



AMERICAN ACADEMY *of* ACTUARIES

**Synthetic GIC Reserve Proposal**

**Deposit Fund Subgroup of the ARWG**

**Presented to the National Association of Insurance Commissioners'  
Life Actuarial Task Force**

**Washington, DC - November 2012**

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## Background

In August 2010, the Life Health and Actuarial Task Force (“LHATF”) of the National Association of Insurance Commissioners (“NAIC”) requested that the Deposit Fund Subgroup of the American Academy of Actuaries’ Annuity Reserve Work Group (“Subgroup”) investigate and recommend modifications to the existing statutory regulations applicable to in-force business based on the report presented at the 2010 NAIC National meeting in Seattle. The August 2010 report highlighted possible areas to review, including the valuation methodology for synthetic guaranteed investment contracts (“Synthetic GICs”) and guaranteed separate accounts.

The purpose of this document is to provide the Life Actuarial Task Force (“LATF”), the group which has assumed the responsibilities of LHATF with respect to life insurance, with a recommendation to modify the existing statutory valuation methodology for Synthetic GICs. The Subgroup intends to provide a separate document with recommendations for a principle-based approach to the statutory valuation methodology.

For reference, the NAIC Synthetic Guaranteed Investment Contract Model Regulation<sup>1</sup> (the “NAIC Model”) defines a Synthetic GIC (in Section 4W) as a “group annuity contract or other agreement that in whole or in part establishes the insurer’s obligations by reference to a segregated portfolio of assets that is not owned by the insurer.”

For additional reference, the NAIC Model provides, in pertinent part, in Section 10A(1):

At all times an insurer shall hold minimum reserves in the general account or one or more separate accounts, as appropriate, equal to the excess, if any, of the value of the guaranteed contract liabilities determined in accordance with Paragraphs (6) and (7) of this subsection, over the market value of the assets in the segregated portfolio less the deductions provided for in Paragraph (2)<sup>2</sup> of this subsection. These reserve requirements shall be applied on a contract-by-contract basis.

Paragraph (6) (referred to above) provides in pertinent part:

... the minimum value of guaranteed contract liabilities is defined to be the sum of the expected guaranteed contract benefits, each discounted at a rate corresponding to the expected time of payment of the contract benefit that is not greater than the maximum multiple of the spot rate supportable by the expected return from the segregated portfolio assets, and in no event greater than 105 percent of the spot rate as described in the plan of operation....

“Spot rate” as used in Paragraph (6) above is defined in Section 4(V) of the NAIC Model in pertinent part as follows:

“Spot rate” corresponding to a given time of benefit payment means the yield on a zero-coupon non-callable and non-prepayable United States government obligation maturing at that time, or the zero-coupon yield implied by the price of a representative sampling of coupon-bearing, non-callable and non-prepayable United States government obligations....

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<sup>1</sup> The NAIC Model’s reserve mechanism is incorporated into the NAIC Accounting Practices and Procedures Manual in appendix A-695 (“NAIC APPM A-695”) by means of the partial reproduction of the NAIC Model therein.

<sup>2</sup> Paragraph (2) of Section 10A provides for a series of reductions from the market value of segregated portfolio assets.

Moreover, Section 10D(1) of the NAIC Model provides in pertinent part:

- (1) Reserves for synthetic investment contracts subject to this regulation shall be an amount equal to the sum of the following:
  - (a) The amounts determined as the minimum reserve as required under Section 10A(1);
  - (b) Any additional amount determined by the insurer's valuation actuary as necessary to make adequate provision for all contract liabilities.

Note that Synthetic GICs may also be subject to the requirements of:

- State of California Department of Insurance Bulletin No. 95-10
- New York State Department of Financial Services Regulation No. 128
- Nebraska Department of Insurance, Title 210, Chapter 80
- Connecticut Regulation 38a-459

#### Recommendation

The Subgroup recommends changes to existing model/statutory regulations applicable to in-force Synthetic GIC business with respect to the determination of the discount rate and, for certain types of contracts, to the deduction from the market value of assets. The proposed changes are as follows:

- Determine the present value of guaranteed contract liabilities by substituting spot rates derived from a blend of U.S. Treasury-based spot rates and spot rates derived from the Barclays Short Term Corporate Index and U.S. Corporate Investment Grade Bond Index rates for 105 percent of the Treasury-based spot rate in Paragraph (6) of Section 10A of the NAIC Model.
- Eliminate the deduction from the market value of assets required by Paragraph (2) of Section 10A of the NAIC Model provided that under the Synthetic GIC the asset default risk is borne by the policyholder.

The proposed methodology results in a reserve equal to the greater of zero and the excess of the present value of guaranteed contract liabilities over the market value of assets.

The proposed methodology recognizes that the guaranteed contract liabilities are supported by the underlying segregated assets and to the extent that segregated assets are not sufficient, by assets of the insurance company held in the general account or in a separate account, if the reserve is established in a separate account as provided for in Section 10A(1) of the NAIC Model. The proposal contrasts with the existing Synthetic GIC valuation methodology which caps the discount rate at a rate "... in no event greater than 105 percent of the spot rate."

The segregated portfolio of assets is managed under a set of investment guidelines that is included as part of the Synthetic GIC. The investment guidelines generally include permissible investments, non-permissible investments and activities, portfolio characteristics with respect to duration, asset quality, diversification and liquidity, and changes in investment guidelines upon a book value termination event. Permissible investments typically include cash or equivalents, Treasuries, government agency securities, asset-backed securities, mortgage-backed securities, commercial mortgage-backed securities, publicly-traded corporate bonds, and private placements. The investment guidelines may also include a benchmark against which the performance of the segregated portfolio of assets is to be measured.

Based on the Stable Value Investment Association's ("SVIA") Stable Value Funds' Quarterly Characteristics Survey dated February 6, 2012 with participation from 24 stable value managers, wrapped stable value assets as of December 31, 2011 of \$440 billion had the following weighted-average characteristics: crediting rate of 2.86%; duration of 2.74; and AA credit quality.

