RVKuhns & ASSOCIATES, INC.

North Dakota Legacy Fund
Asset Allocation and Spending Policy Project

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Consulting Team Biographies

Ronald L. Klotter, CFA – Director of Midwest Consulting, Senior Consultant

Ron is a Senior Consultant and Director of Midwest Consulting operations with R.V. Kuhns & Associates, Inc. and is located in our Chicago office. Prior to joining RVK, Ron was a Principal at Hewitt EnnisKnupp. Ron also has held senior investment management positions at Wellington Management Company, Brinson Partners and INVESCO. In addition to his consulting responsibilities, Ron has responsibility for coordinating and overseeing our Midwest consulting activities. Ron has conducted extensive research on several key topics in the investment consulting industry. Ron is a frequent speaker at major industry conferences.

Ron holds a B.S. (Honors) degree from Miami University (Ohio) and an MBA degree from the J. L. Kellogg Graduate School of Management at Northwestern University in Evanston, Illinois. Ron holds the Chartered Financial Analyst designation. He is a member of the CFA Institute and a member of the Chicago Society of Financial Analysts.

Joshua R. Kevan, CFA – Senior Consultant, Principal

Josh Kevan is a Senior Consultant with R.V. Kuhns & Associates, Inc. He is based in Boise, Idaho and is supported by our Portland office. Josh joined RVK in 2000. As a Senior Consultant he advises a diverse mix of clients that include defined benefit plans, defined contribution plans, insurance companies, and other special purpose funds. In addition to his consulting relationships, he is involved in the firm's investment manager research and due diligence efforts.

Josh earned a Bachelor of Arts degree in Business from the University of Washington and holds the Chartered Financial Analyst designation. Josh is a shareholder, and also serves on the company's board of directors and its executive committee.

Consulting Team Biographies

John P. McLaughlin, CFA – Consultant

John joined R.V. Kuhns & Associates, Inc. in 2009 and currently serves as Consultant to a number of the firm's public and private clients across a wide range of plan types. John is located in our Chicago, Illinois office. Prior to joining RVK, John worked for Russell Investments where he helped manage derivative portfolios for a number of Fortune 500 companies and state governments. Additionally, John consulted nationally to investment management and advisory firms on strategic business issues in his previous role with Moss Adams LLP. He has also worked at Mercer Consulting, where he conducted research for executive compensation projects at publically traded clients.

John graduated Magna Cum Laude from Seattle University, where he earned his Bachelor of Arts degree in Business Administration with a major in Finance and a minor in Economics. John also holds the Chartered Financial Analyst designation. He is a member of the CFA Institute and the CFA Society of Chicago.

William Lee – Investment Associate

William is an Investment Associate and is located in our Chicago office. Prior to joining RVK, he worked at Cambridge Associates as an international investment performance analyst. His responsibilities within that role included leading a cross-functional team in coordination of monthly and quarterly performance reporting for endowed institutions, operating reserves, and high-net-worth private clients. William's previous experience also includes working at Proctor and Gamble as a Finance and Accounting Analyst and experience with the Phi Kappa Tau Foundation and Wolf Trap Foundation for the Performing Arts.

William earned a Bachelor of Science in Business with a major in Finance and a minor in Chinese from the Farmer School of Business at Miami University, Oxford, Ohio.

Section I

OVERVIEW OF THE ASSET ALLOCATION AND SPENDING POLICY PROJECT

Overview of the Asset Allocation and Spending Policy Project

- RVK was selected to prepare a comprehensive asset allocation and spending policy analysis on behalf of the North Dakota Legacy Fund.

- RVK has submitted our full report and has prepared this summary of our process and recommendations for the Board presentation today.

- Based on the work RVK has done on behalf of the Legacy Fund Advisory Board to date, we believe that establishing an appropriate asset allocation policy is the most important investment decision facing the Advisory Board.

- We are confident that this report will provide useful information to help the Board establish an asset allocation structure that will provide the Fund the best chance of achieving all of its objectives over the long-term, and under a wide range of potential economic and investment scenarios.

Key information in the RVK Report Includes:

- Projected revenue flows into the Legacy Fund, including base case and adverse case assumptions.
- Exhibits highlighting the correlation between the drivers of revenue flows (such as oil prices) and asset class return patterns.
- An analysis of the interaction between the revenue flows and the Fund's ability to absorb capital market risk.
- Potential asset allocation structures and a range of candidate portfolios.
- Evaluation of the impact of various spending (outflow) scenarios in the future.
- Summary and recommendations.

Summary of Objectives

"The Legacy Fund was created, in part, due to the recognition that state revenue from the oil and gas industry will be derived over a finite timeframe. The Legacy Fund defers the recognition of 30 percent of this revenue for the benefit of future generations. The primary mission of the Legacy Fund is to preserve the real, inflation-adjusted purchasing power of the monies deposited into the Fund."[1]

- This policy excerpt introduces two key concepts used in our analysis:
  - Focus on building a corpus for future generations
  - Focus on preserving purchasing power
- Implications for asset allocation policy include:
  - Current income is not a primary focus – the Legacy Fund is a mechanism to defer income recognition.
  - The Legacy Fund is intended to help create generational equality – emphasis on growth and a very long-term investment horizon.

1. Source: North Dakota Legacy Fund Investment Policy Statement.

Preserving Real Return

- Preservation of real, inflation-adjusted purchasing power implies the need for assets to grow by a rate that exceeds the combination of the rate of inflation, the spending rate, and expenses.
- Required Rate of Return > Expected Rate of Inflation + Expected Rate of Spending + Expenses
- *Example:*

  2.5% Inflation
  3.5% Spending
  0.6% Expenses

  2.5% + 3.5% + 0.6% = 6.6% or higher Required Rate of Return

- The Required Rate of Return is a function of these variables.

Policy Implications

- As an extreme example, a portfolio that is 100% fixed income (most or all return is derived from income) will almost certainly not protect the real value of the corpus over time.

- The Legacy Fund cannot afford to be too conservative or income oriented if it is to achieve the long-term objective or protecting purchasing power.

- RVK made no attempt to forecast future spending policies. However, there is a limited range of combinations (portfolio allocations and spending rates) that can exist together in a sustainable fashion.

- As of June 30, 2017 approaches, with more clarity on spending policy, we expect that the Advisory Board will refine and/or adjust asset allocation policy as needed.

