

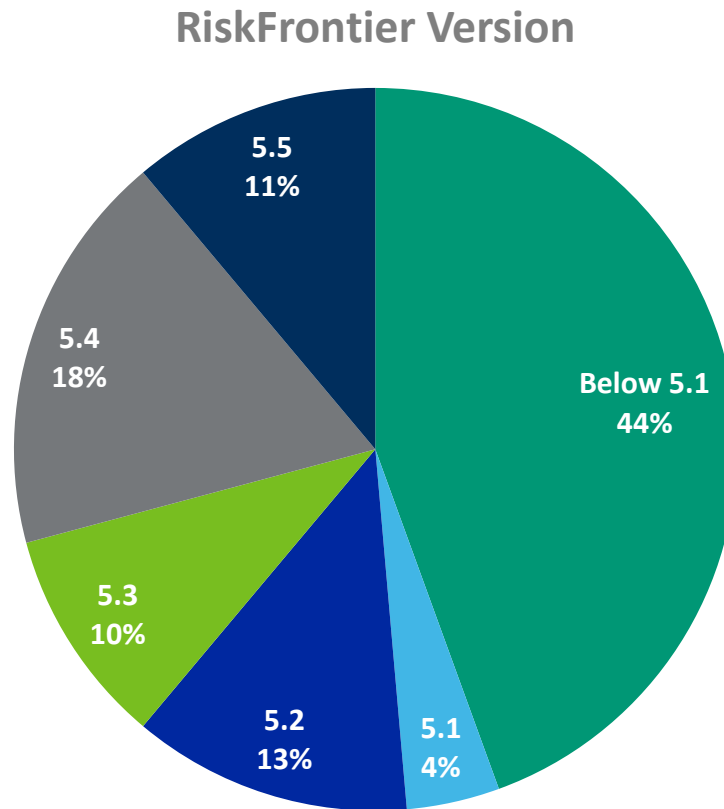
What's New in RiskFrontier™ and GCorr 2019 Update

Agenda

1. Features in Recent RiskFrontier Versions
2. Latest Features in 5.6
3. GCorr 2019 Highlights
4. Modeling Credit Risk Correlations using GCorr
5. Understanding and Implications of GCorr Corporate 2019
6. Validation of GCorr Corporate 2019
7. Understanding GCorr Sovereign 2019

Current user versions

More than half of users are using RiskFrontier 5.1 or above

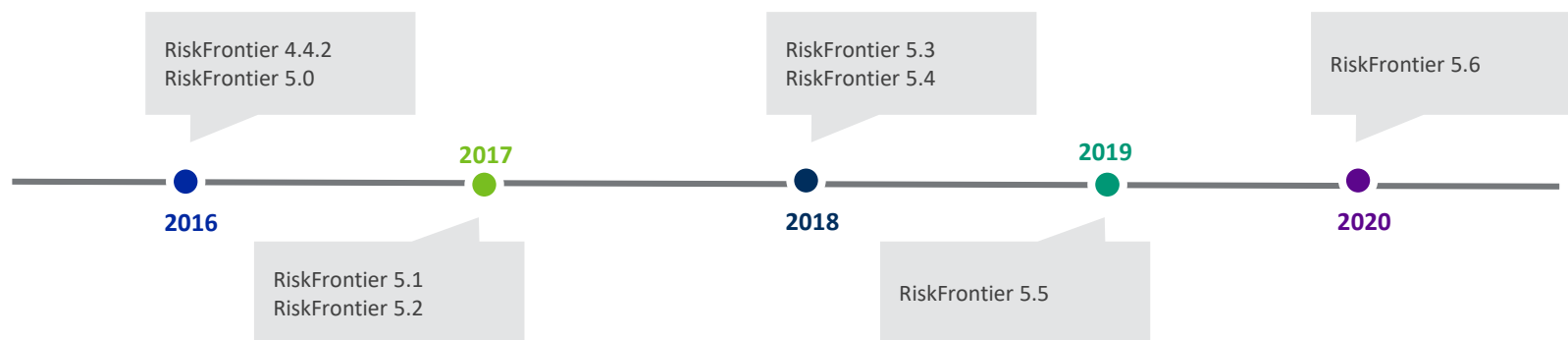


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Features in Recent
RiskFrontier Versions

Recent RiskFrontier versions

Enhancements across usability, analytics, and technology



RiskFrontier 5.4 (December 2018) and 5.5 (September 2019)

Usability	Analytics	Data
<p>Functionality enhancements that ease use and help improve process efficiency</p>	<p>Valuation enhancement of CDO module for more intuitive and accurate outcomes and GCorr update</p>	<p>Increase asset class coverage</p>
<ul style="list-style-type: none"> » CSV import feature supporting 46 commonly used tables (5.5) » Account subscription information display on the RiskFrontier User Interface (5.5) » Support custom correlation model with more than 200 macroeconomic variables (5.5) » RiskFrontier On-Demand SaaS (5.5) » Import performance for bond, loan, and lease instrument types has been improved (5.4) 	<p>CDO valuation grid now considers the number of active collateral loans at analysis date as opposed to the number of collateral loans that mature beyond horizon, making valuation more accurate for CDO tranches that mature beyond horizon with one or more collateral loans that mature prior to horizon (5.4)</p>	<ul style="list-style-type: none"> » GCorr 2018 Release (5.4) <ul style="list-style-type: none"> » Corporate correlations » Emerging Markets correlations » US / Canada Retail Correlations » US / Canada CRE Correlations » Project Finance » Macroeconomic Variables

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Latest Features in RF 5.6

RiskFrontier 5.6 - Highlights

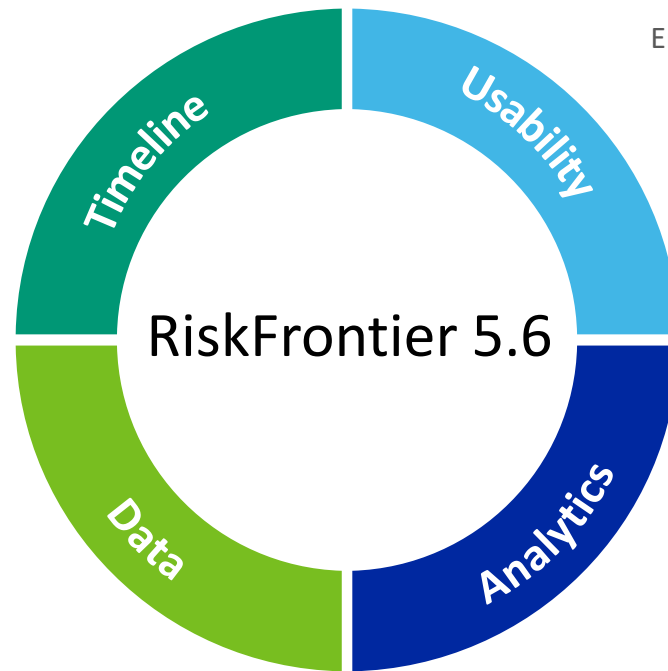


Release Date :
January 31, 2020



Addition of Sovereign
Factors

GCorr 2019 Model



Enhancement to Conditional
Simulation Module

Introduce RF SaaS APIs



Calculation of
Duration Metric



Usability: RF SaaS API

» Instance Management

Provides ability to Start and Stop the Core/DB Servers. Applicable to OnDemand setup only.

» Data Import

Provides ability to Import Portfolios in csv format. The below functionalities are part of the API

- Import CSV files only. For other file formats user will have to use UI
- Export Error Summary
- Check Import Status

» Run Analysis

Run Portfolio Analysis. The analysis & data settings have to be created on the UI

- Only Portfolio Analysis is supported with this release
- Export Error Summary
- Check Analysis Status

» Export Results

Export instrument level results is only available in this release

- Export Exposure Results with all columns included
- Other reports can be downloaded from the UI

Usability: Enhancement to Conditional Simulation

- » Prior versions of RiskFrontier required users to input return values when creating macroeconomic scenarios
- » New feature takes actual macro levels at horizon and analysis date as inputs for Macroeconomic Scenarios
- » Transformations and return calculations are handled by RiskFrontier based on the Macro variable

Before

Macroeconomic Scenario

Scenario Name: RF53 - Conditional Simulation

Description:

Select Correlation Model: GCORR 2018

Select return frequency for Moody's Analytics correlation model: Quarterly Annual

Define a Macroeconomic Scenario

Add macroeconomic variables for the scenario and specify their returns over the selected scenario period. Note that for Moody's Analytics correlation models, inputs are in the form of log returns, as explained in the description field.

Add Edit Delete

Add Macro Variable

Stress the following variable

Macroeconomic Variable	Return	Description
US VIX	0.5658	Log-Return

Add Cancel

After

Macroeconomic Scenario

Scenario Name: RF56 - Conditional Simulation

Description:

Select Correlation Model: GCORR 2019

Select return frequency for Moody's Analytics correlation model: Quarterly Annual

Define a Macroeconomic Scenario

Add macroeconomic variables for the scenario and specify inputs as of analysis date and horizon. Refer to the RiskFrontier User Guide for input definition for each macroeconomic variables. Note that for Moody's Analytics correlation models, inputs must be provided in decimals.

