

# **Creating Synthetic Bonds with Equity Options**

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**Pilgrim Baxter Analytic Investors**

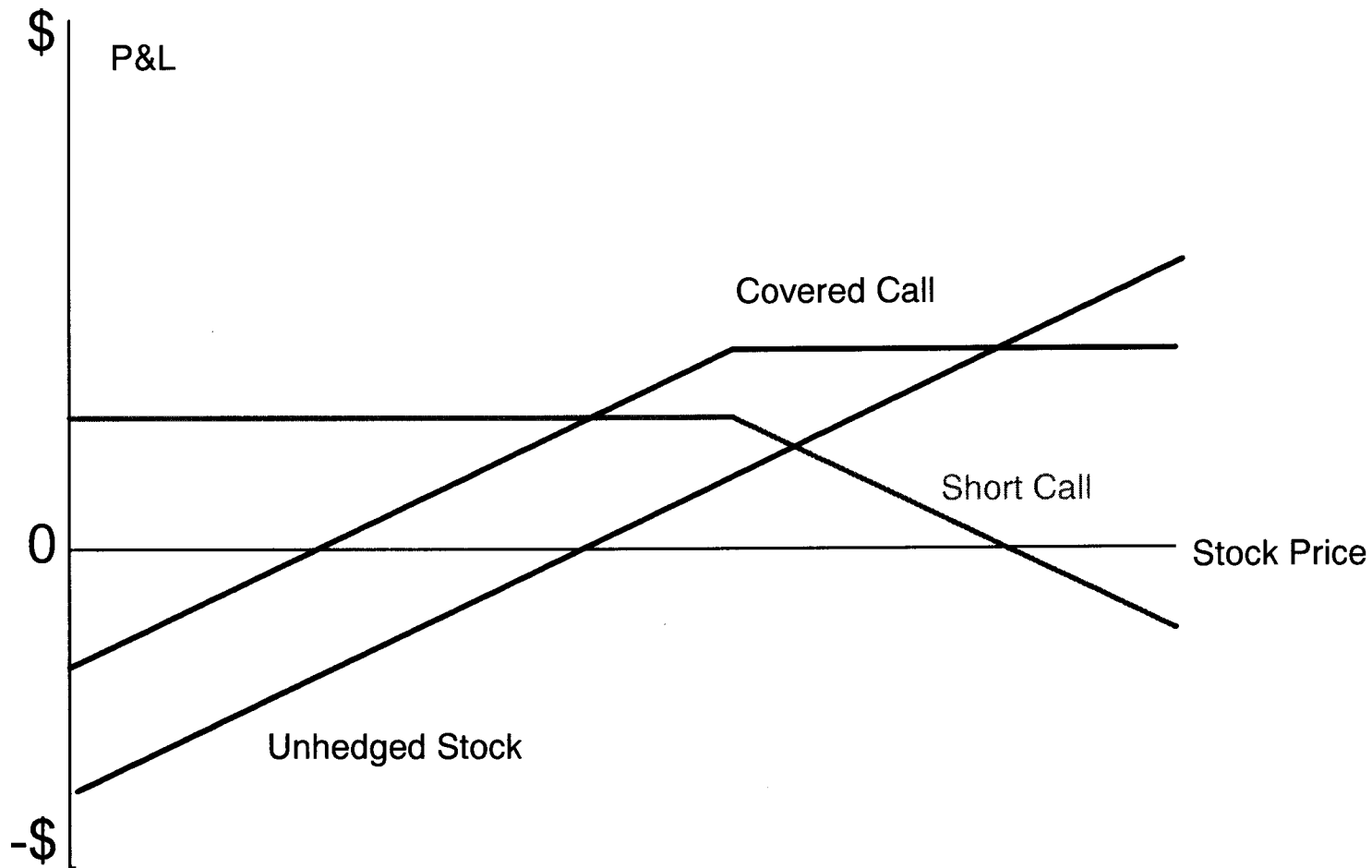
**Bob Bannon, Managing Director**

# Traditional Methods of Fixed Income Analysis

- ☞ Take directional risk
  - rate forecasting/duration management
- ☞ Take quality risk
  - credit analysis
- ☞ Take foreign risk
  - country risk analysis/currency forecasting
- ☞ Take contingent claim risk
  - embedded/explicit option valuation

