

Structured factor copulas for modeling the systemic risk  
of European and U.S. banks

ONLINE APPENDIX

**Abstract**

**Keywords:** Bank risk; Contagion; Credit Default Swaps; Crisis; Default; Distress; Factor vine copulas.

**JEL Classification:** G01; G21; C01; C11; C58.

## A Copula functions

Table 1: Bivariate copula families and the prior distributions of copula parameters

Copula	Notation	Copula distribution function	Prior	Range	Kendall's $\tau$
Gaussian	$G_p$	$C_{G_p}(u, v; \theta) = \Phi_2(\Phi^{-1}(u), \Phi^{-1}(v); \theta)$	$\theta \sim U(0, 0.99)$	$\theta \in (0, 0.99)$	$\frac{2}{\pi} \arcsin(\theta)$
	$G_n$	$C_{G_n}(u, v; \theta) = \Phi_2(\Phi^{-1}(u), \Phi^{-1}(v); \theta)$	$\theta \sim U(-0.99, 0)$	$\theta \in (-0.99, 0)$	
Student- $t$	$T_p$	$C_{T_p}(u, v; \theta, \nu) = T_2(T_\nu^{-1}(u), T_\nu^{-1}(v); \theta, \nu)$	$\theta \sim U(0, 0.99); \nu \sim U(2, 50)$	$\theta \in (0, 0.99), \nu \in (2, 50)$	$\frac{2}{\pi} \arcsin(\theta)$
	$T_n$	$C_{T_n}(u, v; \theta, \nu) = T_2(T_\nu^{-1}(u), T_\nu^{-1}(v); \theta, \nu)$	$\theta \sim U(-0.99, 0); \nu \sim U(2, 50)$	$\theta \in (-0.99, 0), \nu \in (2, 50)$	
Clayton	$C$	$C_C(u, v; \theta) = (u^{-\theta} + v^{-\theta} - 1)^{-\frac{1}{\theta}}$	$\theta \sim U(0, 18)$	$\theta \in (0, 18)$	$\frac{\theta}{\theta+2}$
	$C_{180}$	$C_{C_{180}}(u, v; \theta) = 1 - u - v + C_C(1 - u, 1 - v; \theta)$			
	$C_{90}$	$C_{C_{90}}(u, v; \theta) = v - C_C(1 - u, v; -\theta)$	$\theta \sim U(-18, 0)$	$\theta \in (-18, 0)$	$\frac{\theta}{\theta-2}$
	$C_{270}$	$C_{C_{270}}(u, v; \theta) = u - C_C(u, 1 - v; -\theta)$			
Gumbel	$G$	$C_G(u, v; \theta) = \exp \left[ - \{ (-\log u)^\theta + (-\log v)^\theta \}^{1/\theta} \right]$	$\theta \sim U(1, 10)$	$\theta \in [1, 10)$	$1 - \frac{1}{\theta}$
	$G_{180}$	$C_{G_{180}}(u, v; \theta) = 1 - u - v + C_G(1 - u, 1 - v; \theta)$			
	$G_{90}$	$C_{G_{90}}(u, v; \theta) = u - C_G(1 - u, v; -\theta)$	$\theta \sim U(-10, -1)$	$\theta \in (-10, -1]$	$-1 - \frac{1}{\theta}$
	$G_{270}$	$C_{G_{270}}(u, v; \theta) = v - C_G(u, 1 - v; -\theta)$			
Frank	$F_p$	$C_{F_p}(u, v; \theta) = -\frac{1}{\theta} \log \left( 1 - \frac{(1-e^{-\theta u})(1-e^{-\theta v})}{1-e^{-\theta}} \right)$	$\theta \sim U(0, 35)$	$\theta \in (0, 35)$	$1 - \frac{4}{\theta} (1 - D_1(\theta))$
	$F_n$	$C_{F_n}(u, v; \theta) = -\frac{1}{\theta} \log \left( 1 - \frac{(1-e^{-\theta u})(1-e^{-\theta v})}{1-e^{-\theta}} \right)$	$\theta \sim U(-35, 0)$	$\theta \in (-35, 0)$	
Joe	$J$	$C_J(u, v; \theta) = 1 - \{ (1-u)^\theta + (1-v)^\theta - (1-u)^\theta (1-v)^\theta \}^{1/\theta}$	$\theta \sim U(1, 18)$	$\theta \in [1, 18)$	$1 - 4 \sum_{k=1}^{\infty} \frac{1}{k(\theta k+2)(\theta(k-1)+2)}$
	$J_{180}$	$C_{J_{180}}(u, v; \theta) = 1 - u - v + C_J(1 - u, 1 - v; \theta)$			
	$J_{90}$	$C_{J_{90}}(u, v; \theta) = v - C_J(1 - u, v; -\theta)$	$\theta \sim U(-18, -1)$	$\theta \in (-18, -1]$	$1 - 4 \sum_{k=1}^{\infty} \frac{1}{k(\theta k-2)(\theta(k-1)-2)}$
	$J_{270}$	$C_{J_{270}}(u, v; \theta) = u - C_J(u, 1 - v; -\theta)$			

$D_1(\theta) = \frac{1}{\theta} \int_0^\theta \frac{\theta}{\exp(\theta)-1}$  denotes the Debye function of order one.  $B(\theta) = \frac{\theta}{\exp(\theta)-1}$  denotes the Bernoulli function.

The table shows some common bivariate copula functions. We assume an uninformative but proper prior distribution for the bivariate copula parameter  $\theta$  so that the Kendall- $\tau$  is in the range of  $[-0.9; 0.9]$ . The symmetric copula families are divided into positive and negative Kendall's  $\tau$  correlation copulas to prevent the identifiability issue of the factor copula models, see discussion in Nguyen et al. (2020).

## B Data and marginals

### B.1 Missing values

For some of the variables, the crude CDS spread data contained several missing values. Table 2 reports the number of missing values for each asset.

Table 2: Missing values.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG	AXP	BAC	C	GS	JPM	MS	WFC
Number	30	0	31	0	55	0	1	0	237	9	3	158	1	58	35
%	0.73	0.00	0.75	0.00	1.34	0.00	0.02	0.00	5.77	0.22	0.07	3.84	0.02	1.41	0.85

**Notes:** The table reports the number of missing CDS data values for each asset for the period from January 1st, 2007 to May 1st, 2023. Top row reports the number of total observations, and bottom row reports the corresponding proportion (in %).

To impute the missing values, we have performed the following iterative imputation procedure. Initialize by imputing the NAs in all variables by Kalman Smoothing using the state space representation of the ARIMA model. This was performed using the `imputeTS` package in R (Moritz and Bartz-Beielstein, 2017). Then, for each variable  $i = 1, \dots, d$ , do the following:

1. For variable  $i$ , calculate the running mean of window  $k$ .
2. Regress the variable  $i$  on the values of the rest of the variables as well as the running mean of the variable  $i$ .
3. Predict the missing values of the variable  $i$  using the observed and/or imputed values of the rest of the variables as well as the running mean of the variable  $i$ .

Repeat steps 1-3 for five iterations.

Below we present an artificial example, where we have removed 125 daily observations for one of the series in the CDS spread dataset (Citibank). The first period has a lot of consecutive NAs (100), the second period has fewer consecutive NAs (20), and the last one has very few consecutive NAs (5). We then performed the imputation procedure described above. Figure 1 shows the observed data, the initial Kalman imputation, the regression fitted values after the 1st iteration, and the regression fitted values after the 5th iteration. For this specific example, the value of the coefficient of determination at the 5th regression iteration is 98%, indicating that the CDS spreads are highly correlated. For this specific dataset, only 2 out of 16 variables (the remaining  $d - 1$  banks, the intercept, and the running mean) were statistically insignificant. Overall, the values of the coefficient of determination oscillate between 93 and 99% for other CDS spread series, indicating a very high explanatory power. The most important variable in all cases is the rolling mean. Note that most of the CDS spread series have only a few missing values, therefore, the imputation should have a minimal effect on the analysis.

Next, Table 3 reports the major descriptive statistics for the crude CDS data.

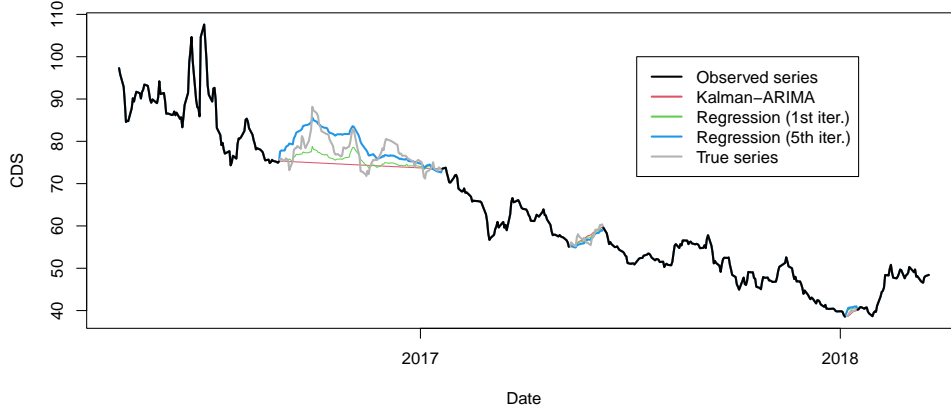


Figure 1: Artificial imputation example.

The figure draws the results of the artificial imputation example for the Citibank CDS spread data. The period containing 100 consecutive NAs is on the left, the period with 20 NAs is in the middle, and the period with 5 NAs is on the right. The rolling mean is calculated using the window of  $k = 50$ .