Add Edit Delete

Add Macro Variable

Stress the following variable

Macroeconomic Variable	Level as of Analysis Date	Level as of Horizon
US VIX	32.20	56.70

Add Cancel

**Note : RiskFrontier 5.3 and below will take inputs in the old format for conditional simulation.*

Analytics: Duration Metric

- » New feature to calculate modified duration for fixed and floating interest rate instruments
- » The option to calculate modified duration is available in the Analysis Setting
- » Generates Two Outputs
 - Yield to maturity
 - Modified Duration
- » Supported only for Lattice Valuation
- » Calculated only for the following types of instruments
 - Bonds
 - Term Loan Bullets
 - Term Loan Amortizing
 - Term Loan Amortizing – Custom Cash Flow
 - Retail Loan
 - CRE Loan

M Analysis Settings Detail

Settings Display Edit

General
Monte Carlo
Advanced
MC Seeds
Valuation
MC Output

Advanced Options

Set risk contribution floor to zero

Use default-no-default mode

Use mark-to-par spread
RiskFrontier calculates the mark-to-par spread value for use in the analysis, replacing any fee or spread information that you have provided.

Use user specified capital for allocation USD
RiskFrontier additionally provides capital outputs based on the capital value you provide and the risk contribution and/or tail-risk contribution normally calculated during a portfolio analysis.

Use user specified deleverage ratio
Leave this option unchecked to use the system's recommended value. Otherwise, check and specify your own value. The acceptable value is from 0 to 0.999.

Calculate modified duration
RiskFrontier calculates modified duration and yield to maturity at instrument level as additional outputs. Calculated only for lattice valuation and for bond and loan instrument types.

Modeling Exposure Profiles

Norm:

User's Own Credit Risk Parameters:
 User-specified value Recommended value

1-Year PD % 1-Year PD 0.020 %

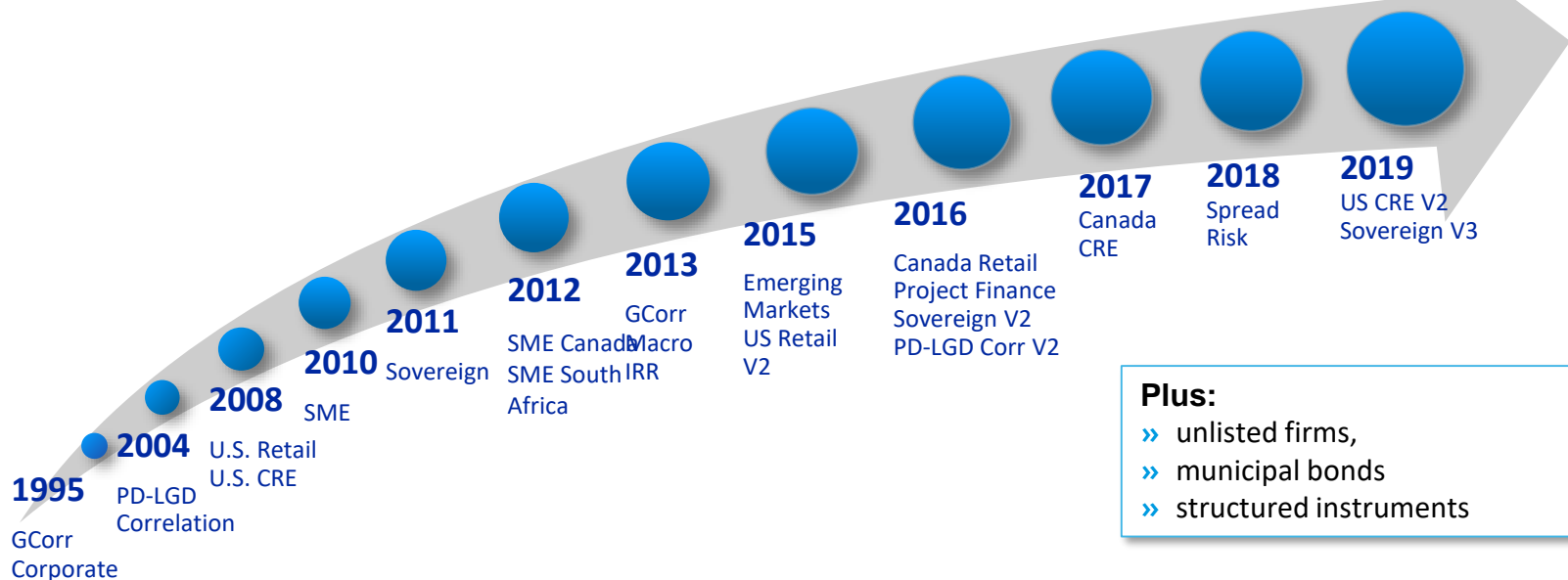
GCorr 2019 Data Update

Models Updated in GCorr 2019	Models made Compatible with GCorr 2019
<ul style="list-style-type: none">▪ GCorr Corporate▪ GCorr Emerging Markets▪ GCorr CRE US▪ GCorr Macro▪ GCorr Sovereign <p data-bbox="117 1158 938 1210"><i>*Note: the dataset used for estimation of above 2019 models will include additional data points</i></p>	<ul style="list-style-type: none">▪ GCorr CRE Canada▪ GCorr Retail US▪ GCorr Retail Canada▪ IRR Model▪ Lambda Correlations▪ PD-LGD Correlation▪ SME▪ Equity

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GCorr 2019 Highlights

Moody's Analytics Global Correlation (GCorr™) Model continues to expand



- » GCorr – a multi-factor model of correlations among Issuers' asset returns
 - GCorr includes several asset classes: corporate (listed firms), CRE, retail, SMEs, sovereigns
 - Correlations for unlisted firms, municipal bonds and structured instruments can be also determined within GCorr
- » GCorr Corporate – a forward-looking multi-factor model of asset correlations among about 47,000 listed firms from over 70 countries and a wide range of industries

GCorr 2019 Highlights

- » Models are updated using market information through March 31st, 2019
 - GCorr Corporate
 - › GCorr 2019 asset correlations are on average slightly lower globally than GCorr 2018 asset correlations.
 - › Results vary by region, sector, and size of firms. For example, asset correlations exhibit slightly increase across sectors in United States.
 - GCorr US CRE
 - › A methodology update by introducing linkage to local macroeconomic variables which allows for state-level stress testing
 - › A mild decrease in asset correlations compared to previous year
- » Sovereign model is updated with most current data, and a methodology update by introducing sovereign specific credit factors
- » Models that were made compatible with GCorr 2019: Retail, Canada CRE, SME and PD LGD model

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Modeling Credit Risk Correlations using GCorr

How to think of correlations in credit risk?

- » Portfolio credit risk analysis has two parts:
 - Stand-alone credit risk of debt instruments in the portfolio
 - Correlations (or more generally a dependence structure) of changes in credit qualities of firms
- » One way to approximate correlations of credit quality changes is to use asset returns and their correlations (i.e. asset correlations).
- » An adequate correlation model should be able to quantify diversification and concentration effects within a credit portfolio.
 - Moody's Analytics GCorr model (Global Correlation Model)

Moody's Analytics Global Correlation (GCorr™) Model continues to expand

GCorr Model continue to expand in terms of both asset classes and global coverage, and number of factors in the model has more than doubled since 2010.

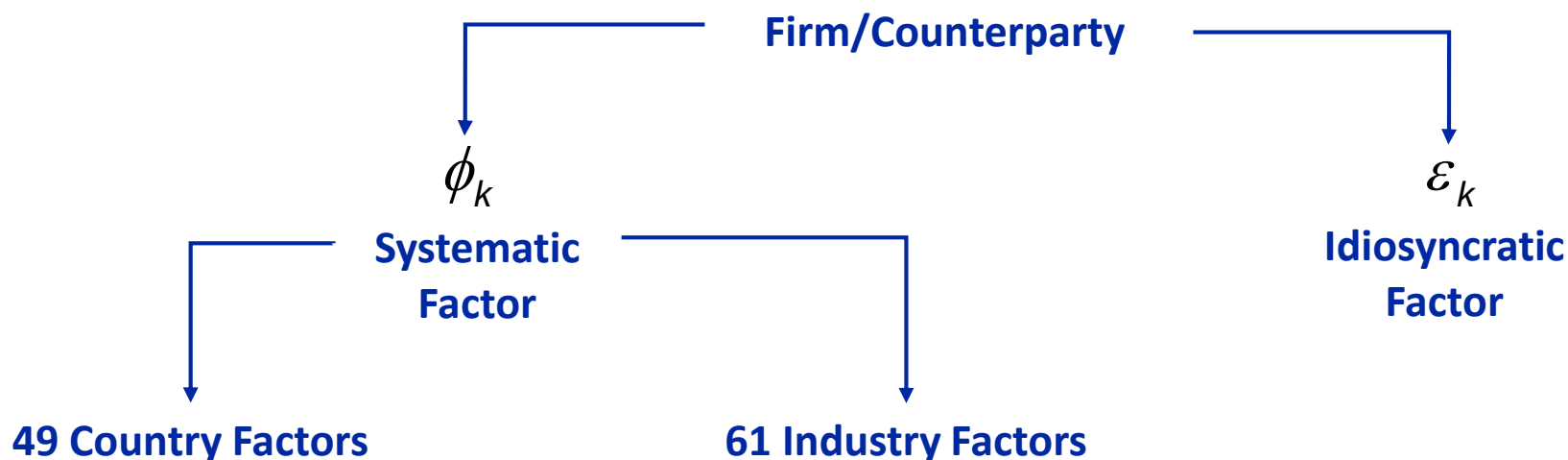
	GCorr 2010	GCorr 2011	GCorr 2012	GCorr 2013	GCorr 2014	GCorr 2015	GCorr 2016	GCorr 2017	GCorr 2018	GCorr 2019
Corporate	110	110	110	110	110	110	110	110	110	110
CRE – US	78	78	78	78	78	78	78	78	78	78
Retail – US	57	57	57	57	57	57	57	57	57	57
Macro	-	-	-	62	77	91	100	103	114	94
IRR	-	-	-	3	3	3	3	3	3	3
EM	-	-	-	-	161	161	161	161	161	161
Lambda	-	-	-	-	-	9	9	9	9	9
Local Macrovariables	-	-	-	-	-	102	138	156	156	156
Retail - Canada	-	-	-	-	-	-	24	24	24	24
CRE - Canada	-	-	-	-	-	-	-	23	23	23
Sovereign	-	-	-	-	-	-	-	-	-	133
Total Factors	245	245	245	310	486	611	680	724	735	848



 Increase of number of GCorr factors

GCorr 2019 Corporate factor structure

$$r_k = \sqrt{RSQ_k} \phi_k + \sqrt{1 - RSQ_k} \varepsilon_k$$



Systematic factors of firms i and k are correlated through their exposure to country and industry factors.