# A Review of Covered Calls

Sell call options while owning the associated stock



# Traditional Interpretations of a Covered Call

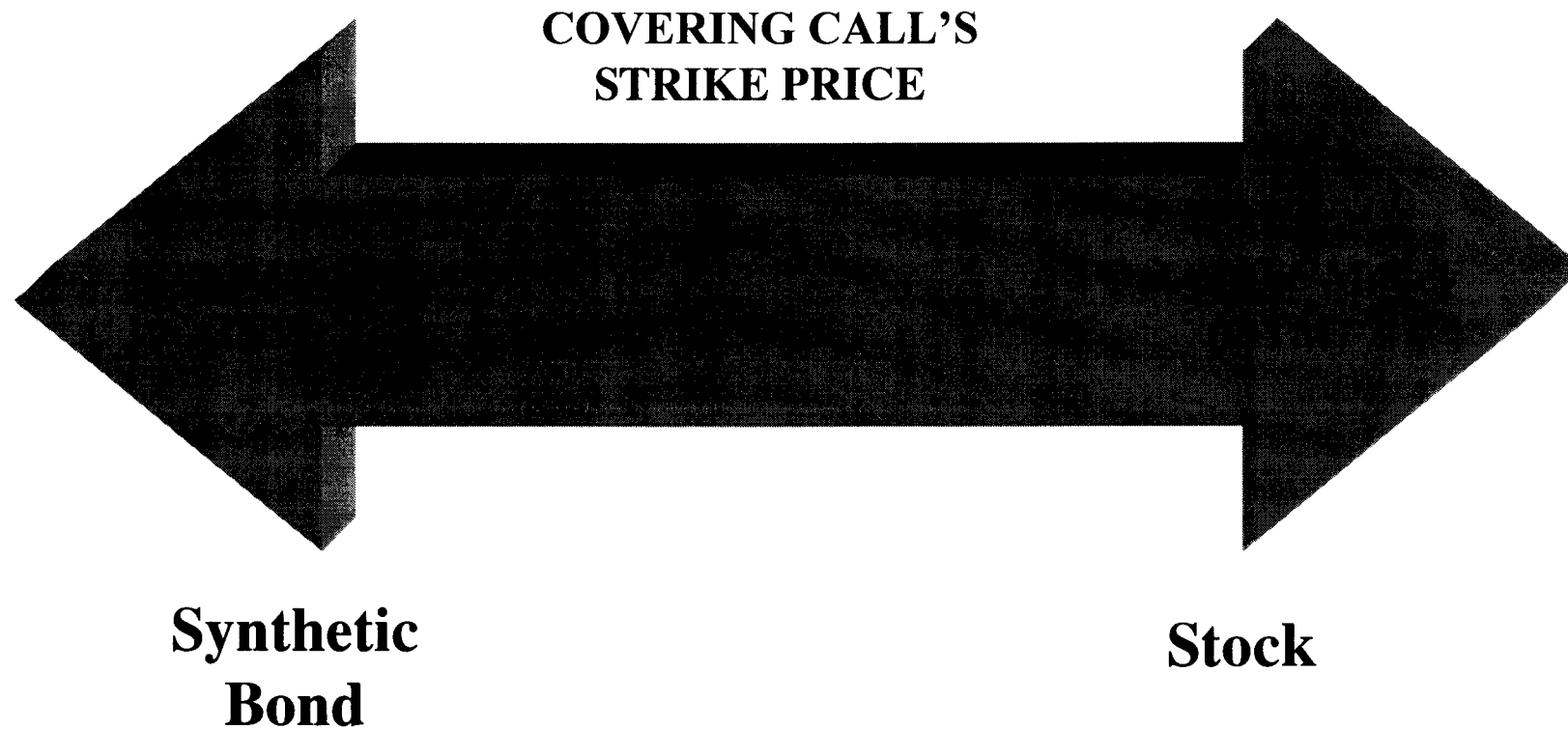
**Income Enhancement**



**Protection against Declining Prices**



# A Unified View of a Covered Call



# A Formula for Valuing a Covered Call

Typical Black-Scholes Option Pricing Formula:

$$C = SN(d_1) - Xe^{-rT} N(d_2)$$

$$d_1 = \frac{LN\left(\frac{S}{X}\right) + \left(r + \frac{\sigma^2}{2}\right)}{\sigma\sqrt{T}} \quad d_2 = d_1 - \sigma\sqrt{T}$$