Section II

REVENUE FORECASTS – BACKGROUND AND ASSUMPTIONS

Revenue Forecast Details

- RVK was provided a great deal of information including a detailed spreadsheet from the North Dakota Office of State Tax Commissioner outlining forecasted monthly cash flow in North Dakota from oil taxes for fiscal years 2013 – 2016.
- RVK created a monthly forecast model for our asset allocation modeling purposes using the following methodology

Average Barrels Produced per Day	*	Days per Month	*	Assumed Oil Spot Price	*	Effective Tax Rate

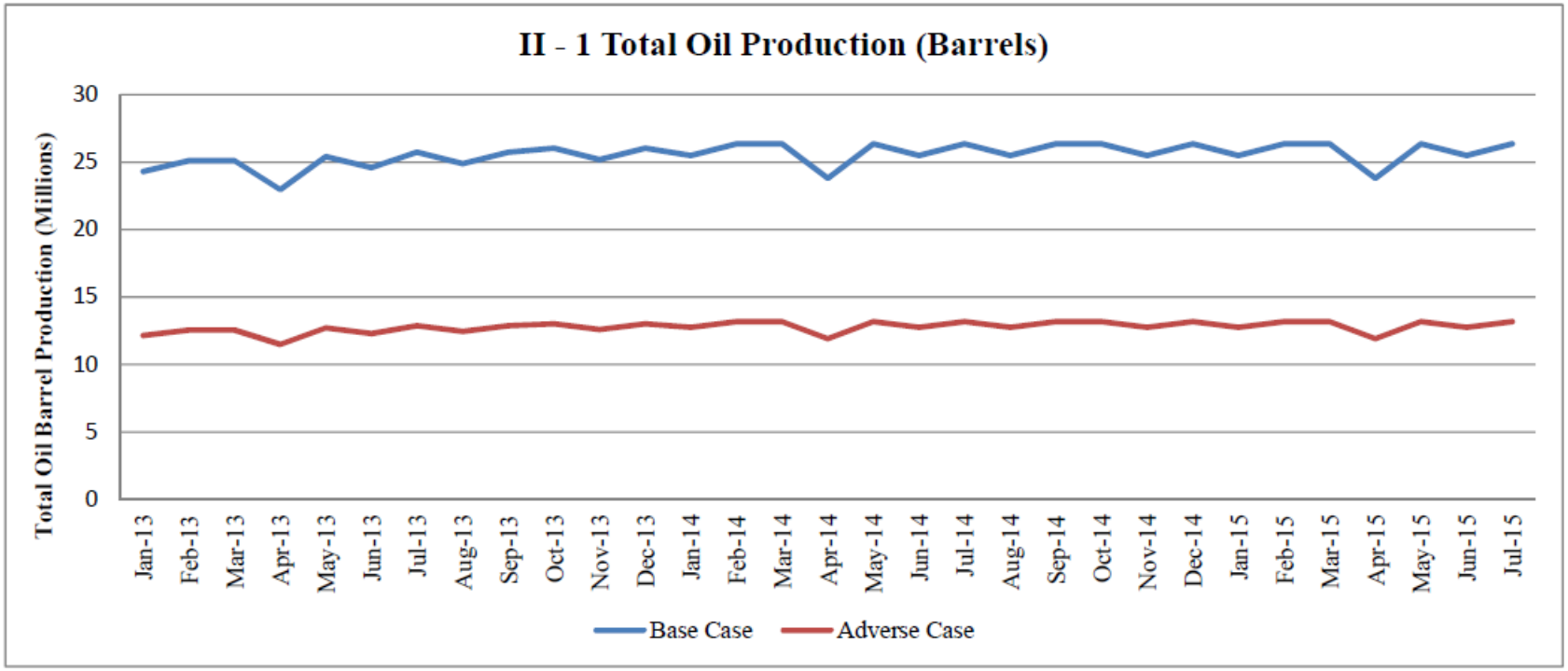
Total Monthly Revenue from Current Production

Total Monthly Revenue from Current Production	-	Tribal Monthly Distribution	*	30%

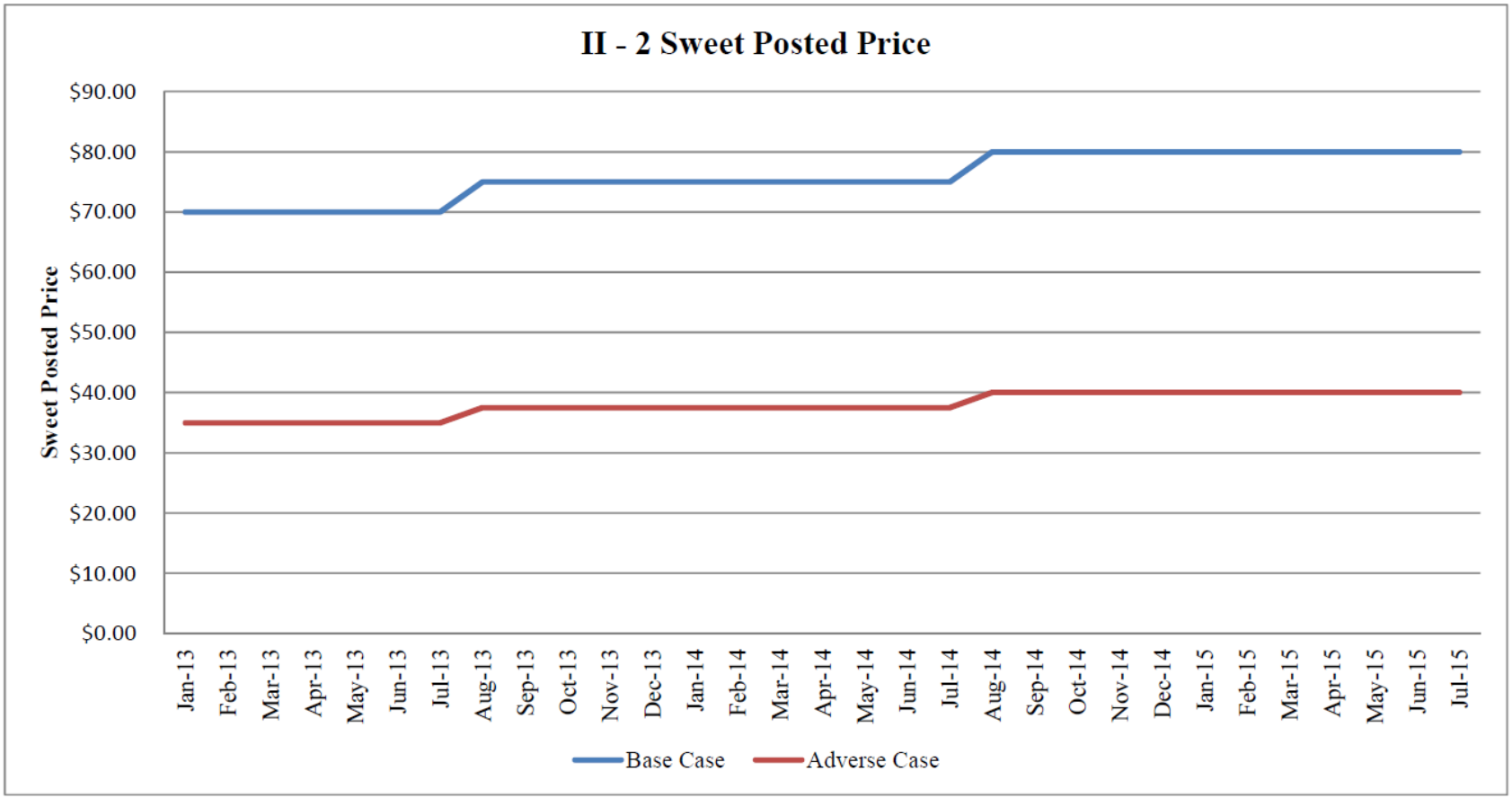
Total Monthly Distribution to Legacy Fund