- » Given the model assumptions, the asset correlation between firms i and k is:

$$\text{corr}(r_i, r_k) = \sqrt{RSQ_i} \sqrt{RSQ_k} \text{corr}(\phi_i, \phi_k)$$

In this factor model, asset correlations are given by two sets of inputs: R-squareds and custom index correlations.

GCorr Corporate is updated and expanded annually

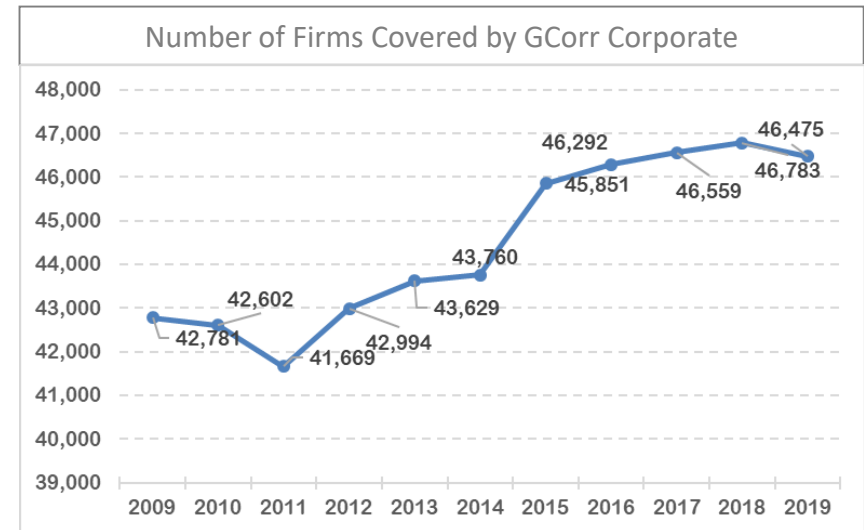
» GCorr 2019 Corporate includes the dynamics of the most recent available weekly asset returns.

- Data used for R-squared estimation – a three-year window: **April 2016 – March 2019**

GCorr 2018 Corporate: April 2015 – March 2018

- Data used for estimation of systematic factor correlations: **July 1999 – March 2019**

GCorr 2018 Corporate: July 1999 – March 2018

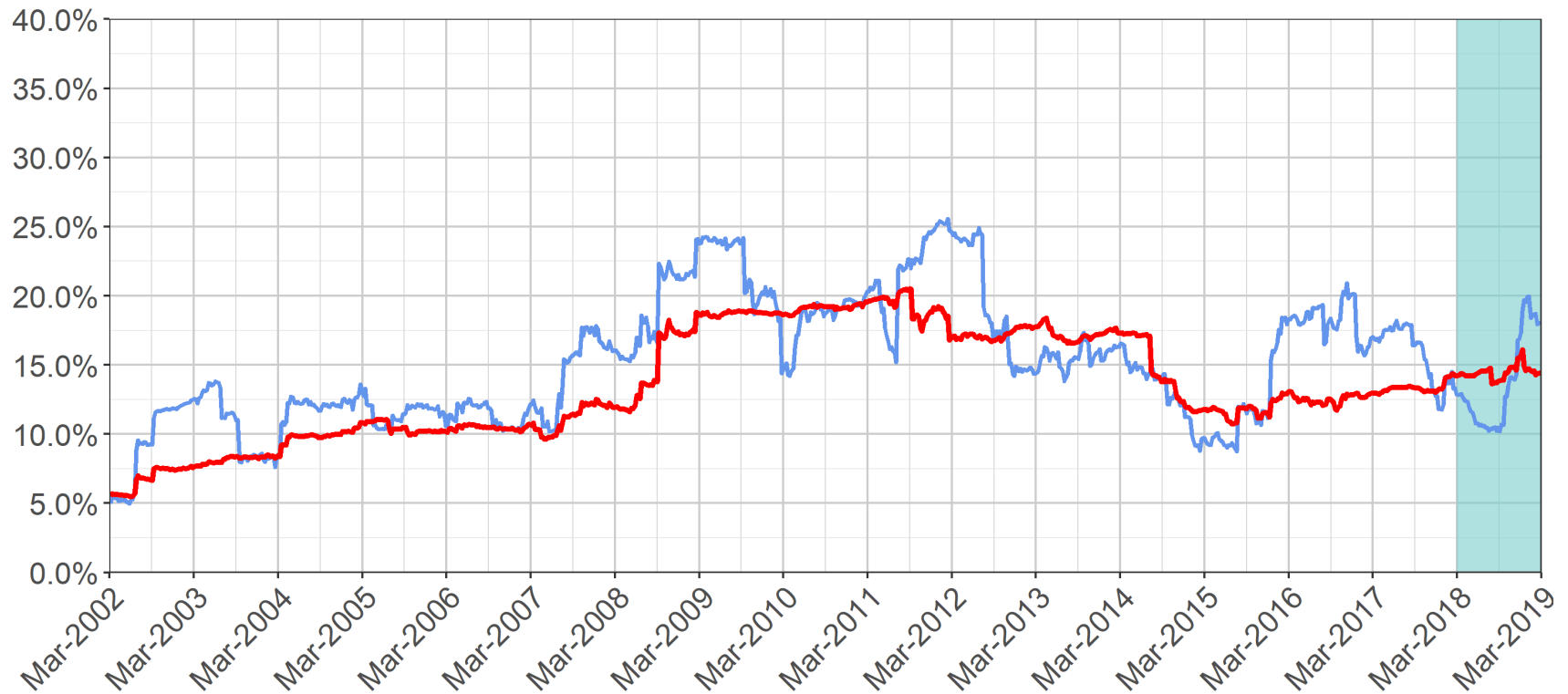


Slightly higher empirical asset correlation

Empirical asset correlation in April 2016 – March 2019 window is slightly higher than the asset correlation in April 2015 – March 2018 window

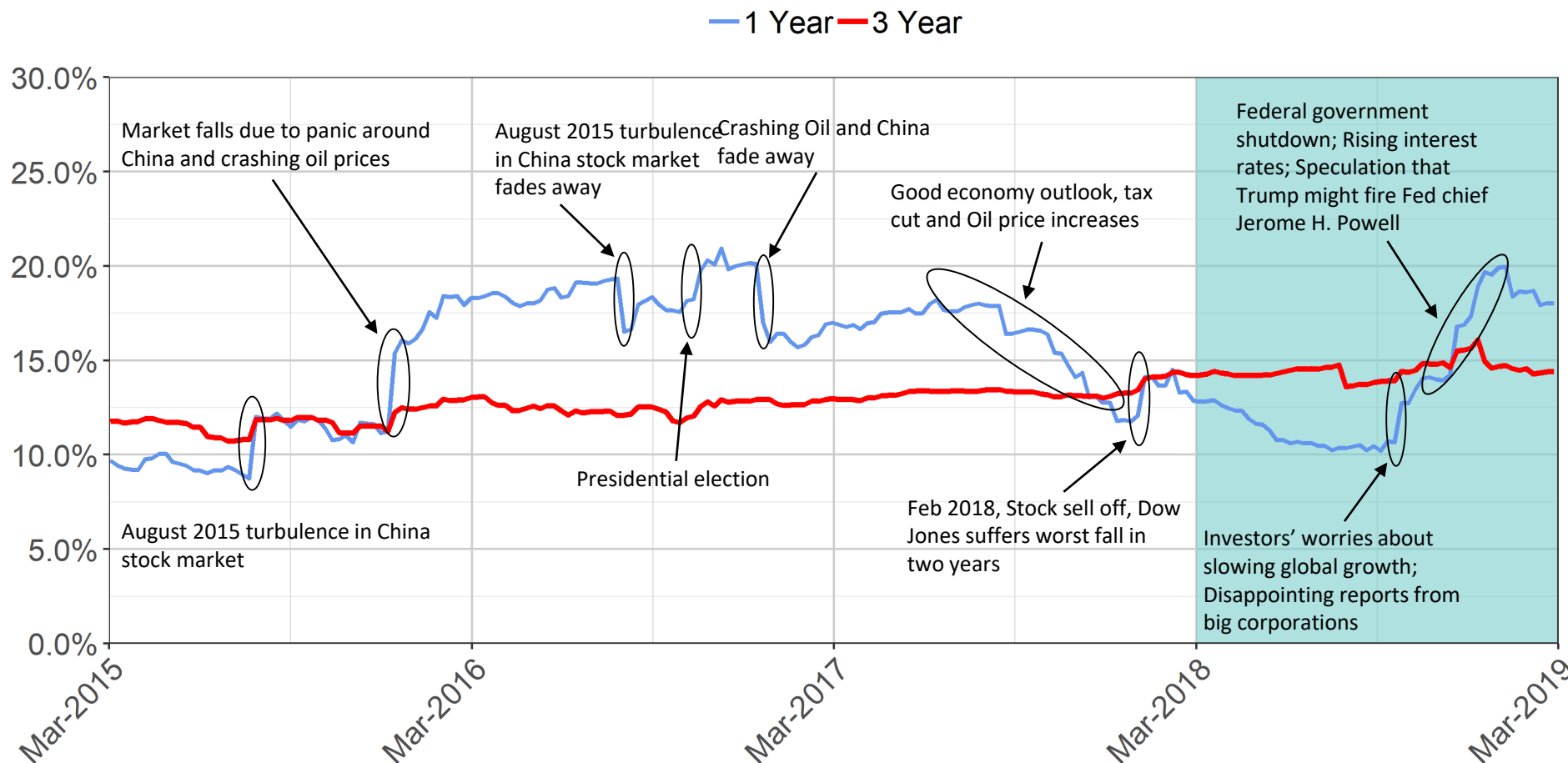
North America financial (820 Firms)