Table 3: Descriptive statistics for the CDS spreads.

	mean	Q2	sd	skew	kurt	min	max	1stACF	ADF(10)	LB(10)	ARCH(10)
BCS	94.98	82.32	51.27	0.92	3.65	5.45	278.64	0.99	0.04	0.00	0.00
BNP	78.49	65.92	57.00	1.92	7.08	5.70	359.59	1.00	0.30	0.00	0.00
CS	98.82	83.00	63.49	3.75	38.09	9.86	1082.15	0.98	0.01	0.00	0.00
GLE	94.86	78.68	75.22	1.94	7.00	6.01	440.26	1.00	0.28	0.00	0.00
ISP	137.49	108.28	103.97	1.82	6.27	5.76	627.82	1.00	0.34	0.00	0.00
SAN	118.45	84.67	95.98	1.43	4.46	7.62	487.50	1.00	0.41	0.00	0.00
UBS	76.50	61.64	54.80	1.50	5.69	4.55	361.68	1.00	0.01	0.00	0.00
UCG	155.77	127.94	111.47	1.81	6.50	7.48	687.10	1.00	0.25	0.00	0.00
AXP	74.59	43.67	88.85	3.82	20.01	8.53	685.75	1.00	0.01	0.00	0.00
BAC	103.14	76.28	76.54	1.96	7.27	5.31	483.06	1.00	0.05	0.00	0.00
C	114.77	82.80	90.03	2.40	10.96	7.44	665.53	1.00	0.02	0.00	0.00
GS	115.41	93.16	71.68	1.89	6.82	20.90	545.14	0.99	0.01	0.00	0.00
JPM	72.63	66.42	32.34	1.08	4.48	14.49	232.30	0.99	0.01	0.00	0.00
MS	132.88	89.34	114.34	3.05	19.62	17.83	1360.00	0.98	0.01	0.00	0.00
WFC	72.03	60.51	37.87	1.79	8.79	6.40	304.12	0.99	0.01	0.00	0.00

**Notes:** The table reports the descriptive statistics for the CDS spreads. 1stACF is the first-order autocorrelation,  $ADF(m)$  is the  $p$ -value for the Augmented Dickey-Fuller test with  $m$  lags, the  $LB(k)$  is the  $p$ -value for the Ljung-Box test for autocorrelation of  $k$  lags, and  $ARCH(l)$  is the  $p$ -value for the test for ARCH effects with  $l$  lags. The data is from January 1st, 2007 to May 1st, 2023.

## B.2 Marginals

Table 4 reports estimation results for each marginal time series of the CDS spread log-differences. Most of the series show negative mean log-difference, even though it is not statistically significant. The estimated values for  $\nu$  and  $\gamma$  in each model indicate that the series are fat-tailed and right-skewed. Using the estimated model parameters, we have transformed the data to uniformly distributed random variables. The  $p$ -values for the Kolmogorov–Smirnov and Anderson-Darling tests do not reject the null that model residuals follow a skew- $t$  distribution and the  $p$ -values for the data-driven smooth test for uniformity do not reject the null that the probability integral transforms are uniformly distributed, see Table 5.

Table 4: Estimation results for the marginals.

	$\mu$	$\phi_1$	$\phi_2$	$\phi_3$	$\phi_4$	$\omega$	$\alpha$	$\beta$	$\gamma$	$\xi$	$\nu$
BCS	-0.062 (0.051)	0.134 (0.018)	0.009 (0.016)	0.012 (0.016)	-0.030 (0.014)	0.492 (0.13)	0.214 (0.032)	0.798 (0.025)	-0.026 (0.032)	1.018 (0.019)	3.810 (0.238)
BNP	0.016 (0.055)	0.117 (0.016)	-0.005 (0.015)	0.000 (0.015)	-0.034 (0.014)	0.435 (0.225)	0.196 (0.036)	0.834 (0.034)	-0.060 (0.031)	1.059 (0.021)	4.069 (0.319)
CS	0.003 (0.054)	0.146 (0.017)	0.010 (0.015)	-0.007 (0.015)	0.007 (0.014)	0.534 (0.172)	0.293 (0.054)	0.765 (0.039)	-0.117 (0.048)	1.031 (0.019)	3.641 (0.216)
GLE	-0.029 (0.056)	0.126 (0.017)	-0.001 (0.016)	-0.004 (0.015)	-0.028 (0.014)	0.631 (0.22)	0.217 (0.036)	0.808 (0.03)	-0.071 (0.032)	1.040 (0.019)	4.027 (0.294)
ISP	-0.027 (0.064)	0.165 (0.017)	-0.001 (0.015)	-0.010 (0.016)	-0.017 (0.015)	0.596 (0.197)	0.202 (0.038)	0.809 (0.031)	-0.024 (0.034)	1.028 (0.022)	3.874 (0.248)
SAN	-0.042 (0.061)	0.159 (0.017)	-0.005 (0.016)	-0.025 (0.015)	-0.013 (0.015)	0.507 (0.172)	0.184 (0.032)	0.834 (0.025)	-0.065 (0.027)	1.028 (0.02)	4.696 (0.383)
UBS	-0.019 (0.056)	0.076 (0.018)	0.022 (0.014)	0.009 (0.015)	-0.029 (0.015)	0.524 (0.166)	0.197 (0.036)	0.840 (0.029)	-0.115 (0.03)	1.030 (0.021)	4.033 (0.286)
UCG	-0.086 (0.064)	0.182 (0.015)	0.003 (0.015)	-0.011 (0.015)	-0.019 (0.014)	0.565 (0.246)	0.240 (0.041)	0.799 (0.033)	-0.078 (0.036)	1.007 (0.021)	4.027 (0.285)
AXP	-0.095 (0.05)	0.076 (0.025)	0.080 (0.017)	0.021 (0.018)	-0.001 (0.018)	0.130 (0.205)	0.139 (0.054)	0.858 (0.068)	0.004 (0.026)	1.005 (0.017)	4.489 (0.314)
BAC	-0.079 (0.051)	0.175 (0.018)	0.038 (0.016)	-0.012 (0.015)	-0.018 (0.012)	0.391 (0.123)	0.215 (0.032)	0.814 (0.027)	-0.059 (0.034)	1.033 (0.02)	3.528 (0.195)
C	-0.062 (0.05)	0.165 (0.019)	0.057 (0.015)	-0.013 (0.015)	-0.024 (0.015)	0.381 (0.137)	0.264 (0.048)	0.788 (0.037)	-0.103 (0.041)	1.058 (0.021)	3.869 (0.246)
GS	-0.069 (0.046)	0.160 (0.018)	0.069 (0.016)	-0.015 (0.016)	-0.032 (0.015)	0.454 (0.173)	0.279 (0.052)	0.772 (0.044)	-0.102 (0.044)	1.030 (0.019)	3.396 (0.196)
JPM	-0.029 (0.049)	0.128 (0.017)	0.046 (0.015)	-0.008 (0.015)	-0.021 (0.015)	0.382 (0.222)	0.214 (0.065)	0.826 (0.06)	-0.082 (0.036)	1.049 (0.021)	3.527 (0.224)
MS	-0.102 (0.048)	0.088 (0.02)	0.057 (0.015)	0.005 (0.016)	-0.031 (0.014)	0.449 (0.139)	0.254 (0.038)	0.788 (0.032)	-0.084 (0.038)	1.028 (0.019)	3.524 (0.2)
WFC	-0.041 (0.047)	0.157 (0.022)	0.044 (0.017)	0.011 (0.017)	-0.032 (0.016)	0.311 (0.137)	0.218 (0.051)	0.827 (0.041)	-0.088 (0.034)	1.074 (0.02)	3.803 (0.269)

**Notes:** The table reports the estimated parameters and standard errors (in parenthesis) for AR(4)-GJR-GARCH(1,1) model with skew- $t$  errors from January 1st, 2007 to May 1st, 2023.

The top panel of Figure 2 contains the residuals for the marginal models, and the bottom panel represents the probability integral transforms of these residuals.

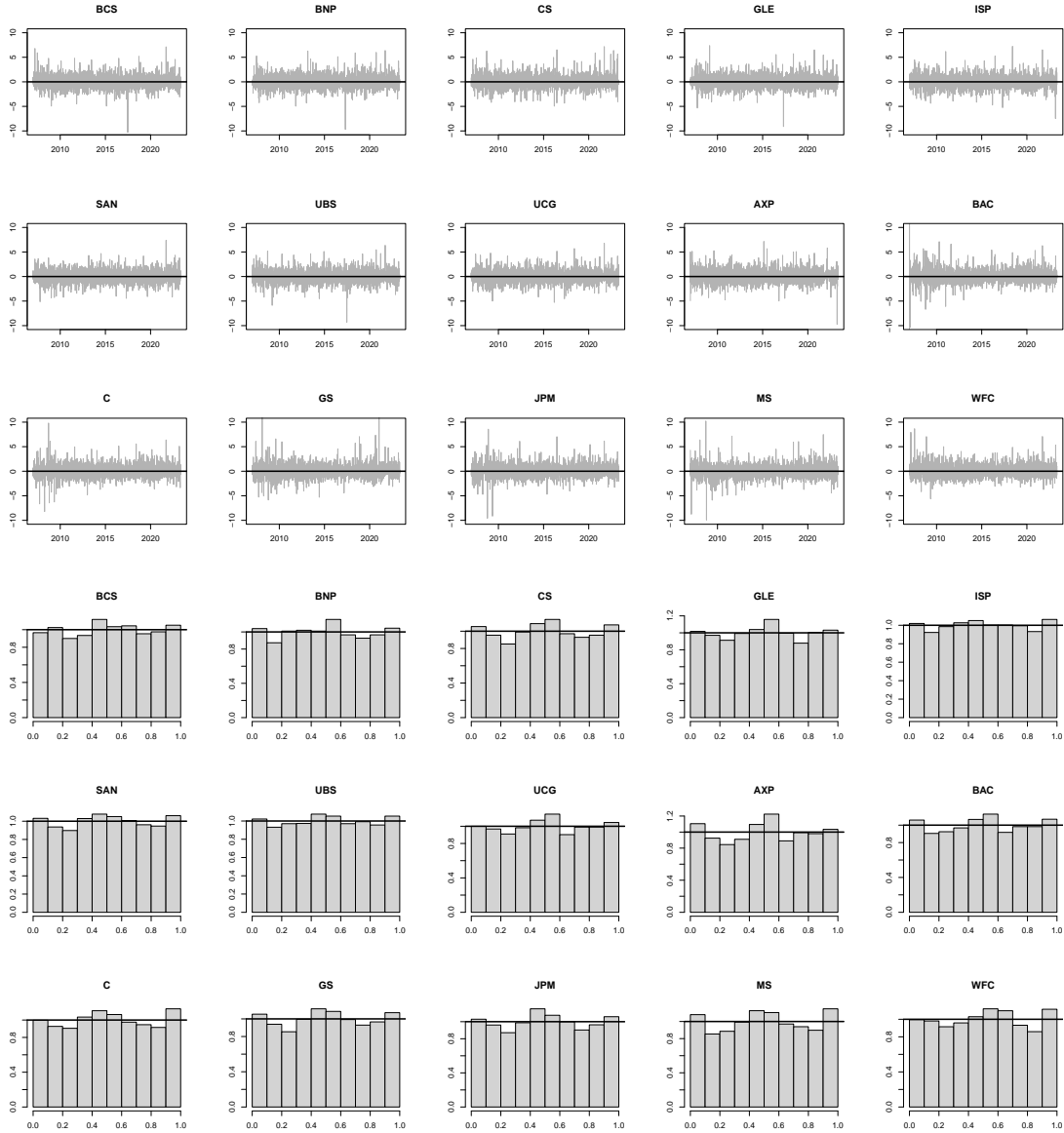


Figure 2: Marginal model residuals and their probability integral transforms.