- From this formula, RVK created two cash flow scenarios for the Legacy Fund: a base case scenario and an adverse case scenario. The distinctions between the two scenarios are that in the adverse case scenario average daily production levels and spot oil prices are cut by 50% and the effective tax rate for oil revenue decreases to 9.0% from 10.8%.

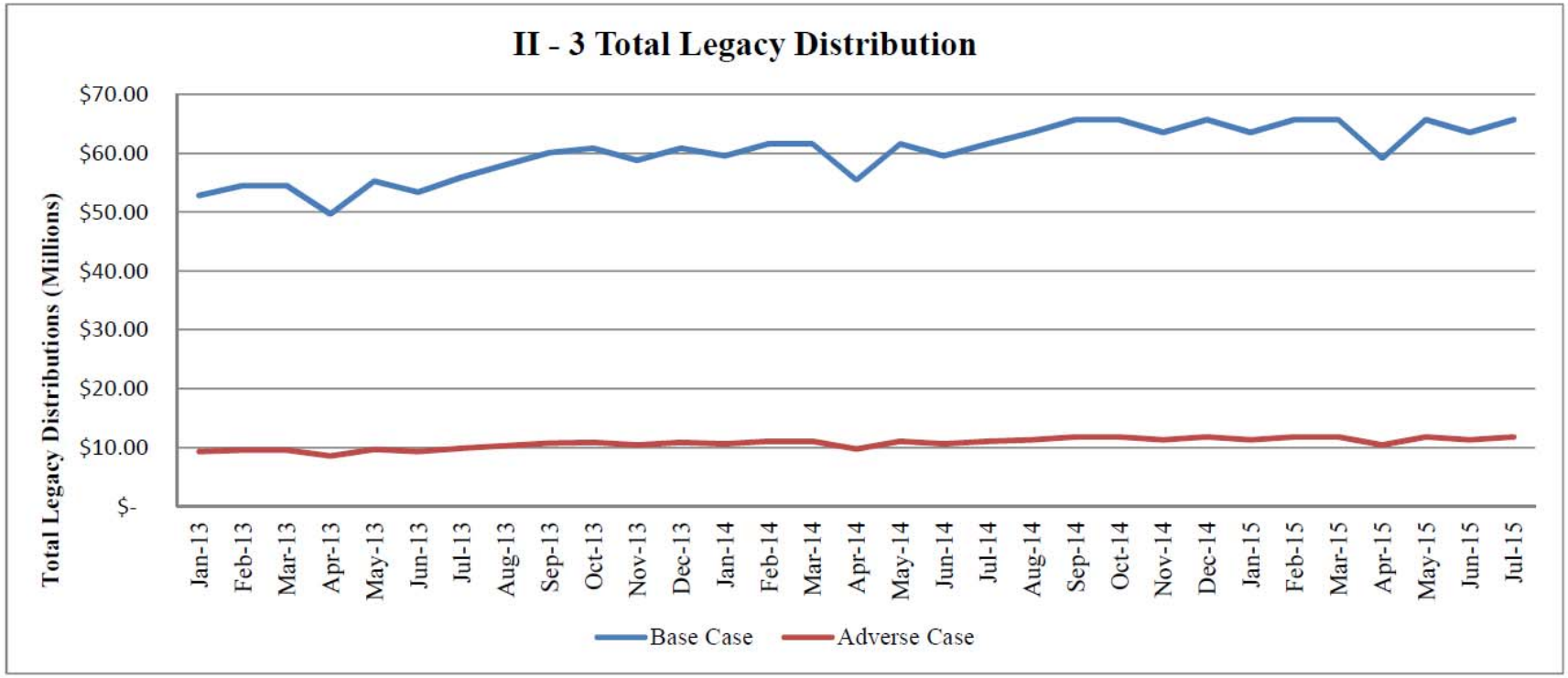
Base and Adverse Case Total Oil Barrel Production in Millions



Base and Adverse Case Sweet Posted Price



Base and Adverse Case Total Legacy Distribution



RVK Modeling Assumptions

- RVK's base line assumption was that total tribal distributions would increase in dollar terms and that spot oil prices increase through fiscal year 2016.
- After fiscal year 2016, RVK assumed that monthly cash flow into the Legacy Fund was static going forward. In the base case scenario this represents a monthly cash flow of $65.8 million and in the adverse case scenario this monthly cash flow figure is $11.8 million.
- The Legacy Fund currently is in an Accumulation Phase, which means:
  1. Liquidity requirements are virtually non-existent,
  2. Regular cash inflows create a natural dollar cost averaging process,
  3. The inflows are large relative to the size of the existing assets.

