

琉球大学 保険フォーラム
基調講演
アクチュアリーへの
使命とその醍醐味

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サムスン生命保険 顧問

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日本アクチュアリー会の主な年表

元号	西暦	日本アクチュアリー会	日本の状況
明治13年	1880		近代的な生命保険会社の創設(旧安田生命＝共済五百名社)、なお翌年に明治生命成立
明治22年	1889		藤澤利喜太郎『生命保険論』発行 日本帝国憲法発布
明治31年	1898		最初の保険業法制定
明治32年	1899	日本アクチュアリー会創立	
大正14年	1925		大正12年関東大震災
昭和11年	1936	日本アクチュアリー会正会員試験開始	
昭和14年	1939		保険業法改正・保険計理人制度の発足
昭和16年	1941	アクチュアリー会第一回会報	太平洋戦争勃発
昭和42年	1967	会員数が1000名を突破	
昭和47年	1972	アクチュアリー講座の開講	翌年 オイルショック
昭和63年	1988	年金数理人制度の発足	
平成7年	1995	生保標準生命表1996を作成	阪神・淡路大震災
平成8年	1996		新保険業法施行
平成11年	1999	日本アクチュアリー会 創立100周年	介護保険制度発足
平成18年	2006	標準生命表2007の制定	
平成24年	2012	CERA試験開始	

主な業務

保険業法の保険計理人の関与事項などにこだわることなく列記

- 責任準備金に関する事象全般
- ソルベンシー・マージンに関する事項
- 主な財務諸表への関与
- 保険料の策定・計算
- 商品開発への関与
- 負債全体の監視
- リスク管理全般
- 募集関連の規定や報酬の策定
- 必要となる人材の育成
- IR
- その他たくさん



What is an Actuary?

Society of Actuaries HP

An actuary is a business professional who analyzes the financial consequences of risk. Actuaries use mathematics, statistics and financial theory to study uncertain future events, especially those of concern to insurance and pension programs. They evaluate the likelihood of those events, design creative ways to reduce the likelihood and decrease the impact of adverse events that actually do occur.

Actuaries are an important part of the management team of the companies that employ them. Their work requires a combination of strong analytical skills, business knowledge and understanding of human behavior to design and manage programs that control risk.

SOA members work in life insurance, retirement systems, health benefit systems, financial and investment management and other emerging areas of practice. The majority of actuaries work within the insurance industry, although a growing number of actuaries work in other fields.

<http://www.soa.org/about/about-what-is-an-actuary.aspx>

What is an Actuary?

Society of Actuaries HP

アクチュアリーはリスクがもたらす財務的な結果(ダメージ)を分析する専門的な職業です。アクチュアリーは主に保険や年金に関する事柄など、不確かな将来事象を探求するために数学、統計そしてファイナンシャル理論を用います。アクチュアリーはリスクイベントが起きる可能性を計量し、その可能性を低減するクリエイティブな方策をさぐり、それが現実が発生したときに生じる有害事象のインパクトを軽減する方法もデザインします。

アクチュアリーは所属する企業のマネジメントチームにおいて重要な役割を果たします。その職務においては、確実な分析能力、ビジネスについての知識、人間の行動についての理解についての統合的な考え方が要求されます。それによって、リスクをコントロールするためのプログラムを考案し運営することができます。

SOAのメンバーは生命保険、退職制度、健康保険制度、ファイナンスと投資マネジメントやその他新たな領域で仕事をしています。アクチュアリーの多くは保険業界で仕事をしていますが、その他のフィールドで仕事をするアクチュアリーも増えています。

解説1

アクチュアリーはリスクによる財務的な結果（ダメージ）を分析する専門的な職業です。

→ ここに「保険」の文字が入っていないことに注意



解説2



アクチュアリーは主に保険や年金に関する事柄など、不確かな将来事象を探求するために数学、統計そしてファイナンス理論を駆使します。

→ここでも「保険」や「年金」は例としてあげられているだけです。「不確かな将来事象」の一つの類例としての「保険」や「年金」です

→その際、数学・統計・ファイナンス理論を用いますので、それらを知っておく必要があります

解説3



SOAのメンバーは生命保険、退職制度、健康保険制度、ファイナンスと投資マネジメントやその他出現したエリアで仕事をしています。アクチュアリーの中には保険業界で仕事をしていますが、その他のフィールドで仕事をするアクチュアリーも増えています。

→ SOAはアメリカのアクチュアリー会(Society of Actuary)を指します。

→ ここでも保険業界から出て多くのフィールドを目指していることがわかります

本日は次の箇所を中心に考えてみます

【第1段落に戻り】アクチュアリーはリスクイベントが起きる可能性を計量し、その可能性を低減するクリエイティブな方策をさぐり、それが現実には発生したときに生じる有害事象のインパクトを軽減する方法もデザインします。

→ リスク発生の計量とクリエイティブな逓減方策

→ 有害事象のインパクトを軽減する方法



保険数理と ファイナンスのミニレクチャー

保険料の計算

保険会社の主なキャッシュフローは

保険料 → 収入

保険金 → 支出

保険会社の副次的なキャッシュフローは

利息 → 収入(支出)

事業費 → 支出

純保険料

営業保険料



営業保険料計算の仮定

• 予定の集合体

• 予定死亡率

一度決めたらまず
変えられない

• 予定利率

長期の固定割引金利

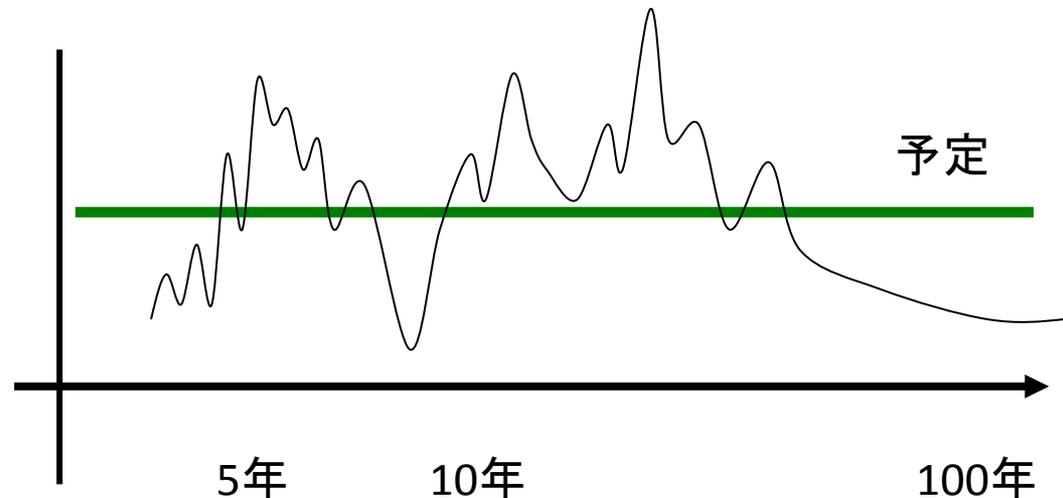
• 予定事業費率



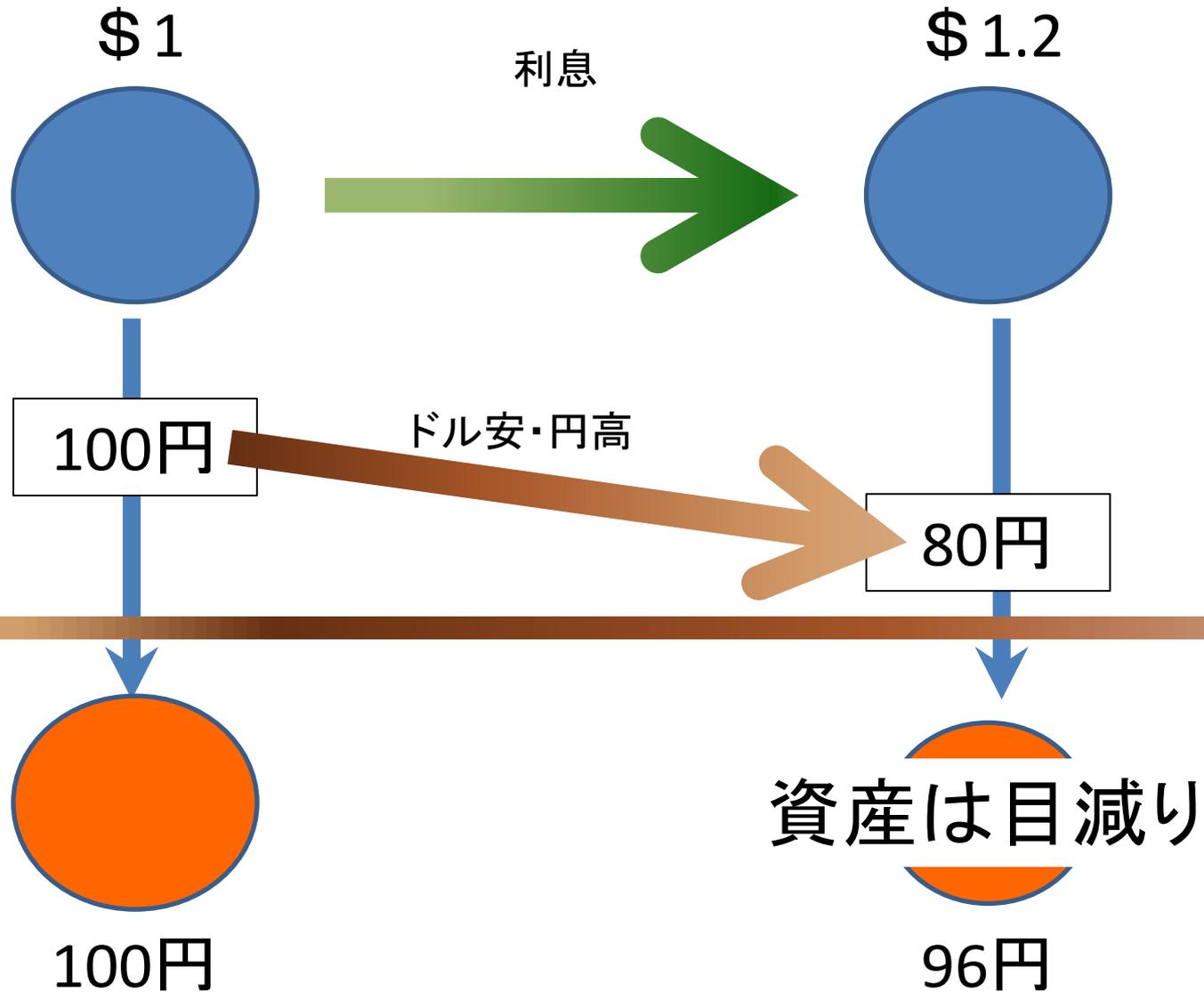
アクチュアリーはコンサルタントとして占い師を雇っている????

アクチュアリーには保守的な視点が求められる

度胸と横並びで保険料を決めた時代は過去の話



ミニファイナンス講座1 円ドルレートと外債



ミニファイナンス講座2 金利と債券価格

1年後100円が償還される次の二つの債券の金利を計算せよ（割引債）

債券Aの現在価格は90円

債券Bの現在価格は80円

それぞれ金利を計算すると

債券Aの金利は11.11% $100 \div 90 - 1$

債券Bの金利は25.00% $100 \div 80 - 1$

貴君は2年後に100を支払う養老保険を販売しようとしている。現在の金利が25%だったのでこれが2年続くと想定して64の価格で販売しようと考えた（死亡は無視する）（ここで、 $64 = 100 \times (1/1.25)^2$ ）

貴君の国では1年物の債券しか存在しなかったとする

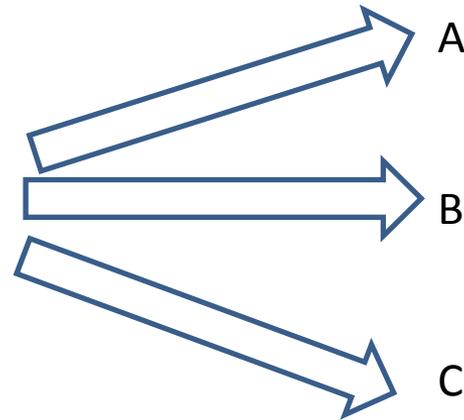
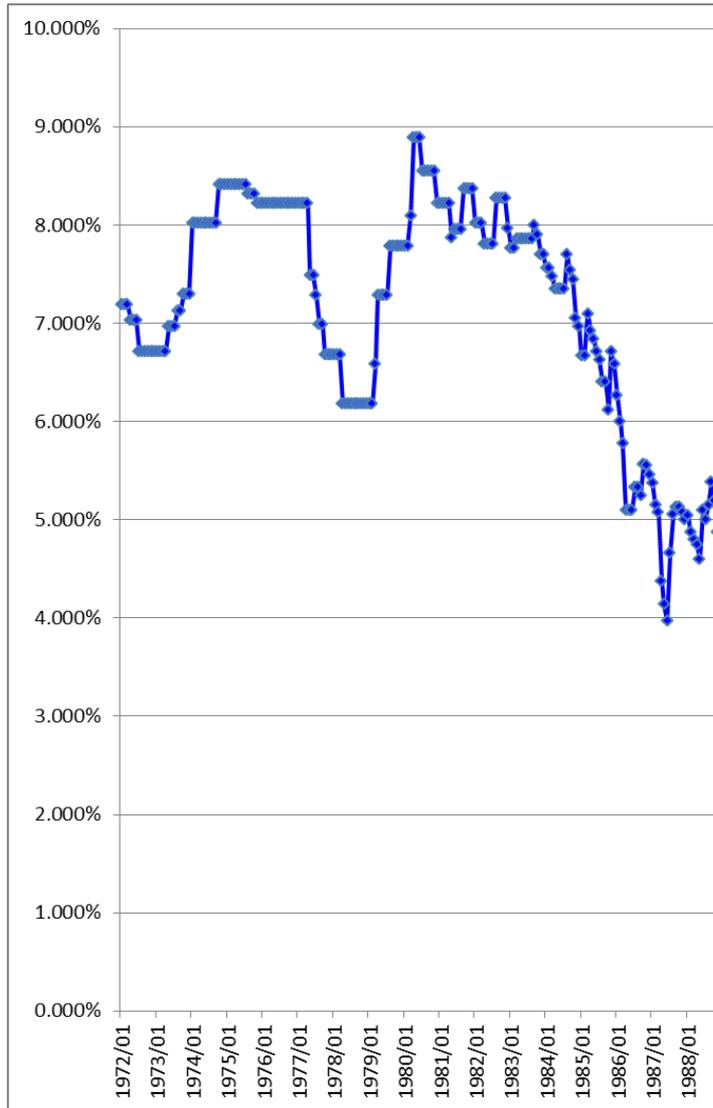
1年後 $64 \times 1.25 = 80$ となっている。

さて意に反して、翌年金利は11.11%まで下がったとすると、貴君は困ったことになる ⇒ なぜか

90を用意しないと100にならないのに、手持ちが80しかないからである

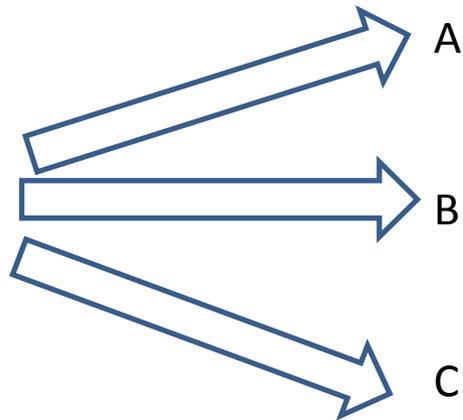
次はどうなりますか？？？

10 years JGB Earning rate past 40 years



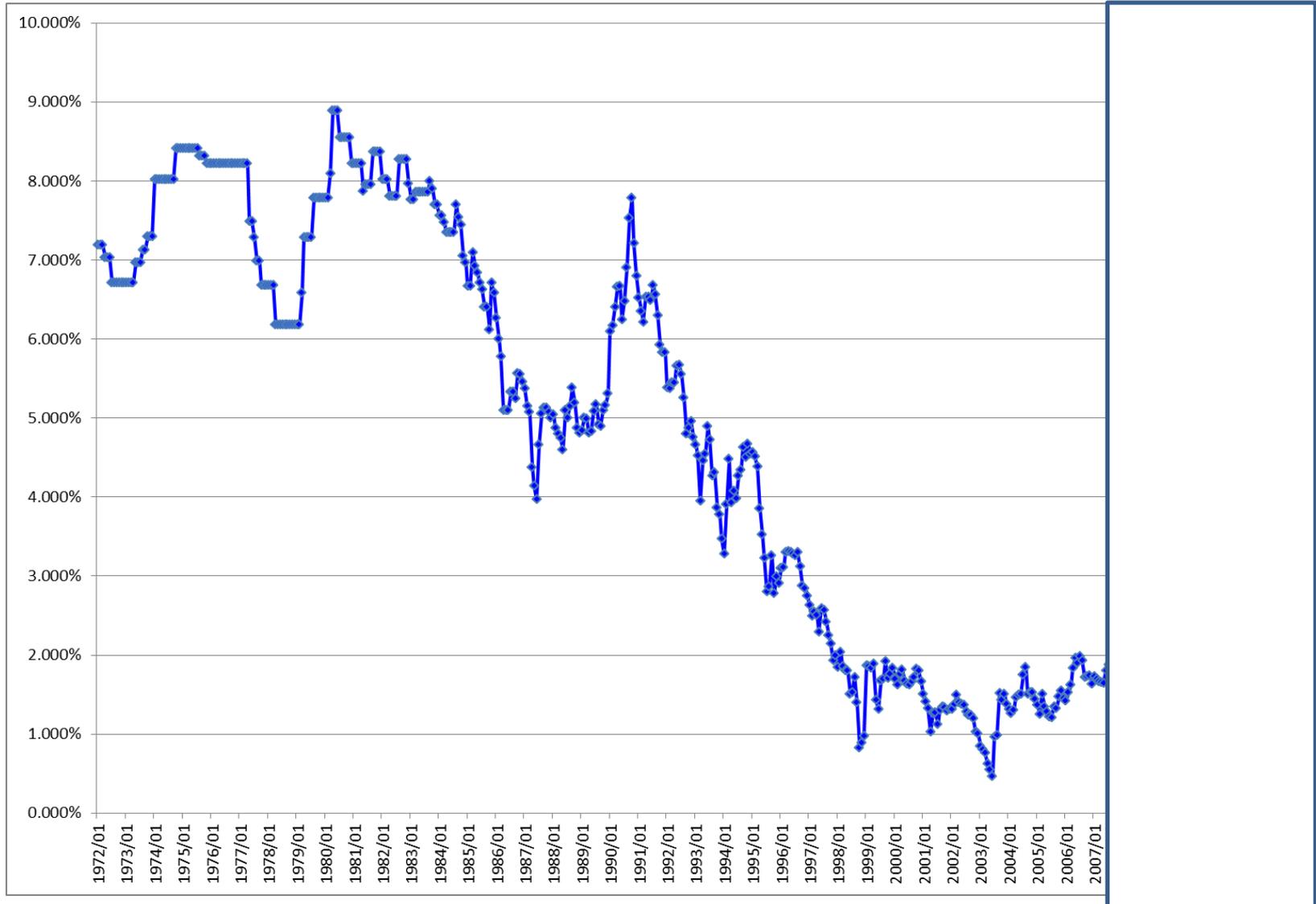
Which direction is most likely?

10 years JGB Earning rate past 40 years

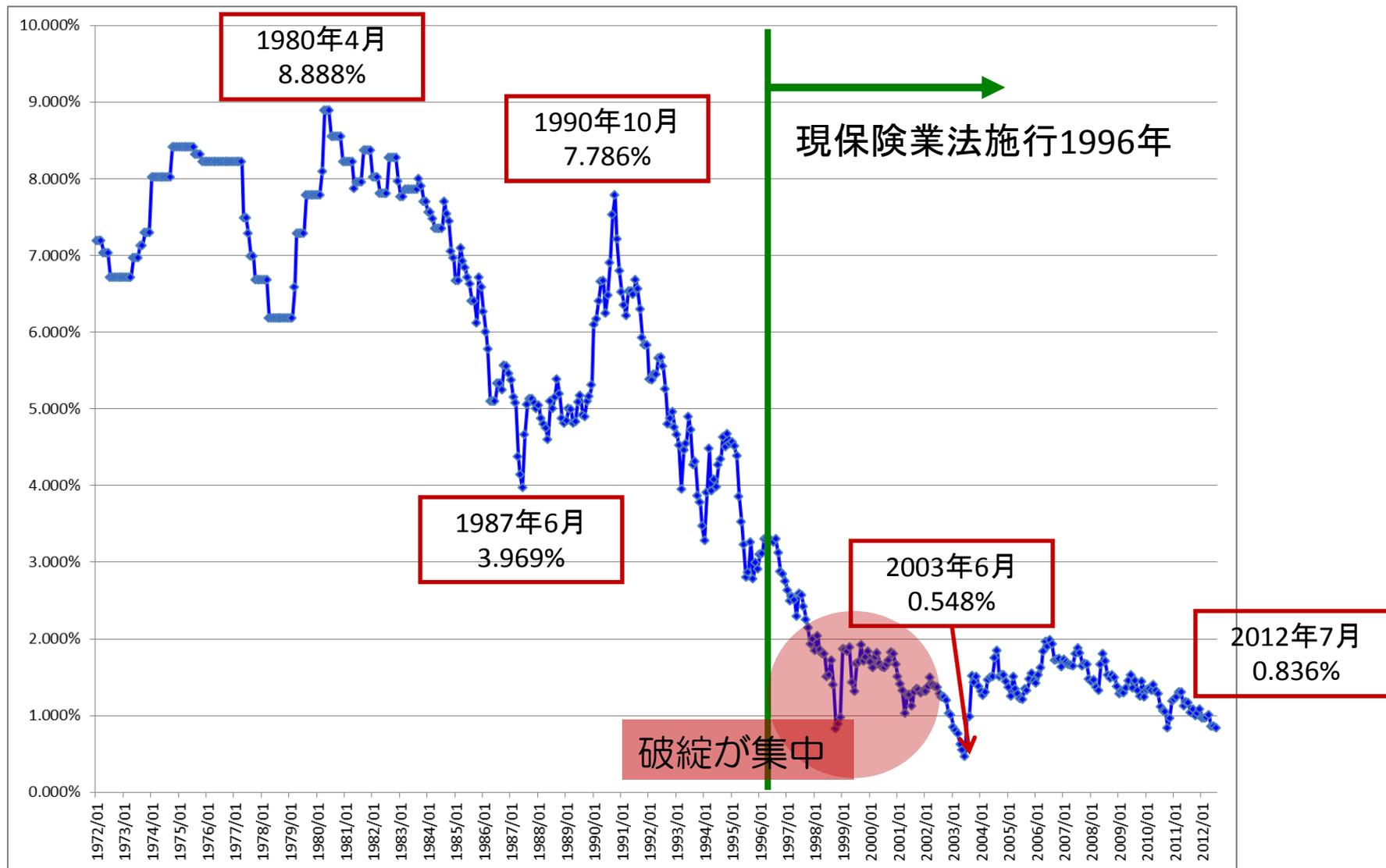


Which direction is most likely?

