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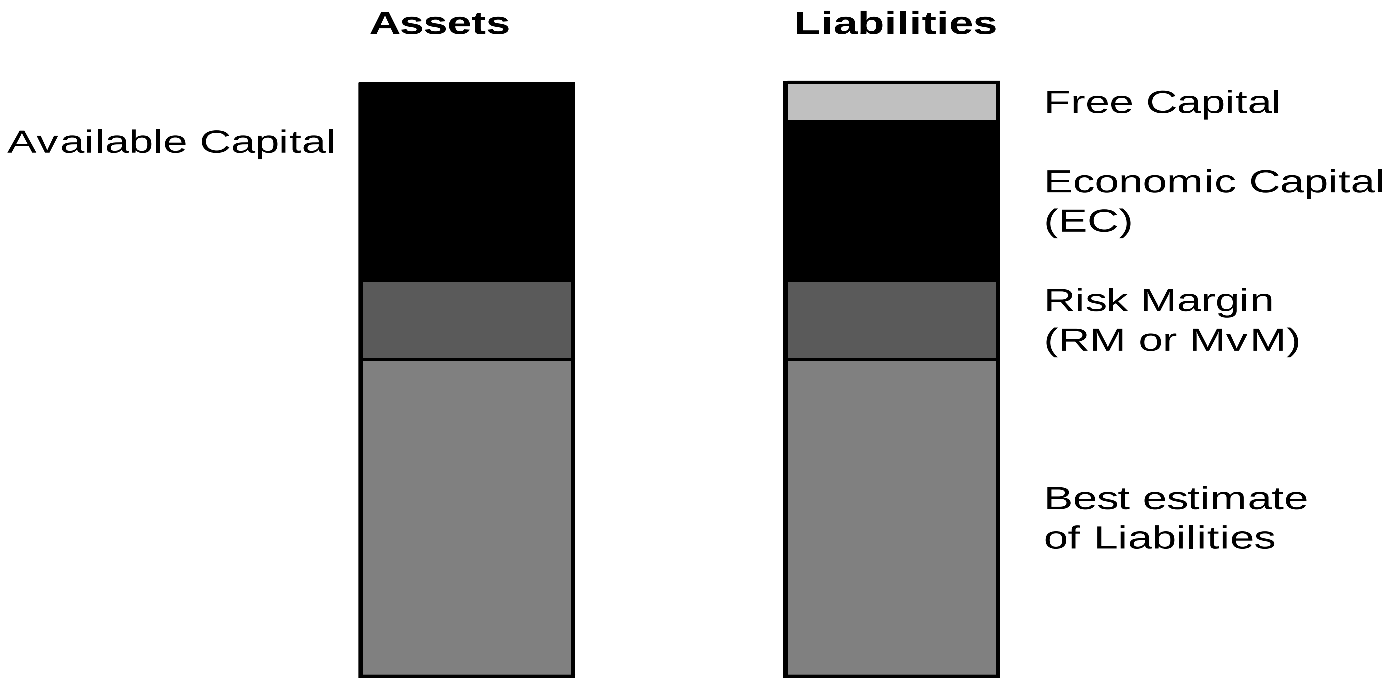
SOLVENCY RISK CAPITAL MODELS FOR THE INSURANCE BUSINESS

March, 2010

Agenda

- Swiss Solvency Test (SST)
- The cost-of-capital (CoC) approach
- The prospective liability approach
- Solvency II and SST applications
  - Non-Life Underwriting Risk
  - Life Underwriting Risk
  - Market Risk
- References / Discussion / Q&A

SST (1) economic balance sheet / fair value of liabilities



Risk Bearing Capital = Available Capital + Risk Margin
= Market value of Assets - Best estimate of Liabilities
Market value of Liabilities = Best estimate + Risk Margin
Available Capital = Market value of Assets - Market value of Liabilities
Target Capital = Economic Capital + Risk Margin

- **Doff(2007)**, Chapter 6, pp. 103-106
- **Hürlimann(2009a)**, pp.447-450

- **Fair value =**
  Best estimate
  + Risk margin (MvM)
- **Two methods** for Risk Margin (MvM) evaluation:
- **CoC approach**
- **Prospective liability approach / quantile approach**
- **SST summary**
  Kaufmann, Wyler(2005)

