

Tangent Theory Enters the Mainstream

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EXECUTIVE SUMMARY

The dominant allocation position for the last 20 years has been an equity-centric portfolio determined through mean variance analysis. As investors reconsider equity-centric asset allocation approaches, one concept gaining broader acceptance is the “risk parity” approach. Loosely defined, risk parity is an allocation concept in which the contribution to total portfolio risk is more equally distributed across a set of asset classes. However, risk parity is not a new concept; it is actually a special case of CAPM (Capital Asset Pricing Model) tangent theory.

By relaxing the leverage constraint, it is our view that tangent portfolios have the potential to produce superior risk-adjusted returns (Sharpe ratios) as compared with portfolios restricted to the efficient frontier. The key determinant of the relative success of tangent portfolios is the performance of risky assets versus cash, both individually and collectively. Recent criticism of tangent-based ideas is centered not on the theory, but rather on the tactical expectation of negative returns for certain risky asset classes relative to cash, particularly bonds. At Mellon Capital, we take these criticisms seriously; that is why we structure optimal tangent portfolios to take into account the following:

1. Tangent portfolios should be dynamic. Risk-parity structures generally have static allocation structures. Asset-class expectations vary through time, and therefore, the slopes of the efficient frontier and tangent line vary. Optimal portfolio construction should respond appropriately.
2. Tangent portfolios should allow for deleveraging. If cash is expected to be a superior investment, exposure to risky asset classes should be reduced.

Investors can apply tangent principles with the goal of improving the information ratio of alpha strategies and/or the Sharpe ratio of strategic beta portfolios. One approach would deploy tangent strategies as a complementary source of alpha to return-seeking mandates such as equities. Whereas stock and sector selection are the primary alpha sources in active equity strategies, tangent strategies offer a unique source of potential excess return from tactical allocation decisions. Furthermore, the structural advantages of tangent strategies may provide downside protection for return-seeking portfolios.

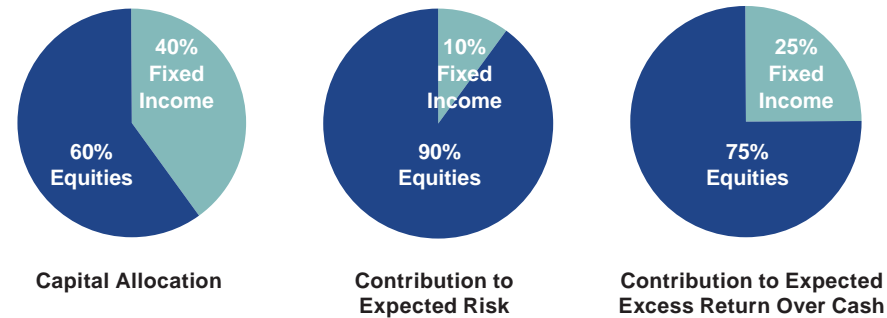
A second approach is to utilize tangent principles in strategic beta mandates such as risk-premium-capture portfolios, real-asset mandates, liability and deflation hedging strategies. When investors try to balance return and risk, they are routinely forced into suboptimal choices, sacrificing one objective to improve the second. Tangent strategies mitigate the “either-or” conundrum because they add risk via higher Sharpe ratio portfolios relative to rolling out the efficient frontier. Investors are not required to reduce return-seeking assets when adding risk-mitigating assets, and vice versa.

INTRODUCTION

As investors reconsider, and explore alternatives to, traditional mean-variance risk management and asset allocation approaches, one concept gaining broader acceptance is the “risk parity” approach. Loosely defined, risk parity is an allocation concept in which the contribution to total portfolio risk is more equally distributed across a set of asset classes. For example, given the traditional 60/40 mix, a disproportionate share of the volatility and excess return derives from the stock portfolio, as shown in *Figure 1*.

Figure 1: The “Not-So-Balanced” 60/40 Portfolio¹

Data Source: Mellon Capital, Thomson Reuters DataStream



In order to produce a balanced portfolio with equal risk contributions from stocks and bonds, a larger share of the capital allocation must be invested in bonds. Typically, capital allocation ratios ranging from 2:1 to 3:1 in favor of bonds produce equal risk-weighted allocations. Of course, unlevered portfolios with bond allocations of 66% or more are not expected to earn sufficient returns for most investors. Therefore, leverage is the second ingredient incorporated into risk-parity concepts.

