Cost of Capital

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BOOTH GMI 2007

Fair Return

- Return earned on book value of equity (ROE) invested in a regulated utility

- Treat equities like bonds
  - Equity investors invest \$105, \$5 goes in issue costs and \$100 goes into rate base. If investor wants to earn 10% (opportunity cost) then 10% on \$105 means the firm has to earn 10.5% on \$100 net invested in the firm
  - ROE is slightly above the opportunity cost so there is no dilution
  - Regie allows 0.30%, others 0.50% as issue costs over what the investor wants and equity market values should be slightly above book values
  - If M/B increases much above 1.1-1.2 investors have received an above fair return

- Yardstick is the investor's opportunity cost, which is the cost of attracting and maintaining capital

Estimating the Opportunity Cost (K)

- Comparable Earnings
  - ROE's earned by a sample of low risk comparable firms
  - Few comparable firms
  - Not a measure of investor opportunity cost
- Discounted Cash Flow (DCF)
  - Investors receive their return as a dividend plus a capital gains yield
  - Standard technique used in the US

$$K = \frac{d}{P_0} + g$$

- Risk premium: Risk free rate + risk premium

$$K = R_F + RP$$

Risk Premium Models

- **Bond yield plus risk premium**
  - **Long standing history for estimating cost of capital**
  - **Extensive use in regulatory hearings**
    - **Estimate DCF cost-bond yield over time**
    - **Experienced utility returns**
- **Explicit Risk premium models**
  - **CAPM (Nobel prize for William Sharpe)**

$$K = R_F + MRP * \beta$$

Time Value of Money

Market Risk Premium * "beta"

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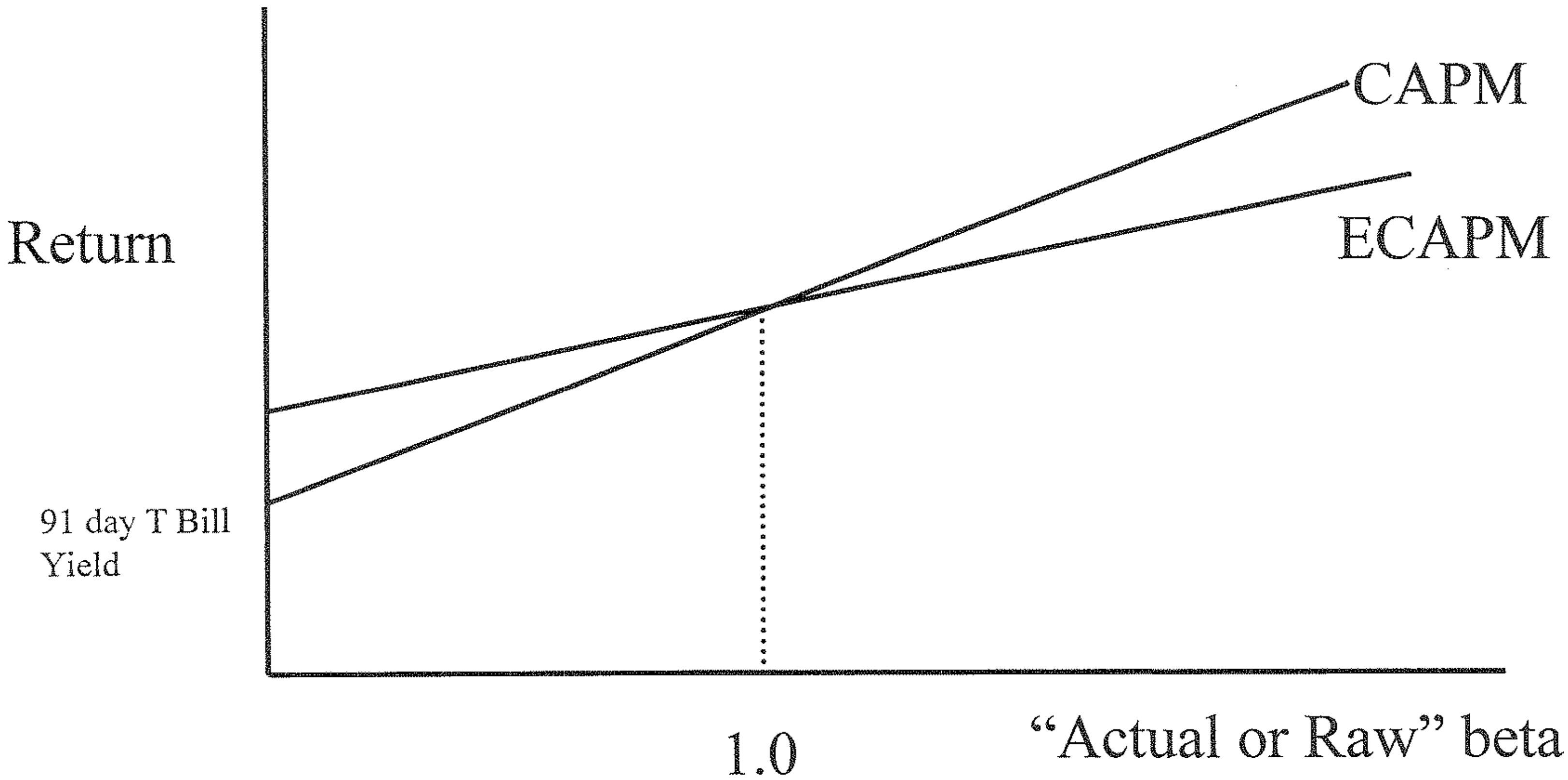
Tests of CAPM



Models are prediction models of return over next 30 days

Regulatory CAPM

- Use long Canada Yield instead of 91 day T. Bill yield
  - Adds 1.25% to risk free rate and flattens the slope as in the Empirical CAPM
  - 1.25% is average term spread between T Bills and long Canadas
  - T Bill yields not relevant to corporate finance as they reflect the short term influence of monetary policy
- Adjusted not actual or raw betas
  - Actual betas are extremely variable as they depend on the estimation
  - Adjust from experience or mechanical
- Corrects for Empirical CAPM

Formula Allowed ROEs

- BCUC 1993, NEB 1994, PUBM 1995 all established adjustment mechanisms, in most cases *at the request* of the company,
- Extensive evidence from different estimation techniques to set "going in" fair ROE
  - Comparable earnings
  - DCF
  - Equity risk premium (not just CAPM)
- Reason for 75% adjustment to forecast long Canada rate
  - "The NEB was of the view that as interest rates change, the risk premium for the benchmark pipeline also changes," OEB guidelines March 1977 page 17
  - No references to any "modified risk-free rate"

Other Risk Premium Models

- **Arbitrage pricing theory (APT)**
  - K is related to a series of unspecified factors
  - Roll and Ross (1980) factors
    - Industrial production/changes in expected and unexpected inflation, term and default spreads
    - "Statistical" Factor models
- **Return Factor models**
  - Fama-French (Dr. Chretien): Market, book to market ratio and size
  - Fama-French (Schink and Bower): market, book to market, size, default, term spread
  - Others: momentum, liquidity, skewness
  - All use short term treasury bill rate as risk-free rate

Implications

- CAPM: Noble prize winning model
  - Easily understood
  - Incorporates portfolio diversification
  - Used with long Canada yield and adjusted betas
  - Accepted in regulatory hearings
- Factor models
  - Many varieties and highly controversial
  - Use treasury bill yields
  - Factors not obvious
  - Data mining/snooping
  - Not accepted in regulatory hearings
- *Key is market risk premium to benchmark returns*

Annual Returns 1926-2006

Annual Rate of Return Estimates 1926-2006

	U.S.			CANADA		
	S&P Equities	Long US Treasury	Excess Return	TSE Equities	Long Canadas	Excess Return
AM	12.34	5.79	6.55	11.67	6.51	5.16
GM	10.41	5.41	5.00	10.07	6.16	3.92
OLS	11.19	4.92	6.27	10.47	5.60	4.86
Volatility[1]	20.07	9.24		18.47	8.91	

Arithmetic is simple average; geometric is compound and OLS is the least squares estimate.

