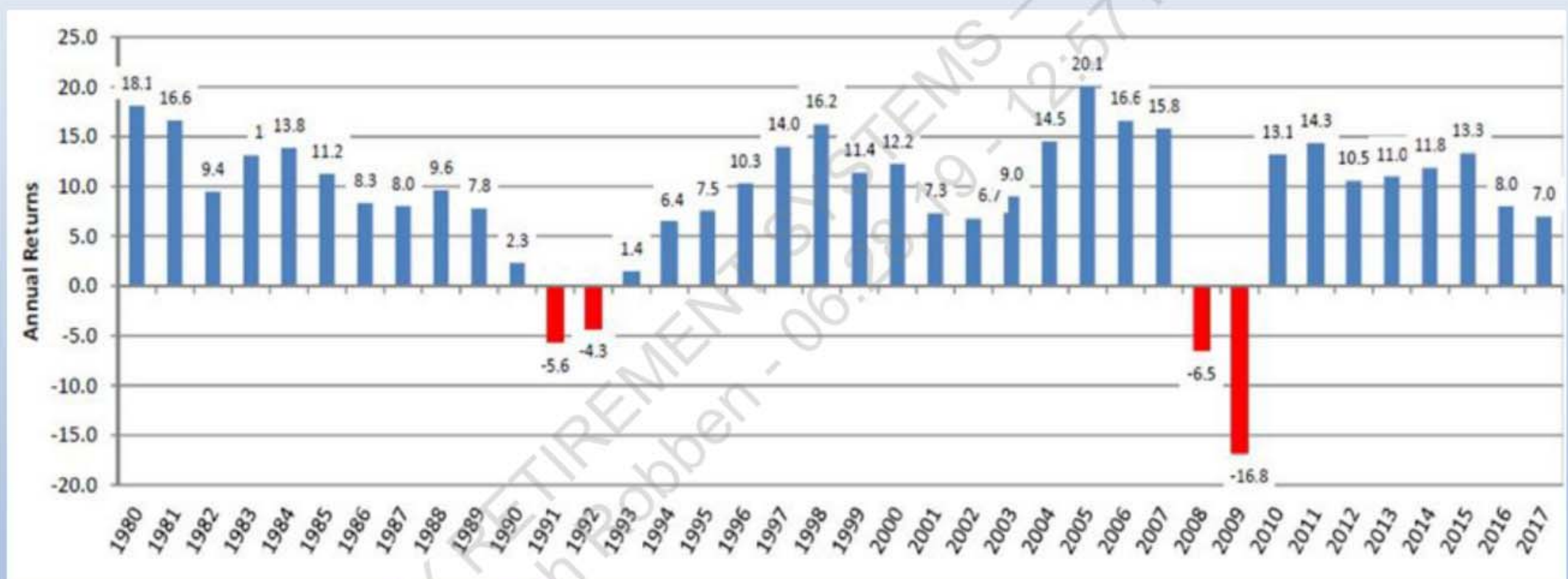
Why Real Estate?

Correlation Matrix

	US Equity	Non-US Equity	Core Fixed Income	High Yield / Credit	Real Estate	Hedge Funds	Real Return	Private Equity	Cash
Expected Return - 10-Year (%)	6.25	6.45	3.55	4.95	6.90	4.75	5.75	8.75	1.75
Expected Risk (%)	17.00	18.75	5.15	10.00	14.00	4.60	7.75	28.00	1.25
Correlations									
US Equity	1.00								
Non-US Equity	0.83	1.00							
Core Fixed Income	0.28	0.09	1.00						
High Yield / Credit Fixed Income	0.54	0.45	0.25	1.00					
Real Estate	0.54	0.47	0.19	0.57	1.00				
Hedge Funds	0.43	0.55	0.08	0.58	0.32	1.00			
Real Return	0.44	0.51	0.30	0.55	0.64	0.50	1.00		
Private Equity	0.74	0.67	0.31	0.34	0.51	0.42	0.46	1.00	
Cash	-0.05	-0.08	0.19	-0.10	-0.05	0.07	0.04	0.00	1.00

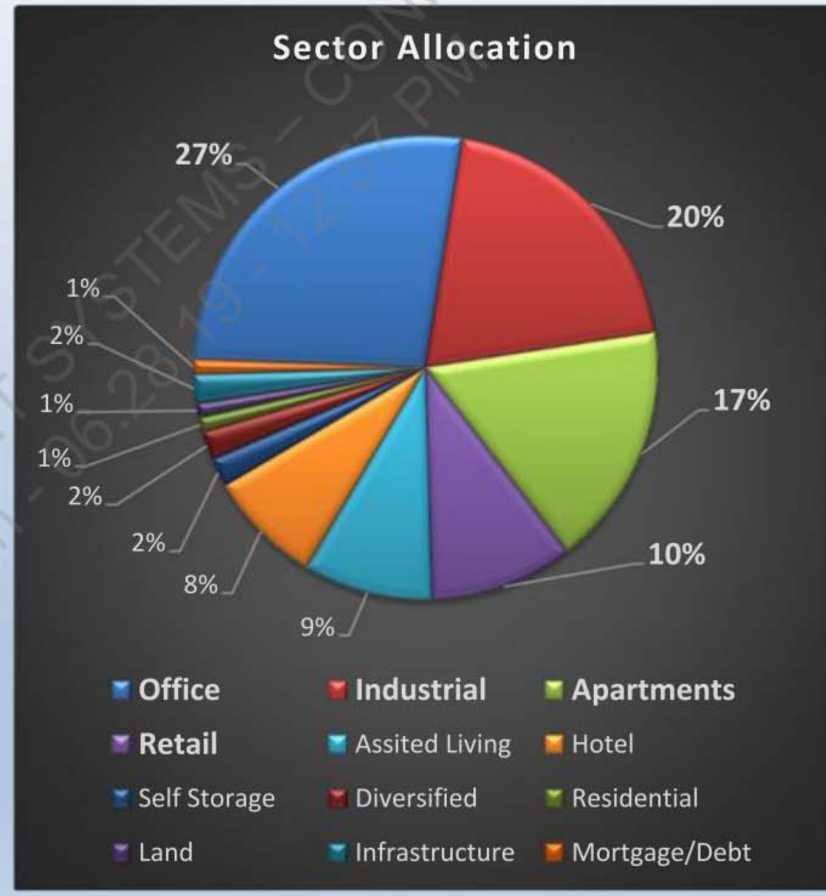
Why Real Estate?

A compelling history….4 down years in last 40.



6

KRS Investment Program

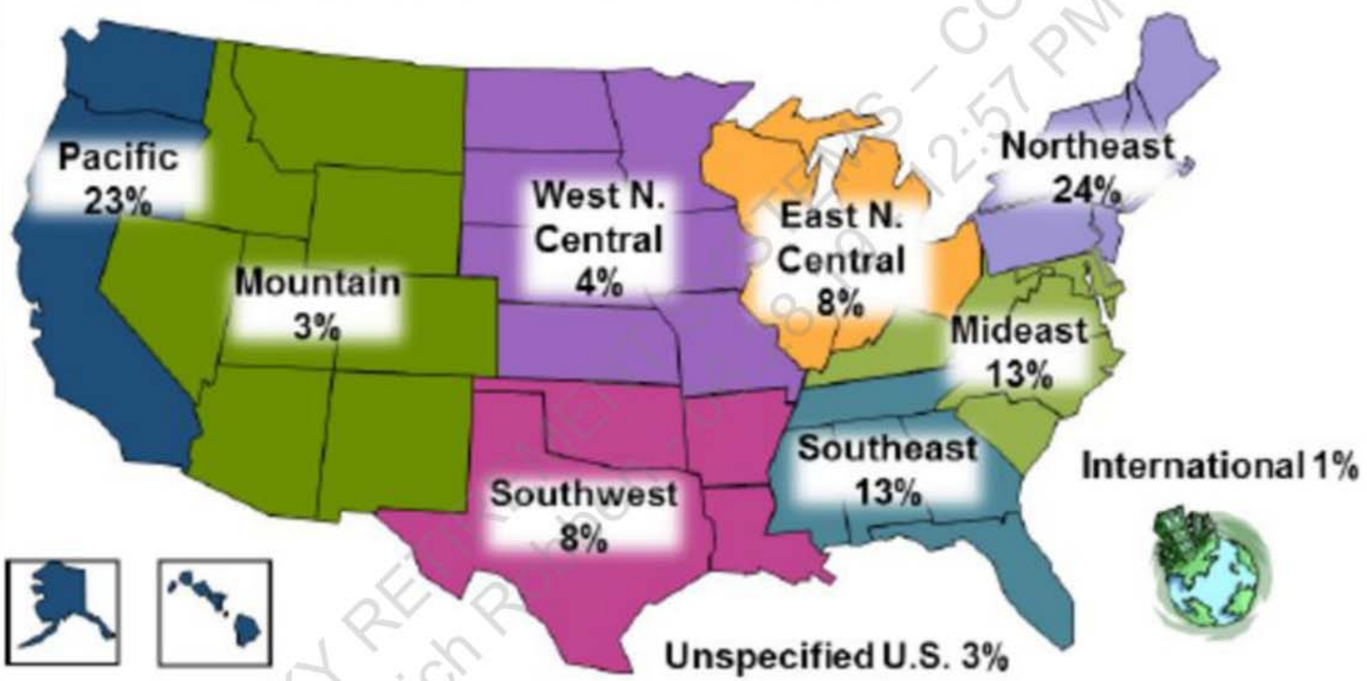


- Approximately $572MM
  - ~ 3.2% of assets
- Down from 5+% in 2017
- 50+% in Core assets
- 75% in top 4 categories

7

KRS Investment Program

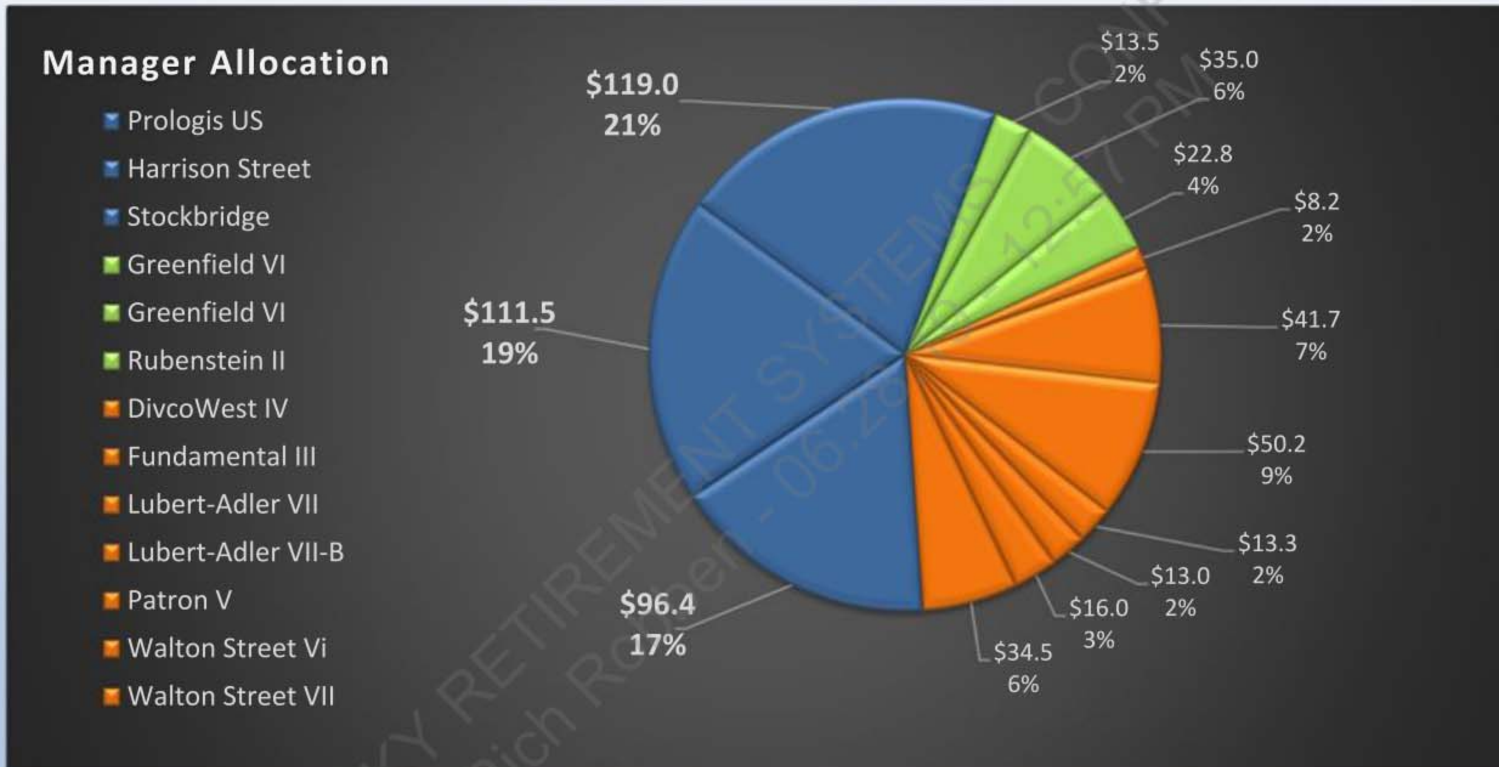
KRS Combined Account—Current Portfolio



- Overweight Mideast and Southeast
  - Underweight Pacific

8

KRS Investment Managers



- KRS's entire CORE allocation (Prologis, Harrison St. and Stockbridge), 50+% of RE assets, offers quarterly liquidity with 60 day notice.