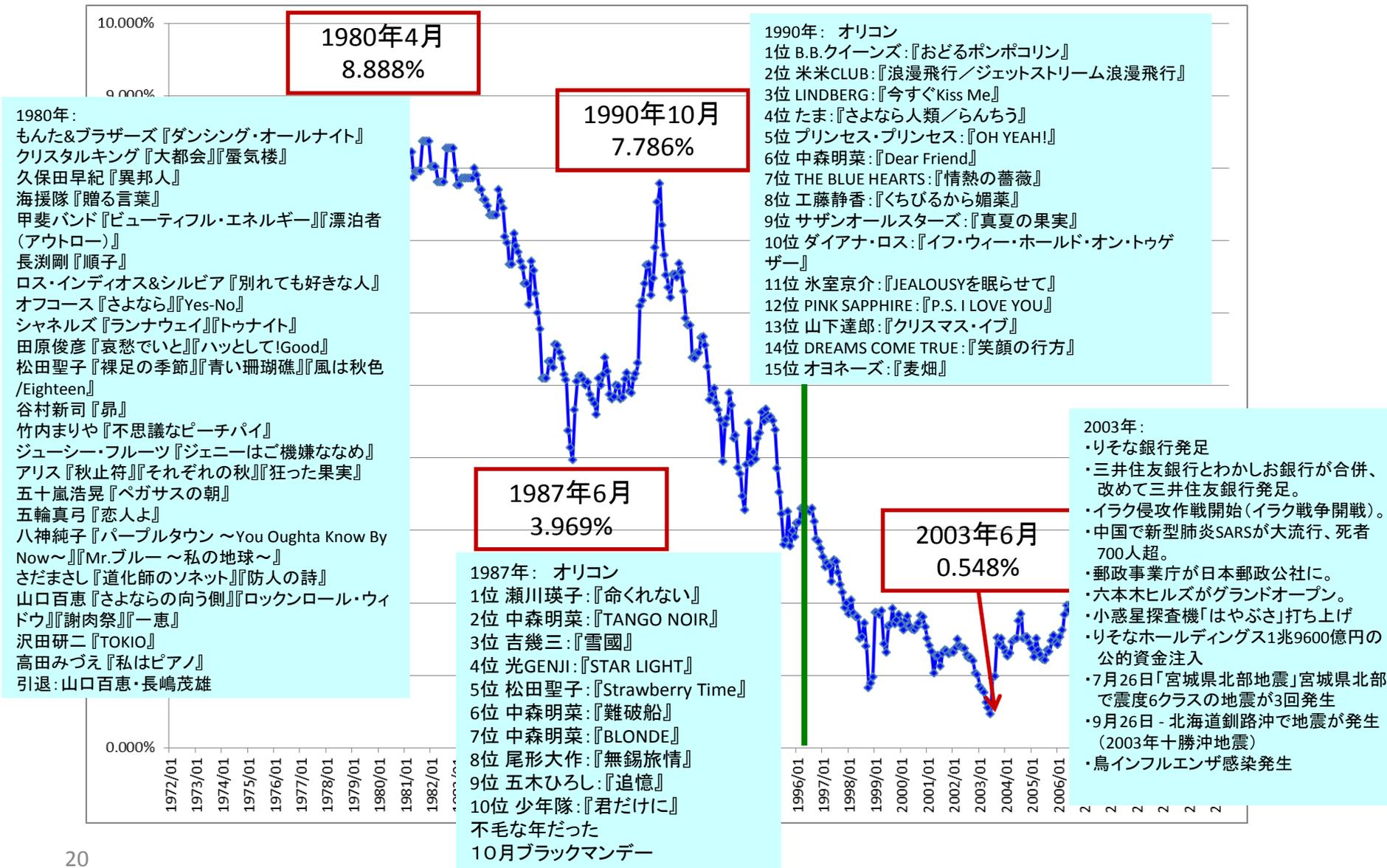
10 years JGB Earning rate past 40 years



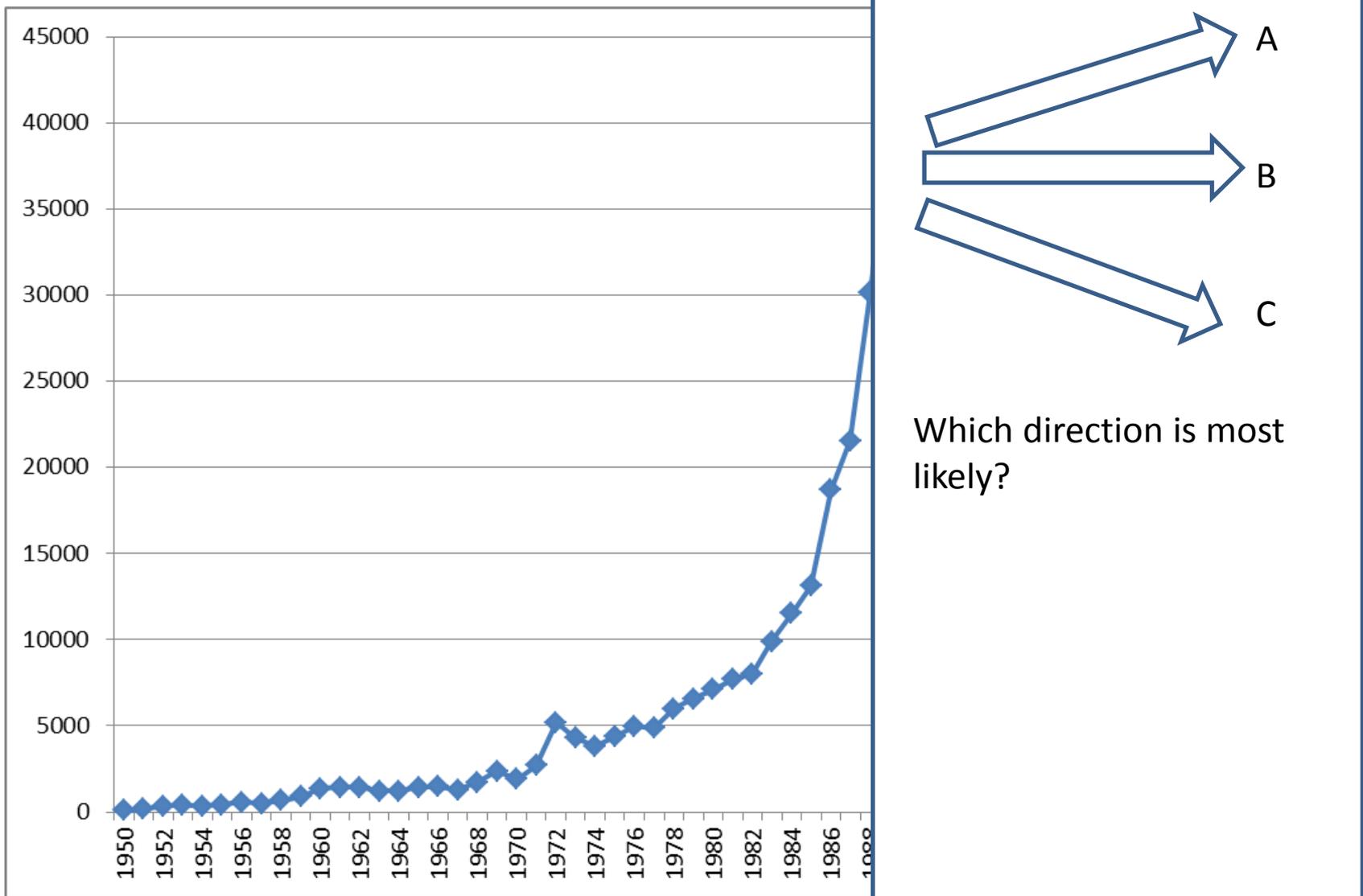
過去40年間の国債の応募者利回り [月別データ]



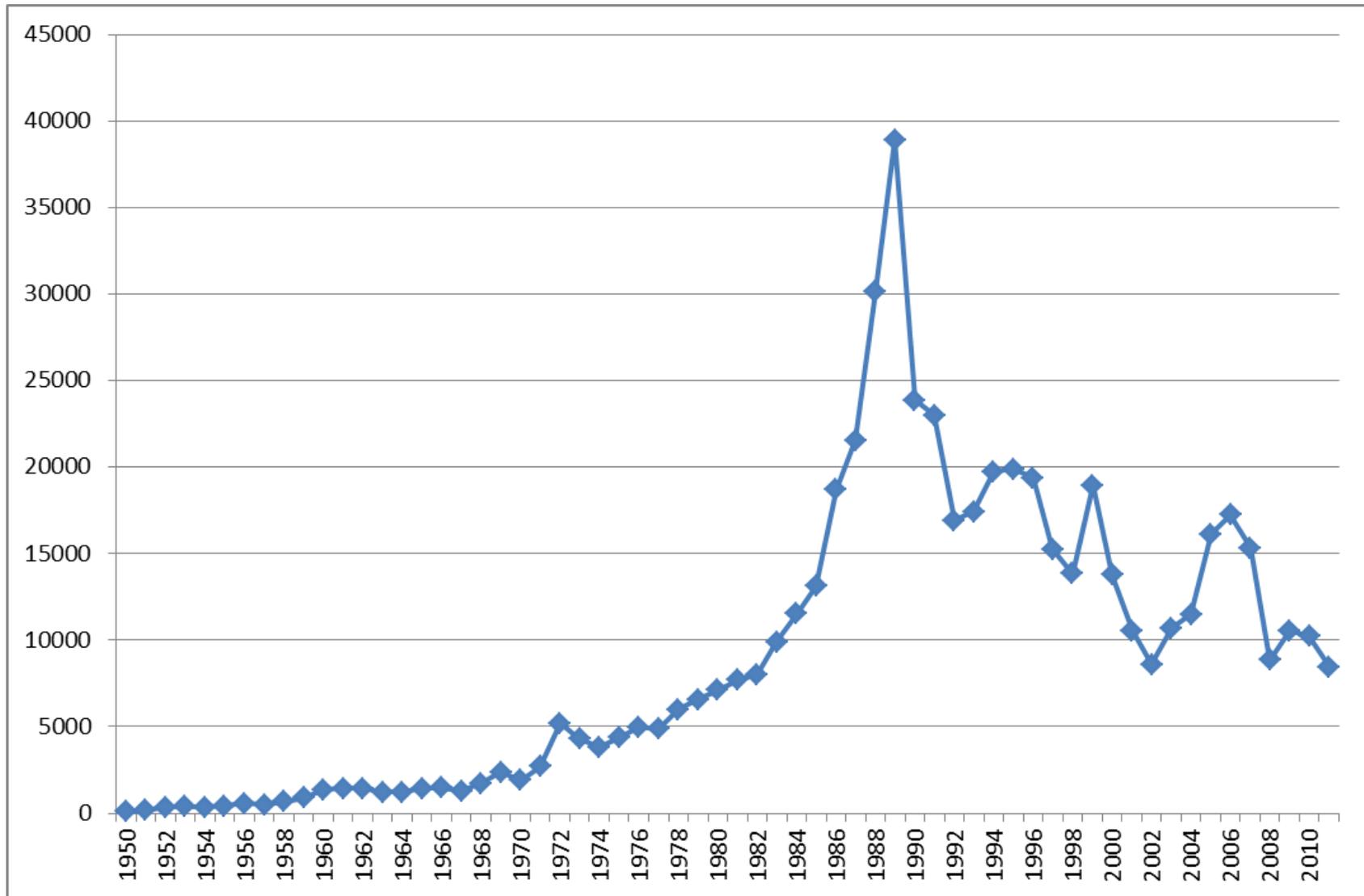
金利の高い時にはいい歌が生まれる



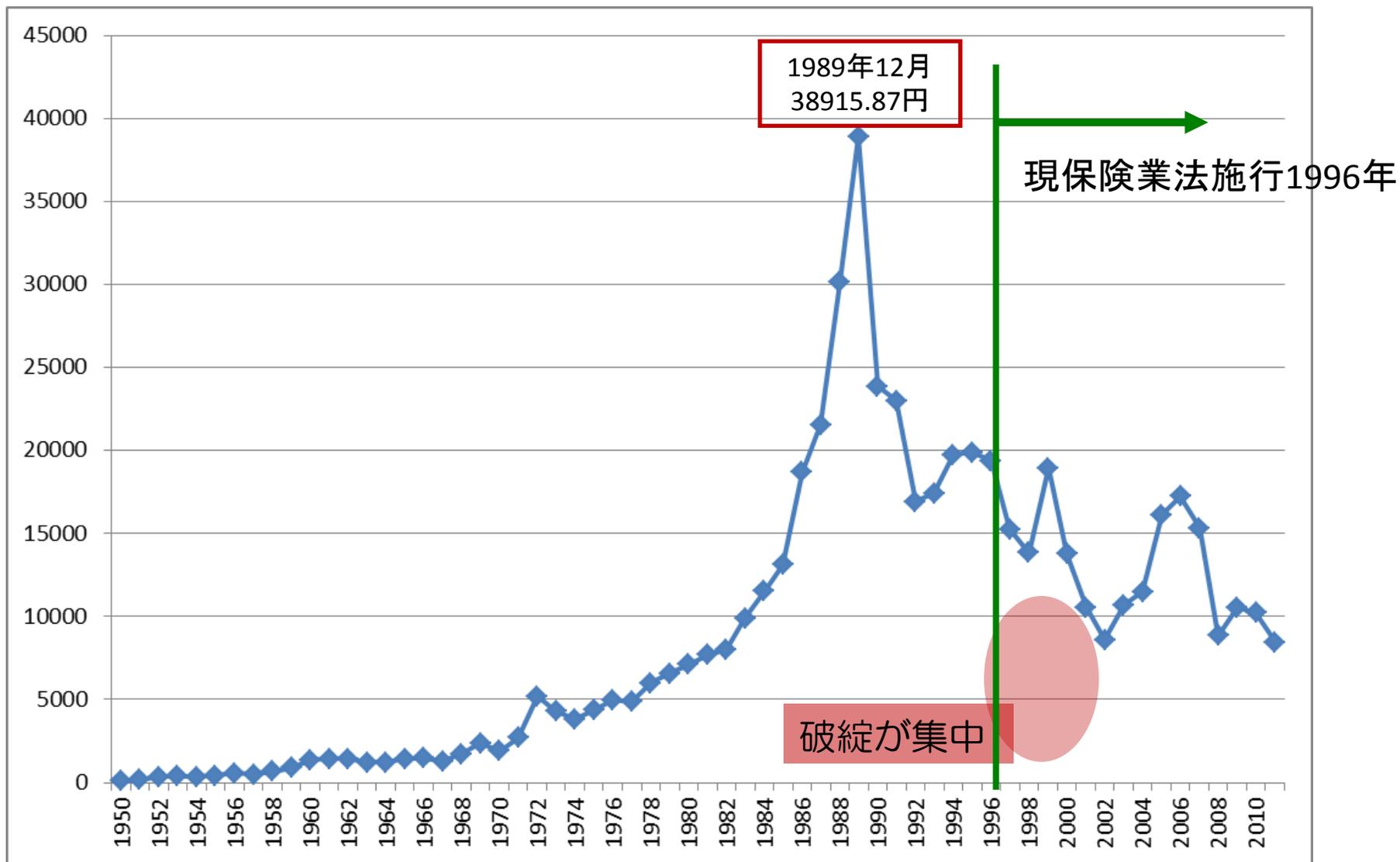
Year end values of stock (Nikkei Average) 1950~



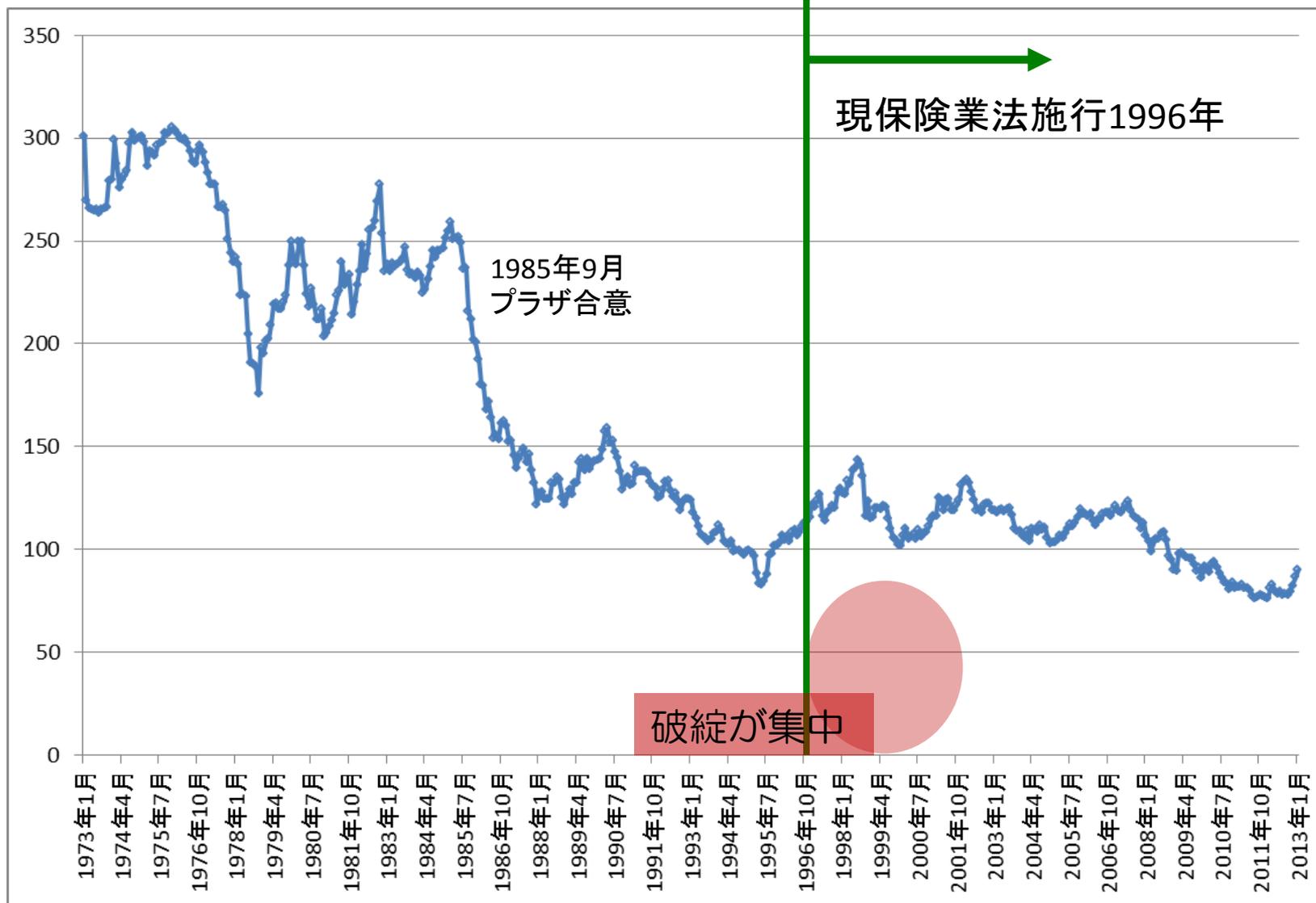
Year end values of stock (Nikkei Average) 1950~



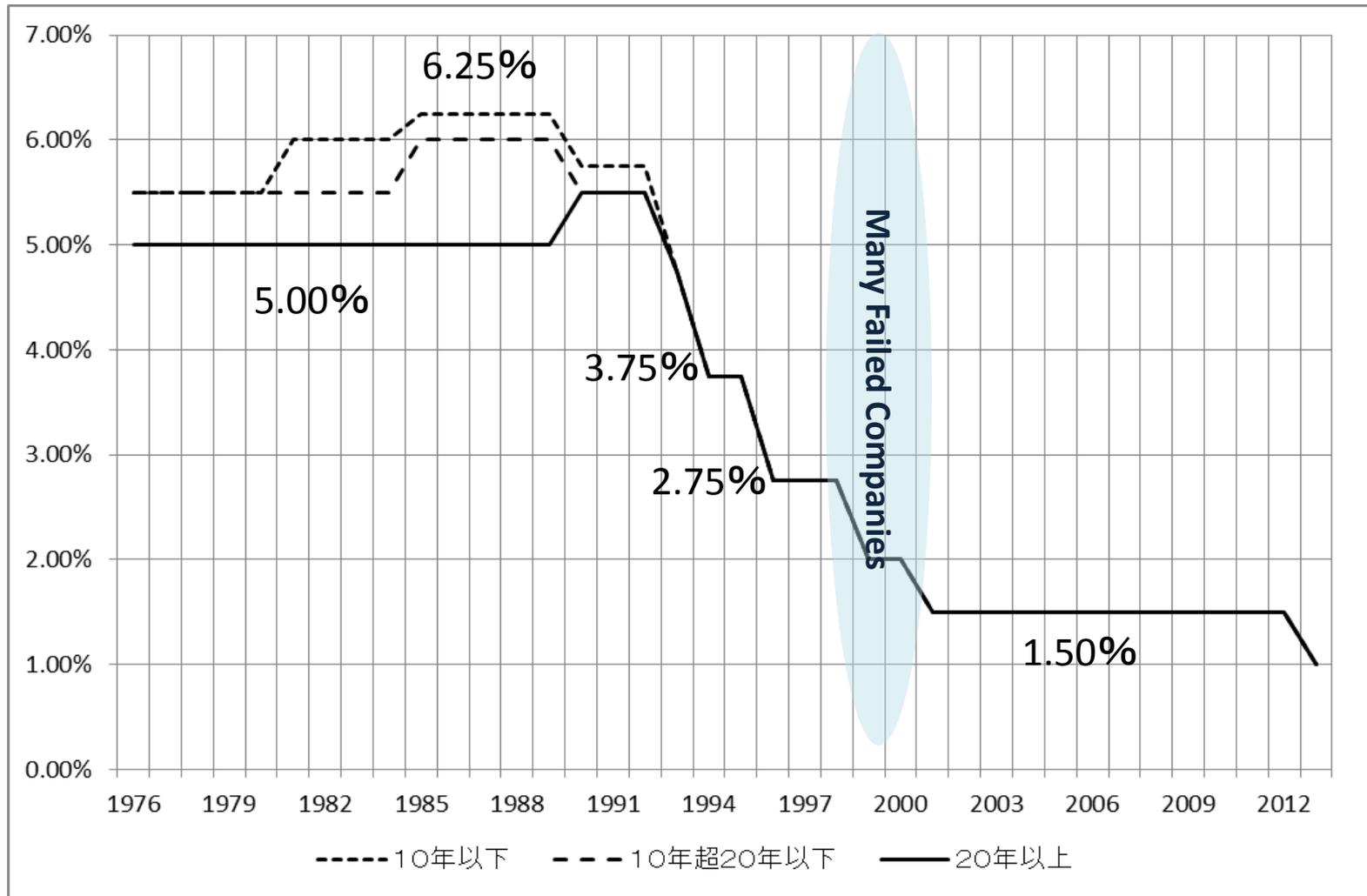
日経平均の年末値（各年の12月末の取引最終日）1950～



円ドルレート



Assumed Interest Rate for Premium and Valuation



皆さんは ご自身についてどこまで推測できますか

- 3分後生きている
- 30分後生きている
- 3時間後に生きている
- 3日後生きている
- 3週間後生きている
- 3か月後生きている
- 3年後生きている
- 30年後生きている

平均余命を鑑賞する〔完全生命表〕

年齢	男性	女性
	平均余命	平均余命
x	e_x	e_x
18	61.02	67.90
19	60.05	66.91
20	59.08	65.93
21	58.11	64.95
22	57.14	63.96
23	56.18	62.98
24	55.22	62.00
25	54.25	61.02
26	53.29	60.04
27	52.32	59.06
28	51.36	58.08
29	50.39	57.10
30	49.43	56.12
31	48.47	55.14
32	47.50	54.16
33	46.54	53.18
34	45.58	52.21
35	44.62	51.23
36	43.67	50.26
37	42.71	49.29
38	41.76	48.32
39	40.81	47.35

年齢	男性	女性
	平均余命	平均余命
x	e_x	e_x
40	39.86	46.38
41	38.92	45.42
42	37.98	44.45
43	37.04	43.49
44	36.11	42.53
45	35.18	41.57
46	34.26	40.62
47	33.35	39.67
48	32.44	38.72
49	31.53	37.78
50	30.63	36.84
51	29.74	35.90
52	28.86	34.97
53	27.98	34.04
54	27.11	33.12
55	26.25	32.20
56	25.40	31.28
57	24.56	30.37
58	23.73	29.46
59	22.91	28.56
60	22.09	27.66

