On the Conjoint Nature of Value and Profitability *

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Abstract

Novy-Marx (2013, 2014) argues that profitability and value are philosophically and economically related: buying highly productive firms at average prices is similar to buying average productivity firms at low prices. We investigate the risk and return of portfolios that hold the entire market but tilt towards the joint distribution of stocks that rank highly on both value and profitability. Over 1940-2019, such "tilted market portfolios" generate substantially higher returns than the pure market portfolio. Even in periods where value has delivered weak returns (2000-2019), tilted market portfolios offer attractive risk-reward ratios. For investors with long horizons, bootstrapped simulations of up to 30-year holding periods indicate that the entire distribution shifts further to the right, generating better outcomes for investors. We conclude that benefits to long-only investors come from targeting value and profitability *jointly*, rather than running them side-by-side or sprinkling one with the other.

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1. Introduction

Novy-Marx (2013) argues that profitability is the other side of value in the sense that purchasing highly profitable assets at average prices is akin to purchasing average profitability assets at low prices. This perspective matches the Miller and Modigliani (1961) present value identity because expected profitability, book value, and prices are joint drivers of expected returns. Novy-Marx (2014) pushes the idea further, showing that selecting stocks based on value and profitability together yields higher returns than investing in these strategy side-by-side. The importance of the joint distribution is also evident in Fama and French (2015) who build factors that account for the correlation structure between value and profitability.[1]

In this paper, we take the above as an empirical regularity and turn to a more practical problem: how does an investor use the above economic intuition and results? There are a myriad of ways in which one could solve what is essentially a portfolio engineering problem. The optimal solution would vary with the constraints faced by investors. For example, the portfolio solution for investors not subject to leverage constraints and with the ability to short securities is likely to be very different than for investors who are bound by these considerations. To focus the analysis, we consider the perspective of an unlevered long-only investor who wants to use the above science to improve portfolio outcomes.

We construct portfolios which hold the entire market but tilt systematically in favor of securities that rank highly on both value and profitability metrics. Using the joint distribution is conceptually quite different from investing in a value portfolio with a profitability screen, or vice versa. It is also different from investing in a value portfolio and a high relative profitability portfolio simultaneously.[2] This is because value stocks need not be high profitability stocks and vice-versa, and/or because the weights ascribed to stocks in a value-only or profitability-only portfolio are not the same as weights in a joint value and profitability portfolio. The average monthly returns to tilted market portfolios are higher than a pure market portfolio over the 1940-2019 period with a small reduction in volatility. The performance improvements are as much as

[1] The Miller and Modigliani (1961) model also requires controlling for expected future investment. However, holding investment constant is difficult for two reasons. First, because investment is a lot less persistent than profitability, it is difficult to obtain good measures of expected investment. Second, as a practical matter, portfolios formed at the intersection of value, profitability and investment quickly become ill-diversified.

[2] This is sometimes referred to as fund-of-funds solution, which often layers fees on fees.

10 basis points per month with only modest tilts and a correlation with the market of 0.99. Even in periods where value has underperformed growth (2000-2019), tilted portfolios outperform market portfolios by similar magnitudes. They do so by providing exposure to value and profitability, as evidenced by factor loadings on three- and five-factor models.

We perform bootstrap simulations of market and tilted market portfolios over a variety of longer holding periods (1, 3, 5, 10, 20, and 30 years). This exercise helps clarify the distribution of payoffs to investors over realistic investment horizons. Two facts stand out. First, the percentage of holding periods with negative payoffs is lower for tilted portfolios than for the market. Second, the distribution of payoffs shifts slightly further to the right. The bottom line is that the distribution of outcomes for long-only investors with longer horizons are significantly improved.