— 1 Year — 3 Year



North American Financials

North America financial (820 Firms)

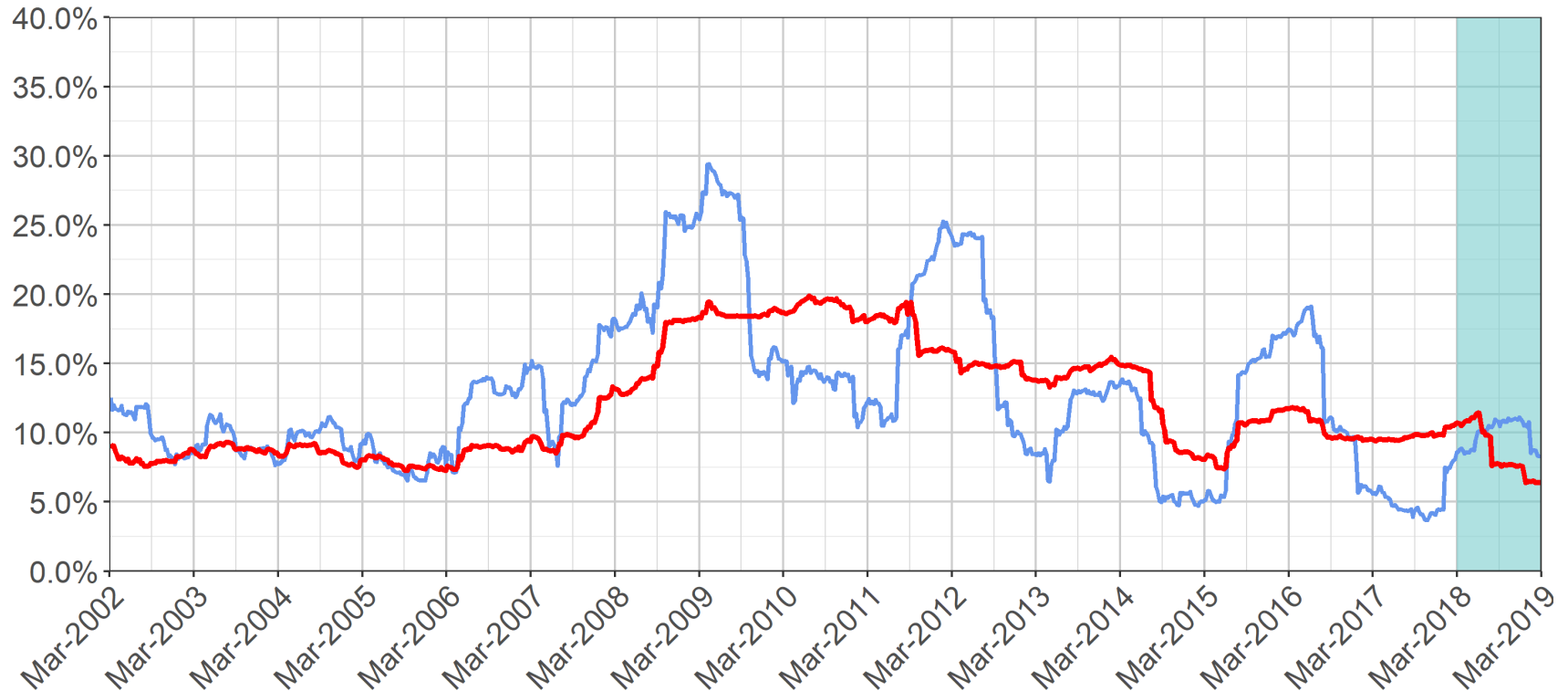


Lower empirical asset correlation

Empirical asset correlation in April 2016 – March 2019 window is lower than the asset correlation in April 2015 – March 2018 window

Asia financial (544 Firms)

— 1 Year — 3 Year



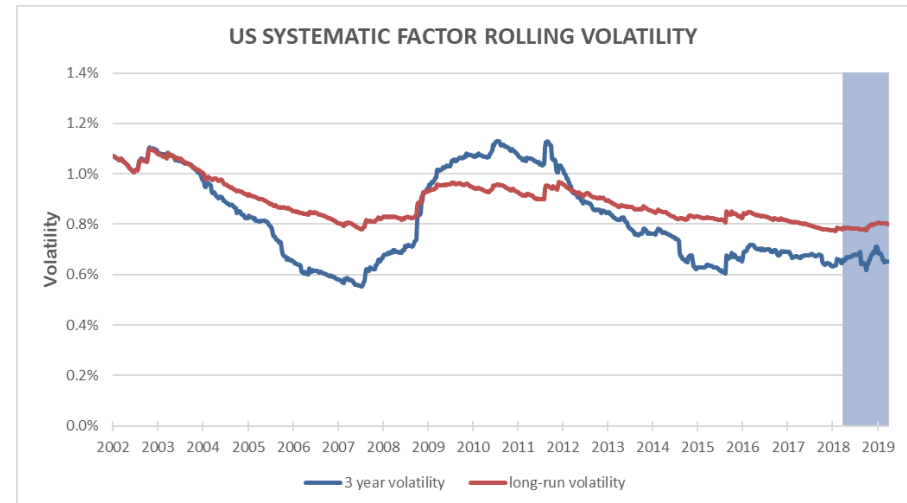
Asia Financials

Asia financial (544 Firms)



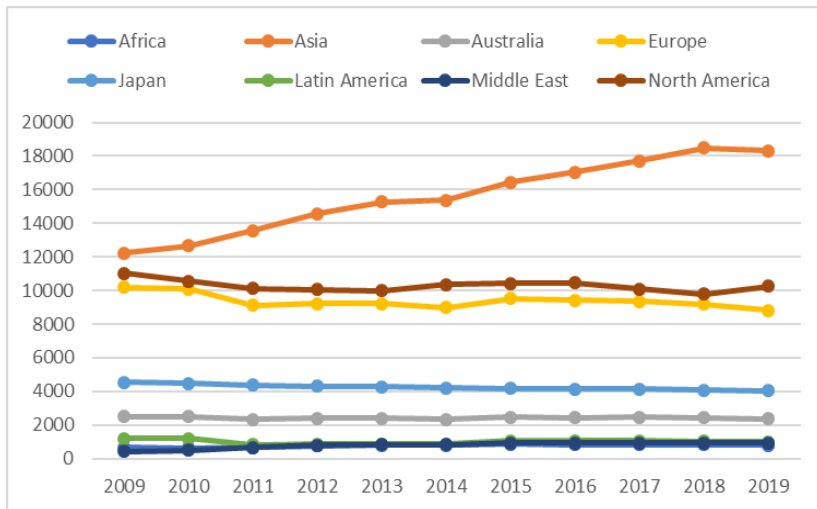
Short run volatility is below the long run volatility

- » Potential increase in volatility levels in next few years:
 - Volatility calculated over April 2016 – March 2019 window is lower than volatility over July 1999 – March 2019 window. If we expect volatility to be mean-reverting, then three-year rolling volatility can potentially increase in next couple of years.

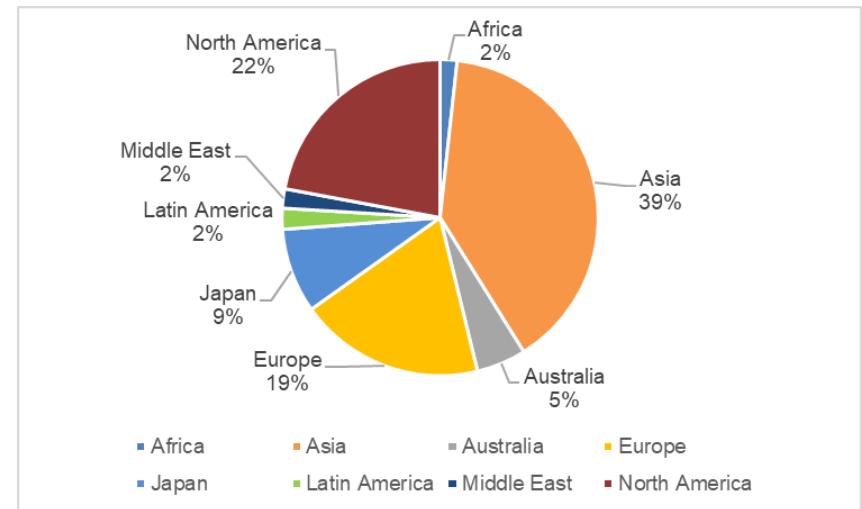


GCorr 2019 covers many firms from Asia, North America, and Europe

Number of Firms by Region



Regional Coverage in GCorr 2019



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Understanding and Implications of GCorr 2019 Corporate

Key Findings

- » GCorr 2019 asset correlations are on average slightly lower than GCorr 2018 asset correlations.
- » GCorr asset correlations are impacted by:
 - » Factor correlations: **flat**
 - » R-squared values: **slightly decrease**
- » Results vary by region, sector, and size of firms

Overall, GCorr asset correlations are slightly lower than the previous model

Global Random 5000 Firms: GCorr Asset Correlations

	Mean	Std	Min	Q1	Med	Q3	Max
GCorr2018	8.61%	5.62%	0.06%	5.06%	7.21%	10.40%	65.00%
GCorr2019	8.33%	5.33%	0.00%	4.95%	6.99%	10.04%	65.00%
GCorr2019 - GCorr2018	-0.28%	1.63%	-16.63%	-0.96%	-0.09%	0.53%	20.07%

Levels: On average, the asset correlations are slightly lower than GCorr 2018.