9

KRS Investment Managers

Manager	Inception	FYTD	1 Year	3 Years	5 Years	10 Years	Fee
Prologis US	2013	9.85%	20.61%	16.20%			.80% / yr.
Harrison Street	2012	5.25%	10.29%	10.0%	9.96%		.75% / yr.
Stockbridge	20014	3.82%	8.36%	10.05%			.95% / yr.
Greenfield VI	2012	5.64%	10.73%	9.90%	11.50%		1.5% w 20% over 9%
Greenfield VII	2014	8.47%	14.92%	14.32%			1.5% w 20% over 9%
Rubenstein II	2013	8.34%	13.59%	8.57%			1.5% w 20% over 9%
DivcoWest IV	2014	- 0.62%	16.06%	27.39%			1.5% w 20% over 7%
Fundamental III	2017	1.87%					1.5% w 20% over 9%
Lubert Adler VII	2014	6.07%	9.18%	4.28%			1.5% w 20% over 9%
Lubert Adler VII-B	2017	- 4.11%					
Patron V	2016	7.02%	15.79%				1.75% w 20% over 9%
Walton St VI	2009	4.62%	7.03%	5.17%	9.31%		1.5% w 20% over 9%
Walton St VII	2013	6.15%	11.58%	13.54%			1.5% w 20% over 9%
KRS Pension	1984	5.79%	11.39%	9.90%	9.54%	7.82%	
KRS Insurance	2009	5.79%	11.53%	10.09%	9.31%		

* Returns through 12/2017

10

Board Education Session June 6, 2018 - KRS Asset Class Review

Looking forward…

"Valuations are stretched, it is becoming more and more difficult to find managers that offer an attractive value proposition…"

~ Ed Schwartz, ORG

11

Wilshire

Prepared for

Kentucky Retirement Systems

WILSHIRE CONSULTING

KRS Marketable Alternatives Direct Investments Review

David Lindberg, Managing Director
Jonathan Miles, CFA, CAIA, Managing Director
Jamie Gnall, CFA, CAIA, Senior Associate

December 7th, 2017

Wilshire Associates

AGENDA

Review Engagement Plan

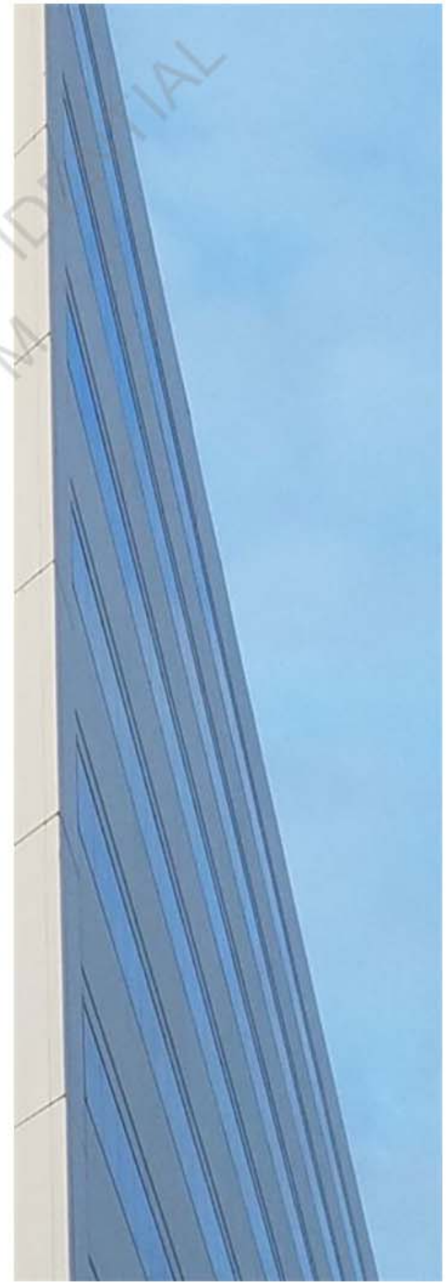
Summary of Initial Due Diligence

Preliminary Structuring Review

Investment Philosophy

Investment Beliefs

Investment Structuring



Wilshire Consulting

Current Engagement Plan

W Wilshire

1. Review existing exposures and classify each managers as immediate termination, likely replace, potentially replace, maintain investment
   - Completed: 12/6 Committee meeting
2. Assess Prisma Daniel Boone custom fund of one
   - Targeted Completion: End of Q1-2018
3. Asset Allocation Phase:
   - Work collaboratively with KRS to determine the most appropriate use and role for Marketable Alternatives on an integrated basis
   - Update the KRS investment policies as necessary.
   - Targeted Completion: End of Q1-2018
4. Investment Structuring
   - Specific manager and sizing recommendations
   - Develop timeline to full implementation
   - Targeted Completion: Q2/Q3 2018

Wilshire Consulting

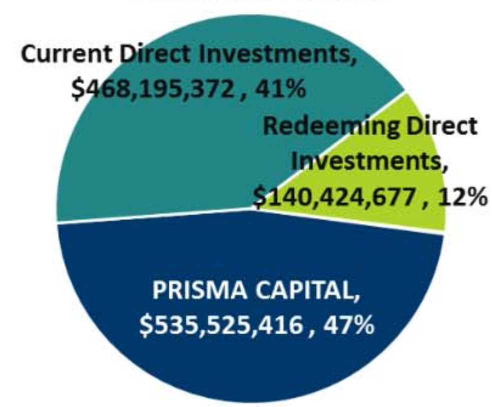
Review of Current Direct Investments

Wilshire

- Wilshire was directed to review the current hedge fund manager exposures:
  - A preliminary qualitative review of the direct investments is complete
  - As detailed in the attached report, Wilshire does not recommend any immediate terminations
- Due to the compressed time frame and limited accessibility, Wilshire was not able to assess the Daniel Boone exposures in time for this committee meeting.

Total Fund

Absolute Return



Wilshire Consulting

INITIAL DUE DILIGENCE SUMMARY

W Wilshire

Terminate Immediately	Most Likely Replace (5 Mgrs, $154mm)	Potentially Replace (5 Mgrs, $99.3mm)	Maintain (6 Mgrs, $214mm)
There are no managers with	**Blackrock GAO** *Diversifying*	**Anchorage Capital** *Directional*	**Credit Suisse SPF** *Diversifying*
sufficient red flags to warrant immediate	**HBK Multi-Strategy** *Diversifying*	**Coatue Qualified** *Directional*	**Davidson Kempner** *Diversifying*
recommendation of termination.	**Karya Master Fund** *Diversifying*	**H20 Alpha 10** *Diversifying*	**Gotham Neutral** *Diversifying*
	Tide Point Partners *Directional*	**PGIM Global RV** *Diversifying*	**Governor's Lane** *Directional*
	Tricadia Financials *Directional*	**Systematic Blue Matrix** *Diversifying*	**Myriad Opps** *Diversifying*
			SRS Partners *Directional*

Wilshire Consulting

Wilshire

Direct Investment Observations

- Of the 15 direct hedge fund investments reviewed, Wilshire will likely recommend retaining 11.
- The current direct portfolio is heavily skewed towards Diversifying Strategies, inline with previous committee mandates.
- The Directional strategies tend to be less reliant on market beta then many peers
- Only five managers have track records through the crisis: Anchorage, Davidson Kempner, HBK, SRS, and Systematica
- Consistent with a risk based approach, managers with higher volatility tend to have lower allocations while the three multi-strategy managers all have allocations over 10%
- Equity Market Neutral strategies are a large portion of the Diversifying allocation, increasing stock selection risk
- Systematic Macro & Risk Premia are under-represented

PRELIMINARY STRUCTURING REVIEW

Wilshire Consulting

Wilshire

ABSOLUTE RETURN PORTFOLIO SUMMARY

Manager	Strategy	Sub-Strategy	As of 8/31/2017	Weight	Post
Directional HFs				**PROGRAM**	**Redemptions**
SRS Partners US	Equity Hedge	Sector- Technology	$10,551,457	0.9%	1.1%
Tide Point Partners	Equity Hedge	Sector- Cyclicals	$22,939,363	2.0%	2.4%
Anchorage Capital	Event Driven	Distressed	$36,798,869	3.2%	3.9%
Governors Lane Fund	Event Driven	Multi-Strategy	$39,880,584	3.5%	4.3%
Tricadia Select	Event Driven	Credit	$6,573,733	0.6%	0.7%
TOTAL DIRECTIONAL			**$240,781,086**	**21.0%**	**12.4%**
Diversifying HFs					
Blackrock GAO Fund	Equity Hedge	Equity Market Neutral	$39,657,122	3.5%	4.2%
Systematica BlueMatrix Fund	Equity Hedge	Equity Market Neutral	$17,207,174	1.5%	1.8%
Gotham Neutral Strategies	Equity Hedge	Equity Market Neutral	$22,370,255	2.0%	2.4%
Davidson-Kempner LP	Event Driven	Multi-Strategy	$53,105,667	4.6%	5.7%
Liquidalts H20 Force	Macro	Systematic Diversified	$22,745,536	2.0%	2.4%
Karya Fund LLC	Macro	Discretionary Thematic	$21,839,052	1.9%	2.3%
Myriad Opportunities	Macro	Asia	$47,008,500	4.1%	5.0%
Credit Suisse SPF	Relative Value	Structured Credit	$41,502,343	3.6%	4.4%
HBK II	Relative Value	Multi-Strategy	$63,502,578	5.5%	6.8%
Prudential GLRV	Relative Value	Fixed Income-Arb	$22,513,139	2.0%	2.4%
TOTAL DIVERSIFYING			**$367,838,963**	**32.1%**	**37.5%**
TOTAL DIRECT MANAGERS	***# of Managers***	***28***	**$608,620,049**	**53.1%**	**0.0%**
Directional Managers in Redemption			***$124,037,079***	***10.8%***	
Diversifying Managers in Redemption			***$16,387,598***	***1.4%***	
DIRECT - POST REDEMPTIONS	***# of Managers***	***15***	**$468,195,372**	**40.9%**	**49.9%**
PRISMA CAPITAL			**$535,525,416**	**46.7%**	**50.1%**
In Redemption			***$66,009,000***	***5.8%***	
Other FoFs			**$1,496,900**	**0.1%**	**0.0%**
TOTAL MARKETABLE ALTERNATIVES			**$1,145,642,366**	**100.0%**	**100.0%**
TOTAL ALTS - POST REDEMPTIONS/FOF CLOSURES			***$937,711,789***		
TOTAL PLAN			**$16,790,994,603**	**6.8%**	**5.6%**

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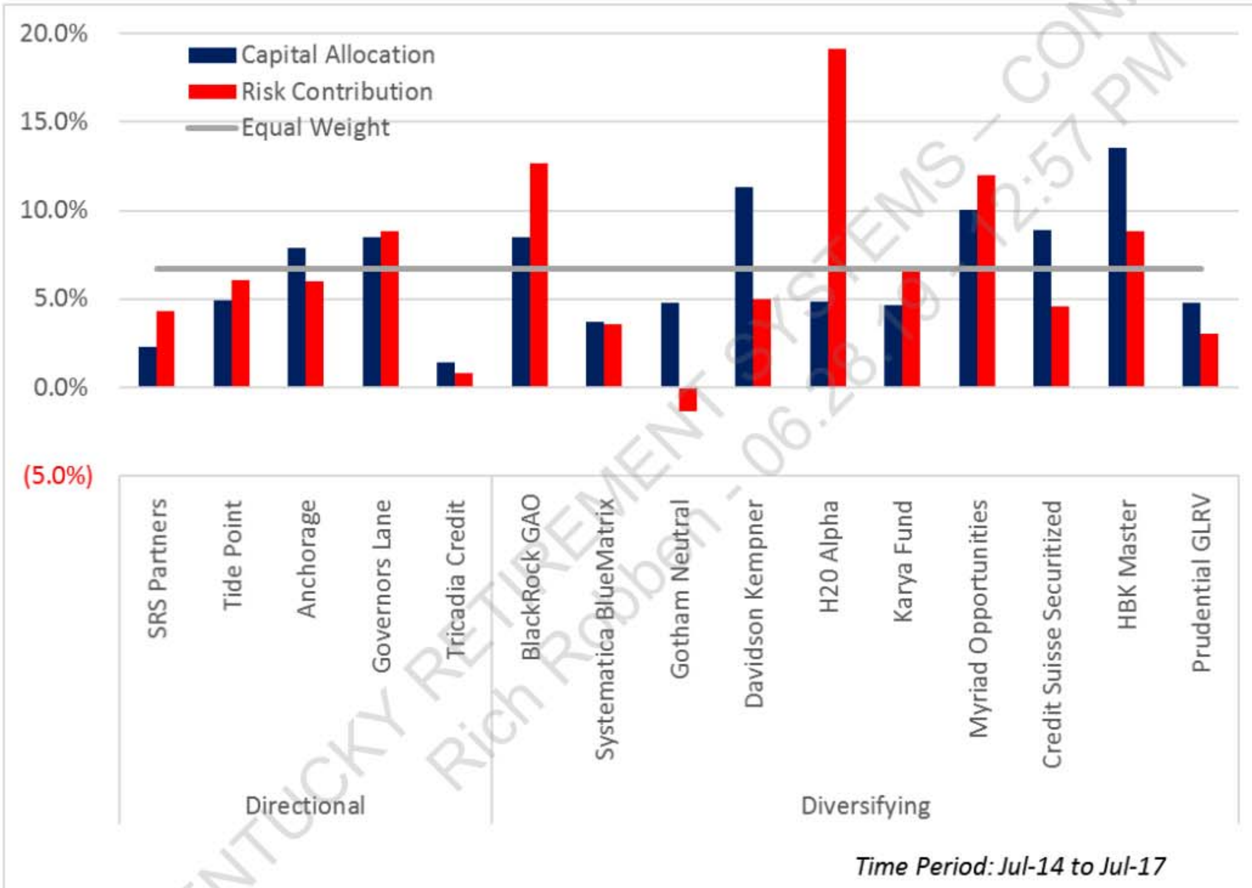
DIRECT PORTFOLIO CAPITAL Vs. RISK



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PERFORMANCE SUMMARY: DIRECT PORTFOLIO

