Asset Allocation Study for

Northwest Natural Retirement Plan

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Introduction

The selection of the asset allocation is one of the most important decisions that the Investment Committee for the Northwest Natural Retirement Plan can make. It is the major determinant of both the long-term rates of return and the volatility of the Plan's asset values. There are two facets to the asset allocation decision: identification of the alternatives to be considered and selection of the alternative that best meets the investment objectives. The identification of the alternative asset allocations consists of projecting the probable future performance of the various asset classes and then using these projections to produce allocations with the most desirable characteristics. Once created, these alternatives can be evaluated in light of the investment objectives to choose the most appropriate one.

The structure of this report follows the process described above. First, the expectations for the asset classes are stated along with a brief explanation of their relevance to asset allocation. The creation of the asset allocation alternatives is addressed next. A description of how the alternatives were identified accompanies a table detailing their composition. Finally, a discussion of the factors relevant to the selection of the appropriate asset allocation for the Northwest Natural Retirement Plan concludes the study.

Asset Class Expectations

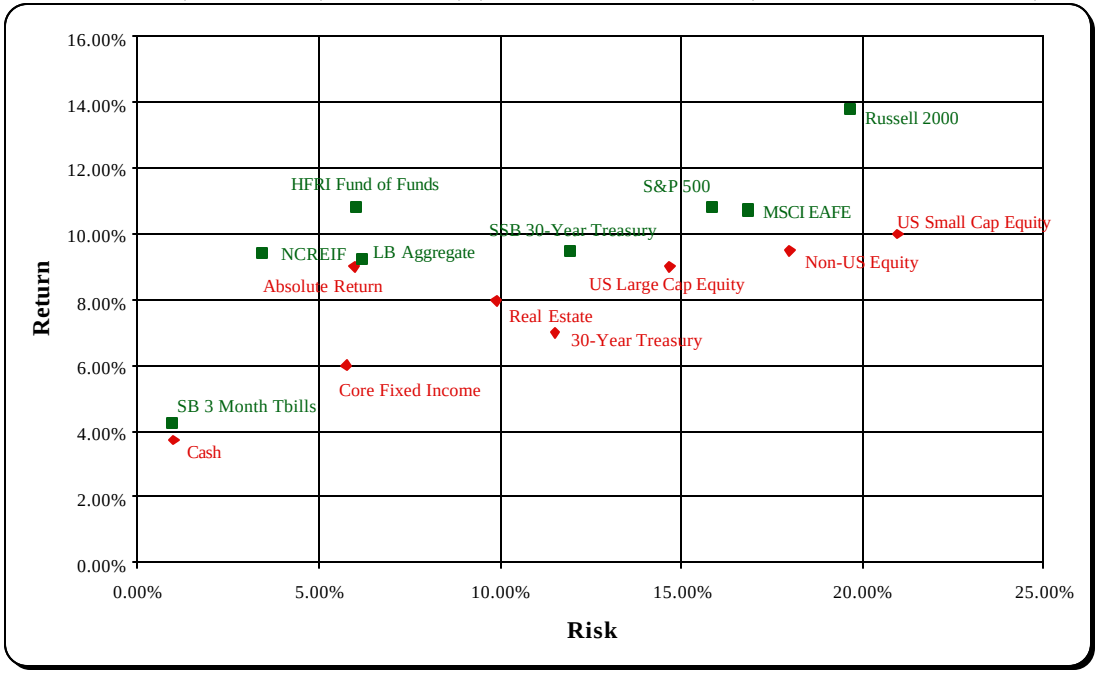
In order to create asset allocation alternatives, it is necessary to project the probable performance of the asset classes to be used in the allocation. The statistical component values for each of the asset classes for each of these statistics are listed below along with an explanation of their importance.

The expected returns are the best estimates of the average annual percentage increases in the values of each of the asset classes over the long term. The expected returns and risks (as measured by standard deviation) are listed on the left side of Figure 1 (in red), the longest possible time frame index returns are listed on the right side of Figure 1 (in green).

