



Appendices

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Appendix A

Generalized Extreme Values

(GEV) Analysis in Asia Emerging Market Morgan

Stanley Capital International (Asia EM MSCI) By R Software

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**Appendix A1-1: Generalized Extreme Value Analysis from Monthly Minima
Block (Maximum Loose Return) of Asia Emerging Market
Morgan Stanley Capital International**

	obs	return
N	121.00000	1.210000e+02
mean	61.00000	2.270768e-02
Std.Dev.	35.07373	1.496296e-02
min	1.00000	2.026334e-03
Q1	31.00000	1.261405e-02
median	61.00000	1.929019e-02
Q3	91.00000	2.736173e-02
max	121.00000	9.994404e-02
missing values	0.00000	0.000000e+00

**Appendix A1-2: Fit Generalized Extreme Value Parameters by Minima Monthly
Block Approach from Maximum Loose Return of Asia
Emerging Market Morgan Stanley Capital International**

Response variable: return

No optimization method selected. Using "Nelder-Mead" (use 'help(optim)' for more details)

L-moments (stationary case) estimates (used to initialize MLE optimization routine):

Location (mu): 0.01559333

Scale (sigma): 0.008676618

Shape (xi): 0.1992034

Likelihood ratio test (5% level) for $\xi=0$ does not accept Gumbel hypothesis.

likelihood ratio statistic is $10.81486 > 3.841459$ 1 df chi-square critical value.

p-value for likelihood-ratio test is 0.001006885

Convergence successfull![1] "Convergence successfull!"

"Maximum Likelihood Estimates:"

	MLE	Stand. Err.
MU: (identity)	0.01554	0.00088
SIGMA: (identity)	0.00849	0.00065
Xi: (identity)	0.22480	0.08099

"Negative log-likelihood: -370.442806295477"

Parameter covariance:

	[,1]	[,2]	[,3]
[,1]	7.784384e-07	3.381903e-07	-2.332967e-05
[,2]	3.381903e-07	4.191261e-07	-3.493112e-06
[,3]	-2.332967e-05	-3.493112e-06	6.558892e-03

"Convergence code (see help file for optim): 0"

NULL

Model name: gev.fit1

Appendix A1-3: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 5 Years by Fitting Minima Monthly Block Base on Generalized Extreme Value Analysis

"Estimating CIs for GEV 5-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 90% confidence interval approximately" "(0.02775, 0.03437)"

"shape parameter (ξ): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 5-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 95% confidence interval approximately" "(0.02724, 0.03521)"

"shape parameter (ξ): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 5-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 99% confidence interval approximately" "(0.02629, 0.03704)"

"shape parameter (ξ): 99% confidence interval approximately" "(0.04169, 0.45565)"

Appendix A1-4: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 10 Years by Fitting Minima Monthly Block Base on Generalized Extreme Value Analysis

"Estimating CIs for GEV 10-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 90% confidence interval approximately" "(0.03581, 0.04715)"

"shape parameter (ξ): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 10-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 95% confidence interval approximately" "(0.03507, 0.04884)"

"shape parameter (ξ): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 10-yr. return level and shape parameter (ξ)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 99% confidence interval approximately" "(0.03372, 0.05265)"

"shape parameter (ξ): 99% confidence interval approximately" "(0.04169, 0.45565)"

**Appendix A1-5: Estimate Return Level and Shape Parameter Confidence
Intervals in the Next 20 Years by Fitting Minima Monthly Block
Base on Generalized Extreme Value Analysis**

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 90% confidence interval approximately" "(0.04419, 0.06332)"

"shape parameter (xi): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 95% confidence interval approximately" "(0.04312, 0.06647)"

"shape parameter (xi): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 99% confidence interval approximately" "(0.04122, 0.07241)"

"shape parameter (xi): 99% confidence interval approximately" "(0.04169, 0.45564)"

Appendix A2-1: Generalized Extreme Value Analysis from Annual Minima Block (Maximum Loose Return) of Asia Emerging Market Morgan Stanley Capital International

	obs	return
N	11.000000	11.00000000
mean	6.000000	0.04711942
Std.Dev.	3.316625	0.02270451
min	1.000000	0.02026334
Q1	3.500000	0.03083771
median	6.000000	0.04746931
Q3	8.500000	0.05491645
max	11.000000	0.09994404
missing values	0.000000	0.00000000