Period Jan-08 to Jul-17		PERFORMANCE				RISK			ANNUAL PERFORMANCE			
Fund Name	Strategy	YTD	1 Year	3 Year	5 Year	S&P 500 Correl	S&P 500 Beta	Std Dev	2016	2015	2014	2008
S&P 500	SP500	11.60%	16.06%	10.9%	14.8%	1.00	1.00	15.4%	12.0%	1.4%	13.7%	(37.0%)
BAML ML 10+ Year US Treasury	Index	4.69%	(9.46%)	5.1%	2.0%	(0.29)	(0.23)	11.9%	1.2%	(1.0%)	24.4%	24.4%
HFRI - Diversifying Strategies- Fund Weighted	HFRI	1.16%	0.52%	2.5%	2.3%	0.29	0.06	3.2%	2.2%	0.6%	5.4%	2.7%
HFRI - Directional Strategies- Fund Weighted	HFRI	6.71%	10.94%	3.6%	6.6%	0.87	0.49	8.5%	7.3%	(2.1%)	2.0%	(27.5%)
HFRI Macro: Systematic Diversified Index	HFRI	(1.53%)	(7.50%)	1.7%	(0.1%)	(0.09)	(0.04)	7.5%	(1.4%)	(2.4%)	10.7%	18.1%
Barclays US High Yield Index	Index	6.10%	10.97%	5.3%	6.7%	0.72	0.51	10.8%	17.1%	(4.5%)	2.5%	(26.2%)
SRS Partners Master Fund LP	Directional	8.93%	17.03%	6.6%	12.0%	0.26	0.18	10.7%	(1.5%)	14.8%	14.9%	(1.0%)
Tide Point Capital	Directional	(10.34%)	(4.62%)	0.1%	7.6%	0.45	0.25	8.5%	16.2%	(2.4%)	18.1%	
Anchorage Capital Offshore, Ltd	Directional	2.75%	4.86%	2.5%	8.4%	0.50	0.21	6.4%	2.3%	1.3%	9.1%	(14.4%)
Governors Lane Fund	Directional	6.93%	12.39%			0.54	0.18	5.1%	10.5%			
Tricadia Credit Strategies Fund LP	Directional	4.08%	5.97%	0.5%	4.3%	0.46	0.16	5.4%	(1.5%)	(1.9%)	4.0%	2.6%
BlackRock GAO Fund Ltd.	Diversifying	2.68%	(3.96%)	3.9%	3.6%	0.40	0.18	6.9%	(10.5%)	18.8%	(1.6%)	
Systematica BlueMatrix Fund Limited	Diversifying	(0.61%)	3.78%	3.3%	5.0%	0.25	0.12	7.4%	(2.7%)	7.9%	10.4%	8.8%
Gotham Neutral Fund LP	Diversifying	(3.29%)	1.42%	0.5%	2.7%	0.23	0.08	5.3%	7.5%	(4.8%)	7.6%	
Davidson Kempner Institutional Partners, L.P.	Diversifying	4.15%	7.35%	3.6%	6.1%	0.62	0.16	3.9%	6.8%	1.6%	4.5%	(9.7%)
H20 Alpha Ten	Diversifying	4.84%	20.74%	8.3%	13.4%	0.15	0.11	12.0%	(2.3%)	18.3%	8.9%	
Karya Fund LLC	Diversifying	(1.47%)	(4.41%)	2.4%	7.3%	0.14	0.10	10.6%	3.8%	2.3%	10.9%	
Myriad Opportunities Fund	Diversifying	9.05%	12.40%	10.9%	12.2%	0.29	0.10	5.4%	3.9%	3.1%	20.5%	
Credit Suisse Securitized Products Fund	Diversifying	7.09%	10.22%	6.8%	10.8%	0.33	0.06	2.8%	4.7%	6.1%	10.7%	
HBK Master Fund	Diversifying	1.81%	4.40%	1.9%	4.1%	0.51	0.14	4.3%	8.2%	(2.6%)	3.2%	(16.2%)
Prudential Global Liquidity Relative Value	Diversifying	7.11%	12.08%	9.6%		0.60	0.12	3.2%	10.9%	9.9%		

Notes:

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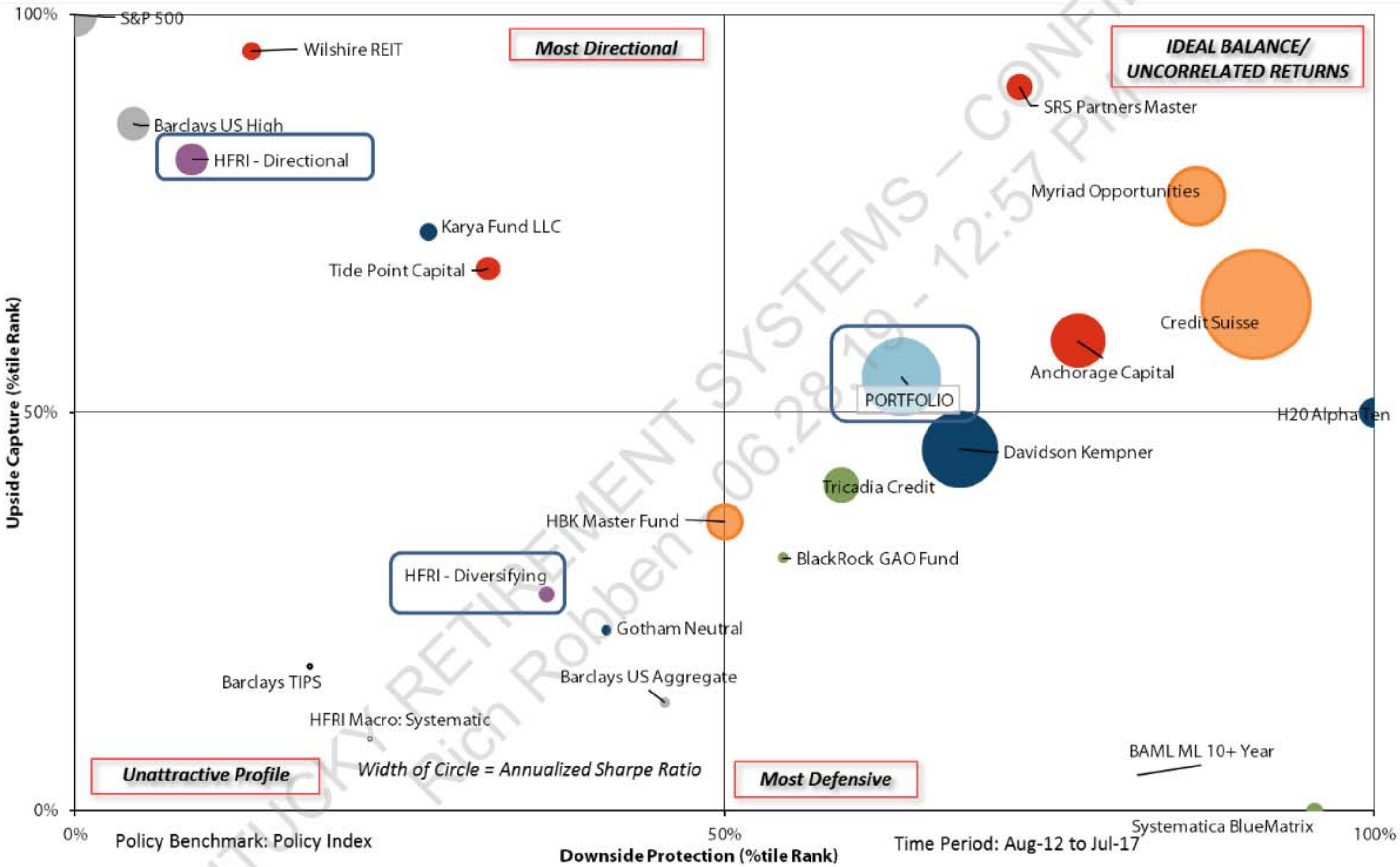
DIRECT: ROLE IN PORTFOLIO - Trailing 5 Years



Notes: Excluded due to short track record: Governors Lane, Prudential GLRV

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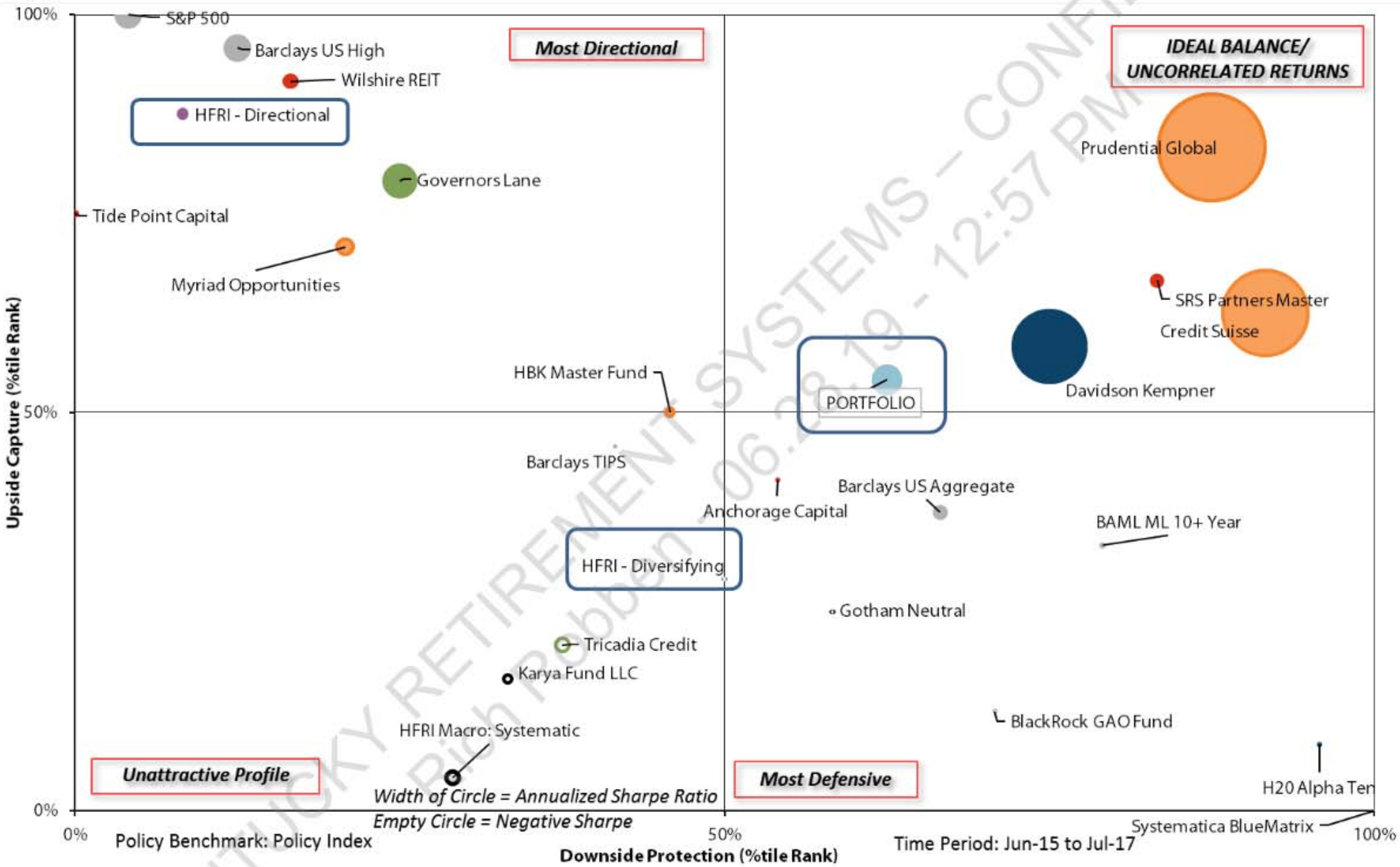
DIRECT: ROLE IN PORTFOLIO- All Managers



Notes: Governors Lane track record begins June 2015.

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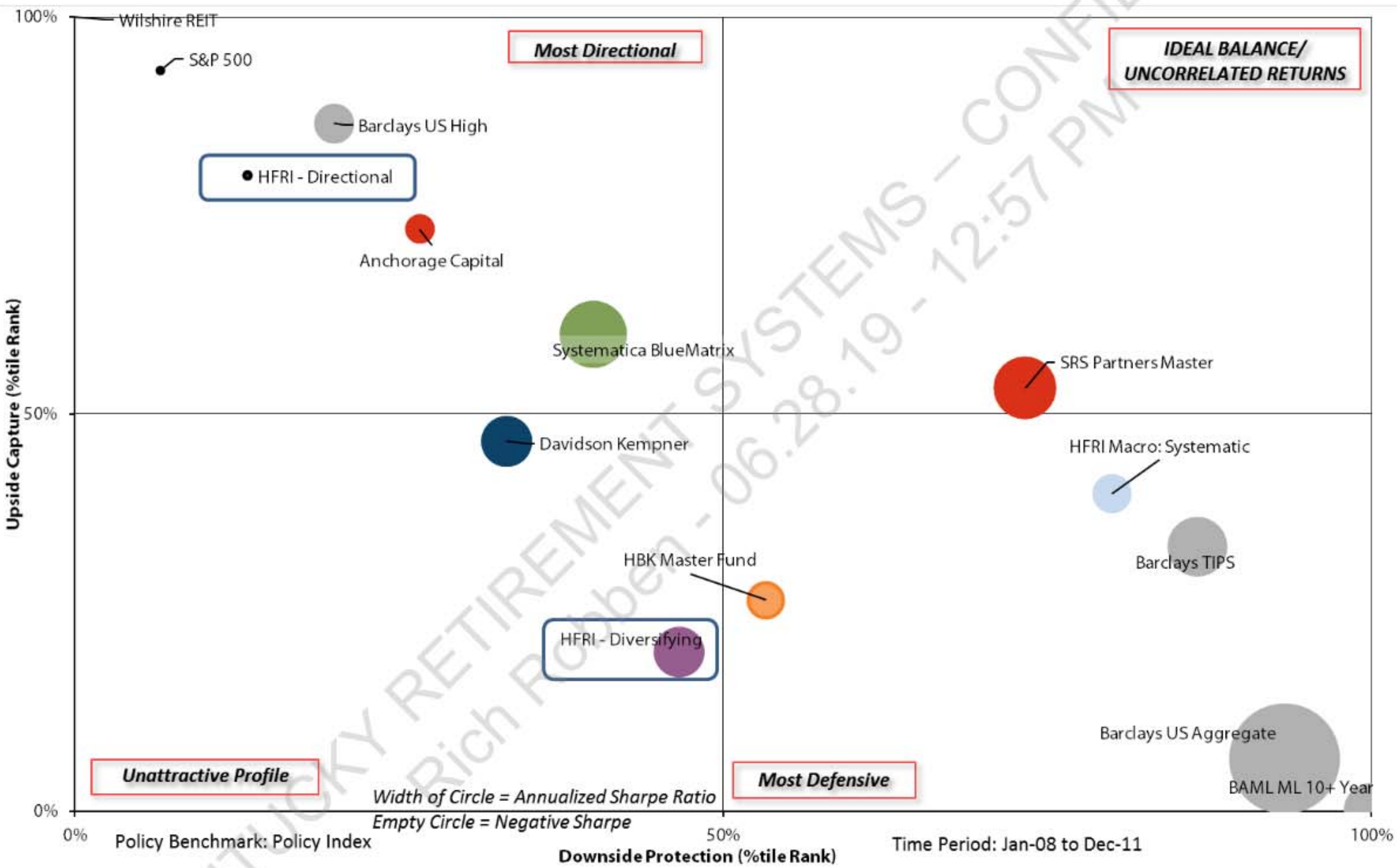
DIRECT: ROLE IN PORTFOLIO- Crisis



Notes: Only five of the 15 current direct exposures have track records through the crisis and recovery.