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SST (2) Target capital TVaR(99%) for Life & Non-Life

SOLVENCY CAPITAL REQUIREMENT RESULTS			Values in Mio. ....
Aggregation without Scenarios			
	Standard Deviation	Value-at-Risk	Expected Shortfall
Insurance Risk	x	x	x
Life	x	x	x
Non-Life	x	x	x
Market Risk	x	x	x
Insurance & Market Risk	x	x	x
Diversification Benefit		x	x
Aggregation with Scenarios			
Insurance & Market Risk		x	x
Aggregation with other Risks			
Credit Risk (Basle II)		x	x
Operational Risk		x	x
Total Risk		x	x
Total Diversification benefit		x	x
Risk Margin (Market value Margin)			x
Target Capital			x
Risk Bearing Capital			x
Ratio of Target Capital to Risk Bearing Capital			x

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SST (3) Public Disclosure TVaR(99%) (SwissRe 2006-08)

ONE-YEAR 99% TVaR (EXPECTED SHORTFALL) billion CHF

Group Level Aggregation	2008	2007	2006
Property & Casualty	7.9	8.6	10.0
Life & Health	5.2	5.9	6.5
Financial Market	8.0	7.7	7.7
Credit	3.0	2.8	2.1
Funding & Liquidity			0.3
Total Diversification Effect	9.1	8.5	8.9
Swiss Re Group	15.0	16.5	17.7

CoC approach (1) stochastic insurance model

Multi-period discrete time stochastic model of insurance

$A(t)$	:	*assets* at time t
$L(t)$	:	*actuarial liabilities* at time t
$C(t) = A(t) - L(t)$	:	*risk-bearing capital* (RBC) at time t (actuarial surplus)
$P(t-1)$	:	*loaded premium* paid at time $t-1$ (fully invested)
$X(t)$	:	*insurance costs* paid at time t (insurance benefits, expenses and bonus payments for period $(t-1,t]$)
$\pi(t-1)$	:	pure premium at time $t-1$ (cover insurance costs)
$\Theta(t-1) = P(t-1) - \pi(t-1)$	:	*premium loading* at time $t-1$
$R(t)$	:	accumulated *rate of return* on investment for period $(t-1,t]$
$v=1/r$	:	*risk-free discount rate* (r is risk-free accumulated rate)

Equation of dynamic evolution of the random assets over the time horizon $[0,T]$:

$$\mathbf{A(t) = (A(t-1) + P(t-1))\cdot R(t) - X(t) , \quad t=1,\dots,T}$$

CoC approach (2) Economic and Target Capital

- **Discounted shortfall RBC and its time period change**

$$SC(t) = v^t \cdot (L(t) - A(t)), \quad \Delta SC(t) = SC(t) - SC(t-1), \quad t=1,\ldots,T$$

- **Economic capital (EC)**

$$EC = R[\ \Delta SC(1)\ ], \quad R[\ \cdot\ ] \text{ risk measure (e.g. VaR, TVaR)}$$

- **Risk Margin (RM) / Market value Margin (MvM)**

$$RM = i_{CoC} \cdot (R[\ \Delta SC(2)\ ] + R[\ \Delta SC(3)\ ] + \ldots + R[\ \Delta SC(T)\ ])$$

i_{CoC} : *cost-of-capital rate* (spread between borrowing and reinvesting)

- **Target Capital (TC)**

$$TC = EC + RM$$

CoC approach (3) VaR & TVaR (SST) target capital

VaR target capital

$$TC_{\alpha,VaR} = A(0) - L(0) + VaR_\alpha[\ v\cdot(L(1)-A(1))\ ]$$

$$+\ i_{CoC} \cdot \sum_{(t=2,\ldots T)} VaR_\alpha[\ v\text{^}t\cdot(L(t)-r\cdot L(t\text{-}1)) - v\text{^}t\cdot(A(t)-r\cdot A(t\text{-}1))\ ]$$

TVaR target capital = SST target capital (FOPI(2004/06))

$$TC_{\alpha,TVaR} = A(0) - L(0) + TVaR_\alpha[\ v\cdot(L(1)-A(1))\ ]$$

$$+\ i_{CoC} \cdot \sum_{(t=2,\ldots T)} TVaR_\alpha[\ v\text{^}t\cdot(L(t)-r\cdot L(t\text{-}1)) - v\text{^}t\cdot(A(t)-r\cdot A(t\text{-}1))\ ]$$