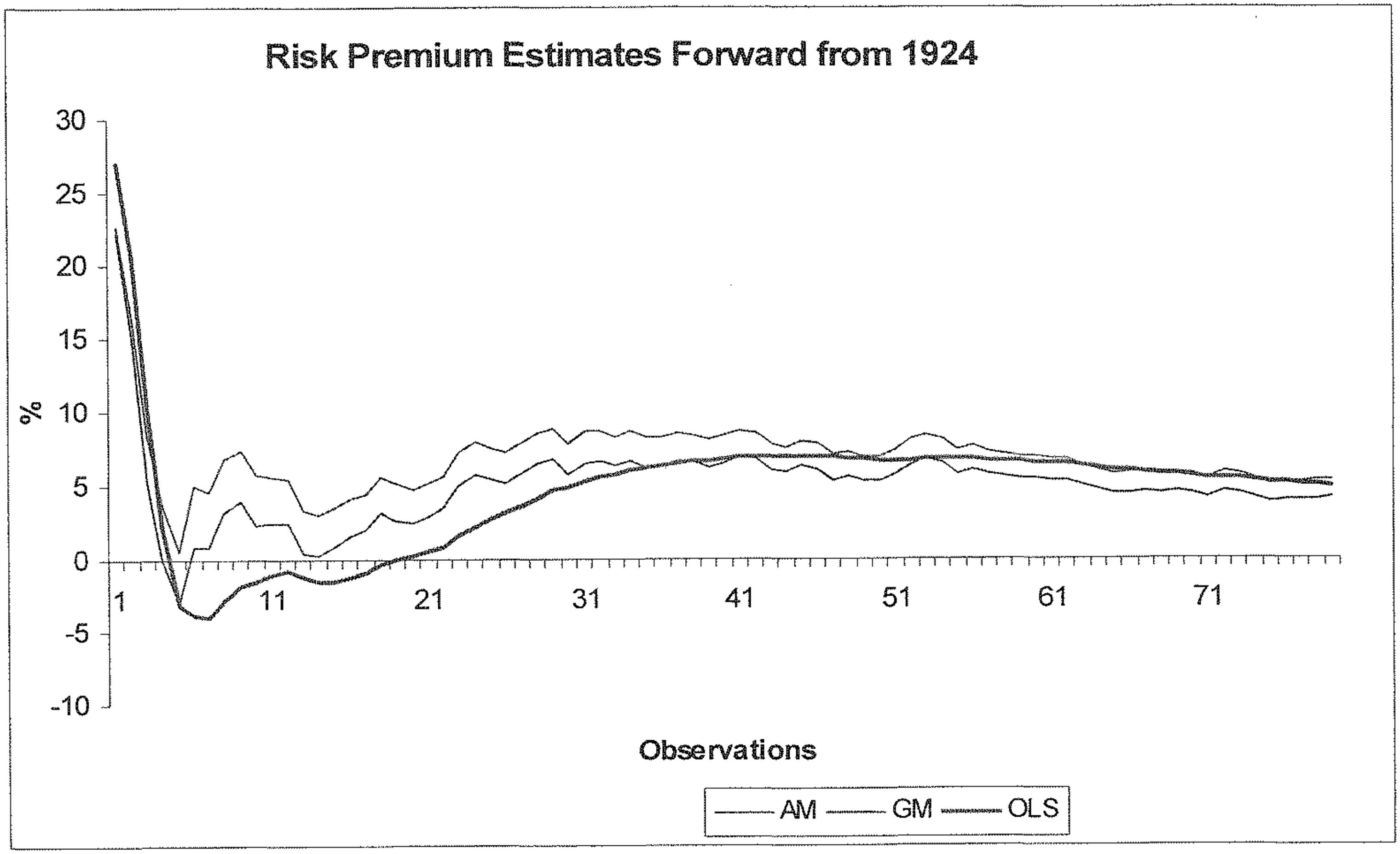
Approximately Geometric Mean = Arithmetic Mean - .5*variance

For example, US variance is about 4%, so AM and GM diverge by about 2%

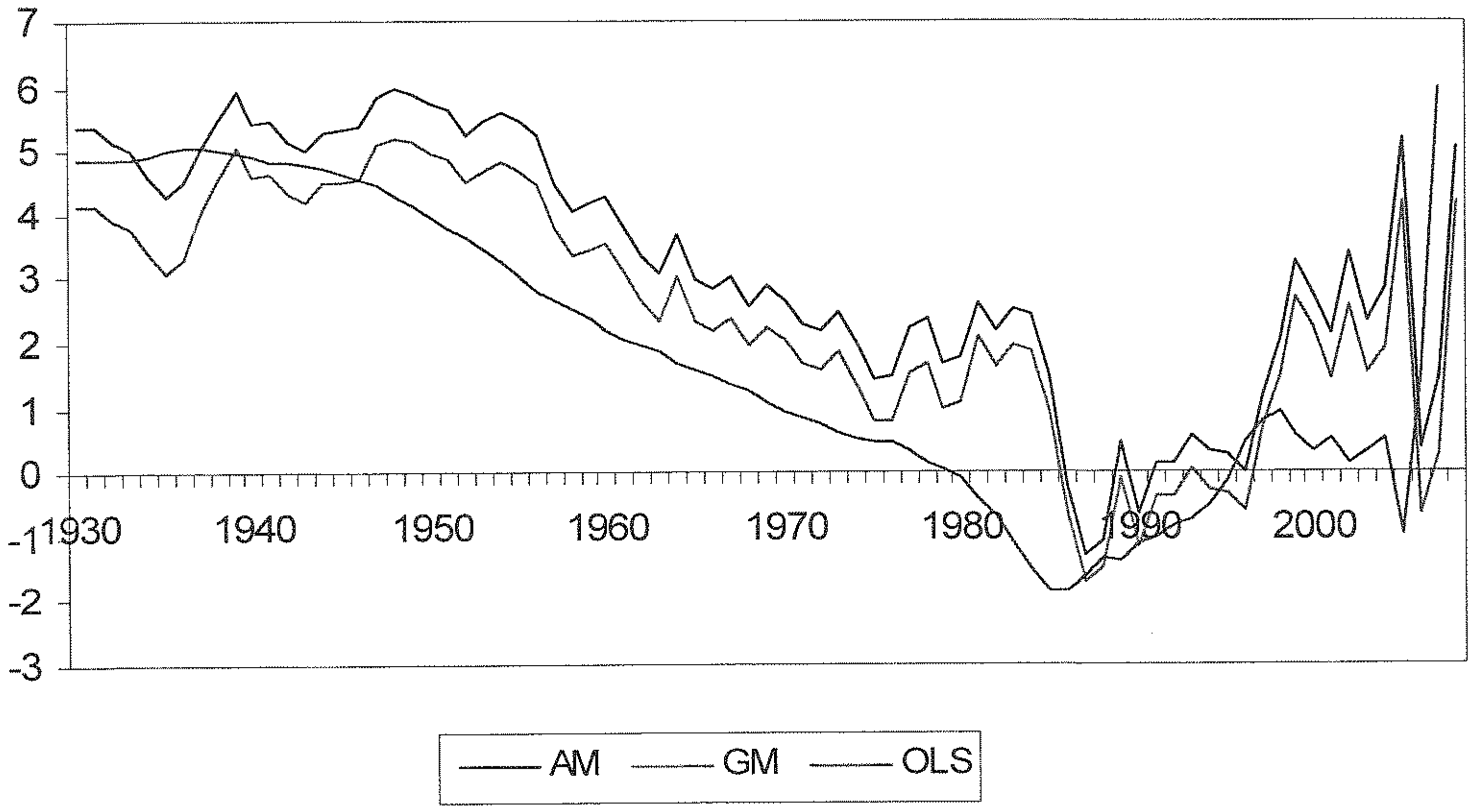
US & Canadian Risk Premium

	Equity	Bonds	MRP
◆ Canada	11.67	6.51	5.16
◆ US	12.34	5.79	6.55
◆ Difference	*+0.67*	*-0.72*	*1.41*

"Equally" split equity & bond markets


Risk Premium Estimates Forward from 1924
%
30
25
20
15
10
5
0
-5
-10
1
11
21
31
41
51
61
71
Observations
AM
GM
OLS