While the “risk parity” idea may seem new, that is not the case. Risk parity is a special case of the tangent concept that has been discussed in academic literature for several decades. The concept seems new because it is now acceptable to seriously discuss a levered strategy among polite company.

THE EFFICIENT FRONTIER, CAPITAL MARKET LINE, AND TANGENT THEORY

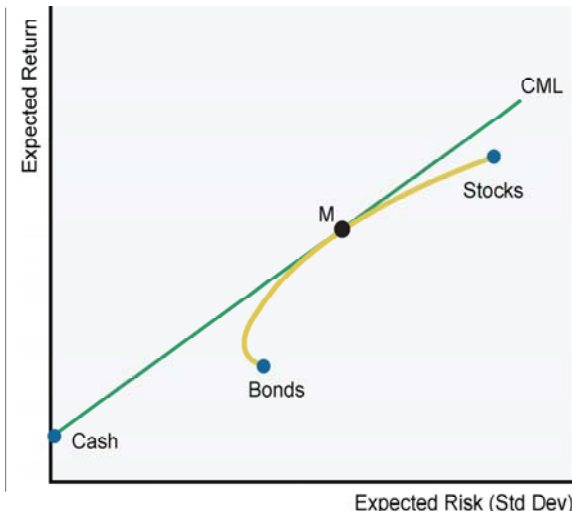
Traditionally, target allocations have been determined through mean variance analysis. The output of mean variance analysis is a set of portfolios (i.e., the efficient frontier) that maximize expected returns for given levels of risk, with leverage excluded. The efficient frontier for a hypothetical, two-asset-class framework is shown in *Figure 2* (yellow, curved line). Since stocks and bonds are not perfectly correlated, the efficient frontier forms a “bowed” shape. Starting from an all-bond portfolio, as increments of stocks are added at the expense of bonds, the expected return continues to increase in linear proportion to the asset-class weights. The risk-adjusted efficiency of each portfolio, as measured by the Sharpe ratio, varies in a non-linear manner all along the efficient frontier.

In order to determine the portfolio with the highest Sharpe ratio, one needs to determine the capital market line (CML). With one end anchored at cash, the CML (green, straight line in *Figure 2*) is determined at the single point of intersection with the efficient frontier: portfolio M. Portfolio M is the asset mix that produces the highest return per unit of risk. The CML can also be referred to as the “tangent” line. As we can see in *Figure 2*, all the points on the CML lie above the efficient frontier, with portfolio M being the only equivalent portfolio. Portfolio M can be combined with cash to form the CML to the left of portfolio M or levered to form the CML to the right of portfolio M. The CML has a constant slope, and thus a constant Sharpe ratio, because the asset mix of portfolio M is unaltered.

1. Based on the S&P 500 Index (representing equities) and the Barclays Capital U.S. Aggregate Bond Index (representing Fixed Income) for the period 1/1/76 to 12/31/09.

Figure 2: Efficient Frontier and Capital Market Line Illustration

Data Source: Mellon Capital



A Prudent Use of Leverage

In today's environment, portfolio M is generally viewed to be a low-risk portfolio with return expectations of less than 7%. Typical investors desire returns between 8% and 10%. If leverage is not permitted, the investor can increase the expected return only by moving out the efficient frontier, thus fundamentally changing the asset mix relative to portfolio M. The resulting portfolios at those higher return levels have lower Sharpe ratios. If the investor is prudently allowed to utilize leverage, we believe higher expected returns can be achieved by moving along the CML to the desired volatility level.

We believe this particular use of leverage is prudent. Investors are allocating to risky assets to achieve higher long-term returns. One method to increase the expected returns is to purchase additional equities, with its incremental risk and implicit leverage via bondholders. Alternatively, investors can assume leverage explicitly through well-balanced tangent portfolios that require less incremental risk for the same increase in expected return. Furthermore, the explicit leverage in tangent portfolios is necessary only in limited amounts, usually less than one time leveraged, to target returns of 8% to 10%.

