

# Potential Adjustments to the MSCI Diversified Multiple-Factor ("DMF") Index Methodology

## PROPOSAL FOR CONSULTATION

April 2021

This consultation may or may not lead to the implementation of any or all of the proposed changes in the highlighted or any other MSCI indexes. Consultation feedback will remain confidential. MSCI may publicly disclose feedback if specifically requested by specific market participants. In that case, the relevant feedback would be published together with the final result of the consultation.

# Agenda

- 1 DMF Indexes: Background and Construction
- 2 Proposed Enhancements
  - i Group 1: Technical Adjustments
  - ii Group 2: Core Settings
  - iii Group 3: Extended Settings
- 3 Appendix

# MSCI Diversified Multiple-Factor Indexes (“DMF”)

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BACKGROUND : INDEX CONSTRUCTION & HISTORICAL PERFORMANCE

# MSCI Diversified Multiple-Factor Indexes : Background

- The objective of the MSCI Diversified Multiple Factor (DMF) index optimization is to maximize the index-level multi-factor score. DMF indexes have historically provided positive exposure to the target factors at index reviews with index risk similar to that of the parent index, in line with the index objectives
- For each regional DMF instance, target factors have cumulatively contributed positively to active returns through the live index history\*, but this has been offset by negative stock specific contribution
- When viewed over a longer horizon by including the backtest period, the stock-specific contribution is muted and positive contributions from the target factors were the dominant drivers of active return
- In the last three years, the underperformance of key target factors relative to the broad market index combined with a negative stock-specific contribution has resulted in the short-term underperformance of MSCI DMF Indexes
- The “target risk” approach\*\* of the MSCI DMF index methodology has been adopted for other factor combinations (e.g. MSCI DMF 5-factor, MSCI DMF 3-factor, MSCI DMF R-series etc.) where the recent performance has differed from MSCI DMF, consistent with the respective methodologies

\* From Dec-2014 to Nov-2020

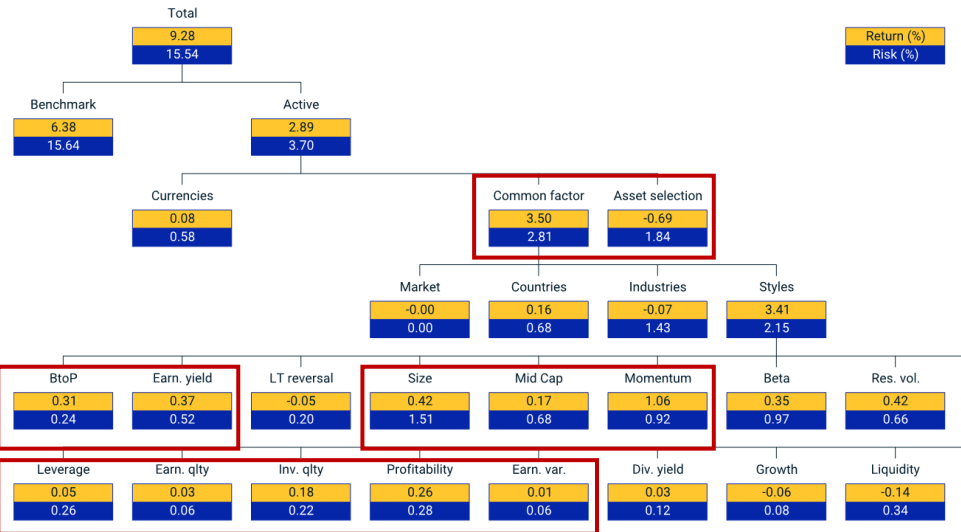
\*\* The MSCI Diversified Multiple Factor Indexes: Maximizing Factor Exposure While Controlling Volatility Doole et al., MSCI, May 2015



# How has DMF Delivered against its Objectives?

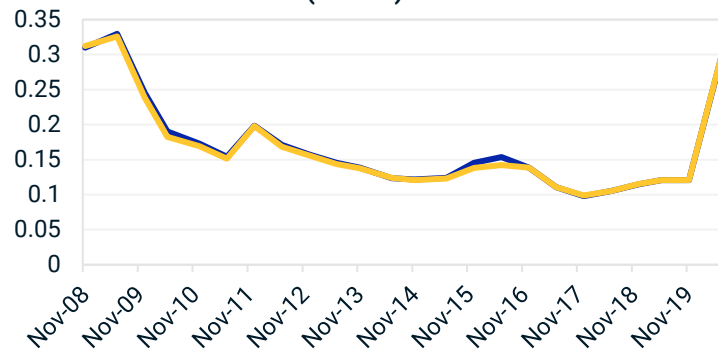
Historical data shows that the DMF's ex-ante risk tracked closely the ex-ante risk of the parent index with significant exposure to target factors

MSCI World DMF vs MSCI World



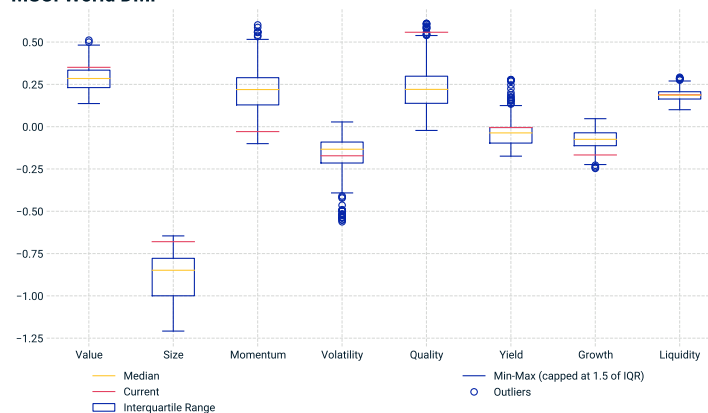
Period: Dec 29, 2000 to Nov 30, 2020

MSCI World (Parent) and MSCI World DMF



Ex-ante Parent Risk (blue line) and Ex-ante DMF Risk (yellow line)

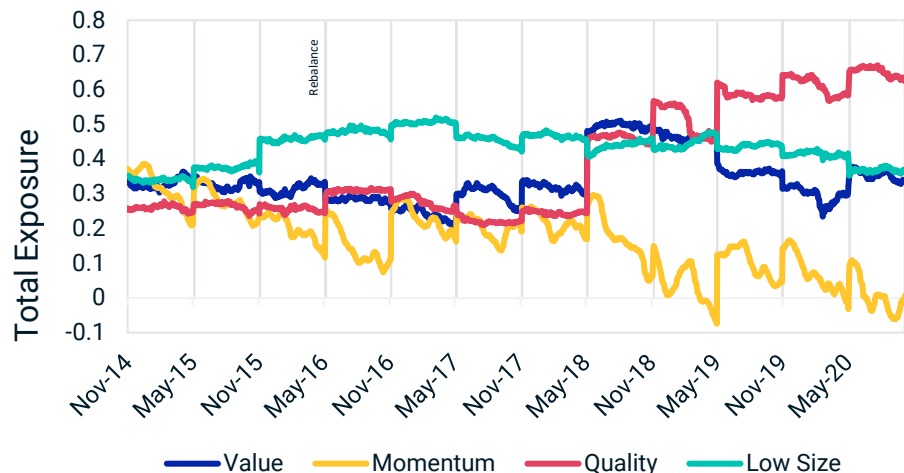
MSCI World DMF



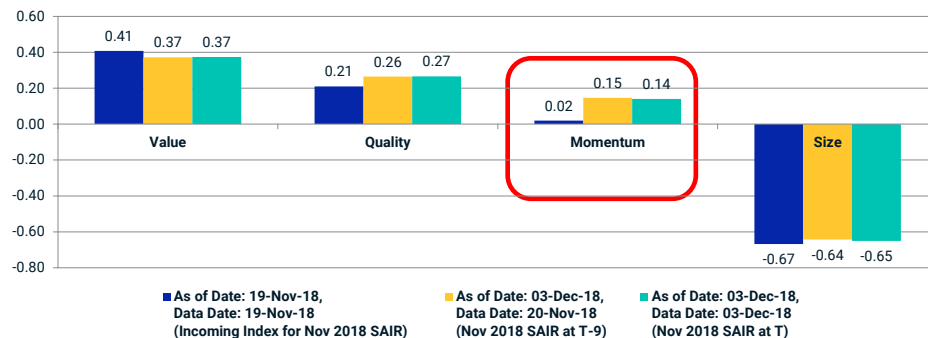
# Recent Factor Exposures & Rebalancing

- The 4-factor alpha term is maximized semi-annually at rebalancing but the individual factor exposures can drift up or down between rebalances
- That is particularly the case for Momentum, which is a “faster decay” factor compared to the other three factors

**World DMF – Absolute FaCS exposures**



**Active Factor Group Exposures at the Nov 2018 SAIR**  
(Based on end of Oct 2018 GEMLT Model data)



*Incoming Index = MSCI World Diversified Multiple-Factor Index just prior to Rebalancing*