$TVaR_\alpha[\ X\ ] = E\ [\ X \mid X > VaR_\alpha[X]\ ]$ (*tail value-at-risk* for continuous distribution functions)

Prospective liability approach (1) risk-free asset values

Prospective insurance liability and premium loading

$CF(t) = v \cdot X(t+1) - \pi(t)$: *insurance cash-flow* at time t period (t,t+1], t=0,…,T-1

$L(t) = \sum_{(j=0,\dots,T-t-1)} v^j \cdot CF(t+j)$: *prospective insurance liability* at time t=0,…,T-1

$\Theta(t) = \sum_{(j=0,\dots,T-t-1)} v^j \cdot \Theta(t+j)$: *prospective premium loading* at time t=0,…,T-1

Risk-free asset valuation

The equation of dynamic evolution of the assets valued at the risk-free rate yields

$A(t+\tau) = (A(t+\tau-1) + P(t+\tau-1))\cdot r - X(t+\tau) = (A(t+\tau-1) - CF(t+\tau-1) + \Theta(t+\tau-1))\cdot r, \quad \tau=1,\dots,T-t,$

=> relationship **$A(t+\tau) + \Theta(t+\tau) - L(t+\tau) = r^\tau \cdot (A(t) + \Theta(t) - L(t)), \quad \tau=1,\dots,T-t-1$**

Prospective liability approach (2) VaR solvency criterion

Liability VaR solvency criterion

Assets and premium loadings should exceed liabilities with high probability at each future time until ultimate liabilities vanish (run-off situation):

$P(A(t+\tau) + \Theta(t+\tau) \geq L(t+\tau), \tau=1,\ldots,T-t-1) \geq 1-\varepsilon$ (QIS4(2008): probability of loss $\varepsilon=0.5\%$)

<=> (from preceding relationship) **$P(A(t) + \Theta(t) \geq L(t)) \geq 1-\varepsilon, \quad t=0,\ldots,T-1$**

$A^*(t) = VaR_\alpha[L(t)] - \Theta(t)$, $\alpha=1-\varepsilon$, minimum solution of probabilistic inequality

Let $V(t) = E[L(t)]$ be the *actuarial reserves* (best estimate of insurance liabilities)

$TC^*_{\alpha,VaR}(t) = VaR_\alpha[L(t)] - V(t)$: *insurance risk VaR target capital*
(available capital to meet the insurance risk)

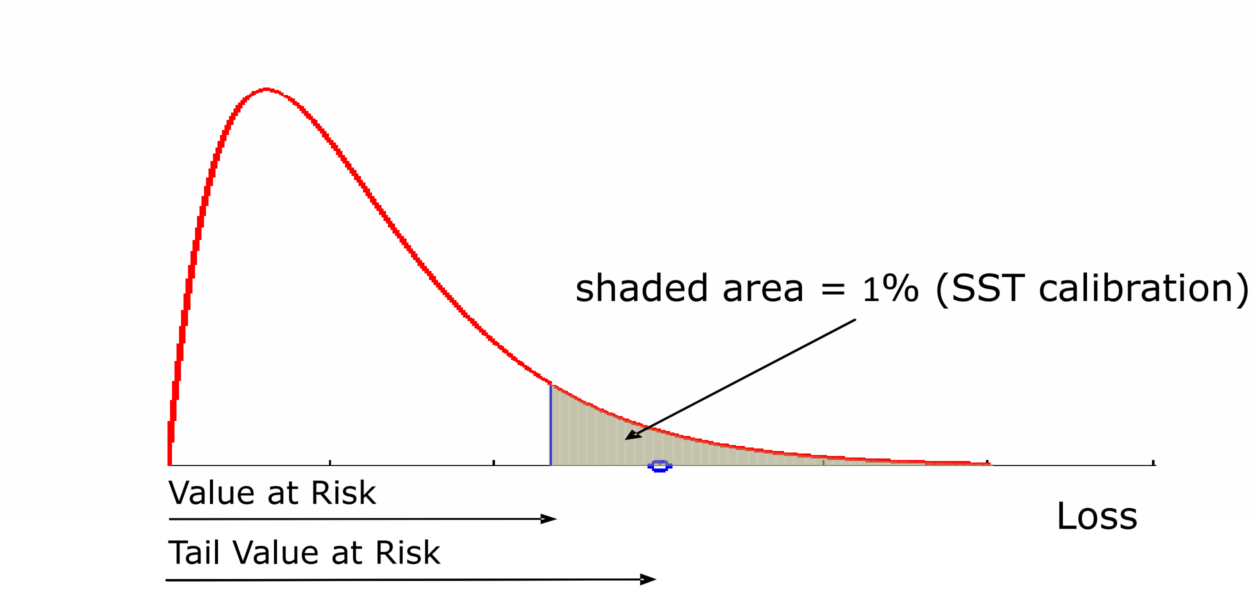
Prospective liability approach (3) TVaR solvency criterion