To the asset pricing cognoscenti, there may be nothing surprising here – the outcomes we observe are precisely what one would expect given the value and profitability premiums. The interesting part comes from recognizing that the joint distribution matters. From a portfolio perspective, the devil is in the engineering details: recognizing that value and profitability are linked allows one to target the premiums more efficiently while being cognizant of trading costs, portfolio capacity, and other such issues of practical import. The results suggest that long-only investors can benefit from properly designed portfolios, especially if their horizons are long.

The remainder of the paper is as follows. Section 2 outlines the data and portfolio construction process. Section 3 describes the tilted portfolios, as well as their returns and exposures. It also contains results from the bootstrap simulations. Section 4 concludes.

2. Data and Portfolio Construction

There are two approaches to understanding the conjoint nature of value and profitability. One could target the joint exposure at the individual security level with z-scores that embed measures of value and profitability, while recognizing the correlation structure between the two (see, for example, Appendix B in Novy-Marx (2014)). Alternatively, one could use portfolios formed at the intersection of value and profitability as the building blocks. Since it is somewhat harder to see tradeoffs between value and profitability at the individual security level, we use the portfolio approach instead. An added advantage is that the weighting matrix of tilted portfolios constructed from other portfolios is easy to illustrate.

The building block consists of 4x4 grids of value and profitability portfolios.[3] As in Fama and French (2015), we use book-to-market ratios and operating profitability to construct portfolios. We use independent sorts on value and profitability, forming portfolios at the end of each June and rebalancing annually. All portfolio returns are value-weighted. Since measurement of expected returns requires the longest possible time series, we use data from Wahal (2019) to generate a time series of portfolio returns dating back to 1940.

Table 1 shows the grid, with each cell containing the average market capitalization weight over the entire time series. There are two important observations to be made from the grid. First, the diagonal of the matrix (colored in yellow), contains 46.2 percent of the aggregate market capitalization. We regard these portfolios as "neutral" in the sense of Fama and French (2015) factors. Second, growth and low profitability portfolios corresponding to the northwest quadrant (left of the diagonal and colored in blue) represent 35.5 percent of the aggregate market capitalization. Under the joint metric, these are lower expected return portfolios. In contrast, value and higher profitability portfolios in the southeast quadrant (right of the diagonal and colored in green) contain 18.3 percent of the aggregate market capitalization.[4] The highest expected return portfolio (high value and high profitability) contains only 0.8 percent of the aggregate market capitalization. The implication is obvious and not surprising – it is difficult to find securities that allow an investor to purchase highly profitable assets at bargain prices. In colloquial terms, there are not a ton of steals out there.

3. Tilted Portfolios

3.1 Portfolio Construction

We employ a simple approach to constructing market portfolios that tilt towards the joint distribution of value and profitability. Since the majority of risk that long-only investors bear

[3] We use 4x4 portfolio grids rather than finer gradations (e.g. 5x5) to ensure that portfolios remain well-diversified, particularly early in the time series.

[4] In contrast, pure value portfolios (the bottom row of Table 1) only contain about 10 percent of the aggregate market capitalization. From a portfolio engineering perspective, this makes investing in pure value more capacity constrained than value and profitability.

comes from the market, we maintain market capitalization weights in the diagonal portfolios. All tilts are therefore generated by overweighting or underweighting portfolios in the northwest and southeast quadrants that correspond to low and high expected return securities respectively. Holding the diagonal weights constant (at 46.2 percent), it is first useful to see how the remainder is distributed absent tilts. Roughly speaking, about 35 percent of the remaining market capitalization resides in high expected return portfolios, while the remaining 65 percent is in low expected return portfolios.[5]

