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ASSET ALLOCATION STUDY
FOR
THE ALASKA PERMANENT FUND

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January, 1994



Summary of Recommendations

Currently, the Alaska Permanent Fund is a well diversified portfolio that has enjoyed tremendous success in recent years. This success is mainly due to the Board's knowledge of the importance of asset allocation and its commitment to diversification. This has resulted in the Fund earning high rates of return at relatively conservative levels of risk. The Fund is well positioned to reap the benefits of diversification, having made investments in many different asset classes, both domestic and international. Also, the Fund appears to be efficiently managed, employing reputable and capable managers for both its equity and fixed income assets. The Fund has been able to manage its substantial fixed income portfolio entirely in-house, keeping administrative costs and outside management fees to a minimum. Several important issues must be addressed, however, in order to ensure the Fund's continued success.

Our analysis suggests the Permanent Fund should alter its asset allocation policy in order for the Fund to enjoy returns similar to those it has earned in recent years. Specifically, the Board should consider the following actions:

- Revise its current three-year target asset mix to include a larger allocation to domestic mid and small capitalization equities, European, Pacific Rim and emerging market equities, and mortgage-backed securities.
- Adopt a more aggressive investment style by allocating a larger percentage of Fund assets to equity assets and real estate.
- Revise its equity management plan by setting specific allocations for international and domestic mid and small capitalization equity managers.
- Set specific target allocations across fixed income sectors.

By implementing these changes, the Board can help ensure that the Permanent Fund will achieve the highest expected return for its chosen risk level. This will help the Board achieve its statutory goals of maximizing total Fund return and providing the maximum amount of disposable income to Alaska's citizens.



This report presents recommendations concerning the Alaska Permanent Fund. The first section provides background information on the procedures we used to perform the asset allocation study. The second section suggests improvements for those portfolios, and outlines a third portfolio suited to a more aggressive investment philosophy. The final section provides guidance on several important implementation issues.

I. Analyzing an Investment Portfolio

A first step in analyzing an investment portfolio is determining whether the portfolio adequately compensates the investor for taking risk. Ideally, the portfolio is *efficient* in providing return to the investor; i.e., the portfolio provides the most return possible for the amount of risk taken. In reality, however, few portfolios accomplish this objective.

Defining Asset Classes

In order to analyze the Fund's portfolio, we had to decide which assets to include in the Fund's investment universe. Currently, the Fund invests in 12 different asset classes that comprise six main categories. The benchmarks used to represent each asset class in our analysis are listed in Appendix A at the end of this report. The asset classes used in our study are as follows:

U.S. Equity Assets

Large Capitalization
Mid/Small Capitalization

Non-U.S. Equity Assets

Canada
Europe
Pacific
Emerging Markets

Other Assets

Real Estate

Non-U.S. Fixed Income Assets

Intermediate-Term Government/Corporate Bonds
Long-Term Government/Corporate Bonds
Mortgage-Backed Securities

Non-U.S. Fixed Income Assets

Non-U.S. Government Bonds

Cash

U.S. Treasury Bills

Forecasting Return

We also had to forecast three estimates for each asset class: expected return, expected risk (as measured by standard deviation), and expected return correlation between assets. Summary tables of our forecasts are provided in Appendix B. It is important to note that our return, risk, and correlation forecasts are *long-term* -- they apply to an investment horizon of 10 years or more. Our forecasts are passive in nature and, therefore, would not change dramatically if we were to recalculate them a year from now. Consequently, the portfolio allocations we recommend will remain stable over a very long time period, and will require few changes over a long-term investment horizon.

The basis for our equity return forecasts is the risk-free rate of return and the historical premium, called an equity risk premium, that is demanded by investors for holding risky assets. We use the historical premium because the amount by which common stocks have outperformed risk-free government bonds has been consistent over time. The long-term equity risk premium for large capitalization domestic equities over the period January 1926 to September 1993 was 7.25 percent. Also, many researchers have found that, as the risk of an investment increases, so does its expected return. For this reason, we forecast the expected return of other equity asset classes, such as domestic small capitalization equities and international equities, to have greater expected returns.