Liability TVaR solvency criterion

The tail value-at-risk measure is *coherent* and has been extensively studied and applied to assess the *solvency risk for insurance liabilities* (e.g. **Hürlimann(2001/02/03)**):

$TC^*_{\alpha,TVaR}(t) = TVaR_\alpha[L(t)] - V(t)$: *insurance risk TVaR target capital*

Graphical representation of VaR and TVaR risk measures



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Solvency II and SST applications

Non-Life Underwriting Risk

- liability VaR criterion vs. standard QIS4 SCR formula / Solvency II vs. SST
- **Gisler(2009), Hürlimann(2010a)**

Life Underwriting Risk

- application of the liability VaR & TVaR criteria / Solvency II vs. Partial Internal Model
- **Hürlimann(2010b)**

Market Risk

- application of the cost-of-capital VaR & SST target capital formulas
- **Hürlimann(2009a)** + important improvements (this presentation)

Market Risk (1) random assets & market risk model

Stochastic representation of the random assets

The equation of dynamic evolution of the random assets yields the representation

$$\mathbf{A(t) = (A(0)+P(0))\cdot exp\{Z(1,t)\} + \sum_{(k=1,\dots,t-1)} (P(k) - X(k))\cdot exp\{Z(k+1,t)\} - X(t)}$$

$$Z(k,t) = \sum_{(j=k,\dots,t)} \ln\{R(j)\}, \quad t=1,\dots,T, \quad k=1,\dots,t$$

Market risk model assumptions

(M1) *Full diversification* of the insurance *liability risk*: $X(t) = r\cdot\pi(t-1)$, $t=1,\dots,T$

(M2) *Loaded* and *pure premium* processes $P(t)$ and $\pi(t)$ are *deterministic*

(M3) *Log-returns* $\ln\{R(t)\} \sim N(\mu,\sigma^2)$ are *independent* and *identically normally distributed* (Black-Scholes-Merton return model)

Market Risk (2) mean and variance of random assets

Mean and variance of the prospective random assets

- market risk model (M1)-(M3)
- $r_M = \exp\{\mu+½\sigma^2\}$: *expected accumulated rate of return* over $(t-1,t]$, $t=1,\dots,T$
- $PV(a,r) = \sum_{(k=0,\dots,T-1)} a(k)/r\hat{}k$: *present value* of vector $a=(a(0),\dots,a(T-1))$ w.r.t. r
- $PV(a,r_a;b,r_b) = \sum_{(0\le s<t\le T-1)} a(s)b(t)/(r_a\hat{}s\cdot r_b\hat{}t)$: *bivariate present value* of a, b w.r.t. r_a, r_b
- $\Theta=(\Theta(0),\dots,\Theta(T-1))$, $\mu_P=(0,P(1),\dots,P(T-1))$, $\mu_X=r\cdot(0,\pi(0),\dots,\pi(T-2))$.