The proposed discount rate incorporates a reference to two indices of U.S. corporate grade bonds (collectively referred to herein as the "Bond Index") as the proxy for the yield on the underlying segregated assets and the recommendation is a blend of the Bond Index with the existing Treasury-based spot rate. The Barclays U.S. Corporate Investment Grade Bond Index was selected as a component of the Bond Index because: (1) it is widely used in portfolio management; (2) it is commonly used as a component of the benchmark for the segregated asset portfolio; (3) it provides more reference rates across the maturity spectrum than alternative indices; and (4) it does not include structured notes, Treasuries or government agency securities. In addition, Barclays Capital also offers a short-term index, which is important since the Barclays U.S. Corporate Investment Grade Bond Index has a minimum constraint of one-year to maturity. The combination of the Barclays Short Term Index and the U.S. Corporate Investment Grade Bond Index (again, collectively referred to herein as the "Bond Index") provides reference rates across the maturity spectrum.

The Subgroup's recommended blend is 50% of the existing Treasury-based spot rate and 50% of the spot rate derived from the Bond Index. The blend was derived from three sources: (1) principles from the general account valuation interest rate methodology; (2) the Barclays historical spread-to-Treasuries decomposition for the U.S. Corporate Investment Grade Bond Index; and (3) a review of historical Treasury rates and index reference rates. The proposed blending factors are consistent with the use of plan type for on-balance sheet products to address interest rate risk associated with policyholder withdrawal options. The proposed blending factors are also consistent with recent historical short-term average default cost. The Barclays historical spread decomposition study separates the credit spread into three components: default cost, risk premium and liquidity cost. The most recent study over the period January 2007 through May 2012 reveals that the average default cost, risk premium and liquidity cost as a percent of the total spread were 46%, 35% and 19%, respectively. Therefore, 54% of the total spread contributed to the net yield. The use of a recent short-term average default cost is reasonable for a Synthetic GIC as the underlying segregated asset portfolio duration typically ranges from 2 to 4 years, with the average from the SVIA survey cited above at 2.74 years. Further, the proposed blending factors generally produce results consistent with a constant percentage of the Treasury rate in a majority of interest rate environments and provide a more reasonable result in the recent historical financial market environments of low Treasury rates and wide investment spreads. Refer to Attachment 1 for a historical comparison of 105% of the U.S. Treasury spot rate and a 50/50 blend of an intermediate corporate index and the 5-7 year U.S. Treasury index.

In addition, the proposed methodology provides for a liability valuation that is more consistent with a market value asset valuation. In the existing methodology, assets are reflected at market value while the present value of guaranteed contract liabilities is determined using the expected return from the segregated portfolio assets subject to a cap (i.e. 105% of the Treasury-based spot rate). The discount rate in the existing methodology does not necessarily reflect the market environment and may result in a disparity between the valuation of assets and the valuation of liabilities if spreads widen, as the expected return increases and the market value of the assets falls. The proposed methodology utilizes a top-down approach to determine the discount rate and is similar to the deterministic reserve computation in the proposed VM20 section of the Standard Valuation Law that utilizes the path of net asset earned rates as the discount rate.

The proposed methodology uses the market value of the assets on the valuation date, and eliminates the deduction to assets to the extent the asset default risk is borne by the policyholders. This is analogous to the current asset valuation reserve (“AVR”) requirement for separate accounts when asset defaults are passed directly to the policyholders. The elimination of the deduction is appropriate when the contractual provisions pass the asset default risk to the policyholder. If the asset default risk is borne by the insurance company, then the existing deduction from the assets remains appropriate in the valuation methodology.

The Subgroup believes the proposed valuation methodology is a significant improvement over the current valuation methodology because it reflects the asset segregation, recognizes the default risk retention by the policyholder, appropriately aligns the liability relationship to the underlying assets, and should reduce the asset and liability valuation basis mismatch. The Subgroup recommends that LATF modify the existing statutory valuation for Synthetic GICs to be consistent with the proposed valuation methodology described in this document.

#### Illustrative Results

For the illustration, we have assumed that the Synthetic GIC is a participating evergreen (no fixed maturity) contract that provides for quarterly rate resets subject to a floor of 0%, is designed to pass most investment and plan cash flow experience, and default risk to the policyholder, is benefit responsive with respect to most participant initiated payouts, and provides a market value payout at termination or a delayed book value payout at the election of the policyholder if book value exceeds market value at termination. Refer to Attachment 2 for specifications of the sample Synthetic GIC used to illustrate the reserve requirements.

In addition, the illustration reflects 5 of the 7 historical valuation dates for which yield curve graphs are provided in Appendix F. These graphs show that there have been valuation dates when 105% of the Treasury-based rate and the recommended 50% Barclays, 50% Treasury rate were reasonably comparable over all maturities. This was true when the NAIC Model and New York State Insurance Department Regulation 128 were introduced and prior to the financial market crisis in 2008; refer to the graphs for December 31, 1990 through December 31, 2006. On the other hand, there were valuation dates, notably September 30, 2008 and December 31, 2008, when the two quantities diverged dramatically, after which they again converged, but not to the pre-2008 levels.

Attachment 3 illustrates the reserve requirements for the above sample contract under the NAIC APPM A-695, New York State (“NYS”) Regulation No. 128 and the ARWG proposal, as well as the impact to each reserve based on the recommendation. The illustrative reserves are computed using a book value of \$100 million on the valuation date, and assumptions with respect to contract duration, current crediting rate and the market value of the segregated portfolio of assets. Contract duration assumptions were 2, 3 and 4 years. Current crediting rate assumptions were 2%, 3% and 4%. Market value assumptions were \$90 million, \$95 million and \$100 million, which translate to 90%, 95% and 100% market value to book value (“MV/BV”) ratios, respectively.