# Analysis of Recent DMF Index Performance

## MSCI World DMF has trailed the MSCI World index over 1yr and 3yr periods

- Short term performance reviews should be balanced with longer perspective

## What has driven the underperformance?

- Some factors were out of favor and detracted, especially Size and Value
- Momentum factor, a faster-moving, more volatile signal, had more modest exposure in recent index reviews and has also depreciated more quickly between successive rebalancings
- Stock-specific contributions from e.g. growth stocks has been a key drivers over the trailing 1yr
- High factor intensity led to high relative performance - and higher stock specific risk

*We propose to incorporate some of these learnings into the index methodology to make it more robust and responsive, without affecting the core objective of the index.*

*This consultation aims to seek feedback on the proposed enhancements*

# Consultation Proposals

Category	Description	Rationale	Current Practice
Technical Adjustments	Use the <b>most recent risk model</b> data	Index construction benefits from the most recent available risk exposures data	Last end of month risk model data
	<b>Normalize</b> Size & Momentum exposures relative to the parent	Brings more consistency in factor exposure treatment while constructing alpha term	Size & Momentum from risk model
Core Settings Changes in methodology parameters to improve robustness and to make it responsive	<ul style="list-style-type: none"> <li>Min. active exposure to <b>Target</b> factors &gt; 0.1 and Max &lt; 0.75</li> <li>Max. active exposure magnitude for <b>Non-Target</b> factors restricted &lt; 0.1</li> </ul>	Helps to ensure minimum active exposure to target factors at Index Review. Also, mitigates over-exposure to non-target factor.	<ul style="list-style-type: none"> <li>Target factors are uncapped</li> <li>Max. active exposure magnitude for Non-Target factors restricted &lt; 0.25</li> </ul>
	Tighter control on <b>size segments</b>	Mitigate concentration in smaller size segments	No differential treatment for size segments
	<b>Quarterly</b> rebalancing	Allows to reflect more recent information with the same turnover budget	Semi-annual rebalancing
Extended Settings Other modifications to address short-term stock specific risk	<b>Mid-cap</b> weights in (b+/-1%, 5x)	Differentiated constraints to allow management of active risk profile instead of the same range for all stocks	Mid-cap weights in (b+/-2%, 10x)
	5x risk aversion factor to <b>specific risk</b> component in the estimated total risk	Aims to lower the contribution of stock-specific risk	
	<b>Liquidity</b> characteristics in asset bounds	Control movements in weights of assets with poor liquidity	No asset bounds constraints based on liquidity



# Applicability of Consultation Proposals to Index Methodologies

Category	Description	DMF	DMF 3-Factor	DMF 5-Factor	DMF Low Vol	DMF R-series	Factor ESG Target
Technical Adjustments	Use the <b>most recent risk model</b> data	*	*	*	*	*	*
	<b>Normalize</b> Size & Momentum exposures relative to the parent	*	Only Momentum	*	Only Momentum	*	*
Core Settings Changes in methodology parameters to improve robustness and to make it responsive	<ul style="list-style-type: none"> <li>Min. active exposure to <b>Target</b> factors &gt; 0.1 and Max &lt; 0.75</li> <li>Max. active exposure for <b>Non-Target</b> factors restricted &lt; 0.1</li> </ul>	*	*	*	*	Except for Low Vol	*
	Tighter control on <b>size segments</b>	*	*	*	*	*	*
	<b>Quarterly</b> rebalancing	*	*	*	*	*	*
Extended Settings Other modifications to address short-term stock specific risk	<b>Mid-cap</b> weights in (b+/-1%, 5x)	*	*	*	*	*	*
	5x risk aversion factor to <b>specific risk</b> component in the estimated total risk	*	*	*	*	*	NA
	<b>Liquidity</b> characteristics in asset bounds	*	*	*	*	*	*

# Group 1: Proposed Technical Adjustments

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ADJUSTMENTS DESIGNED TO IMPROVE THE INDEX CONSTRUCTION  
WITHOUT ALTERING CORE METHODOLOGY CHARACTERISTICS

# Group 1: Technical Enhancements

- 1 Use more recent\* factor model data (v/s current usage as of end-of-month)
  - Using recent model data enables reflecting the more recent information available, especially for the fast-moving signals such as Momentum
- 2 Normalize Size and Momentum factor exposures relative to the starting universe
  - Current methodology uses the factor exposures for these factors as is from the equity factor model (GEMLT). Normalizing it relative to the starting universe would bring in the consistency with the remaining two factors

# Group 1 : Methodology Summary

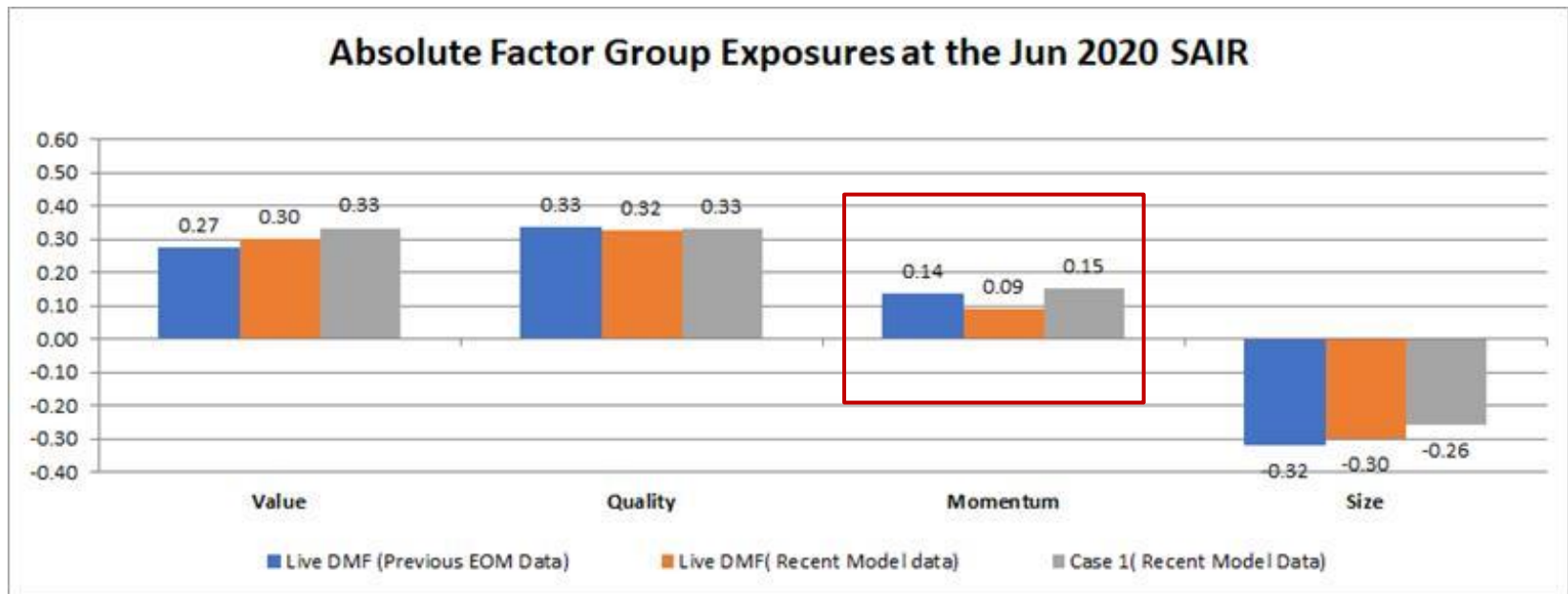
Parameters	World DMF*	World Simulated DMF**	Case 1 (Recent Model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
Adjustments	-N/A-		<ul style="list-style-type: none"> <li>Recent*** Model Data</li> </ul>	<ul style="list-style-type: none"> <li>Size and Momentum exposures were normalized relative to MSCI World (parent)</li> </ul>	<ul style="list-style-type: none"> <li>Recent Model Data</li> <li>Size and Momentum exposures were normalized relative to MSCI World (parent)</li> </ul>

\* MSCI DMF Index (Live) was launched in Sep 2014. The index methodology used MSCI Barra GEM2L model till May 2018. The model data used is as of previous end of month as the rebalancing takes place Nine days before (i.e., T-9) the index review effective date (T)

\*\* Simulated MSCI DMF Index using GEMLT model

\*\*\* Risk model data as of the day prior to the rebalancing day

# Recent\* Model Data : Factor Exposures at Index Review



Using recent model data helped mitigate the decay in fast-moving signals such as Momentum



\* Risk model data as of the day prior to the rebalancing day

Information Classification: GENERAL

Average monthly active exposures over Nov 2014 – Sep 2020

# Active GEMLT factor exposures

Factor	w.r.t MSCI World Index					w.r.t Live DMF Index			
	World DMF	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
Value	0.31	0.37	0.39	0.26	0.28	0.05	0.08	-0.05	-0.03
Size	-0.76	-0.73	-0.72	-0.88	-0.88	0.03	0.03	-0.12	-0.12
Momentum	0.14	0.14	0.15	0.19	0.21	0.00	0.01	0.05	0.07
Quality	0.34	0.54	0.55	0.46	0.46	0.20	0.20	0.12	0.12
BtoP	0.15	0.22	0.24	0.17	0.18	0.07	0.09	0.02	0.03
Earn. yield	0.34	0.36	0.38	0.26	0.27	0.02	0.03	-0.08	-0.07
Size	-0.66	-0.64	-0.63	-0.76	-0.76	0.02	0.03	-0.10	-0.11
Momentum	0.14	0.14	0.15	0.19	0.21	0.00	0.01	0.05	0.07
Leverage	-0.31	-0.37	-0.37	-0.35	-0.34	-0.06	-0.06	-0.04	-0.03
Earn. qlty	-0.02	0.10	0.11	0.03	0.05	0.11	0.12	0.05	0.06
Inv. qlty	0.25	0.37	0.38	0.32	0.33	0.12	0.14	0.07	0.08
Profitability	0.32	0.45	0.44	0.40	0.39	0.13	0.11	0.08	0.07
Earn. var.	-0.01	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03