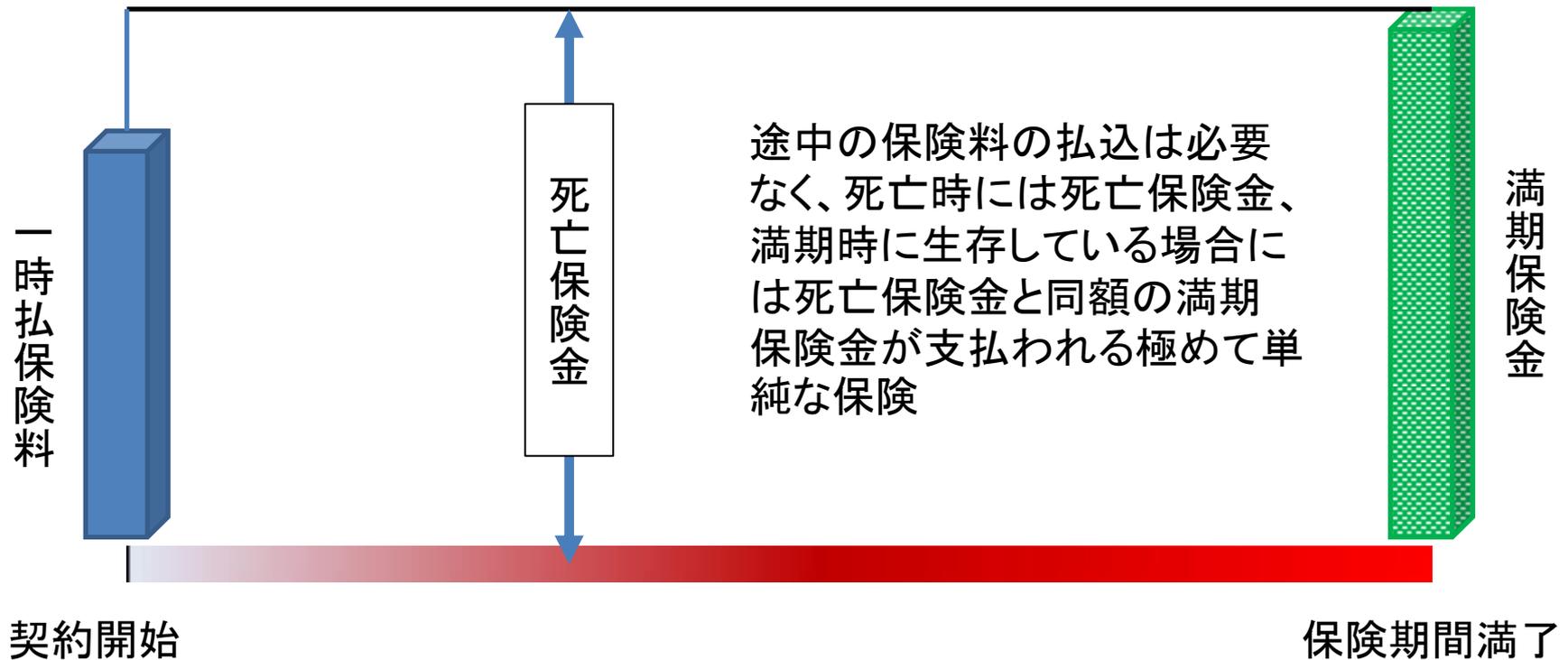
生命保険の 破たん事例

生命保険会社の破たん事例

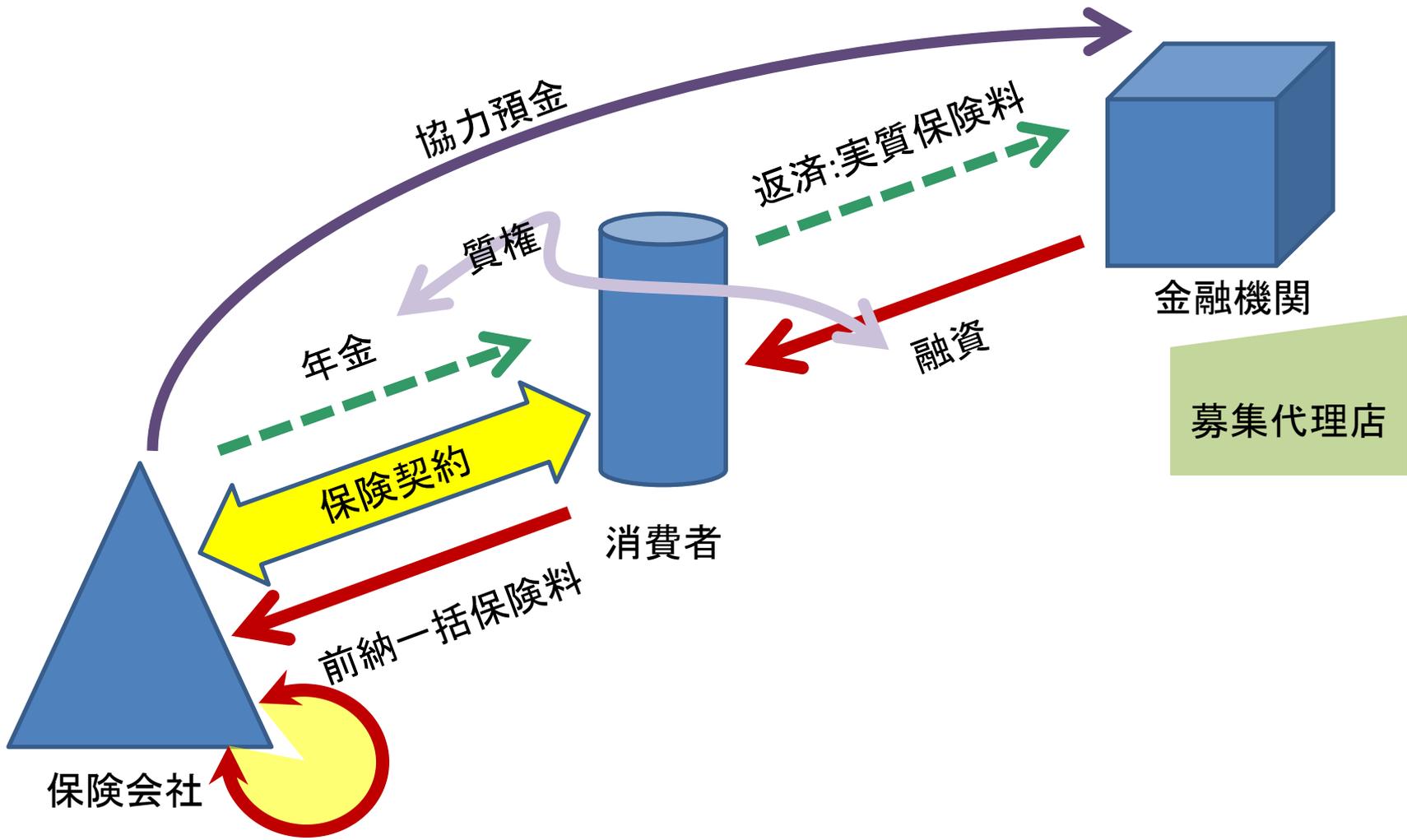
	破綻時	処理完了	債務超過額	予定利率	
				破綻前 (平均)	破綻後 (上限)
日産生命	97年04月	97年10月	3,029億	不明	2.75%
東邦生命	99年06月	00年03月	6,500億	4.79%	1.50%
第百生命	00年05月	01年04月	3,177億	4.46%	1.00%
大正生命	00年08月	01年03月	365億	4.05%	1.00%
千代田生命	00年10月	01年04月	5,950億	3.70%	1.50%
協栄生命	00年10月	01年04月	6,895億	4.00%	1.75%
東京生命	01年03月	01年10月	731億	4.20%	2.60%

植村信保著「経営なき破綻」平成生保危機の真実(日本経済新聞社・2008年)3頁以下、同著を頻繁に引用します。その際、[植村]で略記します。

一時払い養老保険



年金保険ローン

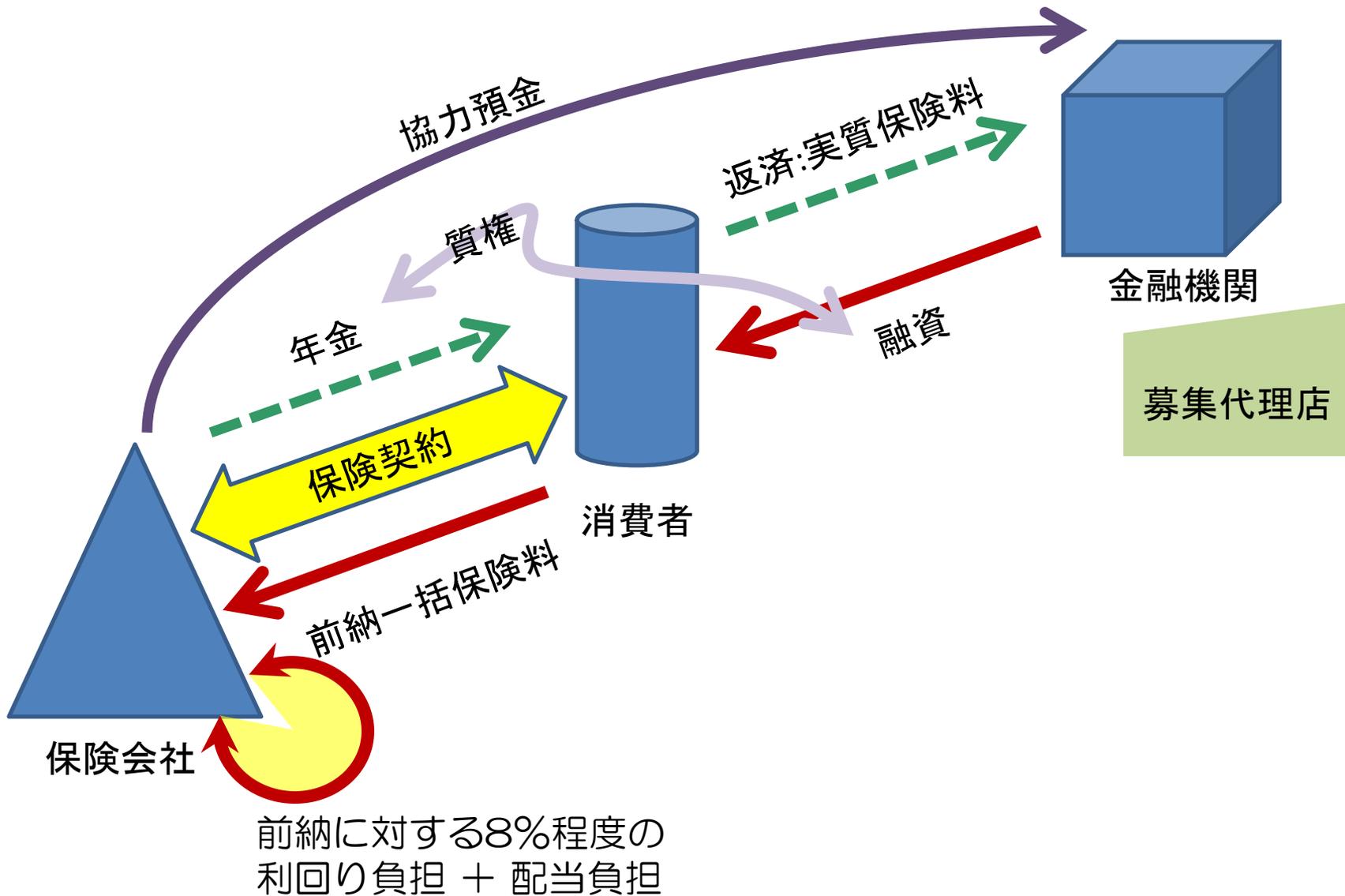


前納に対する8%程度の
利回り負担 + 配当負担

日産生命の例

止められなくなった何か

日産生命の事例 年金保険ローン：1987～88年頃



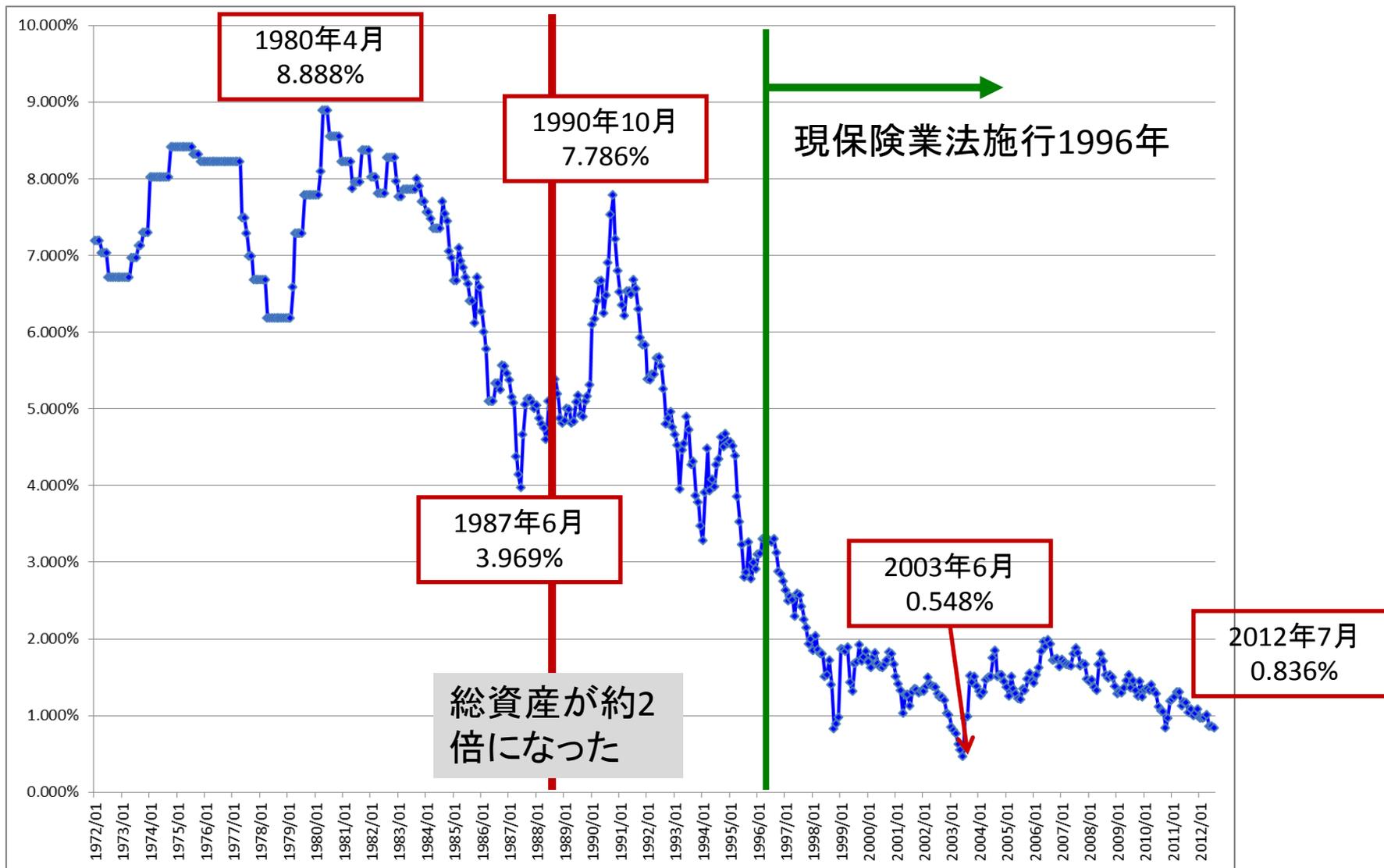
日産生命の事例

総資産の推移

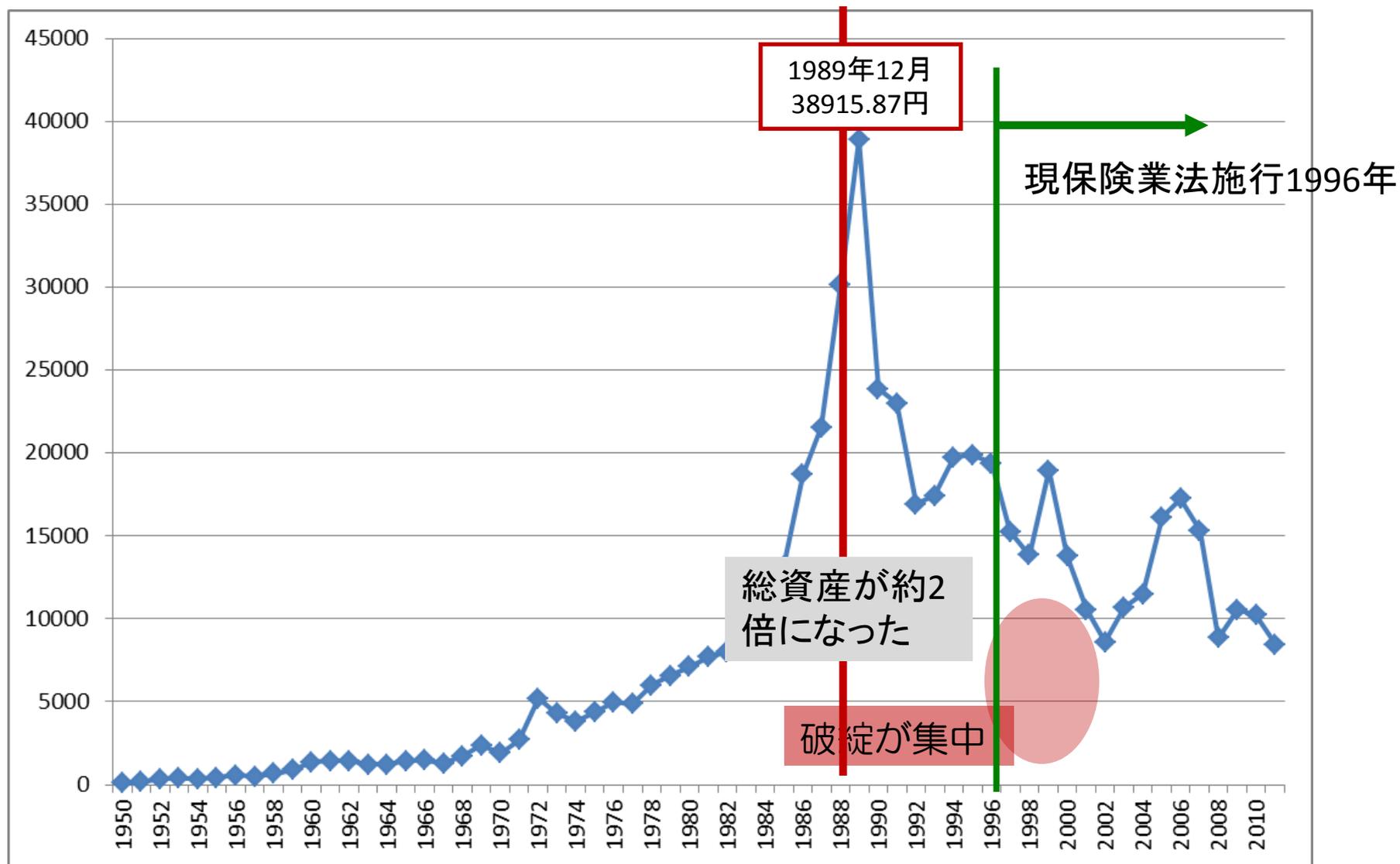
日産生命			生保全体		
年度	資産（億円）	前年比	年度	資産（億円）	前年比
1985	3,680	19.1%	1985	538,706	17.8%
86	4,441	20.7%	86	653,172	21.2%
87	6,964	56.8%	87	792,684	21.4%
88	13,230	90.0%	88	970,828	22.5%
89	16,270	23.0%	89	1,173,439	20.9%
90	18,555	14.0%	90	1,316,188	12.2%
91	19,443	4.8%	91	1,432,341	8.8%
92	20,285	4.3%	92	1,560,111	8.9%
93	21,029	3.7%	93	1,691,221	8.4%
94	21,461	2.1%	94	1,779,655	5.2%

[植村]91頁から引用

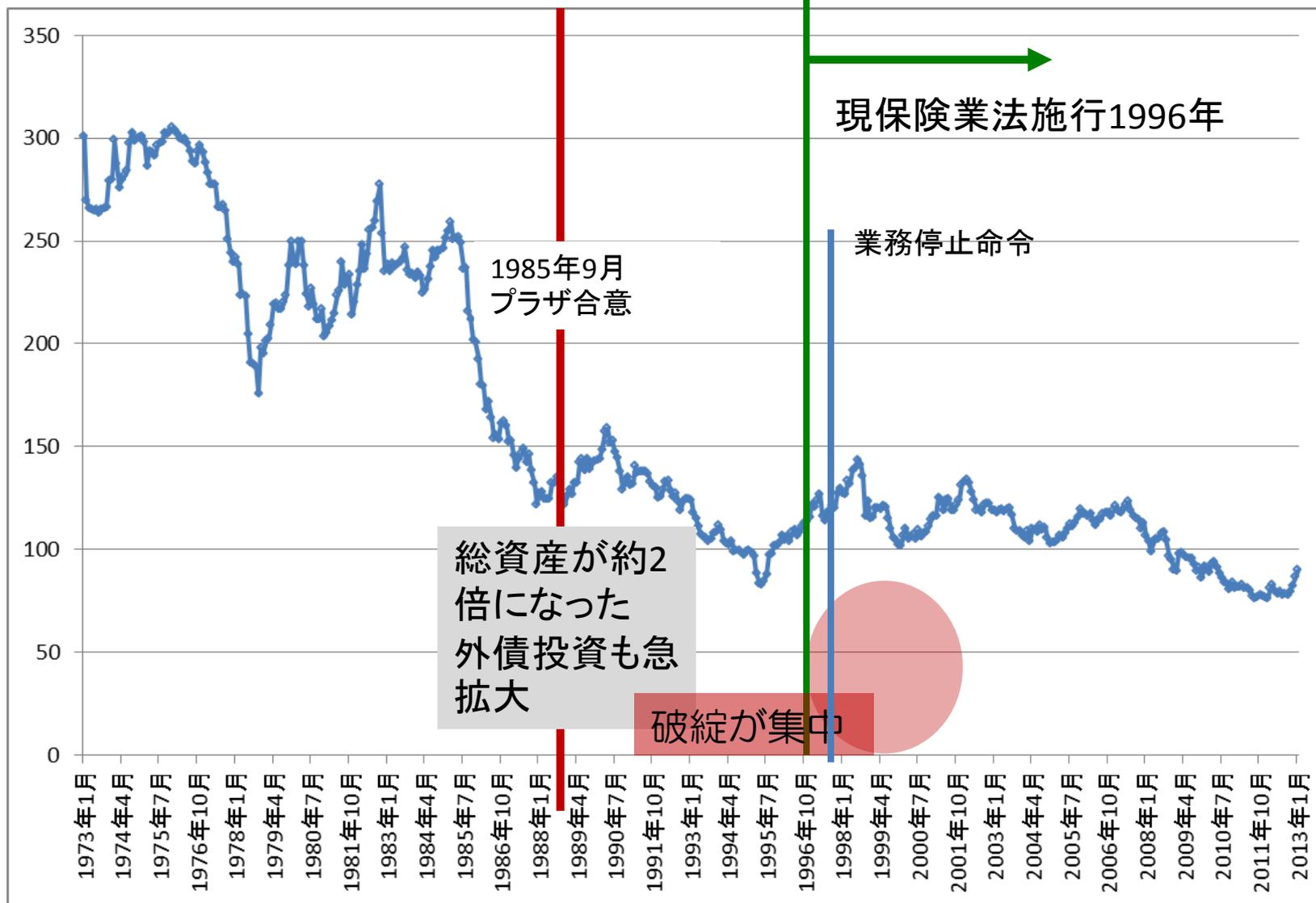
過去40年間の国債の応募者利回り [月別データ]