* Row "Differences" provides statistics for pair-wise differences between GCorr 2019 and GCorr 2018 correlations. Thus, it is not determined by subtracting statistics in the first row from those in the second row.

Overall, GCorr factor correlations are unchanged and RSQs are slightly lower

Global Random 5000 Firms: GCorr Factor Correlations

	Mean	Std	Min	Q1	Med	Q3	Max
GCorr2018	43.8%	17.4%	0.2%	31.8%	40.9%	52.3%	100.0%
GCorr2019	43.8%	17.4%	0.0%	31.7%	40.8%	52.2%	100.0%
GCorr2019 - GCorr2018	0.0%	2.1%	-50.4%	-0.4%	0.0%	0.4%	50.8%

Global Random 5000 Firms: GCorr RSQ

	Mean	Std	Min	Q1	Med	Q3	Max
GCorr2018	21.7%	14.1%	10.0%	10.0%	15.5%	30.2%	65.0%
GCorr2019	20.9%	13.3%	10.0%	10.0%	15.0%	29.0%	65.0%
GCorr2019 - GCorr2018	-0.8%	5.0%	-10.0%	-3.4%	0.0%	1.1%	10.0%

* Row "Differences" provides statistics for pair-wise differences between GCorr 2019 and GCorr 2018. Thus, it is not determined by subtracting statistics in the first row from those in the second row.

Asset correlation changes in different regions and sectors

Random 1000 Firms in Different Regions: Average GCorr Asset Correlation Change

	All	Financial	Industrial
United States	0.09% (1000)	0.21% (235)	0.07% (765)
Europe	-0.36% (1000)	-0.54% (236)	-0.32% (764)
Japan	0.49% (1000)	-1.40% (95)	0.67% (905)
Asia	-0.70% (1000)	-0.32% (110)	-0.75% (890)
Global	-0.34% (1000)	-0.46% (168)	-0.33% (832)

Asset correlation decreased for Asian Industrials

Asset correlations exhibit slightly increase across sectors in United States while decreasing across sectors in Asia.

Factor correlation and R-squared value changes in different regions

Random 1000 Firms in Different Regions:
Average Factor Correlation Change

Random 1000 Firms in Different Regions:
Average R-Squared Change

	All	Financial	Industrial		All	Financial	Industrial
United States	0.52% (1000)	-0.11% (235)	0.75% (765)	United States	-0.05% (1000)	0.19% (235)	-0.12% (765)
Europe	-0.12% (1000)	-0.32% (236)	-0.03% (764)	Europe	-0.73% (1000)	-0.90% (236)	-0.68% (764)
Japan	-0.20% (1000)	-0.14% (95)	-0.20% (905)	Japan	0.55% (1000)	-1.25% (95)	0.74% (905)
Asia	-0.18% (1000)	-0.07% (110)	-0.18% (890)	Asia	-1.50% (1000)	-0.49% (110)	-1.62% (890)
Global	-0.03% (1000)	-0.02% (168)	-0.03% (832)	Global	-0.92% (1000)	-0.94% (168)	-0.92% (832)

Asset correlation change in Asian Industrials is mostly driven by R-squared changes

GCorr asset correlation changes vary by size

Average Asset Correlation Change by Size (Largest versus Random)

	Financial		Industrial		
	Largest 100	Largest 1000	Largest 100	Largest 1000	Random 1000
United States	-2.35%	0.34%	-0.63%	-0.50%	0.08%
Europe	-2.81%	-0.87%	-3.22%	-1.20%	-0.30%
Japan	2.10%	-1.06%	-1.57%	-0.05%	0.72%
Asia	-1.53%	-0.82%	0.14%	-0.64%	-0.73%

In general, the asset correlation decreased in largest firms globally.

Impact on portfolio statistics

Region	Portfolio	Number of Firms	R-squared Change	Asset Correlation Change	Unexpected Loss Change	Economic Capital Change
Global	Non-Financials	30,627	-0.8%	-0.3%	-1.2%	-1.9%
	Non-Financials, EDF < 100 bps	18,247	-0.5%	-0.2%	-1.4%	-1.8%
	Financials	6,018	-1.0%	-0.5%	-2.4%	-3.9%
	Financials, Assets > \$25 billion	629	-1.9%	-1.3%	-3.3%	-2.7%
US	Non-Financials	3,699	-0.2%	-0.1%	-0.8%	-1.1%
	Non-Financials, EDF < 100 bps	2,128	0.1%	0.1%	0.8%	4.6%
	Financials	1,243	0.0%	-0.1%	-0.3%	0.0%
	Financials, Assets > \$25 billion	120	-1.8%	-1.9%	-2.4%	-3.4%
Europe	Non-Financials	4,975	-0.6%	-0.3%	-1.2%	-1.8%
	Non-Financials, EDF < 100 bps	3,382	-0.7%	-0.3%	-1.4%	-2.5%
	Financials	1,459	-1.0%	-0.6%	-2.9%	-4.4%
	Financials, Assets > \$25 billion	155	-3.3%	-2.5%	-4.9%	-12.9%
Asia/Australia	Non-Financials	19,216	-1.0%	-0.4%	-1.0%	-2.5%
	Non-Financials, EDF < 100 bps	11,335	-0.5%	-0.2%	-1.7%	-2.4%
	Financials	2,388	-1.2%	-0.6%	-2.9%	-5.8%
	Financials, Assets > \$25 billion	274	-1.0%	-0.6%	-0.4%	0.0%

- » In general, directional change of unexpected loss and capital will be in line with asset correlation change.
- » In general, portfolios of large financial firms exhibit higher decrease in asset correlation, unexpected loss and capital than the others.

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Validation of GCorr
Corporate 2019

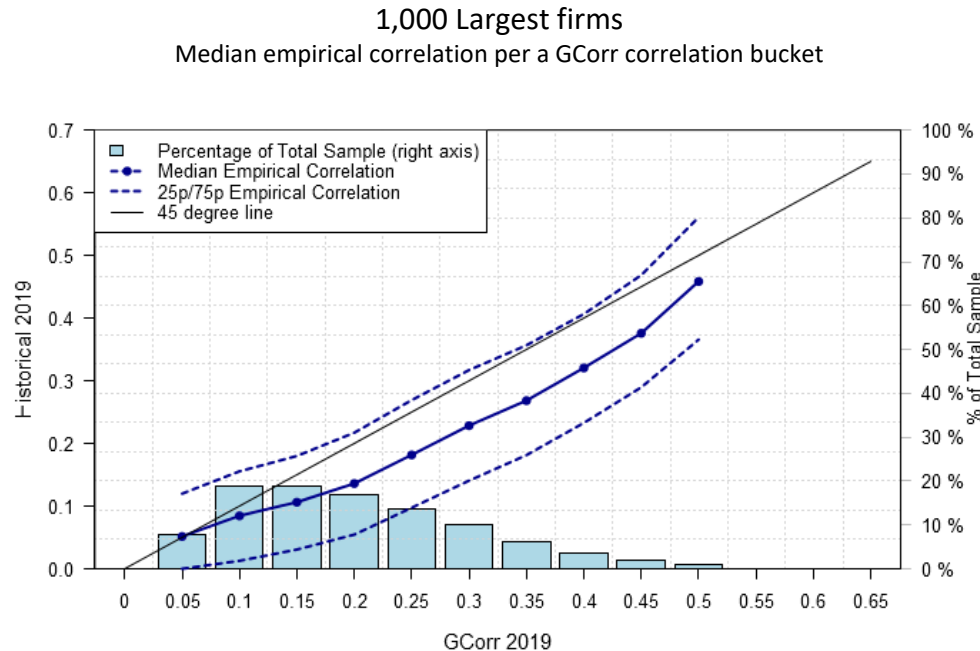
Validation of GCorr Corporate

- » In-sample validation of GCorr 2019 Corporate
 - Comparing GCorr 2019 asset correlation level to 3-year historical asset correlations.

- » Out-of-sample validation
 - Comparing forward-looking R-squared to out-of-sample empirical R-squared.