The basis of our fixed income return forecasts is the current risk-free rate of return, as proxied by the current yield on a risk-free government bond with a maturity matching the investment time horizon. Currently, this rate is 6.81 percent, the current yield on 20-year U.S. Treasury bond. To this rate, we add the appropriate maturity premium (additional return required by investors for relinquishing the use of their money for long time periods) and default premium (additional return that compensates investors for buying bonds that have default risk, such as corporate bonds) for each class of bonds for which we are forecasting returns.

For international fixed income assets, we forecast returns as if the assets were denominated in U.S. dollars. Since currency fluctuations are expected to average to zero over time, any short-term currency gains or losses will not affect the long-term return on international assets. Currency fluctuations do increase risk, however, and are accounted for in our risk forecasts of non-U.S. fixed income assets.

Forecasting Risk

When forecasting the risk of an asset, we typically assume that the future will equal the past. Therefore, we forecast risk by calculating the historical standard deviation using a long time period over which we have reliable data, and data that is representative of possible future scenarios. Although investment risk can be quantified in a number of

ways for asset allocation purposes, we believe that risk is best modeled as the annual volatility of returns, and standard deviation provides an estimate of how much actual returns may deviate from the average, expected return over time. We use shorter time periods only when we can identify a permanent and dramatic process shift in the behavior of an asset class, such as the late 1960s when bond market volatility increased noticeably from its observed volatility during the previous 40 years.

Forecasting Return Correlation

Return and risk are not the only factors that determine how a portfolio performs. The correlation between the returns of two assets also plays an important role in portfolio performance. Correlation measures how much the returns of two assets tend to move together or move separately. If the returns move together, the assets are positively correlated. If they move in opposite directions, the assets are negatively correlated. If no pattern can be detected in the way the assets' returns move, the assets have a return correlation of zero.

Portfolios comprised only of assets that have high, positive correlations with each other are not well diversified. This tends to exaggerate both upside and downside volatility, and the risk of the portfolio. On the other hand, portfolios with assets that have low or negative return correlations will provide more stable returns because, even though some assets may perform poorly, other portfolio assets will perform better, serving to reduce portfolio volatility. The benefits of diversification, therefore, are a direct result of relatively low return correlations among portfolio assets.

When forecasting return correlation, we again typically assume that the future will equal the past. The basis for our forecast of return correlation is, therefore, the historical correlation between assets, observed over the longest time period for which reliable data is available.

Determining the Fund's Current Allocation

The amount of the Fund currently allocated to each asset class was determined by using information in the Fund's 1993 Annual Report, with supplemental information provided by William L. Means, the Fund's Chief Investment Officer. Market values of all investments came from the Annual Report, while Mr. Means provided clarification regarding the amount currently invested in equities of domestic companies with capitalizations larger than \$1 billion (large capitalization equities), the amount currently invested in equities of companies with capitalizations of \$1 billion or less (mid and small capitalization equities), and the amount currently invested in domestic government and corporate bonds with maturities ranging from one to seven years (intermediate-term),



and more than seven years (long-term). The Fund's current allocation, and its expected return and standard deviation is given on page 5.

Determining the Fund's Three-Year Target Allocation

The Permanent Fund's investment manual provided information regarding the three-year target allocation, although some guidelines were too broad for our purposes. For example, the manual lists a 10 percent target allocation for international equities, but gives no country-specific allocations. In this case, we assumed the Fund would increase its international equity exposure to 10 percent, while maintaining the current proportion invested among sectors. Also, the target allocation constrains the amount invested in non-domestic fixed income assets to 10 percent or less, but provides no specific number. We assumed the amount invested in international debt would decrease in proportion to the total decrease in the amount allocated to all fixed income assets. The Fund's three-year target allocation, and its expected return and risk, is listed on the following page.

Current and Three-Year Target Portfolios

Asset Class	Current Allocation (%)	3-Year Target Allocation (%)
U.S. Large Capitalization Stocks	21.17	24.00
U.S. Mid/Small Capitalization Stocks	0.65	6.00
Canadian Stocks	0.03	0.04
European Stocks	2.54	4.28
Pacific Region Stocks	2.94	4.97
Emerging Market Stocks	0.42	0.72
Real Estate	6.69	10.00
Cash	4.64	0.00
Intermediate Govt/Corp Bonds	30.86	25.32
Long-Term Govt/Corp Bonds	25.27	20.74
Mortgage-Backed Securities	3.94	3.24
Non-U.S. Government Bonds	0.85	0.69
Expected Return (%)	8.53	9.93
Standard Deviation (%)	7.57	9.91

II. Asset Allocation Recommendations

The next step in our analysis was to improve the Fund's current and target portfolios by increasing their expected return while keeping expected risk at a constant level.