Section III

ASSET ALLOCATION STUDY

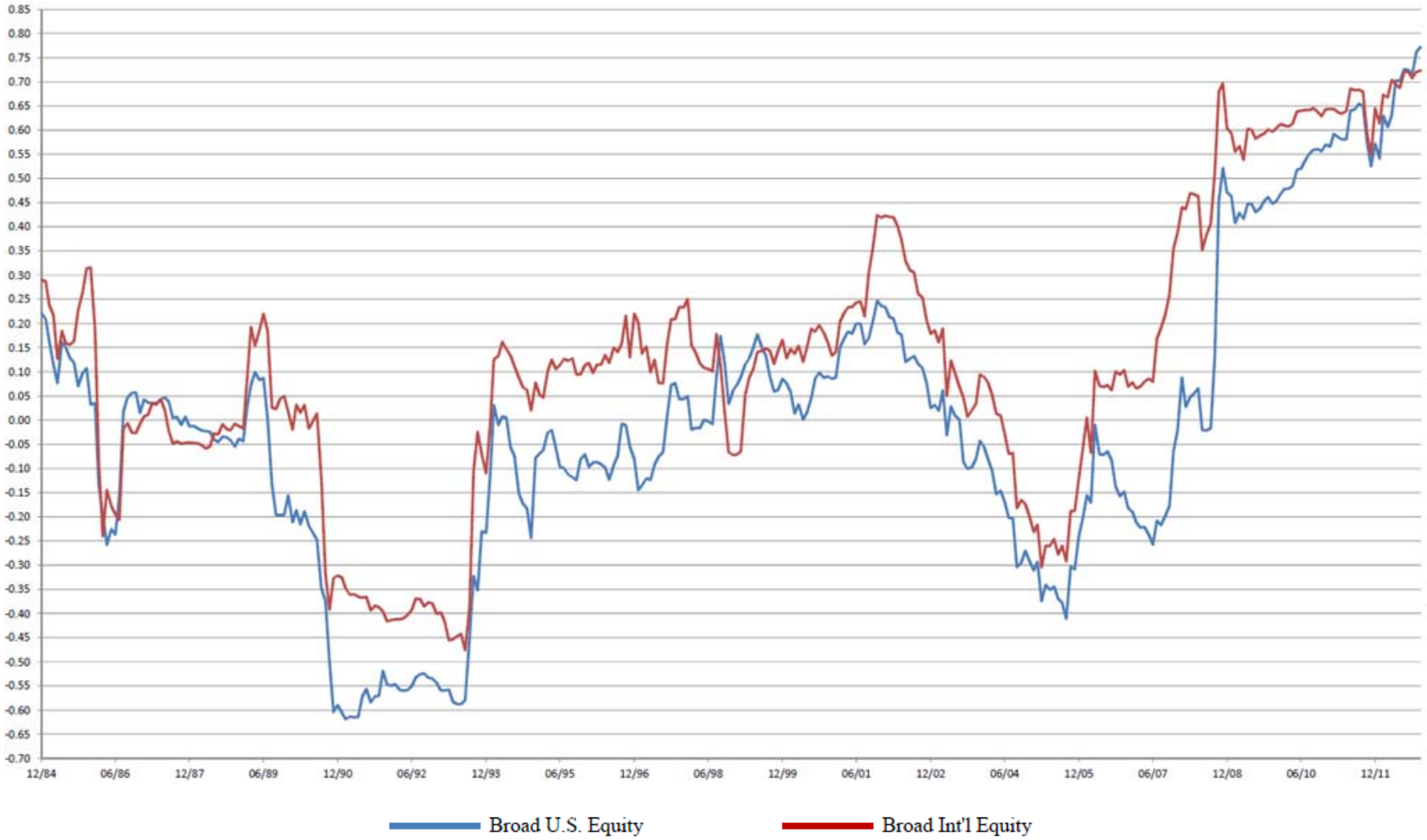
Identification of Asset Classes

- RVK began by estimating the probable future performance and risk characteristics of the various asset classes.
- For the Legacy Fund, RVK also analyzed the historical relationship between the returns of various potential asset classes and changes in the price of oil, using the change of prices of West Texas Intermediate over time as an input to reflect oil price volatility.
- The optimal asset allocation policy should minimize asset class exposures that exhibit a high degree of correlation to oil prices and conversely emphasize asset class exposures that exhibit low degrees of correlation.
- Crude Oil prices over the last decade have been negatively correlated with Fixed Income, Emerging Market Debt, and Timber.
- The remaining asset classes all exhibit varying degrees of positive correlation with Crude Oil.

