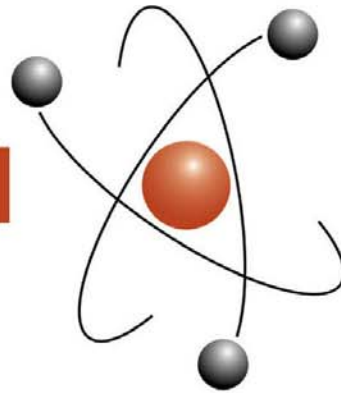


**S U S T A I N**



**A B I L I T Y**

**ACTUARIES AND THE FUTURE**

# **Australian Investment Performance 1960 to 2005 (and investment assumptions for stochastic models)**

**by Colin Grenfell**



Institute of Actuaries of Australia



# Presentation

- **What?**
- **Why?**
- **How? ... briefly**
- **Results ... 10 of 53 charts**
- **Acknowledgments**



## What?

**(1) Australian investment performance  
30 June 1960 to 31 March 2005**

and

**(2) Investment assumptions for  
stochastic models**



## What? Growth Securities

- **S Australian shares**
- **I International shares (unhedged)**
- **Q Property trusts**
- **P Direct property**



## What? Interest Income

- **F Australian fixed interest**
- **J International fixed interest (hedged)**
- **G Government semis (0 to 3 yrs)**
- **N Inflation linked bonds (0 + yrs)**
- **L Loans (floating rate)**
- **M Mortgage trust**
- **C Cash**



## What? Financial Indicators

- **X** **CPI**Index (annual increase)
- **W** **A**W**O****T****E** (annual increase)
- **B** **90** day **b**i**l** rates (mid-year)
- **D** **10** year **b**o**n****d** rate (mid-year)



## What? Statistics

- **Risk margins (over 10 year bond rates)**
- **Coefficients of variation (of rates)**
- **Skewness (of forces)**
- **Kurtosis (of forces)**
- **Cross-correlations (of forces)**
- **Auto-correlations (of forces)**



## Also ...

- **Arithmetic means (38 years)**
- **Compound means (38 and 23 yrs)**
- **Standard deviations (38 years)**
- **Gross/net of superannuation **tax****
- **Gross/net of wholesale passive **fees****





## Why?

- Demand versus supply gap
- EFG investment system = 40 yrs
- Valuable long-term database
- Importance of auto-correlations
- Importance of economic cycles



## Why? another reason

- **1979**      **Pace of funding**      **deterministic**
  - **1992/7**    **Investment models**      **stochastic**
  - **2003**      **Auto-correlations**      **correlations**
  - **2004**      **Skewness/kurtosis**      **3<sup>rd</sup>/4<sup>th</sup> moments**
-



## Why? another reason

- **1979**      **Pace of funding**      **deterministic**
- **1992/7**    **Investment models**      **stochastic**
- **2003**      **Auto-correlations**      **correlations**
- **2004**      **Skewness/kurtosis**      **3<sup>rd</sup>/4<sup>th</sup> moments**

---

**all**      **need data and assumptions**



## How? Methodology

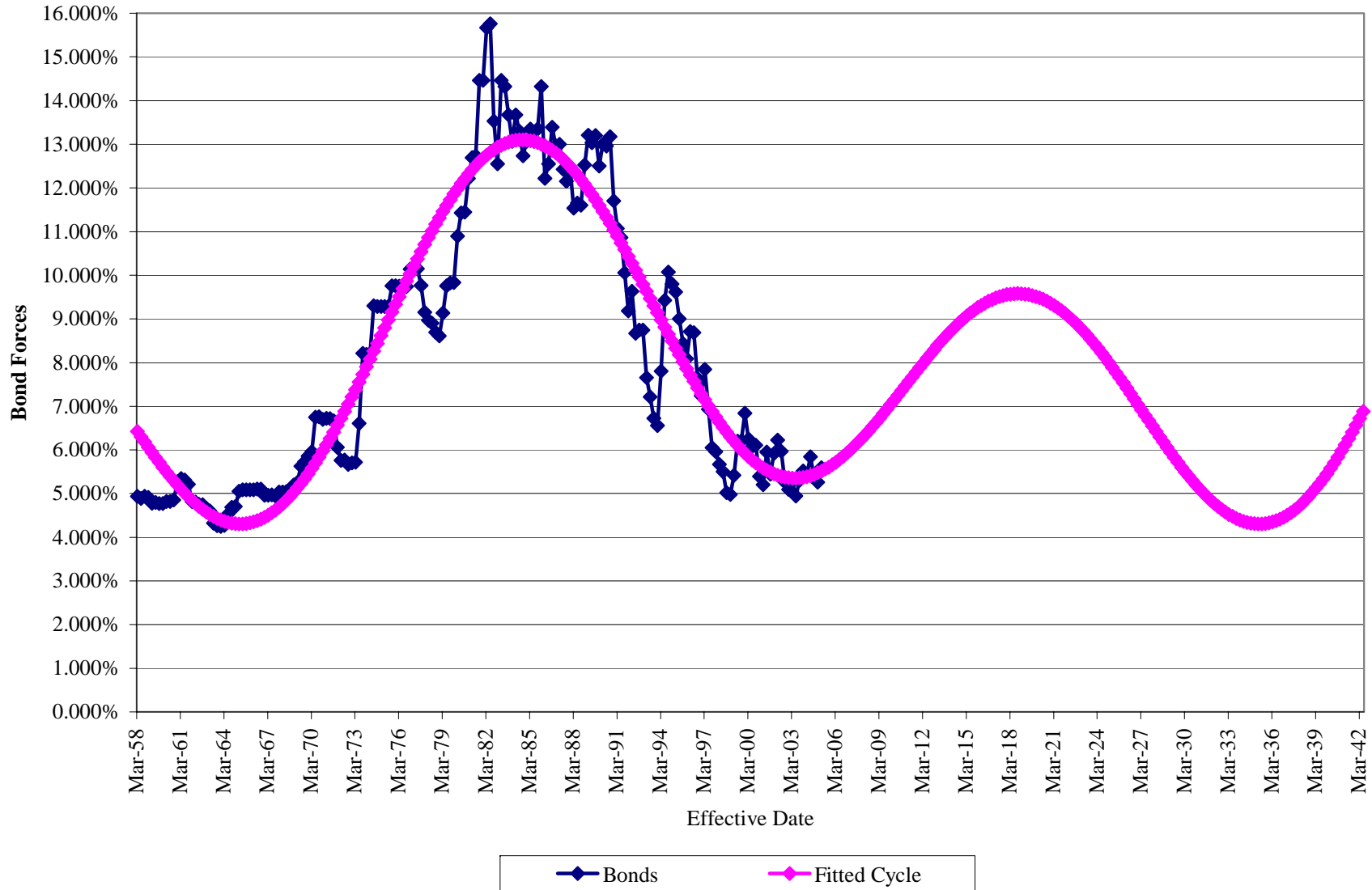
- **Firstly** 31/3, 31/12, 30/9 and 30/6
- **Secondly** annual RM, CoV, g, k, CC, AC
- **Thirdly** 7 averages (ea. 4 yr group)
- **Fourthly** trend + 6 year projection
- **Fifthly** year - 2 (+ judgment)