The top panel contains the AR(4)-GJR-GARCH(1,1)-skew- $t$  model residuals for European and U.S banks. The horizontal black line is at zero. The bottom panel draws the histograms of the probability integral transforms of the residuals from the marginal models, the AR(4)-GJR-GARCH(1,1)-skew- $t$ . The horizontal black line is the theoretical density function of the Uniform (0,1) distribution. The data is from January 1st, 2007 to May 1st, 2023.

Table 5: Descriptive statistics for marginal model residuals.

	mean	Q2	sd	skew	kurtosis	min	max	LB(10)	ARCH(10)	KS	AD	DD	T
BCS	0.02	0.00	0.98	0.10	9.52	-10.30	7.13	0.18	0.89	0.13	0.29	0.35	4110
BNP	0.01	-0.02	0.99	0.19	8.34	-9.69	6.38	0.12	0.76	0.57	0.44	0.72	4110
CS	0.02	-0.00	0.99	0.53	7.97	-4.95	7.17	0.03	0.17	0.13	0.19	0.52	4110
GLE	0.01	-0.01	0.98	0.27	8.35	-9.11	7.38	0.04	0.90	0.29	0.31	0.55	4110
ISP	0.01	-0.01	0.98	0.21	7.42	-7.47	7.23	0.53	0.28	0.69	0.82	0.62	4110
SAN	0.01	-0.01	0.98	0.16	5.61	-5.13	7.38	0.09	0.65	0.28	0.36	0.46	4110
UBS	0.01	-0.01	0.98	0.04	7.92	-9.31	6.36	0.04	0.86	0.66	0.62	0.49	4110
UCG	0.02	0.01	0.97	0.23	6.15	-5.26	6.76	0.05	0.63	0.19	0.30	0.35	4110
AXP	0.02	0.02	1.03	0.17	8.02	-9.75	7.15	0.82	0.63	0.02	0.06	0.00	4110
BAC	0.02	-0.00	1.03	0.13	16.54	-11.46	10.81	0.66	0.00	0.08	0.18	0.31	4110
C	0.02	-0.02	1.00	0.30	10.15	-8.22	9.81	0.05	0.92	0.08	0.15	0.32	4110
GS	0.03	-0.01	1.04	2.25	36.06	-5.86	16.82	0.50	0.88	0.03	0.14	0.39	4110
JPM	0.01	-0.02	0.98	0.22	11.76	-9.58	8.56	0.32	0.74	0.10	0.22	0.61	4110
MS	0.02	-0.00	1.01	0.20	13.20	-9.93	10.22	0.03	0.96	0.03	0.04	0.00	4110
WFC	0.02	-0.01	0.98	0.92	9.30	-5.62	8.65	0.15	0.00	0.13	0.17	0.36	4110

**Notes:** The table reports the descriptive statistics for the AR(4)-GJR-GARCH(1,1) model with skew- $t$  errors residuals. LB( $k$ ) is the  $p$ -value for the Ljung-Box test for autocorrelation of  $k$  lags, ARCH( $l$ ) is the  $p$ -value for the test for ARCH effects with  $l$  lags, KS is the  $p$ -value for the Kolmogorov-Smirnov test, AD is the  $p$ -value for the Anderson-Darling test, and DD is the  $p$ -value for the data-driven smooth test for uniformity. The data is from January 1st, 2007 to May 1st, 2023.

## C Empirical

### C.1 In-sample results: other metrics

Table 6: In-sample log likelihoods.

	Subsample 1 Jan 07 - Dec 10	Subsample 2 Jan 11 - Dec 14	Subsample 3 Jan 15 - Dec 19	Subsample 4 Jan 20 - May 23	Full sample Jan 07- May 23
US banks					
One-factor	2148.77	2963.76	3551.71	3133.74	11369.69
Two-factor	2163.88	2974.76	3562.93	3146.57	11392.39
Factor-Vine	2296.55	2989.95	3585.02	3157.42	11440.65
Euro banks					
One-factor	3734.82	4531.12	3970.27	3418.16	15505.93
Two-factor	3786.51	4553.30	4047.81	3601.29	16232.38
Factor-Vine	3806.08	4656.33	4413.63	3635.29	16443.24
US and Euro banks					
One-factor	4691.02	5820.99	5254.87	5300.60	20690.42
Two-factor	6051.36	7628.95	7656.07	6820.49	27603.33
Bi-factor	6201.35	7845.14	8102.54	6892.05	28343.47
Nested-factor	5997.97	7719.13	7713.65	6854.35	27309.83
Factor-Vine	5961.04	7546.84	7919.52	6840.00	27098.62

**Notes:** The table reports the in-sample log likelihoods for four subperiods and the full sample. The data is from January 1st, 2007 to May 1st, 2023. We calculate the log likelihood of the factor copulas at the posterior modes of the copula model parameters



## C.2 Out-of-sample results: evaluation metrics

Following Bjerregård et al. (2021), we present the detailed formulas for the out-of-sample evaluation metrics: negative log predictive score (LPS), negative conditional likelihood score (CdL), and variogram score (VarS).

$$\begin{aligned} \text{LPS} &= - \sum_{t=t_0}^T \log p(u_{1,t}, \dots, u_{d,t}; \boldsymbol{\theta}), \\ \text{CdL} &= - \sum_{t=t_0}^T I_{\mathbf{u}_{\cdot,t} \in A} \log \left( \frac{p(u_{1,t}, \dots, u_{d,t}; \boldsymbol{\theta})}{\mathbf{P}(A)} \right), \\ \text{VarS}_p &= \sum_{t=t_0}^T \sum_{i=1}^{d-1} \sum_{j=i+1}^d (|u_{i,t} - u_{j,t}|^p - E[|U_{i,t} - U_{j,t}|^p])^2, \end{aligned}$$

where  $p(u_{1,t}, \dots, u_{d,t}; \boldsymbol{\theta})$  is the integrated predicted density of the factor copula model specified in Appendix A in the main manuscript,  $A$  is upper tail region of the distribution that all elements in  $\mathbf{u}_{\cdot,t} = \{u_{1,t}, \dots, u_{d,t}\}$  are greater than 0.5, and  $\mathbf{P}(A) = \int_A p(u_{1,t}, \dots, u_{d,t}; \boldsymbol{\theta}) du_{1,t} \dots du_{d,t}$  is the normalizing probability that we observe  $\mathbf{u}_{\cdot,t} \in A$ , see Diks et al. (2011). We calculate the integrated predicted density via Gauss-Legendre quadrature integration, see Krupskii and Joe (2013, 2015). In order to compute the expectation of the pairwise differences of the components in  $\text{VarS}_p$ , we simulate 100,000 samples from the proposed factor copula models. These samples also help to approximate  $\mathbf{P}(A)$  as the proportion of samples falling into the upper tail region  $A$ .

## D Systemic risk

The tables below report the 20-step-ahead forecasts of the four systematic risk measures: Probability of Distress ( $PD$ ), Joint Probability of Distress ( $JPD$ ), Expected Proportion in Distress ( $EPD$ ), and Expected Shortfall ( $ES$ ). The individual regional (Europe and U.S.) tables are obtained using the factor-vine copula, meanwhile, the joint Europe-U.S. tables are obtained using the bi-factor copula.

Table 7: Probability of Distress for U.S. banks.

	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	0.01	0.00	0.00	0.01	0.01	0.01	0.06
2019-03-28	0.03	0.00	0.01	0.02	0.01	0.06	0.07
2019-04-26	0.01	0.00	0.00	0.01	0.00	0.01	0.02
2019-05-29	0.02	0.03	0.05	0.02	0.01	0.04	0.37
2019-06-26	0.00	0.01	0.01	0.00	0.00	0.01	0.04
2019-07-29	0.00	0.00	0.00	0.00	0.00	0.01	0.02
2019-09-10	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2019-10-08	0.03	0.01	0.01	0.02	0.01	0.02	0.11
2019-11-06	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2019-12-09	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2020-01-13	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2020-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2020-03-11	0.54	0.44	0.58	0.56	0.69	0.61	0.68
2020-04-08	0.81	0.47	0.66	0.51	0.62	0.43	0.90
2020-05-06	0.41	0.09	0.44	0.24	0.41	0.13	0.45
2020-06-03	0.06	0.06	0.08	0.05	0.13	0.03	0.22
2020-07-01	0.02	0.10	0.16	0.13	0.32	0.05	0.35
2020-08-04	0.00	0.02	0.03	0.13	0.05	0.02	0.16
2020-09-02	0.00	0.00	0.00	0.14	0.01	0.00	0.03
2020-10-05	0.01	0.01	0.02	0.19	0.04	0.02	0.13
2020-11-03	0.00	0.01	0.02	0.07	0.02	0.01	0.10
2020-12-04	0.00	0.07	0.01	0.01	0.01	0.02	0.02
2021-01-14	0.01	0.01	0.00	0.28	0.01	0.00	0.01
2021-02-11	0.00	0.01	0.00	0.01	0.01	0.01	0.01
2021-03-11	0.00	0.01	0.00	0.01	0.01	0.01	0.02
2021-04-08	0.02	0.02	0.01	0.01	0.01	0.02	0.04
2021-05-06	0.00	0.01	0.00	0.01	0.01	0.01	0.01
2021-06-03	0.00	0.01	0.01	0.01	0.01	0.02	0.01
2021-07-01	0.00	0.01	0.00	0.01	0.00	0.01	0.00
2021-07-29	0.00	0.01	0.00	0.01	0.01	0.02	0.00
2021-08-26	0.00	0.01	0.00	0.01	0.01	0.01	0.00
2021-09-23	0.00	0.03	0.01	0.01	0.03	0.03	0.01
2021-10-22	0.00	0.01	0.00	0.01	0.01	0.02	0.01
2021-11-19	0.00	0.01	0.01	0.01	0.01	0.02	0.01
2022-01-03	0.00	0.02	0.02	0.01	0.02	0.02	0.01
2022-01-31	0.00	0.16	0.09	0.08	0.17	0.18	0.08
2022-02-28	0.00	0.32	0.27	0.35	0.35	0.20	0.23
2022-03-28	0.04	0.44	0.49	0.23	0.46	0.37	0.27
2022-04-28	0.81	0.84	0.85	0.58	0.89	0.72	0.72
2022-05-27	0.84	0.55	0.56	0.49	0.61	0.51	0.54
2022-06-28	0.32	0.84	0.85	0.86	0.81	0.81	0.80
2022-07-28	0.03	0.31	0.31	0.42	0.40	0.29	0.27
2022-08-25	0.01	0.10	0.08	0.15	0.10	0.12	0.06
2022-09-22	0.09	0.66	0.62	0.58	0.69	0.56	0.61
2022-10-20	0.03	0.81	0.81	0.74	0.77	0.74	0.64
2022-11-17	0.15	0.11	0.14	0.13	0.07	0.24	0.05
2023-01-04	0.02	0.09	0.06	0.06	0.08	0.23	0.05
2023-02-01	0.00	0.01	0.01	0.02	0.01	0.02	0.01
2023-03-01	0.00	0.01	0.01	0.01	0.01	0.01	0.00
2023-03-29	0.04	0.43	0.24	0.18	0.26	0.22	0.40

