

Fund Investment Strategy: *A New Paradigm*

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Introduction

- The New Paradigm refers to a new way to think about, to organize, and to implement investment strategy.
- It builds from the traditional need to balance the desire for reward with the concern for risk, but **it introduces new investment technology to manage that balance more efficiently.**

Introduction (2)

- A fund investment strategy will be outlined that rationalizes the dual objectives of (1) higher fund returns, and (2) assured fund-liability coverage.
- The objective of the strategy is to maximize fund expected return while simultaneously assuring at least a pre-specified level of minimum return.

A Basic Example

- A planned project requires an outlay of 1000 million yuan 5 years from now.
- If the 5-year interest rate were 7.4%, this liability could assuredly be funded today for 700 million yuan.

A Basic Example (2)

- Now, assume an actively managed stock portfolio has an expected return of 14.8%, but its actual return is uncertain.
- At 14.8% return, the 1000 million yuan liability could be funded with only 500 million yuan -- -- a potential saving of 200 million yuan from the assured level of 700 million yuan.

A Basic Example (3)

- However, if the stock portfolio returned only zero percent, the liability would cost 1000 million yuan – 300 million more than the assured level of 700 million yuan.
- Question: What are the policy makers' investment strategy choices, and what are their risk implications?

Strategy Choices

- Traditional I – Choose a fixed percentage mix of actively managed stocks and bonds.
- Traditional II – Add active management of the stock/bond mix as well.
- These strategies benefit from successful active management, **but they introduce substantial managerial and market risk.**

Strategy Choices (2)

- The New Paradigm introduces optimal dynamic stock/bond asset allocation.
- The strategy is “optimal” in the sense of maximizing expected return while simultaneously assuring at least a pre-specified minimum return.
- The “dynamics” are governed by the options “replication” principles of Black-Scholes-Merton (BSM) – no market timing! And, no options!

Bonds and Stocks in the New Paradigm

- The bond portfolio is constructed to “immunize” the liability.
- The stock portfolio is fully actively managed.
- The stock/bond mix is adjusted through time responding to actual stock returns.

The *New Paradigm* and Options Theory

- The *New Paradigm's* asset allocation dynamics are governed by the option “*replicating*” theory implicit in BSM.
- “The investment result of any portfolio of stock plus option can be “*replicated*” using only the stock, a bond, and the BSM dynamic asset allocation strategy –
no options are needed!”

The *New Paradigm* and Options Theory (2)

- The *New Paradigm's* asset allocation dynamics “**replicate**” the investment result of a stock portfolio protected by a Put option.
- In actual implementation, the New Paradigm employs only a stock portfolio, a bond portfolio, and the BSM determined dynamic asset allocation. **No options!**

