

AXA EQUITABLE VARIABLE ANNUITY GUARANTEED BENEFITS DYNAMIC HEDGING CONSIDERATIONS

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Variable Annuity Product Evolution

1970's-1980's: Fixed Annuities

- Tax-deferred returns
- Death benefit returns principal prior to annuitization

1980's-1990's: Variable Annuities

- Equity upside with tax-deferred returns on mutual fund clones
- Return of premium death benefit

1995-1997: VA with Enhanced Death Benefits

- Ratchet resets the guarantee to account value
- Roll-up at guaranteed rate

1996-2000: Living Benefits – Generation I

- GMIB guarantees an account level that can be annuitized
- GMAB guarantees an account value that can be withdrawn

2002: Living Benefits – Generation II

- GMWB limits downside risk; offers upside of equities

2003: Living Benefits – Generation III

- GMWB with ratchets, rollup and/or higher withdrawal max

2004: Living Benefits – Generation IV

- Hybrid GMWB/GMIB
- Immediate annuity products

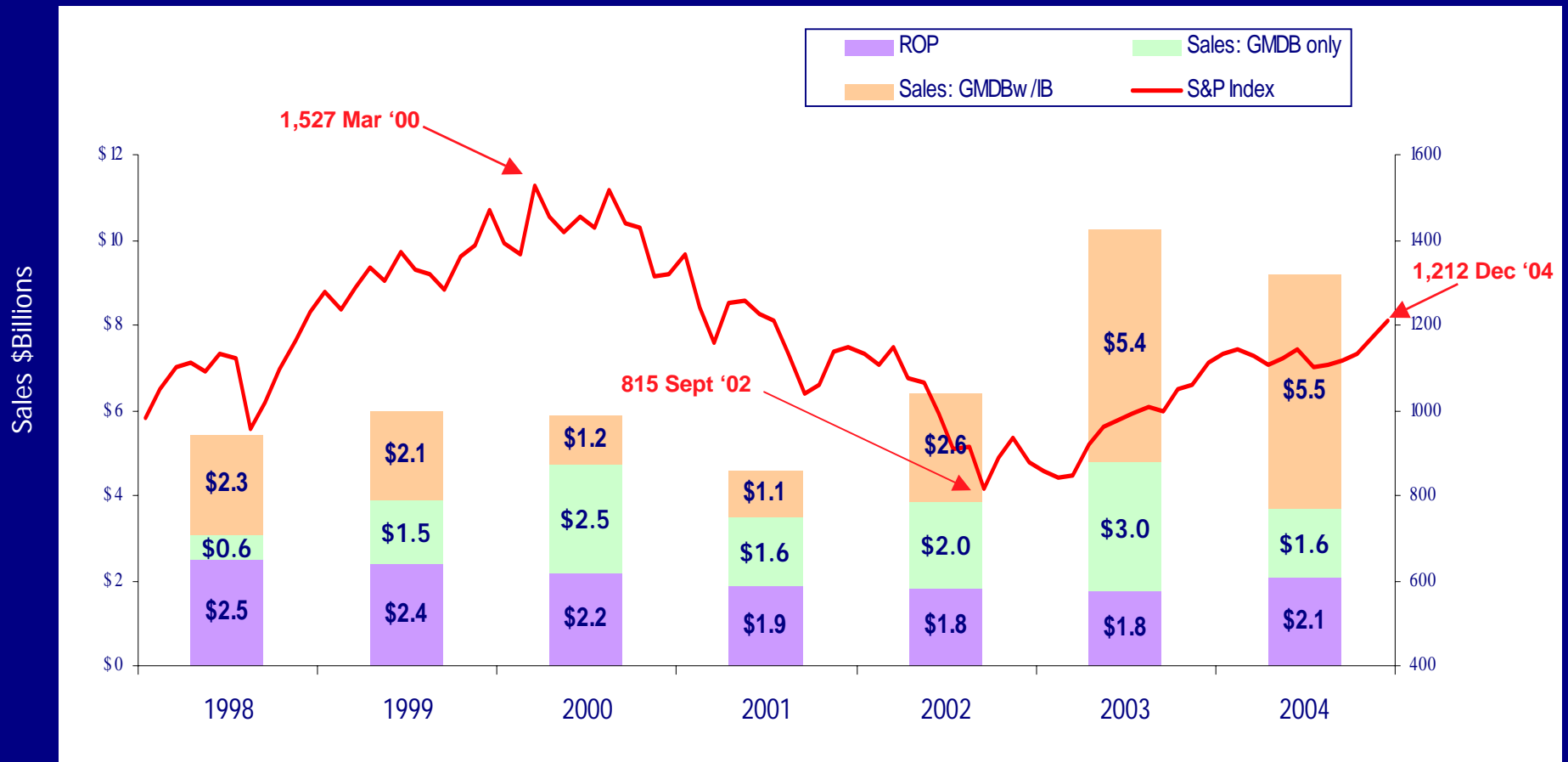
AXA Equitable