Allocation with Risk of the Current Portfolio

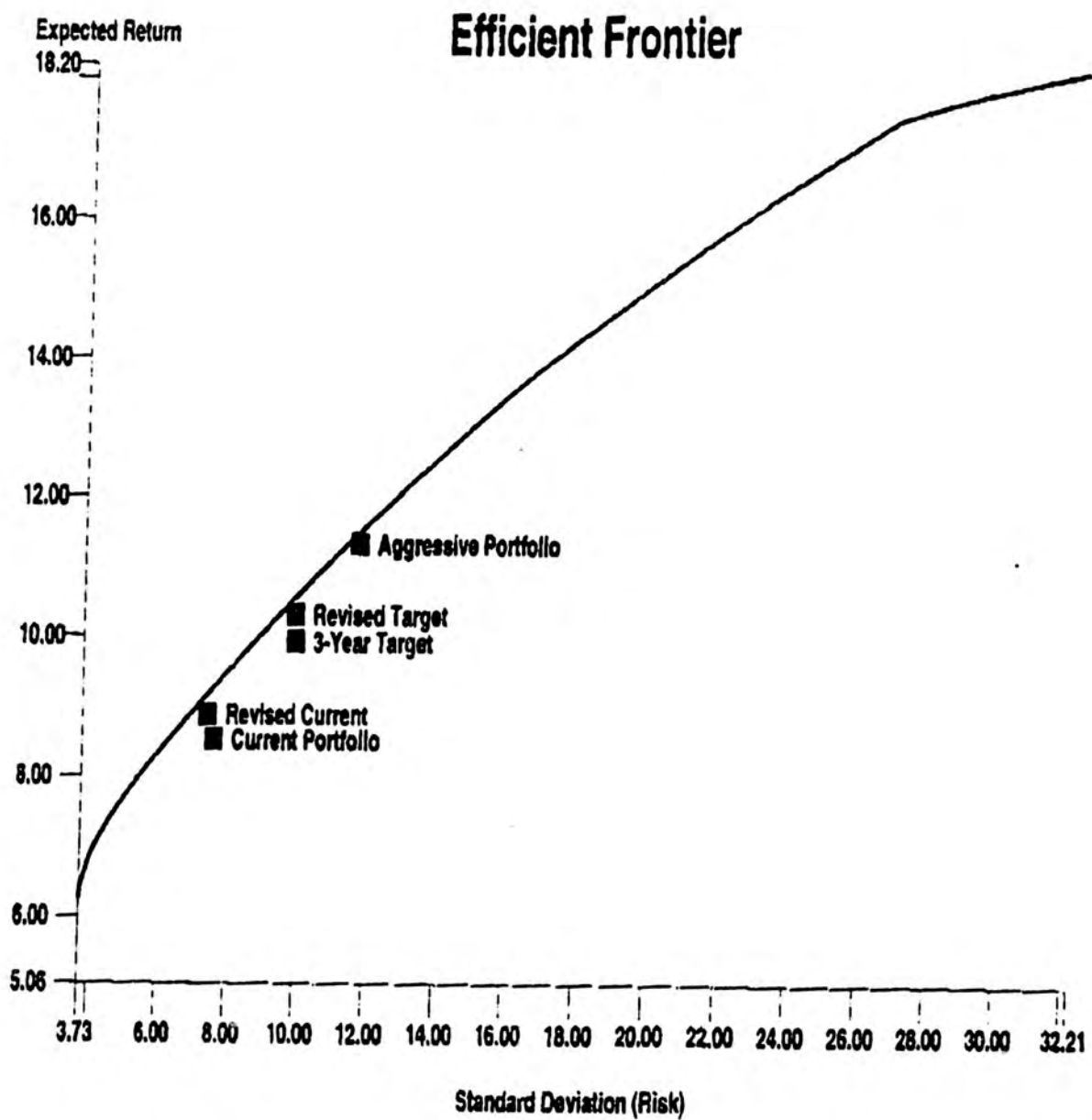
As shown in the graph on page 7, the Fund's current portfolio does not provide the maximum amount of expected return for the amount of risk taken. For example, the portfolio labeled "revised current" provides a higher expected return and slightly less risk than the current portfolio. (The graph is titled "Efficient Frontier" because the line in the graph represents those portfolios which are the most efficient in providing return to the investor; i.e., those portfolios provide the maximum return for a given level of risk.) The allocations for both the current and revised portfolios, as well as their expected returns and standard deviations, are shown on page 8.