Appendix A2-2: Fit Generalized Extreme Value Parameters by Minima Annual Block Approach from Maximum Loose Return of Asia Emerging Market Morgan Stanley Capital International

Response variable: return

No optimization method selected. Using "Nelder-Mead" (use 'help(optim)' for more details)

L-moments (stationary case) estimates (used to initialize MLE optimization routine):

Location (μ): 0.03602358

Scale (σ): 0.01728638

Shape (ξ): 0.06164878

Likelihood ratio test (5% level) for $\xi=0$ does not reject Gumbel hypothesis.

likelihood ratio statistic is $0.06741345 < 3.841459$ 1 df chi-square critical value.

p-value for likelihood-ratio test is 0.7951407

Convergence successfull![1] "Convergence successfull!"

"Maximum Likelihood Estimates:"

	MLE	Stand. Err.
MU: (identity)	0.03671	0.00570
SIGMA: (identity)	0.01593	0.00428
Xi: (identity)	0.07298	0.29965

"Negative log-likelihood: -27.6916118074928"

Parameter covariance:

	[,1]	[,2]	[,3]
[1,]	3.246409e-05	1.265687e-05	-0.0007522739
[2,]	1.265687e-05	1.833384e-05	-0.0004790246
[3,]	-7.522739e-04	-4.790246e-04	0.0897884649

"Convergence code (see help file for optim): 0"

NULL

Model name: gev.fit1

Appendix A2-3: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 5 Years by Fitting Minima Annual Block Base on Generalized Extreme Value Analysis

"Estimating CIs for GEV 5-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 90% confidence interval approximately" "(0.02775, 0.03437)"

"shape parameter (xi): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 5-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 95% confidence interval approximately" "(0.02724, 0.03521)"

"shape parameter (xi): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 5-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0307"

"Estimated (MLE) shape parameter = 0.2248"

"5-year return level: 99% confidence interval approximately" "(0.02629, 0.03704)"

"shape parameter (xi): 99% confidence interval approximately" "(0.04169, 0.45565)"

Appendix A2-4: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 10 Years by Fitting Minima Annual Block Base on Generalized Extreme Value Analysis

"Estimating CIs for GEV 10-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 90% confidence interval approximately" "(0.03581, 0.04715)"

"shape parameter (xi): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 10-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 95% confidence interval approximately" "(0.03507, 0.04884)"

"shape parameter (xi): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 10-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0404"

"Estimated (MLE) shape parameter = 0.2248"

"10-year return level: 99% confidence interval approximately" "(0.03372,0.05265)"

"shape parameter (xi): 99% confidence interval approximately" "(0.04169,0.45565)"

Appendix A2-5: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 20 Years by Fitting Minima Annual Block Base on Generalized Extreme Value Analysis

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 90% confidence interval approximately" "(0.04419, 0.06332)"

"shape parameter (xi): 90% confidence interval approximately" "(0.10210, 0.36703)"

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 95% confidence interval approximately" "(0.04312, 0.06647)"

"shape parameter (xi): 95% confidence interval approximately" "(0.08091, 0.39640)"

"Estimating CIs for GEV 20-yr. return level and shape parameter (xi)."

"Estimated return level = 0.0514"

"Estimated (MLE) shape parameter = 0.2248"

"20-year return level: 99% confidence interval approximately" "(0.04122, 0.07241)"

"shape parameter (xi): 99% confidence interval approximately" "(0.04169, 0.45564)"



Appendix B

Generalized Pareto Distribution

(GPD) Analysis in Asia Emerging Market Morgan

Stanley Capital International (Asia EM MSCI) By R Software

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Appendix B1: Generalized Pareto Distribution Analysis of Asia Emerging Market Morgan Stanley Capital International

	obs	return
N	2789.0000	2.789000e+03
mean	1395.0000	1.206051e-02
Std.Dev.	805.2593	1.842128e-02
min	1.0000	0.000000e+00
Q1	698.0000	3.369582e-03
median	1395.0000	7.149781e-03
Q3	2092.0000	1.369245e-02
max	2789.0000	3.465192e-01
missing values	0.0000	0.000000e+00

Appendix B-2: Fit Generalized Pareto Distribution Parameters by with Minima Block (Daily Maximum Loose Return) of Asia Emerging Market Morgan Stanley Capital International

"Declustering ..."