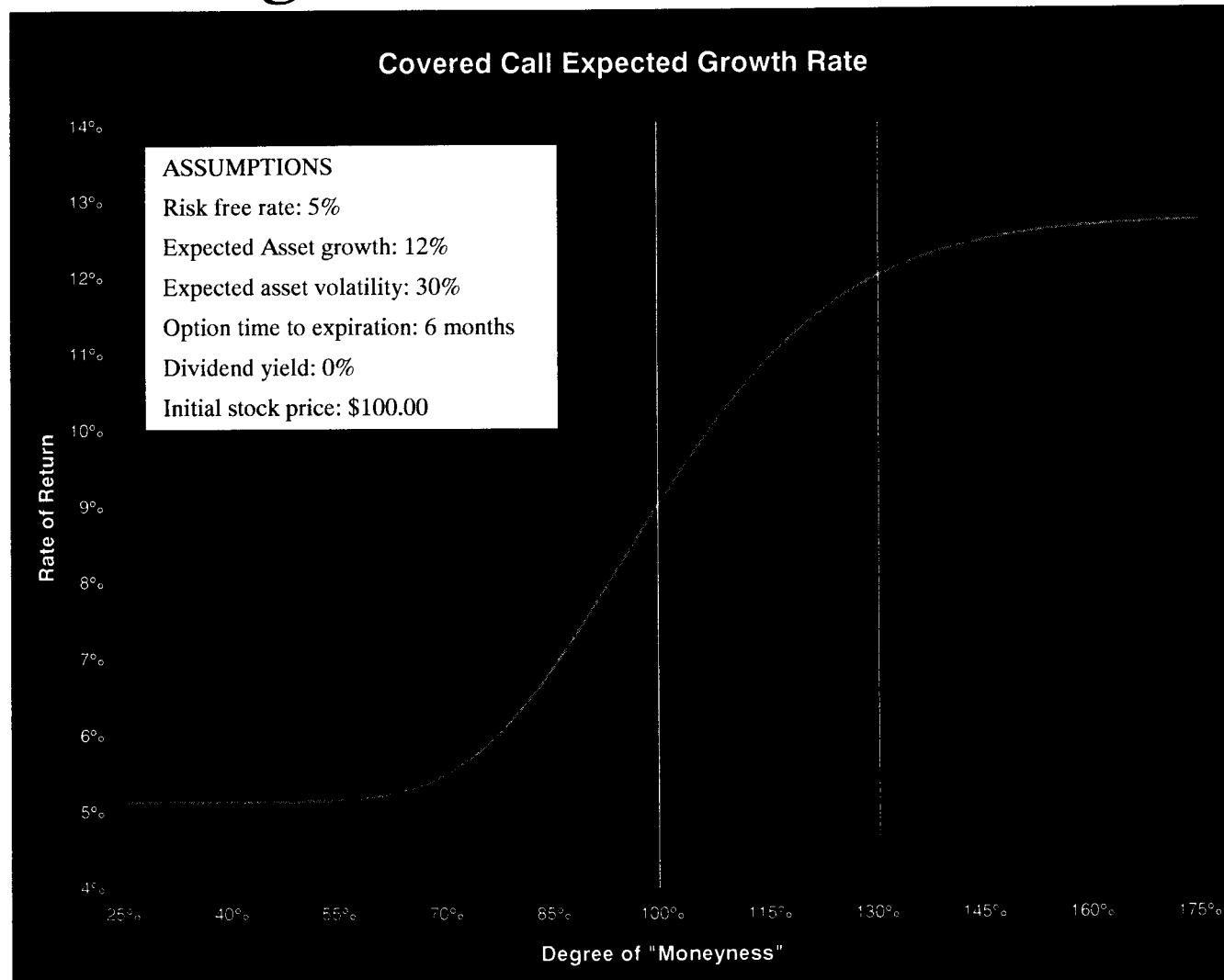
# A Formula for Valuing a Covered Call

**Black-Scholes-Based Covered Call Valuation Formula:**

$$G = LN\left(\frac{X}{S - C}\right) + \sigma\sqrt{T} \left\{ Z(1 - N(Z)) - \frac{e^{-Z^2}}{\sqrt{2\Pi}} \right\}$$