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DOWNSIDE RISK – LAST FIVE YEARS

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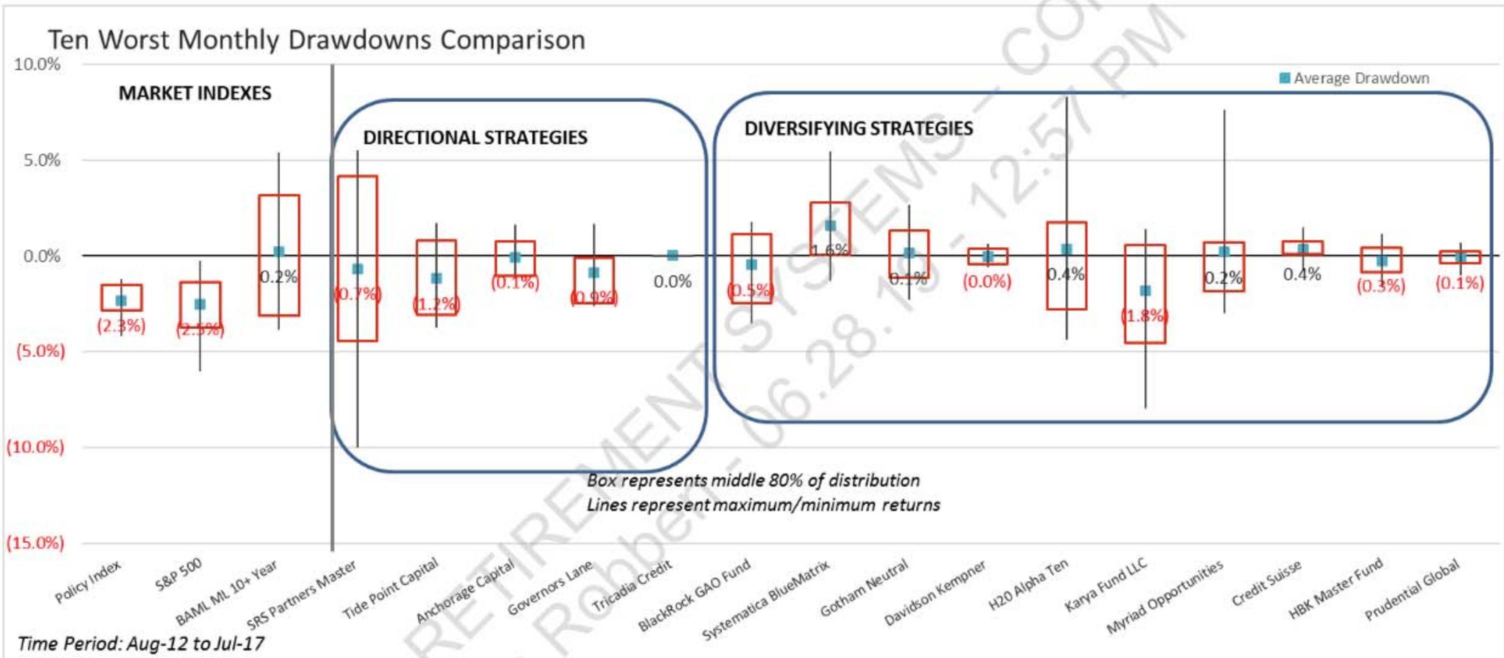

Notes: Only five of the 15 current direct exposures have track records through the crisis and recovery.

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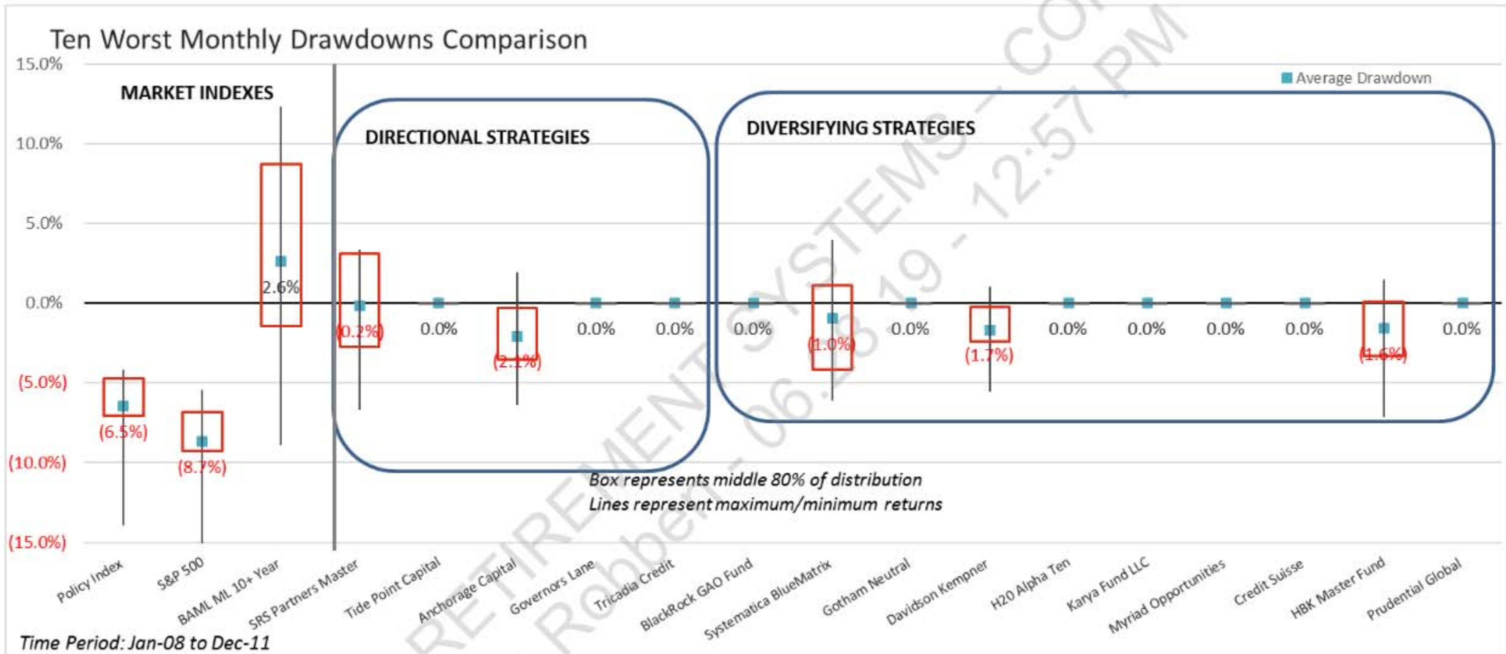
DOWNSIDE RISKS – CRISIS PERIOD



Notes: Only five of the 15 current direct exposures have track records through the crisis and recovery.

ASSET ALLOCATION

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FUNDAMENTAL RISK BELIEFS

Wilshire

Wilshire Consulting has been a pioneer in objectively identifying and quantifying investment risks for more than four decades. Our experience has shown repeatedly that effectively managing risks and costs are critical factors in achieving long-term investment objectives.

Understanding Risk Drives our Investment Process

- **Risk should be compensated:** Risk and return go hand-in-hand, but not all risks are rewarded equally. Be extremely selective.
- **Downside and behavioral risks should be managed:** Investors are enamored with potential returns and often underestimate the associated risks. Drawdowns destroy long-term wealth potential. Actively manage risk exposures.
- **Market timing can be dangerous:** "Tactical" investments may create more risk than return...use tactical positioning only when the potential reward is compelling.
- **Costs matter:** In a world of uncertain outcomes, fees and expenses are risks that are known with near-perfect insight and are a hurdle between the portfolio and its objectives. Be an extremely disciplined buyer.
- **The illiquidity risk premium varies and, alone, may be insufficient to justify private investments:** Tailor alternative investment strategies to take advantage of specific markets or managers that offer unique opportunities.

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THE WORLD THROUGH RISK LENSES

Wilshire Consulting views the world through six different risk lenses. Finding the optimal balance between mitigating certain risks while profiting from others is the key to long-term success.

Risk lenses help to focus the asset allocation process by providing context for modeling results and orienting decisions around organizational goals.

Drawdown: The potential for the portfolio to experience a significant decline in value.

Inflation: The potential for financial assets to lose purchasing power over time.

Liquidity: The potential for an investor to be unable to buy or sell specific assets in the portfolio.

Active: The potential for an investment strategy to experience tracking error due to characteristics that differ from those of the market

Behavioral: The potential for biased decision making to impede the organization's ability to reach its investment goals

Shortfall: The potential for the portfolio to fail to reach the organization's objectives.

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ECONOMIC FACTOR EXPOSURES

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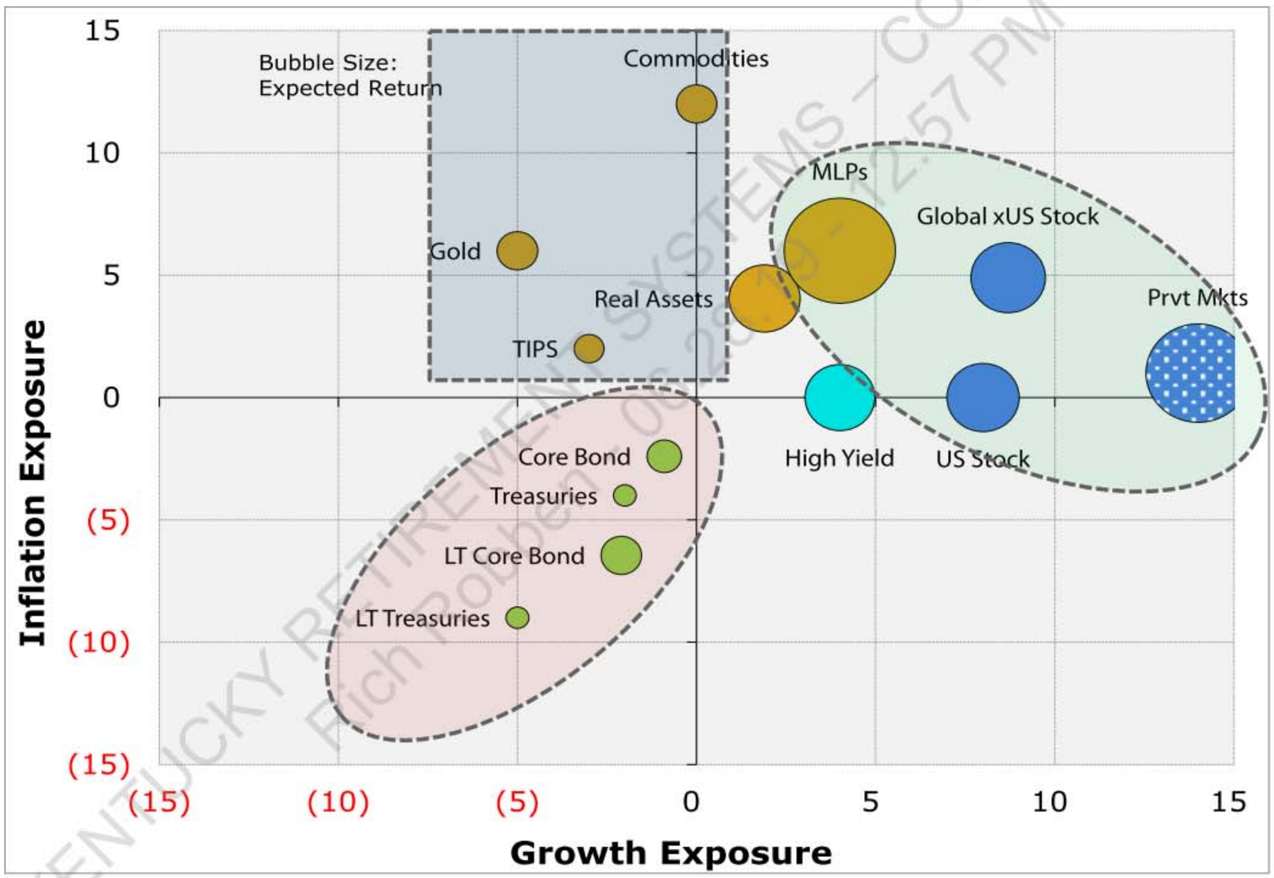
Concentrated factor tilts can represent portfolio vulnerability



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WILSHIRE CONSULTING HEDGE FUND INVESTMENT PHILOSOPHY

- Hedge funds are an implementation tool used to achieve portfolio objectives.
- Hedge funds are not homogenous and have varying levels of directionality, risk and liquidity.
- Manager structuring and selection is highly dependent on investor objectives, risk tolerances, and governance capabilities.

Therefore…

- Instead of "hedge fund", lets talk in terms of marketable alternatives.
    - Benchmark agnostic strategies and/or funds with investment lives of < 5 years.
- Instead of building a diversified portfolio of hedge fund investments (typical mentality), let's invest in a diversified set of strategies to achieve one or more outcomes:
    - Drive returns (Growth)
    - Hedge downside risks (Diversifiers)
    - Protect against inflation (Real Assets)
- Focus on Downside Risks: A reminder from 2008 is that qualitative considerations and potential tail risks can be more important than volatility and historical correlation relationships.