# Bonds

## Fig 5.1

# 35 + 70 yrs

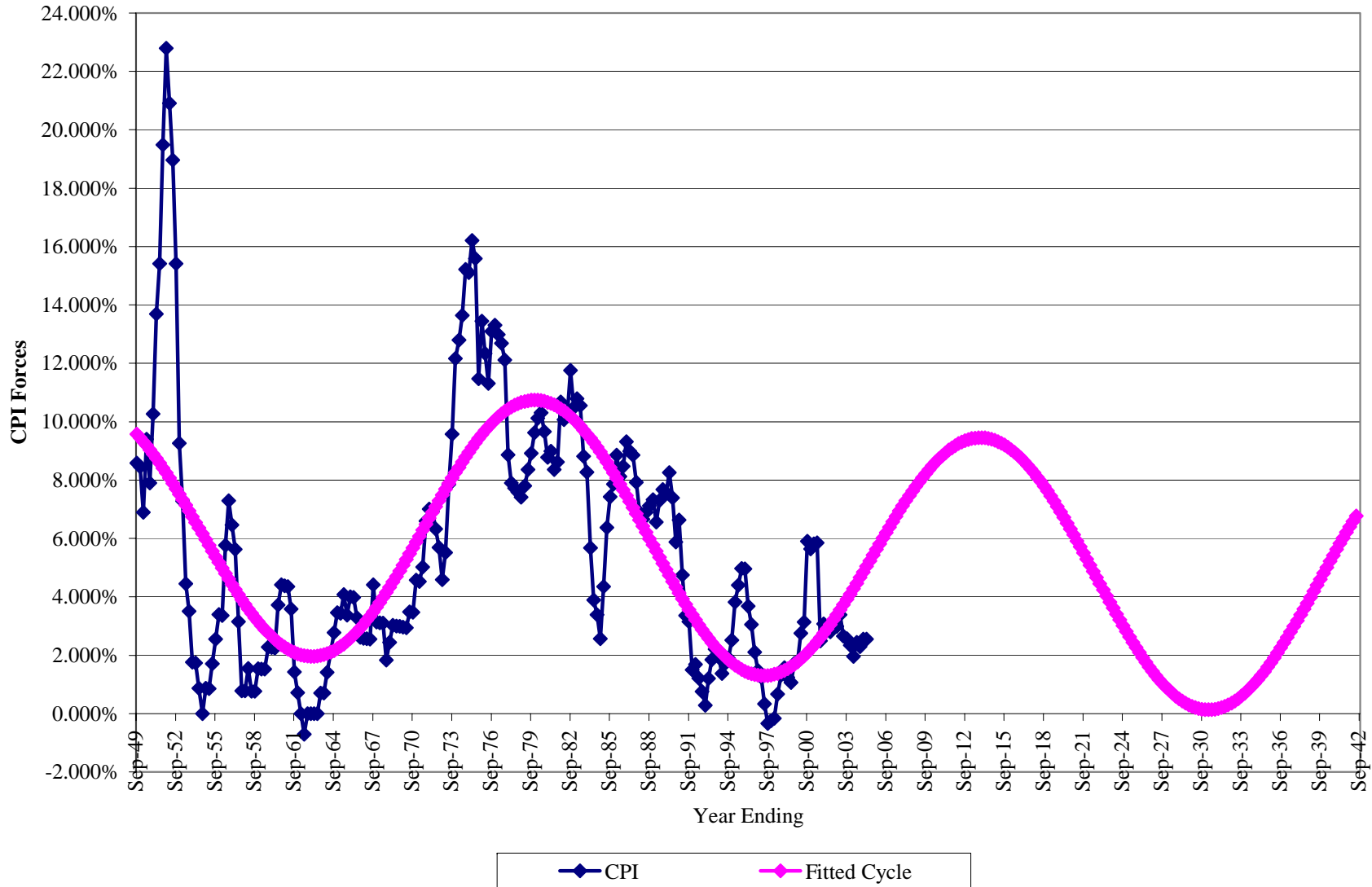




# CPI

## Fig 5.2

# 34 + 136 yrs

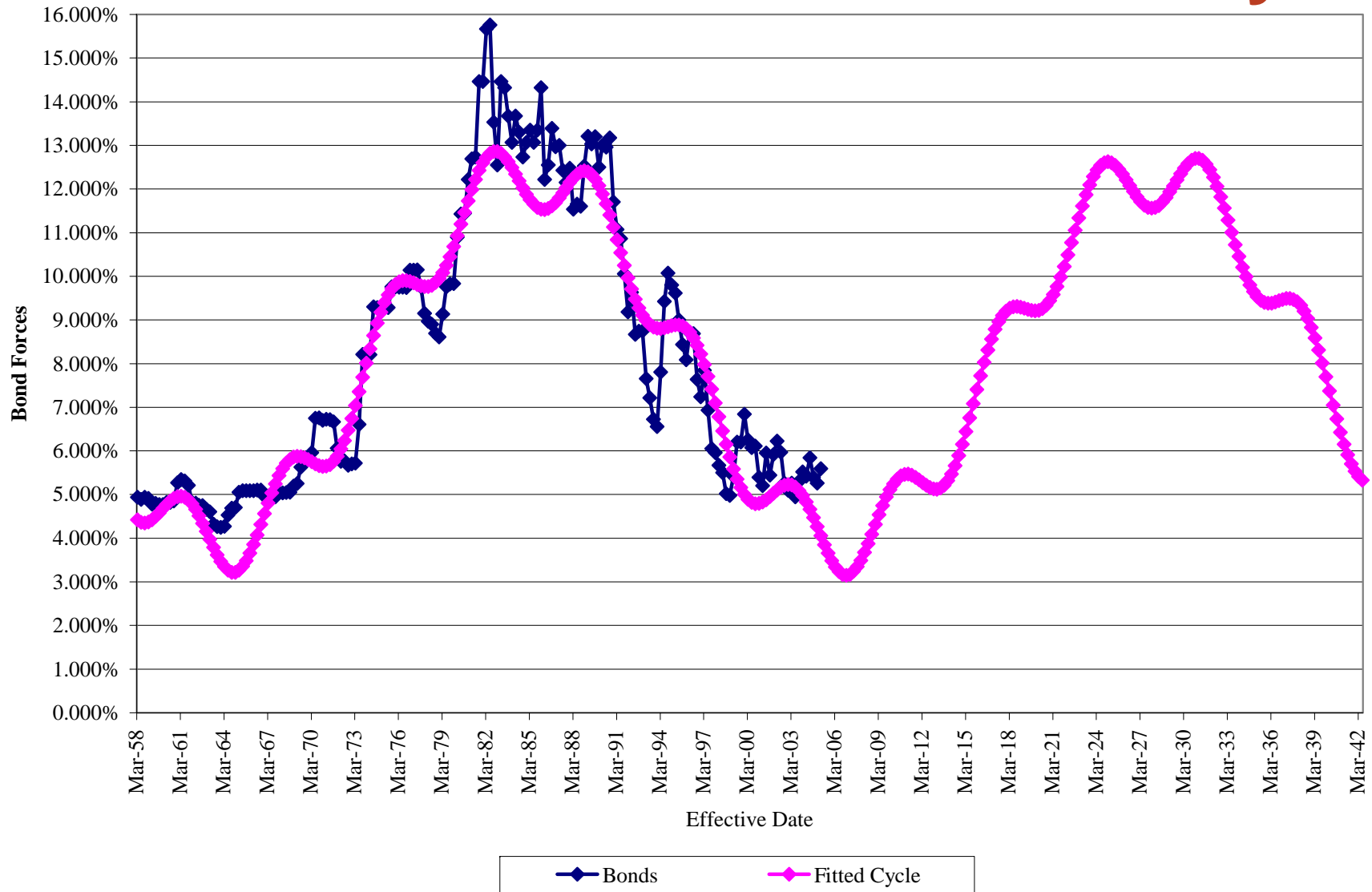