Table 8: Joint Probability of Distress for U.S. banks.

	1	2	3	4	5	6	7
2019-02-28	0.07	0.02	0.01	0.00	0.00	0.00	0.00
2019-03-28	0.12	0.04	0.02	0.01	0.00	0.00	0.00
2019-04-26	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2019-05-29	0.39	0.08	0.04	0.02	0.01	0.01	0.00
2019-06-26	0.05	0.01	0.01	0.00	0.00	0.00	0.00
2019-07-29	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2019-09-10	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-10-08	0.14	0.04	0.02	0.01	0.01	0.00	0.00
2019-11-06	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-12-09	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-01-13	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-02-11	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-03-11	0.89	0.79	0.69	0.60	0.50	0.39	0.23
2020-04-08	0.96	0.88	0.75	0.64	0.52	0.40	0.25
2020-05-06	0.70	0.52	0.39	0.27	0.17	0.10	0.04
2020-06-03	0.30	0.15	0.09	0.05	0.03	0.02	0.00
2020-07-01	0.48	0.29	0.17	0.11	0.06	0.03	0.00
2020-08-04	0.22	0.10	0.04	0.02	0.01	0.00	0.00
2020-09-02	0.15	0.02	0.01	0.00	0.00	0.00	0.00
2020-10-05	0.25	0.10	0.04	0.02	0.01	0.00	0.00
2020-11-03	0.14	0.05	0.02	0.01	0.01	0.00	0.00
2020-12-04	0.09	0.03	0.01	0.01	0.00	0.00	0.00
2021-01-14	0.28	0.02	0.01	0.00	0.00	0.00	0.00
2021-02-11	0.03	0.01	0.01	0.00	0.00	0.00	0.00
2021-03-11	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2021-04-08	0.07	0.03	0.01	0.01	0.00	0.00	0.00
2021-05-06	0.03	0.01	0.01	0.00	0.00	0.00	0.00
2021-06-03	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2021-07-01	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2021-07-29	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2021-08-26	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2021-09-23	0.07	0.03	0.01	0.01	0.00	0.00	0.00
2021-10-22	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2021-11-19	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2022-01-03	0.06	0.02	0.01	0.01	0.00	0.00	0.00
2022-01-31	0.33	0.18	0.12	0.07	0.04	0.02	0.00
2022-02-28	0.57	0.40	0.30	0.22	0.15	0.07	0.00
2022-03-28	0.70	0.54	0.42	0.32	0.21	0.11	0.02
2022-04-28	0.97	0.94	0.89	0.83	0.75	0.62	0.40
2022-05-27	0.93	0.79	0.68	0.58	0.49	0.38	0.24
2022-06-28	0.97	0.93	0.89	0.84	0.77	0.64	0.25
2022-07-28	0.64	0.47	0.35	0.27	0.19	0.10	0.01
2022-08-25	0.28	0.14	0.09	0.06	0.03	0.02	0.00
2022-09-22	0.87	0.77	0.69	0.60	0.49	0.33	0.06
2022-10-20	0.94	0.88	0.82	0.75	0.65	0.48	0.02
2022-11-17	0.40	0.20	0.12	0.08	0.05	0.03	0.01
2023-01-04	0.30	0.12	0.07	0.04	0.03	0.01	0.00
2023-02-01	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2023-03-01	0.04	0.01	0.01	0.00	0.00	0.00	0.00
2023-03-29	0.59	0.43	0.31	0.23	0.14	0.07	0.01

Table 9: Expected Proportion in Distress for U.S. banks.

	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	0.33	0.66	0.51	0.36	0.45	0.42	0.21
2019-03-28	0.32	0.72	0.59	0.45	0.58	0.30	0.28
2019-04-26	0.29	0.64	0.52	0.35	0.45	0.35	0.22
2019-05-29	0.45	0.58	0.47	0.60	0.68	0.48	0.20
2019-06-26	0.38	0.39	0.37	0.47	0.44	0.39	0.21
2019-07-29	0.38	0.42	0.38	0.41	0.44	0.27	0.22
2019-09-10	0.22	0.40	0.42	0.35	0.33	0.32	0.25
2019-10-08	0.33	0.59	0.57	0.50	0.53	0.44	0.23
2019-11-06	0.28	0.43	0.50	0.38	0.37	0.34	0.24
2019-12-09	0.26	0.43	0.36	0.35	0.34	0.30	0.21
2020-01-13	0.20	0.43	0.40	0.37	0.32	0.36	0.22
2020-02-11	0.22	0.43	0.33	0.40	0.33	0.32	0.21
2020-03-11	0.78	0.88	0.81	0.82	0.75	0.79	0.76
2020-04-08	0.71	0.88	0.80	0.86	0.80	0.89	0.68
2020-05-06	0.53	0.84	0.57	0.70	0.58	0.78	0.56
2020-06-03	0.45	0.59	0.56	0.59	0.44	0.66	0.35
2020-07-01	0.68	0.63	0.55	0.58	0.40	0.71	0.40
2020-08-04	0.71	0.63	0.55	0.32	0.46	0.57	0.30
2020-09-02	0.52	0.63	0.52	0.18	0.42	0.49	0.31
2020-10-05	0.49	0.65	0.58	0.27	0.48	0.56	0.31
2020-11-03	0.58	0.55	0.50	0.30	0.50	0.51	0.27
2020-12-04	0.42	0.23	0.50	0.49	0.47	0.34	0.40
2021-01-14	0.36	0.46	0.55	0.16	0.46	0.52	0.42
2021-02-11	0.31	0.34	0.52	0.37	0.40	0.41	0.33
2021-03-11	0.42	0.40	0.51	0.34	0.42	0.34	0.29
2021-04-08	0.30	0.44	0.50	0.42	0.45	0.39	0.31
2021-05-06	0.28	0.34	0.45	0.31	0.36	0.35	0.39
2021-06-03	0.35	0.34	0.46	0.36	0.39	0.31	0.41
2021-07-01	0.30	0.29	0.41	0.27	0.36	0.31	0.39
2021-07-29	0.43	0.33	0.45	0.30	0.36	0.27	0.45
2021-08-26	0.43	0.31	0.40	0.26	0.32	0.25	0.47
2021-09-23	0.64	0.35	0.51	0.41	0.36	0.32	0.44
2021-10-22	0.14	0.38	0.47	0.32	0.37	0.26	0.43
2021-11-19	0.14	0.33	0.47	0.30	0.40	0.29	0.43
2022-01-03	0.14	0.36	0.41	0.40	0.36	0.33	0.42
2022-01-31	0.14	0.46	0.58	0.52	0.44	0.40	0.57
2022-02-28	0.79	0.57	0.62	0.52	0.55	0.61	0.64
2022-03-28	0.77	0.60	0.57	0.69	0.58	0.60	0.70
2022-04-28	0.84	0.86	0.85	0.93	0.84	0.89	0.90
2022-05-27	0.65	0.83	0.82	0.82	0.79	0.81	0.83
2022-06-28	0.94	0.84	0.84	0.82	0.85	0.84	0.85
2022-07-28	0.75	0.65	0.65	0.53	0.57	0.61	0.67
2022-08-25	0.60	0.50	0.57	0.38	0.50	0.42	0.60
2022-09-22	0.89	0.73	0.74	0.74	0.70	0.74	0.75
2022-10-20	0.94	0.75	0.75	0.76	0.76	0.76	0.81
2022-11-17	0.40	0.58	0.54	0.49	0.65	0.38	0.72
2023-01-04	0.48	0.48	0.57	0.47	0.50	0.29	0.59
2023-02-01	0.30	0.37	0.44	0.32	0.46	0.28	0.48
2023-03-01	0.48	0.33	0.44	0.31	0.39	0.32	0.46
2023-03-29	0.69	0.51	0.66	0.64	0.62	0.60	0.52

Table 10: Expected shortfall for U.S. banks.