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STRUCTURING MARKETABLE ALTERNATIVES
ROLE DRIVEN INVESTING

Wilshire Consulting recommends segregating the hedge fund universe of strategies into Directional and Diversifying sub-groups.

Directional Alternatives

- Strategies that tend to be directionally long risk assets and exhibit higher equity correlations, though many exhibit low beta
- Allocations factored into overall directional risk in portfolio
- Most Equity Hedge and Event Driven (Spec Sits & Distressed) with some Relative Value
- Trailing 5 year: Equity correlation of 0.87. Equity beta of 0.45.

Diversifying Alternatives

- Strategies that rely on arbitrage opportunities, dynamic directional exposures or specific market inefficiencies to generate returns. Generally low beta AND low equity correlations
- Designed to diversify versus Policy over most rolling periods > one year
- Strategies: All Global Macro, Equity Market Neutral, Merger Arbitrage, some Relative Value, some Credit, direct lending, opportunistic.
- Trailing 5 year: Equity correlation of 0.30. Equity beta of 0.05.

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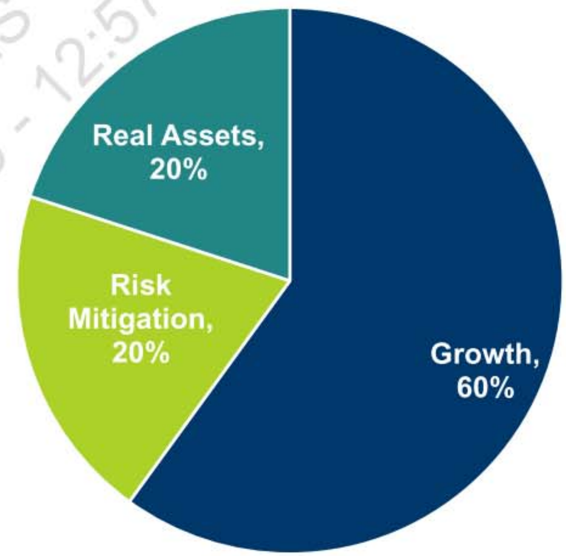
ASSET ALLOCATION

INTEGRATION APPROACH

GROWTH Economic Growth	• Public Equity • Private Equity • Public Credit • Private Credit • Directional Hedge Funds
RISK MITIGATION Safety and Liquidity	• Long Duration Fixed Income • Core Fixed Income • Cash • Diversifying Hedge Funds
REAL ASSETS Inflation Protection	• Global Inflation-Linked Bonds • Commodities • REITs, MLPs • Global Listed Infrastructure • Private Real Assets • Real Asset Hedge Funds

Typical Capital Allocation



INVESTMENT BELIEFS

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MARKET ALTERNATIVES BELIEFS

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- Hedge funds are not an asset class. Return drivers & risk levels vary
- Every investment should have a role in the portfolio: drive returns, hedge inflation, hedge downside risks. Every investment should compete for capital on this basis
- Correlation matters at least as much as beta
- Diversifying investments need not be low volatility
- Managing to volatility levels is not enough: downside risks exacerbate behavioral risks and governance missteps
- Over-diversification is a common structuring mistake and increases risk of achieving mediocre index returns
- Most strategies have an identifiable beta or risk premia. Don't overpay.
- Minimize fixed costs while being willing to pay for edge and upside
- Selection alpha is rare. Focus on structural inefficiencies, control strategies, unique markets/risks, and strategies with tail winds.

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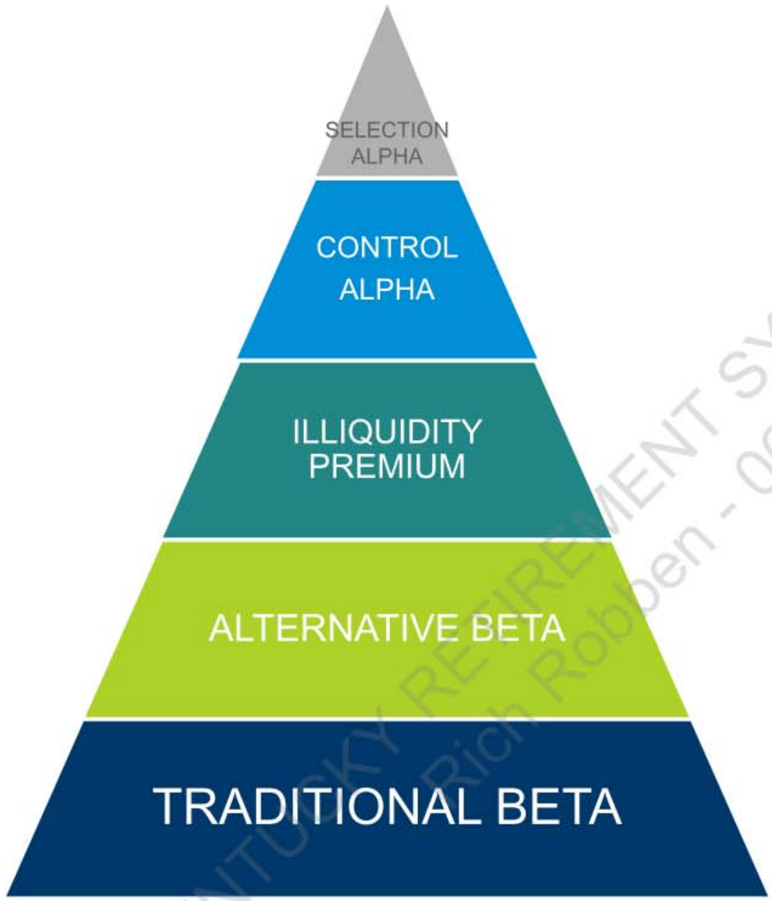
Defining Alpha and Beta Return Components



- **Selection Alpha** – Alpha derived from active security selection with measurable skill versus peers and passive options. Can come from multiple sources and extremely rare.
- **Control Alpha** – Alpha derived from a manager's direct involvement with an investment, e.g., Activist, Distressed for control.
- **Illiquidity Premium** – Premium derived from being a longer term capital provider, i.e., direct lending, whole loan purchases; can have a transitory & or opportunistic element, i.e., bank regulatory relief.
- **Alternative Beta** - Former Alpha strategies that have become more readily accessible due to research and creation of new investment vehicles.
- **Traditional Beta** - Returns derived from being a provider of capital via securities or owning hard assets.

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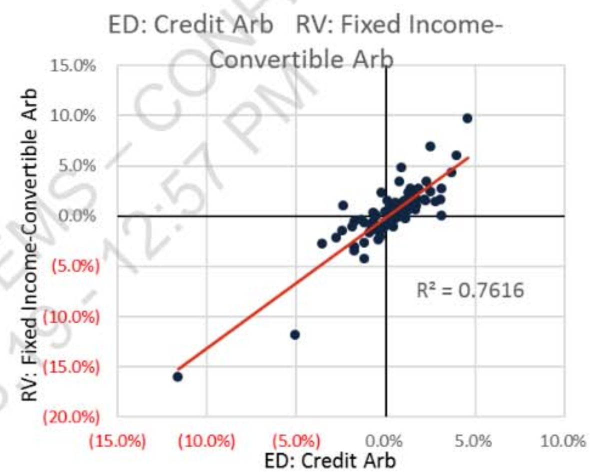
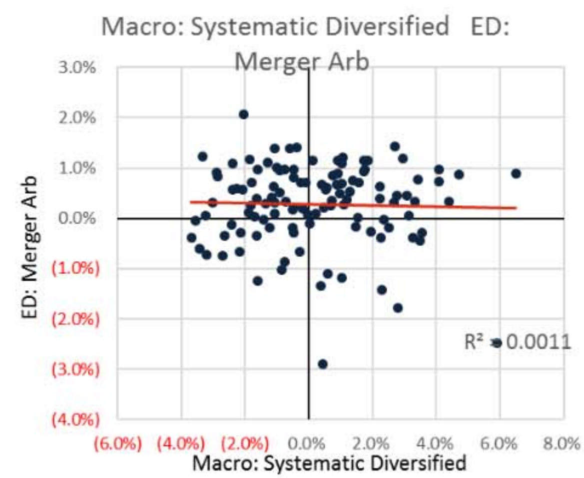
Understanding What Drives Returns

- Diversifying across different hedge fund strategies doesn't always ensure actual diversification
- Hedge fund strategies classified differently often have similar returns drivers
  - The HFRI Event Driven Credit Arbitrage Index is 0.8 correlated to the Relative Value Convertible Arbitrage Index
- While many strategies have unique return drivers
  - The HFRI Macro Systematic Diversified Index is 0.03 correlated to the Event Driven Merger Arbitrage Index





26

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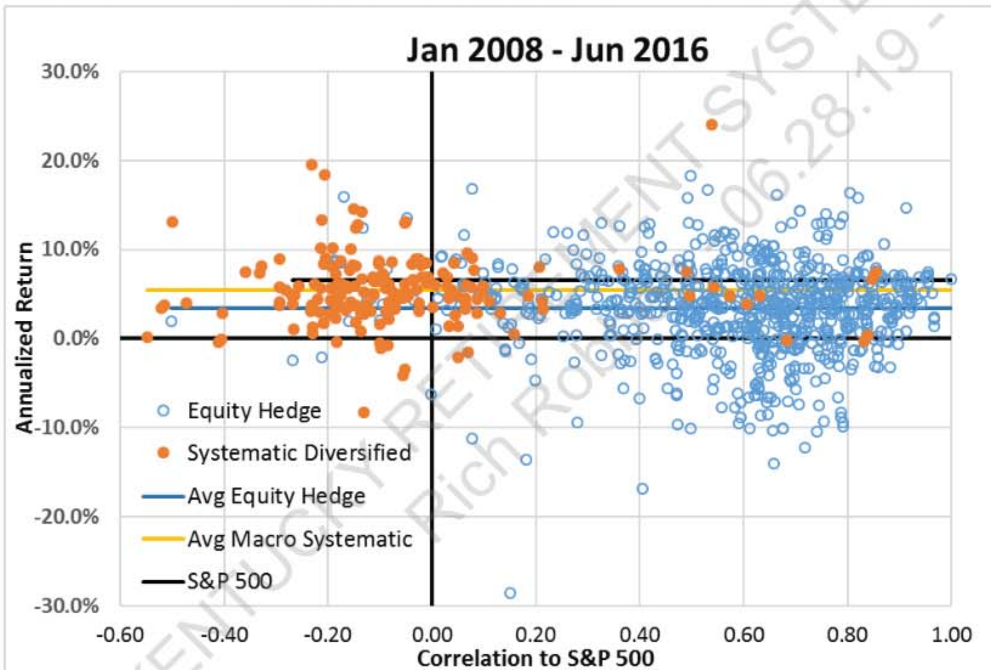
Diversifying Investments ≠Lower Returns

Modern portfolio theory says higher risk (i.e. equity risk) = higher return. The fine print: no leverage, no shorting, perfect information, etc. The reality is structural and behavioral inefficiencies create opportunities for unconstrained, opportunistic managers

Why does this matter? Equity risk doesn't have to be a key driver of returns. Regardless of if they meet or beat risk assets, diversifying investments give investors additional degrees of freedom to manage portfolios, i.e., providing liquidity to buy under-valued assets in 2008



- 2008-2016, the average Equity Hedge manager has returned 3.4% while Systemic Macro managers averaged 5.4%
- Manager selection is critical: Equity Hedge managers exhibited higher dispersion than the Macro managers

Source: HFR and Wilshire. All manager/fund results normalized to the volatility of the S&P 500 for the period January 2008 to June 2016.

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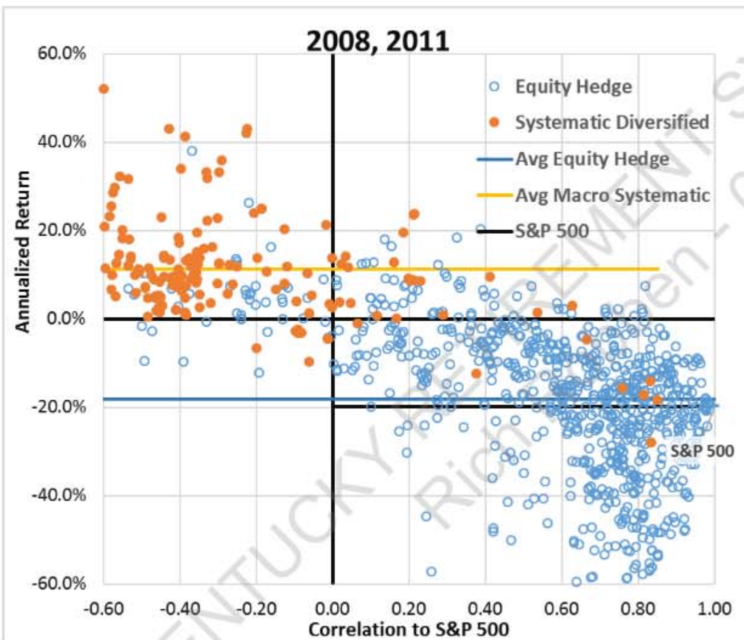
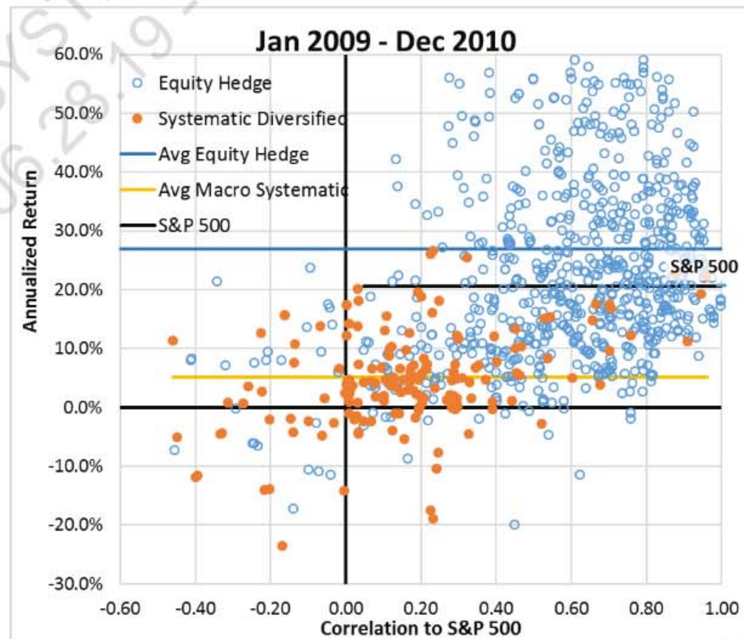
Diversifying Strategies: Path Dependency Matters

More important is the path arriving at these returns…

During 2008 and 2011, Systematic Macro managers were more likely to provide the positive returns to offset losses in the equity and credit markets while having the liquidity to support reallocating.