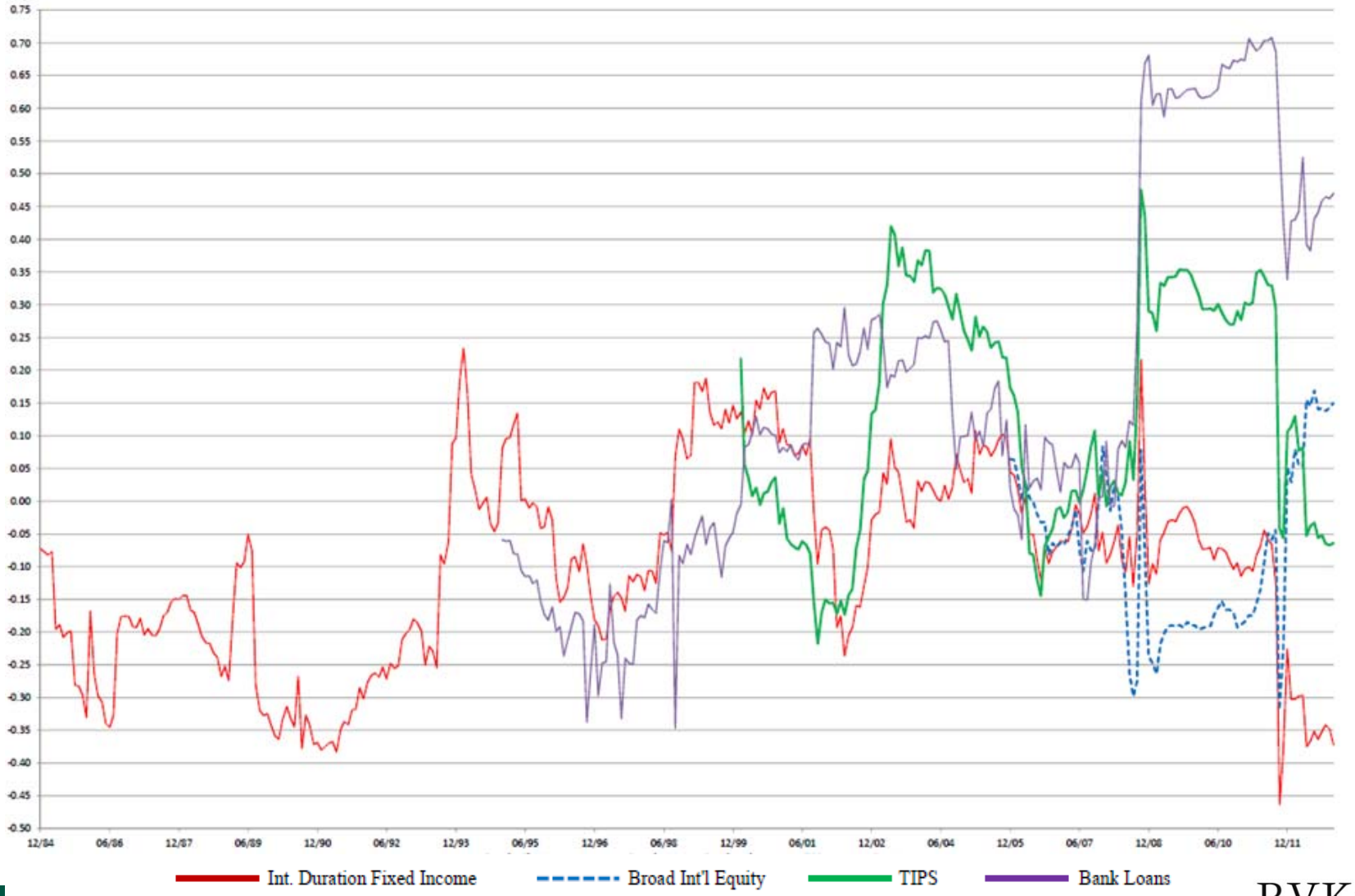
Correlation Statistics

Correlation Statistics January 2003 - September 2012	Crude Oil	Broad U.S. Equity	Broad Int'l Equity	Int. Dur. Fixed Income	EM Debt (Local)	TIPS	Bank Loans	Core Real Estate	Infra-structure	Timber
Crude Oil	1.00									
Broad U.S. Equity	0.45	1.00								
Broad Int'l Equity	0.48	0.92	1.00							
Int. Dur. Fixed Income	(0.35)	(0.22)	(0.15)	1.00						
EM Debt (Local)	(0.55)	(0.03)	(0.04)	0.58	1.00					
TIPS	0.18	(0.02)	0.01	0.57	(0.04)	1.00				
Bank Loans	0.68	0.72	0.71	(0.26)	(0.27)	0.21	1.00			
Core Real Estate	0.11	0.20	0.13	(0.16)	(0.18)	0.02	(0.04)	1.00		
Infrastructure	0.47	0.90	0.90	(0.11)	(0.06)	0.15	0.69	0.34	1.00	
Timber	(0.13)	(0.13)	0.00	0.09	(0.04)	0.02	(0.25)	0.26	0.00	1.00

Equity Correlations with Crude Oil – 3 Years Rolling



Fixed Income Correlations with Crude Oil – 3 Years Rolling



Asset Class Selection

- Asset classes considered were consistent with those currently being used by the State Investment Board.
- In reviewing the 2012 Comprehensive Annual Financial Report of the Retirement and Investment Office we identified the following relevant broad asset class exposures within the Insurance Investment Pool:
  - Domestic Equity
  - International Equity
  - Fixed Income
  - Diversified Real Assets, which includes equally weighted exposure to:
    - TIPS
    - Infrastructure
    - Timber
  - Real Estate (Core)

Identification of Asset Allocation Alternatives

- Detailed below are the forward looking capital markets assumptions for asset classes under consideration in this study.
- The Fixed Income assumption assumes a core plus mandate with flexibility to invest up to 10% in "plus" sectors such as emerging markets debt.
- The diversified real assets assumption assumes a customized mandate that is equally weighted between TIPS, Timber, and Infrastructure.

Long-Term Asset Class Return and Risk Assumptions		
Asset Class	Arithmetic Return %	Risk (Standard Deviation) %
Broad US Equity	7.9	18.0
Broad International Equity	8.7	20.8
Fixed Income	3.7	6.0
Diversified Real Assets	6.1	7.1
Core Real Estate	7.0	12.5

Modeling Results

- The following table shows the range of possible optimal allocations given the selected asset classes and constraints listed under “Min” and “Max.” This range illustrates the tradeoff between return and risk; additional return can only be achieved by undertaking additional risk.

- In addition to the 10 efficient portfolios, the next Table also details 6 potential portfolios that we will refer to as the “candidate portfolios.”

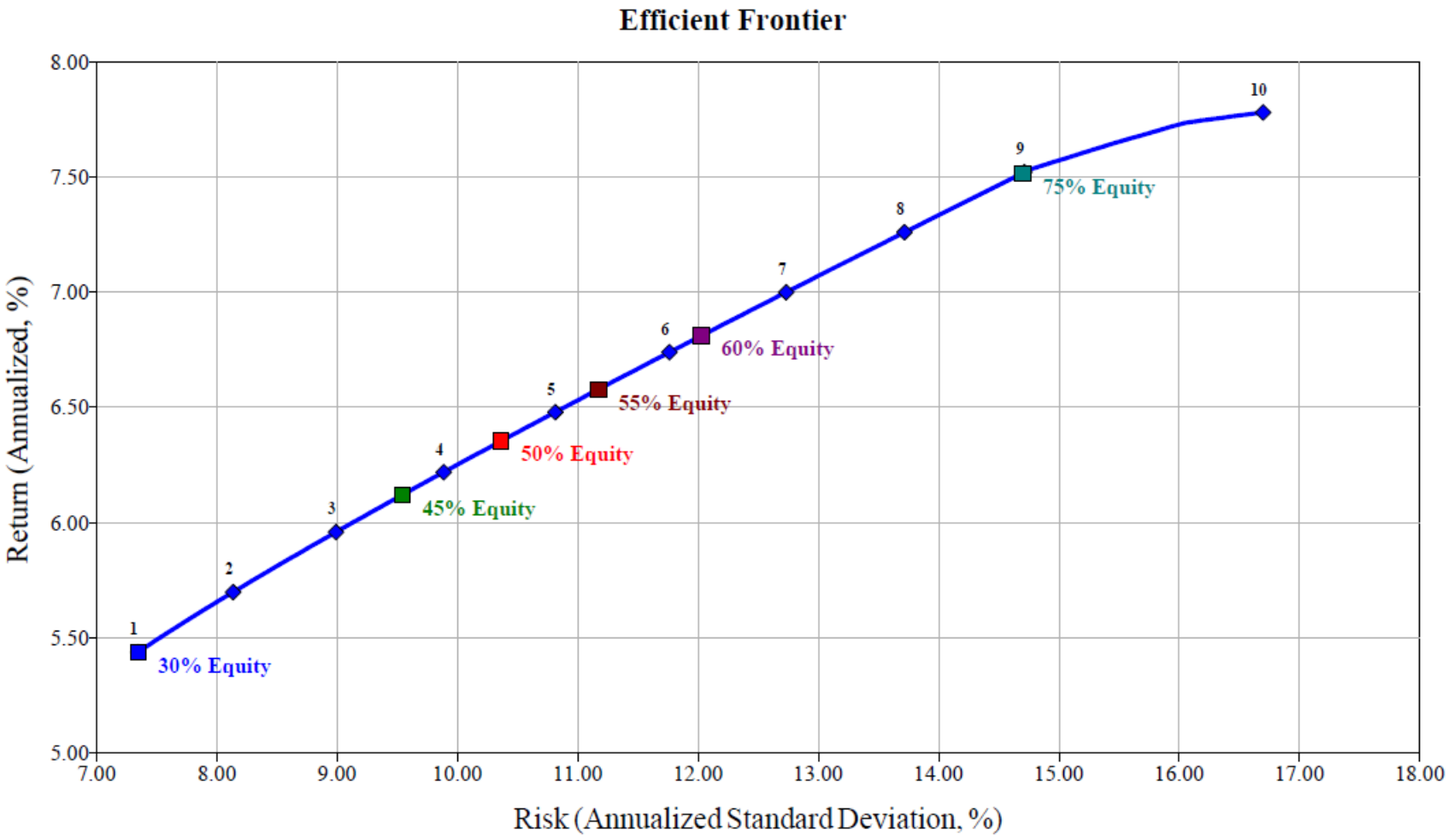
- The candidate portfolios are representative of the full spectrum of the efficient frontier, and vary primarily in their levels of expected return and risk.