Market Risk Premium Estimates Back From 2006

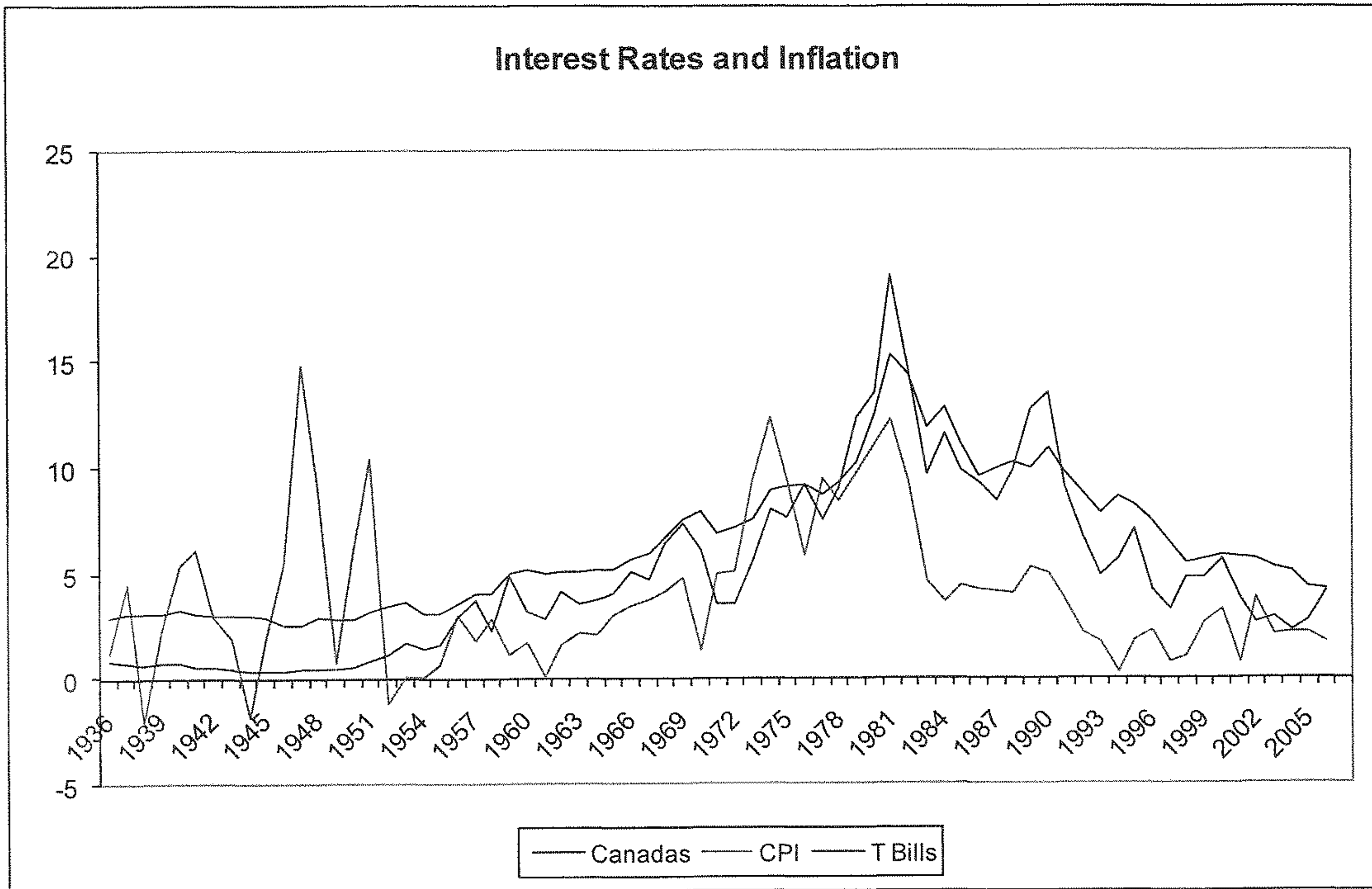


Earned Risk Premiums for Different Holding Periods

Start dates on the horizontal and ending dates on the vertical. For example, an investor would have earned a 3.24% arithmetic risk premium investing from 1957-1996.

	1927	1937	1947	1957	1967	1977	1987	1997
1936	4.86							
1946	3.53	2.21						
1956	8.20	9.87	17.53					
1966	7.50	8.38	11.46	5.39				
1976	6.48	6.88	8.44	3.89	2.39			
1986	6.46	6.78	7.92	4.71	4.38	6.36		
1996	5.37	5.45	6.10	3.24	2.53	2.60	-1.17	
2006	4.99	5.00	5.47	3.06	2.48	2.51	0.58	2.32

Bond Markets since 1936



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Equities Over Long Term Bonds in the U.S. & Canada

	S&P500 Equities	U.S. Treasuries	Excess Return	TSE Equities	Long Canadas	Excess Return
1926-1956						
AM	13.05	3.38	**9.67**	12.55	4.00	**8.55**
GM	10.11	3.27	**6.84**	10.30	3.87	**6.42**
OLS	8.98	3.46	**5.52**	8.90	3.99	**4.91**
Volatility[1]	24.88	4.93		22.09	5.41	
1957-2006						
AM	11.89	7.28	**4.61**	11.12	8.06	**3.06**
GM	10.61	6.77	**3.84**	9.93	7.60	**2.34**
OLS	11.31	7.68	**3.63**	10.40	8.55	**1.86**
Volatility	16.69	10.81		16.25	10.40	