Figure 1

RV Kuhns Assumptions vs Longest Possible Historical Time Frame

Asset Class	Return Assumption	Risk Assumption	Index	Longest Historical Time Frame	Return	Risk
US Large Cap Equity	9.00%	14.70%	S&P 500	Jan 1937 - Jun 2002	10.82%	15.85%
US Small Cap Equity	10.00%	21.00%	Russell 2000	Jan 1979 - Mar 2002	13.80%	19.66%
Non-US Equity	9.50%	18.00%	MSCI EAFE	Jan 1970 - Jun 2002	10.75%	16.82%
Core Fixed Income	6.00%	5.75%	LB Aggregate	Jan 1976 - Jun 2002	9.27%	6.14%
30-Year Treasury	7.00%	11.50%	SSB 30-Year Treasury	Jan 1980 - Jun 2002	9.48%	11.94%
Real Estate	8.00%	9.90%	NCREIF	Jan 1978 - Jun 2002	9.39%	3.45%
Absolute Return	9.00%	6.00%	HFRI Fund of Funds	Jan 1990 - Jun 2002	10.81%	6.04%
Cash	3.75%	1.00%	SB 3 Month Tbills	Jan 1937 - Jun 2002	4.29%	0.92%



While the historical performance in Figure 1 shows the longest time frame available for each individual asset class, recognize that some of the time periods are quite different.

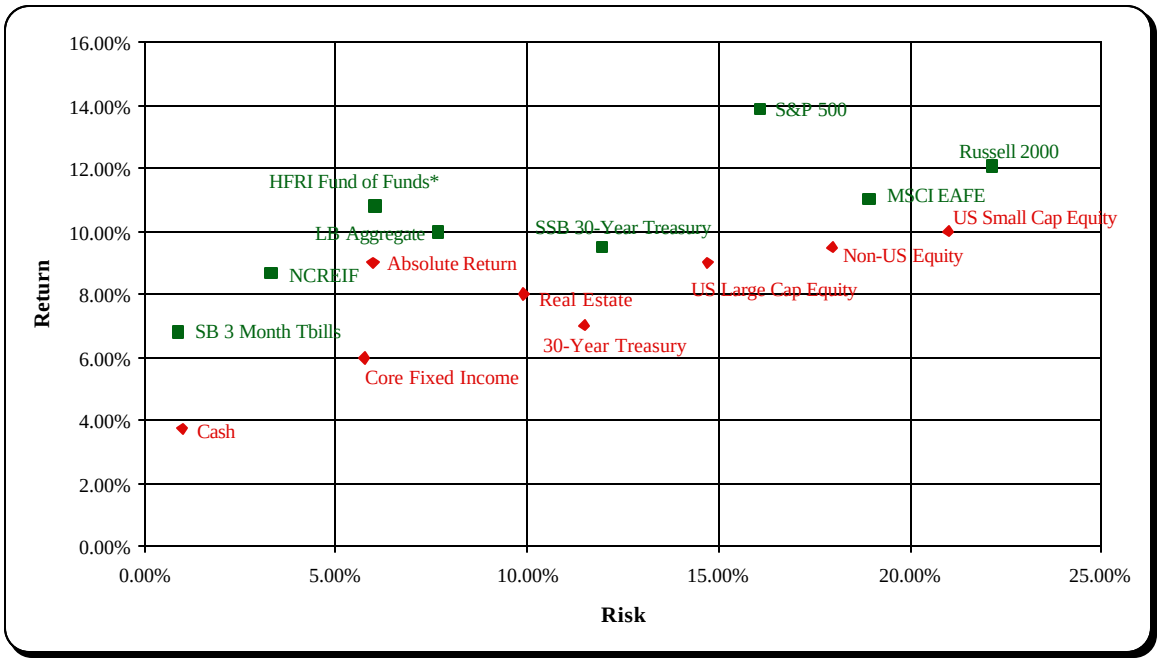
Thus, Figure 2 shows performance over the longest common time frame available. The assumptions (in red) in Figure 2 are exactly the same as Figure 1.