Under *fair value assumption* $r_M=r$, one has

$E[v\hat{}T\cdot A(T)] = A(0)+PV(\Theta,r)$ & **$Var[v\hat{}T\cdot A(T)]=(A(0)+P(0))^2\cdot(e\hat{}T\sigma^2-1)+S(1)+S(2)+S(3)$**

$S(1) = 2\cdot(A(0)+P(0))\cdot(\ e\hat{}T\sigma^2\cdot PV(\mu_P-\mu_X,r\cdot e\hat{}\sigma^2) - PV(\mu_P-\mu_X,r)\ )$

$S(2) = e\hat{}T\sigma^2\cdot PV((\mu_P-\mu_X)^2,r^2\cdot e\hat{}\sigma^2) - PV((\mu_P-\mu_X)^2,r^2)$

$S(3) = 2\cdot(\ e\hat{}T\sigma^2\cdot PV(\mu_P-\mu_X,r;\mu_P-\mu_X,r\cdot e\hat{}\sigma^2) - PV(\mu_P-\mu_X,r;\mu_P-\mu_X,r)\ )$

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Market Risk (3) Solvency II and SST economic capital

Economic capital

$EC = R[\Delta SC(1)] = C(0) - E[v \cdot C(1)] + R[LA(1)]$ (R[·] VaR or TVaR measure)

$\mathbf{LA(1) = E[v \cdot A(1)] - v \cdot A(1)}$: 1st year *asset loss*

1st year Solvency II SCR (VaR measure)

$\mathbf{VaR_\alpha[LA(1)] = \rho_{\alpha,VaR}(\sigma A(1)) \cdot (A(0) + \Theta(0))}$ with $\mathbf{\sigma A(1)}$ *coefficient of variation* of $\mathbf{A(1)}$

$\mathbf{\rho_{\alpha,VaR}(x) = 1 - \exp\{\Phi^{-1}(1-\alpha) \cdot \ln(1+x^2)^{1/2}\}/(1+x^2)^{1/2}}$

(up to sign change identical to non-life SCR VaR: **Hürlimann(2010a), (3.4)**)

SST market risk EC (TVaR measure)

$\mathbf{TVaR_\alpha[LA(1)] = \rho_{\alpha,TVaR}(\sigma A(1)) \cdot (A(0) + \Theta(0))}$

$\mathbf{\rho_{\alpha,TVaR}(x) = 1 - \Phi\{\Phi^{-1}(1-\alpha) - \ln(1+x^2)^{1/2}\}/(1-\alpha)}$

(up to sign change identical to non-life SCR TVaR: **Hürlimann(2009b), (13.9)**)

Market Risk (4) Solvency II versus SST economic capital

Comparison of solvency capital ratios $\rho_{\alpha,\bullet}(\sigma A(1))/\sigma A(1)$

	VaR Method			CVaR Method		
confidence level	0.99	**0.995**	0.99612	**0.98720**	0.99	0.995
percentile	-2.326	**-2.576**	-2.662	**-2.232**	-2.326	-2.576
return volatility σ						
5.0%	2.216	**2.436**	2.512	**2.438**	2.512	2.709
5.5%	2.205	**2.422**	2.497	**2.424**	2.497	2.691
6.0%	2.194	**2.409**	2.482	**2.410**	2.482	2.674
6.5%	2.183	**2.395**	2.468	**2.396**	2.467	2.656
7.0%	2.172	**2.381**	2.453	**2.382**	2.453	2.639
7.5%	2.162	**2.368**	2.438	**2.368**	2.438	2.621
8.0%	2.151	**2.354**	2.424	**2.355**	2.423	2.604
8.5%	2.140	**2.341**	2.410	**2.341**	2.409	2.587
9.0%	2.129	**2.328**	2.395	**2.328**	2.394	2.570
9.5%	2.118	**2.314**	2.381	**2.314**	2.380	2.553
10.0%	2.108	**2.301**	2.367	**2.301**	2.365	2.536

Market Risk (5) Solvency II and SST risk margin

Risk margin (RM)

$RM = i_{CoC} \cdot (R[\ \Delta SC(2)\ ] + R[\ \Delta SC(3)\ ] + \ldots + R[\ \Delta SC(T)\ ])$ (R[·] VaR or TVaR measure)

$R[\Delta SC(t)] = E[v^t \cdot (r \cdot C(t-1) - C(t))] + R[LA(t)], \quad t=2,\ldots,T$

$LA(t)=E[v^t \cdot (A(t)-r \cdot A(t-1))] - v^t \cdot (A(t)-r \cdot A(t-1))$: t^{th} year *asset loss*

Solvency II RM (VaR measure)