HISTORICAL TESTING OF TANGENT THEORY: DOES IT WORK IN THE REAL WORLD?

Continuing with the simple two-asset-class example, we test the tangent theory against actual asset-class performance history since 1973. Since the period covers a complete interest rate cycle and multiple bull and bear equity cycles, we'll be able to examine several critical assumptions of tangent theory. We'll investigate three specific cases as follow²:

Case Study #1 Asset-class return and risk relationships are normal (upward sloping and proportional), resulting in similar positive Sharpe ratios.

Case Study #2 Asset-class return and risk relationships are perverse (downward sloping), resulting in negative Sharpe ratios.

Case Study #3 Asset-class return and risk relationships disproportionately favor risky assets (steep upward slope), resulting in high positive Sharpe ratios.

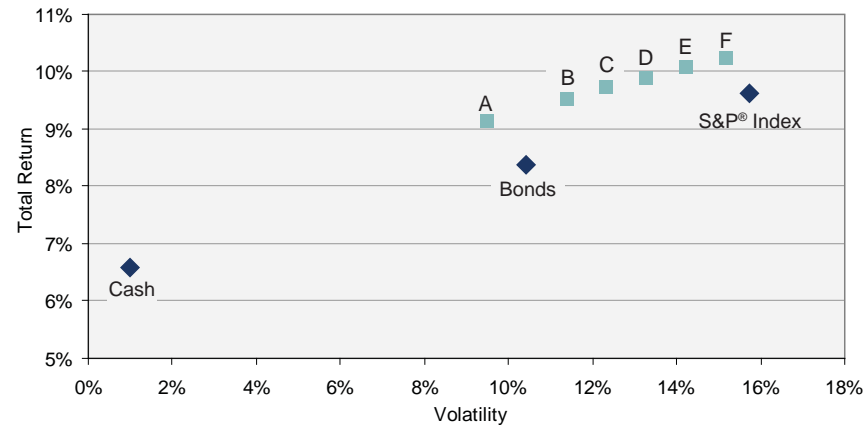
2. Each of the portfolio allocations examined in this case study is hypothetical and does not represent actual trading.

Case Study #1 1973 to 2009

First we'll explore a period in which asset class return and risk characteristics were consistent with long run equilibrium³ expectations. *Figure 3* plots the return and volatility of three U.S. asset classes against the six balanced allocations described in Appendix 1 (*Figure 3A*). The balanced fund allocations represent portfolios with a fixed bond-to-equity ratio of 2:1 and gross exposures ranging from 100% (i.e. unlevered) to 160% (0.6 times levered).

Figure 3: Comparison of Various Simulated Portfolios and Indexes⁴ 1973–2009

Data Source: Mellon Capital



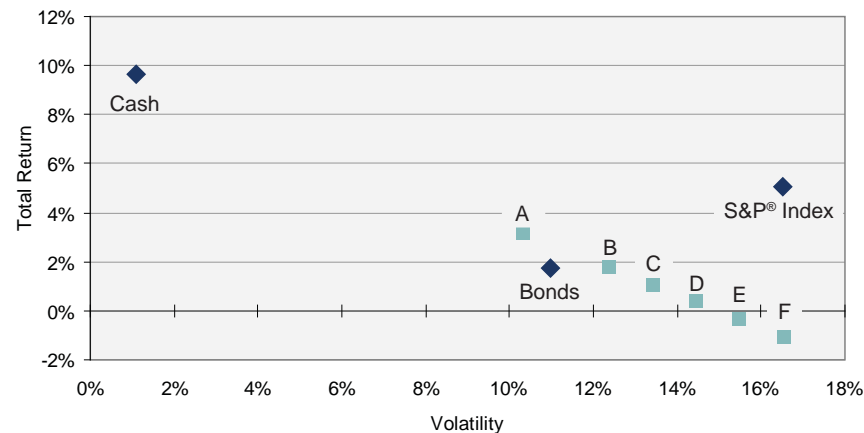
As portfolio A is proportionally levered into portfolios B through F, we see linearly increasing returns and risk as predicted by tangent theory. Therefore, during this regime an investor would have been better off modestly leveraging a static balanced allocation (one-third equity, two-thirds bonds) than shifting toward an unlevered equity-centric allocation.

