|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Senior Secured Bonds** | **Senior Unsecured Bonds** | **Senior Subordinate Bonds** | **Subordinate Bonds** | **Junior Subordinate Bonds** |
| 0.697381551 | 0.71292806 | 0.741059084 | 0.521591555 | 1.125171218 |

**1.Estimated Parameters for Beta distribution**

**alpha**

**beta**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Senior Secured Bonds** | **Senior Unsecured Bonds** | **Senior Subordinate Bonds** | **Subordinate Bonds** | **Junior Subordinate Bonds** |
| 0.610381096 | 1.359699052 | 2.150069658 | 1.259203082 | 12.33220255 |

**2. Λ matrix**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Aaa** | **Aa** | **A** | **Baa** | **Ba** | **B** | **Caa** | **Ca** | **C** | **WR** | **D** |
| **Aaa** | -0.1199 | 0.0723 | 0.0055 | 0.0016 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0404 | 0.0000 |
| **Aa** | 0.0123 | -0.1579 | 0.0810 | 0.0052 | 0.0012 | 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0575 | 0.0003 |
| **A** | 0.0008 | 0.0279 | -0.1461 | 0.0581 | 0.0040 | 0.0006 | 0.0001 | 0.0000 | 0.0000 | 0.0540 | 0.0005 |
| **Baa** | 0.0003 | 0.0020 | 0.0416 | -0.1682 | 0.0511 | 0.0049 | 0.0011 | 0.0000 | 0.0000 | 0.0659 | 0.0012 |
| **Ba** | 0.0000 | 0.0008 | 0.0046 | 0.0643 | -0.2729 | 0.0850 | 0.0058 | 0.0004 | 0.0002 | 0.1046 | 0.0071 |
| **B** | 0.0000 | 0.0005 | 0.0016 | 0.0060 | 0.0613 | -0.3065 | 0.0921 | 0.0037 | 0.0005 | 0.1219 | 0.0189 |
| **Caa** | 0.0000 | 0.0003 | 0.0004 | 0.0016 | 0.0067 | 0.0842 | -0.3866 | 0.0515 | 0.0170 | 0.1573 | 0.0677 |
| **Ca** | 0.0000 | 0.0018 | 0.0012 | 0.0048 | 0.0083 | 0.0543 | 0.1759 | -1.0971 | 0.1359 | 0.2647 | 0.4502 |
| **C** | 0.0000 | 0.0000 | 0.0017 | 0.0067 | 0.0134 | 0.0286 | 0.0908 | 0.0975 | -1.4239 | 0.4051 | 0.7800 |
| **WR** | 0.0001 | 0.0005 | 0.0010 | 0.0013 | 0.0011 | 0.0012 | 0.0005 | 0.0000 | 0.0000 | -0.0068 | 0.0010 |
| **D** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**3. Q(0,1) matrix**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Aaa** | **Aa** | **A** | **Baa** | **Ba** | **B** | **Caa** | **Ca** | **C** | **D** |
| **Aaa** | 0.9244 | 0.0657 | 0.0077 | 0.0018 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Aa** | 0.0114 | 0.9056 | 0.0739 | 0.0069 | 0.0014 | 0.0005 | 0.0000 | 0.0000 | 0.0000 | 0.0003 |
| **A** | 0.0009 | 0.0255 | 0.9145 | 0.0527 | 0.0048 | 0.0009 | 0.0002 | 0.0000 | 0.0000 | 0.0006 |
| **Baa** | 0.0003 | 0.0024 | 0.0383 | 0.9059 | 0.0441 | 0.0061 | 0.0013 | 0.0001 | 0.0000 | 0.0015 |
| **Ba** | 0.0001 | 0.0009 | 0.0055 | 0.0577 | 0.8479 | 0.0712 | 0.0079 | 0.0005 | 0.0002 | 0.0082 |
| **B** | 0.0000 | 0.0005 | 0.0018 | 0.0073 | 0.0525 | 0.8364 | 0.0742 | 0.0036 | 0.0009 | 0.0227 |
| **Caa** | 0.0000 | 0.0003 | 0.0006 | 0.0021 | 0.0082 | 0.0711 | 0.7979 | 0.0298 | 0.0100 | 0.0800 |
| **Ca** | 0.0000 | 0.0013 | 0.0012 | 0.0042 | 0.0078 | 0.0407 | 0.1103 | 0.4146 | 0.0485 | 0.3714 |
| **C** | 0.0000 | 0.0002 | 0.0014 | 0.0051 | 0.0094 | 0.0212 | 0.0553 | 0.0373 | 0.3145 | 0.5555 |
| **D** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **S5COMM Index** | **S5ENRS Index** | **S5FINL Index** | **S5INDU Index** | **S5UTIL Index** |
| **BAC US Equity** | -0.096688 | -0.093122 | 1.098920 | -0.162643 | -0.165579 |
| **C US Equity** | 0.000794 | -0.087018 | 1.161815 | -0.226810 | -0.123372 |
| **CMCSA US Equity** | -0.017805 | -0.243642 | 0.216829 | 0.456320 | 0.193699 |
| **DTE US Equity** | 0.036744 | 0.050151 | 0.014879 | -0.126940 | 0.964009 |
| **JPM US Equity** | -0.053527 | 0.115216 | 1.203296 | -0.412277 | -0.154429 |
| **MET US Equity** | 0.026570 | 0.096100 | 0.837223 | -0.032235 | -0.123503 |
| **OKE US Equity** | 0.177750 | 0.454633 | -0.138307 | -0.002853 | 0.250028 |
| **ROP US Equity** | -0.040753 | 0.070892 | 0.269284 | 0.406202 | -0.018120 |
| **WFC US Equity** | -0.063528 | -0.011038 | 0.980109 | -0.127980 | 0.012629 |