"declustering performed for:"

"return and assigned to return.u0.04r1dc"

"78 clusters using threshold of 0.04 and $r = 1$ "

No optimization method selected. Using "Nelder-Mead" (use 'help(optim)' for more details)

L-moments estimates for (stationary) GPD are:

scale: 0.0385154

shape: 0.1215813

These L-moments estimators were used as initial parameter estimates.

Likelihood ratio test (5% level) for $\xi=0$ does not reject Exponential hypothesis.

likelihood ratio statistic is 0.4348669 < 3.841459 1 df chi-square critical value.

p-value for likelihood-ratio test is 0.5096104

Convergence successfull!

"Threshold = 0.04"

"Number of exceedances of threshold = 78"

"Exceedance rate (per year)= 10.214951595554"

"Maximum Likelihood Estimates:"

	MLE	Std. Err.
Scale (sigma):	0.04054603	0.006895486
Shape (xi):	0.07543111	0.127577214

"Negative log-likelihood: -166.12852311243"

Parameter covariance:

	[,1]	[,2]
[1,]	4.754773e-05	-0.0006166164
[2,]	-6.166164e-04	0.0162759455

"Convergence code (see help file for optim): 0"

NULL

Model name: gpd.fit1

Appendix B-3: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 5 Years by Fitting Minima Block Base on Generalized Pareto Distribution Analysis

Estimating CIs for GPD 5-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 5-yr. return level = 0.2257

Estimated (MLE) shape parameter = 0.0754

5-year return level: 90% confidence interval approximately (0.186, 0.32988)

shape parameter (ξ): 90% confidence interval approximately (-0.08365, 0.34528)

Estimating CIs for GPD 5-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 5-yr. return level = 0.2257

Estimated (MLE) shape parameter = 0.0754

5-year return level: 95% confidence interval approximately (0.18075, 0.36897)

shape parameter (ξ): 95% confidence interval approximately (-0.09200, 0.41163)

Estimating CIs for GPD 5-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 5-yr. return level = 0.2257

Estimated (MLE) shape parameter = 0.0754

5-year return level: 99% confidence interval approximately (0.17155, 0.48334)

shape parameter (ξ): 99% confidence interval approximately (-0.0040, 0.4000)

Appendix B-4: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 10 Years by Fitting Minima Block Base on Generalized Pareto Distribution Analysis

Estimating CIs for GPD 10-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 10-yr. return level = 0.2645

Estimated (MLE) shape parameter = 0.0754

10-year return level: 90% confidence interval approximately (0.2107, 0.43146)

shape parameter (ξ): 90% confidence interval approximately (-0.08365, 0.34528)

Estimating CIs for GPD 10-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 10-yr. return level = 0.2645

Estimated (MLE) shape parameter = 0.0754

10-year return level: 95% confidence interval approximately (0.2043, 0.4993)

shape parameter (ξ): 95% confidence interval approximately (-0.08000, 0.41163)

Estimating CIs for GPD 10-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 10-yr. return level = 0.2645

Estimated (MLE) shape parameter = 0.0754

10-year return level: 99% confidence interval approximately (0.19337, 0.70964)

shape parameter (ξ): 99% confidence interval approximately (-0.02000, 0.55619)

Appendix B-5: Estimate Return Level and Shape Parameter Confidence Intervals in the Next 20 Years by Fitting Minima Block Base on Generalized Pareto Distribution Analysis

Estimating CIs for GPD 20-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 20-yr. return level = 0.3054

Estimated (MLE) shape parameter = 0.0754

20-year return level: 90% confidence interval approximately (0.23418, 0.41673)

shape parameter (ξ): 90% confidence interval approximately (-0.08365, 0.34528)

Estimating CIs for GPD 20-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 20-yr. return level = 0.3054

Estimated (MLE) shape parameter = 0.0754

20-year return level: 95% confidence interval approximately (0.22651, 0.67272)

shape parameter (ξ): 95% confidence interval approximately (-0.08000, 0.41163)

Estimating CIs for GPD 20-yr. return level and shape parameter (ξ).

Using 365.25 days per year.

Estimated 20-yr. return level = 0.3054

Estimated (MLE) shape parameter = 0.0754

20-year return level: 99% confidence interval approximately (0.21381, 1.04191)

shape parameter (ξ): 99% confidence interval approximately (-0.01800, 0.55619)

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