Figure 2

RV Kuhns Assumptions vs Longest Common Time Frame (22 1/2 Years)

Asset Class	Return Assumption	Risk Assumption	Index	Longest Common Time Frame (22 1/2 Years)	Return	Risk
US Large Cap Equity	9.00%	14.70%	S&P 500	Jan 1980 - Jun 2002	13.89%	16.09%
US Small Cap Equity	10.00%	21.00%	Russell 2000	Jan 1980 - Jun 2002	12.05%	22.15%
Non-US Equity	9.50%	18.00%	MSCI EAFE	Jan 1980 - Jun 2002	11.04%	18.93%
Core Fixed Income	6.00%	5.75%	LB Aggregate	Jan 1980 - Jun 2002	9.98%	7.67%
30-Year Treasury	7.00%	11.50%	SSB 30-Year Treasury	Jan 1980 - Jun 2002	9.48%	11.94%
Real Estate	8.00%	9.90%	NCREIF	Jan 1980 - Jun 2002	8.64%	3.31%
Absolute Return	9.00%	6.00%	HFRI Fund of Funds*	Jan 1990 - Jun 2002	10.81%	6.04%
Cash	3.75%	1.00%	SB 3 Month Tbills	Jan 1980 - Jun 2002	6.81%	0.84%

*HFRI Fund of Funds is not included in the common time frame for lack of performance history.

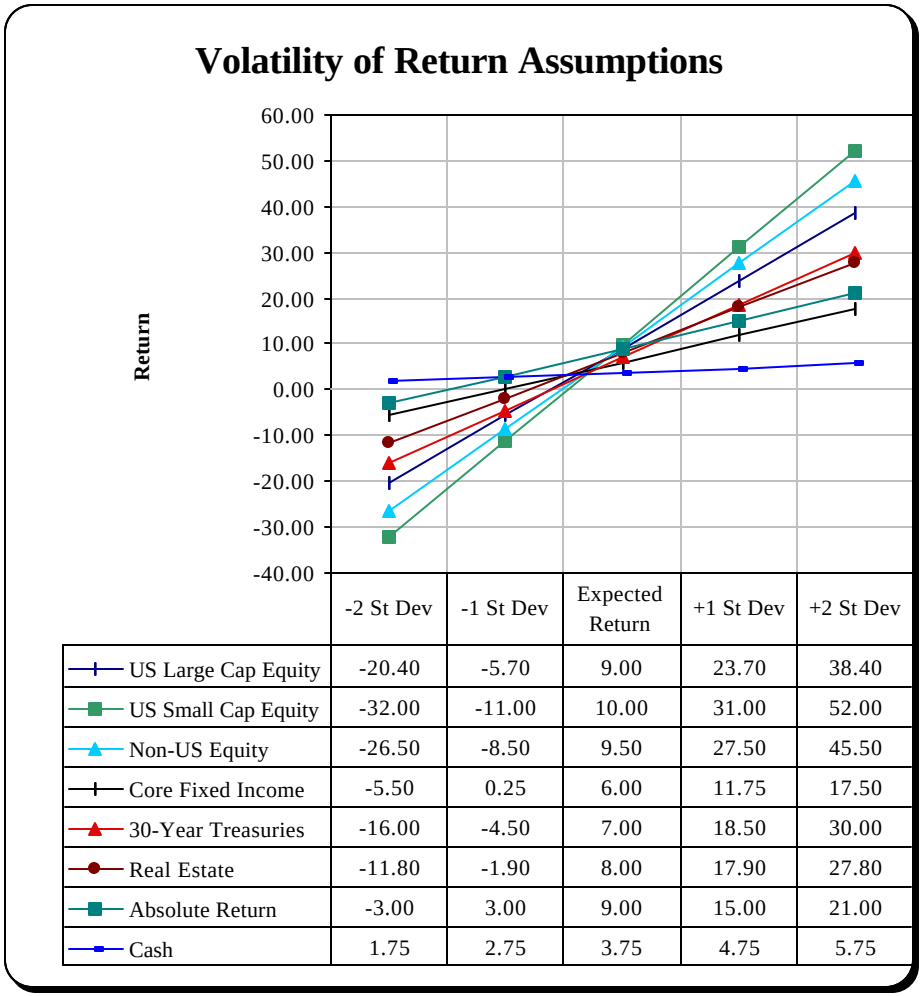


By comparing the assumptions and historical performance in Figure 2, it is clear that the return expectations for each of the asset classes going forward is lower than the returns actually achieved in recent years. The historical time periods are influenced by the excessive returns achieved in recent years. It is the opinion of R.V. Kuhns & Associates that the inflated historical averages are not sustainable in the long term. Thus, our assumptions are conservatively low for these asset classes. Please note that the relationship between the asset classes is the most important factor, while the absolute return level of each asset class should be considered a lesser concern when reviewing the analysis.