**4.Beta coefficients**

**5. Covariance matrix of indices**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Indices cov.** | **S5COMM Index** | **S5ENRS Index** | **S5FINL Index** | **S5INDU Index** | **S5UTIL Index** |
| **S5COMM Index** | 1 | 0.494840421 | 0.681867131 | 0.702482565 | 0.248660484 |
| **S5ENRS Index** | 0.494840421 | 1 | 0.659057291 | 0.741964268 | 0.334885074 |
| **S5FINL Index** | 0.681867131 | 0.659057291 | 1 | 0.876463881 | 0.366345235 |
| **S5INDU Index** | 0.702482565 | 0.741964268 | 0.876463881 | 1 | 0.390638481 |
| **S5UTIL Index** | 0.248660484 | 0.334885074 | 0.366345235 | 0.390638481 | 1 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Threshold** | **C1** | **C2** | **C3** | **C4** | **C5** | **C6** | **C7** | **C8** | **C9** |
| **Aa** | -3.9750 | -3.9739 | -3.9647 | -3.8907 | -3.7225 | -3.4312 | -2.8561 | -2.3307 | -1.4356 |
| **A** | -3.4014 | -3.3999 | -3.3838 | -3.3511 | -3.1364 | -2.8416 | -2.3597 | -1.3848 | 2.2779 |
| **Baa** | -3.2338 | -3.2287 | -3.2173 | -3.1434 | -2.9261 | -2.4847 | -1.5615 | 1.9376 | 3.1304 |
| **Ba** | -2.9579 | -2.9524 | -2.9398 | -2.7593 | -2.3663 | -1.6154 | 1.7391 | 2.7764 | 3.4151 |
| **B** | -2.4010 | -2.3941 | -2.3729 | -2.1262 | -1.3538 | 1.5203 | 2.4850 | 3.1067 | 3.8277 |
| **Caa** | -2.0005 | -1.9849 | -1.9232 | -1.2734 | 1.5372 | 2.3389 | 2.8293 | 3.2689 | 3.9801 |
| **Ca** | -1.4053 | -1.3409 | -1.1761 | 1.3898 | 2.2831 | 2.7450 | 3.1193 | 3.3924 | 4.2012 |
| **C** | -0.3280 | -0.2022 | 0.9721 | 1.5964 | 2.1825 | 2.4703 | 2.7963 | 2.9993 | 4.0489 |
| **D** | inf | inf | inf | inf | inf | inf | inf | inf | inf |

**6.Time-dependent Threshold**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **T** | **Mean** | **Std.dev** | **VaR90** | **VaR95** | **VaR99** |
| **0** | 22.046063 | 0.000000 | 22.046063 | 22.046063 | 22.046063 |
| **1** | 21.428605 | 0.485712 | 21.397486 | 21.299942 | 18.997103 |
| **2** | 20.786704 | 0.753795 | 20.747845 | 20.511002 | 16.373195 |
| **3** | 20.139961 | 0.949536 | 20.107698 | 18.095260 | 15.672019 |
| **4** | 19.479457 | 1.081018 | 18.128460 | 17.489960 | 15.130434 |
| **5** | 18.793810 | 1.204853 | 17.070352 | 16.842684 | 12.943960 |
| **6** | 18.112801 | 1.294473 | 16.465092 | 16.232151 | 12.362396 |
| **7** | 17.408036 | 1.406565 | 15.871972 | 14.017652 | 11.846597 |
| **8** | 16.697600 | 1.499448 | 15.269419 | 13.448824 | 10.540672 |
| **9** | 15.987383 | 1.567664 | 14.646887 | 12.917200 | 9.324429 |
| **10** | 15.286981 | 1.606775 | 12.623777 | 12.358643 | 8.904759 |
| **11** | 14.580124 | 1.627154 | 12.050956 | 11.734422 | 8.491925 |
| **12** | 13.835004 | 1.661536 | 11.495742 | 9.943894 | 8.065798 |
| **13** | 13.106519 | 1.665274 | 10.947474 | 9.426827 | 7.035202 |
| **14** | 12.367268 | 1.673990 | 10.401979 | 8.939660 | 6.009957 |
| **15** | 11.634869 | 1.657163 | 9.821700 | 8.460948 | 5.651985 |
| **16** | 10.888939 | 1.635245 | 8.100092 | 7.978540 | 5.342706 |
| **17** | 10.131048 | 1.606272 | 7.580895 | 6.482046 | 5.015027 |
| **18** | 9.379263 | 1.543503 | 7.065898 | 5.896126 | 4.691229 |
| **19** | 8.605419 | 1.464095 | 6.546085 | 5.456146 | 4.354451 |
| **20** | 7.810289 | 1.375630 | 6.000000 | 5.000000 | 4.000000 |

**7.Descriptive statistics of the portfolio values (in $m unit)**

A graph with blue and purple bars

Description automatically generated

A graph with blue and white bars

Description automatically generated

A graph of a graph showing value

Description automatically generated

A graph with blue bars

Description automatically generated