- Variable Annuities ⇒ 1984
- GMDB and GMIB ⇒ 1996
- GMWB ⇒ Q3'2004



Risk Management - Allows product continuity to market

AXA Equitable – Variable Annuity Sales



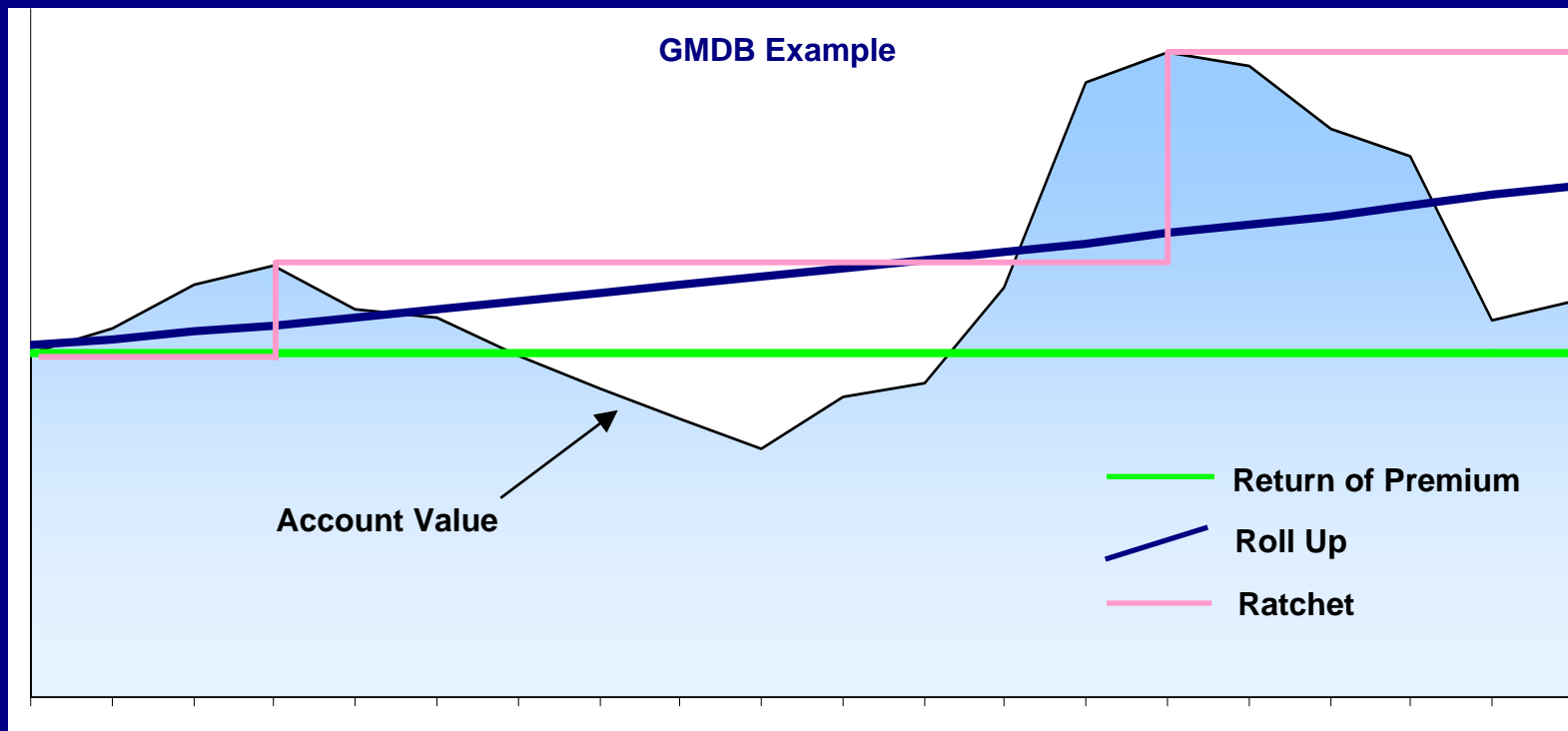
Variable Annuity Guarantees

- Variable annuities have sophisticated guarantees
 - **Guaranteed Minimum Death Benefit (GMDB)** – guarantees a flat or contractually increasing death benefit (return of premium, Roll-up and ratchet)
 - **Guaranteed Minimum Income Benefit (GMIB)** – guarantees a minimum income when annuitization option is elected
 - **Guaranteed Minimum Withdrawal Benefit (GMWB)** – guarantees principal and allows set percentage of withdrawal each year, even if account value is zero
- Guaranteed Benefits - Equity put options
 - Policyholder option value increases as the markets and policyholder account value decreases
 - Stochastic modeling used to value options
 - “Greeks” measure risk dimension of the option positions
 - Changes in option value due to market movement and policyholder behavior