	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	45.58	78.22	92.27	120.89	77.42	110.05	75.51
2019-03-28	49.51	72.79	89.14	111.70	72.45	147.57	70.50
2019-04-26	46.32	77.45	89.56	116.14	77.33	118.48	74.59
2019-05-29	45.07	96.42	113.04	104.43	70.29	120.01	90.29
2019-06-26	39.27	104.44	120.68	104.19	67.55	113.41	95.57
2019-07-29	38.80	82.17	86.39	103.69	56.59	177.11	100.09
2019-09-10	41.10	86.03	87.80	105.08	83.97	126.69	85.05
2019-10-08	47.76	89.97	96.73	115.95	76.82	121.85	84.92
2019-11-06	38.45	88.76	84.54	102.49	72.61	117.70	76.72
2019-12-09	36.70	75.09	81.12	90.60	79.95	126.41	92.07
2020-01-13	40.95	74.41	75.35	100.54	69.26	118.86	73.45
2020-02-11	33.29	65.51	76.80	80.71	63.51	103.97	74.60
2020-03-11	58.69	141.30	162.90	146.33	133.54	178.94	141.11
2020-04-08	71.37	105.02	115.79	117.77	88.10	116.71	98.69
2020-05-06	60.15	78.49	102.32	109.76	79.31	94.44	84.64
2020-06-03	43.06	90.08	97.83	104.98	81.89	90.79	102.10
2020-07-01	32.43	82.84	94.93	106.72	88.40	84.01	94.59
2020-08-04	29.75	71.42	82.62	147.81	70.07	81.04	90.68
2020-09-02	31.94	61.63	74.73	333.48	69.03	71.80	85.74
2020-10-05	37.02	66.37	78.26	178.51	68.21	76.89	88.17
2020-11-03	37.32	70.52	83.12	186.00	64.82	77.48	94.10
2020-12-04	36.40	188.75	73.74	83.74	64.66	145.21	80.66
2021-01-14	42.02	66.68	68.93	499.93	68.62	70.96	77.39
2021-02-11	41.44	80.61	76.29	131.31	80.32	86.66	87.16
2021-03-11	39.96	75.14	76.94	134.97	72.03	103.86	87.01
2021-04-08	43.62	76.38	84.43	113.53	70.28	96.17	87.41
2021-05-06	41.72	78.62	81.94	139.54	79.91	91.23	77.38
2021-06-03	40.31	80.13	82.35	128.71	72.81	106.05	73.44
2021-07-01	40.79	81.20	80.40	165.81	67.16	93.29	71.51
2021-07-29	38.90	78.03	81.07	145.92	77.34	110.33	68.47
2021-08-26	37.98	75.12	79.14	153.11	79.11	101.72	63.16
2021-09-23	38.13	89.36	81.41	122.28	82.44	126.27	77.14
2021-10-22	36.45	73.18	81.63	133.22	76.29	124.90	72.95
2021-11-19	34.22	77.12	83.24	152.42	69.82	104.43	72.47
2022-01-03	34.38	85.00	95.48	108.55	80.01	98.31	81.79
2022-01-31	36.64	84.96	87.76	103.69	79.56	127.61	78.35
2022-02-28	35.53	81.80	90.67	119.44	77.66	90.70	81.59
2022-03-28	41.71	84.83	104.51	104.00	80.11	98.38	81.64
2022-04-28	51.16	91.84	108.28	109.53	87.30	105.31	88.08
2022-05-27	54.26	96.55	110.92	113.43	93.34	110.03	94.88
2022-06-28	51.47	115.31	131.55	135.27	107.09	128.79	109.22
2022-07-28	44.28	103.07	119.08	126.90	99.74	117.34	98.73
2022-08-25	44.16	103.30	115.73	132.86	97.13	150.50	95.11
2022-09-22	46.78	117.21	133.09	129.74	110.95	132.28	110.45
2022-10-20	44.55	120.48	138.81	140.68	110.10	137.93	110.64
2022-11-17	52.41	108.33	128.74	133.40	95.75	161.23	96.20
2023-01-04	46.78	112.63	122.95	130.01	103.76	227.25	101.35
2023-02-01	43.78	114.36	124.58	161.91	102.46	165.82	95.61
2023-03-01	40.92	115.97	122.14	156.62	108.11	127.51	94.15
2023-03-29	44.95	140.80	138.73	129.33	111.92	133.77	129.78

Table 11: Probability of Distress for European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG
2019-02-28	0.01	0.01	0.00	0.00	0.05	0.00	0.00	0.01
2019-03-28	0.01	0.01	0.01	0.01	0.13	0.00	0.00	0.05
2019-04-26	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01
2019-05-29	0.01	0.01	0.00	0.01	0.33	0.00	0.00	0.05
2019-06-26	0.00	0.01	0.00	0.00	0.05	0.00	0.00	0.01
2019-07-29	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01
2019-09-10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2019-10-08	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
2019-11-06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-12-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-01-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-03-11	0.04	0.21	0.26	0.20	0.40	0.04	0.15	0.31
2020-04-08	0.62	0.14	0.32	0.15	0.24	0.01	0.20	0.14
2020-05-06	0.30	0.05	0.02	0.05	0.22	0.00	0.15	0.14
2020-06-03	0.07	0.01	0.01	0.01	0.02	0.00	0.01	0.01
2020-07-01	0.03	0.01	0.01	0.01	0.01	0.00	0.01	0.01
2020-08-04	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00
2020-09-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-10-05	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00
2020-11-03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-12-04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-01-14	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2021-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-03-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-04-08	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
2021-05-06	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00
2021-06-03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-08-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-09-23	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00
2021-10-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-11-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-31	0.00	0.01	0.01	0.01	0.00	0.00	0.02	0.00
2022-02-28	0.00	0.08	0.41	0.17	0.00	0.03	0.36	0.01
2022-03-28	0.02	0.08	0.80	0.30	0.00	0.03	0.60	0.02
2022-04-28	0.05	0.11	0.81	0.26	0.04	0.03	0.44	0.01
2022-05-27	0.05	0.11	0.74	0.24	0.01	0.03	0.43	0.01
2022-06-28	0.79	0.54	0.98	0.77	0.01	0.12	0.96	0.04
2022-07-28	0.59	0.43	0.98	0.61	0.02	0.53	0.90	0.13
2022-08-25	0.57	0.21	0.99	0.28	0.00	0.49	0.84	0.02
2022-09-22	0.73	0.79	0.72	0.83	0.02	0.80	0.94	0.11
2022-10-20	0.82	0.87	0.81	0.90	0.01	0.88	0.97	0.06
2022-11-17	0.52	0.15	0.95	0.16	0.01	0.24	0.61	0.01
2023-01-04	0.03	0.04	0.98	0.05	0.00	0.02	0.22	0.00
2023-02-01	0.01	0.01	0.36	0.02	0.00	0.05	0.05	0.00
2023-03-01	0.00	0.00	0.69	0.01	0.00	0.01	0.02	0.00
2023-03-29	0.56	0.41	0.24	0.68	0.05	0.24	0.86	0.09

Table 12: Joint Probability of Distress for European banks.

	1	2	3	4	5	6	7	8
2019-02-28	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2019-03-28	0.14	0.05	0.01	0.01	0.00	0.00	0.00	0.00
2019-04-26	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-05-29	0.33	0.06	0.01	0.00	0.00	0.00	0.00	0.00
2019-06-26	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-07-29	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-09-10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-10-08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2019-11-06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-12-09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-01-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-03-11	0.56	0.40	0.27	0.18	0.11	0.06	0.03	0.01
2020-04-08	0.72	0.42	0.27	0.18	0.11	0.07	0.03	0.00
2020-05-06	0.43	0.23	0.14	0.07	0.04	0.02	0.01	0.00
2020-06-03	0.09	0.02	0.01	0.01	0.00	0.00	0.00	0.00
2020-07-01	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00
2020-08-04	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-09-02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-10-05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-11-03	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2020-12-04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-01-14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-02-11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-03-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-04-08	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2021-05-06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-06-03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-29	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-08-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-09-23	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2021-10-22	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-11-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-31	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2022-02-28	0.55	0.30	0.14	0.06	0.02	0.00	0.00	0.00
2022-03-28	0.85	0.59	0.27	0.09	0.03	0.01	0.00	0.00
2022-04-28	0.84	0.49	0.24	0.11	0.05	0.02	0.01	0.00
2022-05-27	0.78	0.46	0.22	0.10	0.04	0.02	0.01	0.00
2022-06-28	0.99	0.97	0.88	0.72	0.49	0.12	0.03	0.01
2022-07-28	0.99	0.93	0.77	0.61	0.47	0.31	0.10	0.01
2022-08-25	0.99	0.89	0.65	0.44	0.27	0.14	0.01	0.00
2022-09-22	0.98	0.93	0.87	0.81	0.71	0.53	0.11	0.02
2022-10-20	0.99	0.97	0.93	0.89	0.82	0.66	0.06	0.01
2022-11-17	0.96	0.73	0.47	0.25	0.15	0.07	0.01	0.00
2023-01-04	0.98	0.24	0.07	0.03	0.01	0.01	0.00	0.00
2023-02-01	0.37	0.08	0.03	0.01	0.00	0.00	0.00	0.00
2023-03-01	0.70	0.03	0.01	0.00	0.00	0.00	0.00	0.00
2023-03-29	0.92	0.75	0.57	0.40	0.26	0.14	0.06	0.02

