# Applying Constant Risk Aversion to Cash Investment Management

**Abstract**

In this paper, we discuss the concept and benefits of constant risk aversion in cash portfolio construction. The process may help treasurers understand, gauge and rationalize investment decisions to achieve consistent risk characteristics and to avoid the whiplash that can result from drastic pendulum swings between high-risk and no-risk.

## The Need for a Constant Risk Concept

When it comes to cash investment policies, most organizations uphold principal preservation, liquidity management and reasonable returns as their key objectives. In practice, however, portfolio holdings may be drastically different from one organization to another due to differing interpretations and expectations of risk and return objectives. As external risk conditions change, portfolios often must change to cope with the new environment.

The phenomenon of varying portfolio construction relative to risk is not new, but how one approaches the subject of risk to maintain an appropriate cash portfolio is a form of art. To make efficient use of resources and to arrive at an optimal outcome, we think each organization needs a "risk quotient" consistent with its internal risk tolerance consensus, business and financial conditions, and return expectations. As levels of risk change, a certain "quantity" of exposure to that risk may be adjusted accordingly to reach the optimal risk target. We borrow an economic term, Constant Risk Aversion (CRA), to represent this optimal risk conceptualization in a cash portfolio.

We think that a "constant risk" concept is warranted so that one does not slip into the binomial "risk-on, risk-off" behavior often observed in all forms of investing. This concept may be especially important today for treasury organizations that, in a moment of extreme caution, pulled out of the credit markets at the height of the financial crisis in 2008. Many such organizations remain in government-only securities today with essentially zero returns and are still unsure whether it is time to again assume any element of risk.

Published: April 1, 2013

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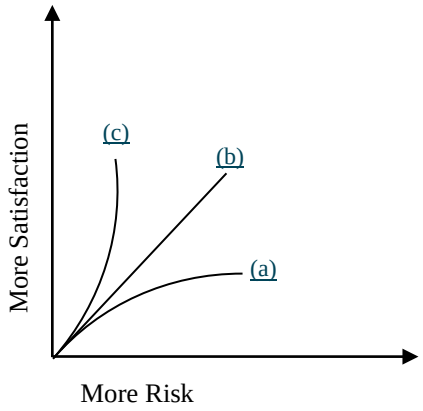
## Risk Averse and Constant Risk Aversion

***Risk Averse Assumption:*** In studies of economic responses to risk, the expected utility hypothesis often is used. How people maximize their expected utility from the choices

given when faced with uncertainty may be summarized in three economic behaviors: Risk Averse, Risk Neutral and Risk Seeking.

*Figure 1: Risk Behaviors*




In *Figure 1*, the convex curve (a) indicates reduced satisfaction for the risk-averse person for each additional unit of risk; while the concave curve (c) depicts the risk seeking person who is willing to take on more risk for the same unit of satisfaction. The risk neutral person (b) is indifferent to risk as long as it is matched by a compensating unit of satisfaction. We believe that, based on the objectives of cash portfolios, the typical treasurer is averse to risk.

**Curvature of Risk Aversion:** While most treasury professionals may be characterized as risk averse, determining their levels of risk aversion is best made on an individual basis. This can be thought of as the curvature of the risk aversion curve in our illustration. While difficult to quantify, one could approximate a treasurer's degree of risk aversion with the maximum marked-to-market portfolio value swings with which the treasurer is comfortable.

**Constant Risk Aversion:** The concept of constant risk aversion may help simplify theoretical decision making. It attempts to ask two basic questions: how does one know if too much or too little risk is assumed and how does one choose between a wide range of risk averse patterns without changing one's risk tolerance?

One way to think of CRA is to use a portfolio of one risky asset and one risk-free asset. As the generic "risk" in the risky asset increases, one may reduce dollars invested in the risky asset and add the corresponding amount to the risk-free asset to maintain a "constant" risk profile. Similarly, when the portfolio's wealth increases or decreases, proportional allocation may be made to risky and risk-free assets so that the overall risk profile remains constant.

**Benefits of the CRA Approach**

The immediate benefit of the CRA approach is that, once the curvature and the constant of risk aversion are determined, one may optimize portfolio decisions to accommodate changing risk conditions.

Another benefit is that the CRA approach overcomes the inherent shortcomings of total return indices as benchmarks for cash investment policies. Implicit in the various indices are return expectations linked to somewhat static duration and credit requirements. They often are incompatible with cash portfolio objectives which, at times, cannot be measured in maturity and yield targets or credit ratings.

**Incorporating CRA in Investment Policy Construction**

Most cash investment policies are biased toward risk aversion in their mandate. This often means that they demand that risks be minimized, even at the cost of losing the utility of the risky activity. These policies often fail to consider the opportunity cost when mitigating a risk – the cost of not taking the risky action. Writing policies focused on the risk without the balance of the utility may not serve the organization's overall goals well. What may be viewed as prudent in one context may be considered imprudent in another.