GMDB – Death Benefit Options

- **Return of Premium:** higher of total premium or account value, adjusted for withdrawals
- **Roll-up:** premiums paid accumulated at guaranteed rate, adjusted for withdrawals
- **Ratchet:** highest account value at contract anniversary dates, adjusted for withdrawals
- **“Greater of” Ratchet or Roll-up:** greater of annual ratchet or roll-up amount



GMIB guarantees minimum annual income when annuitization option elected

- Guaranteed Minimum Income **Benefit** calculated based upon **Benefit Base**
- Benefit Base is not an annuity account value - only used to calculate guaranteed annual income if policyholder elects to annuitize after waiting period
- Benefit Base is the greater of 6% roll-up and annual ratchet, adjusted for withdrawals, up to certain attained age
- Benefit "in-the-money" when guaranteed benefit exceeds what Account Value could purchase at the then current interest environment

(\$000)

Purchased at Age 55			Annual Income at election (at various interest rate levels and Account Value)					
Age Male	Benefit Base *	Guaranteed Minimum Income Benefit	Age 65 AV	-150bps	-75bps	Current Rate		
						+75bps	+150bps	
55	\$ 100.0	\$0.0						
65	\$ 179.1	\$9.7						
70	\$ 239.7	\$14.2	145.0	9.7	10.4	11.2	12.0	12.8
75	\$ 320.7	\$20.5	134.5	9.0	9.7	10.4	11.1	11.9
			125.1	8.3	9.0	9.7	10.4	11.1
			116.8	7.8	8.4	9.0	9.7	10.3
			109.4	7.3	7.9	8.5	9.1	9.7

Guaranteed Annual Annuity at given age for \$100,000

GMIB "in-the-money" - Policyholder should elect

GMIB "out-the-money" - Policyholder should **not** elect



GMWB provides return of principal through periodic withdrawals over a number of years

- **Guaranteed Amount:** the value that will be returned over time through withdrawals is equal to the initial deposit or contract value at time of election, even if account value drops to zero
- **GMWB rider:** includes reset options in which the remaining guaranteed amount may be stepped up to the account value
- **Benefit payment amount:** equal to a pre-stated percentage, is maximum withdrawal that may be taken each year