It is important to understand these are expectations of future performance and are, therefore, subject to uncertainty. The degree of uncertainty for each of the asset classes is called the risk or volatility of the asset class and is quantified by the statistical term known as standard deviation. The standard deviation for each asset class is listed in Figure 1 & 2 under the "Risk" heading.

The standard deviation measures the volatility of an asset class by attaching probabilities to a range of possible different returns. Two-thirds (67%) of all returns are expected to lie within one standard deviation of the mean. For example, the US Large Cap Equity projected return is 9.0% with a standard deviation of 14.7%, which means that two-thirds of the time its return will lie between –5.7 % (= 9.0 – 14.7) and 23.7% (= 9.0 + 14.7). Further, 95% of all return outcomes lie within two standard deviations, which means that there is only a one-in-twenty chance the return on US Large Cap Equity will either fall below –20.4% or rise above 38.4%. Figure 3 shows the range of returns for each asset class.

Figure 3



	-2 St Dev	-1 St Dev	Expected Return	+1 St Dev	+2 St Dev
US Large Cap Equity	-20.40	-5.70	9.00	23.70	38.40
US Small Cap Equity	-32.00	-11.00	10.00	31.00	52.00
Non-US Equity	-26.50	-8.50	9.50	27.50	45.50
Core Fixed Income	-5.50	0.25	6.00	11.75	17.50
30-Year Treasuries	-16.00	-4.50	7.00	18.50	30.00
Real Estate	-11.80	-1.90	8.00	17.90	27.80
Absolute Return	-3.00	3.00	9.00	15.00	21.00
Cash	1.75	2.75	3.75	4.75	5.75

Correlation

The way to achieve a high rate of return while minimizing volatility is to create a diversified portfolio of asset classes. Diversification exists because the returns of different asset classes do not always move up or down at the same time or in the same magnitude. As a consequence, there are times when some asset classes are doing well and make up for the underperformance of others. The degree to which this occurs is measured by correlation. Correlation can take on values between 1 and -1. If returns of two asset classes move up or down at the same time and in the same magnitude they have a correlation of 1 and are called "perfectly correlated." Conversely, returns of asset classes that always move in opposite directions and in the same magnitude are "perfectly non-correlated" and have correlation of -1. A correlation of 0 indicates no relationship between the returns. The correlations for the asset classes used in this study are shown in Table 1.

Table 1

	US Large Cap Equity	US Small Cap Equity	Non-US Equity	Core Fixed Income	30-Year Treasuries	Real Estate	Absolute Return	Cash
US Large Cap Equity	1.00							
US Small Cap Equity	0.82	1.00						
Non-US Equity	0.55	0.49	1.00					
Core Fixed Income	0.55	0.35	0.30	1.00				
30-Year Treasuries	0.40	0.10	0.15	0.90	1.00			
Real Estate	0.25	0.30	0.30	0.25	0.15	1.00		
Absolute Return	0.30	0.25	0.35	0.25	0.15	-0.05	1.00	
Cash	0.30	0.15	-0.20	0.15	0.15	0.30	0.40	1.00

The correlations shown in the table are nearly all positive. This does not mean that these asset classes do not diversify one another. These correlations are significantly below 1, which means that there are a measurable number of instances when the underperformance of one or more of the asset classes will be offset by the outperformance of others.