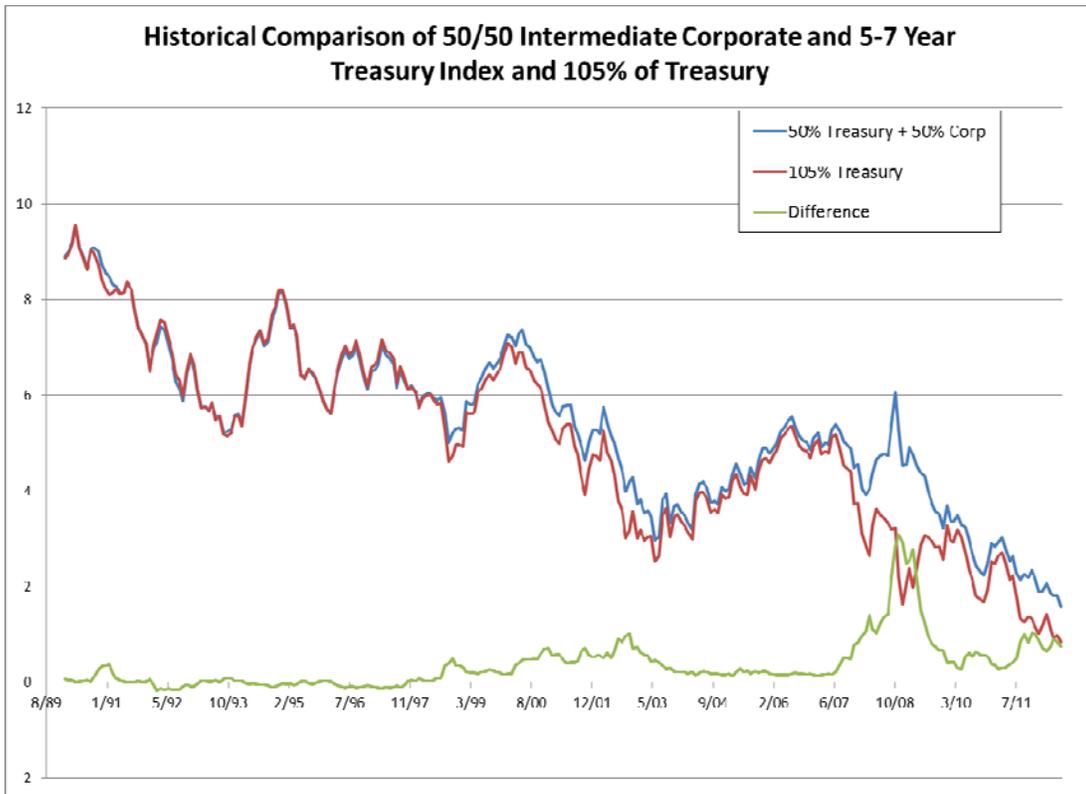
Using the illustrative contract and assumptions, and the results in Attachment 3, the impact to the reserve is most significant on historical valuation dates when Treasury rates are low and credit spreads are relatively wide. This is attributed to the value of the guaranteed contract benefits reacting to changes in market conditions to a greater degree than in existing regulation. With respect to the three assumptions (contract duration, current crediting rate and market value of assets), the pattern of reserves

is similar under the current methodology and the proposed methodology. That is, the reserve increases as the MV/BV ratio deteriorates, as current crediting rates increase and as duration shortens.

## Appendices

- Appendix A - Calculation of Discount Rates
- Appendix B - Alternative Indices including Comparison of Metrics
- Appendix C - Comparison of Metrics from Bond Indices considered
- Appendix D - Information about the Barclays U.S. Corporate Investment Grade Bond Index
- Appendix E - Information about the Barclays Short Term Corporate Index
- Appendix F - Yield Curve Graphs for multiple historical dates

Attachment 1



**Attachment 2 – Illustrative Synthetic GIC**

<p><b>Interest - for Crediting Rate</b></p>	<p>CR = <math>\{(1 + Y) * (MV/BV)^{(1/D)}\} - 1 - F</math>, where</p> <p>CR = the crediting rate, the effective annual rate of interest,</p> <p>Y = the dollar weighted average yield of the securities in the segregated portfolio as of the calculation date,</p> <p>MV = the market value of the segregated portfolio as of the calculation date,</p> <p>BV = the book value account as of the calculation date,</p> <p>D = the effective duration of the securities in the segregated portfolio as of the calculation date, and</p> <p>F= the effective annual rate of the fees, which may include the following:</p> <ul style="list-style-type: none"> <li>(1) administration and risk fee</li> <li>(2) investment management fee</li> </ul> <p>In the event the MV/BV ratio falls within any of the following ranges as of any rate reset date, the insurer has the right to adjust D in the crediting rate formula, as follows:</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>MV/BV</u></th> <th style="text-align: left;"><u>Permitted Adjustment of D</u></th> </tr> </thead> <tbody> <tr> <td>95% &lt; MV/BV ≤ 97.5%</td> <td>90% or more of D</td> </tr> <tr> <td>92.5% &lt; MV/BV ≤ 95%</td> <td>85% or more of D</td> </tr> <tr> <td>90% &lt; MV/BV ≤ 92.5%</td> <td>75% or more of D</td> </tr> <tr> <td>MV/BV ≤ 90%</td> <td>50% or more of D</td> </tr> </tbody> </table> <p>Rate reset date - 1st day of each quarter</p> <p>The crediting rate is subject to a 0% floor.</p>	<u>MV/BV</u>	<u>Permitted Adjustment of D</u>	95% < MV/BV ≤ 97.5%	90% or more of D	92.5% < MV/BV ≤ 95%	85% or more of D	90% < MV/BV ≤ 92.5%	75% or more of D	MV/BV ≤ 90%	50% or more of D
<u>MV/BV</u>	<u>Permitted Adjustment of D</u>										
95% < MV/BV ≤ 97.5%	90% or more of D										
92.5% < MV/BV ≤ 95%	85% or more of D										
90% < MV/BV ≤ 92.5%	75% or more of D										
MV/BV ≤ 90%	50% or more of D										
<p><b>Risk / Administrative</b></p>	<p>... by applying an annual effective rate of 0.25% to the balance in the book value account as of the end of the prior day.</p>										
<p><b>Investment Management</b></p>	<p>... by applying an annual effective rate to the balance in the book value account as of the end of the prior day in accordance with the following schedule:</p> <ul style="list-style-type: none"> <li>0.18% of the first \$100 million, plus</li> <li>0.13% of the next \$100 million, plus</li> <li>0.10% of the excess over \$200 million</li> </ul>										

<b>Termination Provisions</b>	<p>By the policyholder: on 10 days' notice, option of:</p> <ol style="list-style-type: none"> <li>1. Lump sum at MV</li> <li>2. Lump sum at BV at end of 5 years. If, as of any rate reset date during the extension period prior to the end of 5 years, the MV equals or exceeds the BV Account, the contract terminates with no payment by the insurance company. Investment guidelines will change during the winding down period.</li> </ol> <p>By the insurer: on 90 days' notice, lump sum at BV at end of 5 years. If, as of any rate reset date during the extension period prior to the end of 5 years, the MV equals or exceeds the BV Account, the contract terminates with no payment by the insurance company. Investment guidelines will change during the winding down period.</p>
<b>Defaults</b>	<p>The policyholder will absorb market value losses through the crediting rate reset mechanism, subject to the 0% floor, and default risk is passed through to the policyholder through an impaired security provision.</p>
<b>Benefit Responsive Payments</b>	<p>For plan participants upon death, retirement, disability, termination of employment, or for providing in-service and hardship withdrawals or loans to active participants in accordance with the provisions of the plan.</p> <p>The contract allows transfers to other plan-offered investment options, including competing options, but any transfers to competing options must first go through a non-competing plan option and reside there for at least 90 days.</p> <p>The following order of withdrawal from the stable value fund is to be followed by the policyholder:</p> <ol style="list-style-type: none"> <li>(i) first, from the current cash flow to the extent sufficient;</li> <li>(ii) second, from the cash buffer assets, if any; and</li> <li>(iii) third, from the book value account on a pro-rata basis among the contract and other book value instruments held in the fund.</li> </ol>