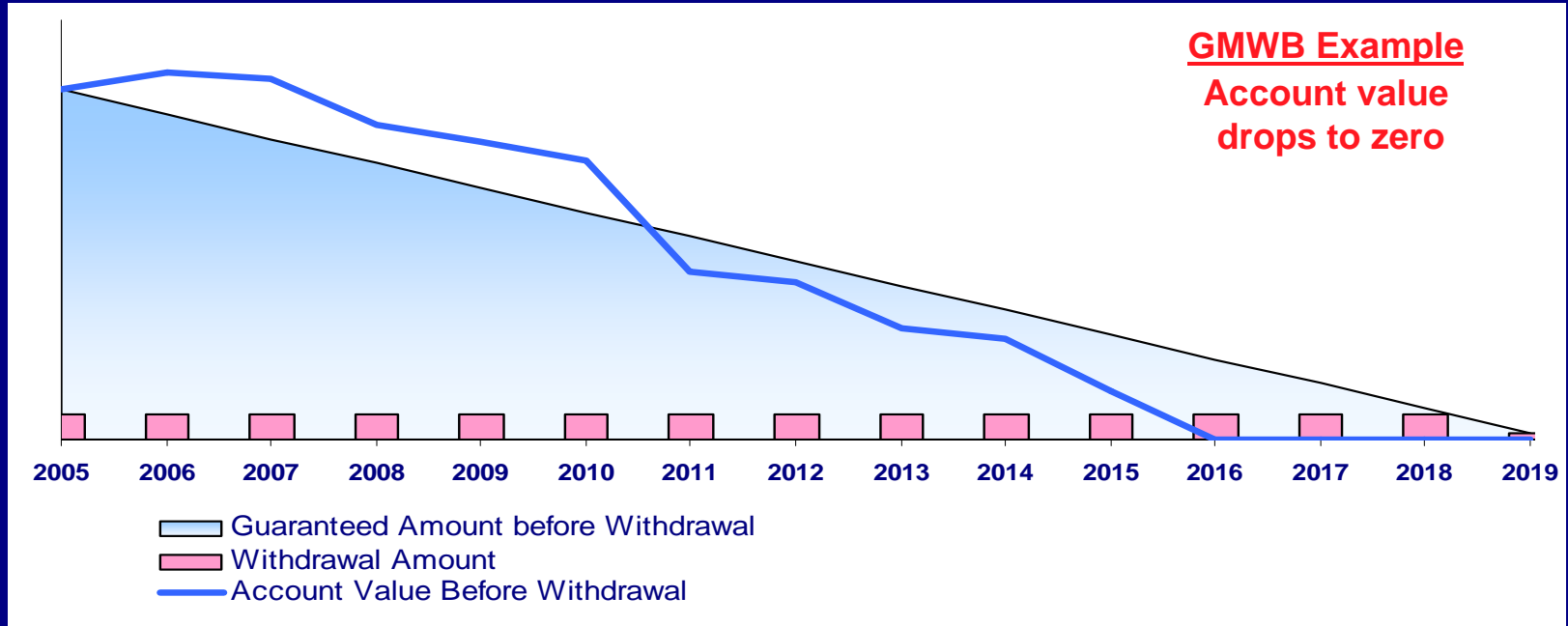


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Dynamic Hedging - Business Objectives

- Dynamic Hedging process designed to accumulate assets to meet future claims from policyholder options
- Isolate Dynamic Hedging as a “business”
 - Guaranteed benefits added to help sell variable annuities
 - Annual guaranteed benefit charges fund dynamic hedging program
- Mitigate economic exposure and P&L volatility
 - Accounting and economics should converge
- Dynamic Hedging assets consist of accumulated funds available to pay guaranteed benefit claims

$$\begin{array}{r} + \\ + \\ - \\ \hline = \end{array} \begin{array}{l} \textit{Policyholder charges} \\ \textit{gain/(loss) on Futures} \\ \textit{accumulated interest} \\ \textit{claims paid} \\ \\ \textit{change in aggregate value of benefits} \end{array}$$



The “Greeks” measure sensitivity of option to changes in markets

- DELTA: Rate of change of the option price with respect to underlying fund value
 - Delta hedge equity exposure with exchange traded futures
- VEGA: Rate of change of the option price with respect to volatility
 - AXA uses a constant level of 95th percentile volatility for option pricing; reduces the probability the economic liability could exceed the option value
- RHO: Rate of change of the option price with respect to interest rates
 - Interest rates impact the value of GMIB guarantee - Hedge this exposure using US Treasury futures



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Market Risk - Volatility Sensitivity

	Current Charge (bps)	Estimated Hedge costs (bps) at Equity volatilities of :			
		15%	22%	26%	32%
Accumulator '04					
GMDB Annual Ratchet	25	6	12	20	26
Greater of Ratchet & 6% rollup	60	41	46	50	54
GMIB Greater of Ratchet & 6% rollup	65	20	32	40	50
GMDB & GMIB sold together					
Greater of Ratchet & 6% rollup	125	66	80	92	104
GMWB 7% Withdrawal Option	50	10	34	52	79
Representative Volatility Level of:		LT 60th Percentile	1 yr ended 6/30/03	LT 95th Percentile	LT 99th Percentile
Wgt avg of S&P500, Russell & Nasdaq volatilities of:		14%, 16%, 18%	22%, 21%, 27%	23%, 30%, 46%	29%, 33%, 52%

- Hedge program assumes 95th percentile level of volatility
 - Realized equity volatility since inception: S&P 11%, Russell 19%, Nasdaq 20%, corresponding to weighted average volatility of approx. 15%
- GMIB election rate 5% / 10% / 15%
 - (Corresponds to “In-the-money” % of: 0%-20%, 20%-50%, greater than 50%)
- GMWB dynamic utilization rate (equivalent to flat 60%)



Market Risk – Basis (1/2)

- Basis risk: Performance mismatch between underlying funds within VA's and basket of futures indices
- Separate Account funds modeled into indices
 - Regression techniques replicate funds to indices with very liquid futures markets
 - Each policy, given its fund allocation, is modeled into market indices
 - Funds correlation re-evaluated on regular basis
- Optimization of funds modeling produces good correlation
 - Weighted average R was 91% for 2004



Market Risk – Basis (2/2)