The current portfolio need not be drastically changed in order to achieve a higher expected return. In fact, the percent of the portfolio invested in equities (approximately 35 percent, including real estate) and in fixed income assets (approximately 65 percent), is the same in both the current and revised portfolios. Rather, the composition of the equity and fixed income portions need only change. By shifting part of the equity portion from large capitalization stocks to mid and small capitalization and international stocks, and part of the fixed income portion from cash and long-term bonds to intermediate-term bonds and mortgage-backed securities, the Fund can achieve a higher expected return while taking less risk.

Although these changes represent shifts from safer assets to more risky ones, the overall risk of the portfolio actually decreases. This is because domestic mid and small stocks, mortgage-backed securities, and international stocks have low correlations with many of the other portfolio assets.

Allocation with Risk of the Target Portfolio

The graph on page 7 shows that the Fund's target portfolio also does not provide the highest possible expected return for the amount of risk taken. Although both the allocations of the target and revised target portfolios are equally divided between equity and fixed income assets, the revised target portfolio has a significantly higher expected return and less risk. The composition of both portfolios, along with their expected returns and standard deviations, is given on page 8.



Current and Recommended Portfolio Allocations

Asset Classes	Allocations				
	Current Portfolio (%)	Revised Current (%)	3-Year Target (%)	Revised Target (%)	Aggressive Portfolio (%)
U.S. Large Cap Stocks	21.17	11.00	24.00	16.00	18.00
U.S. Mid/Small Cap Stocks	0.65	4.00	6.00	8.00	10.00
Canadian Stocks	0.03	0.00	0.04	0.00	0.00
European Stocks	2.54	9.50	4.28	6.00	7.50
Pacific Region Stocks	2.94	4.00	4.97	7.00	10.50
Emerging Market Stocks	0.42	2.50	0.72	3.00	4.00
Real Estate	6.69	10.00	10.00	10.00	10.00
Cash	4.64	1.00	0.00	1.00	1.00
Intermediate-Term Govt/Corp Bonds	30.86	40.00	25.32	30.00	18.00
Long-Term Govt/Corp Bonds	25.27	12.00	20.74	5.00	6.00
Mortgage-Backed Securities	3.94	12.00	3.24	14.00	15.00
Non-U.S. Govt Bonds	0.85	0.00	0.69	0.00	0.00
Expected Return	8.53	8.89	9.93	10.31	11.33
Standard Deviation	7.57	7.40	9.91	9.89	11.69

The superior tradeoff between risk and return of the revised target portfolio can be accomplished by shifting a larger portion of Fund assets into domestic mid and small capitalization stocks, international stocks, mortgage securities, and real estate. Again, these riskier assets have low correlations with many other portfolio assets, and therefore provide enhanced diversification benefits.

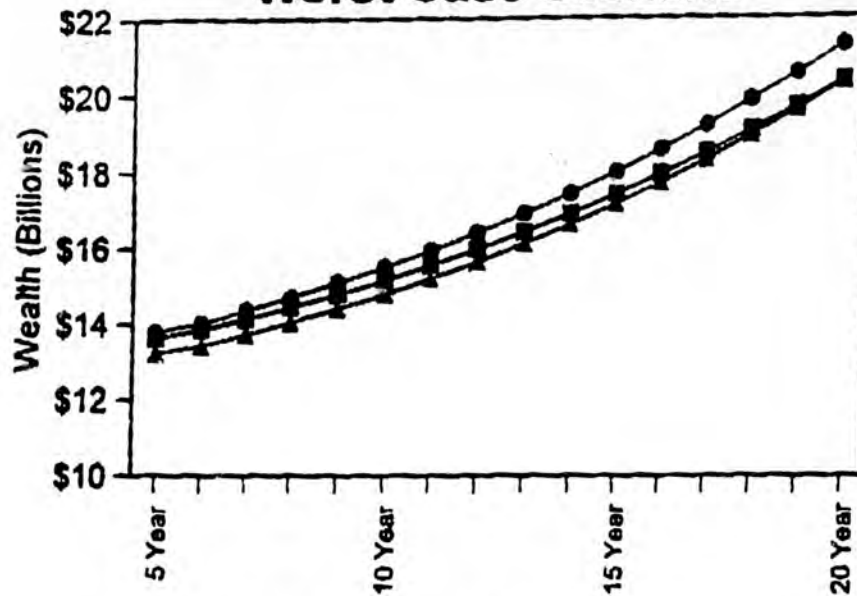
Allocation of a More Aggressive Portfolio