Table 13: Expected proportion in Distress for European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG
2019-02-28	0.28	0.37	0.39	0.38	0.18	0.25	0.44	0.31
2019-03-28	0.36	0.40	0.38	0.46	0.20	0.50	0.45	0.29
2019-04-26	0.28	0.36	0.28	0.42	0.17	0.12	0.46	0.29
2019-05-29	0.31	0.45	0.41	0.44	0.15	0.38	0.44	0.29
2019-06-26	0.28	0.29	0.35	0.46	0.17	0.12	0.38	0.30
2019-07-29	0.23	0.41	0.45	0.18	0.26	0.12	0.39	0.33
2019-09-10	0.18	0.24	0.26	0.33	0.22	0.12	0.28	0.32
2019-10-08	0.23	0.27	0.29	0.36	0.23	0.12	0.29	0.33
2019-11-06	0.17	0.23	0.19	0.27	0.22	0.12	0.17	0.29
2019-12-09	0.20	0.25	0.18	0.31	0.20	0.12	0.33	0.31
2020-01-13	0.17	0.21	0.12	0.38	0.20	0.12	0.12	0.30
2020-02-11	0.25	0.27	0.12	0.28	0.23	0.12	0.12	0.28
2020-03-11	0.64	0.55	0.48	0.56	0.43	0.78	0.54	0.48
2020-04-08	0.33	0.62	0.46	0.61	0.54	0.91	0.52	0.64
2020-05-06	0.30	0.56	0.64	0.57	0.38	0.79	0.39	0.46
2020-06-03	0.18	0.37	0.36	0.43	0.36	0.50	0.30	0.41
2020-07-01	0.21	0.35	0.34	0.40	0.34	0.57	0.27	0.40
2020-08-04	0.22	0.29	0.34	0.40	0.34	0.44	0.28	0.46
2020-09-02	0.16	0.21	0.12	0.31	0.28	0.12	0.20	0.33
2020-10-05	0.19	0.31	0.37	0.39	0.42	0.49	0.26	0.44
2020-11-03	0.17	0.32	0.33	0.41	0.47	0.41	0.30	0.42
2020-12-04	0.18	0.24	0.44	0.38	0.32	0.44	0.28	0.45
2021-01-14	0.22	0.41	0.44	0.44	0.24	0.44	0.30	0.33
2021-02-11	0.18	0.33	0.12	0.33	0.32	0.44	0.22	0.34
2021-03-11	0.21	0.27	0.22	0.29	0.38	0.20	0.18	0.28
2021-04-08	0.26	0.26	0.16	0.33	0.65	0.40	0.22	0.54
2021-05-06	0.27	0.24	0.28	0.28	0.54	0.34	0.20	0.49
2021-06-03	0.24	0.23	0.23	0.26	0.67	0.33	0.19	0.41
2021-07-01	0.18	0.23	0.22	0.23	0.12	0.17	0.19	0.34
2021-07-29	0.22	0.20	0.18	0.22	0.38	0.17	0.17	0.12
2021-08-26	0.17	0.17	0.13	0.18	0.12	0.12	0.12	0.12
2021-09-23	0.28	0.26	0.21	0.30	0.41	0.27	0.26	0.41
2021-10-22	0.23	0.21	0.19	0.26	0.50	0.22	0.20	0.12
2021-11-19	0.20	0.23	0.25	0.26	0.50	0.25	0.30	0.12
2022-01-03	0.32	0.25	0.20	0.26	0.39	0.29	0.23	0.53
2022-01-31	0.37	0.28	0.23	0.29	0.38	0.42	0.18	0.65
2022-02-28	0.64	0.49	0.28	0.39	0.75	0.57	0.29	0.65
2022-03-28	0.61	0.55	0.28	0.41	0.81	0.62	0.32	0.67
2022-04-28	0.58	0.56	0.27	0.44	0.63	0.68	0.36	0.79
2022-05-27	0.55	0.54	0.27	0.43	0.78	0.66	0.35	0.73
2022-06-28	0.58	0.65	0.53	0.59	0.93	0.77	0.54	0.85
2022-07-28	0.66	0.73	0.53	0.67	0.96	0.69	0.56	0.85
2022-08-25	0.55	0.70	0.43	0.67	0.92	0.58	0.47	0.85
2022-09-22	0.71	0.70	0.72	0.69	0.97	0.70	0.64	0.88
2022-10-20	0.72	0.71	0.72	0.71	0.98	0.71	0.68	0.90
2022-11-17	0.46	0.66	0.35	0.65	0.86	0.59	0.44	0.87
2023-01-04	0.48	0.49	0.17	0.47	0.73	0.58	0.31	0.69
2023-02-01	0.42	0.50	0.17	0.44	0.78	0.33	0.32	0.63
2023-03-01	0.44	0.50	0.13	0.40	0.69	0.38	0.30	0.73
2023-03-29	0.54	0.62	0.69	0.51	0.88	0.70	0.44	0.83



Table 14: Expected shortfall for European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG
2019-02-28	113.17	96.05	92.93	85.11	259.09	80.02	44.27	240.24
2019-03-28	99.61	77.84	112.16	71.96	246.78	88.10	48.52	252.60
2019-04-26	100.32	76.45	91.49	68.66	280.45	70.97	41.60	262.92
2019-05-29	112.56	69.56	98.65	69.18	287.30	64.96	35.12	239.98
2019-06-26	96.15	104.59	87.56	58.80	269.34	57.03	39.08	248.84
2019-07-29	115.97	97.54	80.49	245.12	233.97	55.41	43.08	242.71
2019-09-10	151.59	118.46	86.02	103.40	302.84	56.38	45.49	244.98
2019-10-08	122.15	122.91	101.95	85.82	273.34	63.88	50.56	241.28
2019-11-06	172.03	132.31	76.41	108.80	286.41	58.67	42.50	231.22
2019-12-09	108.08	148.12	135.74	90.80	280.65	45.03	57.78	205.09
2020-01-13	83.90	209.25	60.96	89.15	300.35	43.85	33.83	248.17
2020-02-11	156.79	236.15	72.92	117.24	229.51	40.74	32.83	263.39
2020-03-11	88.09	115.14	209.08	103.88	283.72	98.24	78.22	269.96
2020-04-08	140.29	87.94	163.46	87.90	208.07	85.95	73.39	194.25
2020-05-06	125.05	83.23	119.15	81.52	216.35	82.95	72.02	213.20
2020-06-03	130.20	94.71	128.73	85.78	224.12	72.85	64.59	208.04
2020-07-01	116.69	97.13	126.03	86.30	213.19	80.91	65.84	205.24
2020-08-04	119.62	112.13	107.90	87.23	261.74	88.71	60.31	191.75
2020-09-02	151.16	175.40	60.95	104.45	234.10	65.21	41.12	188.00
2020-10-05	126.54	142.96	101.55	103.56	232.21	79.86	68.65	206.43
2020-11-03	130.88	127.64	102.73	97.40	203.97	89.04	51.61	193.53
2020-12-04	146.06	136.42	77.76	94.42	352.27	57.98	48.85	171.83
2021-01-14	108.08	84.13	75.59	72.89	370.94	64.16	50.36	221.51
2021-02-11	164.76	116.19	66.62	105.32	308.33	70.76	47.84	202.33
2021-03-11	101.79	107.88	73.42	96.78	191.86	63.58	41.44	162.96
2021-04-08	88.01	103.83	158.78	75.32	122.17	61.72	47.54	126.50
2021-05-06	99.67	103.63	87.11	87.80	126.38	59.77	49.20	138.08
2021-06-03	89.31	112.11	98.98	90.82	114.92	56.60	44.90	140.70
2021-07-01	69.23	82.91	97.20	89.65	111.59	54.94	46.40	129.36
2021-07-29	107.61	156.54	96.13	86.10	108.43	50.25	38.22	116.59
2021-08-26	154.27	249.09	88.88	79.62	92.30	41.29	32.93	86.10
2021-09-23	83.08	94.65	127.28	81.44	162.37	71.28	45.26	139.07
2021-10-22	105.53	141.14	106.95	84.36	124.17	61.25	42.75	103.42
2021-11-19	79.45	78.23	93.03	85.19	145.96	65.73	44.26	119.62
2022-01-03	98.78	128.06	116.25	90.05	184.22	62.67	51.08	131.20
2022-01-31	82.29	86.98	113.92	76.82	171.65	60.21	56.24	114.75
2022-02-28	67.88	64.41	137.91	79.05	89.64	60.08	59.46	116.66
2022-03-28	74.55	58.43	140.37	73.22	93.94	59.14	66.00	121.75
2022-04-28	84.11	63.40	146.99	72.58	140.50	61.34	62.54	137.53
2022-05-27	87.55	64.45	148.26	73.31	136.85	60.34	64.55	139.47
2022-06-28	119.96	72.60	198.65	80.25	138.57	66.46	76.67	149.40
2022-07-28	114.03	72.20	211.08	81.37	141.00	81.75	75.95	161.91
2022-08-25	113.12	67.15	217.61	73.73	122.85	80.04	75.70	146.99
2022-09-22	133.88	83.98	227.65	91.89	144.29	93.84	96.86	168.30
2022-10-20	141.34	90.32	300.53	107.01	142.27	95.38	116.23	160.06
2022-11-17	133.70	69.81	422.44	77.86	125.03	81.13	91.36	135.62
2023-01-04	110.81	68.87	477.80	77.09	119.01	70.50	89.88	126.99
2023-02-01	112.24	65.52	403.00	75.97	110.24	85.02	83.75	126.15
2023-03-01	102.40	60.41	500.92	73.51	106.69	74.93	85.73	111.56
2023-03-29	164.92	85.47	377.30	113.14	124.69	81.95	159.20	135.08

Table 15: Probability of Distress for U.S. and European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05
2019-03-28	0.00	0.01	0.00	0.00	0.15	0.00	0.00	0.06	0.02	0.00	0.00	0.01	0.00	0.13	0.07
2019-04-26	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2019-05-29	0.01	0.00	0.00	0.00	0.39	0.00	0.00	0.03	0.02	0.05	0.08	0.03	0.01	0.08	0.44
2019-06-26	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.07
2019-07-29	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
2019-09-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-10-08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.02	0.01	0.01	0.15
2019-11-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-12-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-01-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-03-11	0.09	0.33	0.34	0.33	0.46	0.10	0.22	0.41	0.53	0.48	0.56	0.55	0.63	0.58	0.64
2020-04-08	0.59	0.17	0.37	0.22	0.32	0.00	0.26	0.20	0.78	0.50	0.62	0.53	0.59	0.47	0.83
2020-05-06	0.31	0.03	0.01	0.03	0.23	0.00	0.17	0.15	0.42	0.13	0.48	0.30	0.44	0.18	0.49
2020-06-03	0.07	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.07	0.08	0.10	0.08	0.18	0.03	0.30
2020-07-01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.14	0.22	0.18	0.36	0.06	0.40
2020-08-04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.17	0.03	0.01	0.17
2020-09-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.01
2020-10-05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.25	0.03	0.01	0.14
2020-11-03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.10	0.01	0.00	0.11
2020-12-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.02	0.00
2021-01-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00
2021-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-03-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2021-04-08	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.02
2021-05-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2021-06-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2021-07-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
2021-08-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-09-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.02	0.03	0.01
2021-10-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
2021-11-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00
2022-01-31	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.19	0.10	0.11	0.21	0.26	0.10
2022-02-28	0.00	0.11	0.45	0.23	0.00	0.02	0.39	0.00	0.00	0.37	0.30	0.42	0.39	0.25	0.28
2022-03-28	0.02	0.09	0.78	0.34	0.00	0.02	0.58	0.01	0.05	0.47	0.51	0.26	0.49	0.40	0.32
2022-04-28	0.06	0.11	0.80	0.30	0.06	0.02	0.44	0.00	0.78	0.82	0.83	0.59	0.87	0.73	0.72
2022-05-27	0.05	0.10	0.75	0.27	0.00	0.02	0.44	0.00	0.82	0.56	0.57	0.51	0.61	0.53	0.55
2022-06-28	0.74	0.56	0.99	0.77	0.00	0.13	0.96	0.04	0.33	0.80	0.82	0.80	0.78	0.78	0.78
2022-07-28	0.58	0.46	0.98	0.61	0.01	0.55	0.89	0.15	0.03	0.35	0.35	0.44	0.44	0.31	0.30
2022-08-25	0.57	0.21	0.99	0.28	0.00	0.51	0.84	0.01	0.00	0.08	0.06	0.15	0.09	0.19	0.04
2022-09-22	0.70	0.77	0.70	0.82	0.01	0.78	0.93	0.12	0.11	0.65	0.63	0.58	0.68	0.56	0.62
2022-10-20	0.78	0.86	0.76	0.86	0.00	0.86	0.97	0.05	0.03	0.83	0.82	0.75	0.77	0.75	0.65
2022-11-17	0.52	0.18	0.92	0.20	0.00	0.27	0.59	0.00	0.18	0.08	0.14	0.11	0.06	0.32	0.04
2023-01-04	0.03	0.03	0.98	0.03	0.00	0.00	0.25	0.00	0.01	0.07	0.04	0.04	0.08	0.31	0.04
2023-02-01	0.01	0.00	0.39	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
2023-03-01	0.00	0.00	0.69	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023-03-29	0.56	0.44	0.33	0.65	0.07	0.28	0.82	0.11	0.04	0.48	0.32	0.26	0.33	0.29	0.44

