



## **Introducing RCOR**

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## **Abstract**

Duration management has been the hardest job of a fixed income manager. Models that attempt to predict trends or reversion have shown to have very limited “alpha” and tend to fail spectacularly. New Century Advisors introduces a new class of duration management model, the Relative Cost of Risk (RCOR) model. The model attempts to have a manager add duration when the risks that it entails being compensated for. The RCOR model is deliberately designed to work in a relative value or absolute value framework.

## The Cost of Risk

We define the cost of risk as the 5<sup>th</sup> percentile VaR<sup>1</sup> of the three year treasury using an assumed normal yield movement distribution. To measure the COR we take the daily yield volatility over the previous 100 days and convert it into an annual number.

$$s = \sqrt{\frac{\sum (y - \bar{y})^2}{(n-1)}} * \sqrt{252}$$

**Equation 1**

The cost of risk on any given day becomes

$$COR_t = (-2s_t \cdot MDur_t) + y_t$$

**Equation 2**

This is the loss that an investor would face over one month at the 95<sup>th</sup> percentile. New Century Advisors recognizes that this should not be used as a pure annual VaR as it assumes no reduction in volatility when moving from one day to one year. Also it assumes a true normal distribution in yield movements which is not likely to occur. However, these caveats are constant throughout the analysis and since we are going use this measure as a relative comparison these objections become unimportant.

The COR is a measure of how much downside a bond investor would have to tolerate in order to earn their yield. Notice when yields are higher, the COR is naturally lower as the carry component is higher.

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<sup>1</sup> We use the term COR as opposed to VaR as to differentiate this duration model from NCA's true VaR model which is a non parametric model with no distribution assumptions. Conceptually they are the same even if computationally and the results are different. We use this simpler model for the COR calculation because it is computationally less intensive and easier to use and understand.

Three Year Yield and COR

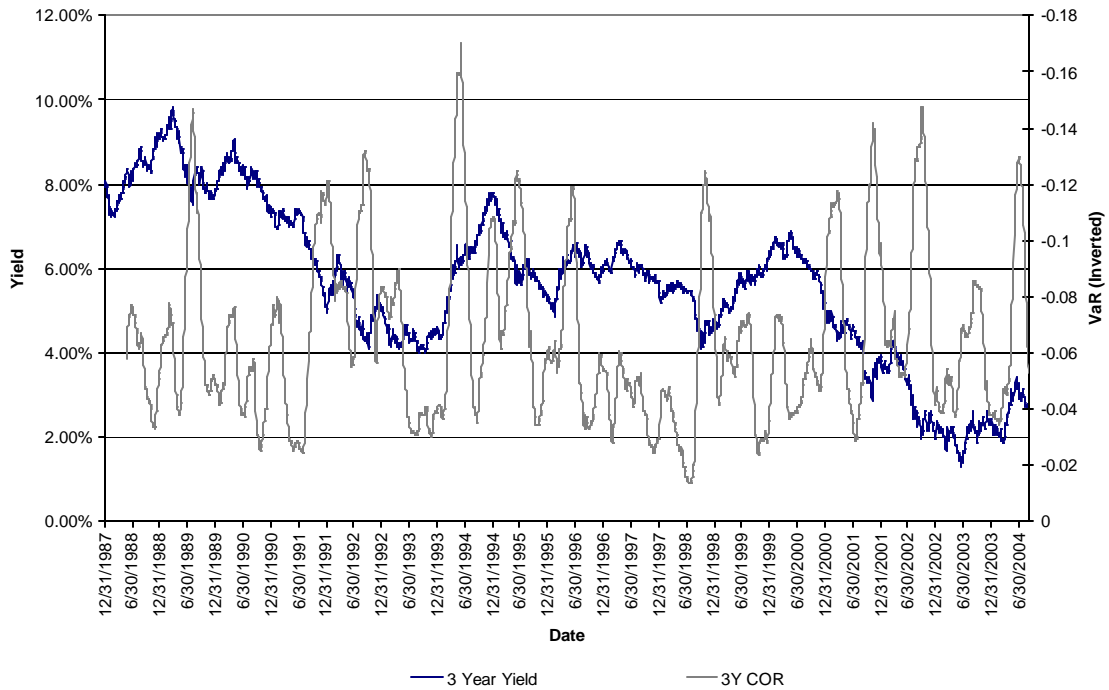


Figure 1: Source JP Morgan and NCA Estimates

***The Relative Cost of Risk***

In absolute terms, investors would find bonds most attractive when their yield per COR ratio was highest. That is when they were earning the most yield per unit of risk. This intuitive observation is not that useful to bond managers. The COR will be lowest when yields are high and volatility low, not a frequent occurrence. To take this into account NCA has developed the Relative Cost of Risk (RCOR).