日経平均の年末値（各年の12月末の取引最終日）1950～



円ドルレート



1985年9月
プラザ合意

総資産が約2
倍になった
外債投資も急
拡大

破綻が集中

現保険業法施行1996年

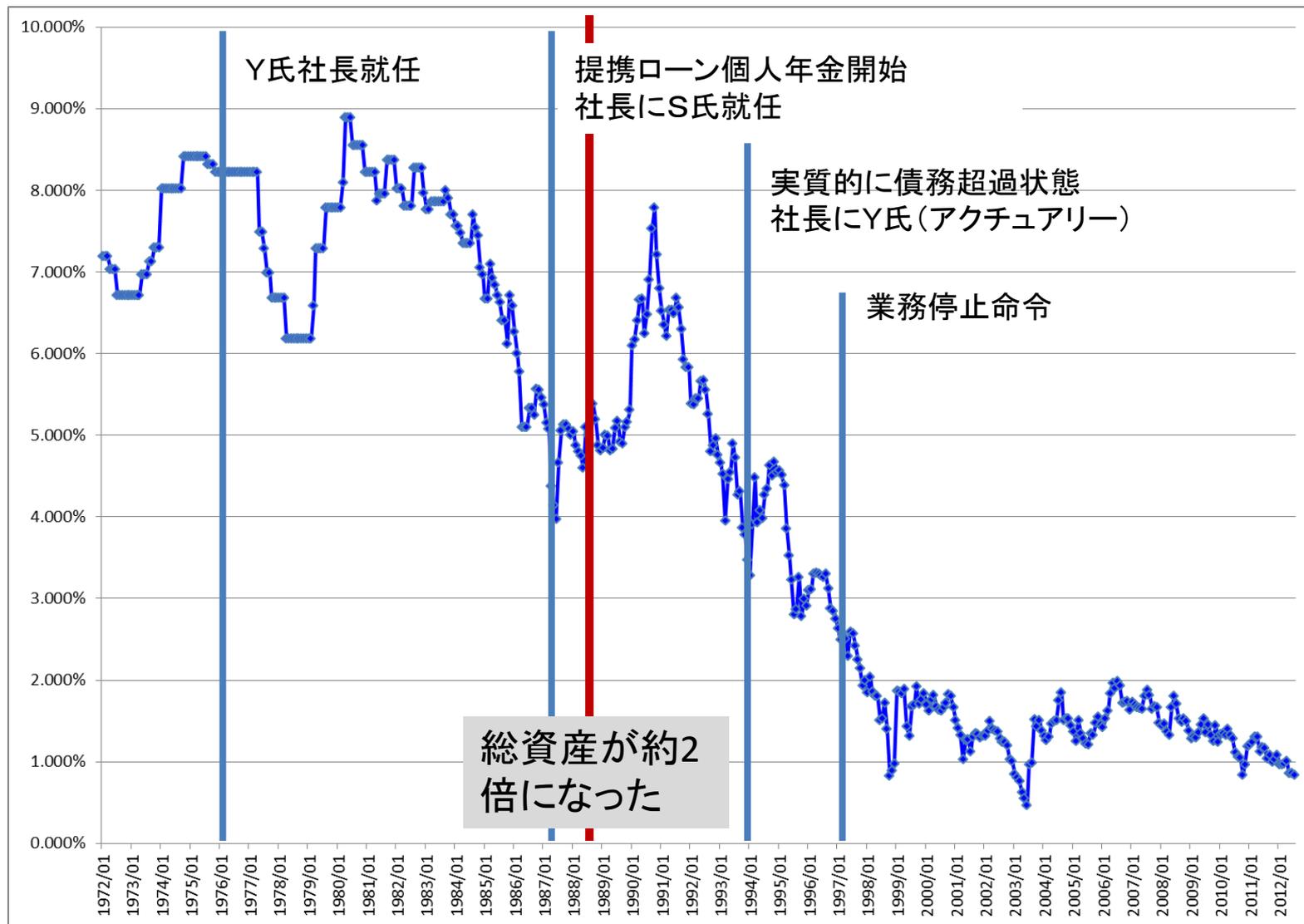
業務停止命令

日産生命の事例

日産生命の資産構成				
	1986年度末		1989年度末	
	資産額（億円）	構成比（％）	資産額（億円）	構成比（％）
総資産	4,441	100.0	16,270	100.0
現預金	348	7.8	1,227	7.5
金銭信託	138	3.1	1,111	6.8
公社債	578	13.0	1,761	10.8
株式	775	17.5	3,501	21.5
外国証券	581	13.1	3,408	20.9
その他証券	37	0.8	71	0.4
貸付金	1,646	37.1	4,226	26.0
不動産および動産	223	5.0	587	3.6

[植村]94頁から引用

国債の応募者利回りと日産生命社長の就任



日産生命の事例

当時の本社スタッフのオーラルヒストリー

- ◆ 87年には、すでに8%の利回り負担を財務部門と数理部門が問題視していた。だが、営業部門を抑えられなかった。
- ◆ その後も資産急拡大について社内で何回も議論し、総資産が1兆円を超えたころ（88年）には保険計理人が経営陣に対し、非公式に警告を出している。しかしこれらは経営に全く生かされなかった。
- ◆ 社長には『〇〇だから大丈夫』という情報ばかりあがっていた

90年代に入り経営が厳しくなってからも

- ◆ 社長自らがリーダーシップを持って再建に取り組むことはなかった。『何とかしろ』と言うだけで主体的に動くことはなかった
- ◆ 大蔵省から指摘を受け、それを社長に伝えても、『できるわけないだろう』と言うだけで、問題を会社全体のものとしてではなく、自分に降りかかってくる災難としてとらえた

第百生命の例

失速して頓死

高く上がったフライを見つめるばかりで
誰も取らなかった

第百生命の事例 = 失速的な頓死

背景

- ◆ 第百生命は川崎系の会社で、川崎家出身の社長が続いていた。
- ◆ 川崎大治郎氏（社長：65～73年）は中興の祖
- ◆ 社長退任後87年まで取締役を続けたので社内の影響力は大きかった
- ◆ アクチュアリーは重く扱われた
- ◆ 全体的に穏やかな社内の雰囲気醸成されていた

当時の本社スタッフのオーラルヒストリー

- ◆ 社内には息子の真次郎氏がいて、入社当初から社長候補と見られていた。経営陣は常に大二郎氏を意識しながら判断せざるを得ず、『貯蓄保険をやめる』『銀行株を売却する』といった思い切った判断はできなかった
- ◆ 議論をすると、対応策として常に『保障性商品の拡販』『コストの削減』『株式売却』といういつものお題目が出てきたが、実行可能かどうかの議論はなく、着手するとすぐに実態と乖離してしまう
- ◆ 一時払い商品に注力したというよりは、むしろ売ってしまったというのが正しいかもしれない

第百生命の事例 = 失速的な頓死

専門家に対するスタッフのオーラルヒストリー

- ◆ 第百（第百生命）のアクチュアリーは、経営にかかわるという意味ではよくやっていたと思う。ただ、経営内容が経営陣の間で共有化されていなかった。出てきた数字だけでは中身はわからない。経営からしばしば『計理はわからない、難しい』といわれることがあった。その結果、走り出したのが遅かった。行政に頼りすぎ、経営に自主性がなかったとも言える
- ◆ 途中で自ら妥協案を出してしまうなど、主張を徹底できず、最後は大勢に流されてしまった

また、数理部門と財務との間では；

- ◆ 数理部門は株式の売却を主張し、財務は売れるものを売却した。財務部門が何かを隠していたうえあけではないが、相互に不干渉な体制だったため、銀行株への集中という意図せざる結果になってしまった

千代田生命の例

貯蓄性商品⇒ハイリスク運用
運用部門の象牙の塔化
不良債権
信用不安による資産流出

千代田生命の事例

総資産の推移

千代田生命			生保全体		
年度	資産（億円）	前年比	年度	資産（億円）	前年比
90	51,544	14.1	90	1,316,188	12.2%
91	56,214	9.1	91	1,432,341	8.8%
92	59,829	6.4	92	1,560,111	8.9%
93	63,166	5.6	93	1,691,221	8.4%
94	63,963	1.3	94	1,779,655	5.2%
95	64,425	0.7	95	1,874,925	5.4
96	58,163	-9.7	96	1,886,590	0.6
97	50,282	-13.5	97	1,901,110	0.8
98	43,599	-13.3	98	1,917,684	0.9
99	35,019	-19.7	99	1,900,329	-0.9

[植村]148頁から引用

千代田生命の事例

背景

- ◆ 失地回復が会社の陰の行動原理
- ◆ 八〇年代後半に高利率、高配当の貯蓄性商品を大量に販売するなかで、リスクの高い、問題の多い運用手段を選択した
- ◆ 投資部門のフロントとエンドの担当者が同じ人になった
- ◆ 総資産6兆円のうち負債サイドには4兆円は団体年金と一時払い養老保険、一方資産サイドは流動性の低い貸付金や不動産が三兆円もあり、しかも穴があいていた。株式にはまだ2000億円以上の含み益があった
- ◆ また、営業に資する資産運用が優先され「営財一体活動」とも言われた

当時の本社スタッフのオーラルヒストリー

一時払い養老保険については、6年のものが節税商品として脚光を浴びた

- ◆ マスコミが勝手に宣伝してくれた
- ◆ 顧客が保険を買うために窓口に並ぶのを見たのは、この時が最初で最後だった
- ◆ 神崎氏が社長になってから契約高や総資産、保険料といった主要指標で挽回し、外部から『大手八社』と言われるようになった
- ◆ 大手復帰がバブル経済初期に重なってしまったことが、結果的に大きな意味を持っていたように思う

千代田生命の事例

アクチュアリーについて

神崎社長時代には内部の経営チェック機能はほとんど機能していなかった。アクチュアリーも同様であった

アクチュアリーについても数理部門が独立しておらず、企画部門内にあった

- ◆ 経営陣からは『単なる計算屋』と言われていた。保険計理人は『保険業法にあるから仕方なく置いている』『当局が見るからそれで十分』といった感じだった
- ◆ 便利だが頼りにならない存在と言われていた

国債の応募者利回りと千代田生命



協栄生命の例

偉大すぎるファウンダーの影
二重・三重の財務諸表

協栄生命の事例

総資産の推移

協栄生命			生保全体		
年度	資産（億円）	前年比	年度	資産（億円）	前年比
1985	12,124	20.5	1985	538,706	17.8%
86	16,037	24.0	86	653,172	21.2%
87	18,996	26.3	87	792,684	21.4%
88	24,601	29.5	88	970,828	22.5%
89	30,009	22.0	89	1,173,439	20.9%
90	35,343	16.7	90	1,316,188	12.2%
91	39,343	12.3	91	1,432,341	8.8%
92	44,804	13.9	92	1,560,111	8.9%
93	50,641	13.0	93	1,691,221	8.4%
94	54,357	7.3	94	1,779,655	5.2%

[植村]161頁から引用

協栄生命の事例

元来協栄生命は保障性商品を中心に販売をしていた

- 養老保険主流の保険業界で自衛隊・教員などを中心として集団定期保険を主軸として販路を広げ、マーケットと一体となった商品開発を行った
- 予定利率も3.75%と当時の他社よりも低い保守的なものだった

川井三郎氏は流行となっていた一時払い養老には消極的だった

- しかし、営業を中心として、一時払い養老への要望が高まった。
- 1987年（昭和63年）方針を転換、一時払い養老を販売し、予定利率も5.5%に上昇させた
- 一時払い養老を一般消費者ではなく提携顧客に販売していたことから販売停止が他社よりも遅くなった。特に、教職員に対する退職金の受け皿としての役目を負っていた

協栄生命の事例

数理部門のオーラルヒストリー

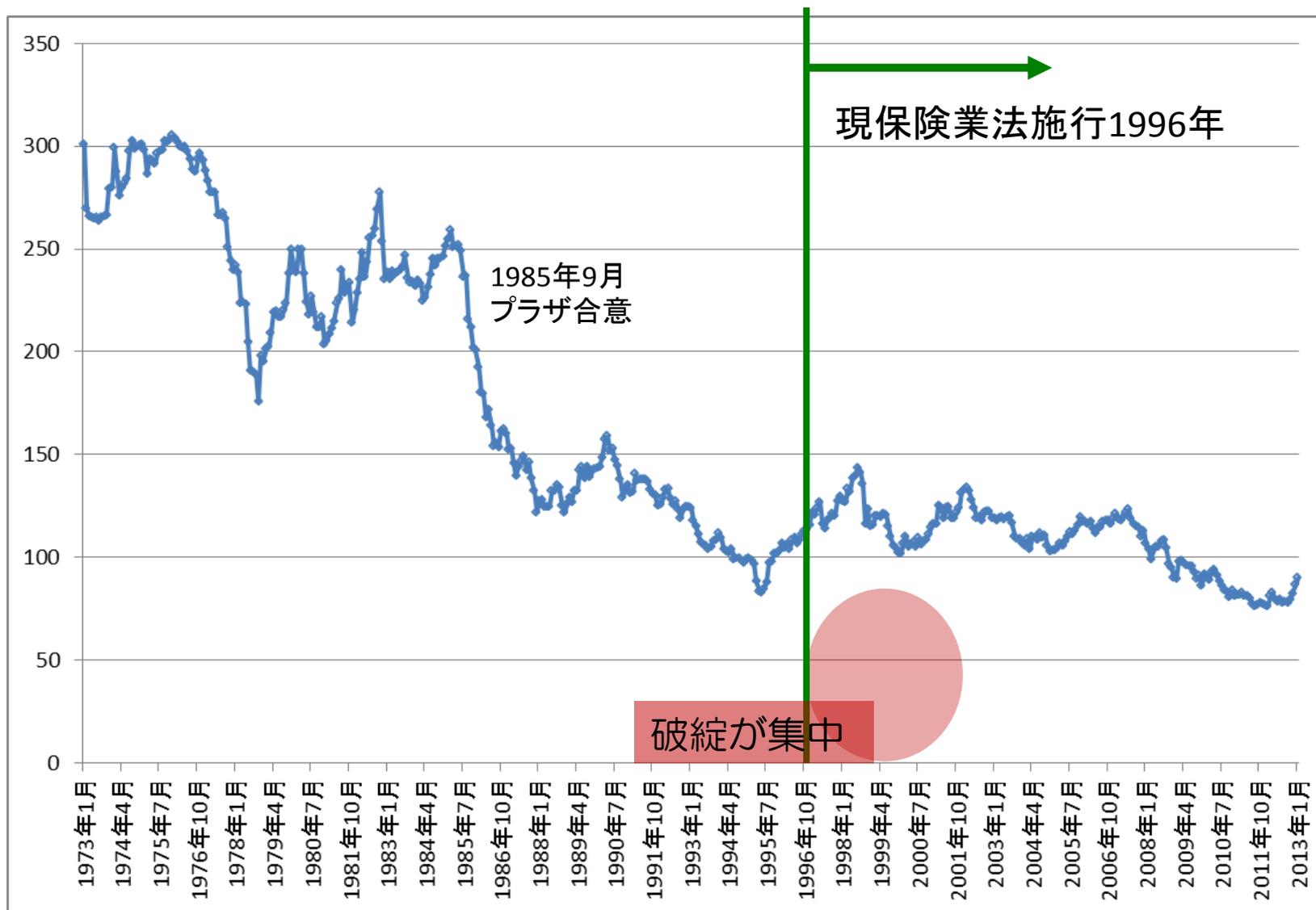
- 川井氏の指示で90年前後から数理部門では将来収支分析を行い『惨憺たる結果』が明らかになっていた。しかし、『十年あれば外部環境も変わるだろう』という判断から、売り止めなど抜本的な対応をなかなか取らなかった。川井氏自身もこの件については嫌な顔をするだけだった。十年満期（協栄生命では一時払い養老は十年満期だけだった）と長いので、その間には持ち直すはずという意識があった
- 92年ごろになると、さすがに営業からも『このまま売っていいのか』という声が出るようになった。だが、営業担当役員が反対し、ブレーキがかけられなかった。（しかし、会社の秘密主義からこの担当役員も正確な情報を得ていなかったとみられる）

最終的に一時払い養老保険を販売停止にできたのは、経常赤字決算となった94年であり手遅れだった

側近たちは川井氏の片言をご宣託として聞いた

長期の世相と運用を
見る目とは

例として再度 円ドルレート



対外投資について

前提となる年表

生命保険会社の配当原則はインカム配当原則といい、利回りの確保が急務であった。

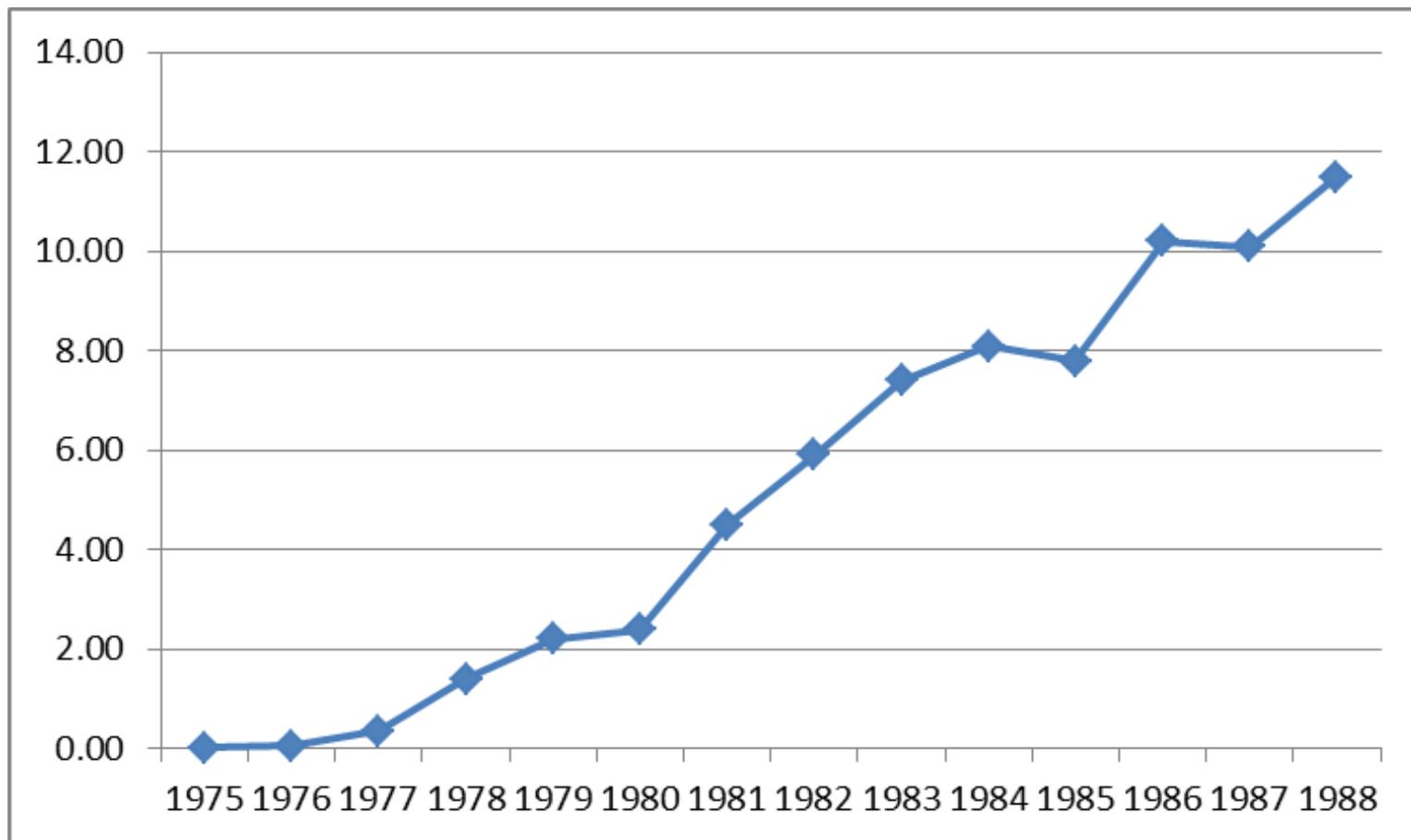
- 昭和52年（1977） 日米の金利差が逆転
- 昭和55年（1980） 外為法が改正となり対外取引が原則自由
- 昭和56年（1981） 米国の流通利回りは13%となった
- 昭和60年（1985） プラザ合意 その後急激なドル安円高となる

- 全生保において昭和50年に34億円に過ぎなかった外国債券は昭和63年には11兆円となった

- 昭和60年（1985） 大量の為替差損が顕在化 9400億円
- 昭和61年（1986） 為替差損 1兆円
- 昭和62年（1987） 為替差損 1兆5000億円
- 昭和63年（1988） 為替差損 5000億円
- 為替ヘッジによるヘッジ損も顕在化する

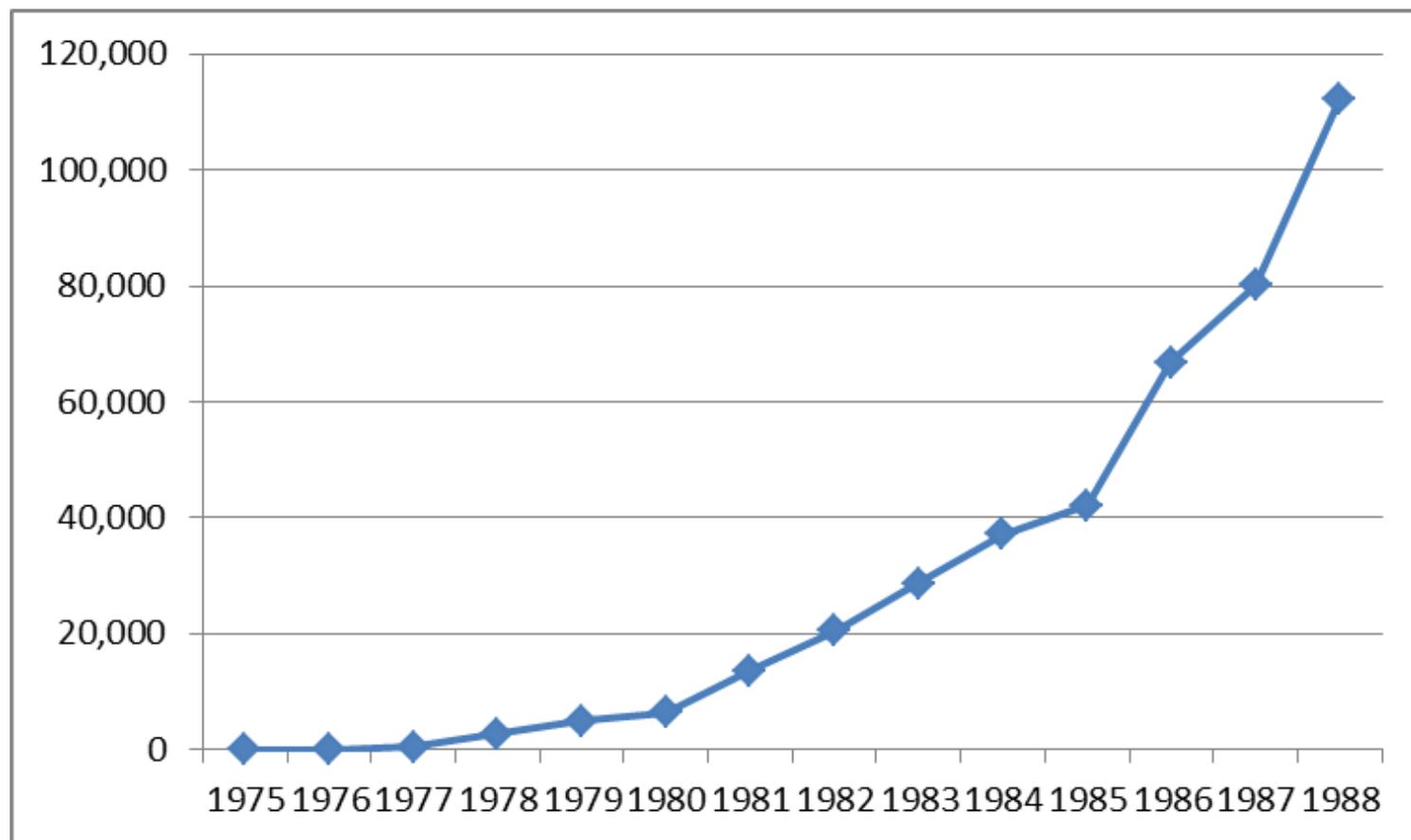
対外投資について

昭和年間の生命保険会社の資産運用中外国債券等への投資割合推移 (%)