Case Study #2 1973 to 1981

Opponents of tangent theory have highlighted the period of surging inflation as the concept's Achilles' heel. Specifically, if risky asset classes do not outperform cash, then leverage may exacerbate underperformance. *Figure 4* summarizes the results during the inflationary surge from 1973 to 1981. (See also Appendix 1, *Figure 4A*).

Figure 4: Comparison of Various Simulated Portfolios and Indexes⁴ 1973–1981

Data Source: Mellon Capital



3. The return and risk characteristics of stocks, bonds and cash were upward sloping and proportional over this long time horizon. As a result, each risky asset class yielded similar Sharpe Ratios.

4. ANY RESULTS PRESENTED BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, SIMULATED OR HYPOTHETICAL RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, SIMULATED RESULTS MAY HAVE UNDER- OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

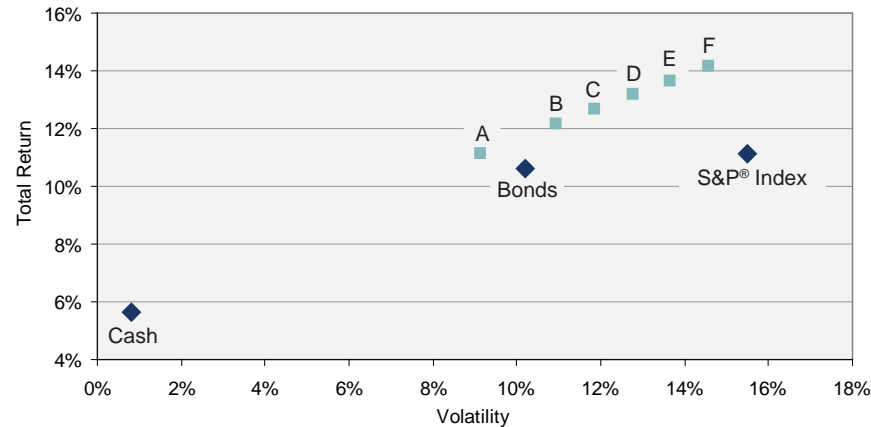
Both stocks and bonds failed to outperform the return of cash from 1973 through 1981. As a result, leveraging risky asset classes led to ever larger underperformance levels. Also, given the much lower Sharpe ratio of bonds relative to stocks over this period, higher ratios of bonds to stocks would produce even worse results. The opponents of tangent theory have legitimate arguments about intermediate time horizons.

Case Study #3 1982 to 2009

The era of disinflation ushered in the golden age of static tangent theory. Both stocks and bonds significantly outperformed the return of cash from 1982 through 2009 as shown in *Figure 5*. (See also Appendix 1, *Figure 5A*). In addition, both asset classes delivered high Sharpe ratios, with bonds actually earning better risk-adjusted returns.

Figure 5: Comparison of Various Simulated Portfolios and Indexes⁵ 1982–2009

Data Source: Mellon Capital



KEY LESSONS FROM TANGENT THEORY AND HISTORY

We believe tangent theory can indeed produce better returns over long periods when risky assets outperform cash. However, no investment strategy is bulletproof, even over reasonably long horizons, as shown in *Figure 4*. So, what are the key takeaways of our research?

Dynamic Portfolio Construction Is Preferred to Static Levered Allocations

Static levered portfolios require normal relationships between risk-free and risky asset classes. We know that there are prolonged periods in which this outcome does not hold. Therefore, a dynamic approach to constructing the optimal levered portfolio provides an opportunity to avoid the poor results of blindly leveraging risky assets in general or certain overpriced assets in particular.

Be Careful Leveraging Bonds and Allow for Deleveraging Exposures

Since the industry is lowering equity allocations in general, and expanding the bond allocation in levered portfolios specifically, it is critical to assess the likelihood of a secular bear market in nominal bonds reminiscent of the 1970s. Given that many investors believe we may be transitioning from a secular bull market in bonds to a secular bear market, this may be an inopportune time to statically lever nominal fixed income. Therefore, it is imperative that the investment mandate allow for deleveraging individual asset classes and/or the entire portfolio in the face of rising interest rates or insufficient expected returns relative to cash.