Maximizing Expected Return

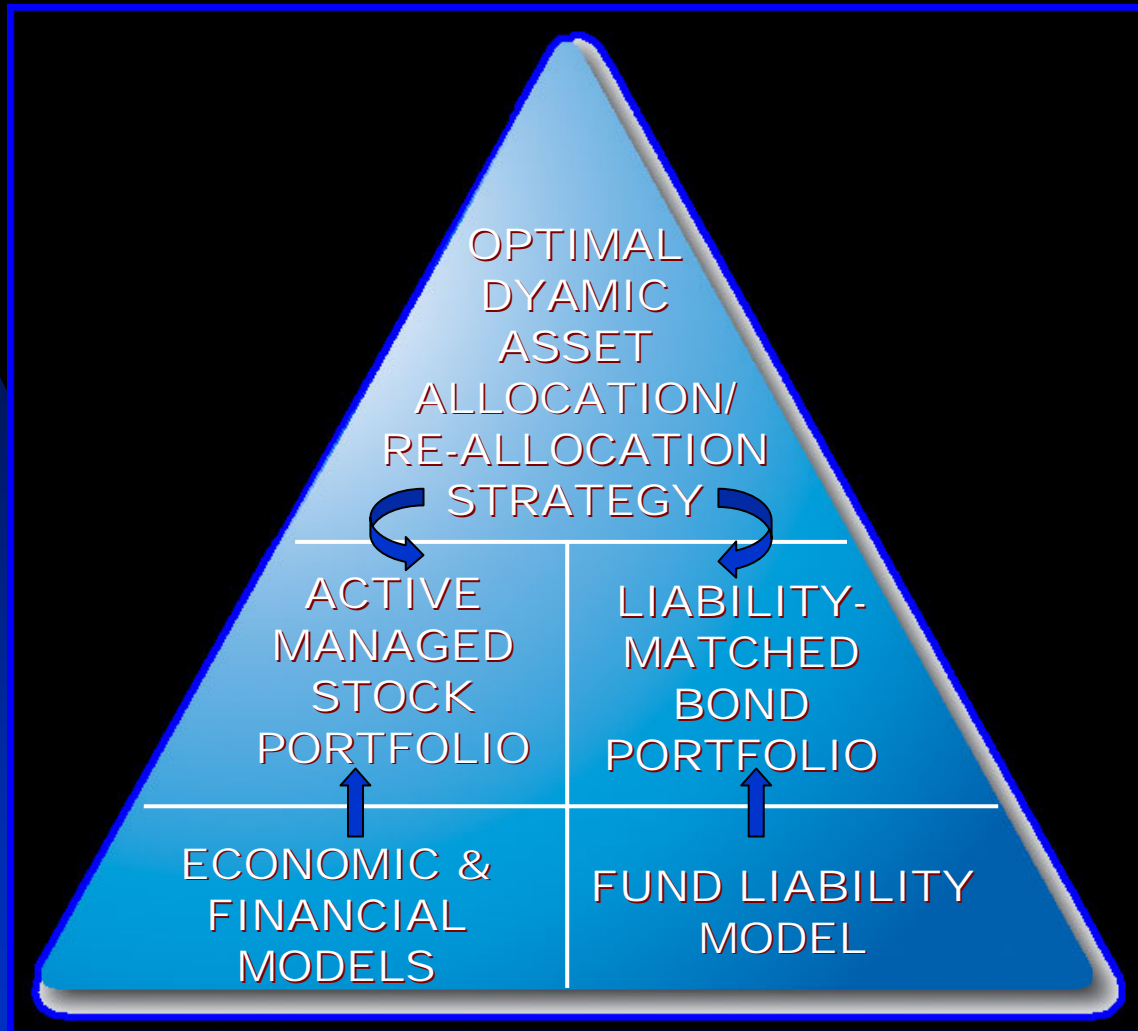
- The attraction of the *New Paradigm* is that it offers the highest expected return of any strategy that simultaneously assures at least a pre-specified minimum return.
- This “maximization” principle is implicit in Black-Scholes-Merton, and was proven by Professor Hayne Leland, U.C. Berkeley.

Implementing The *New Paradigm*

- First, the policy maker chooses the minimum acceptable strategy return.
- Second, the investment professionals construct the immunizing bond portfolio, and the active stock portfolio.
- Third, the financial engineers calculate the implicit bond interest rate, and the relative stock/bond volatility.

Implementing The *New Paradigm*

- Fourth, the optimal initial fund allocation to the stock and bond portfolios is determined from BSM.
- Fifth, the subsequent optimal stock/bond re-allocation is determined by the stock performance relative to the bond portfolio, and BSM.



Dynamic Fund Management

The *New Paradigm* – Applications

- Funding long term public and private projects
- Funding pension and health programs
- Funding insurance programs
- Managing mutual funds
- Managing personal savings programs

Implementation Risks

- Higher than predicted trading and market impact costs reduce return.
- Higher than expected stock/bond relative volatility also reduces return.
- Major market discontinuities could prevent optimal stock/bond reallocations.

The New Paradigm's Examples

- Use CHSH 180 index as Stock
- Use one year Treasury Bond
- **Scenario 1**, allocate asset dynamically for a whole year
- **Scenario 2**, Split the dynamic asset allocation into two half years