The RCOR simply measures how large COR has been compared to its recent past. In practice NCA compares COR to its 100 day moving average. From this a simple trading program can be developed that basically states when your COR is lower then it has been buy bonds, when it is higher sell bonds.

For relative return accounts the simulation was that whenever COR was above its average own 1 Year Treasuries, when it was below own 5 Year Treasuries. This was compared to the 3 Year as a benchmark. For absolute return accounts the process was to go long the 3 Year when COR was below its average and short it when COR was above its average.

This allowed the absolute model to be a true overlay without an expected average duration<sup>2</sup>.

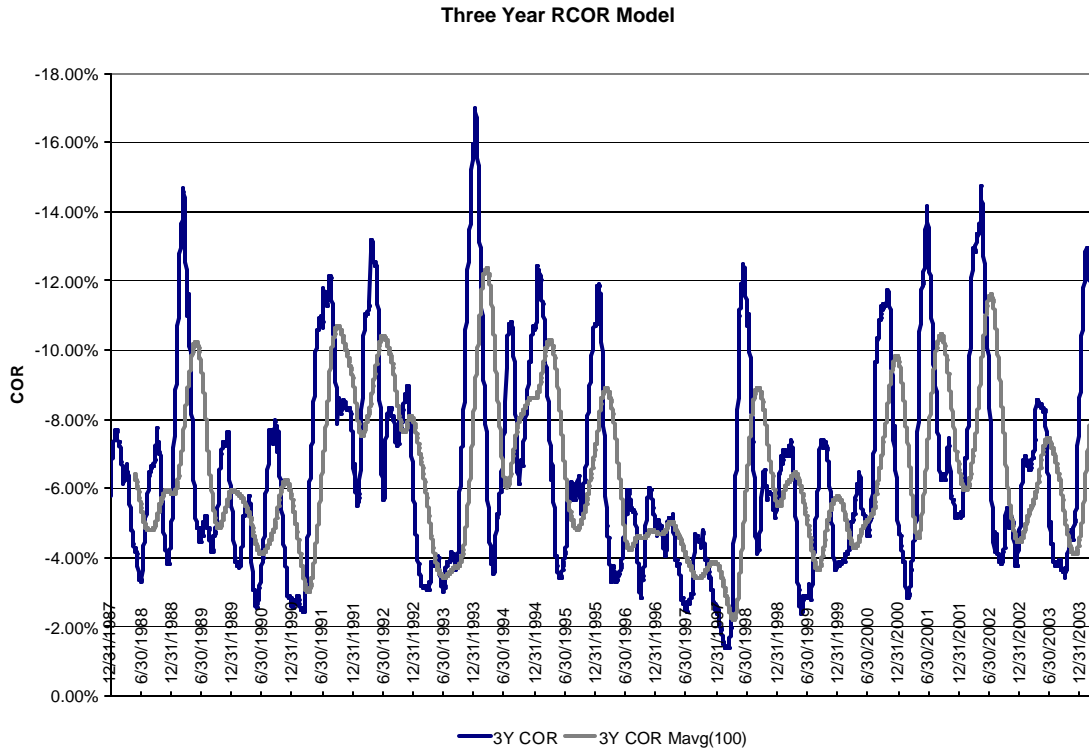


Figure 2: NCA Estimates

## Results

We ran the model since December 31<sup>st</sup> 1987<sup>3</sup> with very positive results. After taking trading costs into account the RCOR model was able to outperform its three year benchmark by 44bps per year while adding only 26bps of volatility per year; a very impressive information ratio. Furthermore the RCOR model had a lower maximum drawdown than the 3 Year benchmark 3.01% to 3.98%