Table 2
Historical Performance

Asset Class	Large Cap US Equity	Small Cap US Equity	Non-US Equity	Core Fixed Income	30-Year Treasury	Cash	Absolute Return	Real Estate
Index	S&P 500	Russell 2000	MSCI EAFE	LB Agg	SSB 30-Year Treasury	90 Day T-Bill	HFRI Fund of Funds	NCREIF
1979	18.4	43.1	6.2	1.9		10.4		20.5
1980	32.4	38.6	24.4	2.7	-4.1	11.9		18.1
1981	-4.9	2.0	-1.0	6.3	0.4	15.0		16.6
1982	21.6	24.9	-0.9	32.6	39.0	11.3		9.4
1983	22.4	29.1	24.6	8.4	-0.7	9.0		13.1
1984	6.1	-7.3	7.9	15.1	14.9	10.0		13.8
1985	31.6	31.1	56.7	22.1	33.4	7.8		11.2
1986	18.2	5.7	69.9	15.3	24.8	6.2		8.3
1987	5.2	-8.8	24.9	2.8	-8.0	5.9		8.0
1988	16.5	24.9	28.6	7.9	8.1	6.8		9.6
1989	31.4	16.2	10.8	14.5	20.3	8.6		7.8
1990	-3.2	-19.5	-23.2	9.0	4.8	7.9	17.5	2.3
1991	30.5	46.1	12.5	16.0	17.3	5.8	14.5	-5.6
1992	7.7	18.4	-11.8	7.4	6.8	3.6	11.6	-4.3
1993	10.0	18.9	32.9	9.7	18.3	3.1	26.3	1.4
1994	1.3	-1.8	8.1	-2.9	-11.9	4.2	-3.5	6.4
1995	37.5	28.4	11.6	18.5	33.5	5.7	11.1	7.5
1996	23.2	16.5	6.4	3.6	-4.5	5.3	14.4	10.3
1997	33.4	22.4	2.1	9.7	15.4	5.2	16.2	13.9
1998	28.8	-2.5	20.3	8.7	16.5	5.1	-5.1	16.1
1999	20.9	21.3	27.3	-0.8	-14.9	4.7	26.5	11.4
2000	-9.1	-3.0	-14.0	11.6	19.8	6.0	4.1	11.7
2001	-11.9	2.5	-21.2	8.4	3.4	4.1	2.8	8.3
Jun-02	-13.2	-4.7	-1.4	3.8	2.1	0.9	0.5	3.2

Table 2 lists the annual performance of several different asset classes that are reflected in the Northwest Natural Retirement Plan study. The highest performing asset class in each year is bolded in blue, while the lowest performing asset class is bolded in red. The purpose of this chart is to illustrate how investments among several low-correlated asset classes can help diversify the portfolio, helping to lower the risk level and potentially increase returns over full market cycles.

Asset Allocation Alternatives

The returns, risks and correlations described in the previous section are the primary inputs for the model that constructs the asset allocation alternatives. With this information, the model weights the asset classes so that they achieve a range of possible returns, given whatever constraints are placed on the model. Except under extreme circumstances, there are a variety of different ways to weight the asset classes to achieve these returns. The value of the model is that it weights them in such a way that the return is achieved with a minimum of volatility. Allocations achieving a given rate of return at the least amount of risk are known as "optimal" portfolios. The model also takes into account any minimum or maximum acceptable level to be allocated to each asset class or groups of asset classes.

It is worth noting that the model finds the optimal portfolios by considering not only the return and volatility of all asset classes individually but also the correlations between the asset classes. Since the correlations are so important to this process, another way of describing the process of minimizing volatility is maximizing diversification.