Given these statistics, we create a sequence of tilted market portfolios in which weights to high expected return portfolios increase by increments of 10 percentage points. We start with a "40-60" tilt in which 40 percent of the weight is allocated to the high expected return portfolios. In the 50-50 portfolio, therefore, the off diagonal market capitalization weights are equally distributed between the two quadrants. Once these tilts are put into place, a remaining issue is how to allocate weights to the building block portfolios within each quadrant. We use rescaled market capitalization weights to perform this allocation. For example, in a 50-50 portfolio where 50 percent of the off-diagonal weight is allocated to high expected return securities (in green), the weights for each individual portfolio are based on its (rescaled) market capitalization weight. Such an approach has important advantages. It ensures that differences in returns are not driven by enormous allocations to portfolios that would be infeasible. As an extreme example, suppose that all 50 percent of the allocation to high expected return portfolios was invested in the highest value and profitability portfolio. Recall that this portfolio only represents 0.8 percent of the aggregate market capitalization. Such an allocation would be quite expensive to trade because most of these firms are small or microcap. Moreover, the allocation would have very limited portfolio capacity because individual security weights would be prohibitively large. Using rescaled market capitalization weights, on the other hand, causes individual security weights to not be too large and portfolio capacity to remain quite high.

[5] In Table 1, the sum of the market capitalization weights of low expected return portfolios (in blue) is 35.5 percent. Dividing that by sum of market capitalization weights of the off diagonal (53.8 percent) is 65 percent, implying that the high expected return portfolios (in green) have a weight of 35 percent. It is also important to note that these are time-series averages of weights. These percentages are different in any given year or month.

3.2 Portfolio Returns

Table 2 contains average monthly returns and standard deviations of the tilted portfolios. As a benchmark, we also report these statistics for the market portfolio.[6] For each tilted portfolio, we include t-statistics for the return difference between the tilted portfolio and the market, as well as the correlation with the market return.

Panel A reports the above statistics for the longest possible sample period, 1940-2019. The average monthly market return over this period is 0.99 percent, with a standard deviation of 4.19. Tilted portfolios generate slightly higher returns relative to the market, increasing monotonically as the tilt increases. For instance, in the 60-40 tilted portfolio, average returns are higher by 10 basis points with a similar standard deviation. The t-statistic for the difference in returns is 5.31. Also notable, and perhaps unsurprising, is the fact that correlations with the market portfolio do not change by large magnitudes: the 60-40 tilted portfolio still has a correlation of 0.99 with the market.

Panel B reports equivalent statistics for 2000-2019, a period in which value stocks have underperformed growth stocks. Allocating jointly to value and profitability continues to generate higher returns than the market portfolio. Focusing again on the 60-40 tilted portfolio, it earns 0.70 percent per month compared to 0.61 percent for the market portfolio, with a t-statistic of 2.52. The hedging value of profitability relative to value is also apparent. In periods where value underperform, the hedging effect of profitability against value lowers the standard deviation of the tilted portfolio: the standard deviation of the 60-40 tilted portfolio is 4.20 compared to 4.32 to for the market portfolio.

3.2 Portfolio Exposures

To provide information on exposures and the source of excess returns, we estimate three- and five-factor regressions for the tilted portfolios over the entire sample period. Panel A of Table 3 reports coefficients from three-factor regressions with t-statistics in parentheses. Three results

[6] The market portfolio return will not be precisely equal to the weighted average returns of the portfolios in the 4x4 grids because constructing value and profitability portfolios imposes specific requirements on accounting data required to construct underlying portfolios (see Fama and French (2015) for details). We also compute a pseudo-market portfolio using weighted average returns of the constituent 4x4 portfolios. The gist of the results in the paper are unchanged.

stand out. First, market betas are 1.00 and virtually identical across the portfolios. Second, as expected, factor loadings on HML are reliably positive. Tilted portfolios provide exposure to value, increasing monotonically with the degree of the tilt. Second, intercepts relative to the three-factor model are positive and statistically significant. The magnitude ranges from 4 basis points per month in the 40-60 portfolio to 6 basis points per month in the 90-10 portfolio. Tilting towards the joint distribution of value and profitability has clear advantages relative to "pure" value portfolios.