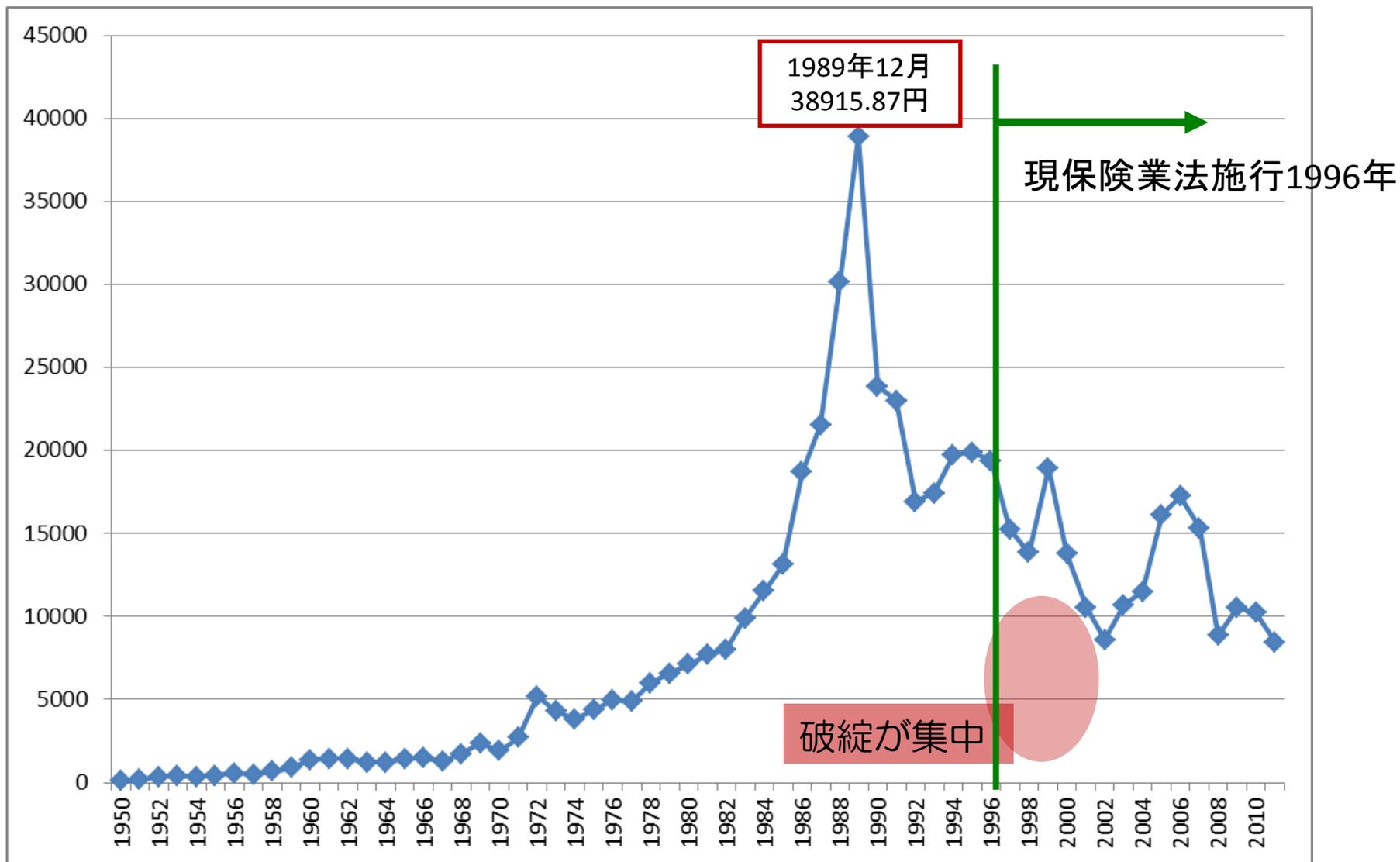


対外投資について

生命保険の対外投融資の推移（外国債券のみ） 億円



日経平均の年末値（各年の12月末の取引最終日）1950～



さて、皆さんはいかがですか??

為替差損

- 昭和60年（1985） 大量の為替差損が顕在化 9400億円
- 昭和61年（1986） 為替差損 1兆円
- 昭和62年（1987） 為替差損 1兆5000億円
- 昭和63年（1988） 為替差損 5000億円
- 為替ヘッジによるヘッジ損も顕在化する

この当時次のように言われていた

- 利回り確保が前提である ⇒ インカム配当原則
- 為替差損は株式の含み益の実現で補えばよい
- その証拠に1989年末には日経平均は最高値となる（前ページ参照）
- 本来利子で埋めるべき損失を株式売却益で埋めるので多くの利息収入が生まれる
- 外債投資は国も後押しをするように解禁している
- 外債投資については運用枠も広がり、業界の自主規制だって撤廃されている
- 国債の金利低下局面で配当率を確保するには外債投資が合理的
- 事情はどこも同じで他の生保会社だって積極的に採用している
- 現状に問題があるはずもなく、もしも、金利状況が現状悪くとも10年経てば、すべて持ち直す

本日は次の箇所を中心に考えてみます

【第1段落に戻り】アクチュアリーはリスクイベントが起きる可能性を計量し、その可能性を低減するクリエイティブな方策をさぐり、それが現実には発生したときに生じる有害事象のインパクトを軽減する方法もデザインします。

→ リスク発生の計量とクリエイティブな逓減方策

→ 有害事象のインパクトを軽減する方法



さて、皆さんはいかがですか??

皆さんは1980年代の後半に社会人として生命保険会社に身を置いていたとします。皆さんは会社の社長から、このような外債の投資政策を意気揚揚と聞かされ、最後は「わが社は大丈夫」と満面の笑みの中で聞かされたとします。

さて、この状況の中で、自分の首をかけて、

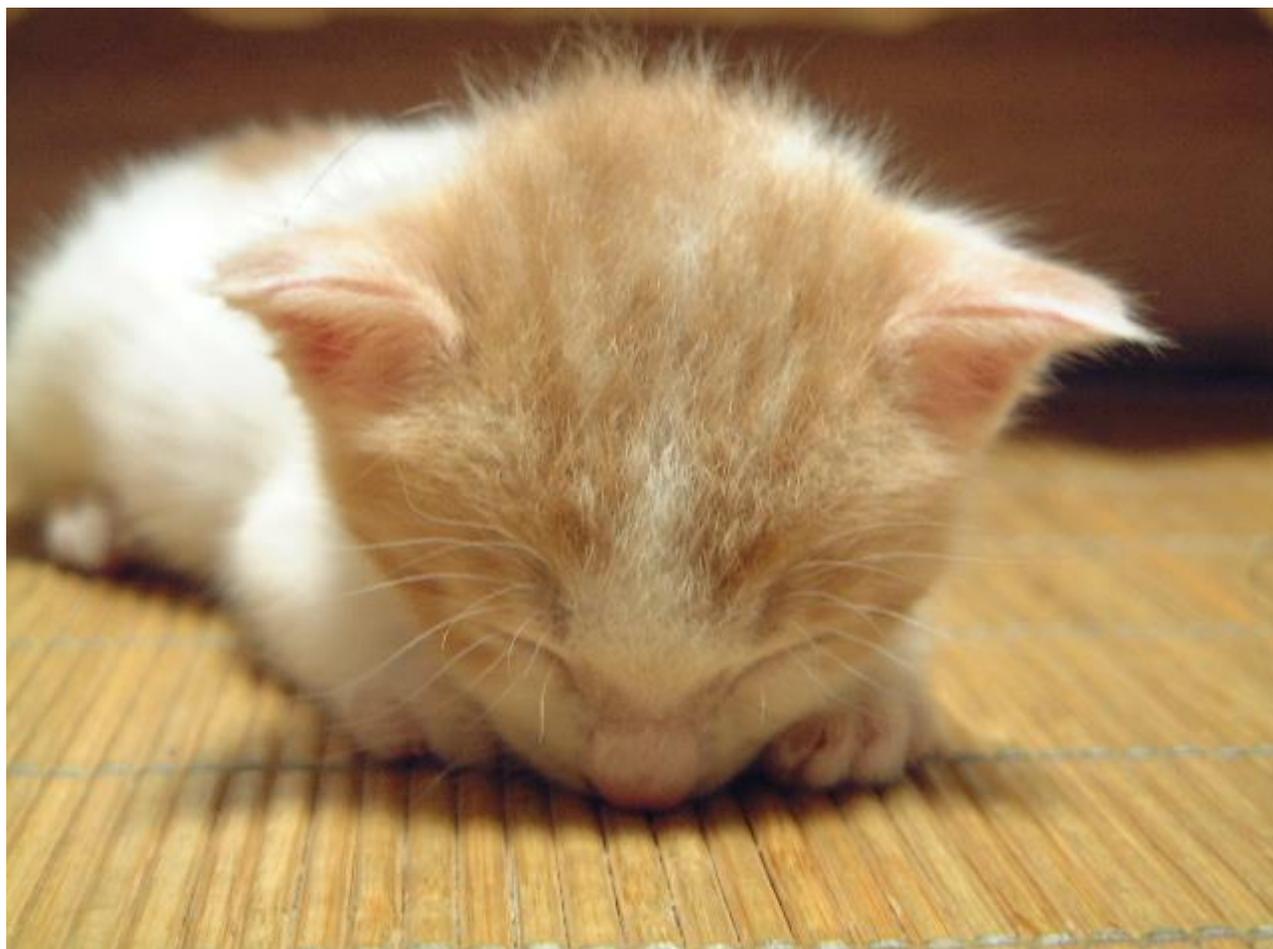
『社長このような投資政策は間違っている。
NO!』

と言えるでしょうか・・・??

いろいろなことが考えられます
下記はあくまで個人的な意見です

- 修正をしながら決断をする
- 長期の将来を概望できる人はわずか
- 誰にでもできることを考える
- 方法化することは必要最低限にとどめる
- 良い話に乗らない
- 偶然は必ず発生する
- 理性では判断できないことも多い。とくに「決断」は常にミステリー

ご清聴ありがとうございました



Appendix

1. 数学と統計学が重要
2. アクチュアリーは日常は淡々としたものである
3. PC skill, 特に Microsoft Excel, Excel VBA, Word, Access and PPT は重要.
4. Programing languages もやはり何か一つは知っていた方がよい.
5. 忍耐強く精勤することが成功の鍵

References

Fred E. Szabo

Actuaries' Survival Guide

*How to succeed in one of the most desirable
professions*

2004 ELSEVIER Academic Press

THE ROLE OF THE ACTUARY 2013 June

By International Actuarial Society

2013 June

http://www.actuaries.org/LIBRARY/Papers/Role_Actuary_EN.pdf

What is an Actuary?

An actuary is a business professional who analyzes the financial consequences of risk. Actuaries use mathematics, statistics and financial theory to study uncertain future events, especially those of concern to insurance and pension programs. They evaluate the likelihood of those events, design creative ways to reduce the likelihood and decrease the impact of adverse events that actually do occur.

Actuaries are an important part of the management team of the companies that employ them. Their work requires a combination of strong analytical skills, business knowledge and understanding of human behavior to design and manage programs that control risk.

SOA members work in life insurance, retirement systems, health benefit systems, financial and investment management and other emerging areas of practice. The majority of actuaries work within the insurance industry, although a growing number of actuaries work in other fields.

The Professional Life

Wherever there is risk, there are opportunities for actuaries. And the recent financial crisis has further highlighted the skills actuaries bring to the table.

http://www.youtube.com/watch?feature=player_embedded&v=rQop4TLj4WI

What is an Actuary

Professional Options

- The word *actuary* comes from the Latin word *actuarius*, which referred to shorthand writers in the days when things like typewriters and computers hadn't even been thought of.
- Today, actuaries work for insurance companies, consulting firms, government departments, financial institutions, and other agencies.
- They provide crucial predictive data upon which major business decisions are based. True to their historical roots, actuaries still use a rather extensive shorthand for many of the special mathematical functions required for this work.
- Actuarial science is an exciting, always-changing profession, based on fields such as mathematics, probability and statistics, economics, finance, law, and business. Most actuaries require knowledge and understanding of all of these fields and more.

What is an Actuary

Professional Options

- To ensure that this is really the case, all actuaries must pass special examinations before being recognized as members of the profession. To perform their duties effectively, actuaries must also keep abreast of economic and social trends, as well as being up-to-date on legislation governing areas such as finance, business, healthcare, and insurance.
- No doubt you have heard about the actuarial examinations you need to pass to become an *Associate* or *Fellow* of one of the actuarial societies.
- The efforts required to succeed in these examinations are in many ways analogous to those required to become a doctor, lawyer, or other high ranking professional.
- So are the rewards. For several years now, the **Jobs Rated Almanac** has considered an actuarial career to be one of the most desirable professions in America.

Job rates almanac

The Best Jobs of 2013 - Actuary #1

- The job “actuary” has been rated as 2013’s best job in the United States by Careercast.com. Careercast.com ranked actuary as No. 1, biomedical engineer at No. 2, and software engineer, the top job of 2012, at No.3.
- Careercast.com ranks careers based on dozens of factors, such as
 - ✓ the degree of hazards personally faced,
 - ✓ physical demands (crawling, stooping bending, etc.),
 - ✓ income growth potential,
 - ✓ employment outlook,
 - ✓ competitiveness,
 - ✓ travel and contact with the public.

The firm used data from the Bureau of Labor Statistics and other government agencies to determine the rankings. As in prior years, the 200 jobs were selected for their relevance in the current labor market as well as the availability of reliable data.

Careercast.com

- See more at: <http://www.beanactuary.org/news/?fa=view&id=2218#sthash.LQAL7ab1.dpuf>

Job rates almanac

The Best Jobs of 2013 - Actuary #1

- **The Ten Best Jobs:**
- Actuary
- Biomedical Engineer
- Software Engineer
- Audiologist
- Financial Planner
- Dental Hygienist
- Occupational Therapist
- Optometrist
- Physical Therapist
- Computer Systems Analyst

CareerCast.com

- See more at: <http://www.beanactuary.org/news/?fa=view&id=2218#sthash.LQAL7ab1.dpuf>

What is an Actuary

Professional Options

- Actuaries are experts in the assessment and management of risk. Traditionally, the risks managed by them have been insurance and pension funding risks, although the management of business risks is also among the responsibilities of insurance actuaries.
- So is the insurance of insurance, known as *reinsurance*. Moreover, many actuaries are now also managing asset-related risks in merchant banks and consulting firms.
- Actuaries are often chosen to be general managers in insurance companies. This is because upper management and boards of directors have a high regard for the knowledge and skills of actuaries, and because the need of a company to maintain its financial integrity makes an actuary's numerical skills invaluable.

What is an Actuary

Actuarial Terms, Acronyms, and Definitions

- You will quickly discover that actuarial science is full of technical terms, acronyms (abbreviations), and definitions.
- This session is not the place for explaining them in detail, because the definitions involved are readily available in textbooks and on the Internet.
- The main objective of this session is to introduce you to the career opportunities that exist in the actuarial world and to sketch for you the steps required to enter that world.
- Actuaries can be grouped in different ways. As their functions change in response to changes in the world around us, the distinctions become less sharp. However, the categories of employment will give you an initial idea.

What is an Actuary

Valuation Actuaries

- Reserves are important to the long-term financial health of a company.
- Because insurance companies are dealing with events that are uncertain in time and amount, they must put aside what they consider to be the most likely amount of money they will need to pay future claims and expenses, and then put aside a little more, just in case.
- The role of *valuation actuaries* is to determine the appropriate amount to be put aside and validate the expected number of claims, which should be what was taken into account when setting the price of the insurance.
- Valuation actuaries also certify the reserves to government agencies.

What is an Actuary

Pricing Actuaries

- *Pricing actuaries* are responsible for determining how much money a company is likely to make on a product.
- A product can be life insurance, which pays an agreed-upon sum to your beneficiary when you die, an annuity, which pays an agreed-upon sum every month as long as you live, or some form of health insurance, which covers the costs of medical care not paid for by a government plan, for example, dental and drug expenses.
- Pricing actuaries use the same assumptions as valuation actuaries when calculating the price of insurance to guarantee consistency and ensure that when valuation actuaries believe that they are adding a little extra to the reserves, they are really doing so.
- Pricing actuaries generally do not certify anything to anyone outside of the company.

What is an Actuary

Consulting Actuaries

- *Consulting actuaries* spend a good deal of their time advising on defined benefit pension plans.
- These are trusts set up to fund tax-assisted retirement benefits at a rate spelled out in a legally certified document.
- In the United States, senior consulting actuaries are usually members of the Conference of Consulting Actuaries (CCA). To become a *Member* of the CCA, candidates must have completed a minimum of 12 years of responsible actuarial work, defined as "work that requires knowledge and skill in solving actuarial problems."
- They must also be a Fellow or Associate of the Society of Actuaries or the Casualty Actuarial Society; or a Fellow of the Canadian Institute of Actuaries, the Faculty of Actuaries, or the Institute of Actuaries; or be enrolled with the Joint Board for the Enrollment of Actuaries (EA), thus having acquired the title of *Enrolled Actuary*; or be a *Member* of the American Academy of Actuaries, the *Asociacion Mexicana de Actuarios Consultores*, the *Asociacion Mexicana de Actuarios* or the *Colegio Nacional de Actuarios*.

What is an Actuary

Pension Actuaries

- *Pension actuaries* look at all members of a pension plan, their ages and salaries, and projects how much each would receive at retirement on average, given that some will terminate before retirement, some will get salary increases, and other such assumptions as to what might happen in the future. Then they look at the assets the pension plan has invested and determine, based on these two analyses, how much the plan's sponsor (usually an employer) needs to contribute to the plan each year. The pension actuary certifies that the contributions needed to fund the plan are adequate and qualify for a tax deduction for the sponsor.
- Pension laws and pension regulations are country-specific. This is the one area in which the global mobility of actuaries is somewhat restricted. Special examinations must be passed in the country of employment to be a pension actuary. In the United States, pension actuaries must be Enrolled Actuaries to be eligible to perform government-related pension fund audits. Enrolled actuaries are also employed in the human resource departments of large companies.
- Senior pension actuaries in the United States are usually also Fellows of the American Society of Pension Actuaries (ASPA), a designation that is awarded only after successful completion of a series of professional examinations.
- The basic examinations are those required to become an Enrolled Actuary, together with three additional ASPA examinations.
- A Fellow of the Society of Pension Actuaries must also be a Fellow or Associate of one of the following societies: the Society of Actuaries, the Casualty Actuarial Society, the Canadian Institute of Actuaries, the Faculty of Actuaries, and the Institute of Actuaries, or be a Member of the American Academy of Actuaries, the Asociacion Mexicana de Actuarios Consultores, the Asociacion Mexicana de Actuarios, or the Colegio Nacional de Actuarios. Although you will see later in this chapter that the actuarial profession is globally mobile, pension actuaries in many countries must meet certain specific national certification standards.

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p4

What is an Actuary

Financial Actuaries

- As the worlds of banking, insurance, and finance become more entwined, a new breed of actuary is emerging, known as a *financial actuary*.
- An advertisement for a senior financial actuary on the Internet describes one of the novel roles of actuaries in business.
- A company was looking for a senior financial actuary whose responsibilities included *developing, analyzing, and testing models of Internet credit card processing systems including product pricing, positioning, and consumer credit, in order to minimize risk and improve return on investment*.
- *You will communicate assumptions, results, and alternatives to staff and provide guidance in systems reengineering.*
- A suitable candidate was expected to have at least a Bachelor's degree in actuarial science, finance, mathematics, or a related field and be an Associate Actuary. In addition to appropriate experience, the candidate was expected to be an effective communicator, and creative thinking skills were essential. The company was looking for a self-starter with a strong statistical background and proven expertise in modeling techniques. Moreover, knowledge of the financial and management needs of an Internet real-time credit card processing company was expected.

What is an Actuary

What Does It Take to Become an Actuary?

- Skills needed include mathematical ability, knowledge of and comfort with computers and computer modeling systems, and the ability to communicate complex topics in terms that customers can understand.
- Most actuarial positions require that you are at least an Associate of the Society of Actuaries, the Casualty Actuarial Society, the Canadian Institute of Actuaries, or have equivalent standing in an actuarial society of another country.
- If you are in a position that requires you to certify actuarial valuations and reports, you must usually be a Fellow of these societies.
- Many actuaries in the United States are also members of the American Academy of Actuaries (*see Appendix D*), the *public policy, communications, and professionalism organization for all actuaries in the United States*.
- Actuaries in different countries belong to wide variety of national and international professional organizations that define and direct the future of the profession. At the international level, the International Association of Actuaries plays a central role in coordinating and advancing global actuarial interests.

Benefit and Rewards

Benefit and Rewards

The author of the quoted book has interviewed hundreds of students who have chosen to be actuaries. They all have one thing in *common* - *they all love mathematics*. Here is what some of them, and some of their employers, have given as reasons for their career choice.

Q Did you ever consider working in a non-actuarial field of applied mathematics (such as engineering) and if so, what tipped the scales in favor of an actuarial career?

Twenty-five percent of all respondents to the survey said "No." There was no doubt in their minds that all they ever wanted to be was an actuary. The rest had considered other careers. Here is what some of them had to say.

- **Answer** I am currently working in a non-actuarial field where strong mathematical and financial skills are highly valuable. Elements that persuaded me to leave the actuarial field were salary and opportunity at the top management level.
- **Answer** Yes. Communications and media. But I found that an actuarial career provides a more secure job, a great work environment, a good reputation, excellent job opportunities, and diversification of tasks, especially at the entry level.
- **Answer** I considered studying engineering. I decided to follow an actuarial career instead because I didn't like some subjects in engineering (chemistry) and because the business part of an actuary's job interested me.
- **Answer** I considered studying engineering. But I like the fact that being an actuary means that you need to acquire knowledge not only in applied mathematics (the primary reason why we're all in this field), but also finance, economics, taxes, politics, and all those things make an actuarial career so interesting.
- **Answer** I did consider many other fields, including engineering and medicine.
- **Answer** I initially was seriously considering going into pure and applied mathematics and even engineering, until I stumbled upon actuarial science. It was the combination of the high-level applied mathematics and business skills required in this field that finally tipped the scales in favor of an actuarial career. The fact that actuarial science led to a much more rounded career appealed to me immensely and really made all the difference.