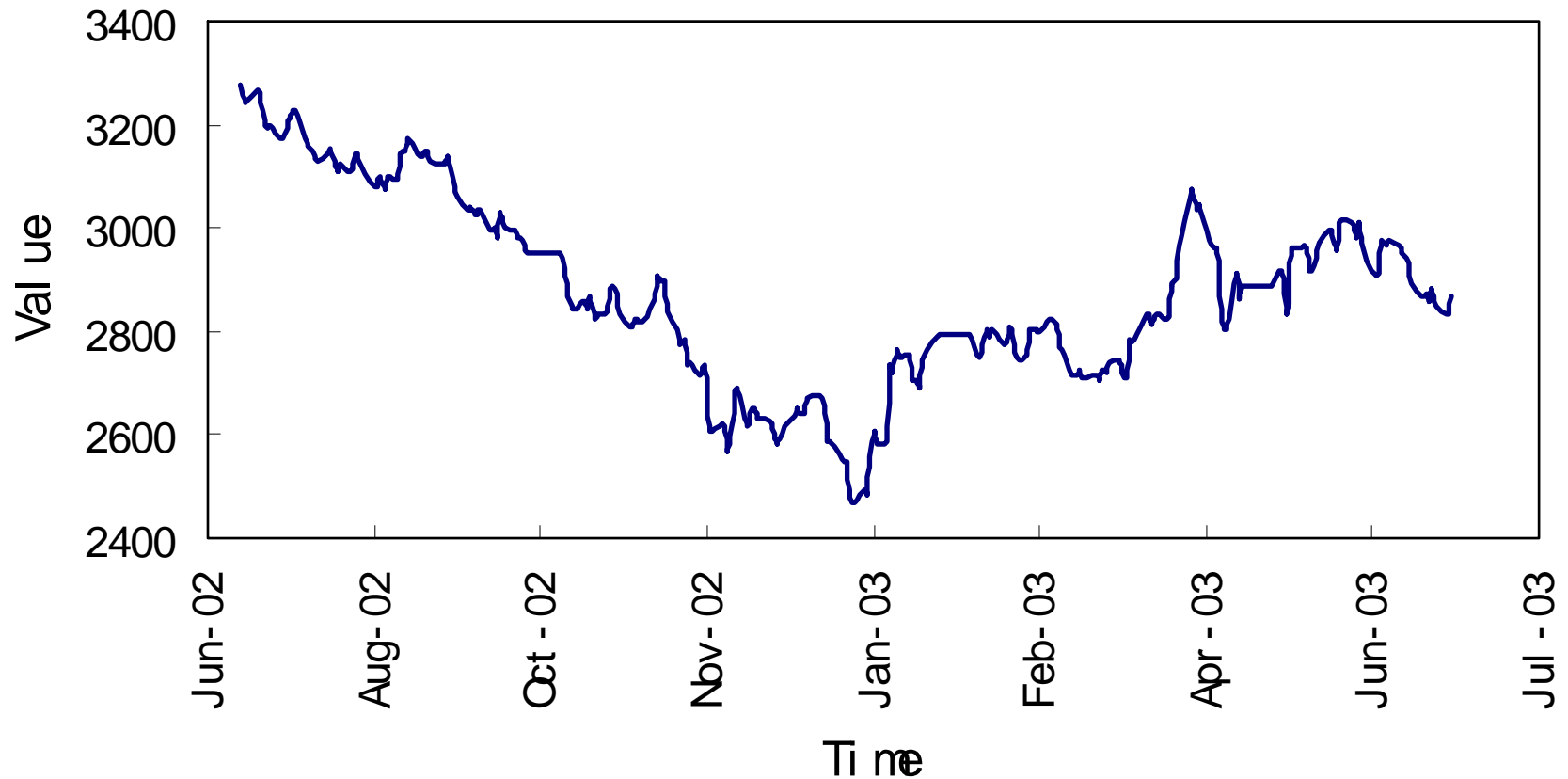
Initial Condition

1 year Treasury rate (beginning at Jul. 3,2002)	2%
CHSH180 Index (Jul. 3,2002)	3279
Volatility for CHSH180 Index	17.6%
Initial Asset	100
Floor (the smallest amount money one can bear after one year)	90

The New Paradigm's Examples (2)

Scenario 1

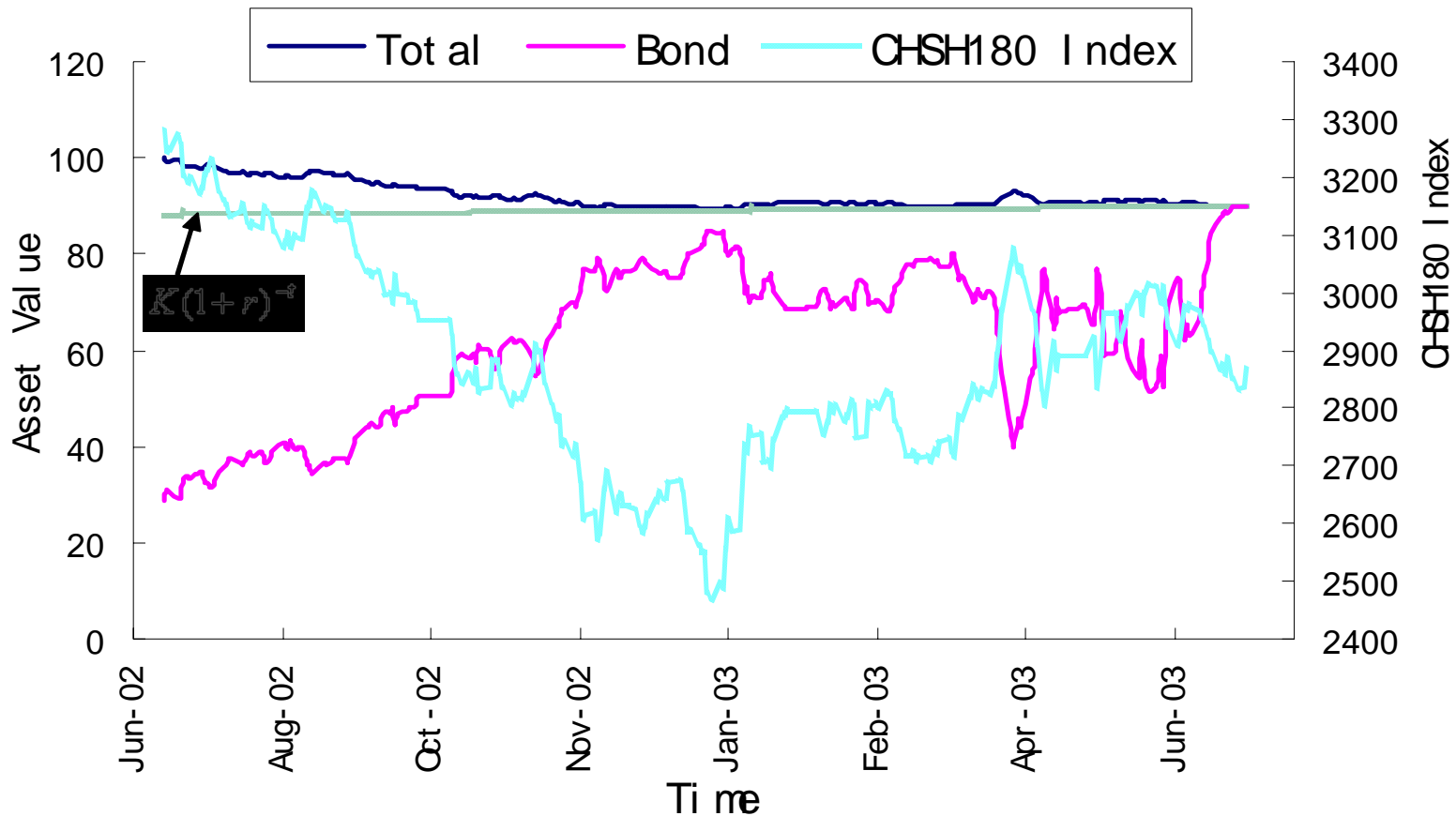
CHSH180 Index for the whole year (Jul.03,02 - Jul.02,03)