Panel B shows contains results from five-factor regressions. In addition to positive factor loadings on HML, the loadings on RMW are also positive and increase with the tilt of the portfolio. Unsurprisingly, introducing RMW on the right hand side of the regression reduces the intercepts, rendering them statistically indistinguishable from zero. In other words, the tilts provide for more finely tuned exposure to priced risk and the returns in Table 1 are compensation for that risk.

The story in Tables 1 and 2 is precisely as one would expect. Joint exposure to value and profitability provides a meaningful improvement to the market portfolio for long-only investors. Targeting value and profitability jointly in a market portfolio provides exposure to both, but more importantly, provides a premium relative to targeting only value. The key here is that the two metrics are integrated, not treated separately and not with one treated as "primary" and the other "secondary".

3.3 Long-Horizon Returns

For long-only investors, issues related to investment horizon are important. In particular, investors are less concerned with monthly returns than with payoffs over their holding period, which may be years or even decades. Unfortunately, it is common among practitioner "pitch books" that tout investment products to present long-horizon return statistics to a strategy with overlapping periods. For example, one might show returns to a strategy over a 10 year period, moving forward one month at a time. The sales pitch then involves showing that over decades, the strategy underperforms only X percent of the time. Such an approach builds in dependence between successive holding periods and misleads investors. Absent this mechanical dependence, the true distribution of outcomes could be much more variable, generating ex post disappointment in investment results.

To generate a better representation of long-horizon returns to tilted portfolios, we perform a simple bootstraps exercise. Bootstrapping (including the block bootstrap) has a long history in academic finance and is used to extract information about true underlying distributions. A recent incarnation is that of Fama and French (2018) who use bootstraps to examine the distribution of long horizon market returns. We adapt their approach as follows.

Since long-only investors are concerned with payoffs, we compute payoffs as

$$1 + R_T = \prod_{t=1}^{T}(1 + r_t)$$

where r_t is the simple return for month t, and the gross return is compounded for T months to generate the payoff $1+R_T$. We use six horizons (T), corresponding to 1 year, 3 year, 5, year, 10 year, 20 year and 30 year payoffs. The simulation samples with replacement from the 954 monthly returns between July 1940 and December 2019, assuming independent and identically distributed returns.[7] We use 100,000 such samples ("replicates"), drawing the requisite number of returns for each horizon. For example, to compute annual payoffs to the market portfolio, we construct 100,000 samples of 12 randomly drawn monthly returns for the market portfolio. For 30 year payoffs, we randomly draw 360 monthly returns to compute payoffs. The process for tilted portfolios is identical except that the draws are from the sample of monthly returns to the tilted portfolios.

The results of this exercise appear in Table 4. Each panel corresponds to a particular horizon with the top row showing payoffs for the market portfolio, followed by the tilted market portfolios. The table shows average payoffs, the standard deviation, skewness, the percentage of the payoffs that are negative (% Neg.), and various percentiles of the distribution.

The basic statistics for the market portfolio across holding periods mirror those of Fama and French (2018, Table 3) with some minor variation because their sample period is only 1963-

[7] One might complain about heteroscedasticity and shifts in volatility over this period. An appropriately modified block bootstrap could accommodate this concern. We elect to use the simple bootstrap because much of the volatility change in market returns occurs between 1926 and the 2nd World War, before the start of the sample period, and because the block bootstrap requires one to explicitly model changes in the variance structure.

2016. The more interesting results reside in differences between the pure market portfolio and the tilted portfolios at longer investment horizons. The reader can obviously inspect detailed results from the table so for illustrative purposes, we focus on comparing the 60-40 tilted portfolio to the market for 3-year and 30-year holding periods.

For a 3-year holding period, the average payoff from the 60-40 tilted portfolio is 1.48 compared to 1.43 for the market portfolio. The standard deviation is only a touch higher (0.37 versus 0.36). More interestingly, the percentage of negative payoffs declines from 10.02 percent for the market to 7.79 percent for the 60-40 portfolio. This shift in the distribution to the right is also apparent from the percentiles. For example, the 5th and 95th percentiles for the market portfolio are 0.90 and 2.07, whereas for the 60-40 portfolio they are 0.94 and 2.17 respectively.