Although we have analyzed and suggested improvements to both the current and target portfolios, we have not yet commented on whether either portfolio is appropriate for the Fund. Ideally, a portfolio provides enough return to meet the goals of the investor while maintaining a level of risk that is comfortable for the investor. By setting a three-year target portfolio that has an increased allocation to equity assets, the Board has indicated that it is comfortable with a more aggressive investment philosophy. In our opinion, such an aggressive investing strategy is appropriate and necessary for achieving the Fund's statutory goals of maximizing total return and providing the maximum amount of disposable income to the citizens of Alaska. Consequently, we believe the Fund should consider the benefits of investing in the "aggressive portfolio," also shown in the graph on page 7.

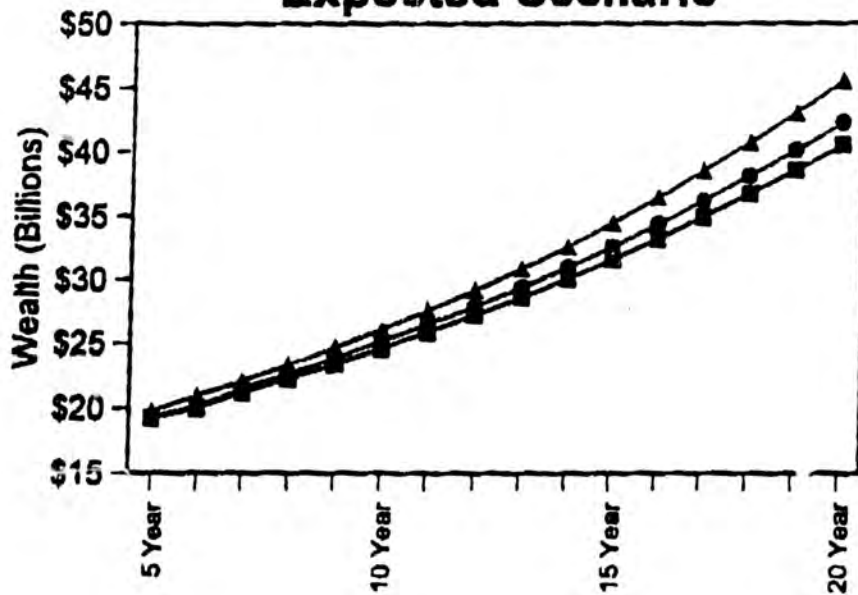
In recent years, the Fund has enjoyed relatively high returns, particularly on its fixed income investments. These high returns were due, in part, to rather unique market conditions, such as a dramatic decline in U.S. interest rates. These market conditions, however, are not expected to continue in the future, as evidenced by the returns expected on the current and target Fund portfolios. The potentially lower returns earned by both these portfolios are important factors to consider, because such low returns will inevitably lead to lower dividend payments to Alaskans. Our recommended aggressive portfolio, however, with its significant allocations to international equities and mortgage-backed securities, has an expected return in the range of the Fund's recent returns. The allocation of this aggressive portfolio, along with its expected return and standard deviation, is provided on page 8.

The graphs on the following page can help to compare the expected performance of each portfolio. The graphs show expected wealth values under the target, revised target, and aggressive portfolios for five-, ten-, and twenty-year investment horizons. Although the Board may consider the aggressive portfolio too risky, the graph shows that the majority of this portfolio's volatility is due to its broad range of possible high, *positive* returns, not negative ones. For all investment time horizons, the aggressive portfolio has a higher expected wealth value under the best- and expected-case scenarios. Only under the worst-case scenario does the aggressive portfolio underperform the target portfolio, while the revised target portfolio performs better than the target portfolio in *all* cases.