$VaR_\alpha[LA(t)] = \rho_{\alpha,VaR}(\sigma A(t)) \cdot E[A(t)-r \cdot A(t-1)]$

$\sigma A(t)$ *coefficient of variation* of **$A(t)-r \cdot A(t-1)$**

SST RM (TVaR measure)

$TVaR_\alpha[LA(t)] = \rho_{\alpha,TVaR}(\sigma A(t)) \cdot E[A(t)-r \cdot A(t-1)]$

Market Risk (6) coherent SST risk measure/target capital

SST target capital via SST risk measure

$TC_{\alpha,SST} = C(0) + R_{\alpha,SST}[SC]$ with

$R_{\alpha,SST}[SC] = TVaR_{\alpha}[SC(1)] + i_{CoC} \cdot \sum_{(t=2,\ldots T)} TVaR_{\alpha}[\Delta SC(t)]$ *SST risk measure*

not a coherent multi-period risk measure (**Filipovic and Vogelpoth(2008)**):

$X \geq Y \Rightarrow R_{\alpha,SST}[X] \geq R_{\alpha,SST}[Y]$ does not always hold!

Coherent SST target capital via coherent SST risk measure

$TC_{\alpha,SST,c} = C(0) + R_{\alpha,SST,c}[SC]$ with

$R_{\alpha,SST,c}[SC] = (1-i_{CoC}) \cdot TVaR_{\alpha}[SC(1)] + i_{CoC} \cdot TVaR_{\alpha}[SC(T)]$ *coherent SST measure*

$\mathbf{TC_{\alpha,SST,c} = C(0) - E[v \cdot C(1)] + i_{CoC} \cdot E[v \cdot C(1) - v^t \cdot C(T)] + R^*_{\alpha,SST,c}[A(1),A(T)]}$ with

$\mathbf{R^*_{\alpha,SST,c}[A(1),A(T)]}$

$\mathbf{= (1-i_{CoC}) \cdot \rho_{\alpha,TVaR}(\sigma A(1)) \cdot (A(0)+\Theta(0)) + i_{CoC} \cdot \rho_{\alpha,TVaR}(\sigma A(T)) \cdot (A(0)+ PV(\Theta,r))}$

and **$\sigma A(1)$, $\sigma A(T)$** the *coefficients of variation* of **$A(1)$, $A(T)$**

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Market Risk (7) coherent SST target capital life insurance

Portfolio of identical life insurance policies

$\pi(0)=\pi$: pure level premium
$\theta(t)=\theta$: constant premium loading factor, $t=0,\dots,T-1$
$\pi(t-1)={}_{t-1}p_x \cdot \pi$: pure premium at time $t-1$, $t=1,\dots,T$, with
${}_{t-1}p_x$: survival probability of a life aged x at initial time $t=0$

Analytical evaluation of coherent SST target capital

Our evaluation of *coherent SST market risk ratios* **$R^*_{\alpha,SST,c}[SC]/A(0)$** uses the formulas

$\sigma A(1)^2 = (1+ \pi/(A(0)+\theta\cdot\pi))^2\cdot(e^{\wedge}\sigma^2 - 1)$

$\sigma A(T)^2 = ((A(0)+(1+\theta)\cdot\pi)^2\cdot (e^{\wedge}T\sigma^2 - 1) + S(1) + S(2) + S(3))/(A(0)+ PV(\Theta,r))^2$

$\sigma A^*(T)^2 = ((A(0)+(1+\theta)\cdot\pi)/(A(0)+ PV(\Theta,r))^2 \cdot (e^{\wedge}T\sigma^2 - 1)$ *simple approximation*

and the parameter values

$\alpha=99\%$, $\sigma=7.5\%$, $\pi=100$, $\theta=10\%$, $A(0)=1000$, $r=1.025$, $i_{CoC}=6\%$