# Bonds

## Para 5.6

# 7 + 43 yrs

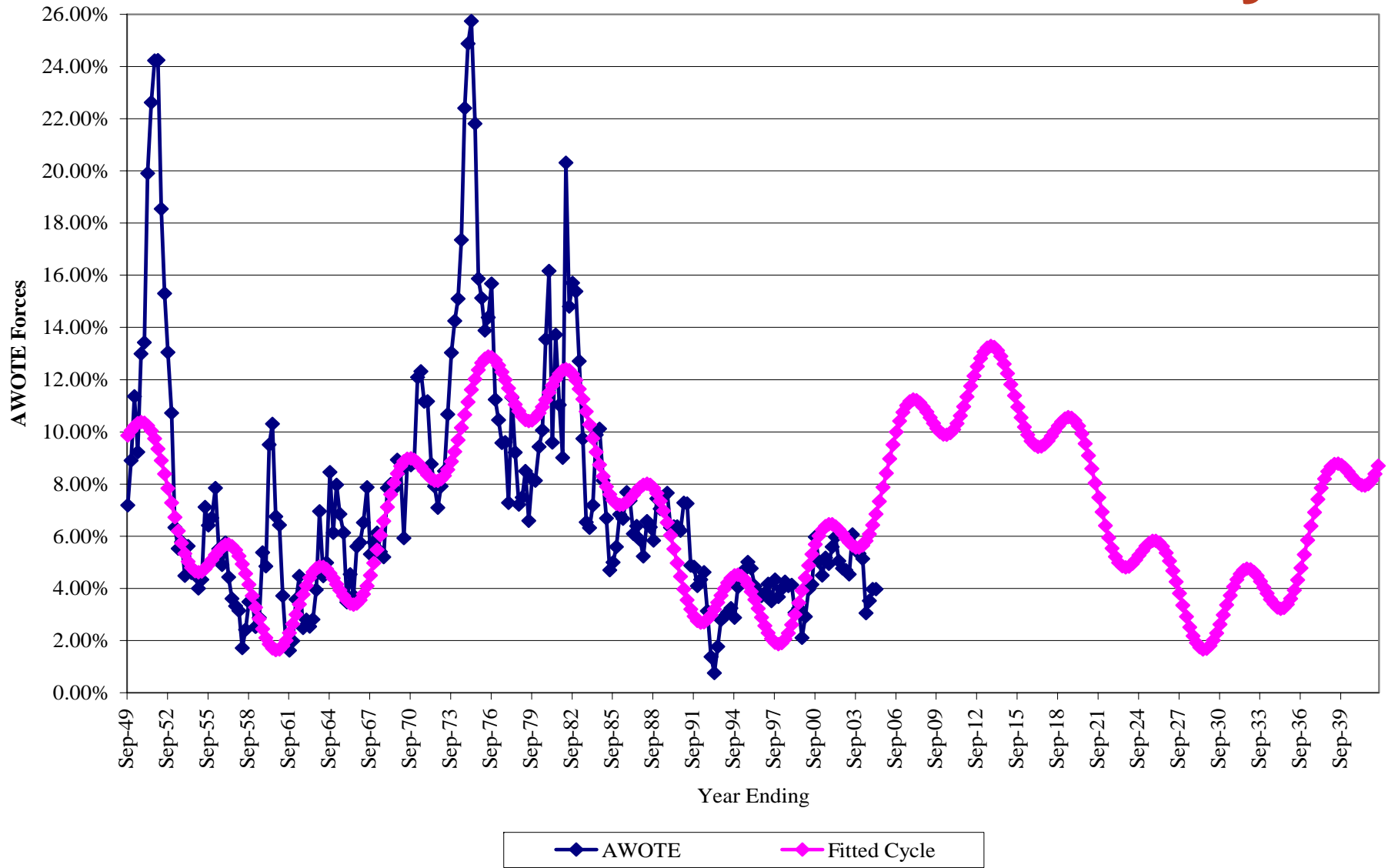




# AWOTE

## Para 5.10

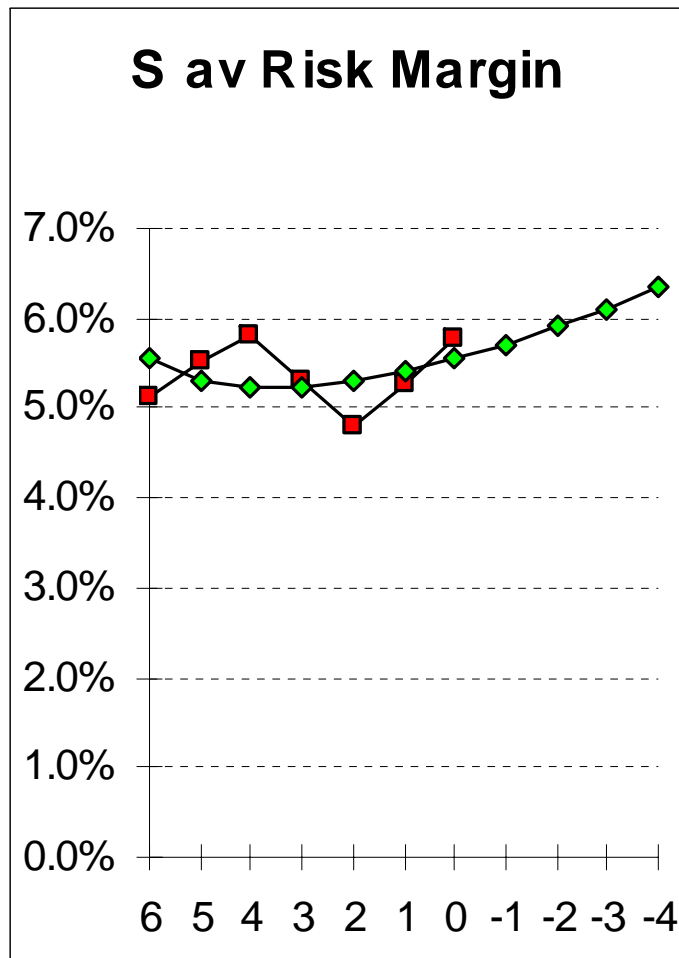
# 6.25 + 34.5 yrs



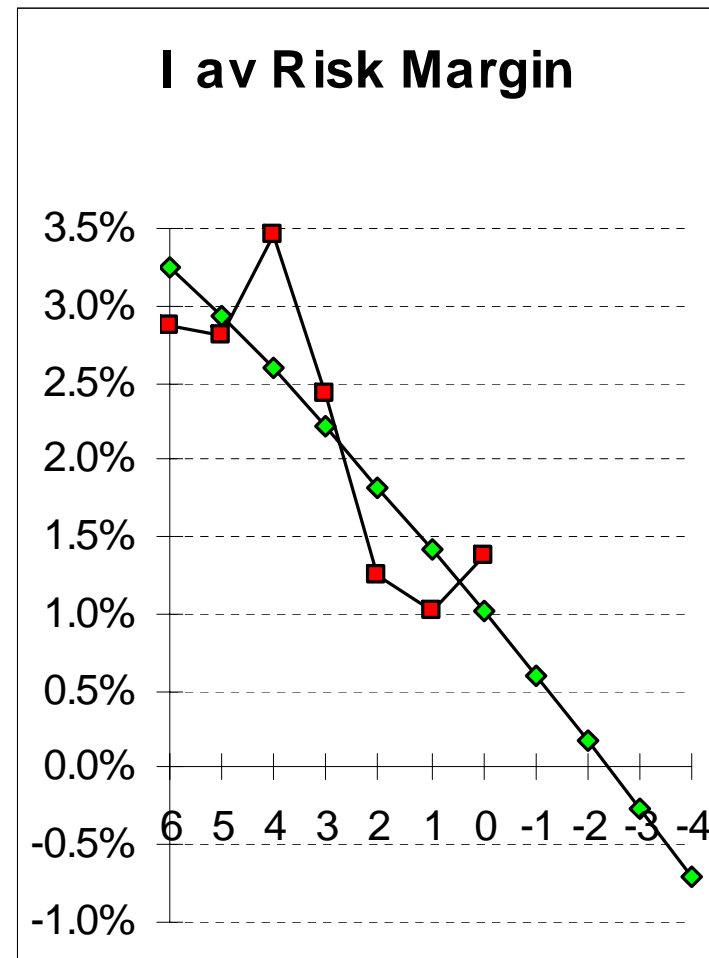




