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## Managing Variable Volatility Risk Using a Stock Yield Projection Model to Manage Variable Volatility and the Upside Cash Accumulation Potential in Variable Life

In February 2007, the M Product Management Team issued the first in a series of Due Care Bulletins on variable volatility risk. This first bulletin - A Review of the Impact of Interim Yield Volatility on Variable Life Policy Performance - reviewed variable life

policy mechanics and detailed the two main factors that cause interim yield volatility to have a significant impact on policy performance - Policy Transaction Timing and COI Leverage. The bulletin also provided analysis to demonstrate that funding levels and number of premium payments are effective tools for managing interim yield volatility.

This second bulletin in the series introduces the use of a stock yield projection model and two strategies - Level of Premium Funding and Dollar Cost Averaging - to manage yield volatility risk in a variable universal life (VUL) product. While the analysis outlined below reflects that with minimum funding there is significant performance risk with a VUL product invested in the stock market, it will also show that:

1. VUL performance risk can be managed by funding at an appropriate level.
2. VUL provides significant upside performance potential.
3. VUL may provide a risk/reward profile that is superior to No-Lapse Guarantee products.

### Utilizing a Stock Yield Projection Model

In the first Due Care Bulletin (February 2007) the M Product Management Team used historical S&P 500 returns to demonstrate the impact of interim yield volatility on variable life performance. This bulletin uses a stock yield projection model to evaluate different risk management strategies. The stock projection model has been calibrated to the S&P 500 index (using historical price data from 1956 to 2006) and projects 1,000 possible future stock price scenarios. The 1,000 stock projection scenarios have been implemented in a currently available VUL product illustration.

#### Characteristics of the S&P 500 Calibrated Stock Projection Model

Actual cumulative annual return of S&P 500 from 1956 to 2006	10.7%
Average cumulative annual return of the 1,000 stock projections	10.8%
Maximum cumulative annual return of the 1,000 stock projections	16.0%
Minimum cumulative annual return of the 1,000 stock projections	5.5%
Standard deviation of cumulative annual return of the 1,000 stock projections	1.8%
80% of cumulative annual returns fall between	8.5% - 13.1%

The S&P 500 is an index comprised of stocks of 500 large publicly held corporations and is the second most widely watched index of large-cap US stocks. It is considered to be a bellwether for the US economy and is often used as a baseline comparison for stock and mutual fund performance charts. The results of the examples in this bulletin are specific to the S&P 500 due to the S&P 500 calibrated stock projection model. Historical returns include dividends in order to reflect actual total returns.



# Managing Variable Volatility Risk (continued)

Variable products include numerous fund options: growth, value, large-cap, small-cap, international, fixed income, etc. Different funds have different historical return characteristics, such as yield and volatility, and therefore would be projected to have different future cumulative yields and yield patterns. As mentioned previously, the analyses in this bulletin are specific to the S&P 500 index. Projections based on other types of funds could have significantly different results.

## Strategy to Manage Variable Volatility Risk: Level of Premium Funding

The February 2007 variable volatility bulletin showed that both the level of premium funding (high funding versus low funding) and the number of premium payments (10 pay versus full pay) could play a significant role in limiting the impact of interim yield volatility on variable life policy performance. Heavy premium funding reduces COI leverage by reducing the net amount at risk (NAR). Increasing the number of premium payments (such as a full pay) reduces premium timing risk similar to dollar cost averaging.

This chart summarizes VUL lapse risk by funding level as measured by the 1,000 projections.

Assumptions are as follows:

- Male, Nonsmoker
- Issue Ages 45 and 65
- \$2 Million Death Benefit
- S&P 500 Calibrated Stock Projection Model
- Four Funding Levels: premium solve assuming level annual yields of 10.7%, 9.0%, 8.0%, and 6.0%
- No additional premiums to keep the policy on track
- Policy Configurations:
  - Pay to age 100 (full pay), solving to endow and \$1 account value at age 100
  - 10 Pay, solving to endow and \$1 Account Value at age 100
  - Single Pay, solving to endow and \$1 Account Value at age 100
  - Seven premiums at the 7 Pay Non-MEC limit