### **Attachment 3**

#### **Blend of 50% Treasury – 50% Bond Index Illustrative Synthetic GIC Reserve Requirements (in \$millions)**

Source: Deposit Fund Subgroup of the Annuity Reserve Working Group

**Attachment 3  
(continued)**

**Blend of 50% Treasury – 50% Bond Index  
Illustrative Synthetic GIC Reserve Requirements  
(in \$millions)**

Years to Maturity (Duration)	Current Crediting Rate <sup>1</sup>	MVA	9/30/2008						12/31/2006					
			Reserves			Impact to Reserve			Reserves			Impact to Reserve		
			NAIC A.695	NYS - Reg 128	ASWGL Proposal	NAIC A.695	NYS - Reg 128		NAIC A.695	NYS - Reg 128	ASWGL Proposal	NAIC A.695	NYS - Reg 128	
2	2.00%	\$100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	4.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	4.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4.00%	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.00%	95	1.7	2.4	0.0	(1.7)	(2.4)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.00%	95	1.9	2.7	0.0	(1.9)	(2.7)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	4.00%	95	2.1	2.9	0.0	(2.1)	(2.9)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	4.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4.00%	95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.00%	90	6.7	7.4	1.4	(5.3)	(6.0)	1.2	1.9	0.9	(0.2)	(1.0)		
3	2.00%	90	3.7	4.4	0.0	(3.7)	(4.4)	0.0	0.0	0.0	0.0	0.0		
4	2.00%	90	0.1	0.9	0.0	(0.1)	(0.9)	0.0	0.0	0.0	0.0	0.0		
2	3.00%	90	6.9	7.6	1.6	(5.3)	(6.0)	1.4	2.1	1.2	(0.2)	(1.0)		
3	3.00%	90	3.9	4.6	0.0	(3.9)	(4.6)	0.0	0.0	0.0	0.0	0.0		
4	3.00%	90	0.4	1.1	0.0	(0.4)	(1.1)	0.0	0.0	0.0	0.0	0.0		
2	4.00%	90	7.1	7.8	1.9	(5.3)	(6.0)	1.6	2.4	1.4	(0.2)	(1.0)		
3	4.00%	90	4.1	4.9	0.0	(4.1)	(4.9)	0.0	0.0	0.0	0.0	0.0		
4	4.00%	90	0.6	1.3	0.0	(0.6)	(1.3)	0.0	0.0	0.0	0.0	0.0		

<sup>1</sup> Current crediting rate guaranteed for 3 months, thereafter, the credited rate is subject to the contractual interest rate reset formula subject to a minimum interest rate of zero.

Source: Deposit Fund Subgroup of the Annuity Reserve Working Group

Calculation of Discount Rates

- Derive the Treasury and Barclays yield curves on each valuation date. The methodology used to derive each yield curve (Treasury-based and Barclays-based), including interpolation, may be described as follows:
  - Treasury rates from Bloomberg
    - Obtain the Treasury yields on the valuation date for the following maturity points (0.25, 0.50, 1, 2, 3, 5, 7, 10 and 30 years). Complete the curve by linear interpolation; the first three months are set equal to 0.25 year rate
  - Barclays rates
    - Obtain the Barclays Short Term Corporate Index yield and the Barclays U.S Corporate Investment Grade Bond Index yields on the valuation date
    - The yields associated with the maturity ranges from the Barclays website for the Short Term Corporate Index and the U.S. Corporate Investment Grade Bond Index are mapped to a single maturity point
      - Short-Term → 0.50
      - 1-3 years → 2
      - 3-5 years → 4
      - 5-7 years → 6
      - 7-10 years → 8.5
      - Greater than 10 years → 20
    - The curve is completed by linear interpolation
      - The first six months are set equal to the 0.50 year rate
      - Years greater than 20 are set equal to the 20 year rate
- Determine the Treasury and Barclays spot rates from the respective yield curve using bootstrapping
- Determine the blended spot rates for use in determining the present value of guaranteed benefits
  - Treasury spot rate + 50% \* (Barclays spot rate – Treasury spot rate)
  - The 50% weight was
    - Derived by considering the principles in the Standard Valuation Law including Plan Type, Guarantee Duration and Window Period; and
    - Validated by the Barclays historical spread decomposition using data from January 2007 through May 2012 in which the average default cost, risk premium and liquidity cost as a percent of the total spread were 46%, 35% and 19%, respectively.

Alternative Indices

In determining the external reference component to the discount rate, the Subgroup evaluated multiple bond indices across ten different market environments to cover varying levels of interest rates and shapes of the yield curve. The bond indices evaluated included the Citigroup U.S. Broad Investment Grade Bond Index ("Citi"), the Merrill Lynch U.S Corporate Investment Grade Bond Index ("ML"), the Moody's U.S. Corporate Bond Index ("Moody's"), and the Barclays U.S. Corporate Investment Grade Bond Index ("Barclays"). The metrics used to evaluate the indices included: the number of issues, the number of reference rates across the maturity spectrum, the distribution of the underlying securities by credit quality weighted by market value, and the availability of a short-term index to provide an external reference rate for the short end of the yield curve. The short-term index is important since the corporate bond indices have a minimum one-year-to-maturity requirement.

Barclays was selected as it provides the most reference rates across the maturity spectrum relative to the alternative indices, it offers a short-term index, and it is commonly used as a component of the benchmark for the asset portfolios supporting Synthetic GICs. When the Barclays historical data was captured in 2011, there were six reference rates (1-3 year, 3-5 year, 5-7 year, 7-10 year, 10-20 year and >20 years). Currently, the Barclays index provides five reference rates, as the last two reference rate categories were combined into one. Moody's was eliminated as it only offers two reference rates across the maturity spectrum, it has less than 10% of the number of issues offered by the other indices evaluated, and it does not offer a short-term index.