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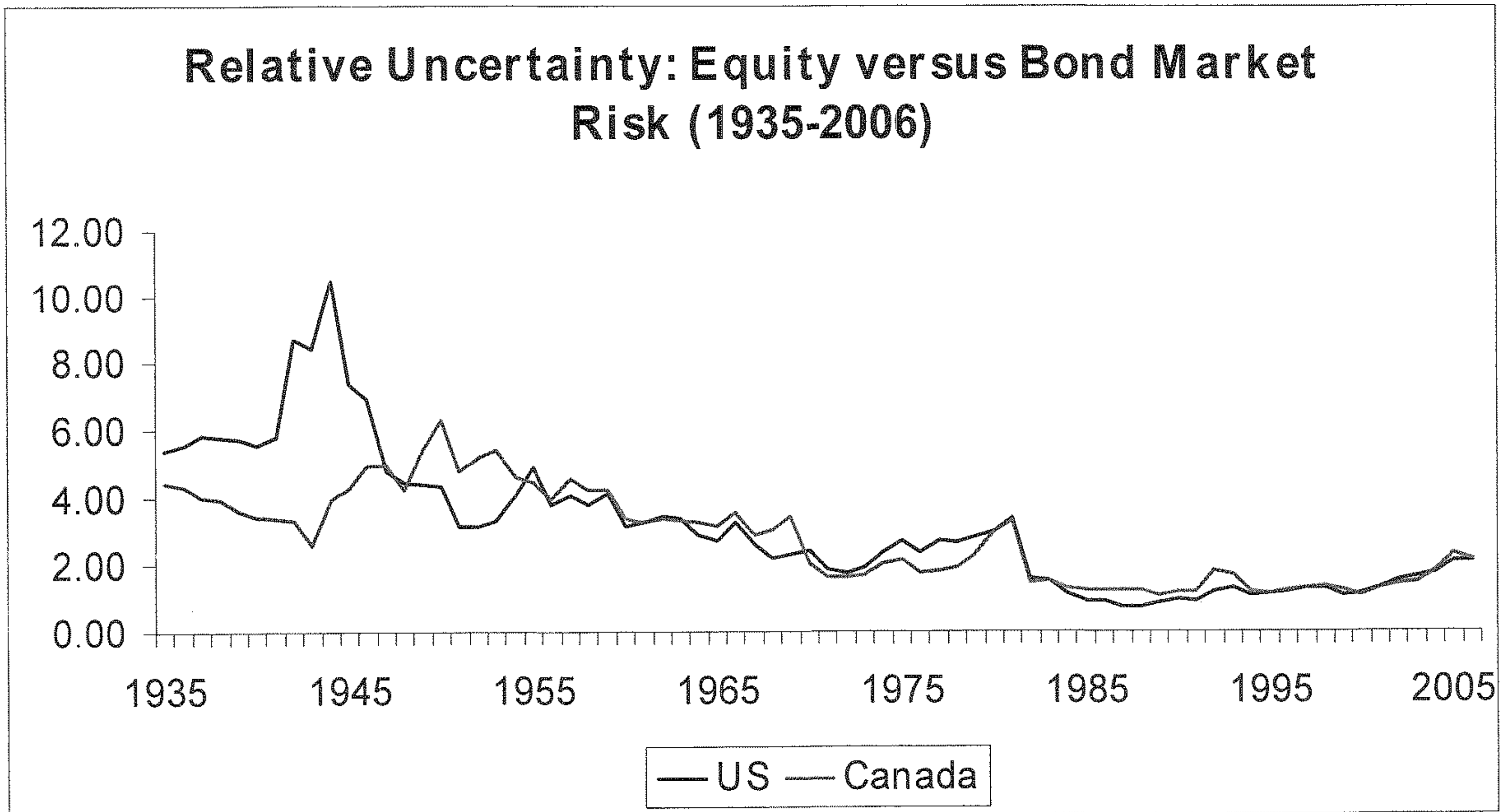
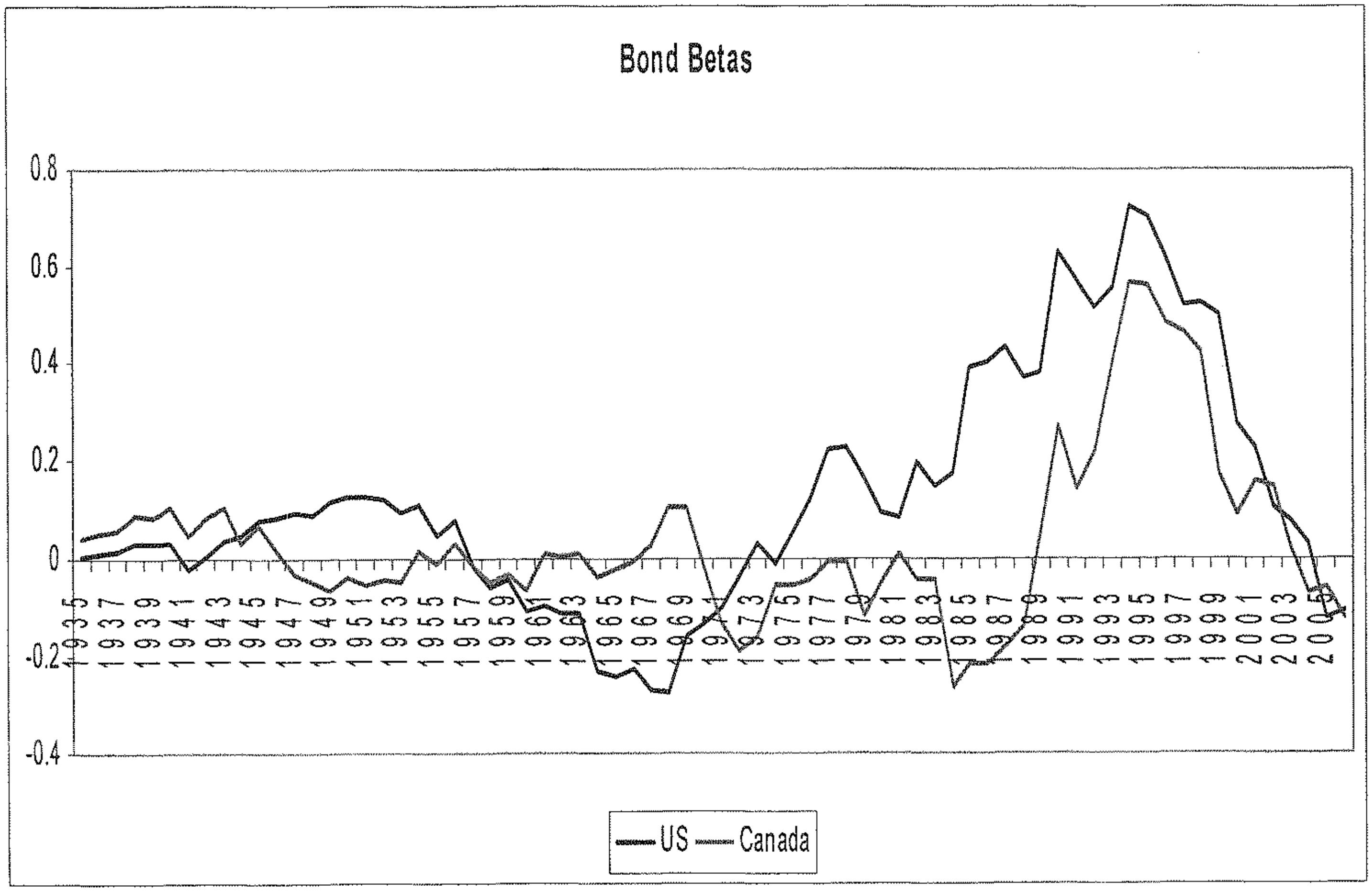
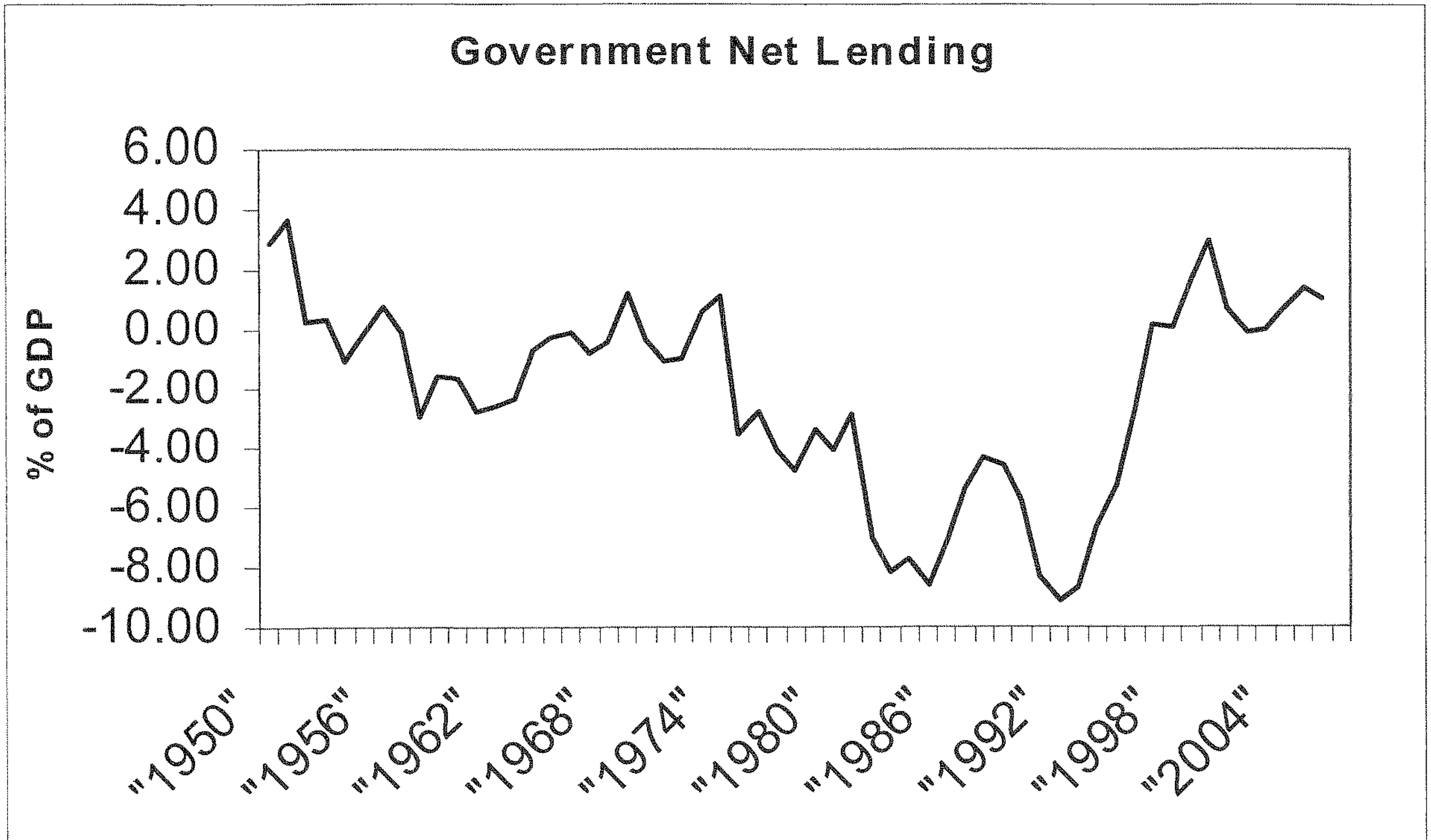