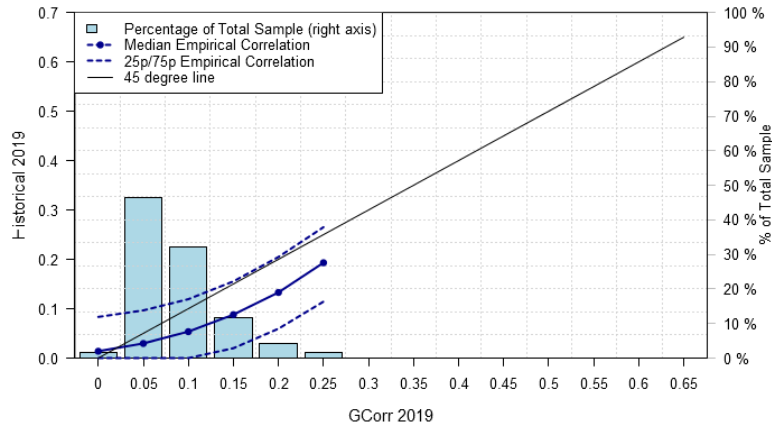
Comparison of forward-looking GCorr correlations and historical correlations

- » Asset correlations and R-squared values produced by GCorr 2019 Corporate are higher than the empirical levels over April 2016 – March 2019:
 - Recent volatilities are low compared to the long-run average, so GCorr predicts future correlations to be slightly higher than what we observe historically

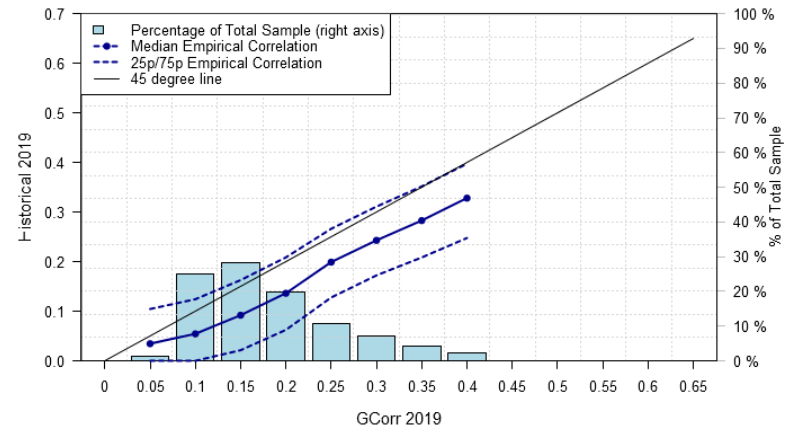


Median analysis for various regions

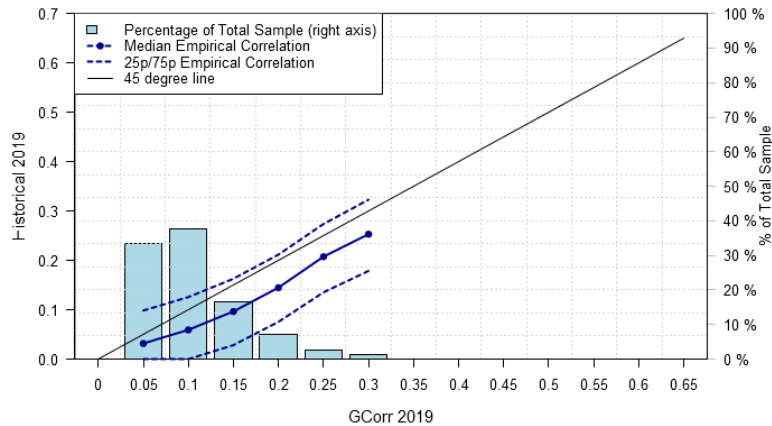
1000 Random – Global



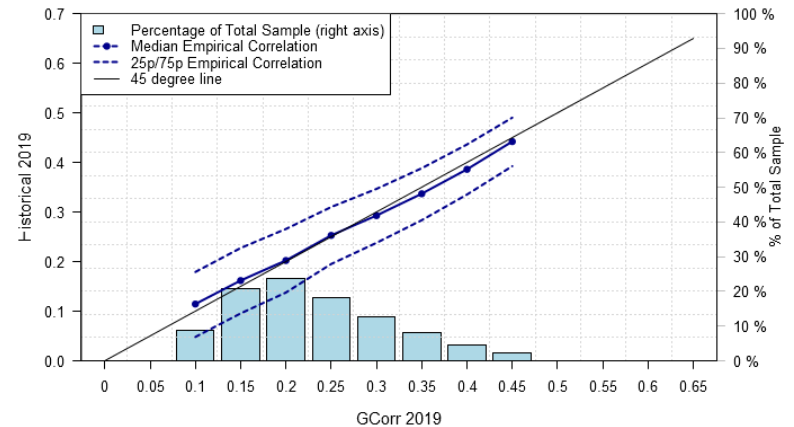
1000 Random – US



1000 Random – Europe

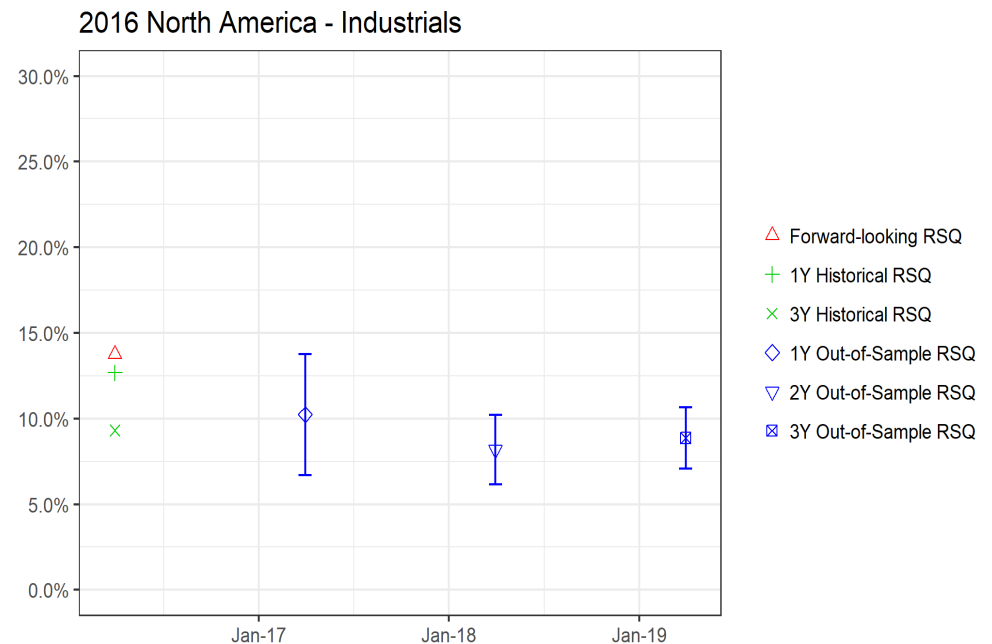
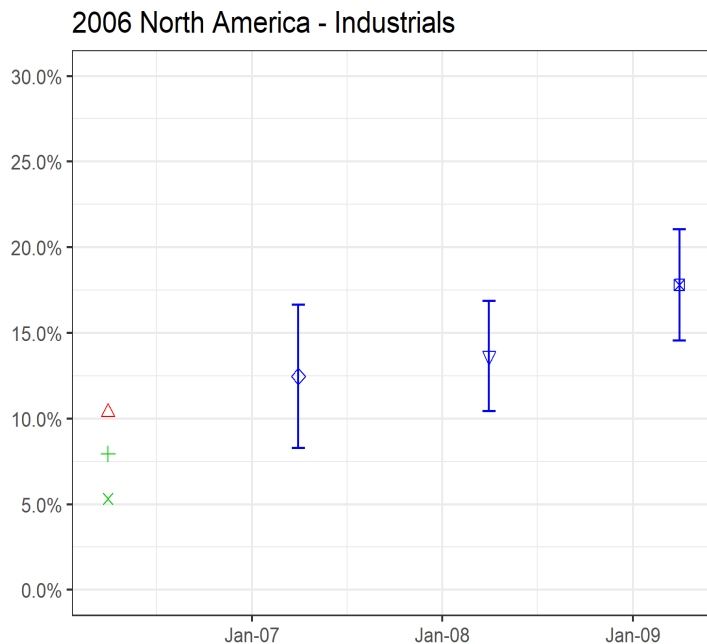


1000 Random – Japan



Out-of-sample RSQ Prediction

- » The forward-looking RSQ accurately predicted that level of RSQ would be higher in the future compared to the historical one-year and three-year RSQ



Additional validation of GCorr Corporate

- » Asset correlations implied by empirical default rates
 - Research paper by Moody's Analytics – *Asset Correlation, Realized Default Correlation, and Portfolio Credit Risk*.
 - GCorr asset correlations were generally higher than the default implied asset correlations.
- » Correlations as an input of a portfolio credit risk model
 - Research paper by Moody's Analytics – *Navigating Through Crisis: Validating RiskFrontier® Using Portfolio Selection*
 - Using GCorr Corporate correlations results in ex-ante Unexpected Losses which perform better in identifying more and less risky portfolios than alternative correlation measures, such as empirical asset correlations.
 - Portfolio losses estimated using ratings-based PDs and Basel II correlations result in a less conservative view of economic capital than parameterization using public EDF and GCorr measures

Summary of GCorr 2019 Corporate

- » Trends in asset correlations:
 - Empirical asset correlations are lower than last year's level for most of the regions and sectors.
- » Main features of GCorr 2019 Corporate:
 - GCorr 2019 asset correlations are lower than GCorr 2018
 - » Factor correlations: **flat**
 - » R-squared values: **slightly decrease**
- » Prediction by GCorr 2019 Corporate:
 - We predict next year's empirical correlations to be higher than this year's

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Understanding GCorr Sovereign 2019

Key Takeaways

GCorr Sovereign – a **multi-factor model** to measure **credit correlations** of sovereigns in the context of a credit portfolio risk analysis. It is linked to factors of other asset classes.

GCorr Sovereign 2019 uses **CDS data up to March 2019** to model the correlations.

- » The CDS spreads come from the CMA database.
- » The model covers **132** sovereigns.

What has **happened to sovereign correlations** in recent years?

- » Higher levels of correlations during the financial and eurozone crises.
- » Generally, **correlations at a lower level** in the past 5 years.
- » In the absence of a global shock in recent years, sovereign risk has become more linked to specific issues of individual countries:
 - **political instability, commodities slump**, reliance on **foreign-currency denominated debt**.

Data & modeling enhancements in GCorr Sovereign 2019

- » Refinement of the factor structure to accommodate new empirical patterns.
- » Move to the CMA database & new liquidity filtering of the CDS data.