		Percentage of 1,000 VUL Projections that Lapse			
		Yield Assumption for Premium Solve			
Age	Funding	10.7% <sup>1</sup> (0 bps Spread <sup>2</sup> )	9.0% <sup>1</sup> (170 bps Spread <sup>2</sup> )	8.0% <sup>1</sup> (270 bps Spread <sup>2</sup> )	6.0% <sup>1</sup> (470 bps Spread <sup>2</sup> )
45	Full Pay \$1	49%	25%	15%	4%
65	Full Pay \$1	47%	29%	20%	9%
45	Full Pay Endow	45%	22%	13%	3%
65	Full Pay Endow	38%	21%	14%	4%
45	10 Pay \$1	50%	27%	17%	5%
65	10 Pay \$1	48%	30%	22%	10%
45	10 Pay Endow	48%	24%	15%	4%
65	10 Pay Endow	43%	25%	18%	6%
45	Single Pay \$1	50%	29%	19%	5%
65	Single Pay \$1	51%	32%	25%	10%
45	Single Pay Endow	49%	27%	17%	4%
65	Single Pay Endow	47%	29%	21%	7%
45	7 Pay Non-MEC <sup>3</sup>	<1%	<1%	<1%	<1%
65	7 Pay Non-MEC <sup>3</sup>	3%	3%	3%	3%

Observations:

- When funding at a level that assumes the expected stock yield (i.e. zero bps premium solve spread), the policy is projected to lapse approximately 50% of the time.
- VUL policy performance risk can be reduced significantly by increasing the funding level.
  - A conservative funding level can be determined by using a premium solve yield assumption that is less than the expected stock yield.
  - The probability of lapse is reduced to 15%-25% with a 270 bps premium solve spread (i.e. 8.0% annual yield)
  - The probability of lapse is reduced to 5%-10% with a 470 bps premium solve spread (i.e. 6.0% annual yield).
- Downside performance risk can be reduced by solving to endow versus solving for a \$1 account value at age 100, with a resulting reduction in lapse probability of 2% to 9%.
- Downside performance risk can be reduced by paying premiums for life (full pay) versus short pay, with a resulting reduction in lapse probability of 2% to 4%. Note that this does not consider the potential opportunity cost of idle money in a side fund, which could occur if money were available to pay premium but was not applied in order to spread timing risk.
- There is a 3% or less probability of lapse when max funding at the 7 Pay Non-MEC level.

<sup>1</sup> Cumulative level annual yield assumption used for premium solve. A 10.7% yield assumption will produce a lower premium solve as compared to 6.0%. The 6.0% yield assumption produces the largest premium solve.

<sup>2</sup> Spread is equal to the difference between the underlying expectation of yield (i.e. 10.7%) and the yield assumption used for the premium solve (basis points or bps).

<sup>3</sup> A modified endowment contract ("MEC") is created when the amount by which the contract death benefit exceeds the policy cash value, or "amount at risk" is less than the minimum allowed by the IRS. A MEC does not receive the same beneficial tax treatment as a life insurance contract. Also, if a life insurance contract becomes a MEC while in force, the policy holder may be subject to additional taxes and penalties.

# Managing Variable Volatility Risk (continued)

## VUL Upside Performance Potential

So far we have focused primarily on quantifying and managing VUL risk. However, we have not considered a key strength of VUL products - upside performance potential.

This chart summarizes the percentage of projections that over endow (i.e. where the age 100 account value is greater than the original death benefit of \$2 million).

The assumptions noted previously remain the same for this analysis.

Observations:

- Approximately 45% to 50% of the 1,000 projections over endow when funding with a zero bps premium solve spread.
- Approximately 75% to 85% of the 1,000 projections over endow when funding with a 270 bps premium solve spread.

Percentage of 1,000 VUL Projections that Over Endow				
		Premium Solve Spread		
Age	Funding	0 bps <sup>1</sup>	170 bps <sup>1</sup>	270 bps <sup>1</sup>
45	Full Pay \$1	48%	72%	83%
65	Full Pay \$1	44%	64%	74%
45	Full Pay Endow	51%	75%	86%
65	Full Pay Endow	52%	72%	80%
45	10 Pay \$1	48%	71%	81%
65	10 Pay \$1	48%	65%	75%
45	10 Pay Endow	50%	73%	83%
65	10 Pay Endow	53%	70%	79%
45	Single Pay \$1	47%	69%	79%
65	Single Pay \$1	47%	65%	73%
45	Single Pay Endow	49%	70%	81%
65	Single Pay Endow	49%	68%	76%

<sup>1</sup> Basis points difference between the projected average annual stock yield (10.7%) and the annual yield assumed for the premium solve.