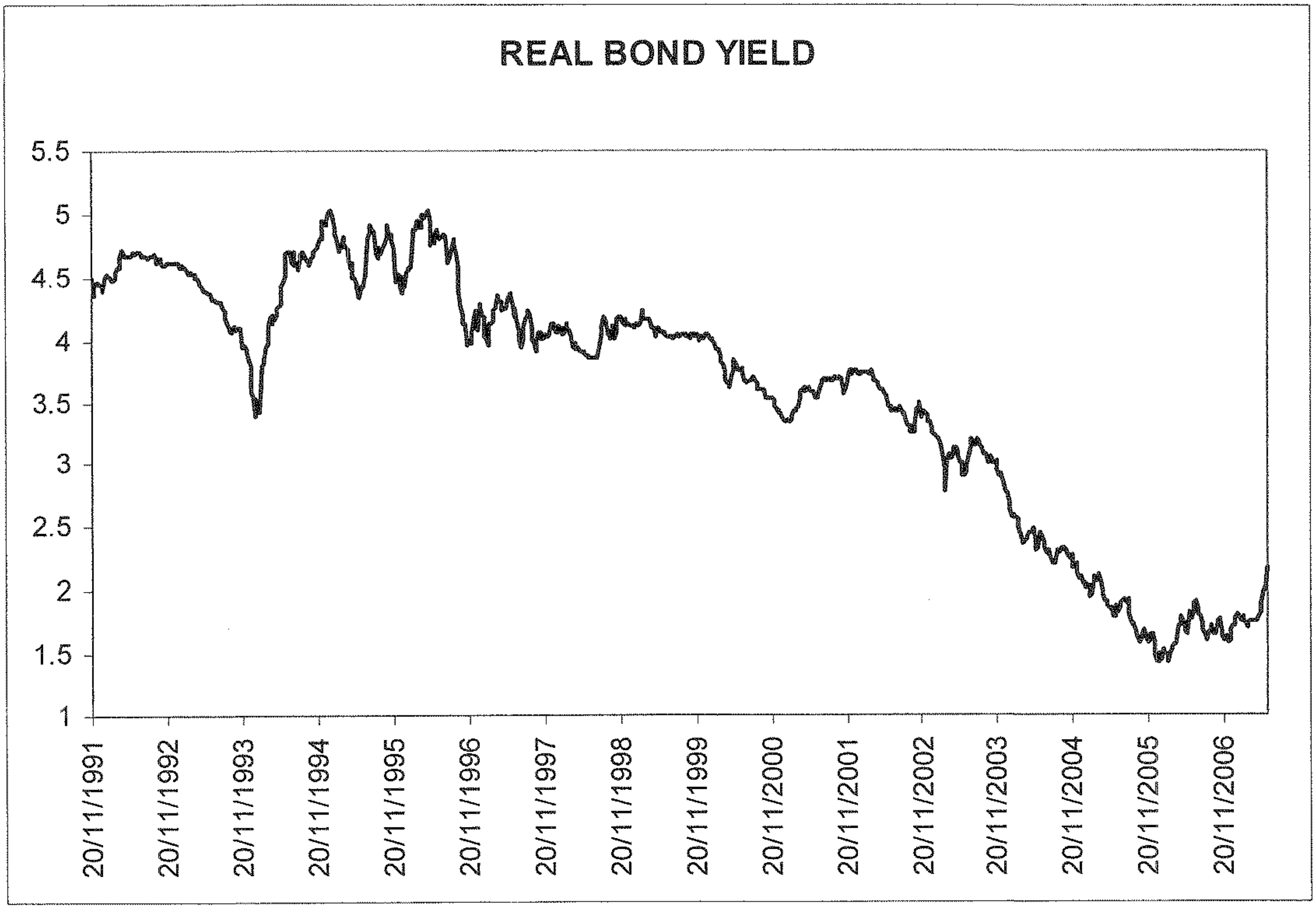
Ratio of 10-year rolling standard deviations of returns



Bond Betas
0.8
0.6
0.4
0.2
0
-0.2
-0.4
1935
1937
1939
1941
1943
1945
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
US
Canada



BOOTH GMI 2007



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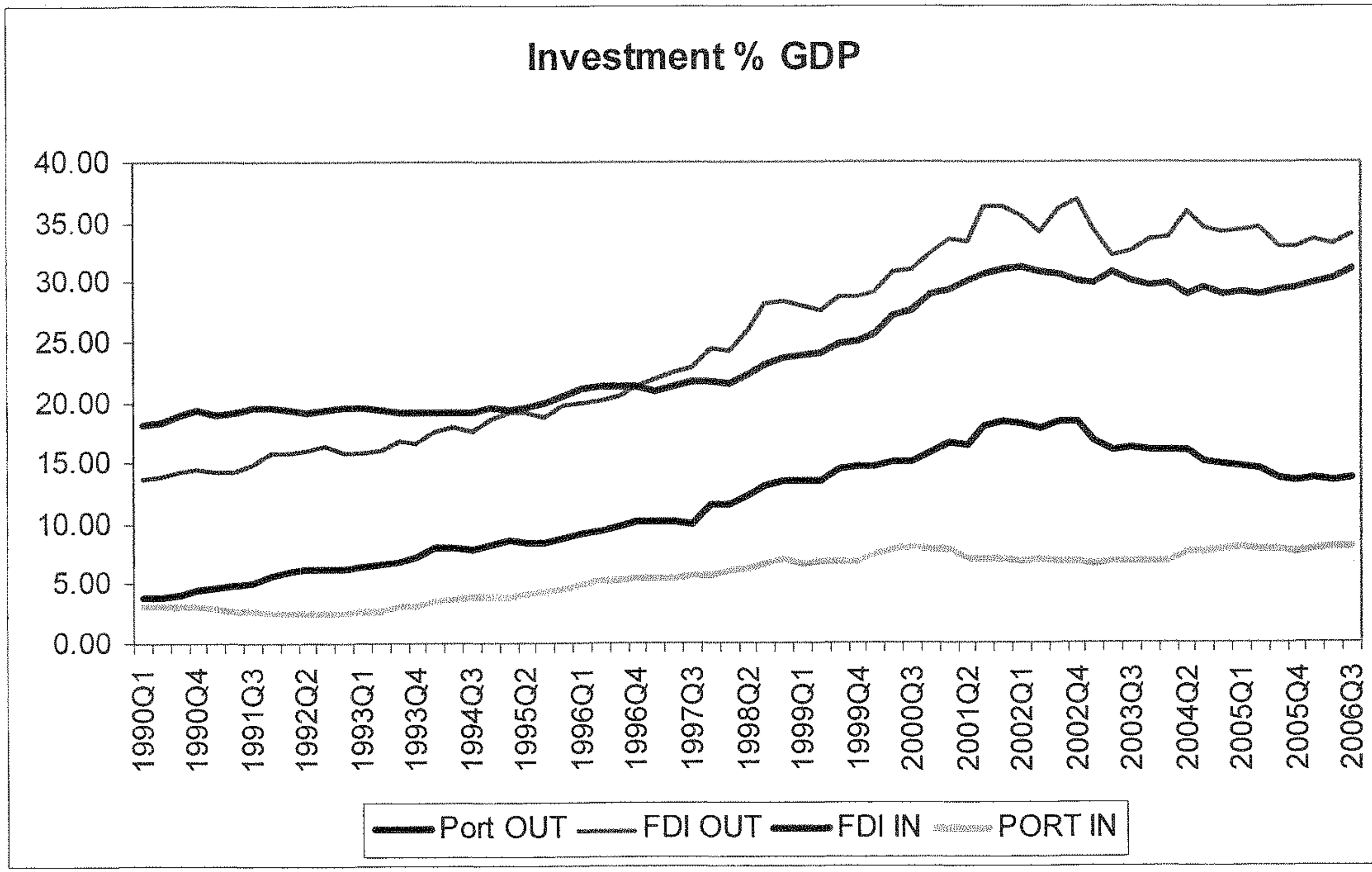
Central Message

- Market Risk Premium is not constant
  - Risk premium of equities over bonds and bond risk has not been constant
  - Bond risk around the world is different even if equity risk is the same
- Earned MRP has not been above 5% in the last 50 years
- Currently conditions are closer to the early 1950s than at any time in the last 50 years
- I use 5.0% for the MRP: Equity cost for the market of 9.5% nominal or 7.5% real
- Canadian real equity return has averaged 6.97% since 1956

Globalisation of Capital Markets



Market Integration

"The relatively high ex post returns provided by internationally diversified portfolios of securities may well be related to market imperfections. If current restrictions on international capital flows, to say nothing of other market imperfections, were removed, returns on internationally diversified portfolios would be expected to decline relative to the risk-free rate of interest. More importantly, the equilibrium rate of exchange of risk and return should decline for most countries, non-diversifiable risk should decline for most projects, and the resulting reduction in the risk premium component of the cost of capital to firms should improve the efficiency of real capital allocation."