Citi was eliminated as it offers fewer reference rates across the maturity spectrum than Barclays, it does not offer a short-term index and it provided credit quality information for only three of the four investment grade categories.

ML had similar attributes to Barclays, but was eliminated as it had a slightly higher concentration of Baa assets.

Refer to Appendix C for a comparison of metrics from the bond indices considered.

## Appendix C

### Comparison of Metrics from Bond Indices Considered

The Subgroup evaluated the following bond indices in determining the external reference component to the discount rate:

- Citigroup U.S. Broad Investment Grade Bond Index (“Citi”)
- Merrill Lynch U.S Corporate Investment Grade Bond Index (“ML”)
- Moody's U.S. Corporate Bond Index (“Moody’s”)
- Barclays U.S. Corporate Investment Grade Bond Index (“Barclays”)

The metrics used to evaluate the indices included: the number of issues, the number of reference rates across the maturity spectrum, the distribution of the underlying securities by credit quality weighted by market value, and the availability of a short-term index to provide an external reference rate for the short end of the yield curve. A comparison of these metrics for the bond indices as of December 31, 2010 is provided.

	Moody's	Barclays	Citi *	ML
# of Issues	258	3,685	4,008	4,435
% of MV in Aaa	1.9%	0.9%		1.2%
% of MV in Aa	7.4%	16.8%	20.9%	17.5%
% of MV in A	43.4%	45.5%	42.8%	42.6%
% of MV in Baa	47.3%	36.7%	36.3%	38.7%
# of Reference Rates	2	6	4	5
Short-Term Index	No	Yes	No	No

\* In credit quality distribution, AAA assets are combined with AA assets

In addition, the Subgroup evaluated yields for the bond indices across the ten different market environments and the yields for each reference rate of the index are provided on the next page.

Date	Moody's (Yield-To-Maturity)		Barclays Short Term	Barclays Corporate (Yield-To-Worst)					
	Intermediate	Long		1-3 Yr	3-5 Yr	5-7Yr	7-10 Yr	10-20 Yr	> 20 Yrs
12/31/2011	3.79%	5.44%	0.87%	1.80%	3.06%	4.11%	4.56%	5.62%	5.83%
06/30/2010	3.75%	5.30%	2.05%	2.34%	3.24%	4.43%	4.69%	5.60%	5.87%
12/31/2009	4.41%	5.84%	2.25%	2.86%	3.75%	4.75%	5.39%	6.03%	6.24%
06/30/2009	5.25%	6.21%	3.90%	4.86%	5.07%	6.18%	6.58%	7.02%	6.92%
12/31/2008	5.89%	6.73%	6.87%	7.70%	7.29%	7.63%	7.60%	7.88%	7.30%
09/30/2008	5.38%	6.42%	8.93%	7.67%	7.48%	7.91%	8.06%	7.89%	8.06%
12/31/2006	5.37%	5.79%	5.41%	5.32%	5.38%	5.54%	5.68%	6.02%	6.22%
12/31/2003	4.55%	6.20%	n/a	2.51%	3.57%	4.42%	5.09%	5.73%	6.31%
12/31/1999	7.30%	7.87%	n/a	7.16%	7.46%	7.77%	7.76%	8.06%	8.16%
12/31/1990	n/a	9.63%	n/a	8.97%	9.19%	9.60%	9.67%	9.70%	10.02%

Date	Citigroup BIG (Yield-To-Worst)				Merrill Lynch Corporate (Yield-To-Worst)				
	1-3 Yr	3-7 Yr	7-10 Yr	10+ Yr	1-3 Yr	3-5 Yr	5-7Yr	7-10 Yr	10+ Yr
12/31/2011	1.42%	3.34%	4.54%	5.71%	1.93%	3.14%	4.24%	4.68%	5.81%
06/30/2010	1.80%	3.48%	4.67%	5.75%	2.49%	3.39%	4.56%	4.82%	5.84%
12/31/2009	2.19%	3.99%	5.32%	6.17%	2.99%	3.95%	5.02%	5.53%	6.28%
06/30/2009	3.42%	5.21%	6.40%	6.88%	5.14%	5.18%	6.40%	6.74%	7.03%
12/31/2008	5.93%	6.71%	7.01%	7.13%	8.04%	7.51 <sup>0</sup> / <sub>o</sub>	8.13%	8.07%	7.57%
09/30/2008	6.77%	7.14%	7.54%	7.69%	7.49%	7.35%	7.74%	8.28%	8.01%
12/31/2006	5.25%	5.43%	5.64%	6.15%	5.35%	5.42%	5.56%	5.73%	6.16%
12/31/2003	2.50%	3.97%	5.15%	6.12%	2.52%	3.56%	4.41%	5.06%	6.07%
12/31/1999	n/a	n/a	n/a	n/a	7.18%	7.45%	7.74%	7.79%	8.06%
12/31/1990	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

## Appendix D

### Information about the Barclays U.S. Corporate Investment Grade Bond Index

The Barclays U.S. Corporate Investment Grade Bond Index is the corporate component of the Barclays Capital Aggregate Index, a broad based index maintained by Barclays Capital that is used to represent investment grade bonds being traded in the United States. Characteristics of the securities in the Barclays U.S. Corporate Investment Grade Bond Index include:

- Fixed rate coupon
- More than one year to final maturity
- Issued by U.S. and non-U.S. corporations, but must be publicly issued and U.S. dollar denominated and non-convertible
- At least \$250 million par amount outstanding
- The following rating requirements (Moody's, S&P, and Fitch)
  - If rated by 3 agencies, rated BBB- or better by 2 agencies
  - If rated by 2 agencies, rated BBB- or better by both
  - If rated by 1 agency, rated BBB- or better

The Barclays U.S. Corporate Investment Grade Bond Index excludes Treasuries, structured notes with embedded swaps or other features, private placements, floating rate securities, Eurobonds and convertible securities.