$$Z = \frac{LN\left(\frac{S}{X} + \mu T\right)}{\sigma\sqrt{T}}$$

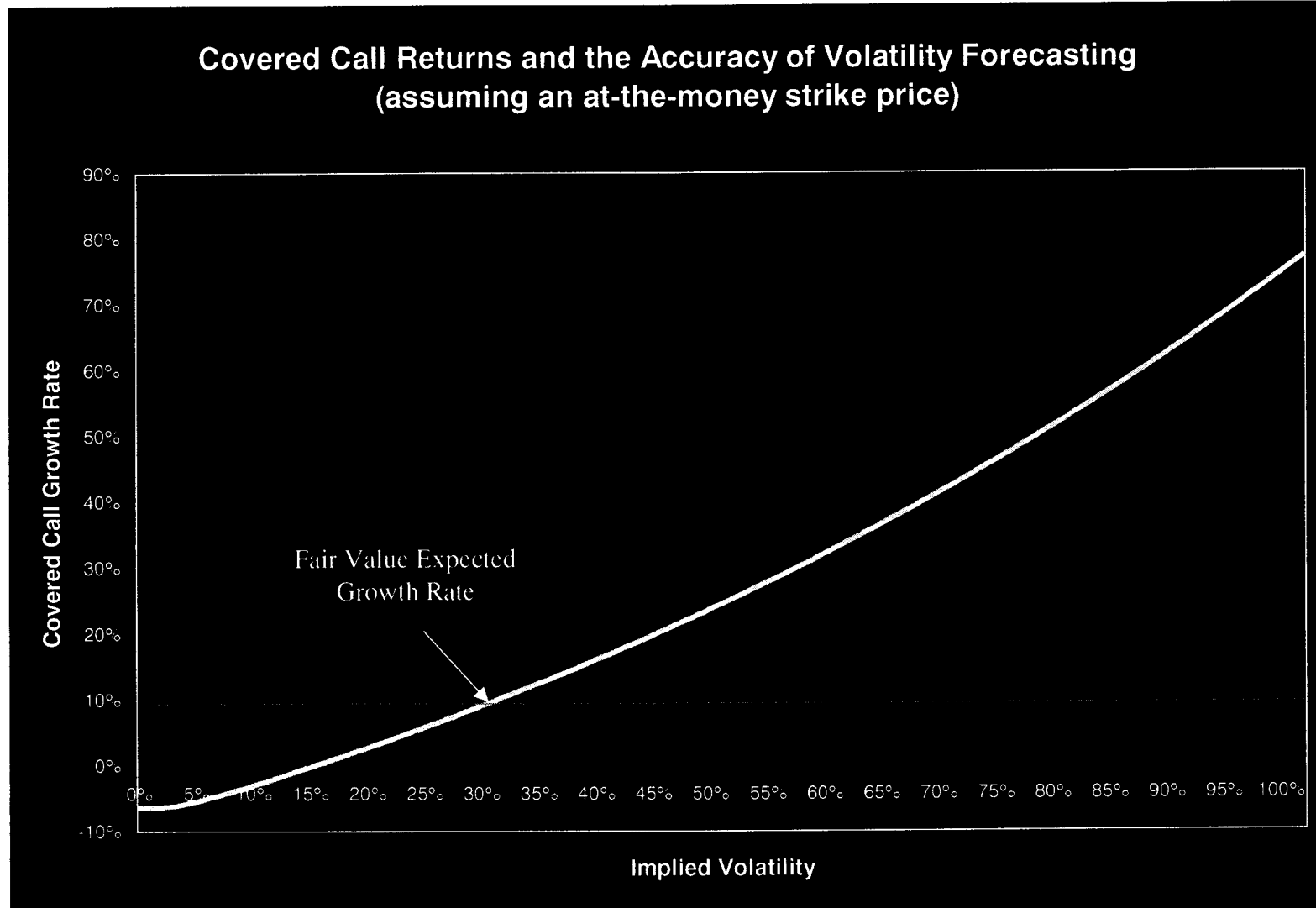
# Using the Covered Call Formula



***Conclusion: varying the covered call strike provides returns varying from riskless rate → bonds → stocks → enhanced stock***