Average monthly active exposures over Nov 2014 – Sep 2020

- Usage of recent model data showed improved exposure to Momentum and Value during the study period.
- Re-normalizing Size and Momentum also resulted in higher exposure to Size and Momentum
- The combination of the two adjustments resulted in improved exposure to Momentum, Size and reduced exposure to Value and Quality

# GEMLT active performance attribution

- The combination of the two adjustments resulted in increased contribution to active returns by Styles (1.77%) against 1.40% in the scenarios without the adjustments
- Similarly, the asset selection component went down to -1.67% vis-à-vis -1.94% between Nov 2014 and Sept 2020

Performance attribution using Barra GEMLT model over  
Nov 2014 – Sep 2020

Factor	w.r.t MSCI World Index				
	World DMF	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
Active	-1.14%	-0.08%	-0.10%	0.21%	0.34%
Asset selection	-2.57%	-1.94%	-2.07%	-1.77%	-1.67%
Common factor	1.34%	1.78%	1.82%	1.79%	1.77%
Countries	-0.07%	-0.18%	-0.03%	-0.22%	-0.20%
Industries	0.31%	0.56%	0.45%	0.27%	0.19%
Styles	1.10%	1.40%	1.40%	1.73%	1.77%
BtoP	0.02%	0.10%	0.13%	0.08%	0.09%
Earn. Yield	-0.42%	-0.44%	-0.46%	-0.30%	-0.35%
Size	-0.17%	-0.12%	-0.12%	-0.16%	-0.14%
Momentum	0.69%	0.67%	0.67%	0.84%	0.92%
Leverage	0.14%	0.15%	0.17%	0.15%	0.15%
Earn. qlty	-0.02%	0.02%	0.02%	0.01%	0.02%
Inv. qlty	0.00%	0.18%	0.20%	0.17%	0.20%
Profitability	0.41%	0.55%	0.54%	0.48%	0.45%
Earn. var.	-0.01%	0.05%	0.05%	0.04%	0.03%



# Key metrics (compared with MSCI World DMF Index)

- When compared with the existing methodology, the Size and Momentum renormalization led to higher number of constituents due to slightly higher exposure to Size factor

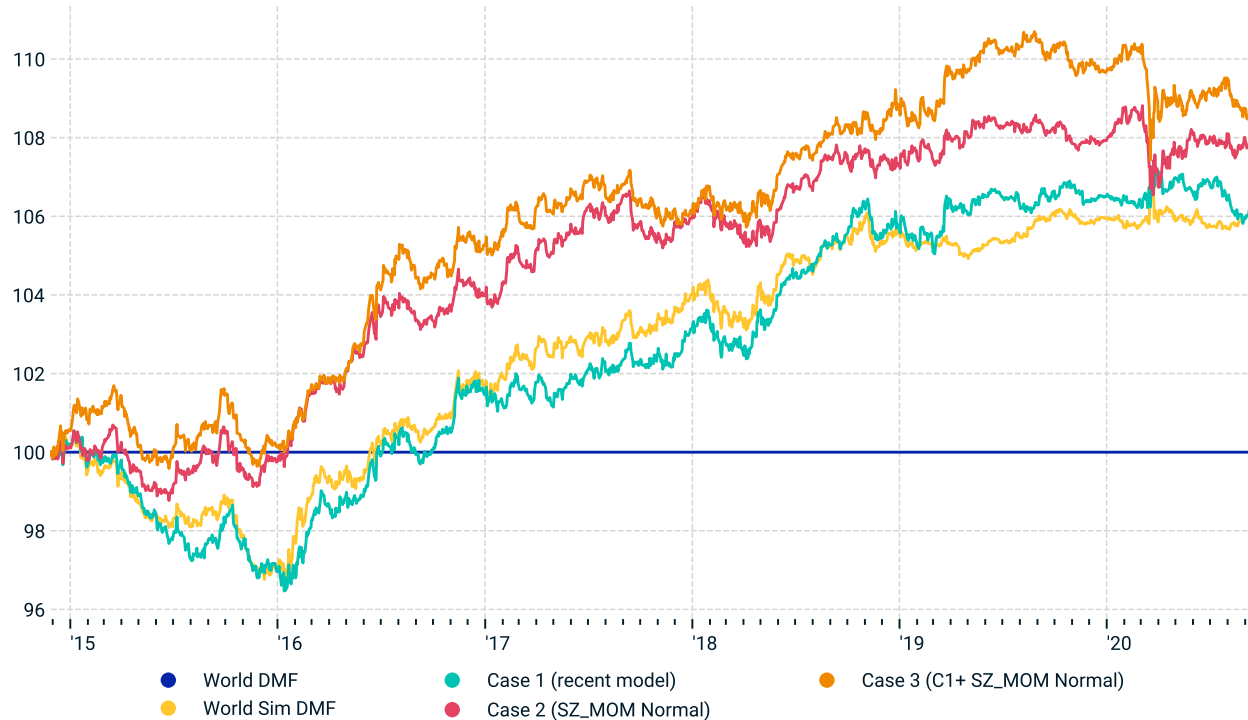
Key metrics					
	World DMF	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
<b>Total return*</b> (%)	6.9	8.0	8.0	8.3	8.4
<b>Total risk</b> (%)	14.1	14.0	13.8	14.3	14.0
<b>Return / risk</b>	0.49	0.57	0.58	0.58	0.60
<b>Sharpe ratio</b>	0.42	0.50	0.51	0.51	0.53
<b>Active return</b> (%)	0.0	1.1	1.0	1.4	1.5
<b>Tracking error</b> (%)	0.0	1.4	1.6	1.5	1.7
<b>Information Ratio</b>	nan	0.76	0.64	0.90	0.87
<b>Historical beta</b>	1.00	0.98	0.97	1.01	0.98
<b>Number of constituents***</b>	362	337	338	382	385
<b>Turnover**</b> (%)	38.7	39.1	39.1	39.0	39.1
<b>Price to book***</b>	1.9	2.0	1.9	2.1	2.0
<b>Price to earnings***</b>	14.6	14.8	14.6	16.0	15.6
<b>Dividend yield***</b> (%)	2.3	2.3	2.4	2.2	2.2

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages



# Relative Performance (compared with MSCI World DMF Index)

## Relative performance



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Information Classification: GENERAL

# Capacity and concentration

## Capacity and concentration metrics

	MSCI World Index	World DMF	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
<b>Concentration*</b>						
Average number of constituents	1642	362	337	338	382	385
Effective number of constituents	314	172	154	153	192	196
Parent index coverage (%)	100.0	13.5	13.5	13.8	13.5	13.6
Top 10 constituents weight (%)	11.7	14.9	16.3	16.4	13.6	13.2
<b>Size family exposures**</b>						
Large (%)	82.7	50.2	53.2	53.3	43.5	43.1
Mid (%)	17.3	49.8	46.8	46.7	56.5	56.9
Small (%)	0.0	0.0	0.0	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>						
Average (%)	0.00	0.02	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>						
Average (%)	0.00	0.02	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>						
Active share (%)	0.0	89.0	89.0	88.7	89.1	89.0
Average weight multiplier	1.0	9.8	9.9	9.9	9.9	9.8
Maximum weight multiplier	1.0	10.9	10.0	10.0	10.0	10.0
Maximum weight (%)	2.4	2.5	2.6	2.6	2.2	2.3

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020

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Information Classification: GENERAL

# Key metrics (since May 2018) (compared with MSCI World DMF Index)

## Key metrics

	World DMF	World Sim DMF	Case 1 (recent model)	Case 2 (SZ_MOM Normal)	Case 3 (C1+ SZ_MOM Normal)
<b>Total return* (%)</b>	1.9	2.5	2.6	2.5	2.4
<b>Total risk (%)</b>	19.0	18.8	18.4	19.6	19.0
<b>Return / risk</b>	0.10	0.13	0.14	0.13	0.13
<b>Sharpe ratio</b>	0.01	0.05	0.06	0.04	0.04
<b>Active return (%)</b>	0.0	0.6	0.8	0.6	0.5
<b>Tracking error (%)</b>	0.0	0.9	1.4	1.4	1.5
<b>Information Ratio</b>	nan	0.69	0.56	0.44	0.35
<b>Historical beta</b>	1.00	0.99	0.96	1.03	1.00
<b>Number of constituents***</b>	343	329	334	373	375
<b>Turnover** (%)</b>	35.5	36.4	36.5	36.4	36.5
<b>Price to book***</b>	2.0	2.0	2.0	2.2	2.2
<b>Price to earnings***</b>	13.9	14.2	14.1	15.3	14.9
<b>Dividend yield*** (%)</b>	2.3	2.3	2.4	2.2	2.2

Period: May 31, 2018 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages



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Information Classification: GENERAL

# Group 1: Discussion Points

- Do you agree
  - using more recent model data reflects reasonably the latest information available?
  - normalizing the Size and Momentum exposures relative to the parent universe brings in more consistency?
- Is there a need for reduced advanced notification gap vis-à-vis the current gap (T-9) i.e. to rebalance the index closer to the effective date (T)?
- Do you think it is desirable to randomize the model data date for rebalancing, say between T-15 to T-10, to mitigate predictability?