From CDS spreads to credit correlations

Spread correlation is not a good measure of credit quality correlation because spreads are driven, among others, by risk-premium dynamics.

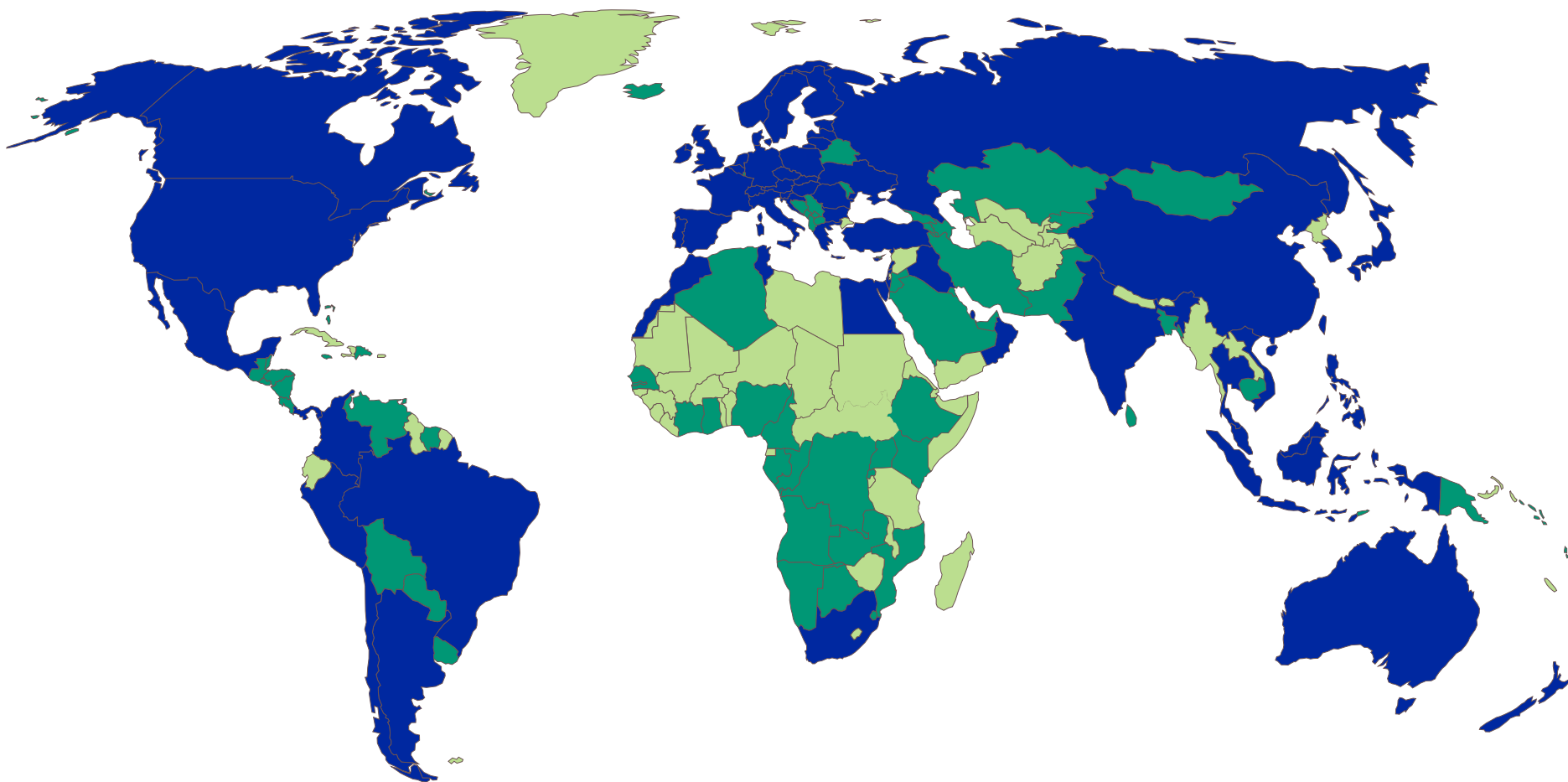
Instead, we consider **Moody's CDS-i-EDF** as a purer measure of sovereign's credit risk dynamics (Physical Probability of Default):



To make the CDS-i-EDF series stationary, we convert them to Distance-to-default (DD), by taking $DD = -N^{-1}(CDS-i-EDF)$.

Credit correlations for sovereigns – correlations of DD changes for a pair of sovereigns:
 $corr(\Delta DD_i, \Delta DD_j)$

Countries covered in GCorr Sovereign 2019

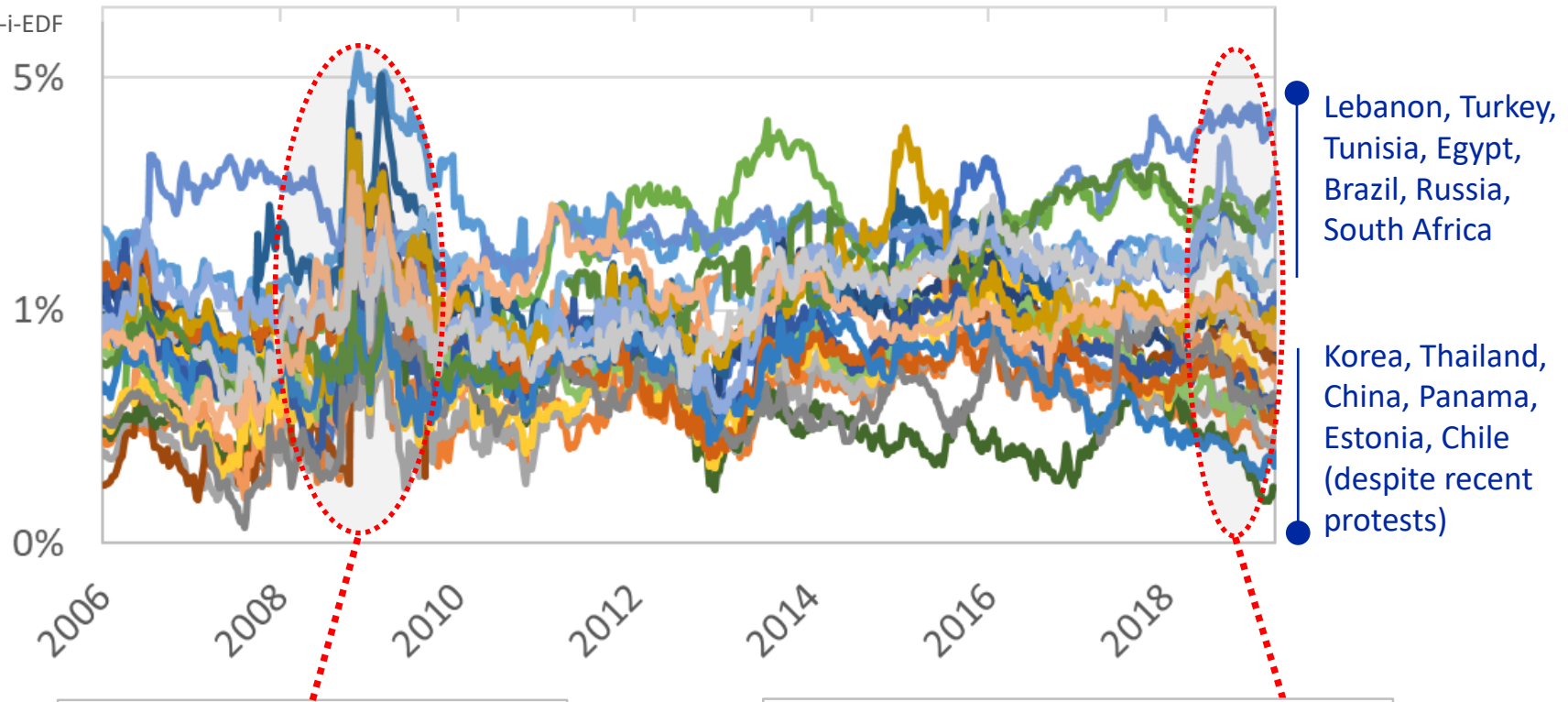


- 62 countries with CDS spread data and covered in GCorr Sovereign 2019
- 70 countries without CDS spread data but covered in GCorr Sovereign 2019
- countries not covered in GCorr Sovereign 2019