Benefit and Rewards

Benefit and Rewards (continue)

- **Answer** Not really-I've been gunning for this since Grade 10. The workload of an engineering student at university steered me away from that, and I didn't want to be a computer programmer for my entire life.
- **Answer** Yes. Statistics. But I felt a training in actuarial mathematics was broader and that it would be easier to switch from actuarial mathematics to statistics than the other way around.
- **Answer** Yes. I applied to engineering. I then chose to become an actuary because it is more of a big-picture profession than engineering. To be an actuary you need to have a long-term vision. You need to understand trends in the economy and be able to predict where the economy will be moving in the future. The concepts and theories you learn in statistics train you to think critically, to analyze, and to recognize patterns and trends. Engineering is a more technical field and is not as conceptual as actuarial mathematics and statistics. I'm a big-picture man, and I believe that in the actuarial profession you get to see a lot more of the picture sooner. I assume that this training can also be applied to other fields in the future. It is a way of thinking and goes beyond technical knowledge.
- **Answer** I haven't so far, but I'd like to keep my options open. The biggest stumbling block would be to realize how much effort I've put into the SOA exams to become qualified as an actuary and then ask myself, "Do I really want to ditch everything I've done for my career, put more time into studying something else, and take a 30% drop in salary?"
- **Answer** I thought of being a teacher, but decided I didn't have the patience for that and I was drawn to a rotational-program setting at an insurance company so that I could have the exam support and variety of rotations. I would consider being an adjunct college professor or teaching an exam review class.
- **Answer** Yes. But I decided to go in actuarial science because it was something less well-known to me and I found that to be a real challenge.
- **Answer** I did consider it, but the job market favored actuaries at the time.

A Typical Day

A Typical Day

Let us take a look at a day in the life of an actuary. What are the typical tasks, and how does the day evolve? Obviously the answers depend on the nature of the company and the seniority of the actuary.

Here is what several actuaries and actuarial students had to say about this in the survey:

Q Describe a typical day In the life of an actuary.

- **Answer** Corporate stuff. Reserve valuations. Asset and liability management. Dynamic capital adequacy testing. Pricing.
- **Answer** Reading, replying and sending e-mail, letters and phone-mail. Keeping in touch with the daily activities of my clients and current economic developments. Talking many times a day with the consultants I work with to keep track of the many projects going on and address issues if necessary. Producing reports of different kinds when a consultant has to meet with a client, depending on the client's needs and what the consultant wants to show them. Calculating performance figures from the different managers investing money for a client's fund, reviewing their historical performance and comparing it with a universe of funds and benchmarks. Following up on previous reports prepared for clients that need to be updated for the coming quarter. Verifying trust statements at the end of the month to make sure there are no discrepancies with the manager's data. Carrying out all kinds of calculations that are required by the consultants in their work with clients. Lots of teamwork.
- **Answer** In the pension consulting industry, a typical day includes many phone calls with clients on subjects as varied as plan funding and investments, tax legislation, particular situation of given plan participants, union negotiations, benefit improvement, accounting treatment of pension plan, etc. Also, peer review of actuarial valuation results, planning and management of projects, business development, formal or informal training, internal or client meetings. It's rarely nine-to-five.
- **Answer** A normal day in the life of an actuary at my level involves a lot of work with computers. Checking data, using programs to calculate liabilities for pension funds, personal calculations, all that can be done in a normal day. It is also not unusual to have training sessions on hot issues or new tools.
- **Answer** I get to the office and check the e-mail and voice-mail messages. In the morning, I tend to work on projects until lunchtime and to contact my clients when problems arise. In the afternoon, I often have meetings with teams or clients, and I then keep on working on specific projects with different people.

A Typical Day

A Typical Day (continue)

- **Answer** Consulting in group health insurance: technical work on actuarial valuation of post-retirement benefits. Core consulting: renewals, review of financial reports, benefits redesign, analysis of insurer's quotations on group insurance benefits. General advice to clients about current issues on group insurance benefits: phone calls, client meetings.
- **Answer** For an actuarial intern, there is no such thing as a typical day. The tasks vary by intern and company but usually start with daily routine jobs such as updating data, checking the results of jobs run the previous day, and meeting with your supervisor. The remainder of the day is spent working on one or possibly several projects you've been assigned. Having junior status, an intern may work for more than one actuary and is often asked to run illustrations, compute premiums, search for data, make graphs, etc.
- **Answer** There aren't too many typical days. Every day has some new wrinkle or challenge. 'Things that are done pretty much every day are working with spreadsheets to perform actuarial calculations, checking the reasonableness of the results of calculations (Are results reasonably consistent with your prior expectation of what the results should be?), communicating with both actuarial and non-actuarial co-workers in person, by phone, or by e-mail. And during exam season, studying for exams if you're still taking them.
- **Answer** Here is an account of a typical day at the office. It's basically a 10-hour day:
 - ☐ 8:00 Walk to the office.
 - ☐ 8:30 Arrive at the office; read e-mail and news
 - ☐ 9:00 Finalize calculations for the report to client ABC; give directives to assistant
 - ☐ 10:30 Preparation for meeting with client A at 1 p.m.
 - ☐ 12:00 Lunch with investment manager of firm
 - ☐ 13:00 Meeting with client A: presentation of the report submitted three days ago, discussions of the next steps and answer questions and recommendations.
 - ☐ 14:30 Prepare memo to client A following meeting concerning issues raised
 - ☐ 15:00 Debriefing with manager for client.
 - ☐ 15:15 Consult voice-mail and e-mail.
 - ☐ 15:30 Peer review report for client B.
 - ☐ 16:30 Help junior analyst with calculation program for client C.
 - ☐ 17:00 Contact Trust D for trust statement figures as of mm.dd.yyyy
 - ☐ 17:05 Search for client E: Investment manager for an equity mandate.
 - ☐ 17:55 Time entry for the day.
 - ☐ 18:00 Go home (and study for actuarial exams!!!).

A Typical Day

A Typical Day (continue)

- **Answer** Internship in a pension consulting firm: every day is different. Different projects and obstacles to overcome. Challenging. It's hard to adjust between school and work routines. When beginning an internship, I often find myself very restless because I am not used to sitting in one place for long. At school, I never sit in one place for more than an hour.
- **Answer** I arrive at the office at 7:30a.m. I am usually the first one there, and I enjoy the quiet time to go through my e-mail.. do some deep thinking, and plan the day's work. I am in the corporate actuarial department. We set valuation policy for the company or, more accurately, develop our company's interpretation of the valuation standards set by regulators and the Canadian Institute of Actuaries. I am currently working on standards for applying the new *Consolidated Standards of Practice* to our valuation.
 - *E-mail.* The first thing I do in the morning is to read my e-mail. I send an immediate response where I can, delete any notes where no further action is needed, store notes that form part of a discussion thread, and print anything that I need to spend more time on during the day.
 - *Calendar.* Next, I check my calendar to see what meetings I have scheduled. Meetings can be a very significant portion of a working day, and if I have a memo or some other piece of work due that day, I need to do some short-term planning on how the work will get done on time. At this point I decide what I will actually do during the day. This will include meetings, project work, occasionally production work, and research.

Project work is a catchall phrase for deliverables that take longer than a day. This could include developing standards for valuation, implementing a new computer valuation system, collecting and coordinating data from different business units in support of a corporate decision. There always are one or two projects on the go that can absorb any available time in a working day not taken up by short-term requirements.

Production work is usually tied to a particular time of the month or year, and relates to reporting requirements of one kind or another. My production work is to examine and analyze the source of earnings reporting for the company. Research means reading some of the CIA or OSFI (Canadian Office of Superintendent of Financial Services) papers that have been prepared for our education. Most of this is directly relevant to my current job since my department interprets these papers for the company.
 - *The Rest.* The rest of the day is spent doing the work I have planned. My door is open, and the plans I have laid out are easily derailed if something comes up with a higher priority, such as a question from upper management

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p10

A Typical Day

A Typical Day (continue)

- **Answer** This greatly depends on the level of responsibility held by the actuary, the size of the organization in which the actuary works, and the type of company: life versus *PIC* [Property and casualty], consultant versus insurer, and so on.
- The answer also depends on the period in question. For example, year end will keep corporate actuaries very busy, while no overtime may be required the rest of the year. In any event, a day in the life of this actuary (meaning me) goes something like this. Bear in mind the following back ground information: I currently work for a small *PIC* reinsurance company (five employees), with both actuarial and underwriting responsibilities.
 - *Rating.* Most of the day I work with Microsoft Excel. My work involves rating (calculating reinsurance premiums), production of reports, or corporate functions such as calculating IBNR [incurred but not reported] loss reserves, doing DCAT [dynamic capital adequacy testing] work, and analyzing quarterly financial information. Knowledge of Microsoft Word and Microsoft Access is also required, since we often write memos and reports and all our data is stored in Access.
 - *Lunch.* Lunch is usually spent at my desk, reading e-mail, newspapers or trade magazines, in order to stay abreast of current events in the world and in the insurance industry in general. From time to time, I may go out for a lunch meeting with a client or broker. Some travel is required from time to time.
 - *The Day.* A typical day will see me coming in the office at 8:15a.m. and leaving at 5:45p.m.
- **Answer** The day in the life of an actuary depends on a variety of circumstances: insurance versus consulting, life versus *PIC*, big company versus small, traditional role versus non-traditional role, and especially the line of business the actuary is involved with-and even that can vary from day-to-day!

Actuaries I have met have handled pricing, reporting, risk management, reinsurance, and corporate and industry issues. Some are in non-actuarial roles like underwriting and senior leadership positions. Some work on group benefits (long-term disability, short-term disability, life, accidental death and dismemberment), some work on annuity products (fixed and variable), some work on life products (term, variable universal life insurance, universal life insurance), some work in investments, etc.

I don't think that there is just one way to describe an actuary's day!

Typical Responsibilities

Typical Responsibilities

How do beginning actuaries spend their time at work, and how do these activities change as an actuary's career advances?

Q What are some of the typical actuarial projects on which you have worked, and what specific knowledge and skills were required? Please give some illustrative examples.

- **Answer** Union negotiations: they require strong analytical skills, a talent for multitasking, and the ability to work well under pressure.
- **Answer** Basic actuarial valuation: calculating the plan's liabilities from the data of the participants of the plan. Basic actuarial projects require rigor, methodology and planning. Preparation of accounting disclosure and calculation of pension expenses: knowledge of accounting rules and their application.
- **Answer** I've worked on annual statements. A good knowledge of Microsoft Excel and pension plans was required. Being methodical and having good organizational and language skills are important. I've also worked on actuarial evaluations. The same skills and knowledge as for the statements were needed, plus a good knowledge of valuation software, as well as familiarity with the law and the valuation process (gain and loss, reconciliation, etc.).
- **Answer** Typical projects that I have been involved with included:
 - *Valuations.* Actuarial valuations: determination of the present value of annuity benefits taking into consideration demographic factors (mortality, termination, retirement, etc.).
 - *Reports.* Financial reports: understanding how balance sheets work, statistical knowledge, analytical skills, credibility notions, software skills (Fortran, Microsoft Excel).
 - *Computing.* Software skills are crucial in the actuarial field. A good grasp of Excel, AXIS, Microsoft Visual Basic for Applications, and even APL are a great advantage and are widely used in the field.
The main project I worked on consisted of reviewing and updating a computation made in the valuation system of an insurance company. My work was very specific and involved many calculations, running illustrations, and analyzing results.
 - *Products.* I also needed to have a good knowledge of the various products sold and their specific details. For example, if my results seemed irregular, my first instinct was to look up the product I was examining for distinct features such as product design or recent re-pricing.

Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Typical projects that I have been involved with included:
 - *Reserves.* Calculating reserves: needed knowledge of actuarial mathematics (life contingencies, theory of interest) and general structure of reserves, as well as computer software. Knowledge of professional standards of practice is also needed.
 - *Balances.* Calculating fund balances for retirement and investment products: actuarial knowledge of the theory of interest and computer software were essential. Knowledge of legislation regulating such products is also needed.
 - *Design.* Design of insurance and investment products: Knowledge of the different mechanisms of insurance products, knowledge of different investment products, rules and regulations regarding those products, computer software, communications skills when working with others were essential.
- **Answer** Typical projects that I have been involved with include actuarial valuations of pension plan liabilities; costing of plan benefit changes; pension expenses.

The skills required for these projects were basic technical skills: mathematical, actuarial and accounting rules, knowledge of internal valuation software, and knowledge of laws affecting pension plans.

I have also written reports to clients: letters, actuarial valuation reports, investment manager monitoring reports, etc.

The skills required for this type of work are the ability to translate complex issues into understandable words, writing skills, and communication skills.
- **Answer** Typical projects that I have been involved with include the production of reports, writing, graphing, editing charts; project management (requires good planning); communication with consultants (requires knowledge of the clients I work with, knowledge of Word, PowerPoint, and Excel); re turns calculations: requires knowledge of the database, and basic financial mathematics.
- **Answer** Reserve valuations, year-end and quarterly pricing, new products, modification of current products, DCAT [dynamic capital adequacy testing], business projections for the next five years, performed once a year, and MCCR [minimum continuing capital and surplus requirements] calculations.

Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Most are in line with post-retirement benefit valuations. Specific knowledge required: applying discount and mortality data to benefits scheduled for a future date.
- **Answer** Typical projects that I have been involved with included:
 - *Valuations.* Pension plan valuations. They are needed to ensure that the retirement benefits promised to employees by their employers are available for their retirement life. A valuation calculates the value of those retirement benefit promises (pension liabilities) and compares them to the assets invested. A fully funded pension plan is a plan that currently has a level of assets sufficient to cover its pension liabilities.
Skills required: actuarial background to calculate the required values; programming skills to understand/program/run the system on which the liabilities are calculated; analytical skills to check, compare and compile results; up-to-date knowledge on current market and economic issues used to set and understand the assumptions used in the valuation.
 - *Benefits.* Administering the benefits of expatriates working in various countries. Expatriates add another layer of complexity in benefits valuation since coordination is required between the host and home countries, as well as potential social security benefits earned in various countries.

Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Typical projects that I have been involved with included:
 - *DCAT.* A lot of work has been done recently on DCAT [dynamic capital adequacy testing]. Essentially, this is a financial model that projects the future financial condition of a company. The model can be deterministic or stochastic in nature. In my last three jobs, I have been involved to various degrees with this.

This type of project requires good understanding of accounting concepts (projection of balance sheet and investment income), investment concepts (calculation of market and book value of investments under various economic scenarios), financial concepts (calculation of corporate income tax), and statistical concepts (calculation of various probability scenarios). Developing appropriate business knowledge through finance, economics, investment and management courses can never be stressed enough.
 - *Computing.* Other projects that I have been involved with usually only require a good understanding of actuarial concepts, acquired through coaching and through the examination process. Expertise with Excel is always a must. So are other computing skills: Microsoft Visual Basic and SAS being the most common ones.

Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Typical projects that I have been involved with included:
 - *Annuities.* I've worked on developing new annuity products and riders (i.e., product management: seeing an idea develop into a real product that is sold to contract holders). Within that process, I have worked with all business areas (compliance, legal, marketing, systems, etc.) to get an idea into a working product.
 - *Ratemaking.* Other projects included setting the credited rates for our various fixed and variable annuity products.
 - *Profitability.* I have worked with in-house actuarial software to examine profitability.
 - *Verifications.* I have verified client illustrations to verify that what is being shown to a client for an annuity product's subaccount growth and death benefit calculations is accurate.
 - *Reviews.* I have also done product reviews of our existing products to validate the pricing.
 - *Economic Value.* I've worked on economic value-determining which areas of the company are contributing what value to our theoretical stock price.
 - *Reinsurance.* I also worked in reinsurance where I dealt with reinsurance intermediaries and brokers to renew contracts. This also involved assessing the risk within our existing contracts.
- **Answer** Renewal analysis (group insurance); financial statement analysis (group insurance); reserves analysis; post-retirement benefit valuation; report writing; various types of research; preparation of benefit statements; policies and booklets verification.
Knowledge and skills: Computer knowledge (programming, Microsoft Word and Excel), communication skills (in French and English), writing skills, planning ability.
- **Answer** Actuarial valuations (knowledge: methods for valuing liabilities); accounting procedures (knowledge: basic accounting); calculations (knowledge: laws and regulations, ability to draft reports, good reading comprehension); plan design (knowledge: industry trends).

Quoted from "Actuaries' survival Guide" p16

Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Most are in line with post-retirement benefit valuations. Specific knowledge required: applying discount and mortality data to benefits scheduled for a future date.
- **Answer** Typical projects that I have been involved with included:
 - *Valuations.* Pension plan valuations. They are needed to ensure that the retirement benefits promised to employees by their employers are available for their retirement life. A valuation calculates the value of those retirement benefit promises (pension liabilities) and compares them to the assets invested. A fully funded pension plan is a plan that currently has a level of assets sufficient to cover its pension liabilities.
Skills required: actuarial background to calculate the required values; programming skills to understand/program/run the system on which the liabilities are calculated; analytical skills to check, compare and compile results; up-to-date knowledge on current market and economic issues used to set and understand the assumptions used in the valuation.
 - *Benefits.* Administering the benefits of expatriates working in various countries. Expatriates add another layer of complexity in benefits valuation since coordination is required between the host and home countries, as well as potential social security benefits earned in various countries.
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 - *Computing.* Other projects that I have been involved with usually only require a good understanding of actuarial concepts, acquired through coaching and through the examination process. Expertise with Excel is always a must. So are other computing skills: Microsoft Visual Basic and SAS being the most common ones.

Typical Responsibilities

Typical Responsibilities (continue)

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Typical Responsibilities

Typical Responsibilities (continue)

- **Answer** Cash flow testing, economic value benchmarking, product development and pricing. Helpful courses: Life contingencies, theory of interest, knowledge of fixed income securities.
- **Answer** An actuarial background is not a prerequisite to work in the asset consulting services group. Some of my colleagues have a finance background. In fact, the projects I work on are not purely actuarial projects.
- **Answer** Typical projects that I have been involved with included the following:
 - *Assets.* How should the assets of a pension plan be invested? These projects are mostly worked on by actuarial people. They require a knowledge of both the liability and assets sides of a pension plan: demographics, financial results, investment markets, etc.
 - *Investment.* Review the pension plan (statement of investment policy and procedures).
 - *Management.* How to implement an investment policy, how many investment managers to assign to each asset class, what kind of investment managers to select (large/midsize/small capitalization, value/growth/core investment style).
 - *Personnel.* Selection of investment managers for each asset class (Canadian equities, US equities, international or foreign equities, fixed income, etc.). A management structure and the manager selection require a good knowledge of the institutional investment market; you need to know the players, their investment process and style, and so on.
 - *Monitoring.* Monitor the investment performance of each manager. It requires a good knowledge of their style as well as how the markets are performing in order to really understand their numbers and be able to explain their performance to clients. You need to know the team players in order to monitor any changes and turnover of people.
 - *Mandates.* Put in place the appropriate paper documents between the pension plan and the investment managers.
 - *Records.* Defined contribution record keeper selection.
 - *Options.* Defined contribution investment options selection.

Progression of Responsibilities

Progression of Responsibilities

Q What are typical SOA and CAS career paths and where should successful actuaries or actuarial students be at age 20, 25, 30, 35, 40, 45 in (a) SOA, (b) CAS?

- **Answer** At 20: at school. At 25: junior consultant. At 30: pre-senior consultant. At 35: senior consultant. At 40: advanced senior consultant. At 45: responsible for major clients, line of business, direction, etc.
- **Answer** I don't think there is such a thing as a typical career path. For SOA, actuaries should have a firm client relationship with clients by the time they're 30. At 45, they should be established as client managers, responsible for high-level work and the relationship with clients.
- **Answer** At 25: SOA graduate with the first three or four exams. Then continue to write exams while working and finish before 30. At that age, actuaries should be familiar with the technical concepts and begin to be relatively autonomous in establishing what needs to be done on different projects. At 30, they should be able to review the work of junior students and have their own clients. At 35, they should be senior consultants.

Progression of Responsibilities

Progression of Responsibilities

Q What are typical SOA and CAS career paths and where should successful actuaries or actuarial students be at age 20, 25, 30, 35, 40, 45 in (a) SOA, (b) CAS?

- **Answer** At 20: finishing an undergraduate degree in statistics or actuarial sciences and have at least written the exam. At 25: be at about Courses 4 or 5, and have spent one or two years as an actuarial assistant. At 30: have completed all courses and have gathered five to eight years of experience in one or more companies and hold an Assistant Manager's position. At 35: manager or director. At 40: permanent senior position, secure and confident in the position they are holding.
- **Answer** In my opinion, this should be stated in terms of duration from when the first exam is attempted, rather than by age. People get into the field at different ages and different places; they have different average ages upon graduation from college. Thus, it is not uncommon for someone to get their FSA prior to age 25 in the United States, whereas it is less common in Ontario because Ontario students graduate from university when they are between 23 and 24, instead of 21 or 22. I have met people who didn't start taking exams until their 30s because they switched careers. Most students should get their Fellowship about 8 to 10 years after they started taking exams. The average age of new FSAs is usually in the mid-30s, although the SOA wants to reduce the exam travel-time and, indirectly, the average age of new FSAs. They want to do this, but I doubt it will happen.

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p23 - 24

Progression of Responsibilities

Progression of Responsibilities (continue)

- **Answer** I will cover only the SOA exams. At 20: start the exams if you want to be an actuary. At 25, you should have completed Courses I through 4. During the first few years of your actuarial career, you will be a junior actuarial analyst. At 30, you should at least be an ASA. You will be a senior actuarial analyst or junior consultant. At 35, you should be an FSA or have decided whether you want to continue writing exams. Life consists of more than SOA exams!!! You should be an intermediate consultant. At 40, you should be a senior consultant.
- **Answer** I would like to have finished all of my SOA exams by the age of 24. After a three-year university program, a solid goal is to have passed four exams.
- **Answer** At 20, you should be in university and have started the first two or three exams. At 25, you should ideally have finished your exams and should be waiting for the completion of your PD [professional development] requirement credits. At 30, you should have two or three persons to whom you delegate work and start helping them build their knowledge. At 35, you should focus on networking and meeting people, start bringing clients to your consulting firm and maintain relationships with existing clients. At 40, you should probably be at the peak of your responsibilities.
- **Answer** At 20: actuarial student. At 25: senior actuarial student. At 30: FSA. At 35: Associate Actuary. At 40: Assistant Vice-President. At 45: Assistant Vice-President or Vice-President.
- **Answer** From the SOA point of view: At 20: in university. At 25: starting out, passing exams, gaining experience at an actuarial firm, deciding on insurance versus consulting, SOA versus CAS, is or is close to being an ASA. At 30: is or is close to being an FSA, settling into the actuarial field with preference for insurance or consulting, SOA or CAS. At 35: twelve or more years of experience. Consultant level with expertise in a preferred field. Providing valuable advice to clients on a wide range of client issues, and a good source of intellectual capital for peers.
- **Answer** In my answer, I will focus on a CAS career. At 20: nice to have passed at least one exam. At 25: two years of experience and at least four exams. At 27: five exams. Very good candidates will have access to a managerial position. At 30: will probably be a Fellow by this age-if not, no problem, but focus on finishing the exams. At 30 to 35: outstanding candidates will have access to senior management positions. Over the first ten to fifteen years of an actuary's career, it is not uncommon for a person to have worked for several employers.
- **Answer** I will describe a typical SOA path. At 20: junior staff in consulting firms or insurance companies. At 25: almost a consultant. At 30 and above: senior consultant for clients and relationship manager.