Table 16: Joint Probability of Distress for U.S. and European banks.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2019-02-28	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-03-28	0.28	0.12	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-04-26	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-05-29	0.64	0.28	0.11	0.06	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-06-26	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-07-29	0.08	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-09-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-10-08	0.17	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-11-06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019-12-09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-01-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-02-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-03-11	0.93	0.86	0.78	0.72	0.65	0.57	0.48	0.37	0.29	0.23	0.16	0.11	0.07	0.03	0.01
2020-04-08	0.97	0.91	0.84	0.76	0.68	0.60	0.51	0.39	0.29	0.22	0.15	0.10	0.06	0.03	0.00
2020-05-06	0.80	0.66	0.53	0.42	0.32	0.23	0.16	0.10	0.06	0.04	0.02	0.01	0.01	0.00	0.00
2020-06-03	0.40	0.22	0.13	0.08	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-07-01	0.53	0.35	0.23	0.15	0.09	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-08-04	0.26	0.11	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-09-02	0.19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-10-05	0.30	0.11	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-11-03	0.18	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020-12-04	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-01-14	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-02-11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-03-11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-04-08	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-05-06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-06-03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-07-29	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-08-26	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-09-23	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-10-22	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021-11-19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-03	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-01-31	0.40	0.24	0.15	0.10	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022-02-28	0.80	0.64	0.52	0.41	0.31	0.23	0.15	0.09	0.04	0.02	0.01	0.00	0.00	0.00	0.00
2022-03-28	0.91	0.79	0.65	0.54	0.45	0.36	0.27	0.19	0.11	0.05	0.02	0.01	0.00	0.00	0.00
2022-04-28	0.98	0.95	0.92	0.87	0.81	0.75	0.65	0.52	0.34	0.19	0.09	0.04	0.01	0.00	0.00
2022-05-27	0.96	0.88	0.79	0.70	0.63	0.55	0.46	0.36	0.24	0.13	0.06	0.02	0.01	0.00	0.00
2022-06-28	1.00	0.99	0.98	0.95	0.92	0.87	0.82	0.77	0.68	0.57	0.42	0.22	0.07	0.01	0.00
2022-07-28	0.99	0.95	0.86	0.77	0.66	0.56	0.46	0.37	0.29	0.22	0.16	0.10	0.04	0.01	0.00
2022-08-25	1.00	0.90	0.71	0.53	0.36	0.23	0.13	0.07	0.05	0.03	0.02	0.01	0.00	0.00	0.00
2022-09-22	0.99	0.97	0.94	0.90	0.85	0.80	0.72	0.64	0.57	0.49	0.39	0.27	0.11	0.02	0.00
2022-10-20	1.00	0.99	0.98	0.96	0.94	0.91	0.85	0.79	0.72	0.64	0.53	0.36	0.06	0.01	0.00
2022-11-17	0.95	0.78	0.60	0.43	0.31	0.21	0.14	0.09	0.05	0.03	0.02	0.01	0.00	0.00	0.00
2023-01-04	0.98	0.47	0.21	0.11	0.06	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2023-02-01	0.40	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023-03-01	0.69	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023-03-29	0.93	0.83	0.74	0.65	0.54	0.45	0.35	0.28	0.21	0.16	0.12	0.08	0.05	0.02	0.01

Table 17: Expected Proportion in Distress for U.S. and European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	0.13	0.20	0.07	0.27	0.08	0.07	0.07	0.19	0.14	0.07	0.20	0.14	0.19	0.21	0.08
2019-03-28	0.21	0.35	0.27	0.42	0.12	0.07	0.30	0.17	0.18	0.34	0.33	0.25	0.30	0.13	0.16
2019-04-26	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.13	0.11	0.07	0.23	0.16	0.20	0.19	0.10
2019-05-29	0.26	0.45	0.07	0.43	0.13	0.07	0.07	0.21	0.31	0.31	0.27	0.33	0.36	0.27	0.14
2019-06-26	0.07	0.18	0.07	0.07	0.08	0.07	0.07	0.17	0.16	0.20	0.17	0.23	0.26	0.21	0.08
2019-07-29	0.15	0.07	0.07	0.09	0.18	0.07	0.07	0.19	0.20	0.24	0.23	0.23	0.07	0.15	0.11
2019-09-10	0.08	0.07	0.07	0.07	0.09	0.07	0.07	0.07	0.07	0.07	0.07	0.13	0.13	0.07	0.10
2019-10-08	0.08	0.23	0.07	0.07	0.10	0.07	0.07	0.07	0.16	0.32	0.28	0.19	0.23	0.21	0.09
2019-11-06	0.07	0.07	0.07	0.07	0.09	0.07	0.07	0.07	0.07	0.07	0.07	0.20	0.20	0.07	0.13
2019-12-09	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.10	0.07	0.13
2020-01-13	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.15	0.07	0.10
2020-02-11	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.09
2020-03-11	0.70	0.62	0.62	0.62	0.58	0.77	0.65	0.60	0.55	0.59	0.56	0.57	0.53	0.56	0.53
2020-04-08	0.53	0.70	0.61	0.67	0.64	0.92	0.63	0.69	0.49	0.58	0.55	0.59	0.55	0.60	0.49
2020-05-06	0.38	0.69	0.71	0.71	0.40	0.84	0.43	0.45	0.35	0.53	0.36	0.43	0.37	0.48	0.36
2020-06-03	0.20	0.43	0.43	0.48	0.29	0.07	0.31	0.32	0.26	0.30	0.28	0.29	0.22	0.34	0.17
2020-07-01	0.28	0.49	0.43	0.51	0.33	0.07	0.34	0.42	0.38	0.31	0.27	0.29	0.21	0.36	0.21
2020-08-04	0.15	0.24	0.07	0.24	0.19	0.07	0.17	0.07	0.33	0.31	0.25	0.13	0.21	0.26	0.13
2020-09-02	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.16	0.07	0.07	0.07	0.15	0.07	0.14
2020-10-05	0.11	0.15	0.07	0.18	0.07	0.07	0.14	0.07	0.24	0.32	0.25	0.11	0.20	0.26	0.14
2020-11-03	0.10	0.15	0.07	0.18	0.07	0.07	0.12	0.07	0.20	0.25	0.21	0.12	0.24	0.27	0.11
2020-12-04	0.09	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.16	0.08	0.26	0.25	0.24	0.13	0.21
2021-01-14	0.11	0.07	0.07	0.07	0.14	0.07	0.17	0.20	0.14	0.17	0.07	0.07	0.16	0.07	0.18
2021-02-11	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.20	0.07	0.10	0.11	0.27	0.12
2021-03-11	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.11	0.19	0.27	0.13	0.19	0.14	0.11
2021-04-08	0.07	0.07	0.08	0.07	0.07	0.07	0.10	0.07	0.11	0.23	0.21	0.14	0.21	0.19	0.11
2021-05-06	0.07	0.13	0.07	0.17	0.07	0.07	0.09	0.07	0.08	0.18	0.17	0.09	0.12	0.07	0.22
2021-06-03	0.07	0.07	0.07	0.07	0.07	0.07	0.10	0.07	0.11	0.19	0.23	0.10	0.16	0.12	0.16
2021-07-01	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.23	0.07
2021-07-29	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.10	0.27	0.22	0.09	0.14	0.11	0.07
2021-08-26	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.09	0.07	0.07	0.08	0.13	0.09	0.07
2021-09-23	0.08	0.21	0.16	0.27	0.07	0.23	0.15	0.07	0.24	0.16	0.30	0.18	0.16	0.14	0.24
2021-10-22	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.24	0.21	0.10	0.17	0.10	0.33
2021-11-19	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.16	0.15	0.15	0.17	0.10	0.13
2022-01-03	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.14	0.15	0.21	0.13	0.16	0.19
2022-01-31	0.07	0.41	0.34	0.34	0.07	0.07	0.27	0.07	0.07	0.23	0.30	0.26	0.22	0.19	0.29
2022-02-28	0.52	0.44	0.33	0.37	0.07	0.62	0.34	0.77	0.63	0.38	0.41	0.35	0.37	0.41	0.41
2022-03-28	0.62	0.60	0.35	0.48	0.07	0.65	0.37	0.62	0.57	0.45	0.43	0.50	0.43	0.45	0.50
2022-04-28	0.72	0.71	0.52	0.63	0.72	0.80	0.59	0.86	0.52	0.53	0.53	0.58	0.52	0.55	0.56
2022-05-27	0.66	0.65	0.45	0.57	0.78	0.74	0.52	0.79	0.43	0.52	0.52	0.53	0.51	0.52	0.53
2022-06-28	0.68	0.71	0.62	0.67	0.89	0.81	0.63	0.86	0.75	0.68	0.68	0.68	0.69	0.68	0.69
2022-07-28	0.54	0.58	0.44	0.54	0.80	0.55	0.46	0.68	0.75	0.64	0.64	0.59	0.60	0.64	0.66
2022-08-25	0.35	0.45	0.27	0.42	0.73	0.36	0.30	0.61	0.62	0.55	0.59	0.47	0.52	0.45	0.62
2022-09-22	0.66	0.65	0.67	0.64	0.89	0.65	0.60	0.81	0.80	0.69	0.70	0.70	0.69	0.71	0.70
2022-10-20	0.70	0.69	0.71	0.69	0.94	0.69	0.66	0.87	0.85	0.70	0.71	0.71	0.72	0.71	0.74
2022-11-17	0.34	0.46	0.26	0.45	0.66	0.42	0.32	0.68	0.40	0.55	0.50	0.49	0.58	0.39	0.65
2023-01-04	0.34	0.35	0.13	0.34	0.60	0.48	0.22	0.65	0.36	0.35	0.40	0.35	0.34	0.22	0.39
2023-02-01	0.21	0.26	0.08	0.27	0.07	0.17	0.16	0.07	0.19	0.26	0.31	0.22	0.32	0.19	0.38
2023-03-01	0.23	0.07	0.07	0.30	0.07	0.20	0.15	0.07	0.07	0.23	0.33	0.22	0.21	0.19	0.33
2023-03-29	0.49	0.53	0.57	0.46	0.81	0.61	0.41	0.77	0.67	0.53	0.60	0.59	0.59	0.58	0.54

