Asset Pricing

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Financial Instruments: Why do we need them?

To construct a hedging strategy:

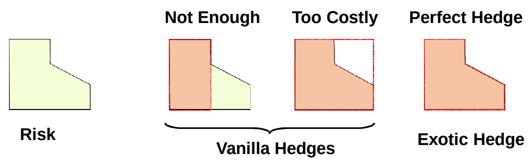
- Protection against an increase or decrease of prices
- Protection against an increase or decrease of interest rate

What about speculation and arbitrage ?

Risk Management

Client has risk exposure

Buys a product from a bank to limit its risk

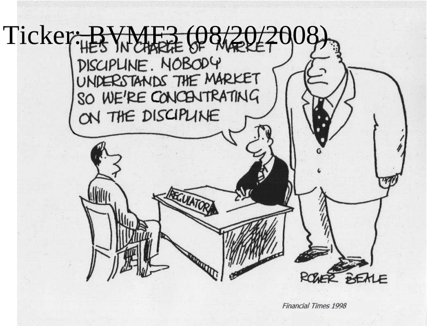


Client transfers risk to the bank which has the technology to handle it

Product fits the risk

Regulators

- Ticker: BVMF3 (08/20/2008)



Pricing Example

- Example: Earthquake Insurance

Payoff Table

Earthquake Insurance

Richter	damage	Return
0 - 4.9	nothing	$ 0
5.0 - 5.4	soft	750
5.5 - 5.9	small	10,000
6.0 - 6.9	medium	25,000
7.0 - 8.9	Large	50,000

Expected Return

- Insurance Return: $(X_1, X_2, \ldots, X_j, \ldots, X_n)$
- Historical Probabilities: $(Q_1, Q_2, \ldots, Q_j, \ldots, Q_n)$

$$0 \le Q_j \le 1 \text{ for all } j$$
and
$$Q_1 + Q_2 + \ldots + Q_j + \ldots + Q_n = 1$$

Expected Return $= Q_1X_1 + Q_2X_2 + \ldots + Q_jX_j + \ldots + Q_nX_n$

Alternatively: $E(X) \equiv \Sigma_j Q_j X_j$

Present Value: r=5%

Historical Probability × Risk Aversion Adjustment =Risk Neutral Probability

Richter Escale	damage	Return	Probability Historical		Adjust Risk Neutral		Probability Risk Neutral	Expect Return Risk Neutral
0 - 4.9	nothg	$ 0	.850	×	.9939	=	.845	0
5.0 - 5.4	soft	750	.100	×	.9976	=	.100	75
5.5 - 5.9	small	10,000	.030	×	1.0472	=	.031	310
6.0 - 6.9	medium	25,000	.015	×	1.1430	=	.017	425
7.0 - 8.9	large	50,000	.005	×	1.3787	=	.007	350
							Expected Future Value:	$1,160

$\Sigma_j P_j X_j = .845(0) + .100(750) + .031(10{,}000) + .017(25{,}000) + .007(50{,}000) = 1{,}160$

Present Value: $1,160/1.05 = $1,104.76

Arbitrage Opportunities

A ***Arbitrage Opportunity*** exists if and only if:

- Two portfolios can be constructed with identical returns, but with different costs.
- Two portfolios can be constructed with equal costs but with different returns.

Fundamental Theorem of Asset Pricing

"Risk Neutral Probabilities exist if and only if there is no arbitrage opportunities"

Pdf2.

Final Thougth

"Derivatives are financial weapons of mass destruction..." Warren Buffet

- Do we need derivatives?
- Regulation
- Legal vs Moral