At the 30-year horizon, the distribution of the payoffs is even more interesting. The average payoff of the 60-40 portfolio is 49.48 compared to 34.82 for the market. But given the variability in the factor premiums, the standard deviation of the tilted portfolios payoffs are quite a bit higher (45.40 compared to 32.15 for the market). The rightward shift of the distributions is also apparent. The 5th percentile for the 60-40 portfolio is a payoff of 9.73, compared to 6.77 for the market, and the equivalent 95th percentiles are 132.40 and 93.26. The upshot is that the joint distribution of value and profitability has clear benefits over longer horizons.

4. Conclusions

Value and profitability are related. Pure value portfolios do not deliver the profitability premium and vice versa. Combining independently constructed value and profitability portfolios is not the same thing as forming portfolios based on the joint distribution of value and profitability. Targeting the joint distribution has clear benefits for long-only investors, especially those with long investment horizons.

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Table 1

Average market capitalization weights of value and profitability portfolios, 1940-2019

Value portfolios are formed based on book-to-market ratios in June of each year following the procedures in Fama and French (2015). Profitability portfolios are similarly formed based on operating profitability. Both portfolio series are supplemented with data from Wahal (2019). The table shows the average market capitalization weights in the 4x4 grid of value and profitability. The diagonal elements (in yellow) represent "neutral" portfolios. Portfolios in the northwest quadrant (in blue) are referred to the text as low expected return portfolios. Portfolios in the southeast quadrant (in green) are referred to as high expected return portfolios.

		Profitability			
		Low Prof.	2	3	High Prof.
Value	Growth	2.3	5.3	13.7	26.0
	2	2.7	7.7	9.4	5.6
	3	3.8	6.4	4.7	1.9
	Value	4.4	3.7	1.6	0.8

Table 2

Monthly returns for tilted market-wide portfolios

The table shows average monthly returns and standard deviations of tilted market-wide portfolios. Tilted portfolios are created using the value-profitability grid in Table 1. Each tilted portfolio holds the diagonal portfolios (in yellow) in Table 1 at market capitalization weights. Portfolio tilts are applied to remainder of the portfolio: the northwest quadrant (in blue) and southwest quadrant (in green). For example, in the 40-60 portfolio, 40 percent of the remainder of the market capitalization is allocated to the high expected return portfolios in blue, and 60 percent is allocated to the low expected return portfolios in green. A similar procedure applies for other tilts. The market portfolio is the CRSP value-weighted market index. T-statistics are for the difference in returns between the average tilted portfolio and the market.

		Tilted Market-Wide Portfolios					
	Market	40-60	50-50	60-40	70-30	80-20	90-10
Panel A: 1940-2019							
Avg. Return	0.99	1.05	1.07	1.09	1.11	1.13	1.15
Std. Dev	4.19	4.17	4.17	4.17	4.18	4.20	4.22
T-stat. (Tilt-Mkt)	-	4.84	5.25	5.31	5.26	5.19	5.11
Corr. (Tilt, Mkt)	-	1.00	0.99	0.99	0.99	0.98	0.97
Panel B: 2000-2019							
Avg. Return	0.61	0.72	0.73	0.70	0.75	0.77	0.78
Std. Dev	4.32	4.22	4.22	4.20	4.23	4.25	4.28
T-stat. (Tilt-Mkt)	-	3.19	2.81	2.52	2.30	2.13	2.01
Corr. (Tilt, Mkt)	-	1.00	0.99	0.99	0.99	0.98	0.97

Table 3

Three- and Five-Factor regression for tilted market-wide portfolios

Tilted market-wide portfolios are constructed as in Table 2. The table shows factor coefficients and t-statistics (in parentheses) from three- and five-factor regressions over the 1940-2019 sample period. The factors are from Ken French's website, with the exception of RMW and CMA for the 1940-1963 period which are based on Wahal (2019).