Table 18: Expected Shortfall for U.S. and European banks.

	BCS	BNP	CS	GLE	ISP	SAN	UBS	UCG	AXP	BAC	C	GS	JPM	MS	WFC
2019-02-28	80.06	68.66	81.84	68.77	170.90	65.69	37.87	156.14	43.32	68.89	80.22	109.45	71.31	91.37	68.34
2019-03-28	84.15	65.19	102.33	65.21	195.76	76.65	43.16	199.18	43.96	61.67	73.75	96.13	60.99	111.84	60.61
2019-04-26	73.07	54.87	83.70	57.41	187.45	59.04	37.73	172.10	43.46	63.47	72.78	100.84	64.70	86.13	61.55
2019-05-29	89.13	55.15	86.35	57.49	214.48	53.57	30.64	175.02	40.95	80.92	91.35	93.05	61.07	96.65	81.06
2019-06-26	68.36	71.07	76.51	47.52	166.58	45.21	31.56	147.36	38.55	90.30	94.87	92.05	60.31	85.50	80.82
2019-07-29	84.15	47.26	64.38	160.81	139.78	43.54	29.21	140.73	36.33	62.09	68.43	82.74	46.04	98.58	68.27
2019-09-10	85.23	39.68	51.62	51.02	113.95	40.41	26.38	101.64	41.93	67.10	73.20	93.15	84.77	90.37	68.79
2019-10-08	74.77	53.62	65.87	48.89	119.69	44.60	30.63	112.92	48.24	79.23	87.85	110.36	69.77	101.68	76.05
2019-11-06	113.82	61.20	59.87	70.70	132.08	42.54	31.35	112.14	33.00	62.29	65.86	83.85	66.65	75.34	60.56
2019-12-09	65.11	41.52	97.63	49.95	114.30	39.48	39.89	89.91	36.96	81.95	70.69	124.41	85.06	91.45	68.51
2020-01-13	51.31	35.26	46.72	38.69	96.75	32.67	25.93	86.95	38.93	73.65	73.81	103.17	91.90	86.84	76.96
2020-02-11	60.23	41.80	61.01	49.96	80.82	34.40	27.48	71.47	34.28	64.88	66.85	83.45	74.48	72.84	74.10
2020-03-11	79.70	96.52	150.05	96.16	251.83	82.42	60.00	235.43	56.86	146.36	165.27	150.29	144.11	180.19	159.17
2020-04-08	127.14	76.44	139.26	77.46	179.41	76.14	63.54	170.76	70.16	103.45	115.55	117.68	89.62	114.06	98.47
2020-05-06	111.82	71.33	106.87	71.33	180.32	71.59	63.67	178.51	55.70	75.28	98.73	106.45	76.39	90.91	80.57
2020-06-03	96.49	55.85	78.30	56.06	125.04	52.42	45.38	125.14	40.11	79.72	89.34	100.52	76.79	80.46	90.82
2020-07-01	82.97	54.38	78.81	55.62	120.33	53.25	44.87	121.87	31.85	79.83	92.27	103.99	86.13	80.88	90.48
2020-08-04	76.47	55.23	69.32	52.07	102.88	56.85	41.55	107.86	28.90	66.24	77.16	133.46	64.81	74.48	83.21
2020-09-02	65.67	41.52	50.83	41.50	83.09	44.24	33.62	79.84	32.22	56.09	70.53	339.79	62.96	68.65	76.95
2020-10-05	69.62	42.02	56.00	42.32	100.32	51.35	36.29	105.03	36.30	61.59	73.42	156.78	62.96	69.63	82.79
2020-11-03	75.39	43.69	58.87	44.02	104.23	55.84	31.80	113.26	36.27	62.02	74.84	149.15	58.17	66.68	85.22
2020-12-04	62.99	43.09	52.14	41.39	68.41	38.78	30.70	74.31	36.68	138.64	63.94	67.25	53.06	106.60	67.27
2021-01-14	66.33	40.52	55.75	39.81	159.30	49.10	35.96	127.94	41.53	55.11	59.04	459.75	58.60	57.72	63.97
2021-02-11	51.69	32.51	46.11	33.16	64.07	36.55	29.18	67.10	42.41	63.32	69.12	165.33	76.37	96.29	72.56
2021-03-11	47.44	29.04	47.27	27.90	70.86	39.31	29.13	76.92	39.03	68.97	72.46	115.94	68.11	84.07	76.97
2021-04-08	52.72	40.15	86.29	38.35	74.82	43.14	36.43	81.61	43.10	65.18	75.09	131.27	61.84	80.11	79.07
2021-05-06	59.56	50.33	68.10	51.49	74.32	47.44	41.71	82.91	41.14	64.25	69.15	205.48	66.32	69.45	63.35
2021-06-03	50.23	41.98	68.10	43.39	68.53	38.57	37.42	75.75	39.43	66.59	75.05	168.84	65.68	118.43	65.54
2021-07-01	46.11	39.16	61.64	40.08	59.20	31.95	35.37	69.44	41.11	64.71	80.41	235.23	58.41	159.71	60.67
2021-07-29	44.54	36.54	62.47	37.82	56.09	33.54	33.05	61.07	38.56	63.78	74.33	171.58	66.09	133.03	60.94
2021-08-26	44.90	36.34	59.30	35.31	55.78	31.52	31.89	61.79	37.06	63.86	74.07	191.63	68.83	160.44	56.12
2021-09-23	53.45	46.18	75.90	44.63	69.73	42.48	36.48	74.54	37.49	76.61	73.57	95.62	71.93	112.41	67.65
2021-10-22	48.22	35.69	59.52	35.65	63.19	40.17	36.02	69.57	36.57	66.08	74.95	182.98	66.03	99.43	64.90
2021-11-19	52.20	41.81	64.29	45.48	68.85	42.38	36.23	78.27	34.23	70.49	83.01	90.08	67.37	136.99	69.52
2022-01-03	58.94	41.06	66.59	43.94	68.32	42.30	36.21	72.75	34.53	78.03	89.50	83.57	72.54	80.54	73.04
2022-01-31	58.80	42.54	76.12	45.37	79.49	44.22	43.35	77.65	36.53	79.76	83.13	96.97	75.07	111.45	74.03
2022-02-28	63.73	54.07	117.36	64.68	81.52	52.99	53.83	105.56	34.65	75.91	84.47	113.90	71.78	84.76	74.99
2022-03-28	72.42	55.84	134.26	69.94	89.50	56.54	62.92	115.15	40.81	79.27	97.32	97.96	75.04	92.26	76.40
2022-04-28	78.64	57.59	135.14	65.87	119.65	56.24	58.10	128.42	51.06	91.00	107.47	107.97	86.58	104.09	87.45
2022-05-27	83.23	59.22	137.57	67.12	126.88	55.03	60.04	129.72	54.00	94.12	108.54	110.35	91.25	107.15	92.61
2022-06-28	119.42	72.02	196.60	79.61	137.46	66.06	76.10	148.53	51.29	112.42	128.80	132.43	104.79	125.54	106.89
2022-07-28	113.48	71.72	209.15	80.80	140.05	81.28	75.40	160.93	42.47	92.89	107.86	115.08	90.64	105.67	90.34
2022-08-25	112.62	66.77	215.82	73.20	122.04	79.71	75.25	146.46	41.34	82.35	93.21	104.23	79.39	89.02	79.26
2022-09-22	132.52	82.89	224.14	90.68	142.78	92.67	95.74	166.99	45.92	110.04	125.00	123.61	104.98	123.56	104.35
2022-10-20	140.36	89.54	295.89	105.85	141.30	94.64	115.01	159.31	44.13	117.08	135.22	136.35	107.33	133.82	107.99
2022-11-17	132.39	68.80	416.78	76.89	123.49	80.19	89.87	134.26	47.93	90.75	108.85	112.15	82.70	117.87	83.30
2023-01-04	105.04	63.62	429.12	70.73	113.97	66.71	81.43	121.98	44.50	93.00	102.93	106.32	85.22	146.36	85.40
2023-02-01	109.58	62.44	379.62	71.13	107.64	82.45	81.12	123.33	40.30	77.67	85.76	91.39	71.04	88.02	72.07
2023-03-01	98.67	56.53	441.79	65.25	103.76	69.27	82.13	110.19	39.04	84.06	91.70	96.87	78.42	87.92	76.46
2023-03-29	160.57	82.51	403.48	109.72	123.01	79.46	155.98	131.92	43.20	119.17	116.78	116.61	94.84	113.39	108.86

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