Information about the Barclays Short Term Corporate Index

The Barclays U.S. Corporate Investment Grade Bond Index has a minimum one-year-to-final-maturity requirement and thus, a proxy for the short end of the yield curve is needed. The Barclays Short Term Corporate Index was established in July 2004 and includes securities that have a remaining maturity of at least one month but less than twelve months. The Barclays Short Term Corporate Index represents securities that have fallen out of the Barclays U. S. Corporate Investment Grade Bond Index because of the minimum one-year-to-maturity constraint. The profile of the Barclays Short Term Corporate Index as of December 30, 2011 is as follows:

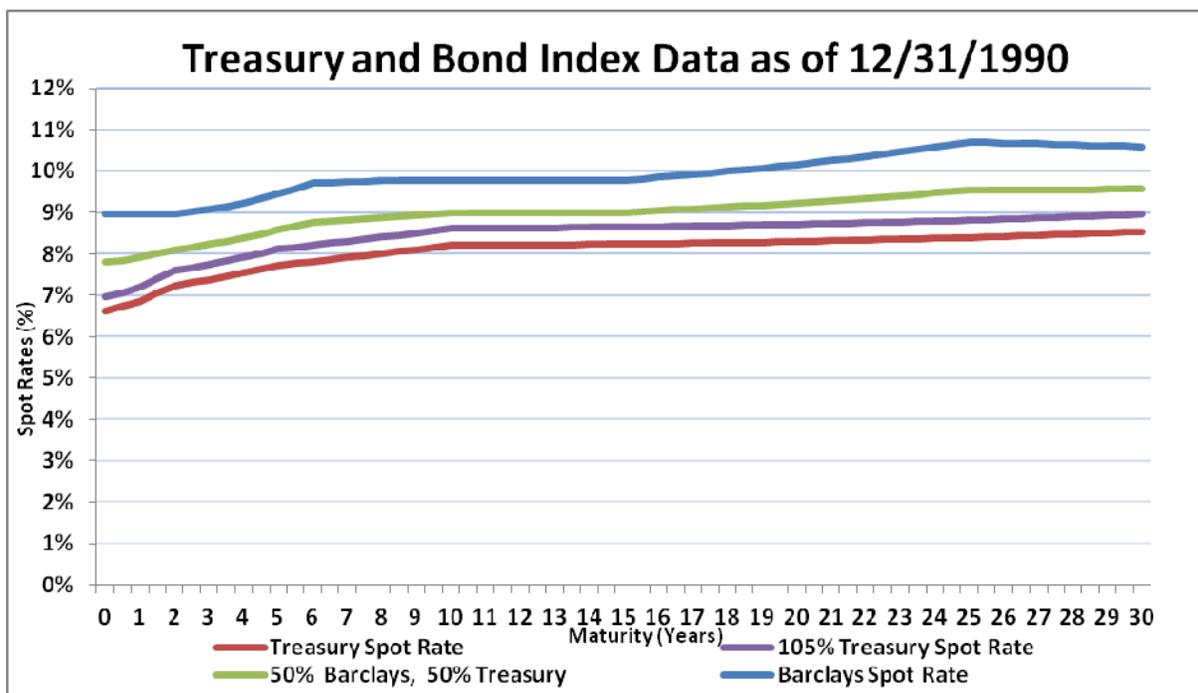
- Number of issues: 264
- Market value: \$193 million
- Average maturity: 0.55 years
- Average quality: A2/A3
- Yield to worst: 1.50%

Yield Curve Graphs for Multiple Historical Dates

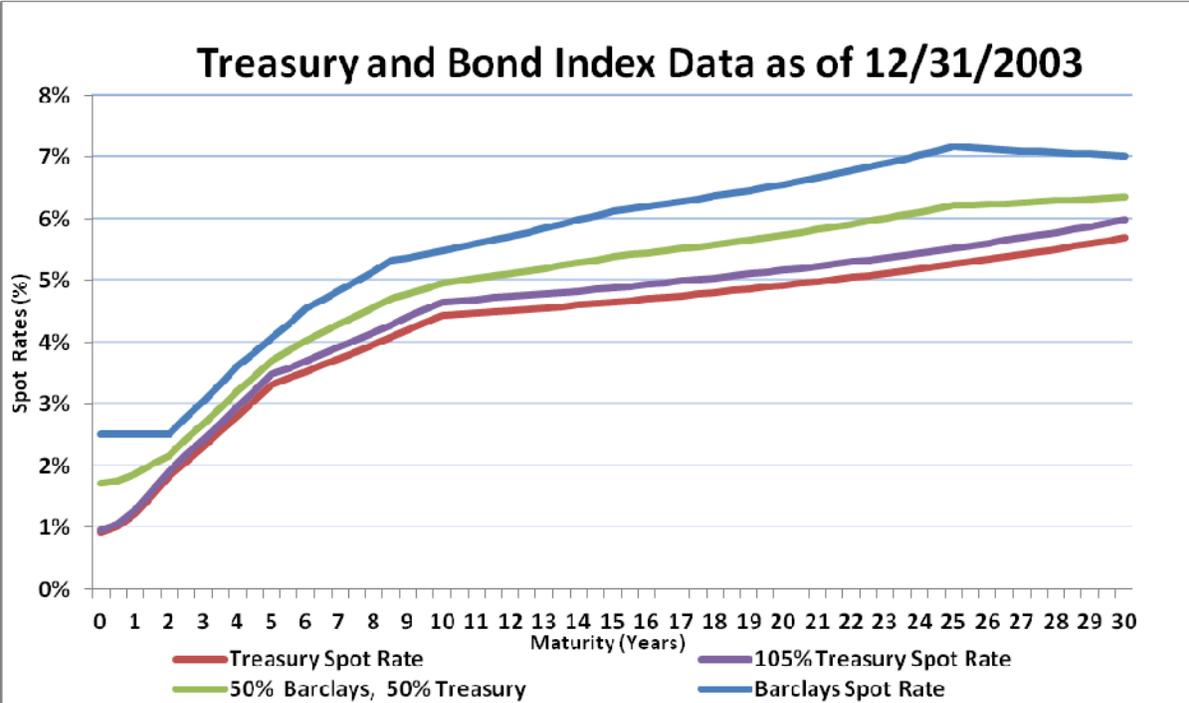
Graphs of Treasury and Barclays spot rates, 105% of the Treasury spot rate and the 50% Treasury/50% Barclays rate are provided for multiple historical dates. These dates were selected to capture a variety of market environments including the level of the Treasury rates, the shape of the Treasury yield curve and the level of credit spreads. The historical dates include the following:

- December 31, 1990
- December 31, 2003
- December 31, 2006
- September 30, 2008
- December 31, 2008
- June 30, 2011
- December 31, 2011