The following chart shows the age 100 account value

exceeded by 50% of the 1,000 projections (50th percentile). As an example, for the issue age 45 Full Pay \$1 with a funding level using a premium solve of 8.0% (i.e. 270 bps premium solve spread), 50% of the projections will have an age 100 account value that exceeds \$13.0 million, which is considerably larger than the target of \$1 and is more than six times greater than the original death benefit of \$2.0 million. The chart also shows the age 100 account value exceeded by 25% of the 1,000 projections (25th percentile).

Observations:

- VUL policy performance will either lapse or exceed the premium solve target (\$1 or endow). Very few policies will experience performance that ranges from just staying inforce to meeting the premium solve target. In other words, variable products invested in the market will either lapse or perform extremely well.
- Depending upon the funding level, there is a significant probability that a policy will exceed the premium solve target.
- The quantity of the upside potential is significant; there is a 25% probability that the age 100 account value will be more than 2.5 times the original death benefit.

50th and 25th Percentile of Age 100 Account Value <sup>1</sup> (\$Millions)							
		Premium Solve Spread					
		0 bps <sup>2</sup>		170 bps <sup>2</sup>		270 bps <sup>2</sup>	
Age	Funding	50th Per <sup>1</sup>	25th Per <sup>1</sup>	50th Per <sup>1</sup>	25th Per <sup>1</sup>	50th Per <sup>1</sup>	25th Per <sup>1</sup>
45	Full Pay \$1	0.8	9.8	8.7	19.3	13.0	27.2
65	Full Pay \$1	0.4	5.4	39.	8.3	5.3	10.3
45	Full Pay Endow	2.4	10.9	9.9	21.3	14.3	30.0
65	Full Pay Endow	2.4	6.6	5.1	10.1	6.7	12.2
45	10 Pay \$1	0.0	13.3	10.9	26.8	17.8	39.5
65	10 Pay \$1	1.1	7.2	5.3	11.5	7.2	14.6
45	10 Pay Endow	1.8	14.2	11.8	29.0	19.5	42.2
65	10 Pay Endow	2.6	8.3	6.4	13.1	8.3	16.7
45	Single Pay \$1	0.0	14.7	12.3	31.3	20.9	46.0
65	Single Pay \$1	0.0	8.5	5.8	13.7	8.4	17.9
45	Single Pay Endow	0.9	15.6	13.2	33.1	22.4	49.1
65	Single Pay Endow	1.7	9.5	6.9	15.4	9.7	20.0

<sup>1</sup> 50th percentile is where 50% of the 1,000 projections have an age 100 account value that is greater than the account value shown.

<sup>2</sup> 25th percentile is where 25% of the 1,000 projections have an age 100 account value that is greater than the account value shown.

<sup>2</sup> Basis points difference between the projected average annual stock yield (10.7%) and the annual yield assumed for the premium solve.

# Managing Variable Volatility Risk (continued)

## Funding VUL at an NLG Premium Level

As seen in previous examples, VUL performance has both significant downside risk (including a policy lapse) and significant upside potential via cash accumulation. One product alternative at the other end of the risk spectrum is No-Lapse Guarantee (NLG). If the client has very little risk tolerance, an NLG product may be appropriate. NLG products guarantee the death benefit for life if the required premiums are paid on time. However, cash values in NLG products are minimal and often nonexistent, and there is no upside performance potential. Comparing VUL performance to that of an NLG product may provide context as to the appropriateness of VUL for a risk averse client.

This chart shows the probability of lapse, the probability of over ending, and the 50th percentile of the age 100 account value when funding with a competitive NLG premium for the appropriate issue age and risk class.

VUL Performance When Funding with a Competitive No-Lapse Guarantee Premium				
Age	Funding to Endow	% of 1,000 Projections that Lapse	% of 1,000 Projections that Over Endow	50th Percentile Age 100 Account Value (\$Millions)
45	Full Pay	4%	95%	24
55	Full Pay	9%	88%	12
65	Full Pay	20%	74%	5
45	Single Pay	4%	95%	52
55	Single Pay	6%	93%	30
65	Single Pay	11%	86%	14

The assumptions noted previously remain the same for this analysis.

Observation:

- Particularly at issue ages below 65, very conservative clients may find the VUL risk/reward performance profile superior to NLG, with a low probability of lapse (4% to 9%) and a high probability of over ending (88% to 95%).