- 1992 – 2003 Actual Market Performance - GMBD Ratchet
- \$1 billion of sales

<u>Year</u>	<u>Basis</u>	<u>Volatility</u>	<u>Net</u>
1	0.3	0.3	0.6
2	(0.4)	0.9	0.5
3	(0.1)	0.5	0.4
4	(0.1)	0.5	0.4
5	(0.2)	0.4	0.2
6	(0.1)	(0.0)	(0.1)
7	(0.2)	0.5	0.3
8	0.3	(1.1)	(0.8)
9	(0.2)	(0.6)	(0.8)
10	(0.9)	(0.1)	(1.0)
TOTAL	(1.6)	1.3	(0.3)

- Back testing shows basis risk amounts to \$1.6 million over 10 years
 - Based on AXA Equitable experience to date and back testing, basis risk is immaterial
 - Regular adjustment to funds mapping captures performance difference and style drift



Market Risk - Interest rate sensitivity during Japan scenario

- Japan scenario – Depressed equity and interest rate performance
 - Equities perform well in early years, setting guarantees at high levels (effect of annual ratchet). Then severe bear market, followed by several years of flat / negative equity returns
 - Interest rates decrease from about 5% to below 2% after the GMIB waiting period, when policyholders can elect to annuitize
 - Simulation uses 95th percentile volatility levels
- Simulation shows hedging program results in a gain of \$6m versus a loss of \$155m without hedging



Japan Scenario – GMDB & GMIB

- Max of ratchet & 6% rollup GMDB & GMIB - \$1 billion of sales
- Gain/Loss does not include base product profitability

\$mil	<u>Market Environment</u>			Futures <u>Gains</u>	Actual <u>Claims</u>	Actual <u>Premiums</u>	<u>Gain / (Loss)</u>	
	<u>Equity Returns</u>	<u>Treasury Rate</u>	<u>Year</u>				<u>Hedged</u>	<u>Unhedged</u>
		5.0%	0					
	43%	5.4%	1	(44)	(0)	10	2	46
	15%	5.2%	2	(15)	0	13	3	18
	40%	4.6%	3	(33)	(0)	15	3	36
	29%	5.7%	4	(25)	0	19	4	29
	-39%	6.5%	5	61	(5)	22	(6)	(67)
	-6%	5.4%	6	19	(8)	21	3	(17)
	-22%	4.8%	7	59	(11)	19	(4)	(63)
	-2%	3.3%	8	29	(11)	18	6	(23)
	15%	4.6%	9	(40)	(10)	16	3	44
	1%	3.1%	10	30	(12)	15	(1)	(32)
	0%	2.8%	11	13	(47)	13	3	(10)
	-22%	1.9%	12	66	(55)	10	(3)	(69)
	-7%	2.2%	13	8	(53)	8	(3)	(12)
	27%	1.7%	14	(11)	(38)	6	3	14
	-20%	1.6%	15	19	(31)	5	(1)	(20)
	-28%	1.4%	16	19	(31)	4	(2)	(21)
	-19%	0.9%	17	10	(28)	3	(2)	(12)
	19%	1.4%	18	(4)	(24)	3	(1)	3
TOTAL				162	(364)	221	6	(155)



Policyholder Risk - GMIB Election Rate

- Estimated cost is stable at various election rates for Greater of Ratchet & 6% rollup benefit (Max)

Election Rates	Cost in bps Max product	
	GMIB Only	DB/IB
5/10/15	40	92
5/20/30	48	92
10/20/40	49	91
Flat 10	34	88
Flat 20	43	88

Assumes 95th percentile volatility

- AXA Equitable election rate experience is limited to one year of election activity
 - Election rates to date 1.5% / 2% / 8%



Policyholder Risk - GMWB Election Rate

- GMWB – 7% withdrawal product
 - GMWB more sensitive to policyholder behavior than other benefit types

Election Rates in %	GMWB only
Dynamic*: Approx. 60% utilization	52
Flat 5% = 71% utilization	65
Flat 7% = 100% utilization	99

Assumes 95th percentile volatility

* Dynamic Utilization Rate:

Account Value / Guaranteed Withdrawal**	Utilization
100% to 75%	36%
75% to 55%	83%
55% to 0%	100%



** Guaranteed Withdrawal is the initial premium less prior withdrawals, adjusted for resets as appropriate. Dynamic assumption is equivalent in cost to a flat 60% utilization.

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Conclusion

- Strong risk management program essential to address exposure
 - VA products have become more complex
- AXA addresses risk dimensions (delta, vega and rho)
- AXA shares risk management expertise across AXA Group
 - AXA Financial → AXA Japan Variable Annuity



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