# Group 2: Proposed Core Settings

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ENHANCEMENTS THAT WOULD MODIFY CURRENT METHODOLOGY  
PARAMETERS BUT WOULD NOT ALTER THE INDEX REBALANCING LOGIC

# Group 2: Core Settings

## 1 Increase the rebalancing frequency to “Quarterly” (v/s semi-annual)

- Reflects more recent information in the index construction
- Current turnover (“TO”) cap per review can be reduced to maintain the annual TO budget

## 2 Apply floors and caps on the active exposures to the target factors

- A floor may help to ensure a minimum level of active exposure to the target factor at Index Review and a cap is designed to mitigate the risk of one or more factors dominating the index portfolio characteristics
- A cap on non-target factor exposures would aim to mitigate unwarranted factors exposures

## 3 Specific controls on exposure to size segments

- Aims to allow fair representation of different size segments in DMF index portfolio
- Aim is to reduce stock specific risk.

# Group 2 : Methodology Summary

Parameters	World DMF	World Simulated DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6 + LC/MC group adj)
Technical Adjustments	--		<ul style="list-style-type: none"> <li>Recent Model Data</li> <li>Parent Rel Size and Momentum Data</li> </ul>				
Target Factors	Unconstrained				Minimum exposure of <b>0.1</b> and maximum of <b>0.75</b> (with appropriate signs)		
Non-Target factors	+/-0.25				+/-0.1		
Size Group Constraints	--						Large Cap group*: <b>b ± 15%</b> Mid Cap group: <b>b ± 15%</b>
Rebalance	Semi annual rebalancing, 20% one-way per rebalancing			Quarterly rebalancing, 10% one-way per rebalancing			

\*Case 7 can be extended to IMI universe by constraining the active weights of Large/Mid/Small-cap segments within the range of 15%/10%/5% respectively



■ : Live Index

■ : From Group 1

# Active GEMLT factor exposures

- Application of floor on target factors and Quarterly rebalancing resulted in increase in Momentum exposure during the stated period
- Controlling Mid cap and Large Cap group exposures in Case 7 reduced the active exposure to Size

Factor	w.r.t MSCI World Index							w.r.t Live DMF Index					
	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
Value	0.31	0.37	0.28	0.28	0.27	0.25	0.31	0.05	-0.03	-0.03	-0.04	-0.06	0.00
Size	-0.76	-0.73	-0.88	-0.87	-0.86	-0.74	-0.60	0.03	-0.12	-0.11	-0.10	0.02	0.16
Momentum	0.14	0.14	0.21	0.22	0.21	0.22	0.21	0.00	0.07	0.08	0.07	0.09	0.07
Quality	0.34	0.54	0.46	0.50	0.52	0.52	0.57	0.20	0.12	0.15	0.18	0.18	0.22
BtoP	0.15	0.22	0.18	0.17	0.16	0.14	0.17	0.07	0.03	0.03	0.01	-0.01	0.02
Earn. yield	0.34	0.36	0.27	0.28	0.27	0.26	0.32	0.02	-0.07	-0.07	-0.08	-0.09	-0.03
Size	-0.66	-0.64	-0.76	-0.76	-0.75	-0.64	-0.52	0.02	-0.11	-0.10	-0.09	0.01	0.14
Momentum	0.14	0.14	0.21	0.22	0.21	0.22	0.21	0.00	0.07	0.08	0.07	0.09	0.07
Leverage	-0.31	-0.37	-0.34	-0.34	-0.33	-0.33	-0.33	-0.06	-0.03	-0.03	-0.02	-0.02	-0.02
Earn. qlty	-0.02	0.10	0.05	0.06	0.09	0.09	0.10	0.11	0.06	0.07	0.10	0.10	0.12
Inv. qlty	0.25	0.37	0.33	0.35	0.34	0.34	0.39	0.12	0.08	0.10	0.10	0.09	0.14
Profitability	0.32	0.45	0.39	0.43	0.43	0.45	0.47	0.13	0.07	0.11	0.11	0.13	0.15
Earn. var.	-0.01	-0.06	-0.05	-0.06	-0.10	-0.10	-0.10	-0.04	-0.03	-0.04	-0.09	-0.09	-0.09

Average monthly active exposures over Nov 2014 – Sep 2020



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Information Classification: GENERAL



# GEMLT active perf. attribution

- Case 4-6 showed gradual increased in contribution by Style factors during the study period
- Case 7 resulted in lower contribution from stock specific component

Factor	w.r.t MSCI World Index						
	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
Active	-1.14%	-0.08%	0.34%	0.22%	0.21%	0.23%	0.74%
Asset selection	-2.57%	-1.94%	-1.67%	-1.83%	-2.01%	-2.07%	-1.78%
Common factor	1.34%	1.78%	1.77%	1.75%	1.91%	1.97%	2.11%
Countries	-0.07%	-0.18%	-0.20%	-0.29%	-0.27%	-0.20%	-0.25%
Industries	0.31%	0.56%	0.19%	0.25%	0.30%	0.22%	0.51%
Styles	1.10%	1.40%	1.77%	1.79%	1.87%	1.95%	1.86%
BtoP	0.02%	0.10%	0.09%	0.08%	0.08%	0.09%	0.11%
Earn. Yield	-0.42%	-0.44%	-0.35%	-0.35%	-0.33%	-0.30%	-0.38%
Size	-0.17%	-0.12%	-0.14%	-0.11%	-0.11%	-0.08%	-0.06%
Momentum	0.69%	0.67%	0.92%	0.93%	0.92%	1.02%	1.00%
Leverage	0.14%	0.15%	0.15%	0.15%	0.13%	0.16%	0.15%
Earn. qlty	-0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%
Inv. qlty	0.00%	0.18%	0.20%	0.19%	0.19%	0.17%	0.19%
Profitability	0.41%	0.55%	0.45%	0.51%	0.52%	0.55%	0.56%
Earn. var.	-0.01%	0.05%	0.03%	0.06%	0.13%	0.12%	0.13%

Performance attribution using Barra GEMLT model over Nov 2014 – Sep 2020



This analysis uses historical back-tested or simulated data. Such performance data is not indicative of future performance, which may differ materially. Please refer to the disclosures at the end of this presentation for more information.

Information Classification: GENERAL

# Key metrics

- Case 4-7 showed gradual improvement in short term performance (1y-5y)

## Key metrics

	MSCI World Index	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
Total return* (%)	8.1	6.9	8.0	8.4	8.3	8.3	8.3	8.8
Total risk (%)	14.1	14.1	14.0	14.0	14.0	14.0	13.7	13.6
Return / risk	0.57	0.49	0.57	0.60	0.59	0.59	0.61	0.65
Sharpe ratio	0.50	0.42	0.50	0.53	0.52	0.52	0.53	0.58
Active return (%)	0.0	-1.1	-0.1	0.3	0.2	0.2	0.2	0.7
Tracking error (%)	0.0	2.9	3.0	3.3	3.1	3.2	3.1	3.0
Information Ratio	nan	-0.39	-0.03	0.10	0.07	0.06	0.08	0.25
Historical beta	1.00	0.98	0.96	0.96	0.96	0.96	0.94	0.94
Number of constituents***	1642	362	337	385	386	384	379	317
Turnover** (%)	2.5	38.7	39.1	39.1	40.0	40.0	40.0	40.0
Price to book***	2.3	1.9	2.0	2.0	2.1	2.1	2.1	2.1
Price to earnings***	19.6	14.6	14.8	15.6	15.7	15.9	16.0	15.4
Dividend yield*** (%)	2.5	2.3	2.3	2.2	2.2	2.2	2.1	2.2

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

## Performance (%)

	MSCI World Index	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
YTD	2.1	-2.2	-2.2	-3.4	-2.1	-1.8	-1.7	-0.9
1 Yr	11.0	5.9	5.8	4.0	5.1	5.4	5.2	7.2
3 Yr	8.3	4.6	5.5	5.2	5.6	5.9	6.0	6.5
5 Yr	11.1	8.8	10.3	10.2	10.2	10.2	10.2	11.3