By incorporating the CRA approach in investment policy construction, treasury professionals may continue to set broader investment criteria in the policies to represent their maximum risk tolerance (risk curvature), while allowing the flexibility to change risk profiles in response to market dynamics.

**Using Credit Default Swap Spreads as CRA Indicators – An Example**

As a simple illustration, let's consider a hypothetical portfolio consisting of five potential bond investments: Deutsche Bank (DB), General Electric (GE), JPMorgan Chase (JPM), Toyota (TOYOTA) and U.S. Treasury (USA). For simplicity's sake, we define our CRA conditions as follows:

- The portfolio seeks to maintain a constant credit default swap (CDS) spread of 100 on a weighted average basis
- Any investments with CDS levels exceeding 150 are excluded from consideration

Credit default swaps essentially are insurance policies that allow policyholders (or swap holders) to swap defaulted bonds for their face value ($100) at the time of default. The swap spreads are equivalent to annual premiums on the policies. For example, a spread of 100 equals a 1.00% annual fee for the duration of the contract. In recent times,

single-name CDS spreads have become popular market indicators of risk for the respective credits. Changes in CDS spreads, which are trading indicators, tend to respond to credit events much more quickly than credit rating changes, which require a more analytical process and offer less differentiation given the limited number of ratings categories.

*Figure 2: CRA Portfolio with Target CDS =100*

| 12/31/2011 | | | | 12/31/2012 | | | |
|---|---|---|---|---|---|---|---|
| Name | CDS | % of Portfolio | Contribution to Avg. CDS | Name | CDS | % of Portfolio | Contribution to Avg. CDS |
| DB | 188 | 0% | - | DB | 93 | 30% | 27.9 |
| GE | 252 | 0% | - | GE | 117 | 37% | 43.0 |
| JPM | 144 | 33% | 47.4 | JPM | 90 | 30% | 27.0 |
| Toyota | 101 | 40% | 40.4 | Toyota | 64 | 3% | 2.1 |
| USA | 45 | 27% | 12.2 | USA | 34 | 0% | - |
| | | 100% | 100.0 | | | 100% | 100.0 |

*Source: CDS spread levels taken from Barclays Capital analytical tools.*

*Figure 2* shows the CDS spread levels for the five investments at the end of 2011 and 2012. To satisfy the two aforementioned portfolio conditions, DB and GE were ineligible at 12/31/2011. The portfolio was allocated among the three remaining investments: JPM (33%), Toyota (40%) and USA (27%). This portfolio allocation results in the target portfolio CDS level of 100.

Credit conditions improved over the course of 2012. At 12/31/12, CDS spreads for all five investments were below 150. Four investments received some allocations: DB (30%), GE (37%), JPM (30%) and Toyota (3%). USA received no allocation due to improved market conditions. Again, this portfolio allocation resulted in the target portfolio CDS level of 100. Note that, in each case, there may be multiple allocation choices based on one's comfort levels in the remaining investments.

**Discussions on the CDS-based CRA Portfolio Construction**

This simplified example is meant to illustrate the concept of constant risk aversion, not as an instruction for portfolio construction. Some clarifications may be needed here:

1. The example does not consider yield, although bond yields do tend to have positive correlation with CDS spreads. As a rule of thumb for liquidity investments, yield needs to be the natural outcome of a well-constructed portfolio, not a benchmark objective. Note that CDS spreads are not directly investible. They are used here simply as risk indicators.

2. The example does not consider maturity. In real portfolio construction, one needs to look at portfolio concentration in the context of both risk and maturity. With simple math, one can arrive at a duration-weighted issuer concentration decision.
3. The example assumes a higher portfolio turnover rate than is typical in cash portfolios. In reality, investments are rarely sold prior to maturity. One can still employ CDS indicators, however, to make smoother portfolio transitions by progressively increasing or decreasing concentrations as CDS levels change.
4. There should be other indicators besides CDS spreads for an actual CRA portfolio, both quantitative and qualitative, to cater to each treasury organization's risk curvature. Also, not all securities have consistent and reliable CDS markets; and there may be risks not captured in market-based indicators.

**In Conclusion: A CRA Portfolio May Help Reduce Nail Biting and Complacency**

While staying largely conceptual, we hope to have established the benefits of applying the constant risk aversion concept to cash portfolio construction. The process may help to achieve more balanced portfolio risk characteristics through economic cycles and to avoid the whiplash that can result from drastic pendulum swings between high-risk and no-risk. The process for applying the CRA portfolio concept may be summarized as follows:

- Each organization needs to understand the curvature of its risk aversion curve by setting a maximum value swing tolerance
- The next step is to conceptualize a constant level of risk with some measureable indicators
- Lastly, as external risk conditions change, one can modify portfolio concentration so that the portfolio's overall risk profile remains constant

As our CDS-based portfolio construction illustrates, CRA may help reduce or remove certain risks not apparent to us as they develop and it also may lead us into higher yield opportunities as risk subsides. While the concept remains in an abstract form in this paper, we welcome the opportunity to work with cash investment clients to put the concept into practice.

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