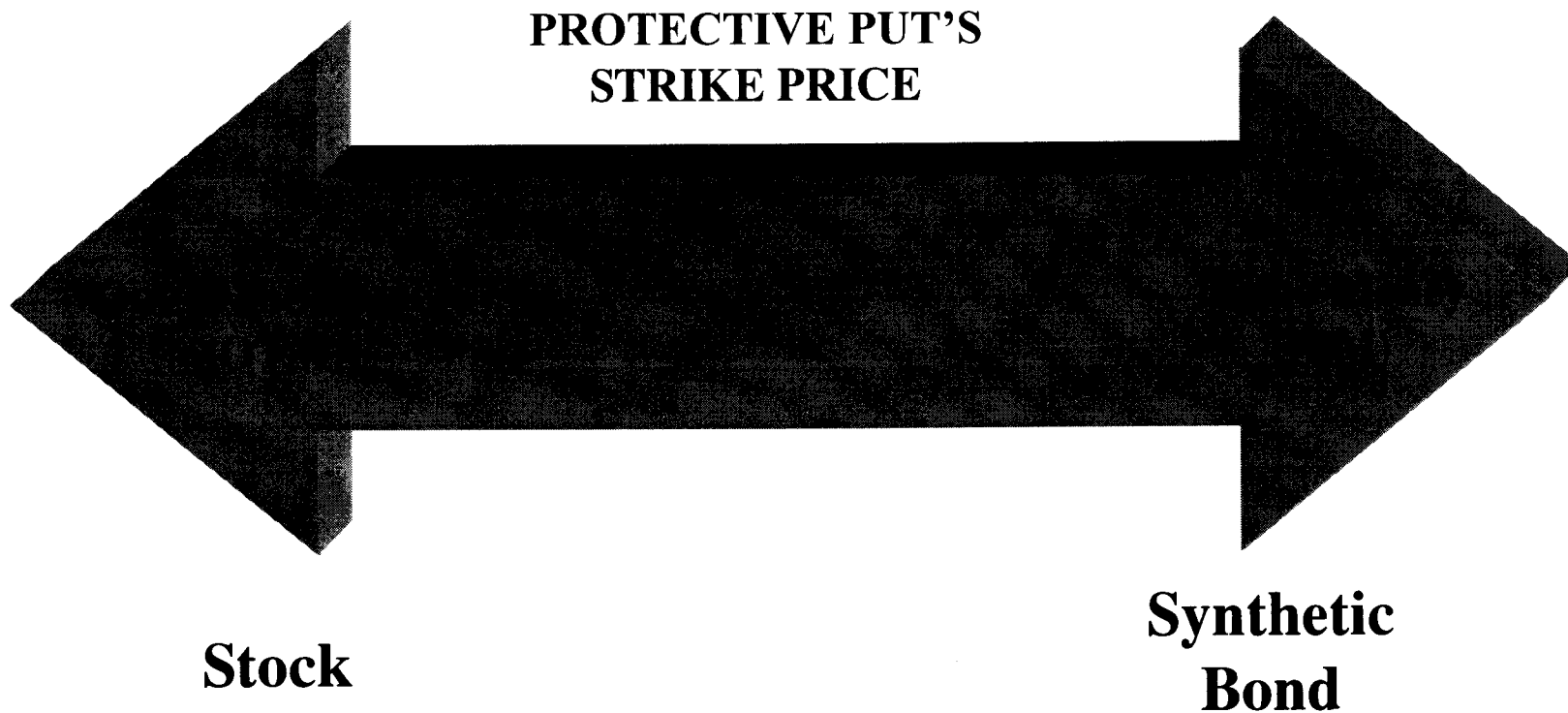
# Adding Value Through Volatility Forecasting