Gross returns for the period ending Sep 30, 2020

Returns are annualized for periods longer than a year



# Key metrics (compared with Live DMF Index)

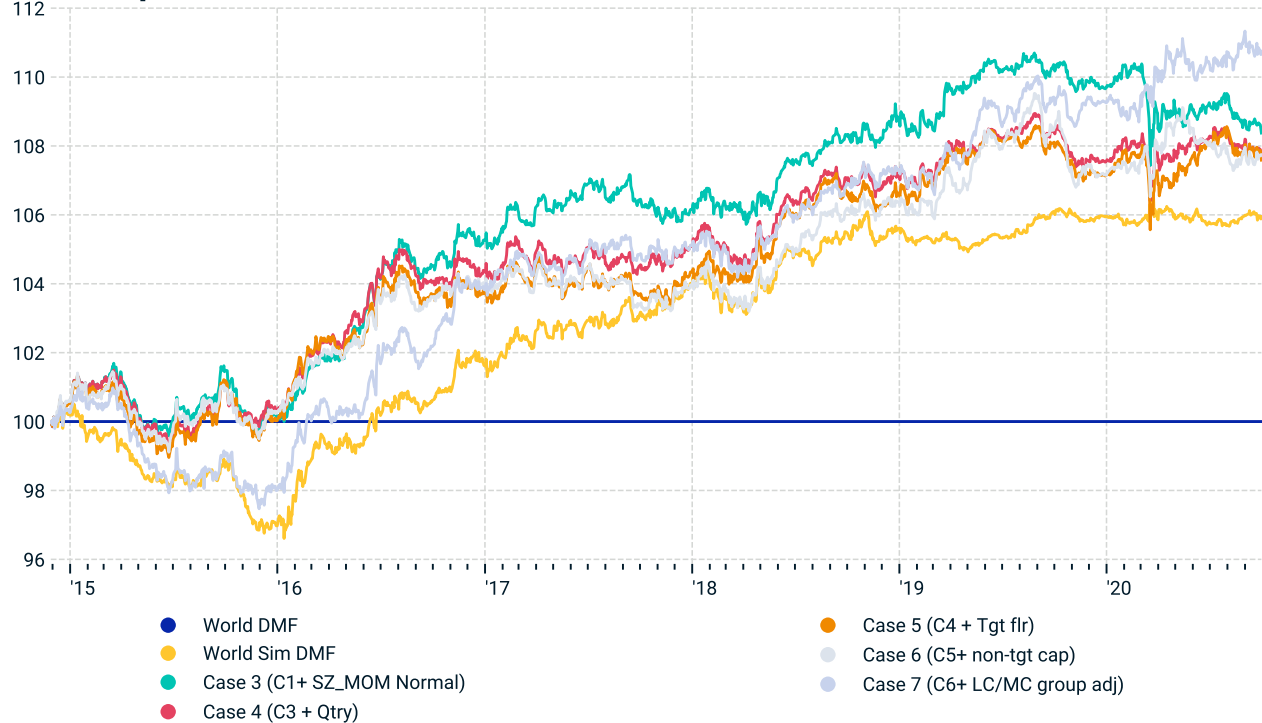
## Key metrics

	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
<b>Total return*</b> (%)	6.9	8.0	8.4	8.3	8.3	8.3	8.8
<b>Total risk</b> (%)	14.1	14.0	14.0	14.0	14.0	13.7	13.6
<b>Return / risk</b>	0.49	0.57	0.60	0.59	0.59	0.61	0.65
<b>Sharpe ratio</b>	0.42	0.50	0.53	0.52	0.52	0.53	0.58
<b>Active return</b> (%)	0.0	1.1	1.5	1.4	1.3	1.4	1.9
<b>Tracking error</b> (%)	0.0	1.4	1.7	1.6	1.7	1.8	1.9
<b>Information Ratio</b>	nan	0.76	0.87	0.85	0.77	0.76	0.98
<b>Historical beta</b>	1.00	0.98	0.98	0.98	0.98	0.96	0.95
<b>Number of constituents***</b>	362	337	385	386	384	379	317
<b>Turnover**</b> (%)	38.7	39.1	39.1	40.0	40.0	40.0	40.0
<b>Price to book***</b>	1.9	2.0	2.0	2.1	2.1	2.1	2.1
<b>Price to earnings***</b>	14.6	14.8	15.6	15.7	15.9	16.0	15.4
<b>Dividend yield***</b> (%)	2.3	2.3	2.2	2.2	2.2	2.1	2.2

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

# Key metrics (compared with Live DMF Index)

## Relative performance



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# Capacity and concentration

## Capacity and concentration metrics

	MSCI World Index	World DMF	World Sim DMF	Case 3 (C1+ SZ_MOM Normal)	Case 4 (C3 + Qtry)	Case 5 (C4 + Tgt flr)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)
<b>Concentration*</b>								
Average number of constituents	1642	362	337	385	386	384	379	317
Effective number of constituents	314	172	154	196	190	187	167	141
Parent index coverage (%)	100.0	13.5	13.5	13.6	13.7	13.7	14.3	14.3
Top 10 constituents weight (%)	11.7	14.9	16.3	13.2	14.0	14.2	15.6	16.7
<b>Size family exposures**</b>								
Large (%)	82.7	50.2	53.2	43.1	43.1	43.4	50.8	67.8
Mid (%)	17.3	49.8	46.8	56.9	56.9	56.6	49.2	32.2
Small (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>								
Average (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>								
Average (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>								
Active share (%)	0.0	89.0	89.0	89.0	88.9	88.8	88.4	88.1
Average weight multiplier	1.0	9.8	9.9	9.8	9.8	9.8	9.7	9.6
Maximum weight multiplier	1.0	10.9	10.0	10.0	10.0	10.0	10.0	10.0
Maximum weight (%)	2.4	2.5	2.6	2.3	2.3	2.4	2.6	2.8

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020

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## Group 2: Discussion Points

- Do these enhancements help improve the index methodology?
  - Quarterly rebalancing
  - Floor of target factors (tighter constraints on non-target factors)
  - Control on Size segment active weights
- Does the quarterly rebalancing with the same annual TO budget help reflect the factor exposures in more timely manner?
  - Does TO budget need to go up to reflect the factor premia?
  - Do you think there is a need for conditional TO increase in volatile markets?
- Is the floor at 0.1 and cap at 0.75 on target factor exposures appropriate?
  - Should the Size factor have narrower band e.g.  $-0.1 > \text{Size} > -0.5$ ?
- Is the tightening of active exposure (max 0.1) to non-target factors justified?
- Does a cap on active exposure to smaller size segments help?

# Group 3: Proposed Extended Settings

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MODIFICATIONS THAT WOULD AMEND THE CURRENT INDEX  
METHODOLOGY

# Group 3: Advanced Methodology Enhancements

- 1 Tighter control on active weights of securities in smaller size segments or with poor liquidity
  - Designed to Mitigate concentration in smaller size segments such as Mid-cap, Small Cap etc
  - Aims to help reduce stock specific risk
- 2 Penalize specific risk component of estimated total risk
  - 5x risk aversion to specific risk aims to help to reduce contribution of specific risk



# Group 3: Methodology Summary

Parameters	World DMF	World Simulated DMF	Case 3 (recent model+SZ_M OM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + Risk aversion adj)	Case 10 (C6 + Liquidity const.)
Adjustments	--		<ul style="list-style-type: none"> <li>Recent Model Data</li> <li>Parent Rel Size and Momentum Data</li> </ul>				
Risk Target						Specific risk aversion 5-times the common risk aversion	
Target Factors	Unconstrained		Minimum exposure of <b>0.1</b> (with appropriate signs)				
			--	--	--	--	--
Non-Target factors	+/-0.25		+/-0.1				
Asset Weight Constraints	<ul style="list-style-type: none"> <li>Maximum asset weight = <math>\min(b + 2\%, b * 10)</math></li> <li>Minimum asset weight = <math>\max(b - 2\%, 0)</math></li> </ul>				<b>Large Caps:</b> $(b \pm 2\%, b * 10)$ <b>Mid Caps:</b> $(b \pm 1\%, b * 5)$	<ul style="list-style-type: none"> <li>Maximum asset weight = <math>\min(b + 2\%, b * 10)</math></li> <li>Minimum asset weight = <math>\max(b - 2\%, 0)</math></li> </ul>	<ul style="list-style-type: none"> <li>Maximum asset weight = <math>\min(b + 2\%, b * 10, c + T)^*</math></li> <li>Minimum asset weight = <math>\max(b - 2\%, 0, c - T)^*</math></li> </ul>
Rebalance	Semi annual rebalancing, 20% one-way per rebalancing			Quarterly rebalancing, 10% one-way per rebalancing			

# Active GEMLT factor exposures

- Controlling Mid cap stock weights tightly in Case 8 reduced the active exposure to Size during the study period