Progression of Responsibilities

Progression of Responsibilities (continue)

- **Answer** I will answer this question from the CAS perspective.
 - *Student.* Typically, at 20, you will still be in university. You will hopefully get some summer work experience, if not working for an insurance company, at least getting some exposure to the office world. You should be planning to write a few actuarial exams while in university to show prospective employers your willingness to write exams, and your capacity for writing them successfully.
 - *Intermediate.* At 25, you should be making the transition from entry-level to intermediate actuary. You should have written several exams by now, including basic ratemaking and reserving (although not necessarily passing them), which will prove invaluable in the new responsibilities being handed to you.
 - *Associate.* At 30, you should be an Associate, even a Fellow if you are one of the more gifted. This is the point in your actuarial career where you are handed management responsibilities. Although everyone wants to be a manager, very few understand what is involved. If working for a good company, the actuary will have been sent to some form of management and other business-training seminar. But the very motivated individuals will not rely on the company, and will read up on these subjects at home.
 - *Vice-President.* At 35, most CAS Fellows are Vice-President or its equivalent such as partner in a consulting firm (at least, in Canada). Responsibilities start shifting from the pure actuarial areas to the areas of company management and client management.
 - *Career Peak.* At 40 and 45, your level of responsibilities will slowly increase, but essentially, things will remain the same until retirement.
- **Answer** I cannot respond with respect to the CAS, so the answers below are with respect to the SOA.
 - *College.* At 20: taking college courses towards a mathematics degree or actuarial degree. Investigating internship opportunities. Planning to take one or two exams before graduation.
 - *Work.* At 25: working at a company with one to three years of experience. Have passed two or more exams.
 - *Almost FSA.* At 30: working for a company with 5 to 8 years experience. Be close to attaining FSA if not already an FSA.
 - *FSA.* At 35: have the FSA designation, have 10 to 13 years of experience, have a staff working for you, have a more prominent position and be out of the "rotational" student program. Know your specific area of interest or track the one you want to pursue in depth.
 - *Leadership.* At 40 to 45: have a significant leadership role within the company and a staff working with you. Be accessible to newer students in the program who want advice.

Progression of Responsibilities

Progression of Responsibilities (continue)

- **Answer** In my answer, I will focus on a CAS career. At 20: nice to have passed at least one exam. At 25: two years of experience and at least four exams. At 27: five exams. Very good candidates will have access to a managerial position. At 30: will probably be a Fellow by this age-if not, no problem, but focus on finishing the exams. At 30 to 35: outstanding candidates will have access to senior management positions. Over the first ten to fifteen years of an actuary's career, it is not uncommon for a person to have worked for several employers.
- **Answer** I will describe a typical SOA path. At 20: junior staff in consulting firms or insurance companies. At 25: almost a consultant. At 30 and above: senior consultant for clients and relationship manager.
- **Answer** Here is a typical CAS career path:
 - *School.* At 20, students are still in school, completing their Bachelor's degree (or Master's degree, even though it is not required in the actuarial field). While in school, students generally start taking actuarial exams. A successful student should have passed the first two exams before graduation and should have had at least two internships related to the actuarial profession or insurance industry.
 - *Analyst.* At 25, students should have a year or two of experience and be well established as an actuarial analyst. At that point, a successful student would have passed 5 or 6 actuarial exams.
 - *Almost Fellow.* At 30, actuaries have typically been exposed to various aspects of the actuarial profession and have expanded their experience to pricing and reserving different lines of insurance. They also have analysts reporting to them and should be close to obtaining their Fellowship (if not done already).
 - *Vice-President.* By 35, actuaries should definitely have their Fellowship and be in a management position (either as a senior consultant in a consulting firm or a Vice-President, or Assistant Vice-President, in an insurance company).
 - *Partner.* At 40, a successful actuary would be a partner in a consulting firm or an officer in an insurance company.
 - *Retired.* At 45, a very successful actuary would retire.
- **Answer** At 20: in university. At 25: actuarial student, 35 hours per week on the job and 40 hours per week studying. At 30: new Fellow, supervisor or manager of a few actuarial students and clerks, or a highly technical position without direct reports. At 35 and above: continually increasing responsibility, demonstrated by increased staff and budget or required technical knowledge.

Skills

Mathematical Skills

Q What general mathematical competencies are required by an actuary? Give some examples and relate them to the SOA or CAS examinations.

- **Answer** Problem-solving, but this has nothing to do with any university course or actuarial exam.
- **Answer** Calculus is needed for the first actuarial exam. Financial mathematics is very useful in the day-to-day work as well as for the exams (tested on more than one exam). The whole of actuarial theory is based on statistics, so it is, of course, a required competency.
- **Answer** For the first exam, you need a lot of basic probability and calculus competency. The second exam is more about financial mathematics, macro- and microeconomics, and finance. The general mathematical competencies required for this exam are mostly integrals and derivatives. After that, you will always be using a variety of mathematical competencies (again basic probability, integrals and derivatives), but they will become more specific.
- **Answer** Course 1 deals with basic probability and calculus competencies. An ability to deal with them and apply them to actuarial problems is crucial. In general, a deep understanding and competency in probability and statistics is essential to passing SOA and CAS examinations since they are the foundation of actuarial mathematics. A strong background in statistics is necessary.
- **Answer** Knowledge of probabilities and statistical distributions, life contingencies, theory of interest, calculus, geometric series. The calculus is often tested via continuous distribution functions where integration of a function is required (Course 1). Probabilities of people living and dying are combined with geometric series to create the mathematics of insurance and annuities (Course 3). The theory of interest is used for the principles of interest discounting and accumulation (Course 2).
- **Answer** Theory of interest, life contingencies.

Skills

Mathematical Skills (continue)

- **Answer** Theory of interest is a must (time value of money). Probabilities are also very important.
- **Answer** Well, everything that's mathematical in the exam syllabus. Plain and simple!
- **Answer** Competency in calculus, statistics, algebra, probability is essential, especially for the early exams.
- **Answer** Actuarial mathematics such as life expectancies, survival models and projections, annuity factors--regression analysis--e.g., calculating trends, building models, etc.
Calculus: background used in most programs and models.
Statistics: always needed to calculate averages, medians, quartiles, etc.
- **Answer** This is a difficult question. The answer also depends on the level of sophistication reached in the various companies. *PIC* companies in Canada are small and not a lot of complex mathematical models are built. I know of one or two companies working on that front, and they have hired a person with a Master's degree in statistics to do the work. However, these people are supervised by actuaries. Advance knowledge of calculus, statistics, theory of interest, life contingencies, and loss distributions are generally required to pass the first four exams. Past that point, at least on the *PIC* side, mathematical competency almost boils down to being able to add and multiply. Basic knowledge of the above is all that is required. And as I said, I find the same is true for our day-to-day life at work.
- **Answer** CAS: only basic mathematical competencies are required. Regression and modeling may be beneficial, but are not a must. It is a common mistake to believe that extensive knowledge of mathematics is required to be an actuary. However, one must like to work with numbers to enjoy being an actuary.
- **Answer** Basic mathematical skills needed. The examinations helpful for a career are the ones that discuss the different methods for valuing liabilities, accounting, and finance.
- **Answer** Calculus, probability and statistics.

Skills

Theory of Interest

Q Why do actuaries need the theory of interest? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** Very important for what I am doing, time value of money is a key concept, actuarial present values, rate of return formulas, amortization tables, etc., are all concepts that I have to play with very often in my work even if the way I work with them is different from an examination in Course 2, for example. Excel is used a lot in playing with these concepts.
- **Answer** This is the basic element of the calculation of today's value of any future payment of one dollar. It is the cornerstone of our field.
- **Answer** It is essential for the calculation of annuities and the understanding of the time value of money. For example, we use it when we calculate things payable at retirement with money accumulated today, or when we want to know what is the value of a pension fund today considering what the membership of the fund might be in the future. Again, it is tested directly in one of the first exams and comes back indirectly in the others.
- **Answer** When dealing with a client, we are looking at the overall result of the company, and this includes investment income, future claims, future revenues, etc. The theory of interest is crucial when it comes the time to take those amounts into consideration. It would not be right to use an amount that will be obtained in 10 years, and this is where discounting comes in. The whole point of theory of interest is to calculate the company's financial situation at a certain point in time.
- **Answer** Similar to the previous question, virtually every business problem the life actuary deals with involves the assessment of risk, i.e., the value of a future event contingent on assumed probabilities. The present value of a future event requires the application of the theory of interest.
- **Answer** Theory of interest is the basic of many actuarial mathematics and finance concepts. This material teaches you the value of money in the time. This has many applications in the every day and in the work life. It is also a big part of the second exam.
- **Answer** Present value of annuities.
- **Answer** The theory of interest is needed to understand the basics of actuarial mathematics. The simple concepts of Present Value and Annuities are present, introduced and explained in details in theory of interest, and are everywhere in actuarial science. In Course 2, these skills are tested.

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p33 - 34

Skills

Theory of Interest (continue)

- **Answer** Time value of money (i.e., accumulation and discounting) and understanding the basic structure of a bond are very important for calculating reserves, premiums. They are crucial for asset-liability management. Courses 2 through 8 use these concepts.
- **Answer** Basis for discounting future value of loss, benefits, etc. Also used in projecting figures in the future.
- **Answer** That is *the* required course. If you don't understand this one, you may as well forget an actuarial career.
- **Answer** The theory of interest is crucial. The time value of money is one of the underlying principles of the insurance industry, only insurance takes it one step further by applying statistics.
- **Answer** Probably not all that necessary now that most work is done on computers using interest vectors.
- **Answer** The theory of interest is one of the essential building blocks of actuarial mathematics. It is needed to define present and future values, for example. Concepts such as calculating present values of bonds and calculating loan payments and outstanding mortgage values involve the theory of interest.
- **Answer** Actuaries in property and casualty insurance are constantly discounting future streams of payments to calculate present values. They also need to understand annuities since they are sometimes used in the claims settlement process. Beyond this, it is not being used too much.
- **Answer** In pension, the theory of interest is an important subject. The payment stream after retirement is based on mortality and interest. It is also needed to project ahead or discount employee contributions.
- **Answer** Interest theory and time value of money are extremely important in any investment-product context (Course 2 of the SOA exams). Reviewing cash flows, profitability, and understanding gain/loss scenarios all hinge on the theory of interest. It is particularly important for actuaries in the investment field.
- **Answer** CAS only: present and future value calculations (investment of insurance funds and discounting of loss reserves). Some annuity calculations.
- **Answer** For valuating pension plans we need the concept of present value.
- **Answer** Calculation of present value of future stream of payments.

Skills

Mathematics of Finance

Q Why do actuaries need the mathematics of finance? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** Finance is a big part of second exam.
- **Answer** Mathematics of finance is also needed to understand the basics of actuarial mathematics. In Course 2, an extensive and deep understanding of finance is needed. This knowledge and skill will also be used in the work place. Often, an actuary will be asked to do some financial analysis. A good basis in mathematics of finance is necessary for a good actuary.
- **Answer** Actuaries need to understand assets as well as liabilities in order to properly set reserves and premium and dividend rates. Actuaries now need to understand both sides of the balance sheet to do their job correctly. Courses 5 through 8 (SOA) really hit on this.
- **Answer** Needed when working on the asset side of a pension plan.
- **Answer** The Course 2 exam. Also, insurance products relate very closely to the time value of money and finance.
- **Answer** Financial mathematics is used when valuing pension assets. Also, a basic knowledge of financial markets is always useful when dealing with clients and in devising models. Investors and their advisors are becoming more and more informed, leading to more sophisticated market developments, products and services. As an actuary, and in most cases, at least indirectly affected by financial markets, a basic knowledge of financial mathematics is highly recommended. Course 6 of the SOA examinations is almost entirely based on financial mathematics. Although probably more technical than most actuaries will ever need, it provides an excellent base.
- **Answer** More and more actuaries are getting involved in the investment side of the business, particularly with DCAT [Dynamic capital adequacy testing]. Although not everyone will use it, it is a good idea to be familiar with it in order to be a well-rounded actuary. Theory around cash flow and duration matching are also in common use. I believe this is now being covered in the CAS Course 8.
- **Answer** In pension, you have the promises made to a participant to receive a pension, but you also have the employee and employer contribution that make up the assets. You need to know about investment.
- **Answer** CAS only: finance is not used *per se* in our day-to-day work. However, knowledge about the effects of diversification may prove to be useful with respect to *planned growth* in *PIC*. This would relate to actuaries who have a more strategic role-at the executive level, or close to that level. Knowledge about the risks related to various investments (bonds, stocks, etc.) may prove to be useful in discussions at a higher level (executive level). Generally, knowledge about finance is very good to have, although the actual use of it is limited in the day-to-day work. No link with exams.
- **Answer** Finance related to good consulting when valuating liabilities.
- **Answer** Investment science.

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p34 - 35

Skills

Economics

Q Why do actuaries need economics? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** Great background to have for working in retirement or asset consulting so you understand more of what is going on *in the real world*. The only thing sometimes is that economics is a very theoretical science. Sometimes it is difficult to see a real-world application to some theories seen in Course 2, for example.
- **Answer** To understand the link between the liabilities of a plan and the assets underlying the plan.
- **Answer** A lot of our work depends on finance. For example, with the market situation today, pension funds are losing money. This fact should guide actuaries when they give advice to their clients on when to file an evaluation or the decision to improve the plan, for example. It is tested in the examinations in Courses 2 and 3.
- **Answer** Economics is a big part of the second exam.
- **Answer** Economics are also needed to understand the basics of actuarial mathematics. In Course 2, competency in economics is tested. This knowledge and skill will also be used in the workplace and serve to understand the ways a company and the market work.
- **Answer** Actuaries need to be able to understand the structure and the workings of the different investment markets in order to manage their assets that back their liabilities well. Course 2 and Courses 5 through 8 touch on this.
- **Answer** Set appropriate economic assumptions for actuarial valuation: discount rate, rate of return on assets, etc.
- **Answer** The thing I remember about my economics class is the *marginal cost* theory, which I apply very often. But I'm not sure if I needed this class.
- **Answer** Course 2. Also, the ideas of balance sheets are crucial even for pension plans and for the reserves of an insurance company. Pension actuaries must weigh the assets and liabilities of a pension plan against each other.
- **Answer** Actuaries should have some idea of how macroeconomic events in the economy may affect the sectors of the economy that have an impact on their business. For example, how will a slowdown in inflation affect long-term interest rates?

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p34 - 35

Skills

Risk Theory

Q Why do actuaries need risk theory? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** Risk theory helps me understand the foundation of actuarial science. It is very important, I think, to be strong in this technical area since the ideas involved come up on a daily basis.
- **Answer** Basic to our job is managing the risk related to a plan.
- **Answer** I rarely use risk theory at my level. But it is important for the examinations.
- **Answer** Course 3 tests these skills.
- **Answer** Actuaries are trained to put a value on risk and handle future contingent events. Risk theory is the real fundamental bridge between life contingency theory and the business of insurance. Courses 3, 5, and 8.
- **Answer** Understand risks, model risks to eventually put a value and cost on it.
- **Answer** Risk theory is the heart of actuarial work. An actuary is an expert in the assessment and management of risk.
- **Answer** Risk theory is the basic building block of the *PIC* business. However, as indicated earlier, the level of sophistication is rather lacking in the Canadian marketplace. However, it is helpful to understand risk theory in order to perform the daily work of a *PIC* actuary.
- **Answer** CAS only: This is the basis of the pricing work in *PIC*. I cannot say, however, that what I learned in school with respect to risk theory helped me in my work.

Skills

Loss Modeling

Q Why do actuaries need loss modeling? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** I guess it is very important in CAS, but is less important in fields such as asset consulting.
- **Answer** I am not yet familiar with loss modeling.
- **Answer** I think this is more of a CAS thing or perhaps also a reinsurance thing.
- You need to be able to calculate the probabilities of incurring a loss before you can accurately set a price for an insurance premium. Loss modeling comes up in Course 4.
- **Answer** CAS stuff. Used in pricing products by modeling future expected losses.
Needed since non-life risks generally have the following characteristics: time of event unknown (so need a frequency distribution) and size of loss unknown (so you need a loss distribution).
- **Answer** More useful for CAS, I think.
- **Answer** Loss modeling is a fairly useful tool that is hardly ever used, at least in my experience. Lack of size (and therefore lack of data) is one of the problems encountered when trying to do loss modeling. Often a lack of time and resources will also force a company to use a broad-brush approach in its pricing and reserving modeling.
- **Answer** CAS only: loss modeling may be used to forecast the severity of certain events, and also to determine how variable results will be from one event to the next (link with credibility of results). For example, in looking at auto mobile theft, vandalism and fire, loss modeling may be used to determine the shape of the curve that best describes severity (average cost). Once this is done, one can determine how variable this severity will be, and therefore how many observations are required in order to get credible estimates.

Skills

Stochastic Ideas

Q What stochastic ideas and techniques do actuaries use? Please give examples and relate them to the SOA or CAS examinations.

- **Answer** I know areas of the actuarial field where it is extensively used and is important. This is not yet the case in asset consulting (at my level). But I know that stochastic ideas are very important in asset and liabilities management, an area I would love to get into later on in my career.
- **Answer** The only method used frequently is the Monte Carlo simulation, mostly for the projection of the assets of the plan.
- **Answer** Continuous Markov chains are used by actuaries and are tested in Course 3, I believe.
- **Answer** Becoming more prevalent, especially with modeling possible future interest rate patterns when determining reserve amounts for life insurance and annuities. Also used for sensitivity testing and pricing of minimum guaranteed death benefits for segregated funds. Course 8 had a big section on this. Course 7 Pre-test had this.
- **Answer** Projections of pension plan assets or surplus based on stochastic distribution of future interest rates. Can then determine the future distribution of values by percentile, calculate the probability of having a value less than some fixed amount, etc.
- **Answer** To forecast what are best and worst case scenarios under different sets of hypotheses for surplus or deficit in a pension plan.
- **Answer** Stochastic modeling of the cost of face amount guarantees on segregated funds.
- **Answer** CAS only: stochastic techniques are not widely used in Canada. They may be used in the area of DCAT [dynamic capital adequacy testing], although I do not know anyone who has programmed or is using a stochastic model in Canada to do DCATs.
- **Answer** More in asset consulting than liability consulting.

Skills

Software Skills

Q What software skills should actuaries have and why? Please give examples.

- **Answer** All Microsoft Office tools (especially Microsoft Excel), databases (of ten firms have their own database system that is learned on the job), and logic. Knowledge of time management software is a must to effectively manage time in and out of the office!
- **Answer** Skills are more related to problem-solving approach than real programming skills.
- **Answer** Knowing all Microsoft tools such as Word, PowerPoint, Excel, etc., well. Being comfortable with searching for information on the Internet.
- **Answer** Actuaries mostly use Microsoft Excel and should feel comfortable using it. Since we are playing with numbers all day long, any software that performs similar operations can be used.
- **Answer** Programming skills are needed. Also, Microsoft Excel is a commonly used tool and the actuary should be very comfortable with using formulas and editing data. Sometimes Microsoft Access is used for data modification or verification.
- **Answer** Strong Microsoft Excel skills are required, I think, in every company.
- **Answer** Microsoft Excel, Access and Visual Basic programming.
- **Answer** Microsoft Excel is a definite must. It is used in the day-to-day routine of an actuary. An actuary should also have good computer programming skills and be comfortable with the Internet. Like in many careers, the computer is one of the basic tools of the actuary.
- **Answer** Actuaries should have good Microsoft Office skills, especially Excel, Access and Word. They should have strong programming skills as well. Entry-level jobs, in particular, require good software skills.
 - *E-mail.* Capacity to use e-mail (obvious, I guess).
 - *Excel.* Capacity to use Excel (most of the calculations are done in Excel).
 - *Word.* Word processing: to write memos/documents (speed of typing is important). To be an actuary, one must like computers because about 90% to 95% of the work hours are spent on a computer.
- **Answer** Good in Microsoft Excel, Word, and Access.
 - *Excel.* Advanced knowledge of Excel is required since most companies use Excel to put together actuarial analyses.
 - *Access.* At least intermediate knowledge of Access is required. The actuary who is able to run complex queries will generate better data as a basis for actuarial analyses.
 - *Word.* Basic knowledge of Word is required to convey results and findings of actuarial analyses.
 - *PowerPoint.* Basic knowledge of PowerPoint is required to prepare presentations to management or clients.

Skills

Programming Skills

Q Which programming languages do actuaries need and why? Please give examples.

- **Answer** Rarely. I need to write macros in Excel. That is about it.
- **Answer** None. All companies have their own software now.
- **Answer** Usually, each actuarial firm has its own program, so I don't think there is some particular programming languages needed. Of course, Microsoft Excel and Visual Basic are used a lot. I would say that an actuary should know at least one of the common programming languages (Fortran, C++, etc.). With that knowledge, it should be enough to adapt to others.
- **Answer** In my day-to-day work, I use Microsoft Visual Basic (for macros) from time to time. Besides that, it is mostly company-specific programs. Therefore, more than knowing a single language inside out, I believe it is more important to have a strong understanding of programming methodology.
- **Answer** I used SAS in a casualty insurance company and in government, and Microsoft Visual Basic in all of my internships. Although I took C++ courses at university, I have never used this programming language.
- **Answer** I don't use any language, but the logic behind it is used for company specialized software for actuarial valuations.
- **Answer** Microsoft Visual Basic and Visual Basic for Applications are often used in the field. Knowing how to program macros and use them is often a great advantage. APL, although now more and more scarce, is also a programming language that has benefits since it is still used in some insurance companies.

Skills

Business Skills

It is often said that good business skills are essential to succeed in the actuarial world. What are business skills? Many companies now specialize in the teaching of business skills. Let us take a look at a typical repertoire of one of these companies. The company *Learn₂*, for example, offers business skills courses which include:

- Appraising people and performance
- Articulating a vision
- Coaching and counseling
- Communication skills
- Conflict resolution
- Counseling and disciplining
- Customer service
- Decision making
- Effective presentations
- Giving clear information
- Interviewing techniques
- Leadership situations
- Planning and scheduling work
- Planning your presentations
- Relationship strategies
- Training, coaching and delegating
- Time management and prioritizing
- Setting goals and standards

Skills

Business Skills

Q What business knowledge and skills do actuaries need and why?

Please give examples.

- **Answer** At a higher level, actuaries sell services to clients. So actuaries need to be good in persuasion, understanding needs, and foresee problems or requests. Honesty is also very important. They need to be aware of the market in general. To understand their clients better, they also need to check specific fields in particular (if your client is a factory, you should know if the market is good for that field, not just for your client or in general). Actuaries also get to manage clients' teams: prices to charge, tasks to perform, who's to work together, time allocated to a project, and so on.
- **Answer** A good background in business is necessary to an actuary. A knowledge of finance is essential in the study of actuarial mathematics, but even skills and knowledge in Marketing and Accounting can be useful since you will often find actuaries in the marketing and assets and liabilities management department of an insurance company. Since actuaries often hold management positions, management skills can be useful.
- **Answer** There are others, but I would start with basic accounting (balance sheet, income statement, double-entry accounting) and finance (investments/assets characteristics).
- **Answer** This depends on the ambition of the person involved. Generally, the more ambitious, the more business knowledge and skills are required. Actuaries who are happy working in the back room and are not interacting with people other than their manager and co-workers probably don't need too many business skills. However, anyone who wants to climb the corporate ladder requires business skills. Indeed, let us not forget that this is what we are doing: running a business. The best actuaries in the field are, first and foremost, businessmen. They can understand the difference between an actuarial indication and the price the market will bear. They understand the implication on the company of their decision with regard to IBNR (incurred but not reported) loss reserves or reinsurance. They get involved in projects and understand the work flow of the organization, the difference between the bells and whistles, and necessary system enhancements. Business skills required include economics, marketing, management (both personal, time, and project), finance, investment, and communication.