# Figure 6.1 Risk margins over 38 years



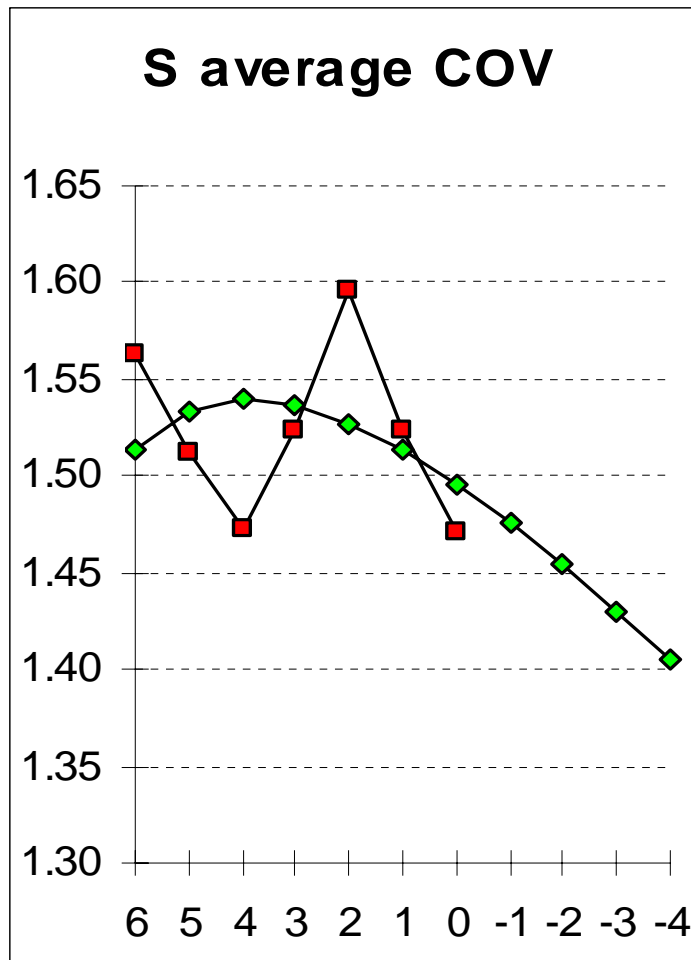
[ 4.0% ]



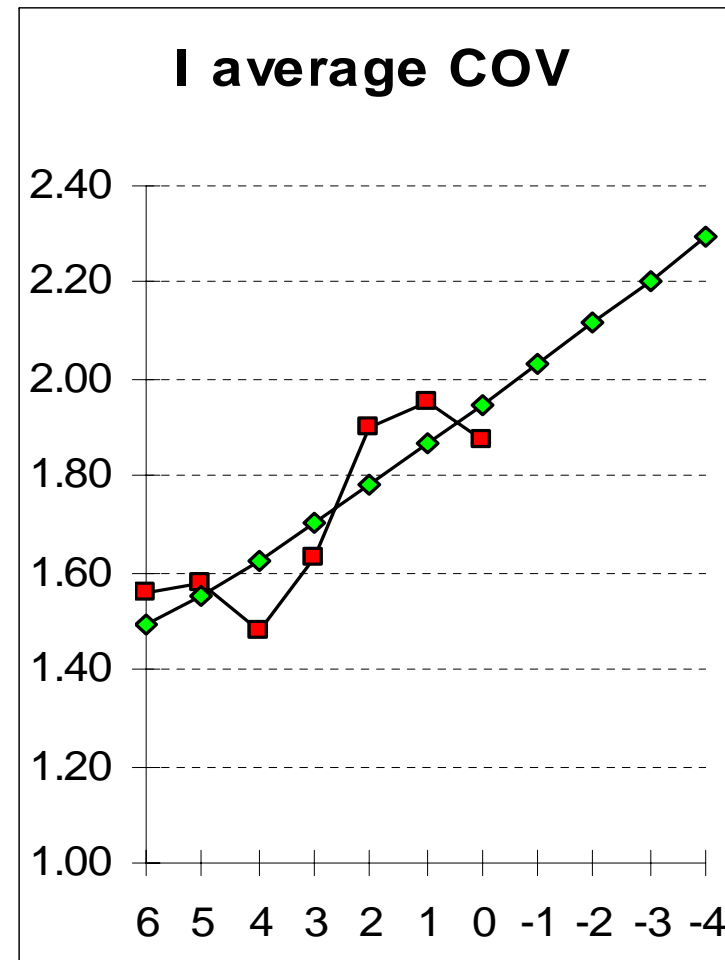
[ 4.0% ]