The New Paradigm's Examples (3)

Scenario 1

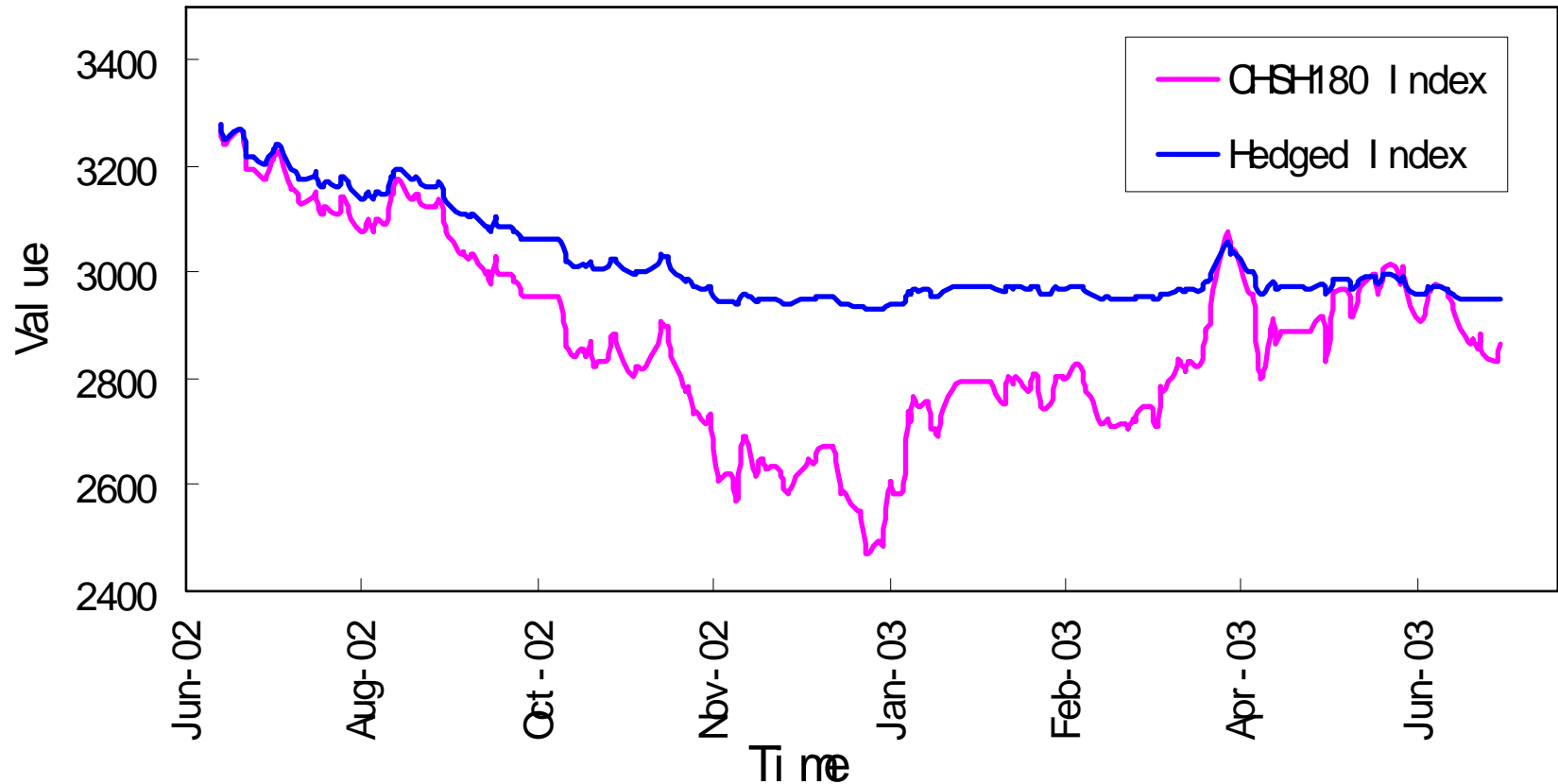
Evolution of Dynamic Asset Allocation for a Whole Year