- We have labeled them as 30% Equity, 45% Equity, 50% Equity, 55% Equity, 60% Equity and 75% Equity.

Efficient Frontier Portfolios with Six Candidate Portfolios

	Min	Max	1	2	3	4	5	6	7	8	9	10	30% Equity	45% Equity	50% Equity	55% Equity	60% Equity	75% Equity
Broad US Equity	20	60	20	26	28	30	32	34	36	38	39	50	20	28	30	33	35	40
Broad International Equity	10	40	10	10	14	17	21	24	28	31	36	40	10	17	20	22	25	35
Fixed Income	10	55	55	49	43	38	32	27	21	15	10	10	55	40	35	30	25	10
Core Real Estate	0	5	5	5	5	5	5	5	5	5	5	0	5	5	5	5	5	5
Diversifed Real Assets	0	10	10	10	10	10	10	10	10	10	10	0	10	10	10	10	10	10
Total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			30	36	42	47	53	58	64	70	75	90	30	45	50	55	60	75
Capital Preservation			55	49	43	38	32	27	21	15	10	10	55	40	35	30	25	10
Alpha			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inflation			15	15	15	15	15	15	15	15	15	0	15	15	15	15	15	15
Expected Return			**5.44**	**5.70**	**5.96**	**6.22**	**6.48**	**6.74**	**7.00**	**7.26**	**7.52**	**7.78**	5.44	6.12	6.35	6.58	6.81	7.52
Risk (Standard Deviation)			**7.35**	**8.13**	**8.99**	**9.88**	**10.81**	**11.76**	**12.73**	**13.72**	**14.71**	**16.70**	7.35	9.54	10.36	11.17	12.03	14.70
Return (Compound)			5.18	5.39	5.58	5.76	5.94	6.10	6.25	6.39	6.53	6.51	5.18	5.69	5.85	6.00	6.14	6.53
Return/Risk Ratio			0.74	0.70	0.66	0.63	0.60	0.57	0.55	0.53	0.51	0.47	0.74	0.64	0.61	0.59	0.57	0.51
RVK Expected Eq Beta (LC US Eq = 1)			0.35	0.41	0.46	0.52	0.57	0.62	0.68	0.73	0.78	0.90	0.35	0.49	0.54	0.59	0.64	0.78
RVK Liquidity Metric (T-Bills = 100)			80	80	80	81	81	82	82	82	83	92	80	81	81	81	82	83

Efficient Frontier with Six Candidate Portfolios

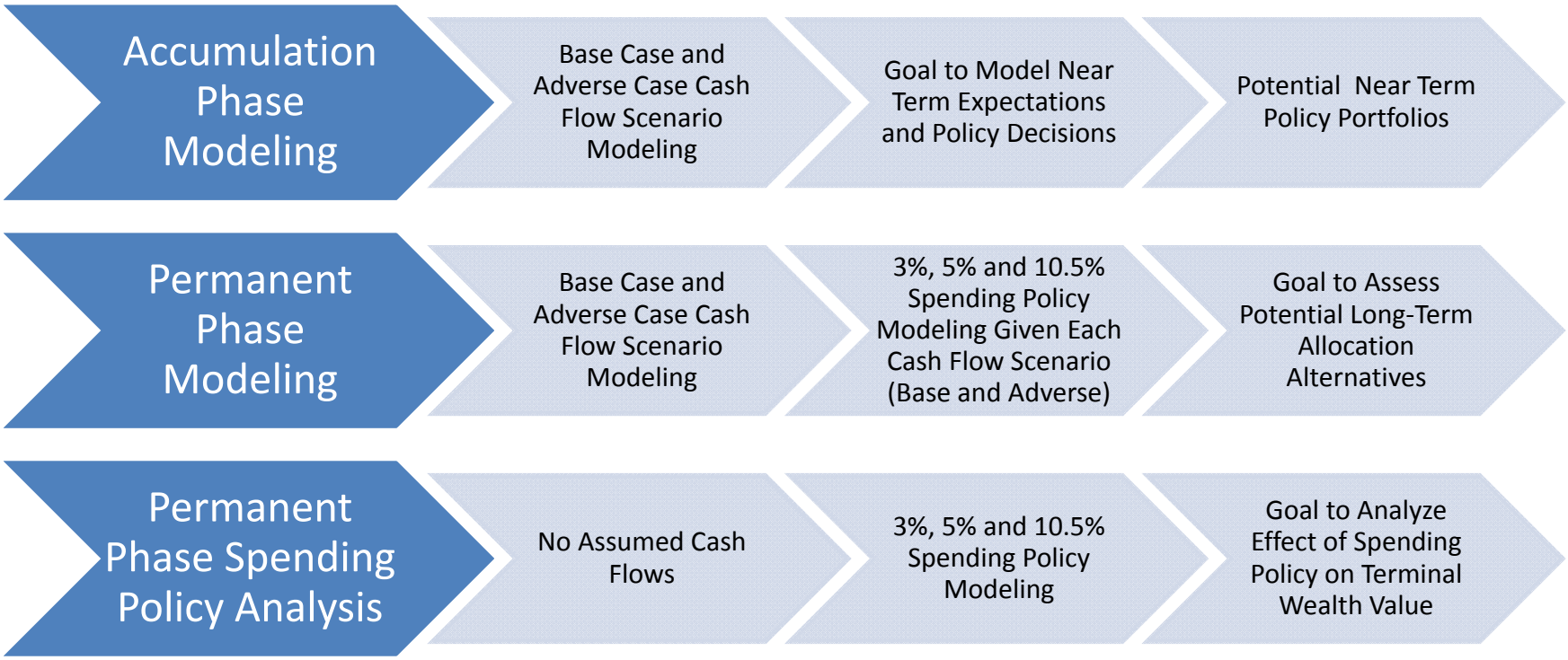


Downside Risk Analysis (Monte Carlo Simulation)