Efficient Allocation

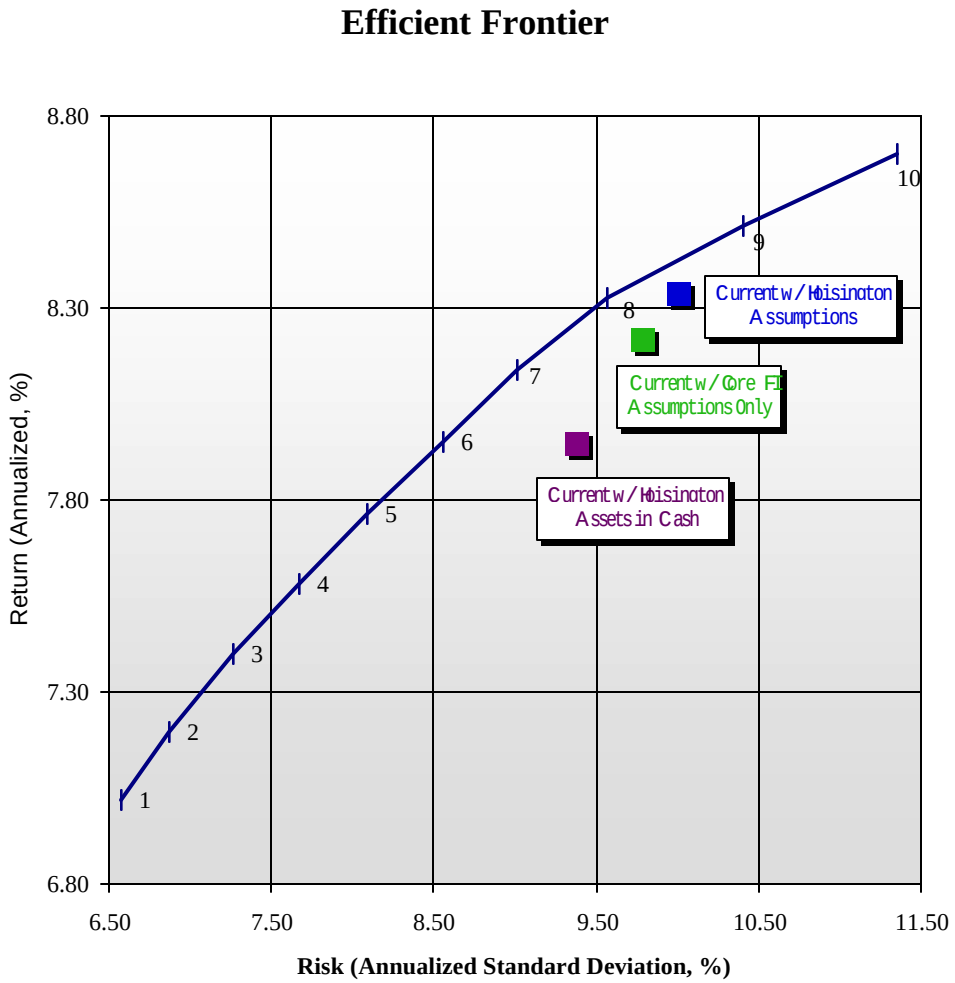
Table 3 shows the possible allocations given the constraints listed under "Min" and "Max". Each frontier portfolio is created using target rates of return both above and below the projected rate of return for the current allocation. The reason for this range is to show the trade-off between return and risk. It is clear from the risk shown on the table that additional return can only be achieved at the expense of additional risk. In addition to the 10 efficient portfolios, Table 3 shows three allocations for the current portfolio as of 8/31/02. The point on the graph labeled "**Current w/ Hoisington Assumptions**" represents the expected risk and return of the current portfolio, treating the assets held with Hoisington as separate from Fixed Income. The "**Current w/ Core FI Assumptions Only**" represents the same current portfolio assuming the assets represented by Hoisington are characterized as Fixed Income assets in the model. Finally, the "**Current w/ Hoisington Assets in Cash**" is a representation of the current portfolio if Hoisington were to choose a 100% allocation to cash.

Table 3

			Current Portfolio w/												
Asset Classes	**Min**	**Max**	**Hoisington Assumptions**	**Core FI Assumptions**	**Hoisington in Cash**	1	2	3	4	5	6	7	8	9	10
US Large Cap Equity	**30**	**50**	**38**	**38**	**38**	30	30	30	30	30	30	31	35	43	50
US Small Cap Equity	**0**	**5**	**4**	**4**	**4**	0	0	1	2	3	2	3	3	4	5
Non-US Equity	**0**	**20**	**18**	**18**	**18**	0	3	6	8	9	16	18	19	19	20
Core Fixed Income	**15**	**35**	**17**	**29**	**17**	34	32	35	30	30	27	25	19	17	15
30-Year Treasuries	**0**	**15**	**12**	**0**	**0**	6	7	5	9	10	9	8	9	4	0
Real Estate	**0**	**5**	**4**	**4**	**4**	5	5	5	5	5	4	5	5	3	0
Absolute Return	**0**	**10**	**7**	**7**	**7**	10	10	10	10	10	10	10	10	10	10
Cash	**0**	**15**	**0**	**0**	**12**	15	13	8	6	3	2	0	0	0	0
Total			**100**	**100**	**100**	85	87	92	94	97	98	100	100	100	100
Total Equity	**30**	**85**	**60**	**60**	**60**	**30**	**33**	**37**	**40**	**42**	**48**	**52**	**57**	**66**	**75**
Return			**8.34**	**8.22**	**7.95**	7.02	7.19	7.40	7.58	7.77	7.95	8.14	8.33	8.51	8.70
Risk (1 Year Holding Period)			**9.99**	**9.77**	**9.37**	6.57	6.87	7.26	7.67	8.09	8.55	9.01	9.57	10.40	11.35
Risk (3 Year Holding Period)			**5.77**	**5.64**	**5.41**	3.79	3.97	4.19	4.43	4.67	4.94	5.20	5.53	6.01	6.55
Risk (5 Year Holding Period)			**4.47**	**4.37**	**4.19**	2.94	3.07	3.25	3.43	3.62	3.82	4.03	4.28	4.65	5.08
Risk (7 Year Holding Period)			**3.78**	**3.69**	**3.54**	2.48	2.60	2.75	2.90	3.06	3.23	3.41	3.62	3.93	4.29
Risk (10 Year Holding Period)			**3.16**	**3.09**	**2.96**	2.08	2.17	2.30	2.43	2.56	2.70	2.85	3.03	3.29	3.59