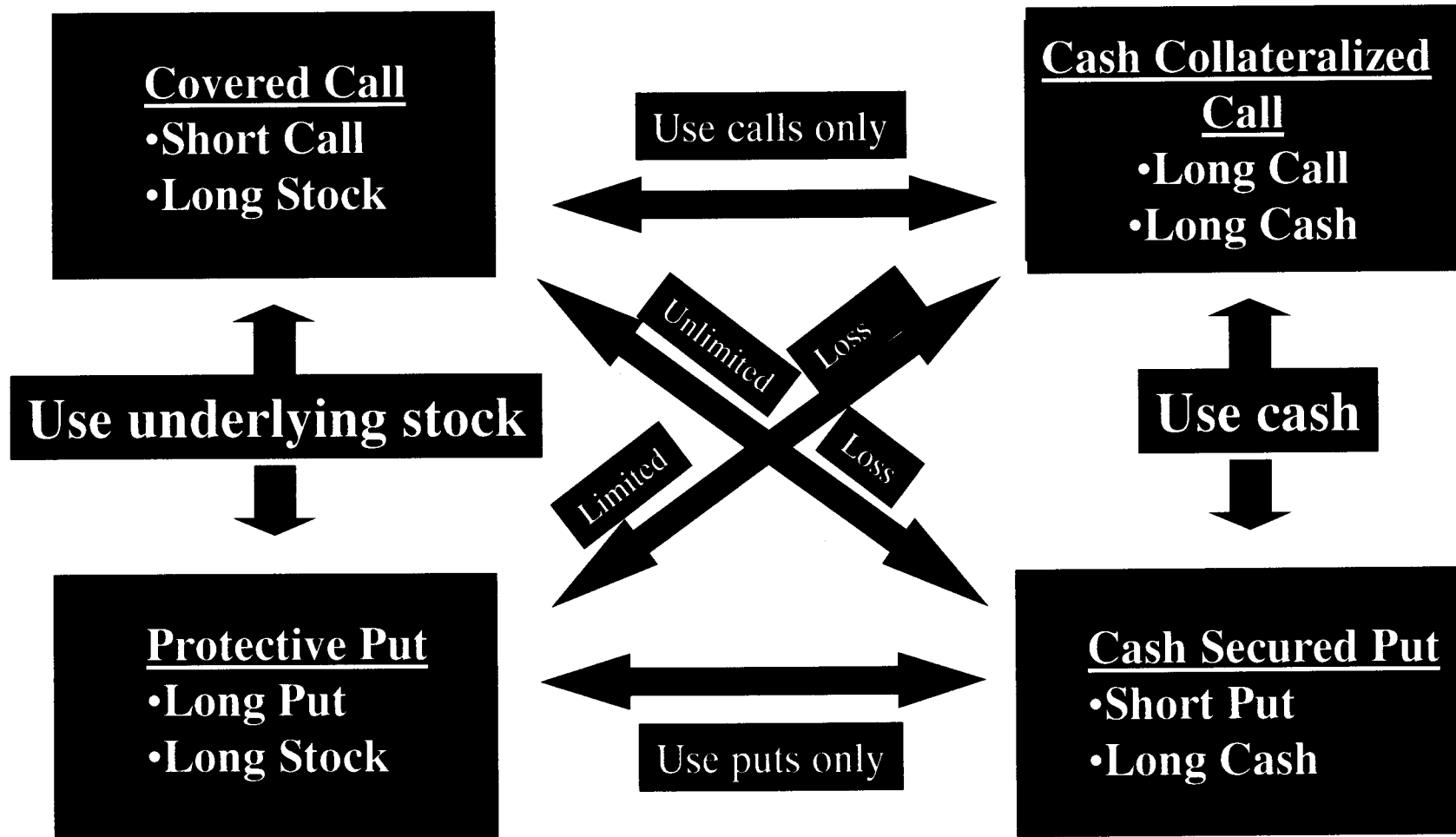
***Conclusion: an accurate forecast of actual volatility well below current implied volatility yields returns in excess of fair value.***