- Case 9 did not alter exposures to target factors significantly

Factor	w.r.t MSCI World Index							w.r.t Live DMF Index					
	World DMF	World Sim DMF	Case 3 (recent model+SZ_MO M Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6+ risk aversion adj)	Case 10 (C6+ liquidity const.)	World Sim DMF	Case 3(recent model+SZ_MO M Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6+ risk aversion adj)	Case 10 (C6+ liquidity const.)
Value	0.31	0.37	0.28	0.25	0.27	0.25	0.25	0.05	-0.03	-0.06	-0.04	-0.06	-0.06
Size	-0.76	-0.73	-0.88	-0.74	-0.59	-0.74	-0.74	0.03	-0.12	0.02	0.17	0.02	0.02
Momentum	0.14	0.14	0.21	0.22	0.20	0.22	0.22	0.00	0.07	0.09	0.06	0.09	0.08
Quality	0.34	0.54	0.46	0.52	0.52	0.52	0.53	0.20	0.12	0.18	0.18	0.18	0.19
BtoP	0.15	0.22	0.18	0.14	0.14	0.14	0.13	0.07	0.03	-0.01	-0.01	-0.01	-0.01
Earn. yield	0.34	0.36	0.27	0.26	0.28	0.26	0.26	0.02	-0.07	-0.09	-0.06	-0.08	-0.08
Size	-0.66	-0.64	-0.76	-0.64	-0.51	-0.64	-0.64	0.02	-0.11	0.01	0.15	0.02	0.02
Momentum	0.14	0.14	0.21	0.22	0.20	0.22	0.22	0.00	0.07	0.09	0.06	0.09	0.08
Leverage	-0.31	-0.37	-0.34	-0.33	-0.29	-0.33	-0.33	-0.06	-0.03	-0.02	0.02	-0.02	-0.02
Earn. qlty	-0.02	0.10	0.05	0.09	0.10	0.09	0.09	0.11	0.06	0.10	0.11	0.10	0.10
Inv. qlty	0.25	0.37	0.33	0.34	0.35	0.34	0.34	0.12	0.08	0.09	0.10	0.10	0.10
Profitability	0.32	0.45	0.39	0.45	0.44	0.44	0.45	0.13	0.07	0.13	0.12	0.12	0.13
Earn. var.	-0.01	-0.06	-0.05	-0.10	-0.10	-0.10	-0.10	-0.04	-0.03	-0.09	-0.09	-0.09	-0.09

Average monthly active exposures over Nov 2014 – Sep 2020



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Information Classification: GENERAL

# GEMLT active perf. attribution

- Controlling Mid cap stock weights tightly in Case 8 reduced the contribution from asset selection component during the study period
- Case 9 resulted in higher contribution from Styles

Factor	w.r.t MSCI World Index						
	World DMF	World Sim DMF	Case 3(recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
Active	-1.14%	-0.08%	0.34%	0.23%	0.75%	0.39%	0.46%
Asset selection	-2.57%	-1.94%	-1.67%	-2.07%	-1.49%	-1.97%	-1.85%
Common factor	1.34%	1.78%	1.77%	1.97%	1.78%	2.01%	1.96%
Countries	-0.07%	-0.18%	-0.20%	-0.20%	-0.23%	-0.18%	-0.24%
Industries	0.31%	0.56%	0.19%	0.22%	0.33%	0.27%	0.32%
Styles	1.10%	1.40%	1.77%	1.95%	1.69%	1.92%	1.89%
BtoP	0.02%	0.10%	0.09%	0.09%	0.09%	0.08%	0.07%
Earn. Yield	-0.42%	-0.44%	-0.35%	-0.30%	-0.34%	-0.31%	-0.31%
Size	-0.17%	-0.12%	-0.14%	-0.08%	-0.06%	-0.08%	-0.08%
Momentum	0.69%	0.67%	0.92%	1.02%	0.90%	1.02%	1.00%
Leverage	0.14%	0.15%	0.15%	0.16%	0.12%	0.16%	0.16%
Earn. qlty	-0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%
Inv. qlty	0.00%	0.18%	0.20%	0.17%	0.17%	0.17%	0.18%
Profitability	0.41%	0.55%	0.45%	0.55%	0.50%	0.54%	0.54%
Earn. var.	-0.01%	0.05%	0.03%	0.12%	0.12%	0.12%	0.12%

Performance attribution using Barra GEMLT model over Nov 2014 – Sep 2020



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Information Classification: GENERAL

# Key metrics

## Key metrics

- Lower exposure to Size contributed to performance in Case 8 in short-term
- It also showed higher number of constituents on an average

	MSCI World Index	World DMF	World Sim DMF	Case 3 (recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
Total return* (%)	8.1	6.9	8.0	8.4	8.3	8.8	8.4	8.5
Total risk (%)	14.1	14.1	14.0	14.0	13.7	13.6	13.8	13.9
Return / risk	0.57	0.49	0.57	0.60	0.61	0.65	0.61	0.61
Sharpe ratio	0.50	0.42	0.50	0.53	0.53	0.58	0.54	0.54
Active return (%)	0.0	-1.1	-0.1	0.3	0.2	0.8	0.4	0.5
Tracking error (%)	0.0	2.9	3.0	3.3	3.1	2.9	3.0	3.0
Information Ratio	nan	-0.39	-0.03	0.10	0.08	0.26	0.13	0.15
Historical beta	1.00	0.98	0.96	0.96	0.94	0.94	0.95	0.96
Number of constituents***	1642	362	337	385	379	494	378	390
Turnover** (%)	2.5	38.7	39.1	39.1	40.0	40.0	40.0	40.0
Price to book***	2.3	1.9	2.0	2.0	2.1	2.1	2.1	2.1
Price to earnings***	19.6	14.6	14.8	15.6	16.0	15.7	16.0	16.0
Dividend yield*** (%)	2.5	2.3	2.3	2.2	2.1	2.2	2.1	2.1

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

## Performance (%)

	MSCI World Index	World DMF	World Sim DMF	Case 3 (recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
YTD	2.1	-2.2	-2.2	-3.4	-1.7	-0.5	-0.8	-0.4
1 Yr	11.0	5.9	5.8	4.0	5.2	7.6	6.4	6.9
3 Yr	8.3	4.6	5.5	5.2	6.0	6.9	6.2	6.4
5 Yr	11.1	8.8	10.3	10.2	10.2	11.2	10.5	10.5

Gross returns for the period ending Sep 30, 2020

Returns are annualized for periods longer than a year

This analysis uses historical back-tested or simulated data. Such performance data is not indicative of future performance, which may differ materially. Please refer to the disclosures at the end of this presentation for more information.

Information Classification: GENERAL



# Key metrics

(w.r.t Live DMF Index)

- Relative to DMF index, Case 8 had positive active returns and lower TE

## Key metrics

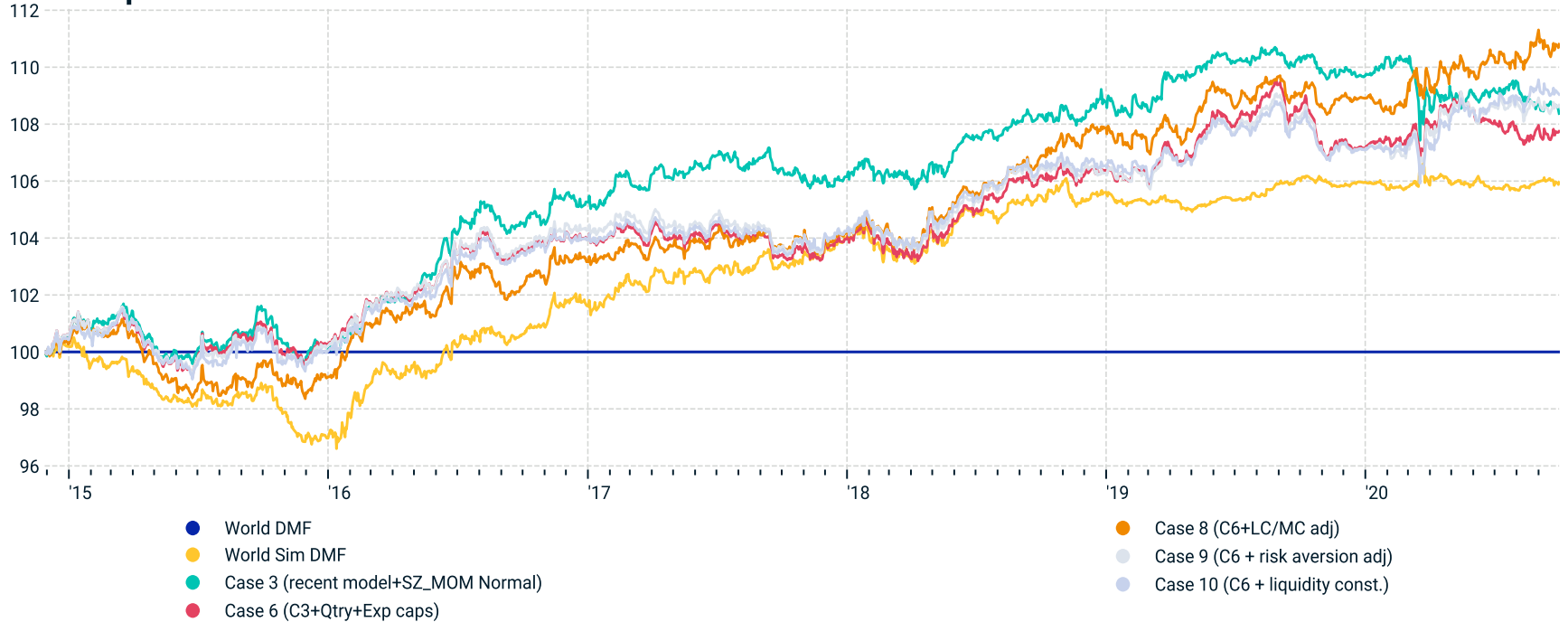
	World DMF	World Sim DMF	Case 3 (recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
<b>Total return*</b> (%)	6.9	8.0	8.4	8.3	8.8	8.4	8.5
<b>Total risk</b> (%)	14.1	14.0	14.0	13.7	13.6	13.8	13.9
<b>Return / risk</b>	0.49	0.57	0.60	0.61	0.65	0.61	0.61
<b>Sharpe ratio</b>	0.42	0.50	0.53	0.53	0.58	0.54	0.54
<b>Active return</b> (%)	0.0	1.1	1.5	1.4	1.9	1.5	1.6
<b>Tracking error</b> (%)	0.0	1.4	1.7	1.8	1.8	1.8	1.7
<b>Information Ratio</b>	nan	0.76	0.87	0.76	1.06	0.86	0.92
<b>Historical beta</b>	1.00	0.98	0.98	0.96	0.95	0.97	0.98
<b>Number of constituents***</b>	362	337	385	379	494	378	390
<b>Turnover**</b> (%)	38.7	39.1	39.1	40.0	40.0	40.0	40.0
<b>Price to book***</b>	1.9	2.0	2.0	2.1	2.1	2.1	2.1
<b>Price to earnings***</b>	14.6	14.8	15.6	16.0	15.7	16.0	16.0
<b>Dividend yield***</b> (%)	2.3	2.3	2.2	2.1	2.2	2.1	2.1