Worst Case Scenario

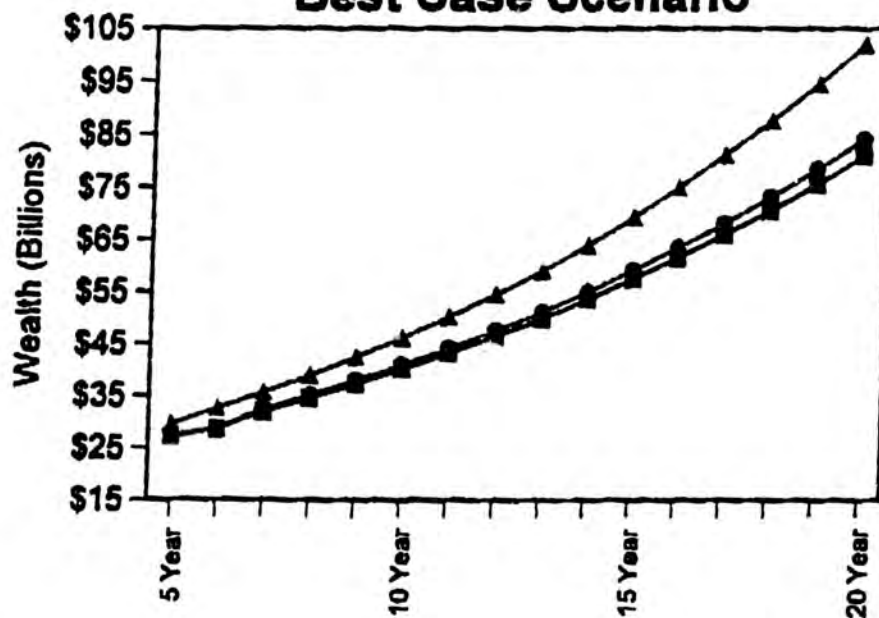


Expected Scenario



- 3-Year Target Portfolio
- Revised Portfolio
- ▲ Aggressive Portfolio

Best Case Scenario



Testing Our Recommended Portfolios

To ensure the validity of our recommended portfolios, we tested those portfolios and the Fund's current and target portfolios for *stability*. A stable portfolio is one that performs well under a variety of possible future market conditions; i.e., the portfolio provides adequate return for the amount of risk taken under conditions that differ from our forecasts. We tested the portfolios using "worst-case" scenarios where the return of one or more assets is lower than expected and the risk is higher than expected. The following scenarios were used, both individually and in combination, to test our recommended portfolios:

- U.S. equity risk premium decreases to 5 percent
- Mid and small capitalization equity return decreases to 15 percent
- Europe equity return decreases to 10 percent
- Europe equity standard deviation increases to 26 percent
- Pacific equity return decreases to 10 percent
- Pacific equity standard deviation increases to 34 percent
- Emerging market equity return decreases to 10 percent
- Return between long-term and intermediate-term bonds increases to 1 percent
- Intermediate-term bond standard deviation increases to 6 percent
- Mortgage-backed securities return decreases to 6 percent
- Mortgage-backed securities standard deviation increases to 11 percent
- Real estate standard deviation increases to 25 percent
- Correlation between U.S. stocks and U.S. bonds increases 30 percent
- Correlation between U.S. stocks and non-U.S. stocks increases 30 percent

Under these scenarios, our recommended portfolios provided higher returns with less risk than either the Fund's current or target portfolios. For example, the improved target portfolio had 10 basis points more return and less risk than the current target portfolio when tested under the assumption that all international markets had the lower returns and higher risks outlined above. This indicates that the revised portfolios will perform better over the long run, despite possible extreme underperformance of some markets.

III. Implementation Issues

Whichever portfolio the Board chooses, several issues must be addressed by the Board to ensure maximum Fund performance. The single most important issue is the degree of adherence to the chosen allocation. Research has suggested that the asset allocation decision accounts for over 90 percent of the variability of returns on a portfolio, and is the single largest determinant of portfolio performance.¹ Consequently, individual security selection and active security management, the two factors commonly assumed to contribute the most to the return of a portfolio, actually account for only a small amount of portfolio return variability. Therefore, adherence to the chosen allocation is *crucial* to the future performance of any investment portfolio, including the Permanent Fund. Accordingly, the Board must decide whether the current investment strategy of the Fund accommodates a strict adherence to the chosen allocation. We address this issue separately for equity and fixed income assets in the following two sections.