The trade-off is that during the 2009-2010 bull market these strategies lagged significantly but still generated modestly positive returns on average.





Source: HFR and Wilshire. All manager/fund results normalized to the volatility of the S&P 500 for the period January 2008 to June 2016.

28

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Market Outlook and Strategy Focus

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- **Tight credit spreads, relatively rich equity markets, and consistently low volatility levels point to a possible downturn in the current market cycle.**
- Wilshire currently favors true "***diversifying***" strategies or those less correlated to risk assets.
  - CTA Strategies
  - Market-Neutral Strategies
  - Multi-Strategy Funds
  - Relative Value Strategies
  - Structured Credit Strategies
- When considering "***growth"*** investments, Wilshire favors directional strategies that have some barriers to entry or have a control/catalyst element.
  - Activist Strategies
  - Private Credit Strategies
  - Sector-Specific Strategies
  - Small/Mid Cap Strategies
  - *Migration away from large cap, long-biased equity and high yield strategies*

INVESTMENT STRUCTURING

Wilshire Hedge Fund Advisory

SAMPLE HEDGE FUND PORTFOLIO

"DIRECTIONAL" PORTFOLIO EXAMPLE
3-5 Funds

"DIVERSIFYING" PORTFOLIO EXAMPLE
3-5 Funds

When considering *"directional"* hedge funds, Wilshire favors investment strategies that have barriers to entry or a control/catalyst element.

EXPECTED STRATEGY CHARACTERISTICS

	DIRECTIONAL STRATEGIES	DIVERSIFYING STRATEGIES
Return	6.34%	5.03%
Risk	8.31%	4.45%
Beta (S&P 500 Index)	0.4-0.5	0.0-0.1
Correlation (S&P 500 Index)	0.72	0.54

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STRUCTURING –SAMPLE IMPLEMENTATION

	Role	Market Sensitivity	Liquidity	Expected Return	Expected Volatility	Allocation
Directional Strategies	Return Driver	High	Quarterly, lock up	> 8%	8% to 12%	10%, 3-5 managers
Diversifying Strategies	Diversification / Liquidity	Low / Medium	Monthly, no lock ups	6% to 12%	5% to 10%	15%, 3-5 managers
Opportunistic Credit	Return Driver / Niche Investment	Varies	Annual, lock up, Drawdown	> 10%	< 8%	0-5%, TBD

- Goal: Rationalize manager line-up while improving strategy & manager diversification
- Approach: Barbell hedge fund portfolio: go more directional in the Growth portfolio and add liquid, less correlated managers to the Diversifying portfolio
- Opportunistic: Placeholder for investments like Angelo Gordon Energy Credit Opps

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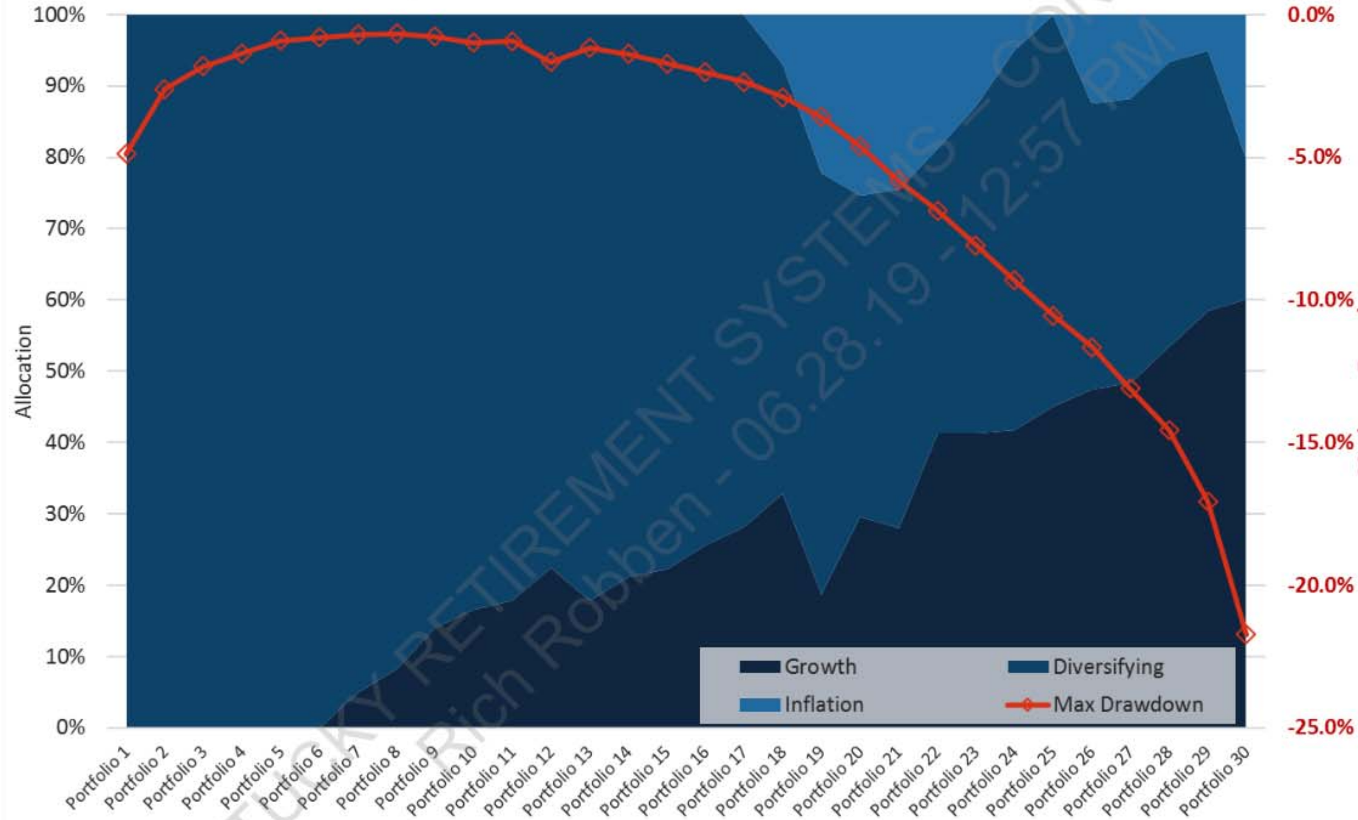
Optimizing Hedge Fund Risk Allocations

Drawdown Minimization Optimization: Risk Sleeve Allocations



Source: HFR, WIlshire. Optimization across 27 HFRI Sub-Strategy Indexes, January 2008 to June 2017

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Wilshire Private Markets

WHAT IS PRIVATE EQUITY?

Wilshire

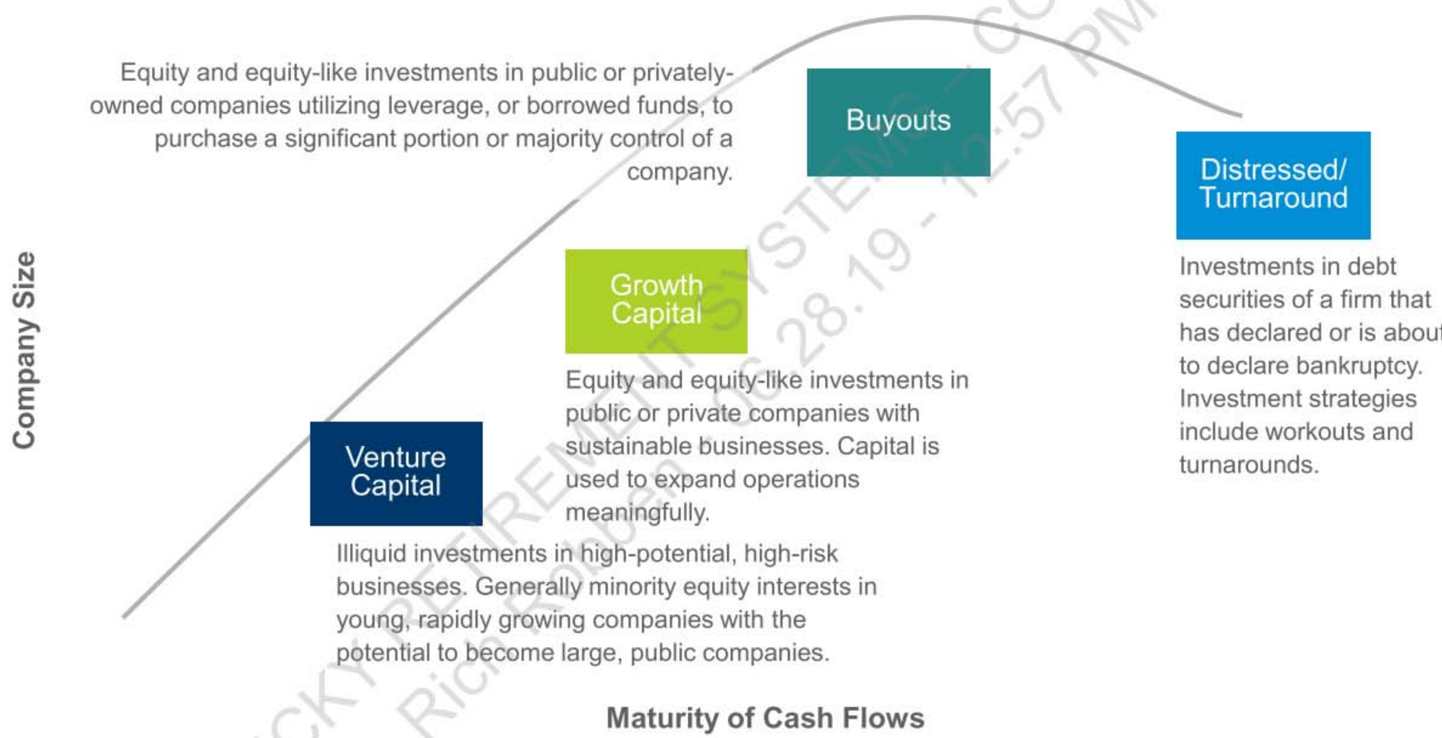
- Private Equity is any investment representing an ownership interest where there is no readily tradable or public market.

CHARACTERISTICS	PUBLIC EQUITY	PRIVATE EQUITY
AVAILABLE INVESTMENTS	• Approximately 63,000 companies worldwide (Bloomberg).	• 65,000,000 private companies worldwide (Hoovers).
INVESTMENT SECURITY	• Minority equity participant with limited control or influence.	• Often control equity ownership, but in some cases various debt positions are available.
BUSINESS CYCLE ACCESS	• Typically only mature or growth businesses are eligible to be public.	• Availability to invest in any phase of the business life cycle (seed investments through distressed).
BARRIER TO ACCESS	• Can be accessed through any registered broker.	• Invitation only (available only to qualified investors as defined by the Securities Act of 1934).
LIQUIDITY	• Often provide for daily liquidity options.	• Return of capital investment and returns over 10-12 year period, with no discretionary liquidity option.
VALUATIONS	• Daily valuations based on market pricing.	• Quarterly valuations on unrealized investments and available market pricing on divestitures.
RETURNS	• Historical average return expectations of 6-8.5% with a mean of 8%[1].	• Current average return expectations of 12%-17% with a median of 15%[1].

[1]J.P. Morgan Asset Management Long Term Capital Market Return Assumptions

Wilshire Private Markets

PRIVATE EQUITY INVESTMENTS DURING COMPANY LIFECYCLE



Wilshire Private Markets

DIFFERENT CHARACTERISTICS

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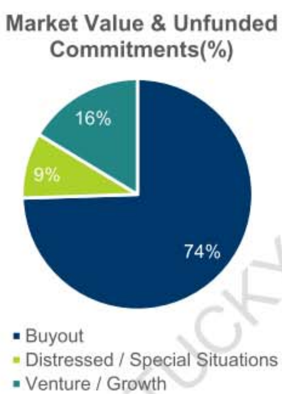
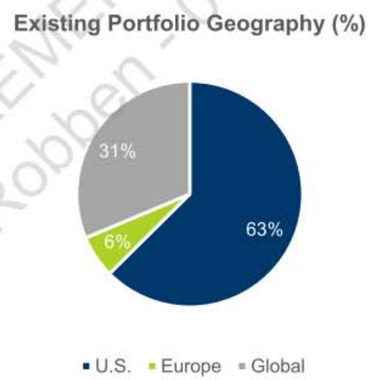
	VENTURE CAPITAL	GROWTH EQUITY	BUYOUT	DISTRESSED
Portfolio Company Stage	Early-Late	Expansion	Mature	Little to no growth
Revenues	None / Low but growing	Substantial growth	Self-sustaining	Mature and eroding
Number of Fund Investors	Multiple	One or multiple	One or multiple	One or multiple
Management Involvement	Moderate-Heavy	Moderate	Heavy	Heavy
Financing Rounds by Investors	3 -5	1-3	Often 1	Often 1
Use of Debt	Rarely	Rarely	Almost always	Always
Source of Quarterly Valuations	New financing rounds Fair market value	Comparables Fair market value	Comparables Fair market value	Comparables Fair market value
Failure Rate	Meaningful	Sometimes	Infrequent	Infrequent

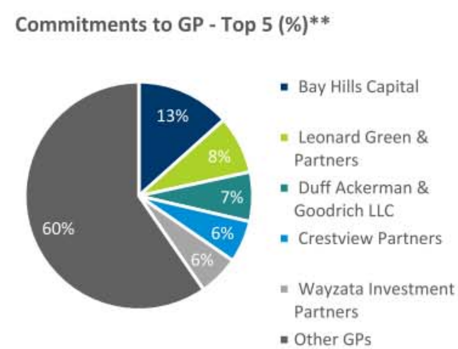
Wilshire Private Markets

EXISTING PRIVATE EQUITY PORTFOLIO COMPOSITION - PENSION

Investment Type	Market Value ($M)	Market Value & Unfunded Commitments($M)*	% Total
Total	**1,209**	**1,645**	**100%**
Buyout	857	1,226	74%
Distressed / Special Situations	104	151	9%
Venture / Growth	248	269	16%
Number of GPs	**37**		
Number of Funds	**66**		
Average Deal Size	**$37.6**		







*Market Value & Unfunded Commitments data as of Q3 2017.
** Commitments to GP chart reflects commitment percentages from 2006-present.