Market Risk (8) coherent SST market risk ratios / σ=7.5%

α	0.99	coherent SST risk measure ratio by varying time horizon														
T	${}_{T-1}p_x$	$a=\mu_P-\mu_x$	PV(Θ,v)	PV(a,v)	$PV(a,v_\sigma)$	S1	S2	S3	σA_1	σA_T	σA^*_T	$\rho_\alpha(\sigma A_1)$	$\rho_\alpha(\sigma A_T)$	$\rho_\alpha(\sigma A^*_T)$	R_c/A_0	R^*_c/A_0
1	1.00000	7.402	10.0	0.0	0.0	0	0.0	0.0	8.3%	8.3%	8.3%	20.0%	20.0%	20.0%	**20.0%**	**20.0%**
2	0.99911	7.387	19.7	7.2	7.2	90	0.3	0.0	8.3%	11.6%	11.6%	20.0%	27.0%	26.9%	**20.4%**	**20.4%**
3	0.99815	7.371	29.2	14.3	14.1	269	0.9	0.6	8.3%	14.2%	14.1%	20.0%	31.9%	31.8%	**20.7%**	**20.7%**
4	0.99710	7.353	38.5	21.1	20.9	535	1.7	1.7	8.3%	16.3%	16.1%	20.0%	35.8%	35.5%	**21.0%**	**21.0%**
5	0.99596	7.334	47.5	27.8	27.4	886	2.8	3.3	8.3%	18.1%	17.9%	20.0%	39.0%	38.6%	**21.2%**	**21.2%**
6	0.99473	7.313	56.3	34.2	33.7	1320	4.1	5.5	8.3%	19.8%	19.5%	20.0%	41.7%	41.2%	**21.4%**	**21.4%**
7	0.99338	7.290	64.9	40.5	39.8	1835	5.7	8.1	8.3%	21.3%	20.9%	20.0%	44.1%	43.5%	**21.6%**	**21.5%**
8	0.99193	7.266	73.2	46.7	45.7	2430	7.5	11.1	8.3%	22.7%	22.2%	20.0%	46.2%	45.5%	**21.7%**	**21.7%**
9	0.99035	7.239	81.4	52.6	51.4	3103	9.5	14.6	8.3%	24.0%	23.4%	20.0%	48.1%	47.2%	**21.9%**	**21.8%**
10	0.98863	7.210	89.3	58.4	56.9	3852	11.7	18.5	8.3%	25.2%	24.5%	20.0%	49.8%	48.8%	**22.0%**	**22.0%**
11	0.98677	7.179	97.0	64.1	62.2	4676	14.1	22.8	8.3%	26.3%	25.6%	20.0%	51.3%	50.3%	**22.1%**	**22.1%**
12	0.98475	7.145	104.5	69.5	67.4	5573	16.7	27.5	8.3%	27.4%	26.6%	20.0%	52.8%	51.6%	**22.3%**	**22.2%**
13	0.98256	7.108	111.8	74.9	72.3	6542	19.5	32.5	8.3%	28.5%	27.5%	20.0%	54.1%	52.9%	**22.4%**	**22.3%**
14	0.98019	7.068	118.9	80.0	77.1	7581	22.4	37.8	8.3%	29.5%	28.4%	20.0%	55.4%	54.0%	**22.5%**	**22.4%**
15	0.97761	7.025	125.8	85.0	81.7	8688	25.4	43.5	8.3%	30.4%	29.3%	20.0%	56.5%	55.1%	**22.6%**	**22.5%**
16	0.97482	6.978	132.6	89.9	86.2	9863	28.7	49.5	8.3%	31.3%	30.1%	20.0%	57.6%	56.1%	**22.7%**	**22.6%**
17	0.97179	6.928	139.1	94.6	90.5	11103	32.0	55.8	8.3%	32.2%	30.9%	20.0%	58.6%	57.1%	**22.8%**	**22.7%**
18	0.96851	6.873	145.5	99.1	94.6	12406	35.5	62.3	8.3%	33.1%	31.6%	20.0%	59.6%	58.0%	**22.9%**	**22.8%**
19	0.96496	6.814	151.7	103.5	98.6	13773	39.2	69.1	8.3%	33.9%	32.4%	20.0%	60.5%	58.8%	**23.0%**	**22.8%**
20	0.96111	6.750	157.7	107.8	102.4	15200	42.9	76.2	8.3%	34.8%	33.1%	20.0%	61.4%	59.6%	**23.0%**	**22.9%**