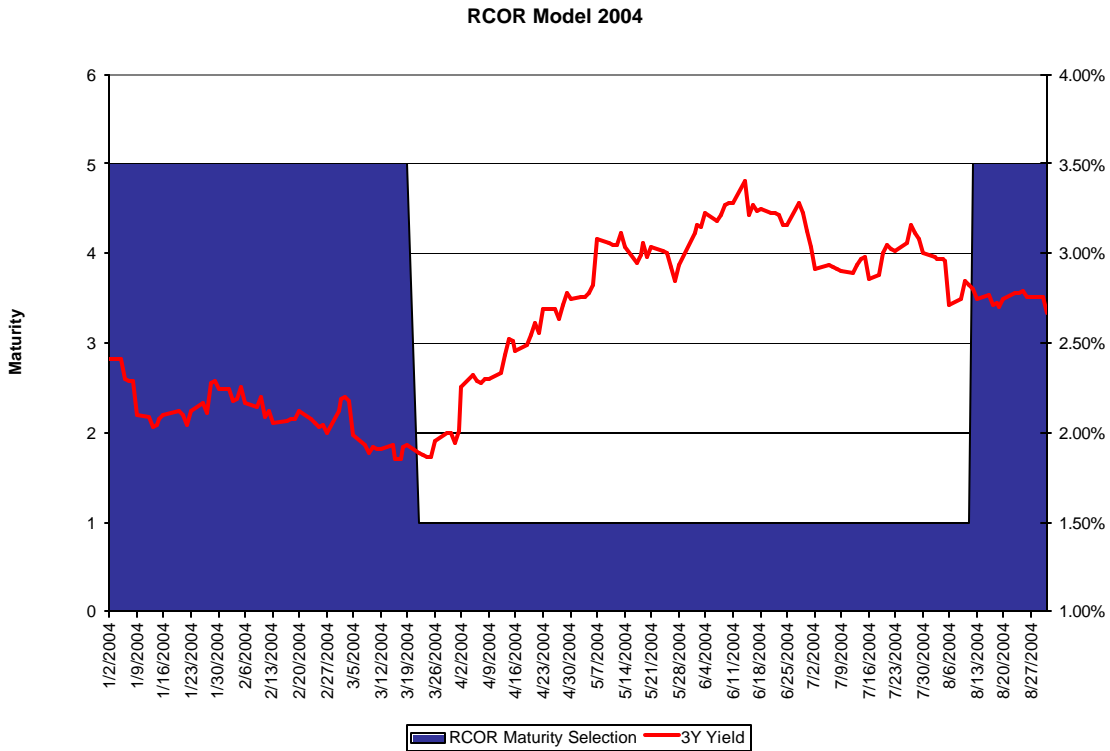
<sup>2</sup> The three year was used for two main reasons. First it is an area of the yield curve that is in short, intermediate, and total return benchmarks thus likely to be priced correctly. Second NCA has found the shorter end to be a better predictor of future yield moves, ie the autocorrelation is higher.

<sup>3</sup> Note it takes 200 trading days before the model can produce its first signal. The first trade was October 13<sup>th</sup> 1988.

	RCOR	
	Model	3 Year
Total Return	215.6%	194.9%
Daily Vol	0.18%	0.17%
Annualized Return	7.13%	6.70%
Annualized Vol	2.91%	2.65%
Max Drawdown	-3.01%	-3.98%

**Table 1: RCOR Model Results**

Looking at the model in more detail this year we see that it has yielded excellent signals. The model was long going into 2004<sup>4</sup> which started at a yield on the three year of 2.30%, it remained this way until March 22<sup>nd</sup> 2004 when 3 year yields were at a 1.88% or 42bps of yield rally. The model then went short and remained that way until August 12<sup>th</sup> when the yield was 2.80% a 92bps sell off in three year yields. It has remained long since then and the month of August ended with a 2.66% yield on the 3 year.



Now it did not get the top of the market exactly correct (although it did a pretty good job at the bottom) but still the signals it gave would have been very important and profitable to a fixed income manager.

Using the RCOR model in an absolute sense where it could be used as a pure overlay added 117bps of return per year since 1987. This could be put on top of any fixed

<sup>4</sup> It went long on November 2<sup>nd</sup> 2003 when the 3 year was at 2.33%

income strategy or even a non-fixed income one. This came at the cost of adding 2.68% of volatility.

	<b>Absolute</b>
Total Return	21.4%
Daily Vol	0.17%
Annualized Return	1.17%
Annualized Vol	2.68%
Max Drawdown	-6.95%

**Table 2: Absolute RCOR Model Results**

New Century Advisors feels that this volatility is likely to be uncorrelated with any other strategy (as the average duration over the entire time period was zero). This makes it very attractive to add on to other strategies as 1.17% of return is a nice addition from trading three years.