# Figure 7.1 CoV's over 38 years



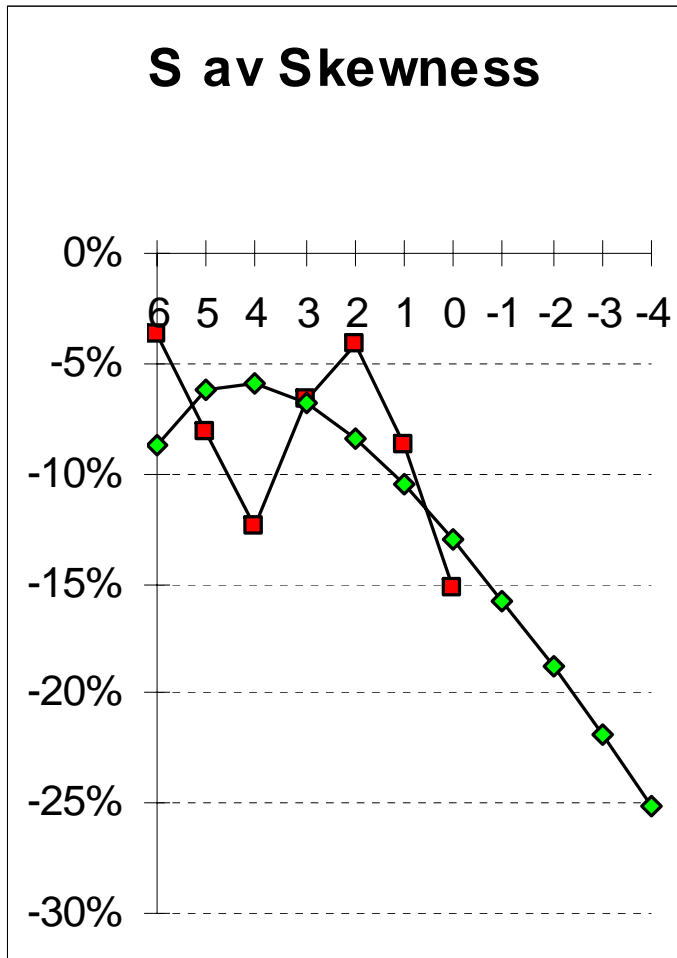
[ 1.600 ]



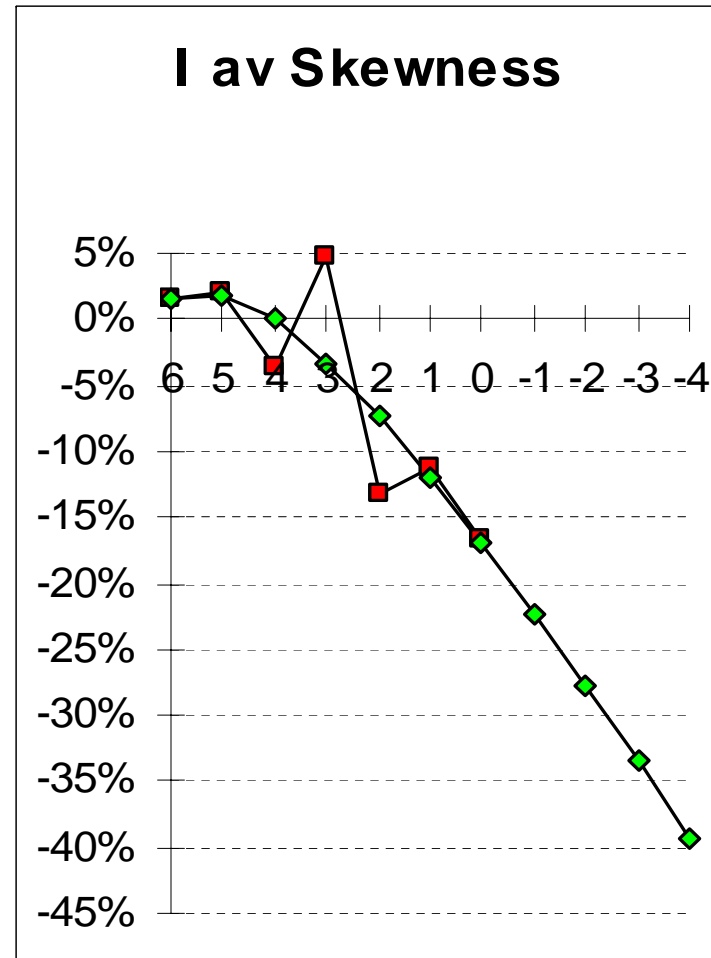
[ 1.600 ]



# Figure 10.1 Skewness over 38 years



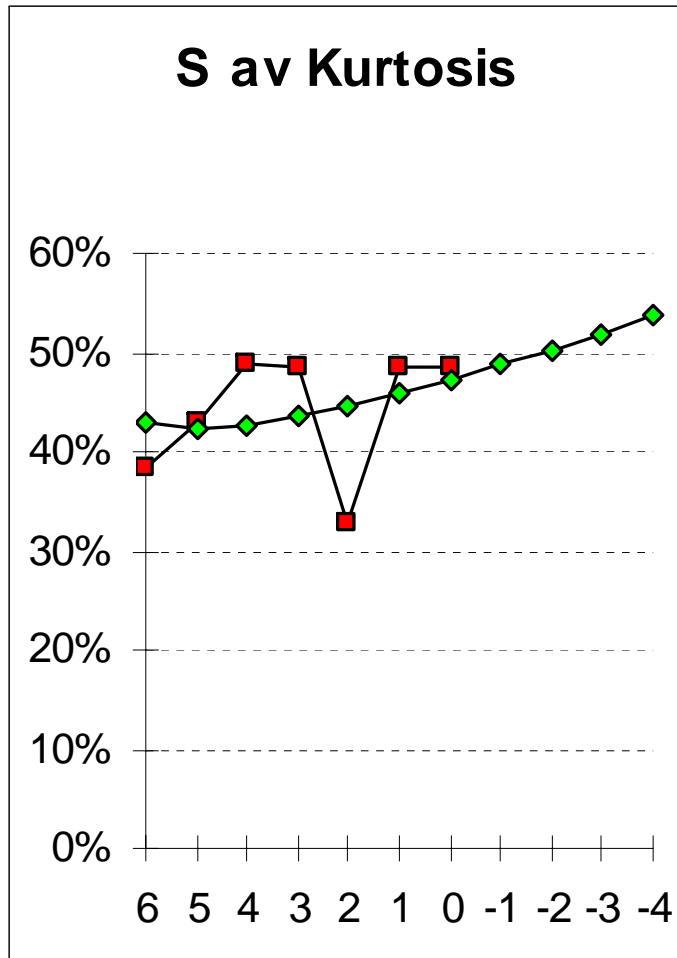
[ -19% ]