5. ANY RESULTS PRESENTED BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, SIMULATED OR HYPOTHETICAL RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, SIMULATED RESULTS MAY HAVE UNDER- OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

Construct a Global Portfolio and Include Real Assets

The foregoing analysis concerned a simple U.S.-only portfolio. Global asset-class inclusion can mitigate the outlier periods that may occur when one considers only local markets. Real assets such as commodities and inflation-linked bonds have the potential to mitigate the problem of financial asset underperformance during inflationary cycles.

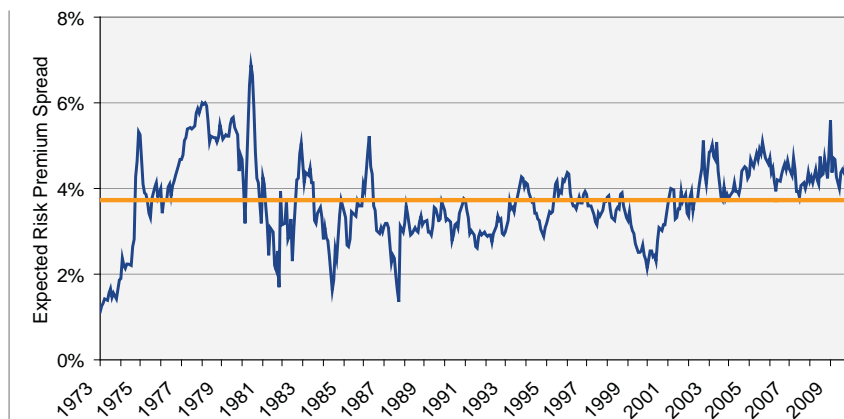
APPLYING THE KEY LESSONS OF TANGENT THEORY TO THE MARKETPLACE

Evolving asset-class expectations result in evolving efficient frontiers and tangent lines. Critics of tangent theory raise serious issues with regard to asset-class characteristics, particularly the chance that risky asset classes will underperform cash.

In response, there are three courses of action. First, an investor may sit on the sidelines and avoid risk. Second, the investor may take a long-term strategic perspective in order to earn the rewards of tangent portfolios while riding out the intermittent periods of underperformance. Third, an investor could assume that same long-term strategic perspective yet seek to exploit changes in asset-class expectations via shifting risk exposures along the tangent line. At Mellon Capital, we believe a combination of a strategic perspective with some degree of tactical flexibility is the optimal approach.

Figure 6: Expected Risk Premium of U.S. Stock Market vs. U.S. Bond Market⁶
January 1973–March 2010

Data Source: Mellon Capital, Thomson Reuters DataStream



Tactical Flexibility Within a Strategic Framework

Since the early 1970s, the founders of Mellon Capital have successfully managed tactical asset allocation (TAA) portfolios. The active allocations in the strategy are derived from an analysis of asset-class risk premiums. The U.S. stock-bond risk premium is illustrated in *Figure 6*. If the risk premium analysis reveals that the expected return on stocks relative to bonds is higher than normal (in our view), an overweight position to stocks is assumed with a complementary underweight to bonds.

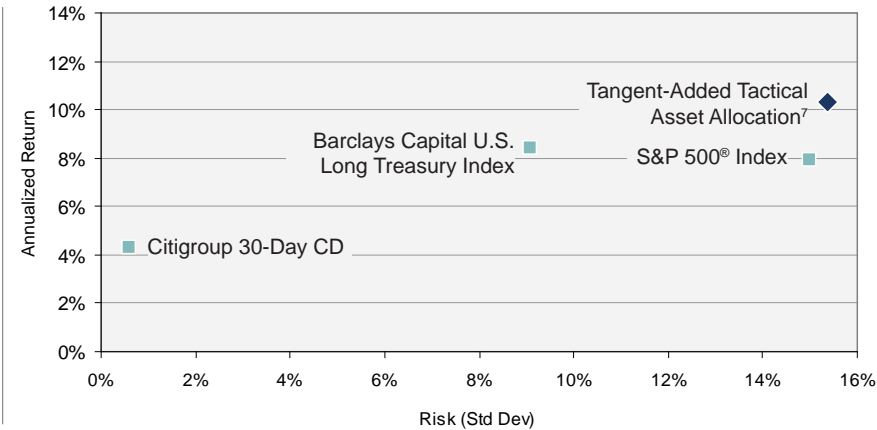
Mellon Capital's Tangent Added[®] Tactical Asset Allocation Strategy