The New Paradigm's Examples (4)

Scenario 1 with Hedge

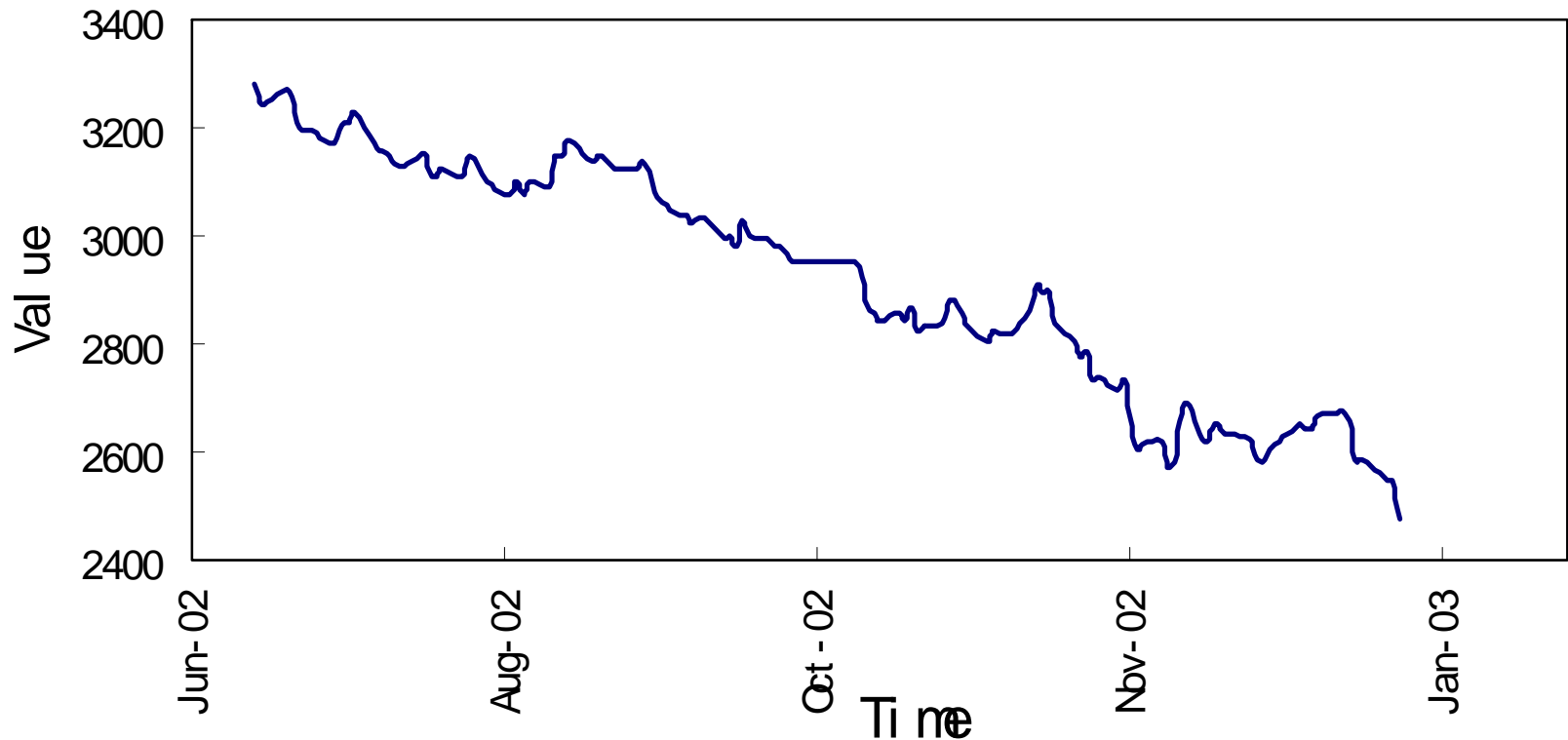
CHSH180 Index and Dynamically Hedged Index for the year
(Jul.03,02 - Jul.02,03)