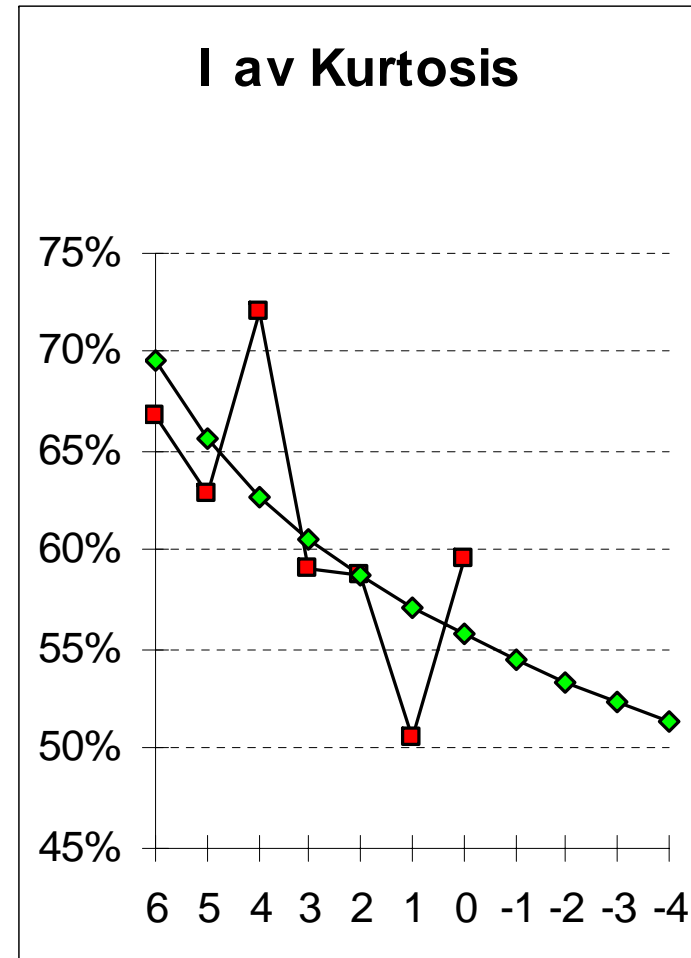
[ -28% ]



# Figure 11.1 Kurtosis over 38 years



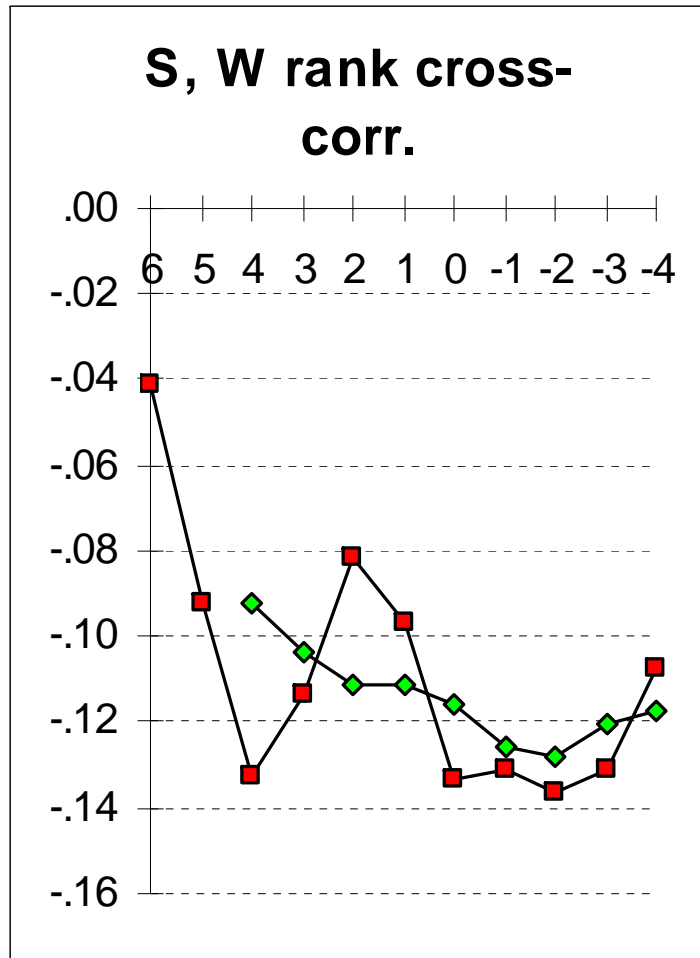
[ 50% ]



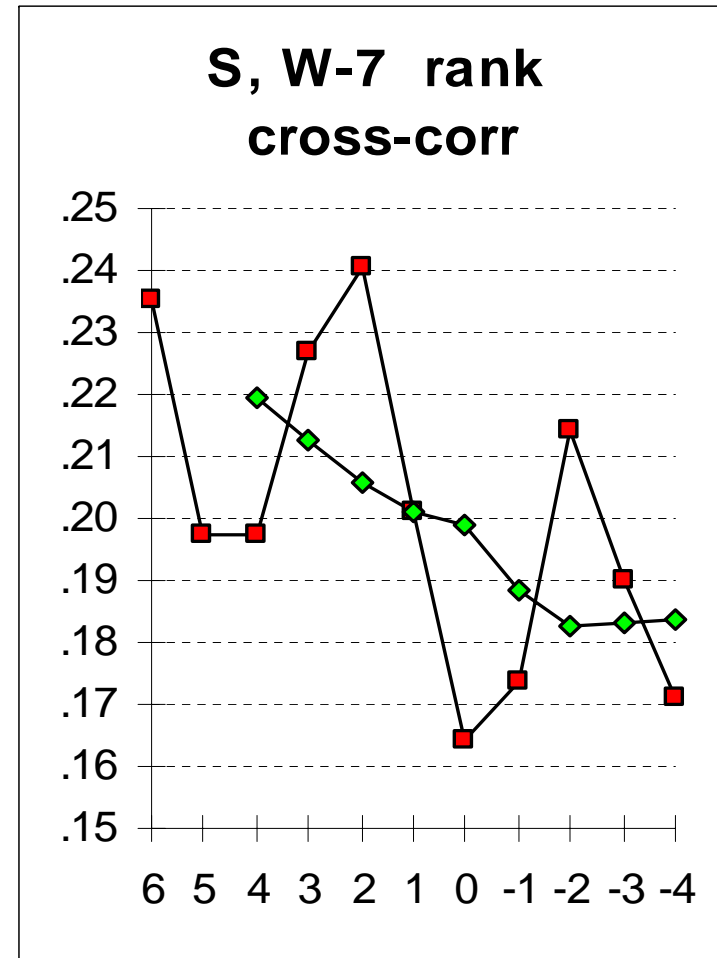
[ 53% ]