Starting in 1989, Mellon Capital combined tangent principles with the active asset-allocation strategy and launched the Tangent Added Tactical Asset Allocation (TATAA). For evaluation purposes, the strategy is benchmarked against the S&P 500. Essentially, the strategy relaxes two constraints. First, leverage was allowed up to one-half time (or 150% gross exposure). Second, the long-only constraint was relaxed. Therefore, with these two constraints relaxed, each asset-class exposure can range from -50% up to +150% of the portfolio's value.

6. Based on the S&P 500 Index (representing the U.S. Stock Market) and a representative long duration A rated industrial bond (representing the U.S. Bond Market) illustrating when stocks appear to be attractive (above the orange line) and when stocks appear to be expensive (below the orange line).

The results achieved by the strategy are shown in *Figure 7*. As expected, the combination of the tangent theory and successful tactical shifts generated returns that far exceed the S&P 500 over more than 20 years. At the same time, the total risk is comparable to that of the equity index. Furthermore, since the strategy's inception, there have been five calendar years in which the benchmark S&P 500 index was negative (1990, 2000, 2001, 2002, and 2008). The TATAA strategy produced positive alpha in all five of those years.

Figure 7: Risk/Return Characteristics
September 1989–May 2010
Data Source: Mellon Capital



While impressive, the live track record for the tangent strategy does not extend back into the less favorable 1970s. However, our TAA strategy does, and we are therefore able to simulate tangent strategy returns back to 1973. We postulated that if tangent portfolio construction was dynamic and logically responded to varying risk premiums, opportunities existed to decrease equity or bond allocations when either were unattractive and to de-lever the overall tangent portfolio when cash appeared attractive. The simulated results for the TATAA strategy from 1973 through 1981 are summarized in *Figure 8*.

Figure 8: Simulated Model Calendar Year Results for MCM's TATAA Portfolio⁸
1973–1981

This is being provided as supplemental information to the Tangent-Added Tactical Asset Allocation Composite

Data Source: Mellon Capital, Thomson Reuters DataStream

Year	Simulated Model Results TATAA ⁹	S&P 500® Index	Difference	Beginning of Year Allocation: Stock/Bond/Cash
1973	-4.52%	-14.75%	10.23%	0/150/-50
1974	3.42	-26.62	30.04	10/20/70
1975	30.04	36.79	-6.75	110/40/-50
1976	25.92	23.95	1.97	60/90/-50
1977	-11.06	-7.21	-3.85	80/70/-50
1978	5.21	6.49	-1.28	150/0/-50
1979	25.92	18.49	7.43	100/-50/50
1980	38.16	32.40	5.76	80/-50/70
1981	9.70	-4.99	14.69	60/-50/90

7. All returns are gross of fee except Tangent-Added Tactical Asset Allocation (which represents the performance of the Tangent Added Tactical Asset Allocation Composite net of fees). Please see attached Disclosure Statement for additional information. The Tangent-Added Tactical Asset Allocation Composite and the Simulated Model Results TATAA reflects the deduction of an annual 0.50% management fee.

8. ANY RESULTS PRESENTED BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, SIMULATED OR HYPOTHETICAL RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, SIMULATED RESULTS MAY HAVE UNDER- OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

9. All returns are gross of fee except simulated Tangent-Added Tactical Asset Allocation performance (which is shown net of fees). The Tangent-Added Tactical Asset Allocation Composite and the Simulated Model Results TATAA reflects the deduction of an annual 0.50% management fee.

Risk premiums were volatile during this period. As a result, the optimal mix varied substantially through time, as did the overall amount of leverage applied by our model. In a period in which static tangent structures failed, a more dynamic approach dramatically altered the outcome in these simulations.

Mellon Capital's Global Tangent Added® Tactical Asset Allocation Strategy

We believe the strategy is even more effective on a global basis. First, a more diverse set of global asset classes is utilized. Second, relative-value opportunities exist in addition to the global stock/bond/cash alpha decision. Mellon Capital has been managing the GTATAA Strategy since 1997.