The New Paradigm's Examples (5)

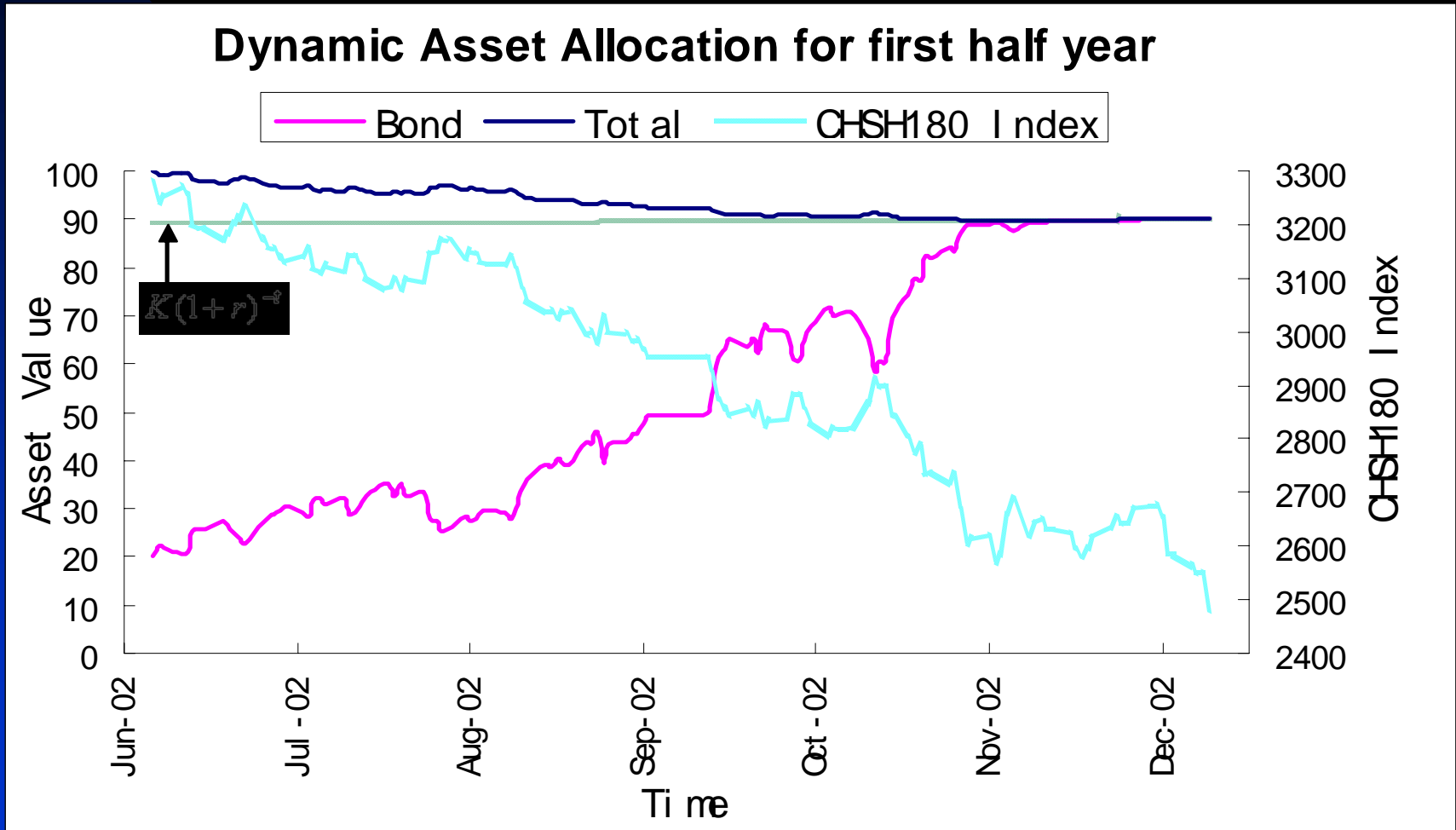
Scenario 2- First Half Year

CHSH180 Index for the first half year (Jul.03, 02 - Jan.02,03)



The New Paradigm's Examples (6)