Wilshire Private Markets

CURRENT PRIVATE EQUITY GEOGRAPHIC ALLOCATION - PENSION

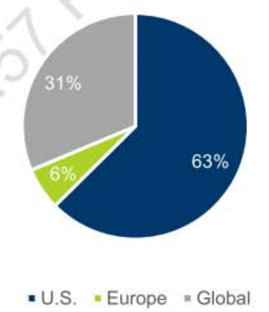
Existing Portfolio:

- The Pension Plan has limited non-US exposure, nearly entirely through global mandates
- Limited exposure to Europe and no exposure to Asia Pacific or Emerging Markets through dedicated private equity managers

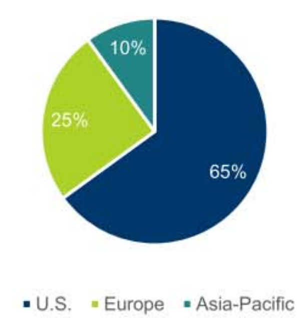
Considerations for Future Allocations:

- Consider additional dedicated European strategies
- Consider allocating to dedicated Asia-Pacific strategies
- Gradually increase exposure to non-US based managers

Existing Portfolio Geography (%)



Target Commitment by Geography



Wilshire Private Markets

CURRENT PRIVATE EQUITY SECTOR ALLOCATION - PENSION

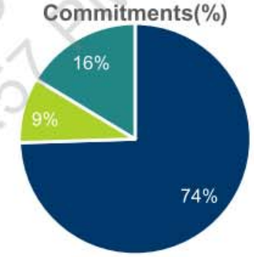
Existing Portfolio:

- The current portfolio is well diversified across private equity types based on current NAVs and commitments
- No venture or special situations dedicated commitments since 2015

Considerations for Future Allocations:

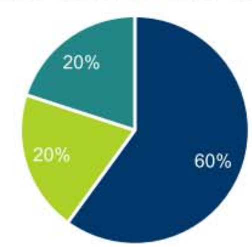
- Consider increasing commitments to special situations strategies, focusing on increasing exposure to non-US based strategies
- Consider annual commitments to each strategy type to ensure appropriate vintage year diversification

Market Value & Unfunded Commitments(%)



- Buyout
- Distressed / Special Situations
- Venture / Growth

Target Commitment by Sector



- Buyout
- Distressed / Special Situations
- Venture / Growth

Wilshire Private Markets

CURRENT PRIVATE EQUITY GP CONCENTRATION - PENSION

Wilshire

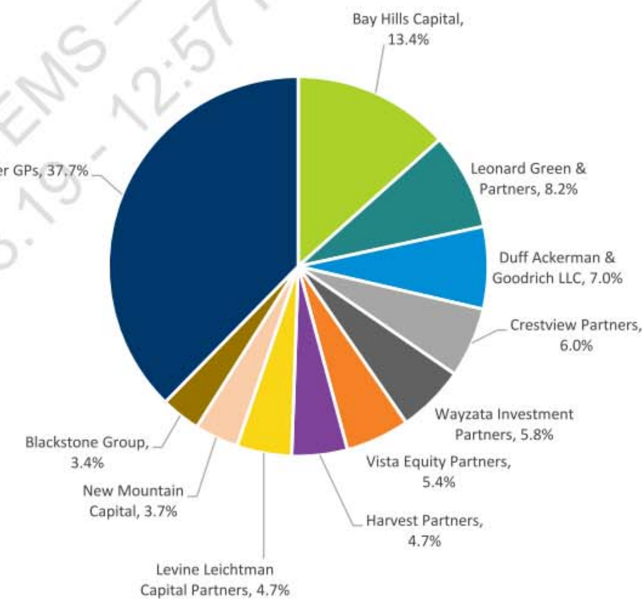
Existing Portfolio:

- The Pension Plan is diversified by general partner
- The largest allocation to a single GP is a fund-of-funds strategy

Considerations for Future Allocations:

- Continue to pursue a diversified portfolio of commitments by general partner

Commitment to GP - Top 10 (%)



Kentucky Retirement Systems - Pension Fund
December 31, 2017

Wilshire

RETURNS AND PERFORMANCE - SINCE INCEPTION (BY VINTAGE YEAR)

RETURNS AND PERFORMANCE

Fund	Returns Since Inception				Performance vs. Expectations			
	RVPI	TVPI	IRR pa	Benchmark IRR pa	Too Early	Below	At	Above
2002								
JW Childs Equity Partners III, L.P.	0.00	2.00	15.89%	5.54%				X
Total 2002 Vintage Year Funds	0.00	2.00	15.89%	5.54%	0.0%	0.0%	0.0%	1.5%
2003								
Green Equity Investors IV, L.P.	0.06	2.02	11.00%	3.93%				X
MatlinPatterson Global Opportunities Partners	0.00	1.76	29.80%	8.18%				X
VantagePoint Venture Partners IV, L.P.	0.11	1.26	3.97%	4.81%		X		
Total 2003 Vintage Year Funds	0.05	1.78	13.48%	4.87%	0.0%	1.5%	0.0%	4.5%
2004								
MatlinPatterson Global Opportunities Partners II	0.02	0.58	(21.89%)	9.80%		X		
Total 2004 Vintage Year Funds	0.02	0.58	(21.89%)	9.80%	0.0%	1.8%	0.0%	0.0%
2005								
Columbia Capital Equity Partners IV (QP), L.P.	0.23	2.18	11.83%	5.27%				X
H.I.G. Venture Partners II, L.P.	0.46	1.31	4.18%	6.87%		X		
Merit Mezzanine Fund IV, L.P.	0.24	1.78	10.51%	5.04%				X
New Mountain Partners II, L.P.	0.01	1.67	11.71%	2.09%				X
Oak Hill Capital Partners II, L.P.	0.04	1.67	9.85%	3.10%				X
Warburg Pincus Private Equity IX, L.P.	0.07	1.49	7.92%	2.01%				X
Wayzata Opportunities Fund, L.P.	0.01	1.43	8.44%	2.44%				X
Total 2005 Vintage Year Funds	0.08	1.59	9.22%	3.19%	0.0%	0.7%	0.0%	10.6%
2006								
Arbor Capital II, L.P.	0.29	2.49	19.85%	8.36%				X
Blackstone Capital Partners V, L.P.	0.05	1.34	5.63%	4.67%			X	
DAG Ventures II-QP, L.P.	0.22	0.63	(5.20%)	5.17%		X		
Golder Thoma Cressey Rauner IX-A, L.P.	0.09	1.76	13.46%	9.84%			X	
VantagePoint Venture Partners 2006, L.P.	0.40	0.48	(10.95%)	6.48%		X		
Total 2006 Vintage Year Funds	0.14	1.36	5.92%	6.47%	0.0%	2.2%	4.5%	0.9%
2007								
Bay Hills Emerging Partners I, L.P.	0.55	1.93	13.19%	11.44%			X	
DAG Ventures III-QP, L.P.	0.17	1.61	8.74%	6.60%			X	
Green Equity Investors V, L.P.	0.57	2.06	17.81%	10.76%				X
Harvest Partners V, L.P.	0.31	1.91	18.64%	11.22%				X
Hellman and Friedman Capital Partners VI, L.P.	0.08	1.40	9.70%	3.51%				X
Institutional Venture Partners XII, L.P.	0.39	2.66	26.33%	10.14%				X
MatlinPatterson Global Opportunities Partners III	0.46	1.24	4.68%	7.92%		X		

Kentucky Retirement Systems - Pension Fund
December 31, 2017

Wilshire

RETURNS AND PERFORMANCE - SINCE INCEPTION (BY VINTAGE YEAR)

RETURNS AND PERFORMANCE

Fund	Returns Since Inception				Performance vs. Expectations			
	RVPI	TVPI	IRR pa	Benchmark IRR pa	Too Early	Below	At	Above
New Mountain Partners III, L.P.	0.39	1.52	10.59%	10.78%		X		
Oak Hill Capital Partners III, L.P.	0.24	1.16	4.09%	7.73%			X	
Warburg, Pincus Private Equity X, L.P.	0.31	1.31	6.03%	10.11%		X		
Wayzata Opportunities Fund II, L.P.	0.07	1.88	16.56%	9.04%				X
Total 2007 Vintage Year Funds	0.32	1.64	12.12%	9.06%	0.0%	4.7%	5.2%	9.7%
2008								
Crestview Partners II, L.P.	0.71	1.88	16.29%	12.58%			X	
DAG Ventures IV-QP, L.P.	0.61	1.01	0.14%	12.93%		X		
Essex Woodlands Health Ventures Fund VIII, L.P.	0.53	1.04	1.00%	15.91%		X		
Mill Road Capital I, L.P.	0.88	1.90	12.36%	11.78%			X	
Tenaska Power Fund II, L.P.	0.03	0.93	(1.74%)	12.54%		X		
Vista Equity Partners III, L.P.	0.27	2.63	29.14%	8.77%				X
Total 2008 Vintage Year Funds	0.55	1.56	10.35%	12.07%	0.0%	5.6%	3.8%	1.8%
2009								
Bay Hills Emerging Partners II, L.P.	1.59	2.04	21.80%	11.90%				X
Horsley Bridge International Fund V, L.P.	1.48	1.75	16.28%	11.92%			X	
Total 2009 Vintage Year Funds	1.55	1.94	19.89%	11.89%	0.0%	0.0%	1.8%	3.6%
2010								
Arcano KRS Fund I, L.P.	1.11	1.25	5.75%	11.95%		X		
CM Growth Capital Partners, L.P.	0.46	0.48	(10.45%)	9.62%		X		
DCM VI, L.P.	1.10	1.27	4.98%	11.41%		X		
Keyhaven Capital Partners Fund III, L.P.	0.90	1.31	9.44%	11.69%			X	
Total 2010 Vintage Year Funds	0.88	1.07	1.48%	11.52%	0.0%	2.9%	1.2%	0.0%
2011								
Blackstone Capital Partners VI, L.P.	0.87	1.38	11.45%	11.55%			X	
DAG Ventures V-QP, L.P.	3.18	3.84	33.81%	12.23%				X
H.I.G. BioVentures II, L.P.	0.98	1.30	9.88%	10.93%			X	
Vista Equity Partners IV, L.P.	0.78	1.87	18.36%	11.97%				X
Total 2011 Vintage Year Funds	1.03	1.69	17.05%	11.79%	0.0%	0.0%	3.0%	1.4%
2012								
Green Equity Investors VI, L.P.	0.88	1.37	13.24%	11.35%			X	
Harvest Partners VI, L.P.	0.77	1.65	19.69%	12.24%				X
Total 2012 Vintage Year Funds	0.83	1.50	16.67%	11.84%	0.0%	0.0%	1.3%	1.1%
2013								
Bay Hills Emerging Partners III, L.P.	1.10	1.16	9.79%	13.76%			X	

Kentucky Retirement Systems - Pension Fund
December 31, 2017

Wilshire

RETURNS AND PERFORMANCE - SINCE INCEPTION (BY VINTAGE YEAR)

RETURNS AND PERFORMANCE

Fund	Returns Since Inception RVPI	TVPI	IRR pa	Benchmark IRR pa	Performance vs. Expectations Too Early	Below	At	Above
H.I.G. Capital Partners V, L.P.	1.01	1.23	15.19%	11.34%			X	
Levine Leichtman Capital Partners V, L.P.	0.72	1.17	10.15%	11.53%			X	
Riverside Capital Appreciation Fund VI, L.P.	0.99	1.37	15.18%	10.91%			X	
Triton Fund IV, L.P.	0.79	1.10	5.47%	10.10%		X		
Wayzata Opportunities Fund III, L.P.	0.50	1.01	0.42%	10.34%		X		
Total 2013 Vintage Year Funds	0.84	1.18	9.44%	11.34%	0.0%	2.6%	7.1%	0.0%
2014								
CVC European Equity Partners VI, L.P.	0.95	1.14	11.60%	12.71%			X	
New Mountain Partners IV, L.P.	1.14	1.29	18.43%	12.01%				X
Secondary Opportunities Fund III, L.P.	0.96	1.27	24.70%	13.62%				X
Total 2014 Vintage Year Funds	1.03	1.23	17.44%	12.56%	0.0%	0.0%	1.1%	2.3%
2015								
Ares Special Situations Fund IV, L.P.	0.66	0.78	(14.49%)	7.56%		X		
BDCM Opportunity Fund IV, L.P.	1.01	1.11	7.77%	14.52%			X	
Crestview Partners III, L.P.	1.08	1.09	5.27%	11.98%			X	
Total 2015 Vintage Year Funds	0.93	1.01	0.63%	11.61%	0.0%	1.1%	3.0%	0.0%
2016								
Harvest Partners VII, L.P.	0.85	0.96	(6.13%)	16.13%		X		
Kayne Anderson Energy Fund VII, L.P.	0.92	1.26	34.67%	19.62%				X
KCP IV Co-Invest L.P.	0.96	0.96	(3.59%)	17.21%		X		
Keyhaven Capital Partners Fund IV, L.P.	1.43	1.46	44.62%	17.56%				X
Vista Equity Partners VI, L.P.	0.92	1.01	1.81%	19.40%		X		
Total 2016 Vintage Year Funds	0.95	1.16	20.70%	18.98%	0.0%	2.4%	0.0%	2.6%
2017								
Green Equity Investors VII, L.P.	0.98	0.98	NM	NM	X			
Levine Leichtman Capital Partners VI, L.P.	0.55	0.97	NM	NM	X			
Total 2017 Vintage Year Funds	0.76	0.97	NM	NM	2.5%	0.0%	1.0%	0.0%
Total	0.48	1.50	10.24%	7.73%	2.5%	25.5%	32.9%	40.1%

Wilshire Private Markets

Wilshire

NORTH AMERICA INVESTMENT THEMES

	REGIONAL CONTEXT	LOCAL OPPORTUNITIES
Demographic Shifts	Aging Population "Millennials" Income Inequality	Clinical Trial Management Retail Mortgage Origination QSR Franchise Finance
Economic Rebalancing	Sector Cyclicality Economic Cyclicality/Bubbles	Oilfield Chemicals On-Premise to Cloud Migration
Technology & Innovation	Device Proliferation Ubiquitous Connectivity Unlimited Computing Power	Content for Young Audiences Workflow Automation Software Music Royalties
Energy, Commodities, & Climate Change	U.S. Energy Revolution Renewable Portfolio Standard	O&G Fuel Distribution Home Energy Efficiency Finance
Government / Geo-Politics	Fiscal Expansion De-Regulation Populism & Protectionism	Infrastructure Services Healthcare Services Financial Services
Financial Markets & Efficiency	Widespread Exuberance Increased Competition Commoditized Strategies	Midwest Special Situations Los Angeles-Based Startups Post-FDA Healthcare Credit

North America Private Markets	
Buyout	Neutral
Growth	Cautious
Venture	Cautious
Special Situations	Favorable
Credit	Neutral
Real Estate	Neutral
Natural Resources	Favorable
Infrastructure	Neutral
Non-traditional	Favorable

– Highly Favorable
– Favorable
– Neutral
– Cautious
– Unfavorable

Represents the current opinion of WPM as of the date of preparation and are subject to change without notice. WPM assumes no duty to update any such statements.