WHERE CAN INVESTORS UTILIZE TANGENT STRATEGIES?

As investors think more critically about traditional mean-variance approaches and move away from rigid style boxes, opportunities exist to apply tangent theory to several objectives.

Equity Mandates and Other Return-Seeking Objectives

We believe that the U.S. and Global TATAA portfolios are excellent additions to a diversified domestic and/or global equity allocation. Whereas stock and sector selection are the primary alpha sources in active equity strategies, tangent strategies offer a unique source of potential excess return from tactical allocation decisions.

Furthermore, typically these strategies are liquid on a daily basis, are relatively transparent, employ limited leverage (150% exposure, or one-half time levered), and are fee friendly relative to other equity-replacement strategies such as equity long/short hedge funds.

Utilizing Tangent Theory in Strategic Asset Allocation (or Beta) Mandates

Investors can consider strategic tangent strategies at the total-portfolio level. Here again there are several potential uses.

Risk-Premium Capture Mandates

Most commonly, these tangent portfolios are utilized in a risk-premium-capture scheme. They are global balanced-type strategies with a volatility target approximating that of the typical 60/40 portfolio (volatility ranging from 8% to 12%).

MCM's Advanced Beta strategy generally consists of the liquid, global public asset classes inclusive of real assets. While the strategy is primarily strategic in nature, we've noted that static levered exposures can lead to prolonged periods of underperformance. The Advanced Beta strategy acknowledges this risk and allows for defensive reductions (i.e., deleveraging) in certain equity and bond asset-class exposures when our models show that their future return prospects look unattractive.

Real-Asset Mandates

The Advanced Beta strategy can also be utilized as part of a real-asset program. Many investors are faced with a conundrum regarding real assets, especially commodities, which are likely to have an insufficient long-term risk premium. In order to gain diversifying exposure to commodities, investors are often forced to sell equities. Tangent strategies open the opportunity set to both seek long-term returns and hedge inflation risks by simultaneously owning stocks and commodities. If allowed to use leverage, an investor does not have to sell return-seeking assets in order to gain exposure to diversifying assets.

Liability-Driven-Investment (LDI) Mandates

Defined benefit pension plans also face a return-versus-risk conundrum when it comes to liability-matching programs. First, the larger bond allocations of tangent portfolios tend to increase the duration exposure versus traditional 60/40 schemes. Second, the increased exposure to the low-return hedging assets in tangent portfolios does not come at the expense of return-seeking assets. Tangent portfolios are designed to own more bond exposure while maintaining the desired complement of return-seeking assets in order to achieve long-term return expectations in excess of the liability discount rate. We believe tangent strategies debunk the myth that LDI programs are not appropriate for underfunded plans.

Deflation Hedging Mandates

Similar to the LDI benefits derived from the embedded bond exposures, tangent portfolios can also serve as a deflation hedge. The most common problem, in our view, associated with hedging against deflation is the opportunity cost should such an environment not develop. Based on today's starting level of interest rates, the expected long term total returns for sovereign bonds is lackluster relative to the most recent decades. If the future is non-deflationary, a direct allocation to these securities or a tail risk insurance program may detract from long term total returns. Tangent strategies allow for the potential to protect against deflation through the exposure to government bonds without sacrificing allocations to return seeking assets.

CONCLUSION

We analyzed historical data to confirm the soundness of tangent theory on a strategic basis. However, we noted that there are prolonged periods of suboptimal results when risky asset classes underperform cash for extended periods. Therefore, we structure optimal tangent portfolios with the following characteristics:

1. They are dynamic in nature. Asset-class risk and return expectations vary through time, and therefore, the slopes of the efficient frontier and tangent line vary. Optimal portfolio construction should respond appropriately.
2. They allow for deleveraging. If cash is expected to be a superior investment, individual asset classes as well as the entire structure should be reduced.