Risks of Emerging Markets seemed to have diverged

BRA CHL CHN COL DOM EGY IDN IND KAZ
 KOR LBN MAR MEX MYS OMN PAN PER PHL
 QAT RUS THA TUN TUR VNM ZAF

Moody's CDS-i-EDF

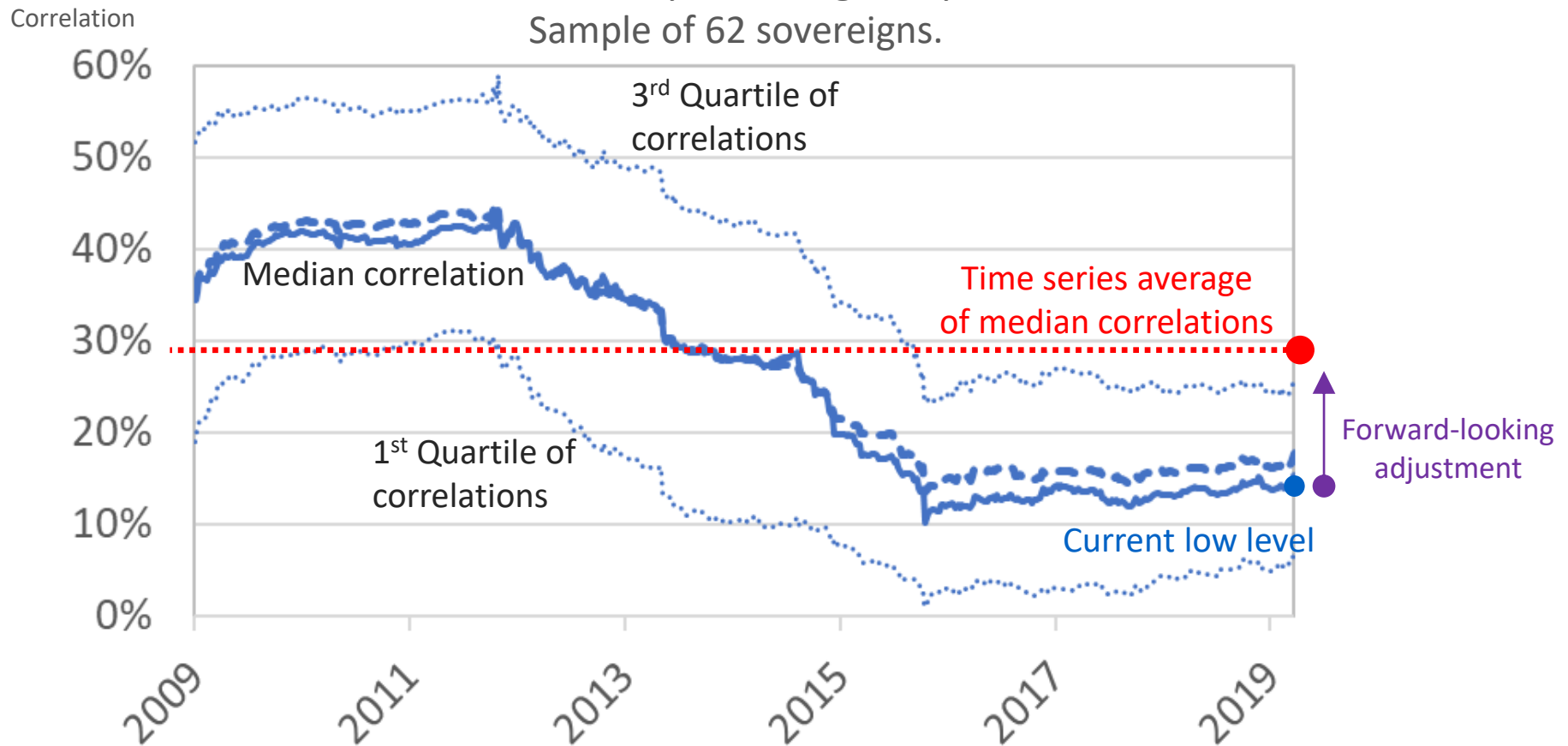


Global Financial Crisis and its aftermath. High correlations.

Performance of Emerging Markets begins to diverge. Lower correlations.

Forward-looking correlations?

Correlations of weekly DD changes, 3 year window.
Sample of 62 sovereigns.



Why consider forward-looking adjustment?

The model should not reproduce only the recent correlation level, but also consider the possibility that correlations may rise if the global economy undergoes a shock affecting many sovereigns at once.

Introducing sovereign factors into the GCorr factor structure

$$\phi^{Corp} = r_i^C + r_i^I$$

Corporate Custom Index

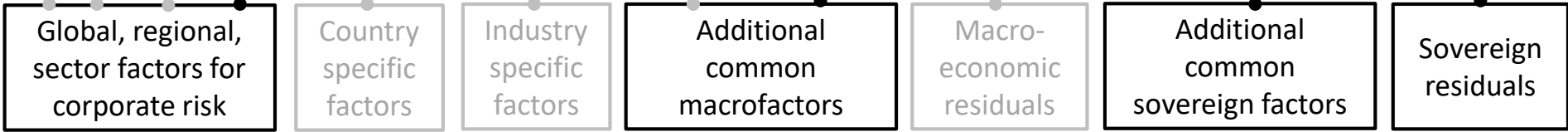
ϕ^{MV}
Macroeconomic factors
Unemployment Rates, Equity Market Index, Oil

ϕ^{Sov}
132 Sovereign systematic factors

r_i^C 49 Corporate Country Factors
 r_i^I 61 Corporate Industry Factors

Sources of systematic risk for sovereign exposures

contagion effect – we define the 8 additional sovereign common factors by region: Asia, Australia, Eastern Europe, Latin America, Middle East, North America, Southern Europe, Western Europe



Common orthogonal factors

Overall, sovereign asset correlations are lower than the previous model

62 Sovereigns with CDS data: GCorr Asset Correlations

	Mean	Std	Min	Q1	Med	Q3	Max
Previous Model	33.42%	13.95%	7.89%	22.99%	32.22%	39.19%	87.17%
GCorr2019	32.01%	7.20%	14.86%	27.02%	31.14%	35.91%	72.22%
GCorr2019 - Previous Model	-1.41%	11.15%	-55.95%	-6.88%	-0.12%	5.68%	28.45%

Levels: On average, the asset correlations for sovereigns with CDS data are lower than previous model

* Row "Differences" provides statistics for pair-wise differences between GCorr 2019 and previous model correlations. Thus, it is not determined by subtracting statistics in the first row from those in the second row.

Asset correlation changes in different regions and markets

62 Sovereigns in Different Regions: Average GCorr Asset Correlation Change

	All	Emerging Markets	Developed Countries
Americas	-6.12%	-14.87%	3.28%
Asia/Australia	-8.28%	-16.37%	0.23%
Europe	-3.01%	-5.46%	-3.15%
Middle East and Africa	0.26%	0.26%	N/A
Global	-1.41%	-3.46%	-0.93%

In general, asset correlations exhibit decrease in emerging markets across regions.

* "N/A" means none of 62 sovereigns in Middle East and Africa is assigned to developed countries.

Patterns in sovereign asset correlations by geographical areas

62 Sovereigns in Different Regions: Average GCorr 2019 Asset Correlation

	Asia	Australia	Eastern Europe	Western Europe	Latin America	Middle East & Africa	North America	Southern Europe
Asia	38.7%	32.3%	31.0%	29.6%	38.4%	30.2%	26.9%	29.0%
Australia	32.3%	34.6%	29.3%	30.6%	34.0%	28.9%	28.3%	29.1%
Eastern Europe	31.0%	29.3%	39.4%	31.1%	32.8%	29.7%	27.1%	30.9%
Western Europe	29.6%	30.6%	31.1%	36.2%	31.5%	29.2%	31.2%	34.7%
Latin America	38.4%	34.0%	32.8%	31.5%	48.2%	32.4%	32.7%	29.7%
Middle East & Africa	30.2%	28.9%	29.7%	29.2%	32.4%	33.6%	26.8%	27.8%
North America	26.9%	28.3%	27.1%	31.2%	32.7%	26.8%	35.0%	28.7%
Southern Europe	29.0%	29.1%	30.9%	34.7%	29.7%	27.8%	28.7%	35.9%

Within-region correlations are higher than across-region correlations

Summary of GCorr Sovereign 2019

- » Trends in asset correlations:
 - Generally, correlations at a lower level in the past 5 years.
 - In the absence of a global shock in recent years, sovereign risk has become more linked to specific issues of individual countries.
 - Empirical asset correlations are more diverse across sovereigns in recent years than in previous time periods.

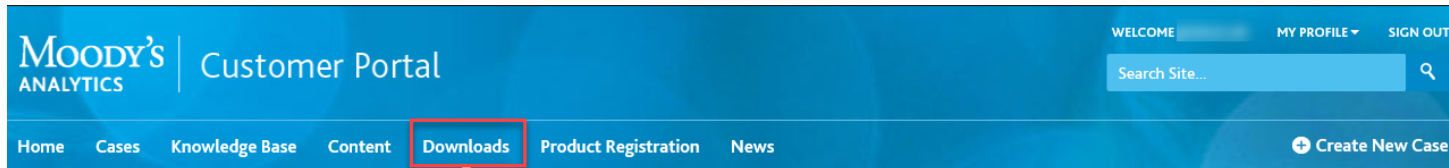
- » Main features of GCorr Sovereign 2019:
 - GCorr 2019 uses data up to March 2019 and covers 132 sovereigns.
 - GCorr 2019 asset correlations are lower than GCorr 2018 on the average level.
 - Correlations of countries within the same region are stronger than correlations of countries in different regions.

8

Next Steps

Visit Customer Portal

- » Tell your colleagues about the latest RiskFrontier version 5.6
- » Check out Moody's Analytics Customer Portal
 - Download installation files and standard product documentation



Downloads

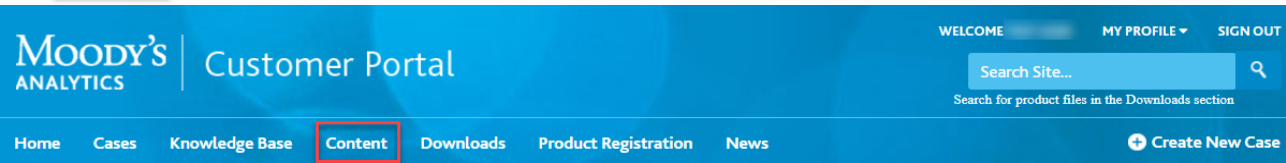
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 - Phone: +1 212 553 1653
 - Customer Support Web: <http://moodysanalytics.com/support>

- » RiskFrontier Methodology Document: “Modeling Credit Portfolios”
- » RiskFrontier product documents can be downloaded via the Customer Support Web.
- » Future RiskFrontier education via trainings and seminars conducted by Moody's:
 - RiskFrontier Methodology and Business Use Training (2 days)
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- » Moody's Conferences to interact with other MA clients of RiskFrontier:
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