- Monte Carlo simulation overcomes the static nature of typical Mean-Variance optimization by "stress-testing" portfolios.
- Incorporates the effects of various assumed capital market factors.
- Provides insight into the performance of asset allocation by examining randomly sampled return outcomes.
- RVK uses 10,000 random samples and assumes a fat-tailed[1] distribution.

1. Mean-Variance optimization assumes asset class returns are normally distributed. Empirical asset class returns have been non-normal, however, exhibiting a greater probability of extreme outcomes than would be predicted by a normal distribution.

Simulation Analysis



Simulation Analysis

- Emphasis is on the next 20 years of projected revenue inflows combined with potential spending scenarios that begin mid-2017.
- Goal is to determine which portfolios provide the highest values at the end of this period, and the best trade-off between expected results and potential downside scenarios.
- Although we are recommending an “Accumulation Phase” asset allocation policy, we believe it is important to start with a portfolio allocation that will not need to be significantly altered within a relatively short period of time.

The Accumulation Phase

- The base case (50th percentile) annualized return ranges from approximately 5.4% (30% equity) to 7.0% (75% equity).
- At the 5th percentile (which would represent a poor investment environment as 95% of all outcomes are better) the returns range from an annualized loss of approximately 1.4% (30% equity) to an annualized loss of approximately 7.4% (75% equity).
- At the 95th percentile (which would represent a very good investment outcome) the annualized returns range from approximately 11.4% to 18.6%.

Accumulation Phase – Best/Worst Case Returns

4.5 Years	30% Equity	45% Equity	50% Equity	55% Equity	60% Equity	75% Equity
5th Percentile	(1.4)	(3.1)	(3.8)	(4.4)	(5.1)	(7.4)
10th Percentile	0.1	(0.9)	(1.2)	(1.6)	(2.0)	(3.4)
25th Percentile	2.7	2.6	2.5	2.4	2.3	1.9
50th Percentile	**5.4**	**6.0**	**6.2**	**6.4**	**6.5**	**7.0**
75th Percentile	7.9	9.2	9.6	10.0	10.5	11.8
90th Percentile	10.1	12.0	12.7	13.4	14.1	16.2
95th Percentile	11.4	13.7	14.5	15.3	16.1	18.6

The Accumulation Phase

Accumulation Phase – Base Case Market Values

4.5 Years	30% Equity	45% Equity	50% Equity	55% Equity	60% Equity	75% Equity
5th Percentile	$3,341	$3,226	$3,181	$3,147	$3,111	$2,978
10th Percentile	$3,496	$3,441	$3,415	$3,393	$3,363	$3,266
25th Percentile	$3,772	$3,767	$3,759	$3,755	$3,743	$3,707
50th Percentile	**$4,071**	**$4,137**	**$4,155**	**$4,171**	**$4,192**	**$4,250**
75th Percentile	$4,407	$4,534	$4,582	$4,629	$4,681	$4,838
90th Percentile	$4,693	$4,909	$4,990	$5,066	$5,148	$5,403
95th Percentile	$4,894	$5,138	$5,239	$5,345	$5,452	$5,800

*All market values in millions

Adverse Case Revenue Scenario

Accumulation Phase Adverse Case Revenue Scenario

4.5 Years	30% Equity	45% Equity	50% Equity	55% Equity	60% Equity	75% Equity
5th Percentile	$1,018	$972	$954	$936	$917	$860
10th Percentile	$1,074	$1,049	$1,038	$1,026	$1,014	$973
25th Percentile	$1,171	$1,170	$1,169	$1,168	$1,166	$1,154
50th Percentile	**$1,287**	**$1,313**	**$1,324**	**$1,331**	**$1,340**	**$1,361**
75th Percentile	$1,410	$1,465	$1,485	$1,503	$1,523	$1,585
90th Percentile	$1,525	$1,612	$1,645	$1,681	$1,717	$1,830
95th Percentile	$1,596	$1,711	$1,753	$1,793	$1,838	$1,978

*All market values in millions

Section IV

SPENDING POLICY – CONSIDERATIONS AND ASSUMPTIONS

Spending Policy – Considerations and Assumptions

- Our analysis is based on the assumption that no spending will occur until mid–2017 per the details of the Legacy Fund legislation.
- The asset allocation and spending discussion effectively has two distinct components:

  1. The Accumulation Phase: Present – June 2017

  2. The Permanent Phase: Post June 2017

- Given the positive cash flow characteristics of the Legacy Fund during the Accumulation Phase (positive income, no spending, minimal expense), the corpus of the Fund will grow during the phase under every modeling scenario considered by RVK.
- As noted in Exhibits IV- 1 to 13, there is a wide range of potential values for the Fund as of June 2017, but all of the projected values are higher than the current market value.

Spending Policy – Considerations and Assumptions

- The cash flow characteristics during the Permanent Phase will change significantly. The more meaningful changes will include the following:
  1. All income from the Fund will be withdrawn each biennium.
  2. The Legislature may spend, subject to the terms defined in the Legacy Fund legislation, an additional amount equal to 15% of the market value of the Fund every biennium.
  3. For modeling purposes, we assume a 3.0% annual income disbursement paid out at the end of each biennium. The income component for modeling can be adjusted and refined at a later date when the modeling results are updated in the future.
- RVK recommends that the Advisory Board conduct an asset allocation and policy review every 3 - 4 years.
- Specifically, we recommend that modeling tailored for the Permanent Phase be conducted at some date after June 2016.