Investors should consider diversifying allocations to these strategies within their U.S. and global equity allocations. MCM's Tangent Added TAA and Global Tangent Added TAA strategies are dynamic optimal levered portfolio allocations that seek to produce higher and more consistent returns than typical equity strategies. Whereas stock and sector selection are the primary alpha sources in active equity strategies, these tangent strategies offer a truly unique potential source of excess return. Investors can also consider employing tangent principles for strategic risk-premium-capture mandates, real-asset exposures, and liability and deflation hedges.

APPENDIX

Figure 3A: Simulated Supplemental Data for Figure 3 1973–2009

Data Source: Mellon Capital, Thomson Reuters DataStream

	Index or Stock/Bond/Cash Mix	Gross Exposure	Annualized Return (1973–2009)	Annualized Volatility (1973–2009)	Sharpe Ratio
Equity Index	S&P 500® Index	100%	9.62%	15.74%	0.19
Bond Index	Barclay's U.S. Long Treasury	100	8.38	10.43	0.17
Cash Index	Citigroup 30-Day CD	100	6.59	1.01	n/a
Portfolio A	33/66/0	100	9.15	9.47	0.27
Portfolio B	40/80/-20	120	9.56	11.36	0.26
Portfolio C	43/87/-30	130	9.74	12.31	0.26
Portfolio D	47/93/-40	140	9.92	13.26	0.25
Portfolio E	50/100/-50	150	10.09	14.20	0.25
Portfolio F	53/107/-60	160	10.25	15.15	0.24

Figure 4A: Simulated Supplemental Data for Figure 4 1973–1981

Data Source: Mellon Capital, Thomson Reuters DataStream

	Index or Stock/Bond/Cash Mix	Gross Exposure	Annualized Return (1973–1981)	Annualized Volatility (1973–1981)	Sharpe Ratio
Equity Index	S&P 500® Index	100%	5.08%	16.53%	-0.28
Bond Index	Barclay's U.S. Long Treasury	100	1.75	10.98	-0.72
Cash Index	Citigroup 30-Day CD	100	9.64	1.09	n/a
Portfolio A	33/66/0	100	3.18	10.30	-0.63
Portfolio B	40/80/-20	120	1.80	12.36	-0.63
Portfolio C	43/87/-30	130	1.10	13.40	-0.64
Portfolio D	47/93/-40	140	0.40	14.43	-0.64
Portfolio E	50/100/-50	150	-0.32	15.47	-0.64
Portfolio F	53/107/-60	160	-1.03	16.51	-0.65

Figure 5A: Simulated Supplemental Data for Figure 5 1982–2009

Data Source: Mellon Capital, Thomson Reuters DataStream

	Index or Stock/Bond/Cash Mix	Gross Exposure	Annualized Return (1982–2009)	Annualized Volatility (1982–2009)	Sharpe Ratio
Equity Index	S&P 500® Index	100%	11.12%	15.49%	0.35
Bond Index	Barclays's U.S. Long Treasury	100	10.61	10.19	0.49
Cash Index	Citigroup 30-Day CD	100	5.62	0.82	n/a
Portfolio A	33/66/0	100	11.14	9.15	0.60
Portfolio B	40/80/-20	120	12.17	10.96	0.60
Portfolio C	43/87/-30	130	12.67	11.86	0.59
Portfolio D	47/93/-40	140	13.17	12.77	0.59
Portfolio E	50/100/-50	150	13.66	13.67	0.59
Portfolio F	53/107/-60	160	14.14	14.58	0.58

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The Tangent-Added Tactical Asset Allocation Composite net of fee return for the period ending 5/31/2010 - 1 year: 27.35%, 3 years: -7.77%, 5 years: 1.22%. The benchmark total return for the same period - 1 year: 20.99%, 3 years: -8.69%, 5 years: 0.31%. The Tangent-Added Tactical Asset Allocation Composite and the Simulated Model Results TATAA reflects the deduction of an annual 0.50% management fee.

Mellon Capital has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®). Mellon Capital has been independently verified for the periods January 1, 2007 through December 31, 2008. A copy of the verification report is available upon request. A complete list and description of Mellon Capital's composites, as well as additional information regarding policies for calculating and reporting returns, is available upon request.

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Samer Habi, previous Managing Director, was employed by Mellon Capital from 1988 until 2009.

The highest fee charged for this Composite is .50% on assets under management. Actual fee schedules may vary depending on account size.

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