R. Cohn and J. Pringle, "Imperfections in International Financial Markets: Implications for Risk and the Cost of Capital to Firms," *Journal of Finance,* March 1973, pp 59-66

The integration of capital markets ***reduces*** market risk premiums

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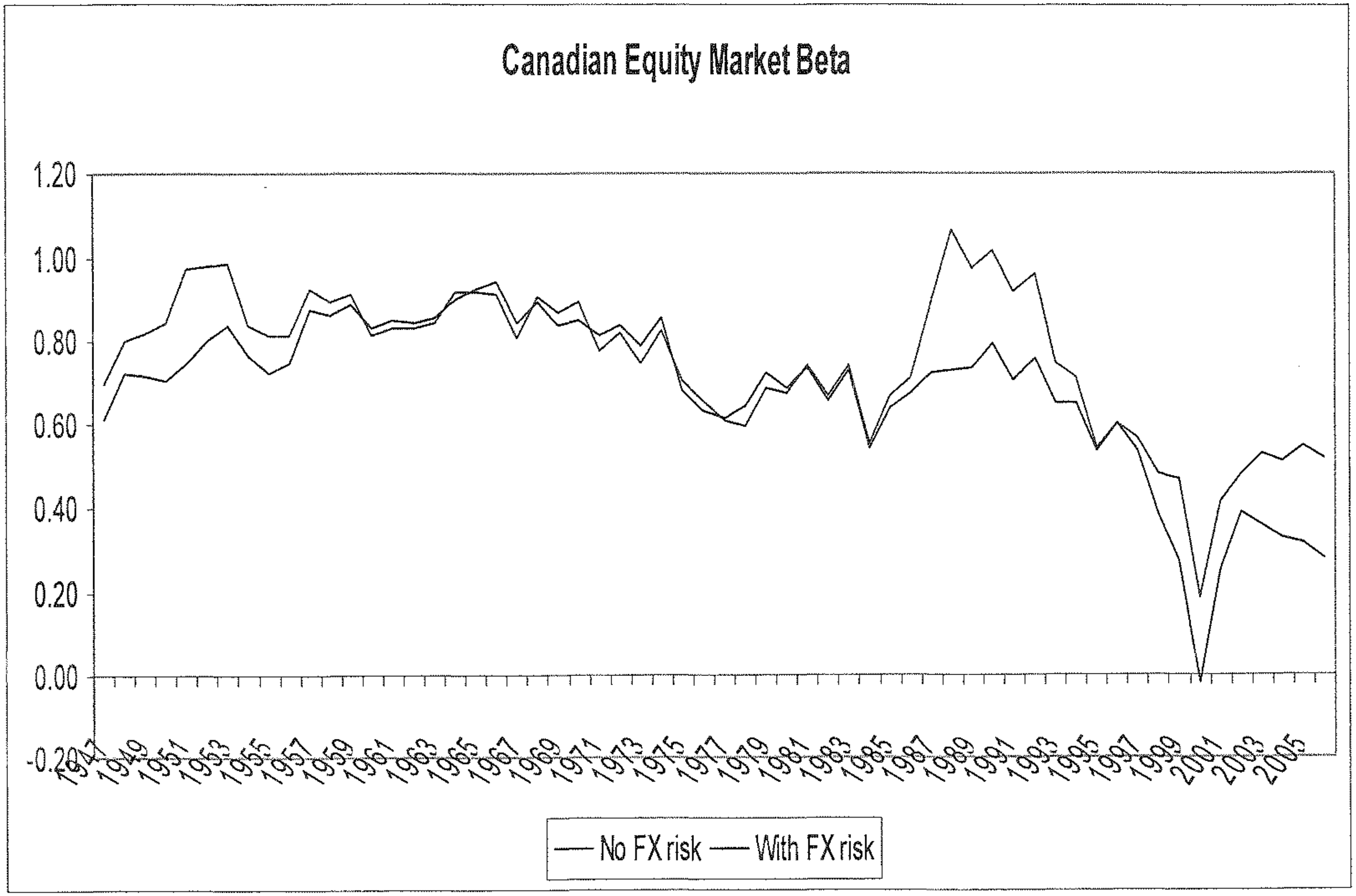

Canadian Equity Market Beta
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
1947
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
No FX risk
With FX risk

From US Perspective

- Assume US MRP is 6.5%
- Beta for investing in Canada is 0.4-0.6
- US investors require a risk premium of
  - 0.40 * 6.5 = 2.6%
  - 0.60 * 6.5 = 3.9%
- Canada is lower risk since the TSX is less correlated with US markets and offers diversification gains.
- Canada is increasingly an economy driven by resources (back to the 1970s)

Utility Risk 1

EARNED ROE vs ALLOWED

	TCPL		Foothills		TCPL BC (ANG)		TQM	
	Allowed	Actual	Allowed	Actual	Allowed	Actual	Allowed	Actual
1990	13.25	13.34	14.25	14.25	13.25	13.25	13.75	14.87
1991	13.5	13.65	14.25	14.25	13.38	13.38	13.75	13.94
1992	13.25	13.43	13.83	13.83	13.43	13.43	13.75	13.97
1993	12.25	12.31	11.73	11.73	12.08	12.08	12.25	12.5
1994	11.25	11.16	11.5	11.5	12	12	12.25	12.55
1995	12.25	12.56	12.25	12.25	12.25	12.25	12.25	12.65
1996	11.25	11.83	11.25	11.25	11.25	11.25	11.25	11.83
1997	10.67	11.15	10.67	10.67	10.67	10.67	10.67	10.94
1998	10.21	10.63	10.21	10.21	10.21	10.21	10.21	10.32
1999	9.58	9.64	9.58	9.58	9.58	9.58	9.58	9.94
2000	9.9	9.99	9.9	9.9	9.9	9.9	9.9	9.96
2001	9.61	10.01	9.61	9.61	9.61	6.86	9.61	10.21
2002	9.53	9.95	9.53	9.53	9.53	9.53	9.53	9.8
2003	9.79	10.18	9.79	9.79	9.79	8.21	9.79	10.21
2004	9.56	10.18	9.56	9.56	9.56	8.51	9.56	9.84
2005	9.46	9.66	9.46	9.46	9.46	9.46	9.46	9.82
Average	10.96	11.23	11.09	11.09	11.00	10.66	11.10	11.46
ovrearn		0.27		0.00		-0.34		0.36

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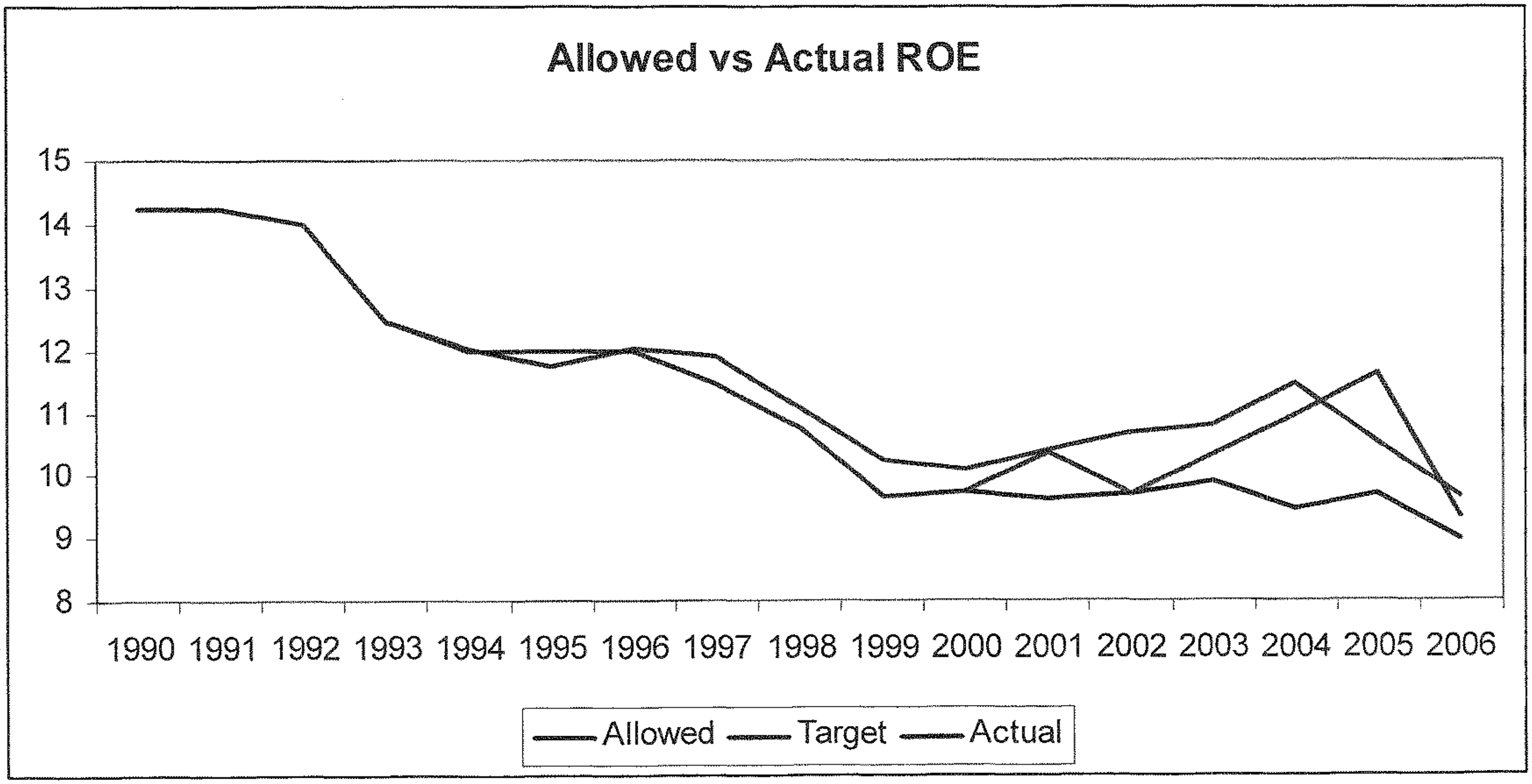
Utility Risk 2