# Fig 12.1 Cross-correlation over 38 yrs



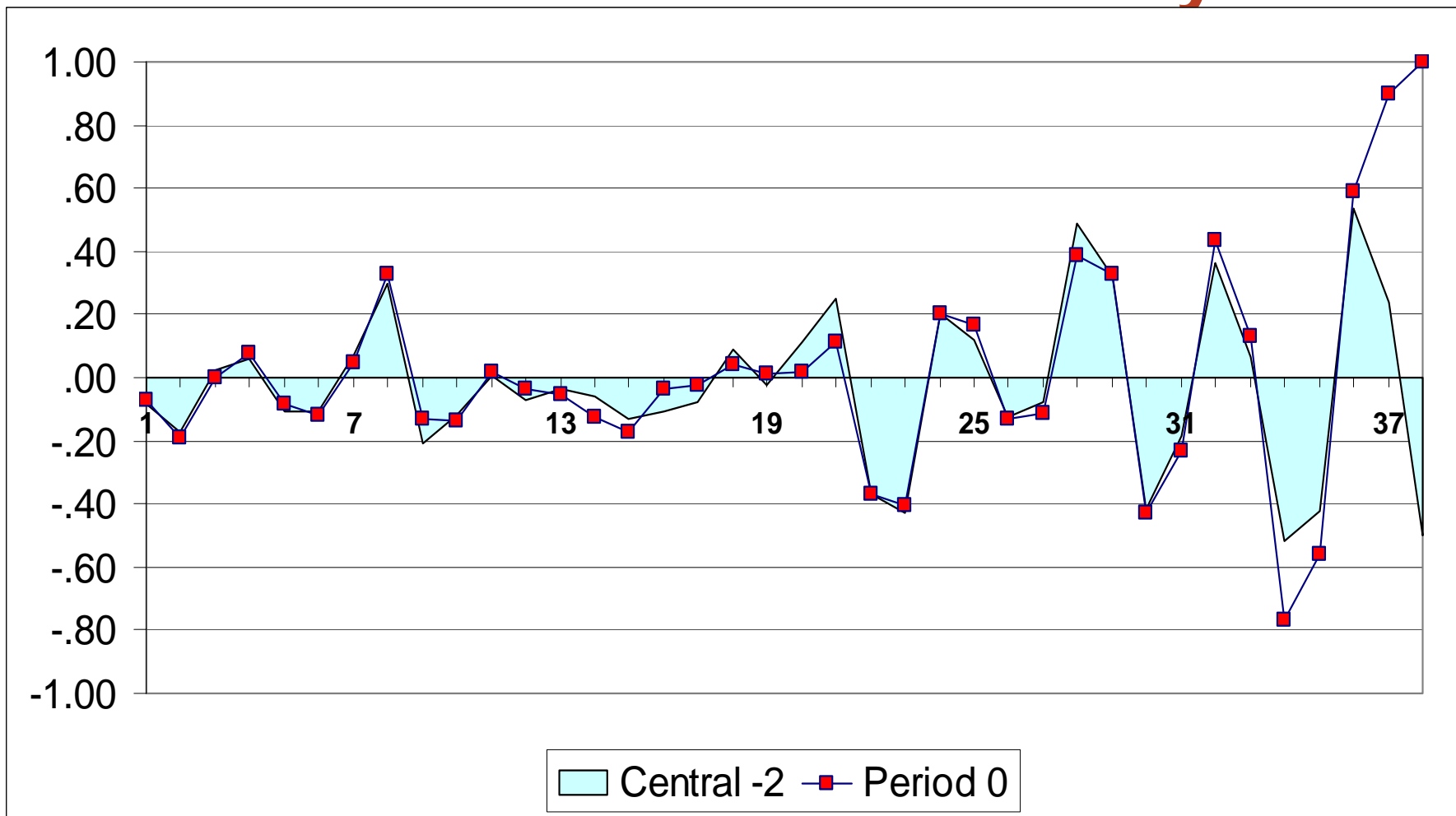
[ -13% ]



[ 18% ]