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

# Key metrics

(w.r.t Live DMF Index)

## Relative performance



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Information Classification: GENERAL

# Capacity and concentration

## Capacity and concentration metrics

	MSCI World Index	World DMF	World Sim DMF	Case 3 (recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
<b>Concentration*</b>								
Average number of constituents	1642	362	337	385	379	494	378	390
Effective number of constituents	314	172	154	196	167	150	166	170
Parent index coverage (%)	100.0	13.5	13.5	13.6	14.3	17.8	14.2	14.7
Top 10 constituents weight (%)	11.7	14.9	16.3	13.2	15.6	16.9	15.8	15.7
<b>Size family exposures**</b>								
Large (%)	82.7	50.2	53.2	43.1	50.8	65.9	51.0	51.3
Mid (%)	17.3	49.8	46.8	56.9	49.2	34.1	49.0	48.7
Small (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>								
Average (%)	0.00	0.02	0.02	0.02	0.02	0.01	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>								
Average (%)	0.00	0.02	0.02	0.02	0.02	0.01	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>								
Active share (%)	0.0	89.0	89.0	89.0	88.4	84.7	88.5	88.0
Average weight multiplier	1.0	9.8	9.9	9.8	9.7	6.0	9.7	9.4
Maximum weight multiplier	1.0	10.9	10.0	10.0	10.0	10.0	10.0	10.0
Maximum weight (%)	2.4	2.5	2.6	2.3	2.6	2.9	2.6	2.6

Period: Nov 28, 2014 to Sep 30, 2020.

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020

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# Liquidity and cost of replication

## Liquidity and cost of replication metrics

	MSCI World Index	World DMF	World Sim DMF	Case 3 (recent model+SZ_MOM Normal)	Case 6 (C3+Qtry+Exp caps)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)	Case 10 (C6 + liquidity const.)
ATVR* (%)	186.0	171.9	172.4	177.0	173.4	168.6	171.8	170.7
<b>Days to trade - periodic index review**</b>								
Average	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1
95th percentile	0.0	0.2	0.2	0.2	0.3	0.2	0.3	0.3
95% of all trading volume	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3
Maximum	0.1	0.6	0.6	0.6	1.1	0.8	1.2	1.0
<b>Days to trade - relative to benchmark***</b>								
Average	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
95th percentile	0.0	0.2	0.2	0.3	0.3	0.2	0.3	0.3
95% of all trading volume	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Maximum	0.0	0.9	0.9	0.9	1.4	0.9	1.0	1.4
<b>Days to trade - relative to cash***</b>								
Average	0.0	0.2	0.2	0.2	0.2	0.1	0.2	0.2
95th percentile	0.1	0.5	0.5	0.5	0.5	0.3	0.5	0.5
95% of all trading volume	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Maximum	0.2	1.0	1.0	1.0	1.6	0.9	1.1	1.5
<b>Cost of replication</b>								
Turnover**** (%)	2.5	38.7	39.1	39.1	40.0	40.0	40.0	40.0
Performance drag at 25 bps***** (bps)	1.3	19.3	19.5	19.5	20.0	20.0	20.0	20.0
Performance drag at 50 bps***** (bps)	2.5	38.7	39.1	39.1	40.0	40.0	40.0	40.0
Performance drag at 75 bps***** (bps)	3.8	58.0	58.6	58.6	60.0	60.0	60.0	60.0

\* As of September 30, 2020

\*\* Average of last four index reviews ending September 30, 2020 and assuming a fund size of USD 1.0 bn and a maximum daily trading limit of 20%

\*\*\* As of the latest index review on August 31, 2020

\*\*\*\* Annualized one-way index turnover over index reviews

\*\*\*\*\* Performance drag aims to represent the total two-way annualized index level transaction cost assuming various levels of security level transaction cost



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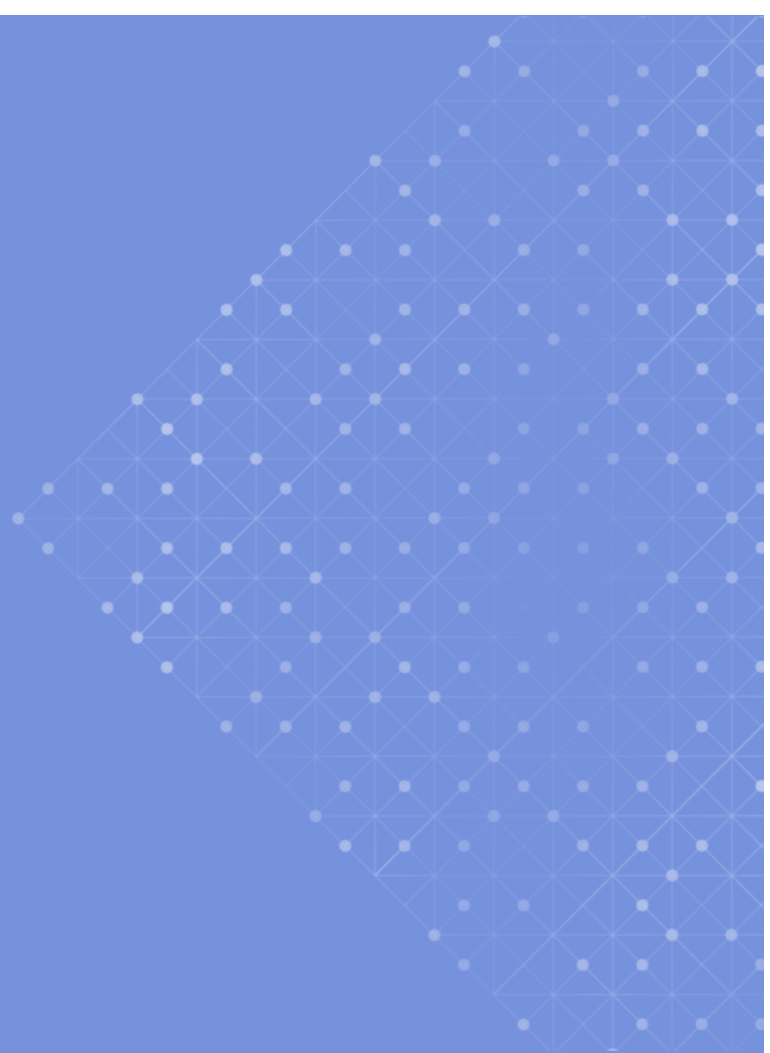


# Group 3: Discussion Points

- Do you think it is better to control active weights in mid-cap, small cap segments?
  - If yes, should the mid-cap securities be capped at  $\max(b+1\%, 5x)$ ?
- Does liquidity-based condition in asset bounds add value by controlling weights of liquidity outliers?
- Do you think controlling specific risk component adds value to the methodology?
- Should the proposed adjustments (Group 1/2/3) to standard MSCI DMF be extended to other multiple-factor (5-factor, 3-factor) indexes that follow the same framework?
- Should MSCI consider launching new multi-factor index solutions
  - with a cap on active risk?
    - What do you think will be a reasonable TE budget for a multi-factor strategy?
  - with “Growth” as one of the target factors?
  - where the “alpha” in the optimization is computed based on the risk contribution of the individual target factors instead of a current equal-weighted combination?
- Do you think GEMLTESG model should be considered instead of GEMLT to reflect ESG factor risk?