Spending Scenarios

- RVK tested three spending scenarios:
  1. Only income is spent – modeled at 3.0% per year (paid out at the end of each biennium)
  2. A total of 5.0% is spent per year, which would include 3.0% per year in income and 2.0% in additional authorized annual spending (paid out at the end of each biennium)
  3. The maximum spending amount is spent each year, which is modeled at 10.5% per year in total (paid out at the end of each biennium)
- For all of the candidate portfolios, income can be drawn from the portfolio and the corpus of the Fund can still grow. In other words, the total return of the Fund is expected to exceed the 3.0% annual income disbursement.
- To protect the inflation-adjusted or "real" value of the corpus, returns will need to exceed the combined impact of spending income (3.0% per year) and inflation.

Spending Scenarios

- A 5.0% total spending target is roughly in line with that historically used by a majority of foundations, and is a useful threshold for purposes of analysis. This roughly equates to a required return of around 8.0%, as shown below:
  1. 5.0% spending
  2. 2.5% inflation
  3. 0.5% expense estimate
- To meet this target return the Fund would need to take on an endowment-like asset allocation structure, which would include a significant amount of equity investments and likely would require some investment in alternative investments.
- If the Fund were to spend at the maximum allowed level of spending, the corpus of the Fund would be negatively impacted. The pace and amount of the reduction of the corpus would depend on market conditions, the actual level of spending and the asset allocation of the fund.

Impact on Simulation Analysis of Different Spending Policies

- The following exhibit shows the probability that each portfolio will earn various "real" or inflation-adjusted returns over a 20-year time horizon.
- There is greater than 50% probability that 5 of the 6 candidate portfolios will earn a real return of 3% or greater. Only the 30% equity portfolio has less than a 50% chance of achieving this goal. If 3% is used as a proxy for the automatic spending that will occur through the distribution of income, then it is reasonable to assume that a 30% equity target is too conservative and not likely to achieve the objectives of the Legacy Fund.
- None of the candidate portfolios provides a greater than 50% probability of achieving a real return of 5% or greater. The 60% equity portfolio provides a 32% chance with the 75% equity portfolio providing a 38% chance. 5% is a common historical spending policy level for many foundations and endowments, although we have observed a general downward migration of this rate where it is permissible.
- The probability of earning a 10% real return is virtually zero for all portfolios, which indicates that regardless of the asset allocation structure, the Legacy Fund will be unlikely to achieve its objectives if the maximum amount of spending is pursued.

Analysis of Spending Policies and Asset Allocation Options

Probability of Meeting Return Targets with Different Equity Mixes

20 Years	Target 0%	Target 3%	Target 5%	Target 7%	Target 10.5%
30% Equity	91%	43%	11%	1%	0%
45% Equity	89%	53%	22%	5%	0%
50% Equity	88%	55%	26%	7%	0%
55% Equity	87%	57%	29%	10%	0%
60% Equity	87%	58%	32%	12%	1%
75% Equity	84%	60%	38%	20%	3%

Implications

- The level of spending has a significant impact on the ability of the Legacy Fund to meet its objectives. For example, at 3% spending (which we use as a proxy for the automatic disbursement of income), all of the candidate portfolio options have reasonable odds of achieving the objectives. At 10.5% spending, there is virtually no chance that the objectives can be met regardless of the asset allocation mix.
- If you assume even a very modest amount of additional spending beyond 3% income (such as an additional 2% per year), the preservation of real purchasing power becomes a much more challenging objective, and likely requires a higher level of equity exposure (such as 50% or greater).

Section V

SUMMARY OF CONCLUSIONS

Reminder of the Primary Mission

The primary mission of the Legacy Fund is to preserve the real, inflation-adjusted purchasing power of the monies deposited into the fund.

- The most difficult aspect of determining an appropriate asset allocation recommendation is the unknowable nature of future distributions (distribution amounts and timing) from the Legacy Fund.
- RVK recommends that the Board assume a traditional endowment-like long-term level of spending - 4.0% to 5.0% per year - from the Legacy Fund for the purposes of asset allocation planning. We recommend this approach for the following reasons:

  1. Assuming a higher level of spending would require a very aggressive portfolio allocation.
  2. Conversely, there is risk in assuming that only income will be spent (which we have modeled at a 3% spending rate), as it could lead to portfolio allocations that fail to meet the real wealth preservation objectives of the Legacy Fund.

Recommendations

- RVK recommends selection of one of the target asset allocation portfolios between 50% to 60% in equity.
- Our rationale for this recommendation is summarized as follows:

1. The stated purpose and primary mission of the Legacy Fund imply a very long-term investment horizon, a desire to create long-term generational equality in North Dakota, and the long-term growth of the corpus in real (inflation adjusted) terms. All of these suggest the need for long-term return generation that is best supported by portfolios with at least this level of equity investment.
2. Positive projected revenue into the Legacy Fund, and particularly over the next 4.5 years where there are no liquidity requirements, are supportive of higher levels of investment risk.
3. The Legacy Fund will eventually enter what we call a "Permanent Phase" – in which there will be both revenue into and disbursements out of the Fund. At this point it will become important to provide a balance between long-term growth objectives and near-term liquidity needs which remain uncertain at this point.
4. Even though the Permanent Phase will not commence for approximately 4.5 years, we believe it is appropriate to develop a long-term asset allocation policy now, that will not likely need significant alteration within a relatively short period of time.

Real Wealth Variances for Various Equity Levels

20 Years	30% Equity	45% Equity	50% Equity	55% Equity	60% Equity	75% Equity
5th Percentile	$6,750	($344)	($483)	($621)	($822)	($1,310)
10th Percentile	$7,393	($152)	($246)	($332)	($448)	($852)
25th Percentile	$8,653	$110	$138	$145	$136	$72
50th Percentile	**$10,275**	**$590**	**$764**	**$935**	**$1,125**	**$1,611**
75th Percentile	$12,160	$1,131	$1,551	$1,955	$2,391	$3,797
90th Percentile	$14,189	$1,824	$2,533	$3,231	$4,025	$6,514
95th Percentile	$15,473	$2,462	$3,408	$4,415	$5,531	$9,152

*All market values in millions

- The table above displays the differences for each candidate portfolio in terminal real wealth values assuming a base case cash flow assumption and a 5% spending policy.
- Under the 30% Equity column we have shown the actual inflation adjusted values after 20 years as a baseline.
- To the right of the 30% Equity column, at progressively more aggressive equity percentages, we have shown the difference in each portfolio's real wealth value at that same distribution point relative to the baseline 30% equity portfolio.
- Positive differences reflect the modeled benefit to assuming additional equity risk at various distribution points.
- Negative differences reflect the modeled cost to assuming additional equity risk under adverse market scenarios at various distribution points.
- Note that as additional equity risk is assumed the change in terminal real wealth increases at an increasing rate at each distribution point (with the exception of adverse market scenarios where the converse is true).