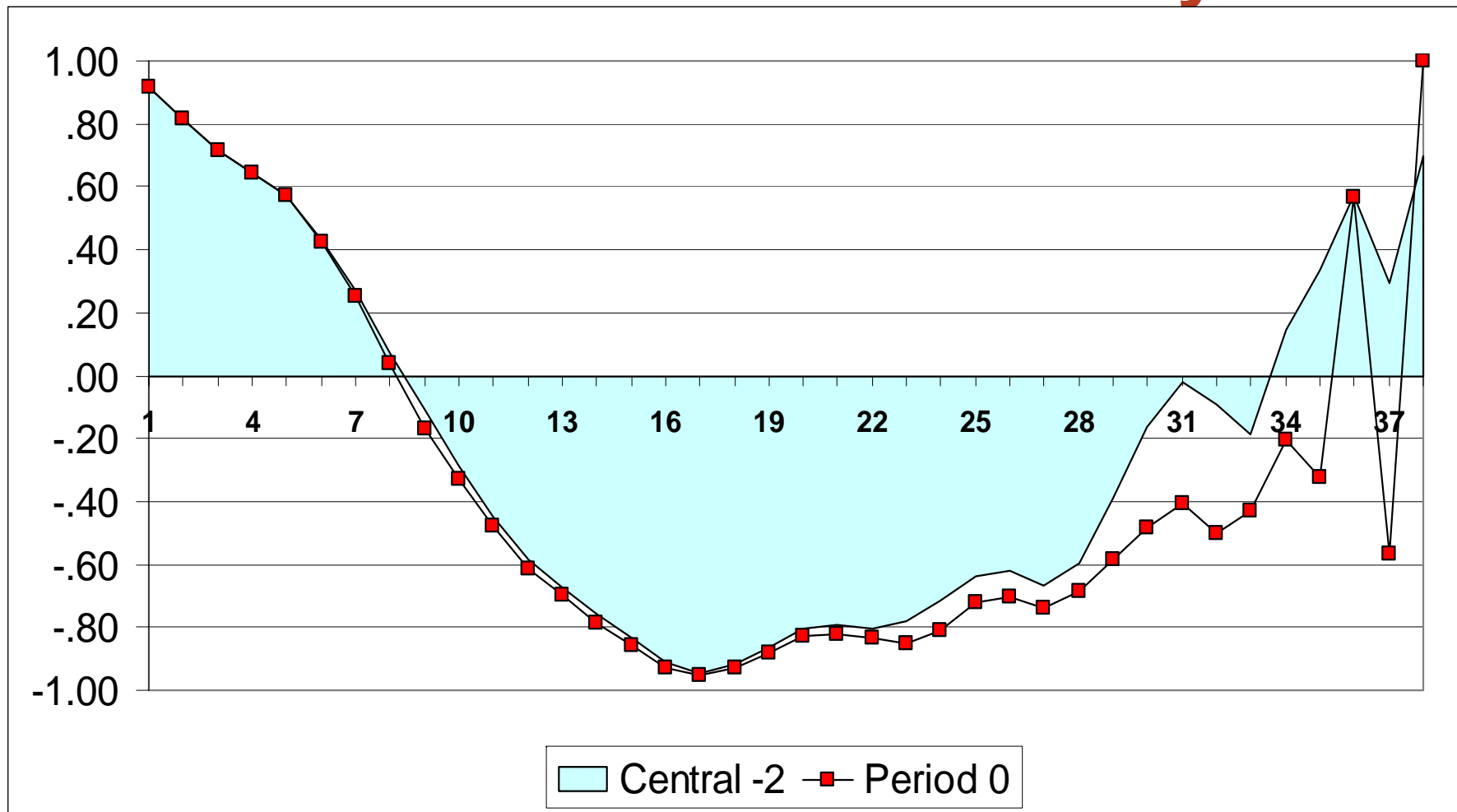


# Figure 14.2 S Sector Auto-correlations over 40 yrs





# Figure 14.3 Bond Auto-correlations over 40 yrs





# Table 15.1 Investment Assumptions

Sector	Risk margin (arithmetic average)	Mean rate (arithmetic average)	Coefficient of variation	Standard deviation of rates	Skewness	Kurtosis
<b>S</b>	4.0%	10.0%	1.600	16.0%	-19%	50%
<b>I</b>	4.0%	10.0%	1.600	16.0%	-28%	53%
<b>Q</b>	3.5%	9.5%	1.221	11.6%	-23%	93%
<b>P</b>	1.2%	7.2%	1.000	7.2%	-128%	326%
<b>F</b>	1.0%	7.0%	0.700	4.9%	-93%	242%
<b>G</b>	0.5%	6.5%	0.600	3.9%	9%	-33%
<b>J</b>	0.8%	6.8%	0.691	4.7%	-95%	237%
<b>C</b>	-0.5%	5.5%	0.490	2.7%	70%	-77%
<b>N</b>	1.0%	7.0%	0.800	5.6%	-57%	71%
<b>B</b>	-0.50%	5.50%	0.527	2.90%	81%	-38%
<b>D</b>		6.00%	0.384	2.30%	38%	-118%
<b>W</b>	-2.25%	3.75%	0.600	2.25%	162%	324%
<b>X</b>	-3.50%	2.50%	0.700	1.75%	58%	-47%





## Acknowledgments

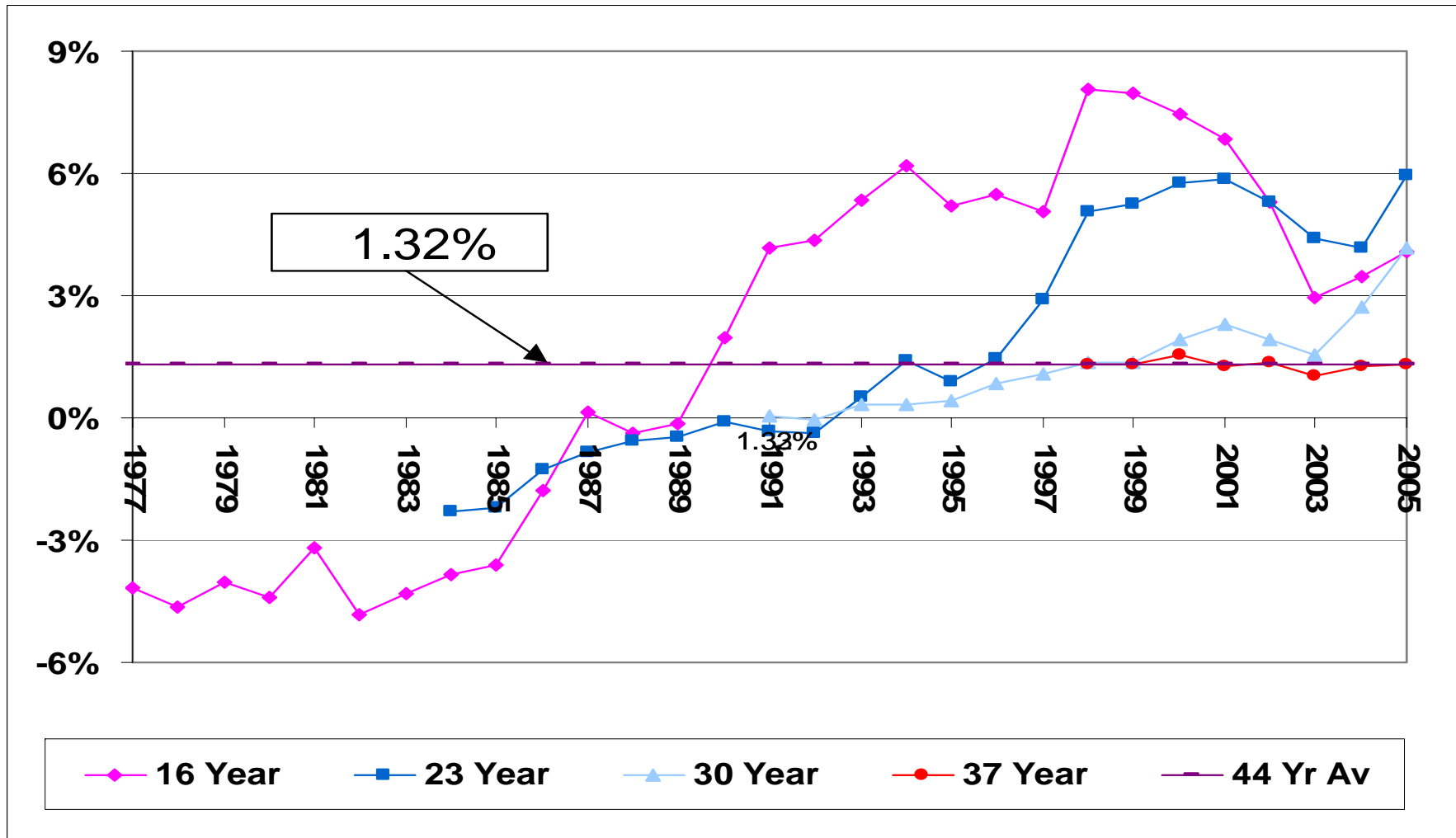
- **Alan Brown**
- **Cary Helenius**
- **Clive Amery**
- **IAAust (for special timetable)**
- **AXA Australia and National Mutual**



## Paragraph 4.3

*“Of major significance was the introduction in 1965 of a selective investment facility known as the EFG system. Evidence of the success and wide acceptance of this concept, which was pioneered by National Mutual in Australia, may now be seen in the fact that it has since been adopted by a number of other financial institutions as a medium for superannuation investment.”*

# Rolling Average Real “Balanced” Returns



**Net of Tax and Fees, Real over AWOTE, to 31/3/05**



**If the next 37 years equal the last 37 years:**  
Superannuation Guarantee 9.000%  
Net accumulation towards retirement = 6.375%

### 40 Year Supn Guarantee Retirement Benefits as a multiple of Final Salary