	Tilted Market-wide Portfolios					
	40-60	50-50	60-40	70-30	80-20	90-10
Panel A: Three-Factor Regressions						
Intercept	0.04	0.05	0.05	0.05	0.06	0.06
	(3.92)	(3.76)	(3.50)	(3.24)	(3.01)	(2.81)
Rm-Rf	1.00	1.00	1.00	1.01	1.01	1.01
	(382.84)	(7.61)	(290.51)	(250.30)	(217.48)	(191.08)
SMB	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03
	(9.17)	(21.36)	(-6.16)	(4.96)	(4.00)	(3.25)
HML	0.05	0.10	0.14	0.18	0.22	0.26
	(13.80)	(21.36)	(26.34)	(29.50)	(31.53)	(32.88)
Panel B: Five-Factor Regressions						
Intercept	0.01	0.01	0.01	0.00	0.00	0.00
	(1.14)	(0.77)	().43)	(0.16)	(0.05)	(0.20)
Rm-Rf	1.01	1.01	1.01	1.01	1.01	1.01
	(401.35)	(368.27)	(324.15)	(281.35)	(244.62)	(214.44)
SMB	-0.01	0.00	0.01	0.01	0.02	0.03
	(2.75)	(0.49)	(1.36)	(2.73)	(3.71)	(4.43)
HML	0.06	0.10	0.15	0.19	0.24	0.28
	(12.93)	(20.60)	(25.80)	(29.03)	(31.00)	(32.21)
RMW	0.09	0.11	0.13	0.15	0.17	0.19
	(17.18)	(19.63)	(20.67)	(20.88)	(20.70)	(20.37)
CMA	0.01	0.01	0.00	0.00	-0.01	-0.01
	(1.40)	(0.77)	(0.22)	(0.20)	(0.51)	(0.75)

Table 4

Distribution of long-horizon payoffs.
The table shows the distribution of long-horizon payoffs generated from a bootstrap procedure in which 100,000 samples are generated with replacement from the time series of monthly portfolio returns from the 1940-2019 period. %Neg. shows the percentage of simulation outcomes with negative payoffs for each horizon.