Equity Assets

As of April 1993, the Board decided to use active managers only for domestic mid/small capitalization stocks and all international equities. Since our recommended portfolios are based on passive benchmarks, we believe that the long-term performance we forecast can be achieved through the use of passive managers, although it is certainly possible for active managers to meet or exceed that performance. For this reason, we believe the Board's decision to retain active managers is appropriate, *as long as each manager is given only that portion of Fund assets that is recommended in the chosen allocation, and is required to invest those assets in the specific, recommended asset class.*

This stipulation is in direct contrast to the Board's new global investment strategy as outlined in the Fund's 1993 Annual Report. The new strategy allows active international equity managers to decide when and where to invest Fund assets, essentially shifting the asset allocation decision from the Board to the manager. As mentioned earlier, asset allocation, not security selection or active market timing, is the largest determinant of portfolio performance. Under the planned strategy, the Fund's equity allocation will shift continuously, violating the most crucial aspect of strategic asset allocation: maintaining a stable asset mix which was chosen based on long-term forecasts and needs of the fund. For this reason, we suggest a slightly modified strategy where the Board hires managers that have a specific style of investing. For example, under this modified strategy, the European equity allocation would be managed by a manager who specializes in European equities. This type of management strategy would allow the Board to retain control over the equity allocation of the Fund.

¹ Gary P. Brinson, Brian D. Singer, and Gilbert L. Beebower, "Determinants of portfolio performance II: An update," *Financial Analysts Journal*, May-June 1991.

The Fund's domestic equity managers also have similar control over the asset allocation decision. Currently, the performance of each domestic equity manager is evaluated by using a benchmark portfolio that consists of 80 percent large capitalization equities and 20 percent mid and small capitalization equities. The equity managers, however, are not specifically required to invest 80 percent of their Fund allocation in large capitalization stocks and 20 percent in mid and small capitalization stocks. A manager could alternate between large cap and mid and small cap stocks, and still *average* an 80 percent large cap and 20 percent mid and small cap investment. This manager could potentially be 100 percent invested in large cap stocks when the return in the mid and small cap market is high, and vice-versa. Again, this causes the overall equity allocation of the Fund to change continuously, and shifts control of the asset allocation decision to individual managers. Because the asset allocation decision is so important to the overall performance of the Fund, we feel the Board should set specific domestic equity allocations, and select managers who specialize in each asset class. This will ensure the maximum expected return for the Fund's equity investments.

Fixed Income Assets

Currently, the Fund's fixed income assets are passively managed in-house by the Fund's Chief Investment Officer, and are generally treated as a single asset class. Our analysis, however, treats the fixed income category as five distinct asset classes, because each contributes unique benefits to the overall portfolio. Treasury bills, for example, provide more liquidity than the other assets, and are, consequently, the least risky. Also, mortgage-backed securities perform differently from government or corporate bonds. For this reason, each fixed income asset class must be considered separately in the asset allocation decision.

Currently, the Board treats all fixed income assets as a single asset class and provides only a broad allocation directive. This essentially shifts the asset allocation decision to the fixed income manager. While the current allocation across fixed income assets may be appropriate when viewed in isolation, that same allocation may be inappropriate when viewed in the context of the overall portfolio. The Board has a comprehensive perspective on the Fund and, as such, should determine the Fund allocation to each asset class. For this reason, we suggest that the Board set specific target allocations for fixed income asset classes. In this way, the Board maintains control over the Fund's asset allocation and ensures maximum overall Fund performance.

Prior to beginning our study, several Board members and senators voiced concern over the Fund having only one manager for the entire fixed income portfolio. We feel that a single, capable manager, such as the current manager, can manage a large, passive fixed income portfolio with few problems, as long as that portfolio has only a small allocation to mortgage-backed securities. However, if a larger proportion of funds was invested in

mortgage-backed securities (as is our recommendation), it may be required to hire additional staff. This is because mortgage-backed securities are more complex to analyze, and the holders of mortgage securities continually receive principal and interest payments which must be accurately recorded. All our recommended portfolios contain substantial allocations to mortgage-backed securities. Consequently, we suggest that the Board hire an outside manager to manage the mortgage portfolio, or, at the very least, hire additional support staff.