The risk and return relationship is illustrated in Figure 3. The risk of each alternative is plotted against the horizontal axis while the return is measured on the vertical axis. The line connecting the points represents all optimal portfolios and is known as the "efficient frontier". The upward slope of the graph indicates the direct relationship between return and risk.

Figure 3



Summary

As of 8/31/02, the Northwest Natural Retirement Plan is structured with Total Equities at 60%, 29% in Total Fixed Income, 4% in Real Estate and 7% in Absolute Return. The current portfolios' risk and return assumptions for the Northwest Natural Retirement Plan are close to the efficient frontier between portfolios 7 and 9. As the Plan approaches its target allocation of 5% in Real Estate and 10% in Absolute Return, the Plan's asset allocation will more closely approach the efficient frontier.

Three separate portfolio allocations are shown for the Plan to explain the role asset class definitions can play in the outcome of the study. The first portfolio (outlined in blue) determines the risk and return characteristics of the current portfolio; assuming that Hoisington is treated separately from the Core Fixed Income asset class and is given its own risk and return assumptions that better reflect those of 30-Year Treasuries. The second portfolio (outlined in green) shows the risk and return characteristics expected of the same portfolio, with all Core Fixed Income held by the Plan (including the Hoisington assets) treated under the same risk and return assumptions used for the Core Fixed Income asset class. The final portfolio (outlined in purple) is another interpretation of the Hoisington assumption, as it is common during periods of high inflation for Hoisington to liquidate all of its treasuries to cash.

Due to the higher return and risk assumed by the 30-Year Treasury asset class, the portfolio with the Hoisington-based assumptions has a higher expected risk and return than the portfolio with the Core Fixed Income only assumptions and the portfolio with the Hoisington assets in cash. This outcome is in line with the common theme that investors must assume more risk for a return premium. Also consistent with this asset allocation study is the effect of Hoisington on the long-term performance of the Northwest Natural Retirement Plan. The Plan has accepted the trade-off of more volatility for higher returns with the Hoisington investments when compared with other Core Fixed Income investment alternatives.

Appendix

Definitions of terms used in this analysis:

Asset Allocation is a systematic analysis of the properties of specified asset classes to determine the allocation of those assets that meet the return targets of a portfolio.

Performance Expectation is the best estimates of the average annual percentage increases in the value of an asset class over the next five years.

Investment Risk is quantified by the **standard deviation** of returns. Also known as the volatility of returns, it provides a statistical range of performance relative to the average expectations. With this measure, we can establish a level of "confidence" about the expected range of returns for the portfolios.

Correlation is a statistical measure of the relationship of the asset classes. A value of 1 is a perfect correlation; that is, the indices move together. A value of -1 indicates a perfect negative correlation, where the indices move opposite of each other. A value of 0 indicates there is no relationship between the returns of the two asset classes and they move independently.

The Efficient Frontier is the set of portfolios that minimizes risk at given target levels of return. This process takes into account the risk, return and correlation of the asset classes to arrive at the most efficient set of portfolios.