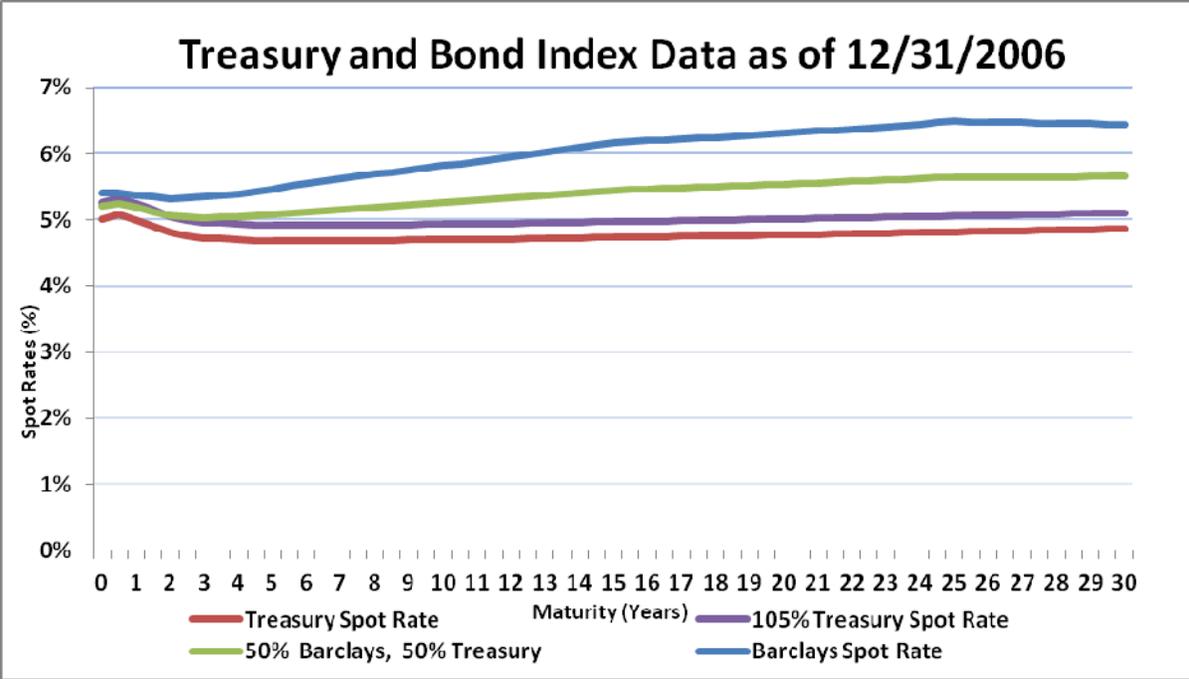
December 31, 1990 was selected since the Treasury rates were relatively high, the yield curve was upward sloping and credit spreads were close to the most recent year-end (2011) levels. The Treasury curve ranged from a 90-day rate of 6.64% to a 30-year rate of 8.26%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 1.70% to 2.00%.



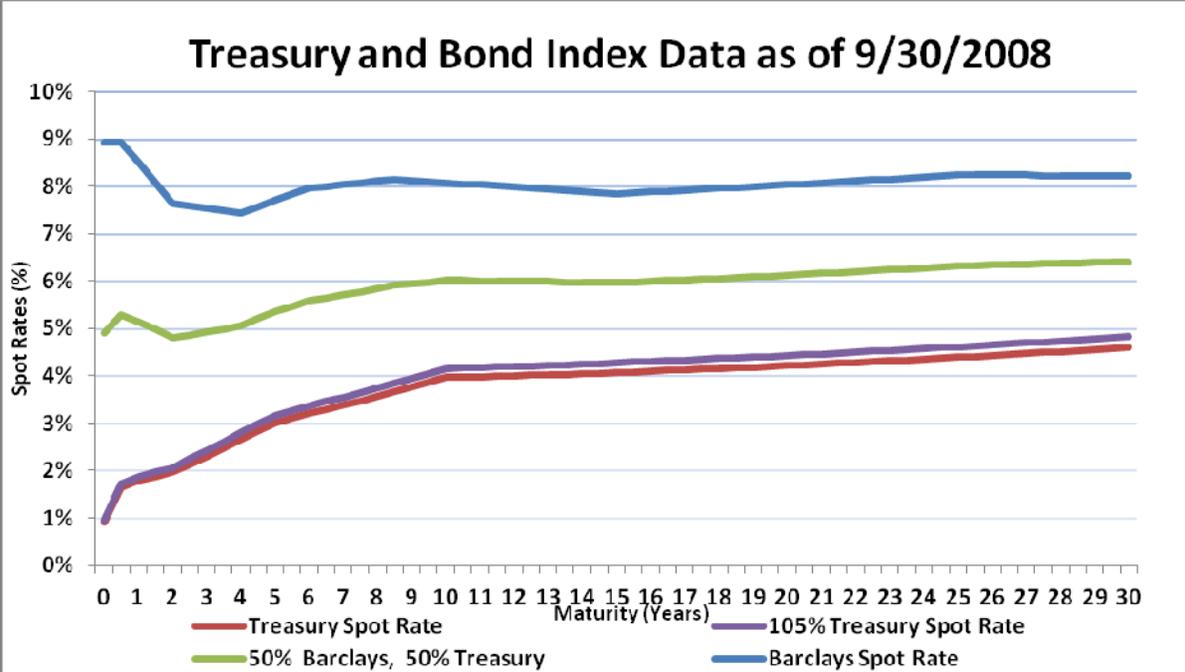
December 31, 2003 was selected since Treasury rates had declined from their 1990s era levels, the yield curve reflected a steep upward slope and credit spreads had narrowed. The Treasury curve ranged from a 90-day rate of 0.91% to a 30-year rate of 5.01%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 0.70% to 1.35%.