	EGDI		UNION		Terasen	
	Allowed	Actual	Allowed	Actual	Allowed	Actual
1990	13.25	13.60	13.50	13.40		
1991	13.13	13.29	13.50	12.50		
1992	13.13	13.40	13.00	13.70	12.25	9.06
1993	12.30	14.43	12.50	14.30	na	11.91
1994	11.60	12.49	11.75	12.14	10.65	9.73
1995	11.65	12.66	11.75	12.12	12.00	12.03
1996	11.88	13.14	11.75	12.52	11.00	11.80
1997	11.50	13.00	11.00	12.26	10.25	11.27
1998	10.30	11.97	10.44	11.14	10.00	9.41
1999	9.51	10.77	9.61	10.10	9.25	10.70
2000	9.73	10.83	9.95	10.11	9.50	10.75
2001	9.54	10.03	9.95	11.45	9.25	9.38
2002	9.66	11.81	9.95	12.36	9.13	10.03
2003	9.69	13.14	9.95	12.08	9.42	10.23
2004	9.69	10.66	9.62	10.45	9.15	9.46
2005	9.57	9.46				
	11.01	12.17	11.21	12.04	10.15	10.44
Over		1.16		0.83		0.29

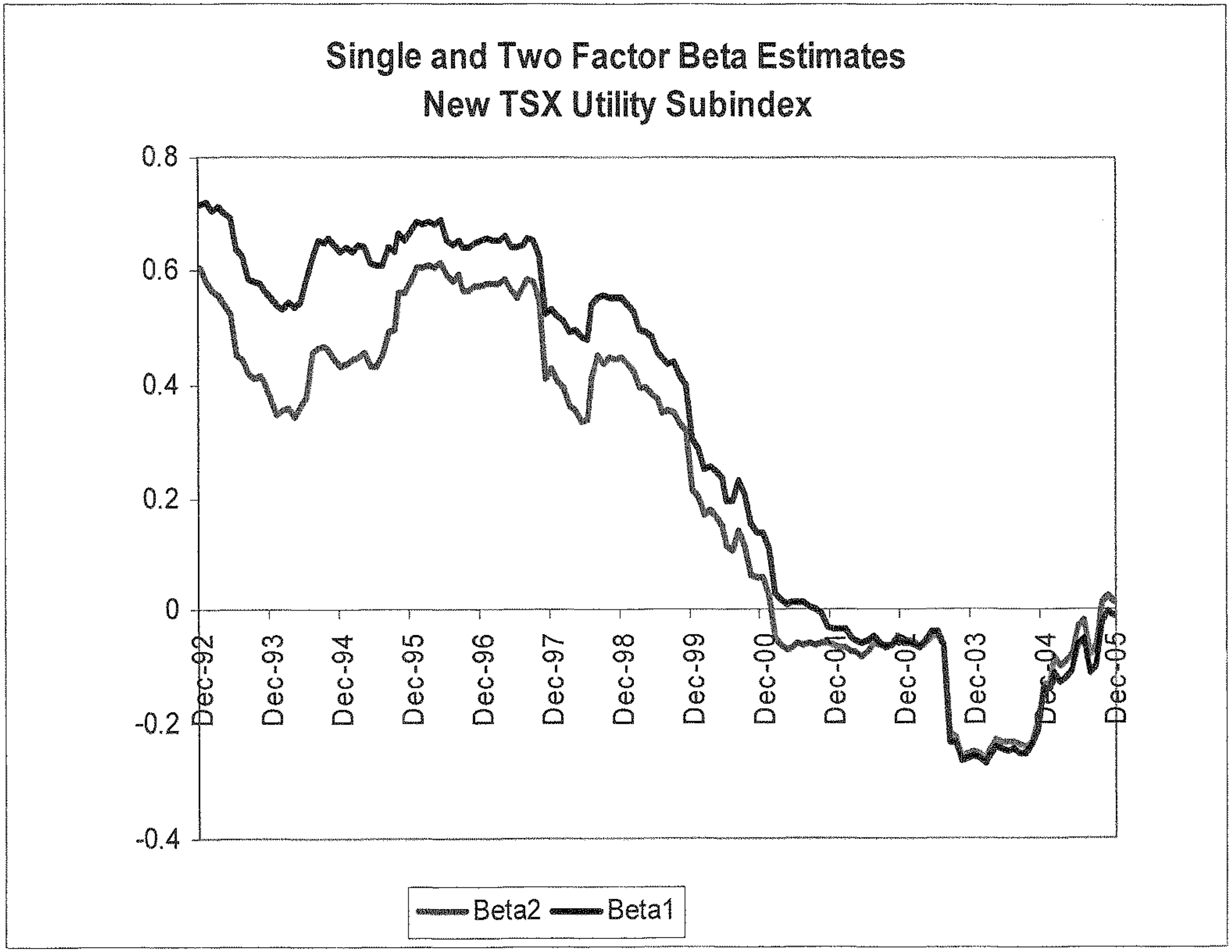
Gaz Metro

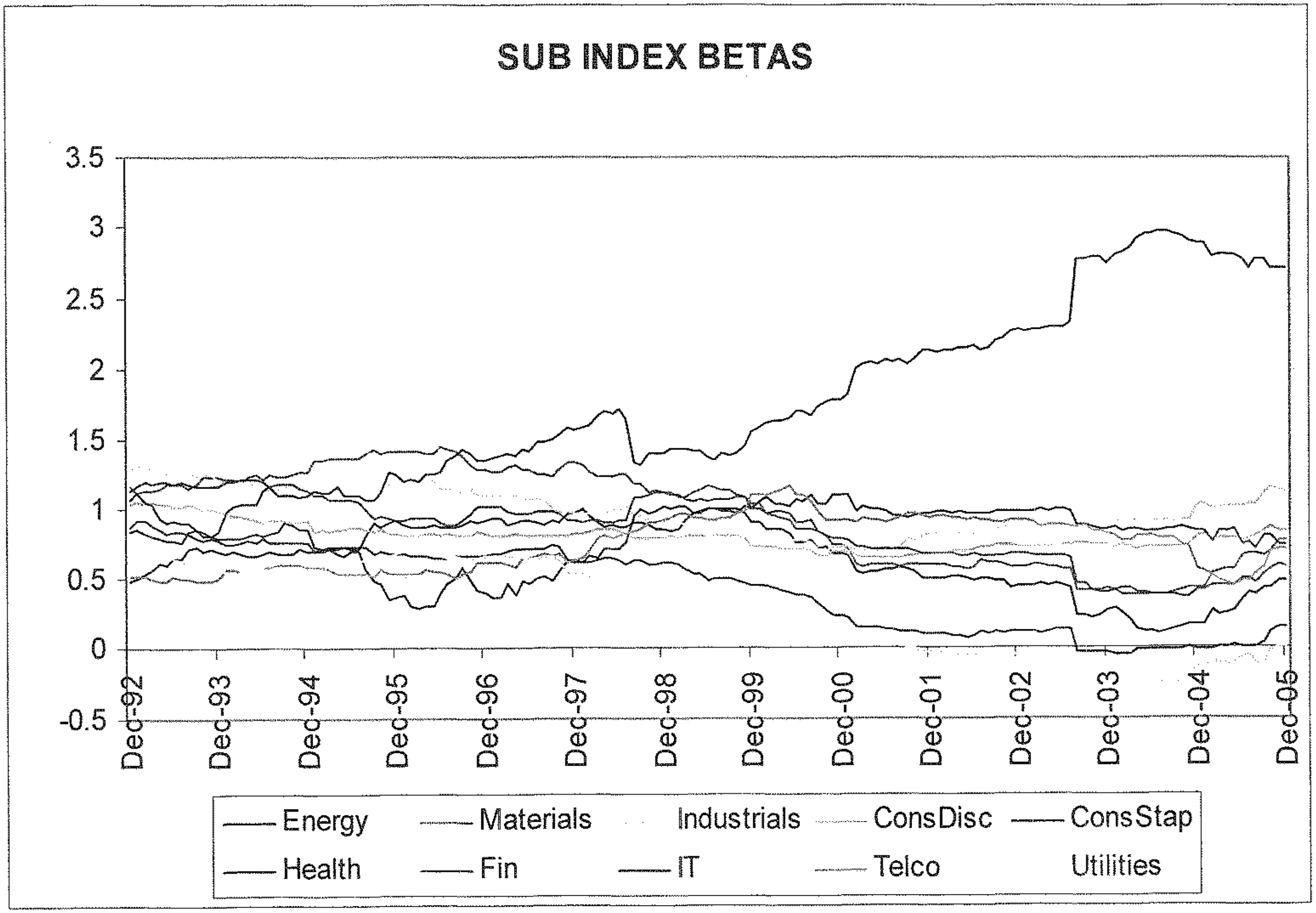


Allowed vs Actual ROE
15
14
13
12
11
10
9
8
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
Allowed
Target
Actual