Skills

Communication Skills

Q What communication skills do actuaries need and why? Please give examples

- **Answer** The more skilled actuaries are, the better they are, as I have found out since working full-time. Especially in Montreal, being able to speak and communicate fluently in both English and French is a *great* asset. For a junior consultant, it is of the utmost importance to communicate very well with the seniors so we understand exactly the work that needs to be done and once completed, to be able to explain it to the consultant in clear words. Listening is also a forgotten skill, but very important in day-to-day work. Presentation skills become more and more important, I assume, as you grow in the business and have to meet with clients and present them ideas and reports. Being able to support your ideas and organizing your thoughts are also key skills.
- **Answer** Clarity, since it is difficult. Simplicity, since the client must understand.
- **Answer** Knowing at least two languages, enough to be able to communicate, is essential. It is not unusual to encounter French-speaking clients, for example. Canada is so bilingual that it's not an option anymore. Also, an actuary needs to be able to express his thoughts and his knowledge. It will happen often that a more advanced actuary needs to explain something to a new one or even to a client. So being able to be clear, not too complicated and see when the other person doesn't understand is essential. The same skill applies for writing (the annual statements, for example, need to be clear, but simple).
- **Answer** You need verbal skills to give presentations to your colleagues and to clients (particularly in the consulting field). Your writing skills will be useful to write actuarial evaluation reports or prepare internal status documents.
- **Answer** Very good communication skills in order to gain credibility from people we are working with and to explain simply what we have done and why.

Skills

Communication Skills (continue)

- **Answer** Presentation skills are necessary since it is often required from actuaries to present their research results, projects or recommendations. Actuaries must also be able to *sell* an idea. In the consulting business, actuaries will interact with clients and need to be able convince the client of the necessity of a benefit plan for example. Actuaries also sometimes need to explain their results and recommendations. Hence communication skills are, as much as mathematics and business skills, essential in the making of a great actuary.
- **Answer** Verbal: speaking to other actuaries in technical language, speaking to non-actuaries in non-technical language, presenting to management/board on reserves (appointed actuaries), presenting updated pricing models to underwriters, leaving phone messages. Written: documenting in clear and understandable language, writing some letters and reports (especially in consulting), e-mail. Listening: gathering information, learning about other areas of the company, learning other peoples' terms so you can speak to them in their language.

Skills

Communication Skills (continue)

- **Answer** Written: you often need to write important reports for management and regulators and/or auditors. Internal documentation of processes is needed as well. You also need to use e-mail effectively to communicate with non actuarial staff, the field force, and customers who need to have technical concepts explained in non-technical language. Verbal: same reasons as above, without the written reports for regulators and auditors. Public speaking: you are often required to make presentations to audiences with varying actuarial knowledge.
- **Answer** You need good writing and verbal skills. Mastering two or more languages is a must.
- **Answer** The biggest challenge is to understand what you are doing and then to be able to explain it to people who don't have an actuarial background. Therefore, it requires excellent communication skills if you don't want to spend your life in front of your computer.
- **Answer** You need to be able to communicate complex actuarial concepts to a variety of audiences and levels of understanding.

Skills

Communication Skills (continue)

- **Answer** Expression. It might often be hard to express a mathematical calculation in words, but this is a necessary ability. When working with a team, it is necessary to be able to discuss one's work and the need for certain calculations. It is important to be able to give oral presentations and to be able to speak in front of a crowd. In a corporation, you must speak in front of a group to share knowledge and ideas.
- **Answer** Verbal and presentation skills to be able to present and *sell* your ideas and concepts to management. This is often critical when you work closely with upper management (such as corporate actuaries).
- **Answer** Depending on the actuarial field, various levels of communication skills are required. For consulting actuaries, communication skills are extremely important. The level of knowledge of clients is quite broad; ranging from clients who are well informed to clients who have only a basic knowledge and depend on consultants to provide them with the required knowledge and information. A consulting actuary must therefore be able to communicate technical information into laymen terms and be able to tailor the information based on the level of knowledge of the clients.
- **Answer** Actuaries need both written and oral communication skills, especially as more responsibilities are assigned to them. Actuarial mathematics is a difficult concept and it is difficult to explain to a lay audience. Further more, at least with P/C companies, actuaries interact a lot with marketing, sales, and branch managers. In addition, all corporate actuaries interact with finance and upper management, as well as IT [information technology]. Rarely do actuaries price a product in a vacuum. The actuarial indication is only the beginning of the process. What good is it to price a product at the actuarially sound rate if nobody is going to buy it? Especially if the high price is driven from conservative assumptions. Pricing actuaries often have to explain or sell their recommended increases to a variety of people. When involved in various projects (or business), actuaries are often experts relied upon to help shape the requirements of the project. Good writing skills are essential in these instances. Corporate actuaries often need to explain their IBNR [incurred but not reported] loss reserve calculations to upper management. When a change in IBNR can erase the entire profit for a given year, not only are good communication skills necessary, political savvy is also essential! At a certain level, appointed actuaries also have to report to the Board of Directors. To avoid the "glassy eye" syndrome, good verbal communication skills are again essential.

Actuary Around the World

Australia

- Admission as a Fellow of the Institute of Actuaries of Australia (FIAA) is granted once all five parts of the Institute of Actuaries of Australia's (IAAust) education program are successfully completed: (1) Part I- Technical Subjects. (2) Part II The Actuarial Control Cycle. (3) Part III-Specialist Subjects. (4) The Practical Experience Requirement. (5) Professionalism Course.
- Part I is made up of nine subjects including statistical modeling, financial mathematics, stochastic modeling, survival models, actuarial mathematics, economics, finance and financial reporting and financial economics. All nine subjects must be completed.
- Accredited undergraduate actuarial programs and non-award courses are offered by Macquarie University, Sydney, the University of Melbourne, the Australian National University (ANU) in Canberra, and the University of New South Wales (UNSW) in Sydney. Alternatively, these subjects can be studied by correspondence through the Institute of Actuaries (London).
- Part II of actuarial education is the actuarial control cycle, which is an innovative means for learning how to apply actuarial skills to business situations across a wide range of traditional and non-traditional practice areas. Developed by the IAAust, this course is taught by four universities in Australia (as mentioned above). A strong and rigorous policy framework for accreditation of the university courses is in place, so that the IAAust maintains quality control of the teaching and assessment of the courses. After completing Parts I and II, members achieve Associateship of the IAAust (AIAA).
- Part III consists of specialist subjects, of which students must complete two, in life insurance, general insurance, superannuation and planned savings, finance, and investment management. These yearlong courses are developed and managed by the IAAust and are offered by distance education.
- Students must complete 45 full-time working weeks of relevant work experience after having completed Part II. Activities that qualify as relevant experience would include work that makes use of economic, financial and statistical principles to solve practical problems; work that deals with the financial implications of uncertain events.
- The Professionalism Course is a highly participative three-day residential course conducted by the IAAust. It aims to facilitate knowledge of the obligations, risks and the legal responsibilities of being a member of the actuarial profession.
- The IAAust has concluded a number of bilateral agreements for mutual recognition of Fellows with the Faculty and Institute of Actuaries (UK), the Society of Actuaries, the Canadian Institute of Actuaries, and the Society of Actuaries of Ireland.

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p73

Actuary Around the World

France

- The education of actuaries in France is university-based. Three universities offer degree programs in actuarial science: Brest, Lyon, and Strasbourg. According to Morgan (*"Love it or hate it"*, The Actuary 2001), "The profession is still underdeveloped compared to the United Kingdom, and France is the only European country where actuaries are not a legally recognized profession." Morgan points out that "as in many European countries, the actuarial profession has been more academic and less practical than that in the United Kingdom, but this is changing as elements of accounting, law, and tax have been added to the course of study. These days, actuaries work in banks and consultancies as well as in insurance companies. In insurance their role is widening to include marketing and communication as well as just technical matters such as ALM [Asset and liability management], and embedded values are starting to become more widespread."

Germany

- Germany has its own version of professional accreditation. In order to qualify for membership in the *Deutsche Aktuarvereinigung* (Actuarial Association of Germany), candidates must pass examinations testing their general and specific competence in actuarial science. The *Deutsche Aktuarvereinigung* has joined forces with the *Deutsche Gesellschaft für Versicherungsmathematik* (German Society for Insurance Mathematics) and the *Institut der Versicherungsmathematischen Sachverständigen* (Institute of Experts in Insurance Mathematics) and founded the *Deutsche Aktuar-Akademie* (DAA) (German Actuarial Academy), which provides basic and advanced training for actuaries. The DAA holds seminars and workshops for the courses in which actuarial candidates are examined.
- The German accreditation system consists of three levels of examinations, each consisting of several courses. Each level is considered to require one year of preparation. Level 1 consists of three examinations and one compulsory course in data processing. The subjects examined include mathematics of the life insurance, mathematics of finance, and other elementary actuarial topics. Level 2 consists of two examinations, chosen from four topic areas: P/C, pensions and stochastic methods, real estate, and health. Level 3 consists of a compulsory seminar and examination in one of the following specialties: life insurance, P/C, pensions, applications of stochastic methods, health, and finance. Several German universities offer degree programs in actuarial science. Among them are the universities of Ulm and Göttingen.

Actuary Around the World

Japan

- The actuarial education is profession-based. The Institute of Actuaries of Japan offers actuarial courses that enable applicants to acquire basic knowledge and to prepare for qualification examinations. Actuarial courses are divided into two categories, basic and advanced courses. The basic courses are intended for students of the Institute, while advanced courses are aimed at persons who have completed the basic subjects.
- To become an Associate member of the Institute, candidates must pass examinations in the following five basic courses:
 1. Probability and statistics.
 2. Basic principles and applications of life insurance mathematics.
 3. Basic principles and applications of non-life insurance mathematics.
 4. Basic principles of pension mathematics and pension finance.
 5. Basic principles of accounting, economics and investment theory. After passing these courses, candidates qualify for Associate membership in the Institute of Actuaries of Japan.

Actuary Around the World

Japan

- To become a Fellow of the Institute, Associates must pass two additional advanced courses: (LI1) Life insurance products and development and (LI2) Life insurance accounting, settlements of accounts, or (NLI1) non-life insurance products and development and (NLI2) non-life insurance accounting, settlements of accounts and asset management, or (PI) Tax qualified pension plan scheme and pension-related tax and accounting and (P2) Public pension system and employees' pension fund scheme. Fellowships are approved by the Board of Directors of the Institute. New fellows are also strongly recommended to take a half-day professionalism course.
- The education system of the Institute is under review with the following objectives: broader areas to be examined and the completion of a professionalism course for fellowship will eventually be required.
- Several Japanese universities offer courses on actuarial mathematics and risk management, but there are no exemptions for qualification examinations. In 2001, the membership of the Institute was made up as follows: 958 Fellows (including six honorary members), 772 Associates, and 1667 Students.
- [As of 31. Jan. 2011, 1,254 Fellows, 963 Associates, 2,255 Students, total 4,472.]

Quoted from Fred E. Szabo "Actuaries' survival Guide" Academic Press (2004) p81

Occupational distribution of Japanese Actuaries

	Life	Trust Bank	Non-Life	Others	Total
Fellow	534	180	171	369	1,254
Associate	404	103	155	301	963
Student	892	153	374	863	2,255
Total	1,830	436	700	1,506	4,472

This is the occupational distribution of the actuaries of Japan. As of 31. Jan. 2011.
40.9% in the Life business, 15.7% in non-life, 9.7% in trust bank.
Historically, Life business needs many actuaries.

<http://www.actuaries.jp/actuary/fields.html>

Role of Japanese Chief Actuary

Article 120 (Appointment of Actuary, etc.)

- (1) The board of directors of an Insurance Company (limited to a Life Insurance Company or a Non-Life Insurance Company meeting the requirements specified by a Cabinet Office Ordinance. The same shall apply in the paragraph (3) and in Article 122) shall appoint an actuary to Participate in the matters prescribed by a Cabinet Office Ordinance as actuarial matters pertaining, among others, to the method of calculating insurance premiums.
- (2) The actuary shall be a person with necessary knowledge and experience with regard to actuarial science who meets the requirements specified by a Cabinet Office Ordinance.
- (3) An Insurance Company shall, when it has appointed an actuary or when its actuary has left his/her office, notify the Prime Minister thereof without delay, pursuant to the provisions of a Cabinet Office Ordinance.

Japanese Insurance Business Law

<http://www.fsa.go.jp/news/19/ginkou/20080627-4/03.pdf>

Role of Japanese Chief Actuary

Article 121 (Actuary's Duties)

- (1) The actuary shall, for each accounting period, check the following matters pursuant to the provisions of a Cabinet Office Ordinance and submit to the board of directors a written opinion describing his/her findings:
 - (i) Whether the policy reserve pertaining to the insurance contracts specified by a Cabinet Office Ordinance has been funded according to sound actuarial practice;
 - (ii) Whether policy dividends or dividends of surplus to members have been distributed in a fair and equitable manner; and
 - (iii) Any other matter specified by a Cabinet Office Ordinance.

Role of Japanese Chief Actuary

Article 121 (Actuary's Duties) (continue)

- (2) The actuary shall, without delay following the submission to the board of directors of the written opinion set forth in the preceding paragraph, submit a copy of the written opinion to the Prime Minister.
- (3) The Prime Minister may request the actuary to provide explanations about the copy of his/her written opinion set forth in the preceding paragraph and to present an opinion on any other matter in the scope of his/her duties.
- (4) In addition to what is provided for in the preceding three paragraphs, any necessary matter regarding the written opinion set forth in paragraph (1) shall be specified by a Cabinet Office Ordinance.

Role of Japanese Chief Actuary

Article 122 (Dismissal of Actuary)

The Prime Minister may order an Insurance Company to dismiss its actuary, when the latter has violated any provision of this Act or any measures of the Prime Minister under this Act.

Japanese Insurance Business Law

<http://www.fsa.go.jp/news/19/ginkou/20080627-4/03.pdf>

Actuary Around World

Korea

- To be the assistant actuary, the student has to pass the 4 exam. After that, passing the three professional exams, he'll be a candidate to be fellow. For being the fellow, it is required to finish two years' practical experience in the financial institute, or half years' experience and the submitting the qualified article.
- The detail of the subjects are presented in the following sheets. One of the distinctive subjects is the Language. The applicant has to choice English or Japanese.
- From 2014, the Korean examination system will be changed. The subjects will have much more risk management items.
- Following table shows the number of fellows and assistant actuaries in Korea. (as of June 2012)

Total	1,327
Fellow	820
Assistant Actuary	507

Actuarial Exam in Korea

First stage	9:00 ~ 10:20 (80 minute)	10:50 ~ 12:40 (110 minute)	
Subject 1	Insurance Law (contract and business law)	Language (English or Japanese)	
Subject 2	Economics or Business science	Insurance Math. (Basic Life Ins. Math., calculus and probability)	
Second stage	9:00 ~ 10:40	11:00 ~ 12:40	13:40 ~ 15:40
	Insurance Theory	Accounting	Actuarial Math

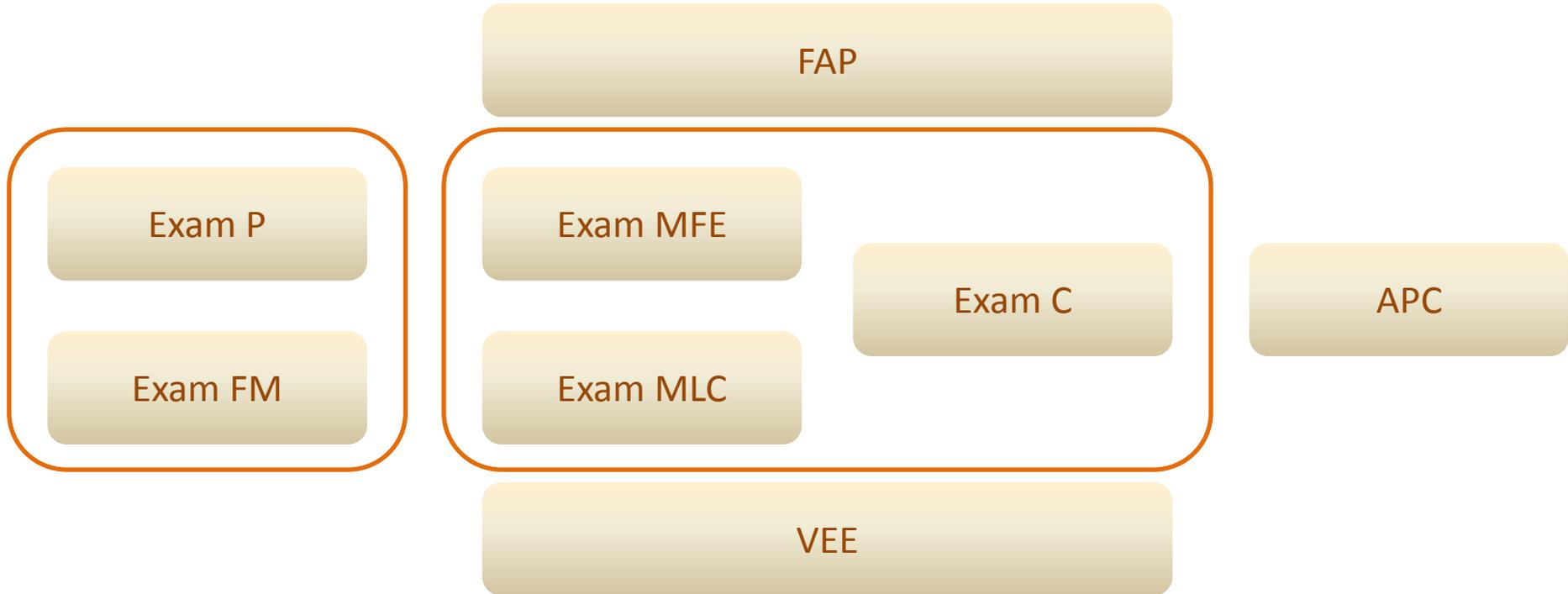
1. The pass mark of the each subject of the first stage is 40, however the average of the paired subjects shall be over 60.
2. For the second stage, the pass mark is also 40 for each subject, however, the examination committee decides the number of the successful applicants. This number varies every year. In the past, the number was 10 to 20, but recently this number is over 100.
3. After the second stage, two years' business experience (OJT), or half years' business experience and submitting a study paper, the applicant will be a fellow of the Korean actuary.
4. There is two years limited period to success the second stage, the candidate has to pass all subjects of second stage within two years.

Actuarial Exam in Korea

	Up to 2013	From 2014
First stage	1 Economics or Business science 2 Insurance Math. 3 Language 4 Insurance related Laws	1 Economics 2 Insurance Math. 3 English 4 Law (Insurance contract, Insurance Business and workers' retirement benefit law) 5 Accounting
Second stage	1 Insurance theory 2 Accounting 3 Actuarial Math	1 Actuarial risk management 2 Actuarial Math. 3 Pension Math. 4 Actuarial modeling 5 Corporate finance and financial technology

1. Expand the Exam to the risk management and finance
2. The sufficient mark of TOEIC or TOEFL is substitute for Exam of English
3. There is five years restriction period to pass the second stage, the candidate has to complete all subjects of second stage within five years.
4. To be a fellow, it is requested business experience.

ASA Pathway to Membership



Exam P : Probability

Exam FM : Financial Mathematics

Exam MFE : Actuarial Models – Financial Economics

Exam MLC : Actuarial Models – Life Contingencies

Exam C : Construction and Evaluation of Actuarial Model

FAP : Fundamentals of Actuarial Practice

VEE : Validation by Educational Experience

APC : Associateship Professionalism Course

FSA Pathway to Membership

When you are ready to take the Fellowship-level requirements, you must select a specialty track and complete all requirements in the track (Mixing requirements from different tracks is not permitted.). The SOA offers six specialty tracks.

Corporate
Finance and
ERM

Individual
Life and
Annuities

Group and
Health

Quantitative
Finance and
Investment

Retirement
Benefits

General
Insurance

FSA Pathway to Membership

Ex. Individual Life and Annuities

Regulation and Taxation Module

Enterprise Risk Management (ERM)
Module

Financial Economic Modules

Life Pricing Exam

Life Finance and Valuation Exam

Life Risk Management Exam or ERM Exam

DMAC

The Decision Making and
Communication

FAC

Fellowship Admission Course

CERA

Changing the conversation around risk

Risk has changed. So, too, has the kind of professional best qualified to manage it.

The most comprehensive and rigorous demonstration of enterprise risk expertise available, the Chartered Enterprise Risk Analyst® (CERA) is a professional who blends the quantitative and the qualitative—who thinks critically, creatively and collectively about risk, and acts with integrity.

Building upon a rich history and standard of excellence, the CERA credential from the Society of Actuaries CERA reflects the actuary's evolution—from helping the world better understand risk to playing a leading role in an organization's risk management. Today, CERAs are changing the conversation around risk—speaking not merely to what we can lose, but to what we can gain.

No other type of risk professional is better equipped to take a 360-degree approach to risk, to drive better decision-making and optimize risk enterprise wide.

- See more at: <http://www.ceranalyst.org/index.asp#sthash.tFqATDEd.dpuf>
- <http://www.ceranalyst.org/index.asp>

CERA Pathway to Membership

FAP

Exam P

Exam MFE

ERM Module

ERM Exam

Exam FM

Exam C

APC

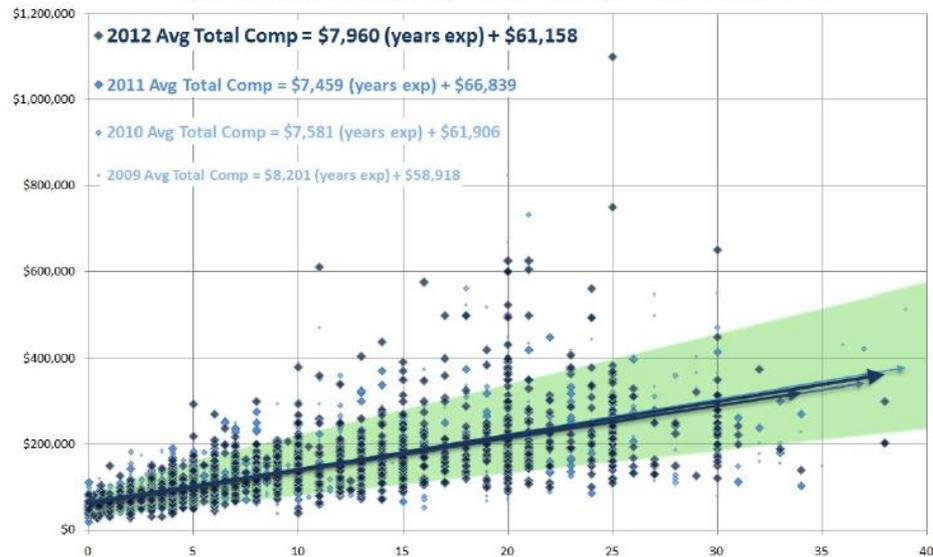
VEE

About the salary survey



Actuarial Salaries vs. Years Experience

Total Compensation (\$US) = Base + Bonus [All Disciplines]



MOST PLACEMENTS = MOST DATA = MOST TRUSTED

dwsimpson.com/salary

About the salary survey



Survey in USDS (000) 10th - 90th percentile [Base Salary + Paid Bonus] - Updated October 2012

<i>Life & Health October 2012</i>	0-0.5 yrs	0.5 - 2.5 yrs	2.5 - 4.5 yrs	4.5 - 6.5 yrs	6.5 - 9.5 yrs	9.5 - 14.5 yrs	14.5 - 19.5 yrs	19.5+ yrs
1 exam	50-58	54-69	55-72					
2 exams	54-64	55-75	60-80	66-86				
3 exams	56-69	58-81	64-87	70-93				
4 exams	60-74	62-89	65-93	72-101	75-110			
4 exams + FAP 1		66-92	68-101	76-111	82-122			
ASA		72-101	77-114	84-128	95-144	96-160	110-234	121-244+
FSA			97-146	104-158	118-198	131-245	148-348	163-403+

<http://www.actuaryjobs.com/>

Summary

1. Mathematics and Statistics is important
2. The daily life of an actuary is so called “bread-and-butter.”
3. PC skill, especially the Microsoft Excel, Excel VBA, Word, Access and PPT are essential.
4. Programing languages are also important.
5. Patience and hard work are the key to success.