					Percentiles						
	Mean	Std. Dev	Skew	% Neg.	P1	P5	P10	P50	P90	P95	P99
					Panel A: 1-Year						
MKT	1.13	0.16	0.24	21.95	0.77	0.87	0.92	1.12	1.34	1.40	1.53
40-60	1.13	0.16	0.25	20.33	0.78	0.88	0.93	1.13	1.34	1.41	1.54
50-50	1.14	0.16	0.25	19.90	0.79	0.88	0.93	1.13	1.35	1.42	1.55
60-40	1.14	0.16	0.26	19.49	0.79	0.88	0.94	1.13	1.35	1.42	1.55
70-30	1.14	0.16	0.26	19.09	0.79	0.89	0.94	1.14	1.36	1.43	1.56
80-20	1.15	0.16	0.26	18.76	0.79	0.89	0.94	1.14	1.36	1.43	1.56
90-10	1.15	0.17	0.27	18.43	0.79	0.89	0.94	1.14	1.36	1.43	1.57
					Panel B: 3-Year						
MKT	1.43	0.36	0.65	10.02	0.75	0.90	1.00	1.39	1.90	2.07	2.44
40-60	1.46	0.37	0.65	8.55	0.77	0.93	1.02	1.42	1.94	2.11	2.48
50-50	1.47	0.37	0.65	8.16	0.77	0.94	1.03	1.43	1.95	2.13	2.51
60-40	1.48	0.37	0.65	7.79	0.78	0.94	1.04	1.44	1.97	2.14	2.52
70-30	1.49	0.37	0.66	7.42	0.78	0.95	1.04	1.45	1.98	2.16	2.55
80-20	1.50	0.38	0.66	7.15	0.79	0.95	1.05	1.46	2.00	2.18	2.57
90-10	1.51	0.38	0.67	6.88	0.79	0.96	1.06	1.47	2.02	2.20	2.59
					Panel C: 5-Year						
MKT	1.81	0.59	0.92	5.14	0.79	1.00	1.13	1.72	2.59	2.91	3.57
40-60	1.87	0.61	0.92	4.06	0.82	1.04	1.17	1.79	2.67	3.00	3.69
50-50	1.89	0.62	0.92	3.75	0.83	1.05	1.19	1.81	2.71	3.04	3.73
60-40	1.92	0.63	0.91	3.51	0.84	1.06	1.20	1.83	2.74	3.08	3.79
70-30	1.94	0.63	0.92	3.26	0.85	1.07	1.22	1.85	2.78	3.12	3.84
80-20	1.96	0.64	0.92	3.03	0.85	1.08	1.23	1.87	2.81	3.16	3.89
90-10	1.99	0.66	0.92	2.86	0.86	1.09	1.24	1.89	2.85	3.20	3.95
					Panel D: 10-Year						
MKT	3.26	1.55	1.40	1.12	0.98	1.37	1.63	2.95	5.27	6.19	8.33
40-60	3.49	1.65	1.40	0.71	1.06	1.47	1.75	3.16	5.65	6.61	8.92
50-50	3.58	1.69	1.40	0.60	1.09	1.51	1.80	3.24	5.79	6.77	9.15
60-40	3.66	1.73	1.40	0.53	1.11	1.54	1.84	3.32	5.92	6.93	9.38
70-30	3.75	1.78	1.41	0.47	1.14	1.58	1.88	3.40	6.07	7.10	9.62
80-20	3.84	1.83	1.41	0.41	1.16	1.61	1.92	3.48	6.22	7.29	9.88
90-10	3.94	1.88	1.42	0.38	1.18	1.65	1.96	3.56	6.38	7.49	10.17
					Panel E: 20-Year						
MKT	10.65	7.53	2.35	0.06	1.85	2.95	3.75	8.70	19.75	24.80	37.77
40-60	12.24	8.62	2.37	0.03	2.16	3.42	4.35	10.02	22.63	28.49	43.41
50-50	12.84	9.04	2.37	0.02	2.26	3.58	4.55	10.51	23.74	29.89	45.31
60-40	13.47	9.49	2.38	0.02	2.37	3.74	4.76	11.02	24.90	31.33	47.58
70-30	14.14	9.99	2.38	0.01	2.47	3.92	4.99	11.56	26.18	32.96	49.98
80-20	14.82	10.52	2.40	0.01	2.57	4.09	5.21	12.10	27.51	34.62	52.48
90-10	15.56	11.10	2.41	0.01	2.67	4.26	5.44	12.68	28.92	36.36	55.22
					Panel F: 30-Year						
MKT	34.82	32.15	3.36	0.00	3.88	6.77	9.10	25.52	70.17	93.26	158.32
40-60	42.90	39.34	3.36	0.00	4.87	8.46	11.30	31.55	86.29	114.58	193.26
50-50	46.08	42.23	3.35	0.00	5.24	9.07	12.16	33.93	92.65	123.20	207.60
60-40	49.48	45.40	3.36	0.00	5.61	9.73	13.05	36.45	99.57	132.40	222.93
70-30	53.22	48.95	3.37	0.00	5.98	10.42	13.98	39.16	107.08	142.55	241.64
80-20	57.14	52.78	3.39	0.00	6.35	11.12	14.95	41.97	114.88	153.19	259.96
90-10	61.43	57.07	3.41	0.00	6.76	11.87	15.97	44.98	123.68	165.39	280.26