## Strategy to Manage Variable Volatility Risk: Dollar Cost Averaging

Dollar cost averaging (DCA) is a tool provided with some variable life products where one-twelfth (1/12) of the premium is allocated to the target separate account fund on a monthly basis. The remaining premium is allocated to the general account, which has an associated credit rate. In simple terms, in the first month 1/12 of the annual premium is allocated to the separate account and 11/12 is allocated to the general account; in the second month another 1/12 of the annual premium is allocated to the separate account (for a total of 2/12) and 10/12 remains in the general account. This continues until the entire premium has been allocated to the separate account (in month 12). This approach is designed to reduce the premium timing risk associated with yield volatility.

The offsetting factor with DCA may be the opportunity cost of a lower yield in the general account (credit rate) versus the separate account yield. The general account is invested in short- to medium-term high quality fixed income instruments (bonds and mortgages) with book value accounting. The general account does provide a non-volatile credit rate, but historically credit rates are significantly less than stock market returns over the long term. While DCA reduces timing risk, it may come with the opportunity cost of a reduced yield.

## Measuring the Effectiveness of Dollar Cost Averaging

Assumptions:

- Male, Nonsmoker
- Issue Age 45
- \$2 Million Death Benefit
- S&P 500 Calibrated Stock Projection Model
- Separate Account - Stock projection model has been adjusted so that the average annual return of the 1,000 projections is 8.0%, 6.0% and 4.7% (versus the historical return of 10.7%)
- General account crediting rate is 4.70%
- Three Funding Levels: Premium solve assuming level annual yields of 8.0%, 6.0%, and 4.7%
- Premium solve yield assumption is equal to the average yield of the 1,000 stock projections (i.e. zero bps spread)

# Managing Variable Volatility Risk (continued)

The chart below summarizes the probability of lapse of the 1,000 projections, with and without DCA.

Probability of Lapse						
Yield Assumption <sup>1</sup>	Full Pay to Endow		10 Pay to Endow		Single Pay to Endow	
	No DCA	With DCA	No DCA	With DCA	No DCA	With DCA
8.0%	46.4%	47.8%	49.7%	51.0%	50.5%	50.7%
6.0%	43.0%	43.5%	45.6%	45.6%	47.3%	48.4%
4.7%	41.2%	41.2%	49.8%	49.1%	51.2%	52.4%

<sup>1</sup> Level lifetime annual yield assumption used for the premium solve and the average lifetime annual yield of the 1,000 stock projections.

Observation:

- Based on the DCA analysis above, there is no benefit to using DCA to manage variable volatility risk. Any reduction in premium timing risk is more than offset by a general account with a lower yield than the separate account. Even if there is no opportunity cost (i.e., the general account crediting rate is equal to the separate account yield; 4.7% in the examples above), DCA does not provide a significant reduction in downside performance risk.

DCA may be appropriate for a single pay or a 1035 exchange when there is an expectation that there will be an imminent and permanent market reduction. DCA would provide that not all of the lump sum premium payment is invested at or near a market high just before a market correction.

## Conclusions Regarding the Management of Variable Volatility Risk

- Conclusions in this bulletin are based on the results of a specific stock yield projection model that has been calibrated to the S&P 500 index, and based on a specific VUL product. Results will vary based upon the type of stock yield projection model, the type of fund used to calibrate the model, and the specific product.
- Policy performance risk due to variable volatility is significant. When funding with a zero bps premium solve spread, there is a 40% to 50% probability of lapse.
- The level of premium funding (both the number of premium payments and particularly the amount of the premium payments) is an effective tool for managing risk associated with variable volatility. Increased premium funding builds a cushion to endure downside yield scenarios and reduces the leverage of COI charges. Using a premium solve spread of 170 bps to 270 bps reduces the probability of lapse to 15%-30% from 40%-50% with a zero bps spread.
- Dollar Cost Averaging provides no material benefit to managing performance risk due to variable volatility, and policy performance will actually be reduced if there is an opportunity cost from the lower yield (credit rate) in the general account.
- There is tremendous upside policy performance potential with a variable product. The specific examples in this bulletin show that over 75% of the 1,000 projections over endow when funding with a 270 bps premium solve spread.
- While VUL may seem like the more appropriate choice for clients with a higher risk tolerance looking to capture upside performance, even risk averse clients below age 65 may find the VUL risk/reward profile superior to NLG products. VUL product with NLG premium funding has a relatively low probability of lapse and significant cash accumulation potential.

## For More Information

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