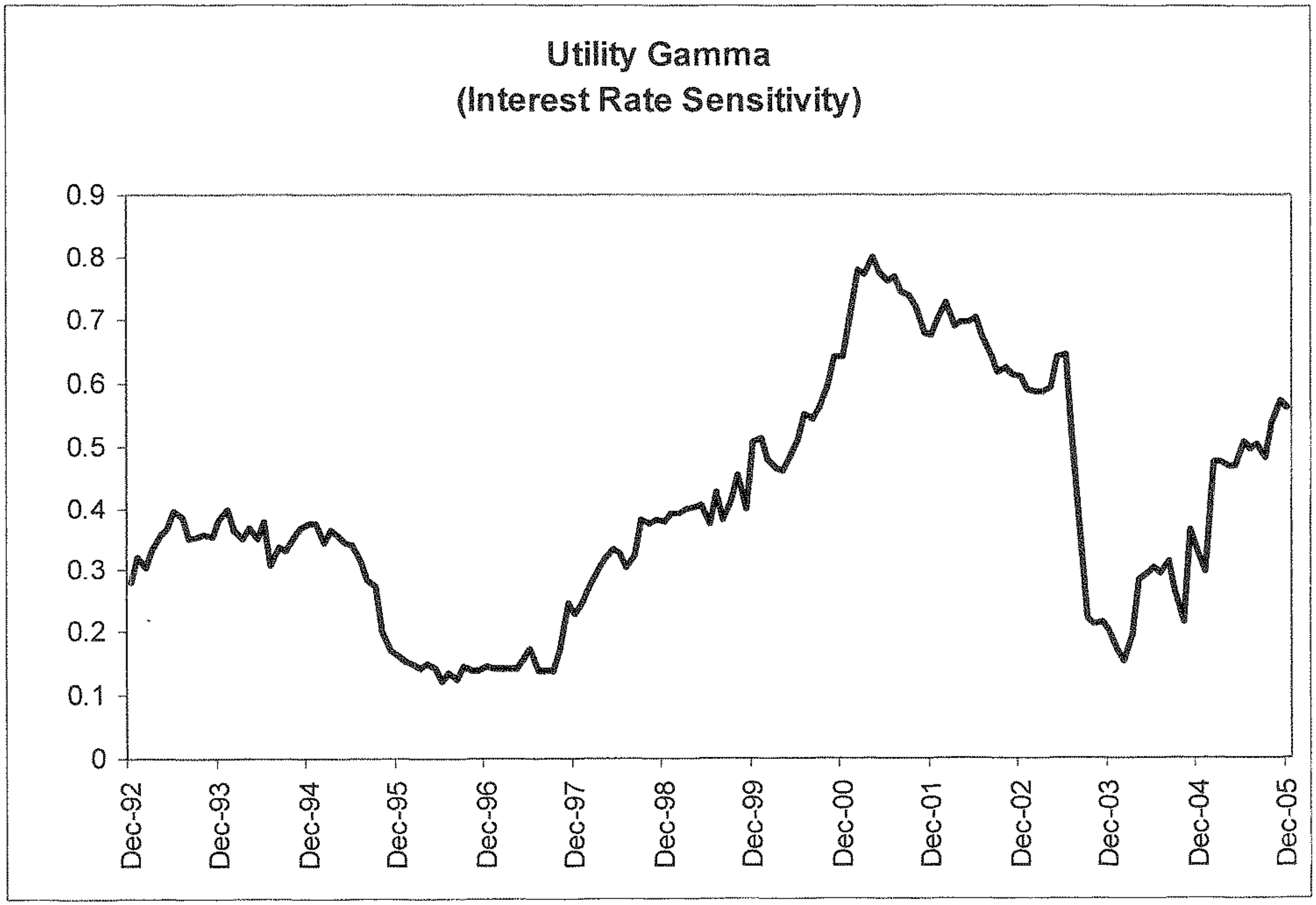
Utility Risk

- Very little business risk as they almost always earn their allowed ROE
  - Forward test year
  - Annual rate hearings
  - Deferral accounts
  - Go back to regulator if unanticipated events (risk)
- Investment risk
  - Remember long Canadas had betas of 0.5-0.60 in mid 1990s and were risky
  - Utilities have interest rate risk


Single and Two Factor Beta Estimates
New TSX Utility Subindex
0.8
0.6
0.4
0.2
0
-0.2
-0.4
Dec-92
Dec-93
Dec-94
Dec-95
Dec-96
Dec-97
Dec-98
Dec-99
Dec-00
Dec-03
Dec-05
Beta2
Beta1



SUB INDEX BETAS
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
Dec-92
Dec-93
Dec-94
Dec-95
Dec-96
Dec-97
Dec-98
Dec-99
Dec-00
Dec-01
Dec-02
Dec-03
Dec-04
Dec-05
Energy
Materials
Industrials
ConsDisc
ConsStap
Health
Fin
IT
Telco
Utilities



Utility Gamma
(Interest Rate Sensitivity)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Dec-92
Dec-93
Dec-94
Dec-95
Dec-96
Dec-97
Dec-98
Dec-99
Dec-00
Dec-01
Dec-02
Dec-03
Dec-04
Dec-05

Summary

- Long Canada bond yield 4.3%
- Canadian market risk premium
  - Since 1956 about 3.0%
  - Situation now similar to 1950's
  - My estimate 5.0%
  - Globalisation would reduce this
  - US MRP is an "academic puzzle" at 6.50%
- Utility risk
  - Very low business risk for utilities
  - UHC's have half the market risk
  - UHC's have half the interest rate risk of the long bond
- Overall fair ROE is about 7.5-8.0 plus issue costs%

Régie de l'énergie Québec

Bordereau de télécopie

Date : 2 août 2007 Nombre de pages : 2

Destinataire : Me Jocelyn Allard – Société en commandite Gaz Métro - (514) 598-3839

c.c. : Tous les participants au dossier R-3307-94 (voir liste ci-dessous)

Expéditeur : Peggy Lareau
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Tél. : (514) 873-2452, poste 225
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Message : **R-3307-94 / SCGM, Coût du gaz 1er août 2007**

M. Yves Godin – (514) 376-5232

Me Louis Leclerc – (514) 871-8977

M. Jean-Marc Rousseau – (450) 462-5388

Me Guy Sarault – (514) 921-1317

Régie de l'énergie
Québec
Bureau du secrétaire

Montréal, le 2 août 2007

PAR TÉLÉCOPIEUR

Me Jocelyn B. Allard
Directeur, Affaires juridiques et réclamations
SCGM
1717, rue du Havre
Montréal (Québec) H2K 2X3

Objet : Suivi des décisions D-95-44, D-99-11, D-2001-78, D-2001-214, D-2002-196, D-2003-180, D-2004-196 et D-2006-86
Notre dossier : R-3307-94, phase II
Votre dossier : 312-00259

Cher confrère,

En réponse aux documents transmis à la Régie concernant le coût du gaz au 1er août 2007, la Régie constate que votre proposition est conforme à ses décisions D-95-44, D-99-11, D-2001-78, D-2001-214, D-2002-196, D-2003-180, D-2004-196 et D-2006-86.

Veuillez agréer, cher confrère, l'expression de nos sentiments distingués.

nom Véronique Dubois, avocate
Secrétaire de la Régie de l'énergie

VD/pl

c.c. : intervenants

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