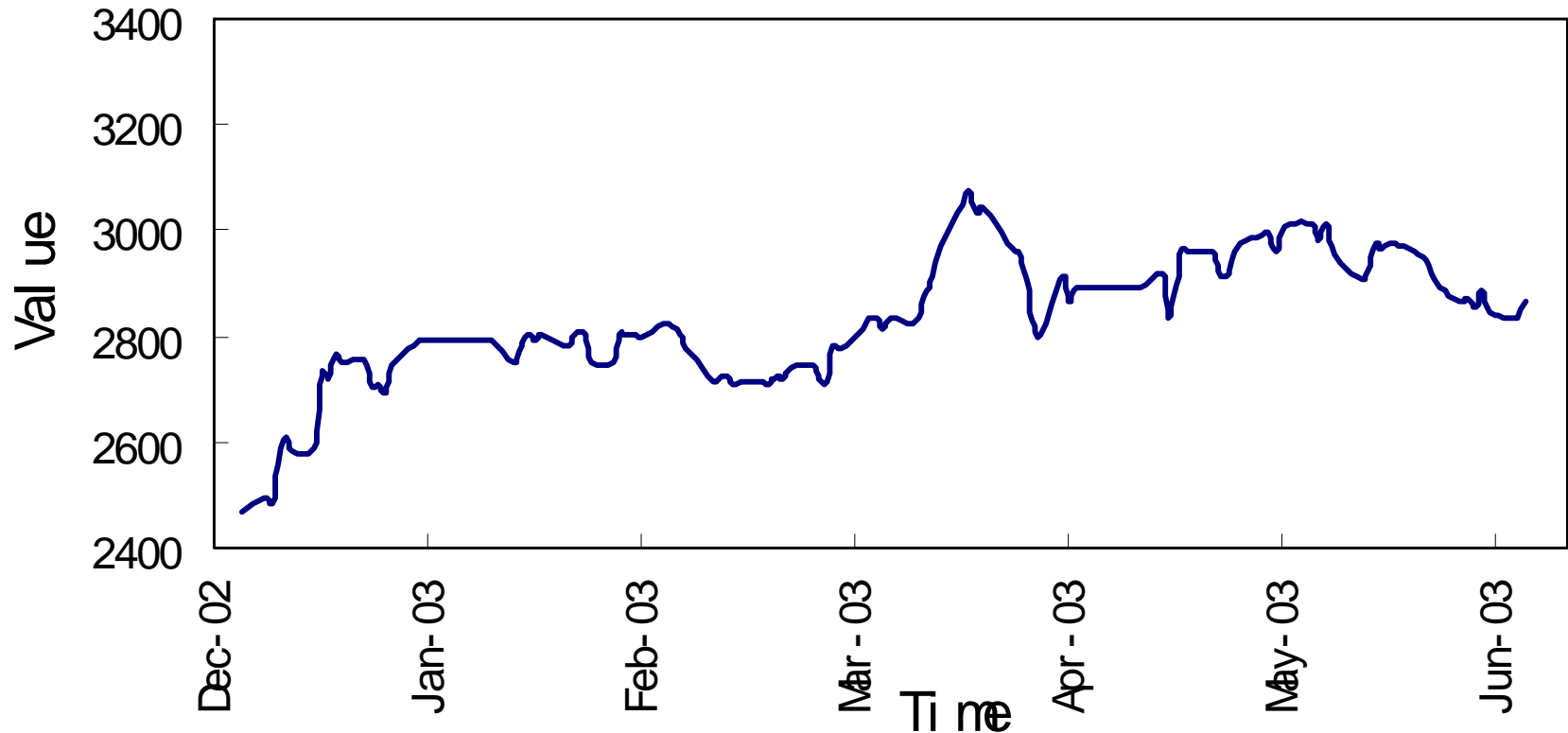
Scenario 2- First Half Year



The New Paradigm's Examples (7)