Kentucky Retirement Systems

Overview of the Fixed Income Portfolio

Richard Robben, CFA
Interim Executive Director - Investments

Kentucky Retirement Systems

- KRS currently has over $4.6 billion invested in Fixed Income Assets
- Split between "Core" and "Specialty Finance"

KRS Fixed Income	Fiscal YTD	1 Year	3 Years	5 Years	10 Years	ITD
Fixed Income	1.43	3.11	3.06	3.67	4.85	7.56
Benchmark (50% US High Yield / 50% US Universal)	0.79	2.65	4.46	3.83	4.67	7.36

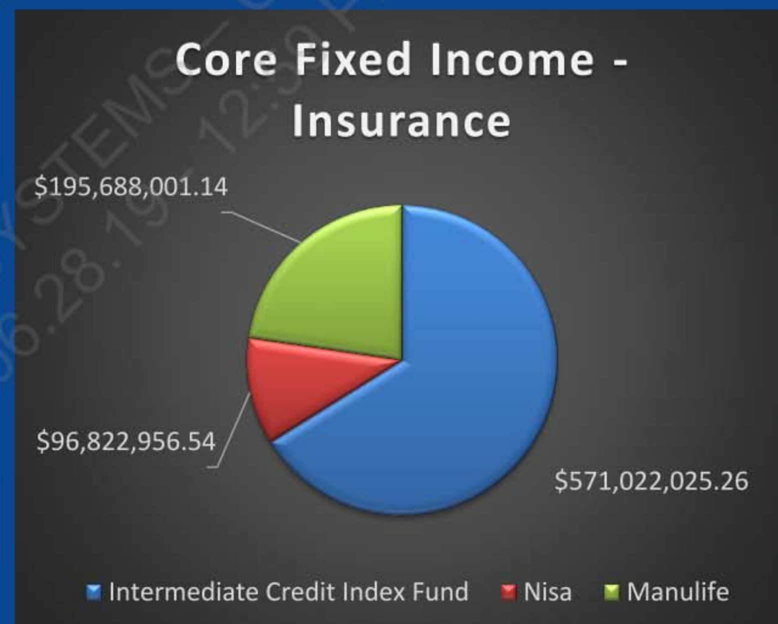
Core Fixed Income

- Part of the Liquidity allocation
- Predominately Investment Grade bonds
- Global government bonds, corporate bonds, mortgage loans, and asset backed securities
- Publically traded securities with daily pricing
- Comprised of 3 external managers with a total of $3 billion

Core Fixed Income Managers

- **NISA Investment Advisors ($383,784,000)** - Core Fixed Income benchmarked to the Bloomberg Barclays Aggregate Index
- **Manulife ($691,000,000)** – Global Total Return portfolio managed to the Bloomberg Barclays US Universal
- **Intermediate Credit Indexed CTF ($1,940,000,000)** – Split between BNY Mellon and Blackrock

Core Portfolio Construction



Performance and Fees

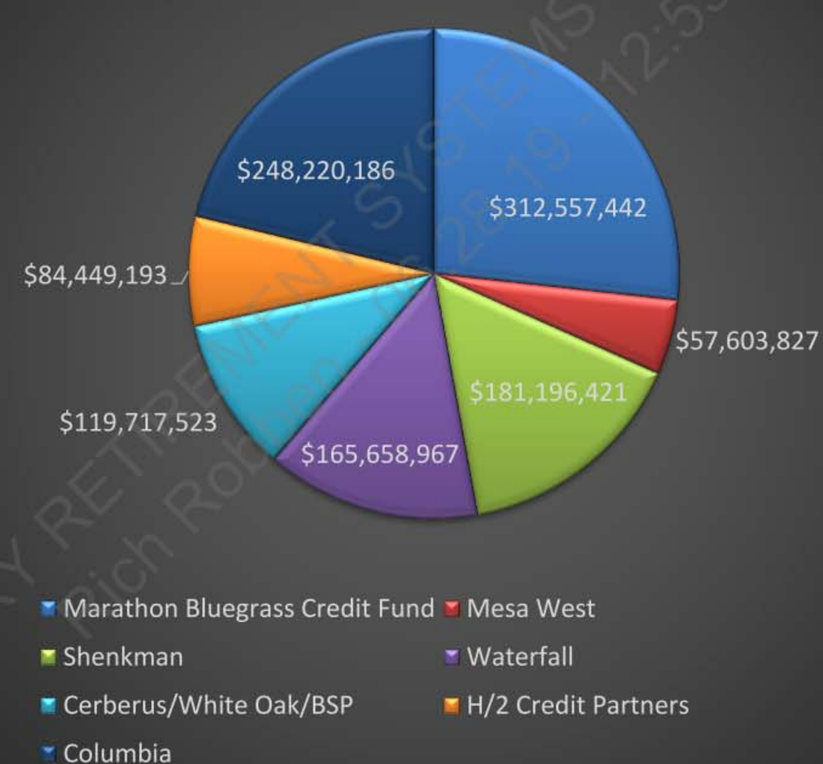
Annual Rates of Return for periods greater than 1 year, net of fees							
Core Fixed Income	**Fiscal YTD**	**1 Year**	**3 Years**	**5 Years**	**ITD**	**Mgmnt Fee**	**Performance Fee**
NISA	-0.04	1.47	1.53	2.05	3.95	0.165%	None
Bloomberg Barclays U.S. Aggregate Bond Index	-0.24	1.20	1.20	1.82	3.73		
MANULIFE ASSET MGMT	0.81	2.45	2.38	2.51	4.14	0.36%	None
Manulife Benchmark	0.00	1.52	1.68	0.67	1.08		
IG Credit FI Unit	-0.27	0.89			0.89	0.03%	None
Bloomberg Barclays U.S. Credit-Intermediate Index	-0.28	1.10			1.10		
BNY IG Credit Unit	-1.62				-1.62	0.03%	None
Bloomberg Barclays U.S. Credit-Intermediate Index	-1.12				-1.12		

High Yield / Specialty Credit

- Part of the Growth allocation
- Predominately below Investment Grade bonds and loans
- Includes High Yield bonds, direct lending / private credit, real estate specific lending, and other types of specialty finance.
- Mix of public and private securities
- Comprised of 9 external managers with a total of $1.6 billion

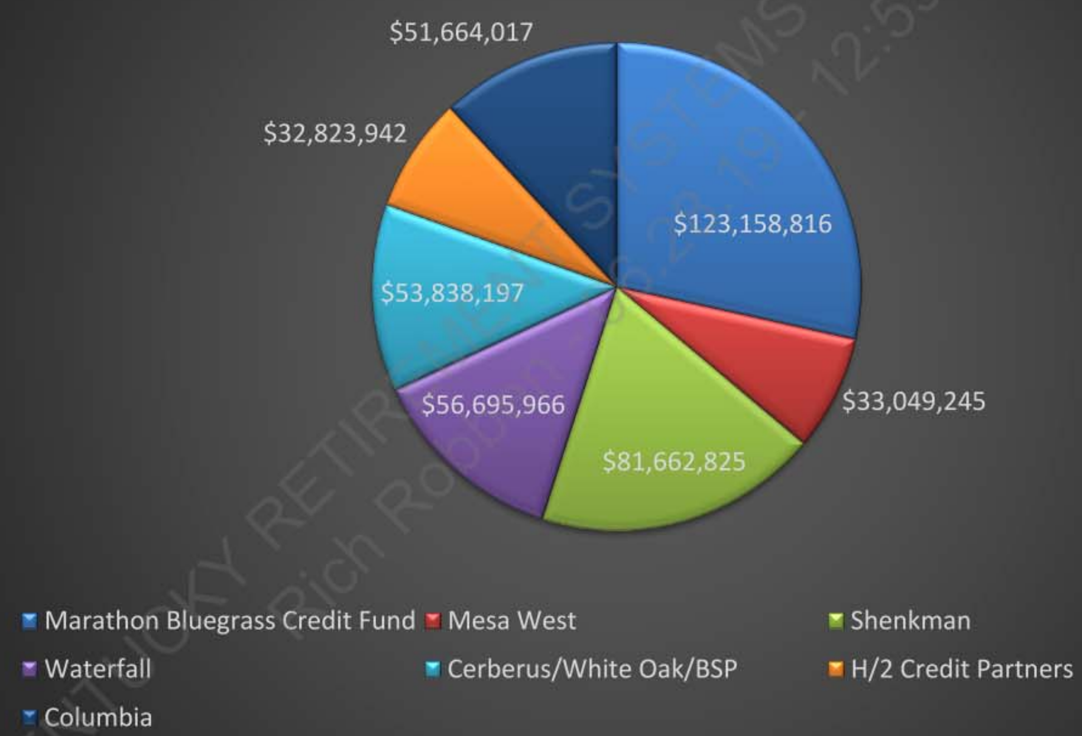
Investment Program

High Yield / Specialty Credit - Pension



Investment Program

High Yield / Specialty Credit - Insurance



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Specialty Credit Managers

- **Columbia Threadneedle ($300,000,000)** - High Yield Bond portfolio benchmarked to the Bloomberg Barclays US High Yield Index
- **Marathon Investment Management ($435,000,000) –** Manages the Bluegrass Credit Fund, which is a multi-sector credit portfolio of below investment grade assets benchmarked to the Bloomberg Barclays US High Yield Index.
- **Shenkman Capital ($300,000,000)** – Dedicated bank loan mandate benchmarked to the S&P LSTA Leveraged Loan Index.
- **Waterfall Asset Management ($223,000,000)** – High Yield structured securities portfolio.

Performance and Fees

Annual Rates of Return for periods greater than 1 year, net of fees

High Yield	Fiscal YTD	1 Year	3 Years	5 Years	ITD	Mgmnt Fee	Performance Fee
COLUMBIA	0.69	3.16	4.43	4.91	6.82	0.37%	None
Bloomberg Barclays U.S. Corporate High Yield	1.57	3.78	5.17	4.99	6.82		
MARATHON BLUEGRASS CREDIT FUND	1.29	1.77			8.12	0.85%	17% over hurdle
Bloomberg Barclays U.S. Corporate High Yield	1.57	3.78			10.36		
SHENKMAN CAP	2.56	3.65	3.29	3.61	4.76	0.37%	None
Shenkman Blended Index	3.64	4.43	4.20	4.31	5.77		
WATERFALL	8.72	12.88	9.56	10.41	12.22	0.50%	Yes - Scaled
Opportunistic FI Blended Index	1.95	3.61	4.03	3.76	5.25		

Specialty Credit Managers

Private Credit / Direct Lending

- **Cerberus ($120,000,000) –** Private Credit / Direct Lending portfolio benchmarked to the S&P LSTA Leveraged Loan Index.
- **White Oak ($150,000,000)** – New Private Credit / Direct Lending portfolio benchmarked to the S&P LSTA Leveraged Loan Index.
- **Benefit Street Partners ($150,000,000)** – New Private Credit / Direct Lending portfolio benchmarked to the S&P LSTA Leveraged Loan Index.

Performance and Fees

Annual Rates of Return for periods greater than 1 year, net of fees							
Private Credit / Direct Lending	**Fiscal YTD**	**1 Year**	**3 Years**	**5 Years**	**ITD**	**Mgmnt Fee**	**Performance Fee**
Cerberus KRS LP	4.77	7.42	8.53		8.09	1.00%	15% over 6%
S&P LSTA Leveraged Loan Index	3.64	4.43	4.20		3.80		
White Oak Yield Spectrum Fund	New					1.1%	15% over 6.5%
S&P LSTA Leveraged Loan Index							
BSP Private Credit Fund	New					1.13%	15% over 6.5%
S&P LSTA Leveraged Loan Index							

Specialty Credit Managers

Real Estate Lending

- **Mesa West Core Lending Fund ($93,000,000)** – Real estate debt fund.
- **Mesa West IV ($16,000,000)** – Real estate debt fund.
- **H2 Credit Partners ($117,000,000)** – Real estate debt fund.

Performance and Fees

Annual Rates of Return for periods greater than 1 year, net of fees

Real Estate Debt	Fiscal YTD	1 Year	3 Years	5 Years	ITD	Mgmnt Fee	Performance Fee
H/2 CREDIT PARTNER	2.80	4.88	6.11	5.41	6.24	1.00%	10% over hurdle
S&P LSTA Leveraged Loan Index	3.64	4.43	4.20		3.80		
MESA WEST CORE LEND	5.17	7.10	7.63		6.60	1.00%	20% over 8%
S&P LSTA Leveraged Loan Index	3.64	4.43	4.20		3.80		
Mesa West IV	5.39	2.70			2.49	1.50%	20% over 6.5%
NCREIF NFI ODCE Net 1Qtr in Arrears Index^	5.04	6.66			7.98		