Market Risk (9) coherent SST market risk ratios / σ=5%

α	0.99	coherent SST risk measure ratio by varying time horizon														
T	$_{T-1}p_x$	$a=\mu_P-\mu_x$	PV(Θ,v)	PV(a,v)	PV(a,v_σ)	S1	S2	S3	σA_1	σA_T	σA^*_T	$\rho_\alpha(\sigma A_1)$	$\rho_\alpha(\sigma A_T)$	$\rho_\alpha(\sigma A^*_T)$	R_c/A_0	R^*_c/A_0
1	1.00000	7.402	10.0	0.0	0.0	0	0.0	0.0	5.5%	5.5%	5.5%	13.7%	13.7%	13.7%	**13.7%**	**13.7%**
2	0.99911	7.387	19.7	7.2	7.2	40	0.1	0.0	5.5%	7.7%	7.7%	13.7%	18.8%	18.8%	**14.1%**	**14.1%**
3	0.99815	7.371	29.2	14.3	14.2	119	0.4	0.3	5.5%	9.4%	9.4%	13.7%	22.5%	22.3%	**14.3%**	**14.3%**
4	0.99710	7.353	38.5	21.1	21.0	237	0.8	0.7	5.5%	10.8%	10.7%	13.7%	25.4%	25.2%	**14.5%**	**14.5%**
5	0.99596	7.334	47.5	27.8	27.6	392	1.2	1.5	5.5%	12.0%	11.9%	13.7%	27.8%	27.5%	**14.7%**	**14.6%**
6	0.99473	7.313	56.3	34.2	34.0	583	1.8	2.4	5.5%	13.1%	12.9%	13.7%	29.9%	29.6%	**14.8%**	**14.8%**
7	0.99338	7.290	64.9	40.5	40.2	810	2.5	3.6	5.5%	14.1%	13.8%	13.7%	31.8%	31.3%	**14.9%**	**14.9%**
8	0.99193	7.266	73.2	46.7	46.2	1071	3.3	4.9	5.5%	15.0%	14.7%	13.7%	33.5%	32.9%	**15.1%**	**15.0%**
9	0.99035	7.239	81.4	52.6	52.1	1366	4.2	6.4	5.5%	15.9%	15.5%	13.7%	35.0%	34.4%	**15.2%**	**15.1%**
10	0.98863	7.210	89.3	58.4	57.7	1695	5.2	8.2	5.5%	16.7%	16.2%	13.7%	36.4%	35.7%	**15.3%**	**15.2%**
11	0.98677	7.179	97.0	64.1	63.2	2055	6.2	10.0	5.5%	17.4%	16.9%	13.7%	37.7%	36.9%	**15.4%**	**15.3%**
12	0.98475	7.145	104.5	69.5	68.6	2447	7.3	12.1	5.5%	18.1%	17.5%	13.7%	38.9%	38.0%	**15.5%**	**15.4%**
13	0.98256	7.108	111.8	74.9	73.7	2869	8.5	14.3	5.5%	18.8%	18.1%	13.7%	40.1%	39.0%	**15.6%**	**15.5%**
14	0.98019	7.068	118.9	80.0	78.7	3320	9.8	16.6	5.5%	19.4%	18.7%	13.7%	41.1%	40.0%	**15.7%**	**15.6%**
15	0.97761	7.025	125.8	85.0	83.5	3801	11.1	19.1	5.5%	20.0%	19.3%	13.7%	42.1%	40.9%	**15.8%**	**15.7%**
16	0.97482	6.978	132.6	89.9	88.2	4310	12.5	21.6	5.5%	20.6%	19.8%	13.7%	43.1%	41.7%	**15.8%**	**15.8%**
17	0.97179	6.928	139.1	94.6	92.7	4846	14.0	24.4	5.5%	21.2%	20.3%	13.7%	44.0%	42.5%	**15.9%**	**15.8%**
18	0.96851	6.873	145.5	99.1	97.1	5409	15.5	27.2	5.5%	21.8%	20.8%	13.7%	44.8%	43.3%	**16.0%**	**15.9%**
19	0.96496	6.814	151.7	103.5	101.3	5998	17.0	30.1	5.5%	22.3%	21.3%	13.7%	45.6%	44.0%	**16.1%**	**16.0%**
20	0.96111	6.750	157.7	107.8	105.4	6612	18.7	33.2	5.5%	22.8%	21.7%	13.7%	46.4%	44.7%	**16.1%**	**16.0%**

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Discussion

Q&A

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