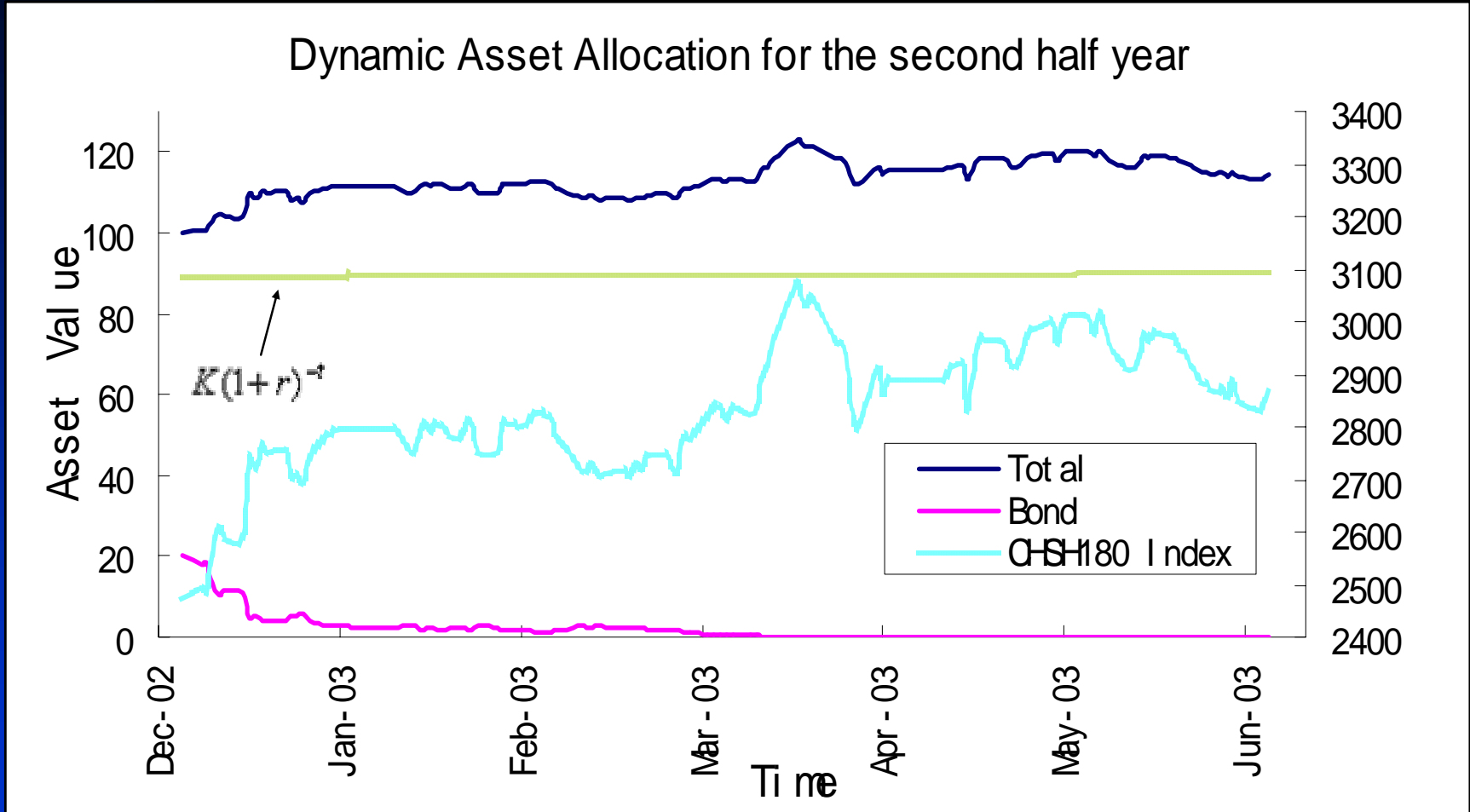
Scenario 2- Second Half Year

CHSH180 Index for second half year (Jan.03,03 - Jul. 02,03)



The New Paradigm's Examples (8)

Scenario 2- Second Half Year



The New Paradigm's Examples (9)

Comparison of Scenario 1 and 2

	Initial value	All in Bond	All in CHSH180	Dynamic Allocation
Scenario 1				
Total year (07/03/02-07/02/03)	100	102	87.4	90.0
Scenario 2				
First half year (07/03/02-01/02/03)	100	101	75.5	90.0
Second half year (01/03/03-07/02/03)	100	101	116.0	114.5
Total year (07/03/02-07/02/03)	100	102	87.4	103.1

Conclusions

- The *New Paradigm* rationalizes fund investment strategy by clarifying the responsibilities of the policy maker, the stock and bond managers, and the asset allocation process.
- *The benefit: Higher investment return and greater downside risk control.*

Appendix – Option Pricing theory on Dynamic Asset Allocation (1)

- The payoff function one year later can be written as:
 $V = K + a \cdot \max(0, S - K/a)$
K: Floor, a: capture rate, S: stock price one year later
- Using Black-Scholes formula, the present value of future payoff is:

$$V = Kr^{-t} + a[S_0 N(d1) - (K/a)r^{-t} N(d2)]$$

$$d1 = [\log(S_0 / (K/a)r^{-t}) / \sigma \sqrt{t}] + 1/2 \sigma \sqrt{t}$$

$$d2 = d1 - \sigma \sqrt{t}$$

Appendix – Option Pricing theory on Dynamic Asset Allocation (2)

- Use Initial condition and Newton Raphson search to calculate the capture ratio a .
- Buy E yuan CHSH 180 Index, and B yuan treasury bonds

$$E = aN(d1)S_0$$

$$B = Kr^{-t} [1 - N(d2)]$$

- Dynamically adjust E and B