PILGRIM BAXTER ANALYTIC INVESTORS

# The Same Logic Holds for Protective Puts



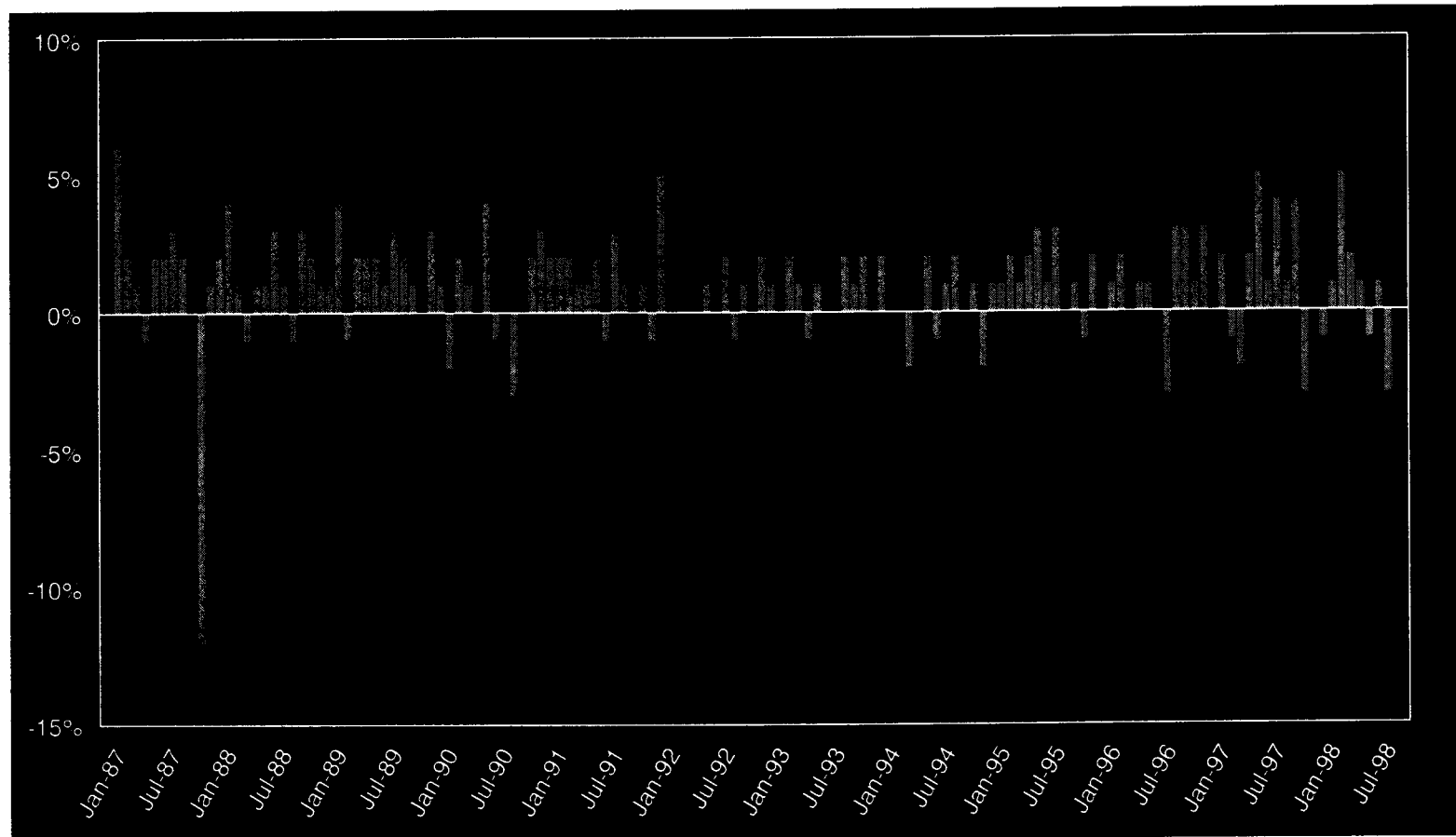
# Using Put-Call Parity



*Conclusion: All option combos can create synthetic bonds*

# A Decade of Actual Implementation

## Analytic Investor's Synthetic Fixed Income Program



# Sensitivity to Major Markets of a Synthetic Bond Portfolio

<b>Market</b>	<b>Correlation</b>	<b>Beta</b>
Stock Market	87%	42%
LB Govt/Corp.	21%	32%
US Dollar	13%	32%
EAFE	59%	26%
VIX Index	-58%	-30%

# Practical Issues When Creating a Synthetic Bond Portfolio with Options

- ☞ Efficient search algorithms needed - more than 250,000 option combos exist
- ☞ Program volatility may be too high - dilute with traditional fixed income
- ☞ Alternative uses
  - Create callable synthetics
  - Perform arbitrage against convertibles