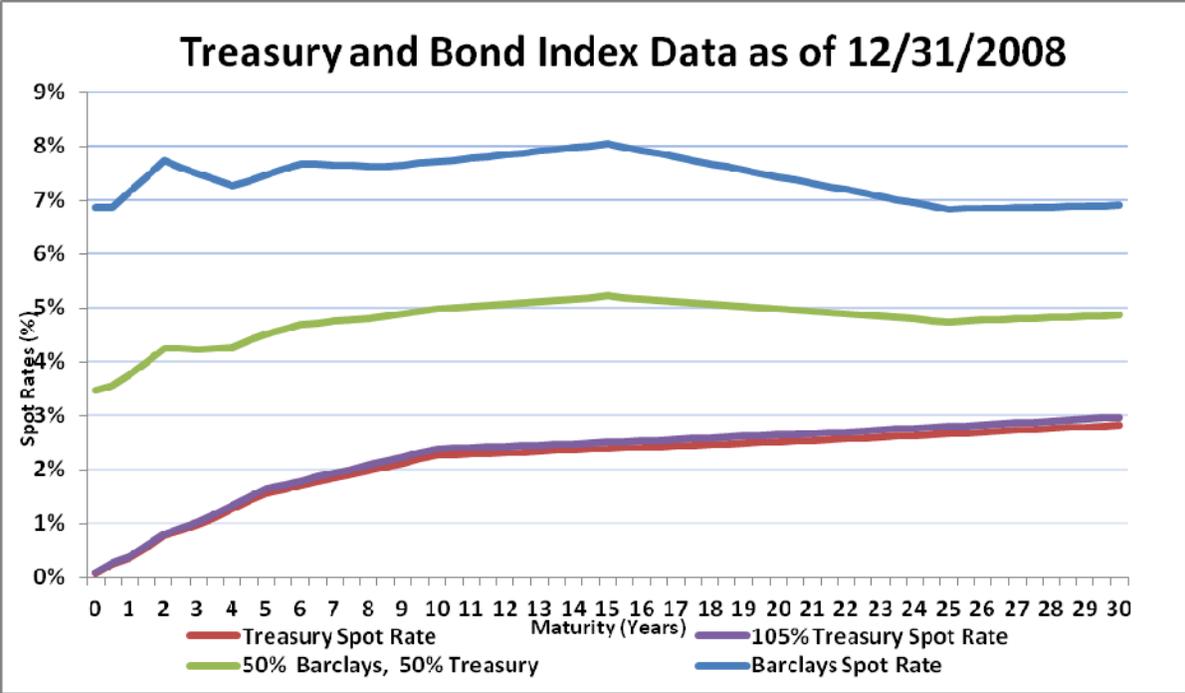
December 31, 2006 was selected due to the shape of the yield curve. The 90-day rate of 5.06% exceeded the 30-year rate of 4.80%. In addition, the intermediate and long-end of the Treasury curve were flat. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 0.50% to 1.60%.



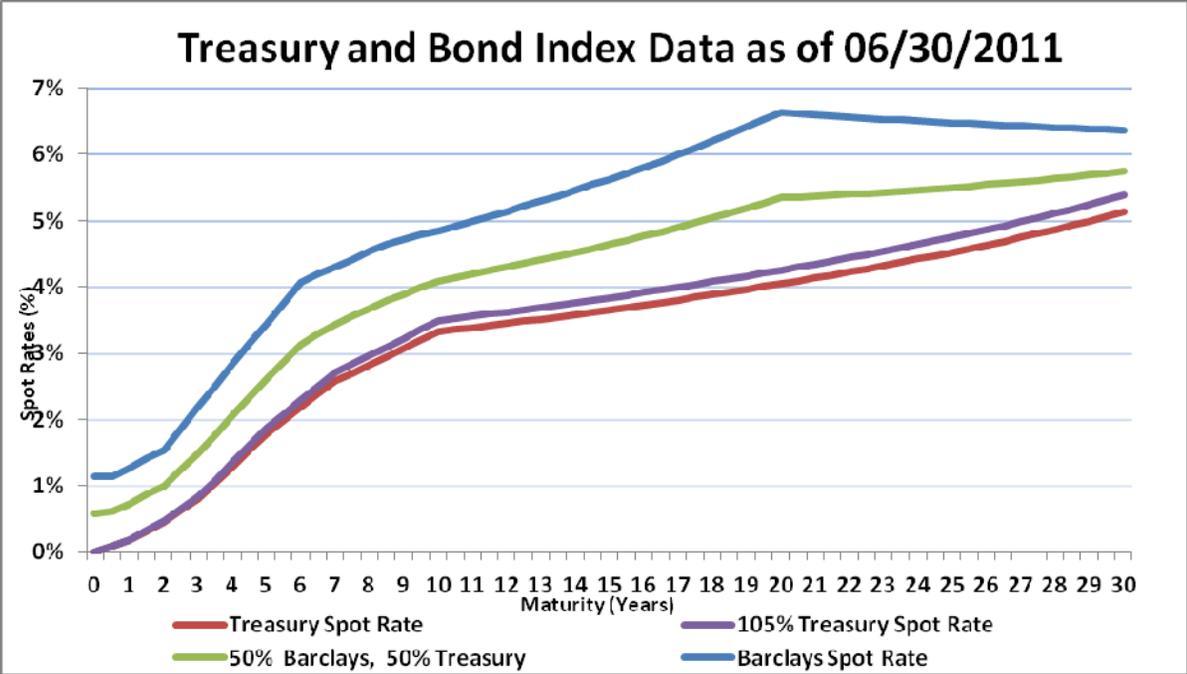
September 30, 2008 was selected as Treasury rates hit a new low for the times, the yield curve reflected a steep upward slope and credit spreads widened significantly. The Treasury curve ranged from a 90-day rate of 0.87% to a 30-year rate of 4.29%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 6.0% at the short-end of the curve to approximately 3.6% at the long-end of the curve.



December 31, 2008 was selected as Treasury rates continued to hit new lows, the yield curve remained upward sloping and credit spreads continued to widen from their September 30, 2008 levels. The Treasury curve ranged from a 90-day rate of 0.12% to a 30-year rate of 2.66%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 7.0% at the short-end of the curve to approximately 4.0% at the long-end of the curve.



June 30, 2011 was selected since Treasury rates remained low, the yield curve remained upward sloping and credit spreads narrowed significantly from their late 2008 levels. The Treasury curve ranged from a 90-day rate of 0.03% to a 30-year rate of 4.38%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 1.0% at the short-end of the curve to approximately 1.25% at the long-end of the curve.



December 31, 2011 was selected as Treasury rates remained low with the 30-year rate dropping below 3%, the yield curve remained upward sloping and credit spreads widened from the June 30, 2011 levels. The Treasury curve ranged from a 90-day rate of 0.02% to a 30-year rate of 2.89%. Credit spreads based on the Barclays U.S. Corporate Investment Grade Bond Index ranged from approximately 1.9% at the short-end of the curve to approximately 2.2% at the long-end of the curve.