Conclusion

Although the Permanent Fund has an excellent performance history, the Fund faces new and uncertain investment challenges in the coming years. The Board, realizing the importance of asset allocation to overall Fund performance, has created a target allocation to meet those challenges. However, as our analysis reveals, the Board can implement a better allocation for the Fund, one that has higher expected return and less risk than the Fund's target portfolio. Also, the Board can implement a new investing policy, one emphasizing an adherence to the chosen allocation. By doing so, the Board will help ensure the maximum expected performance of the Fund over the long-term investment horizon, thereby providing the highest possible income to the State's citizens and fulfilling its obligation to those citizens.

Appendix A: Benchmarks Used in Asset Allocation Study

<u>Asset Class</u>	<u>Benchmark Description</u>
U.S. Large Capitalization Equity	S&P 500: A market capitalization-weighted index of 500 of the largest stocks of companies domiciled in the United States.
U.S. Mid/Small Capitalization Equity	Russell 2000 Index: A market capitalization-weighted index of the stocks of the bottom two thirds of the largest 3,000 publicly traded companies domiciled in the United States.
Canada Equity	Morgan Stanley Capital International Canada Total Return Index: A market capitalization-weighted index of 81 large Canadian stocks.
Europe Equity	Morgan Stanley Capital International Europe Total Return Index: A market capitalization-weighted index of large stocks from Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.
Pacific Equity	Morgan Stanley Capital International Pacific Total Return Index: A market capitalization-weighted index of large stocks from Australia, Hong Kong, Japan, Malaysia, New Zealand, and Singapore.
Emerging Markets Equity	IFC Emerging Market Composite Index: A broad-based, market capitalization-weighted index of stocks listed in countries with a per capita GDP below an annually-disclosed figure. Currently, 20 countries are represented in the Composite index.
Cash	U.S. 90-Day Treasury Bills: Published by Salomon Brothers in <i>International Bond and Money Market Performance</i> .

IT Govt/Corp Bonds

Lehman Brothers Intermediate-Term Government/Corporate Bond Total Return Index: A portfolio of U.S. government issues (>\$100 million par value) and investment grade corporate debt (>\$50 million par value) with an average maturity of 4.42 years as of November 29, 1993.

LT Govt/Corp Bonds

Lehman Brothers Government/Corporate Bond Total Return Index: A portfolio of U.S. government issues (>\$100 million par value) and investment grade corporate debt (>\$50 million par value) with an average maturity of 10.91 years as of November 29, 1993.

Mortgage-Backed Securities

Lehman Brothers Mortgage-Backed Securities Total Return Index: An index of all fixed-rate securities backed by mortgage pools of the Government National Mortgage Association (GNMA), Federal Home Loan Mortgage Corporation (FHLMC), and the Federal National Mortgage Association (FNMA). The index has an average maturity of 6.89 years.

Non-U.S. Bonds

Salomon Brothers Non-U.S. 1+ Bond Index: A market capitalization-weighted index of bonds from Australia, Canada, Germany, Japan, Netherlands, Switzerland, and the United Kingdom with one year or more to maturity. The average maturity of bonds in the index is 6.95 years.

Real Estate

Willshire Real Estate Securities Total Return Index: A market capitalization-weighted index of approximately 85 real estate investment trust and real estate operating companies.

Appendix B: Forecasts Used in Asset Allocation Study

Forecasts of Expected Return and Standard Deviation

Asset Class	Expected Return	Standard Deviation
U.S. Large Cap Stocks	13.56	20.61
U.S. Mid/Small Cap Stocks	18.03	32.95
Canada Stocks	13.73	24.64
Europe Stocks	13.98	22.69
Pacific Stocks	15.11	28.24
Emerging Market Stocks	21.38	47.00
Real Estate	9.90	13.63
Cash	4.61	2.73
IT Govt/Corp Bonds	5.89	4.10
LT Govt/Corp Bonds	6.37	7.22
Mortgage-Backed Securities	7.45	9.28
Non-U.S. Govt Bonds	6.01	14.75