# Appendix

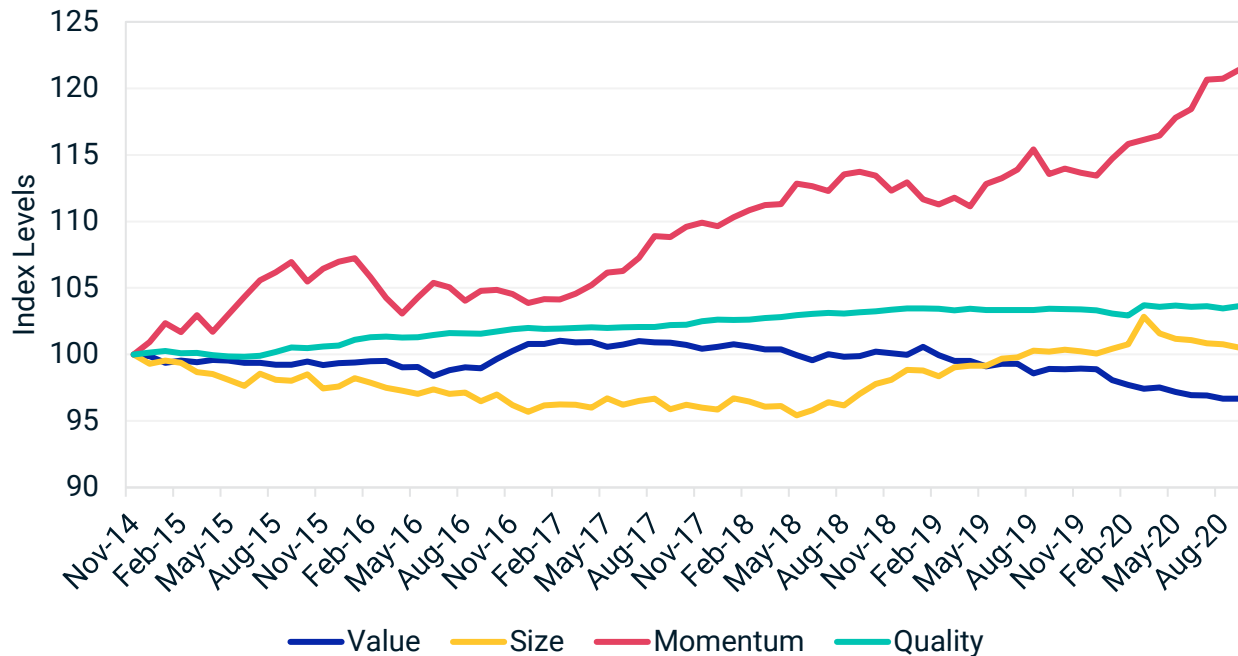
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# MSCI Diversified Multiple-Factor Index Methodology

Parameters	Standard Methodology	Small Cap Methodology
Universe	Any MSCI Standard Index	Any MSCI Small Cap Index
Objective	Aims to represent high exposure to the four factors (equal weighted combination of security-level exposures to four target factors) while maintaining market risk exposure similar to the underlying parent index	
Target Factors	<ul style="list-style-type: none"> <li>• <b>Value:</b> <math>(0.33)B/P + (0.67)Earnings\ Yield</math> (descriptors as defined in the Barra GEMLT model), sector-relative</li> <li>• <b>Size:</b> Size Factor Score (Barra GEMLT model)</li> <li>• <b>Momentum:</b> Momentum Factor Score (Barra GEMLT model)</li> <li>• <b>Quality:</b> <math>(0.2)Profitability + (0.2)Inv\ Qual + (0.2)Ear\ Qual + (-0.2)EarVar + (-0.2)Lev</math> (descriptors as defined in the GEMLT model), sector-relative</li> </ul>	
Exposure Constraints	<ul style="list-style-type: none"> <li>• Target risk: ex-ante risk of derived index <math>\leq</math> ex-ante risk of parent index</li> <li>• Factor exposures: <math>\pm 0.25</math> active exposure to Growth, Liquidity, Volatility</li> <li>• Country &amp; sector weights: <math>\pm 5\%</math> active weights on countries and sectors</li> </ul>	
Investability Constraints	<ul style="list-style-type: none"> <li>• Maximum asset weight = <math>\min(b+2\%, b*10)</math></li> <li>• Minimum asset weight = <math>\min(b-2\%, 0\%)</math></li> <li>• Maximum annual one way turnover = 40%</li> </ul>	<ul style="list-style-type: none"> <li>• Maximum asset weight = <math>\min(b+1\%, b*5)</math></li> <li>• Minimum asset weight = <math>\min(b-1\%, 0\%)</math></li> <li>• Maximum annual one way turnover = 40%</li> </ul>

# Historical Factor Returns



- Momentum has been the driver of the returns historically, while Value and Size have underperformed in recent times.

# Size $\geq -0.5$ : Key metrics

## Key metrics

	MSCI World Index	World DMF	World Sim DMF	Case 11 (C6 + SZ $\geq -0.5$ )	Case 12 (C3 + risk aversion adj)
Total return* (%)	8.1	6.9	8.0	8.8	7.5
Total risk (%)	14.1	14.1	14.0	13.6	14.1
Return / risk	0.57	0.49	0.57	0.65	0.53
Sharpe ratio	0.50	0.42	0.50	0.57	0.46
Active return (%)	0.0	-1.1	-0.1	0.7	-0.6
Tracking error (%)	0.0	2.9	3.0	3.0	3.3
Information Ratio	nan	-0.39	-0.03	0.25	-0.18
Historical beta	1.00	0.98	0.96	0.94	0.97
Number of constituents***	1642	362	337	320	384
Turnover** (%)	2.5	38.7	39.1	40.0	78.9
Price to book***	2.3	1.9	2.0	2.1	2.1
Price to earnings***	19.6	14.6	14.8	15.3	15.7
Dividend yield*** (%)	2.5	2.3	2.3	2.2	2.2

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

## Performance (%)

	MSCI World Index	World DMF	World Sim DMF	Case 11 (C6 + SZ $\geq -0.5$ )	Case 12 (C3 + risk aversion adj)
YTD	2.1	-2.2	-2.2	-0.3	-4.2
1 Yr	11.0	5.9	5.8	7.3	2.5
3 Yr	8.3	4.6	5.5	6.6	4.5
5 Yr	11.1	8.8	10.3	11.0	9.2

Gross returns for the period ending Sep 30, 2020

Returns are annualized for periods longer than a year

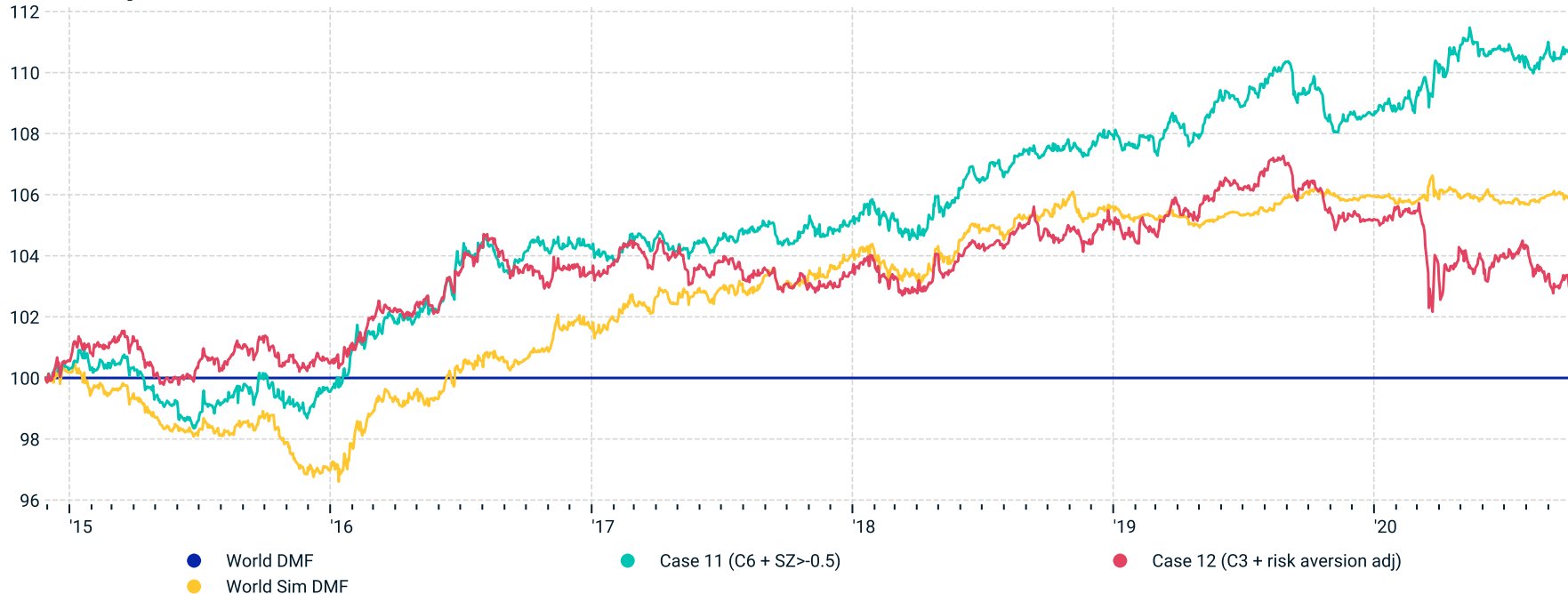


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# Size $\geq -0.5$ : Key metrics (compared with Live DMF Index)

## Relative performance



# Size $\geq -0.5$ : Capacity and concentration

## Capacity and concentration metrics

	MSCI World Index	World DMF	World Sim DMF	Case 11 (C6 + SZ $\geq -0.5$ )	Case 12 (C3 + risk aversion adj)
<b>Concentration*</b>					
Average number of constituents	1642	362	337	320	384
Effective number of constituents	314	172	154	135	192
Parent index coverage (%)	100.0	13.5	13.5	14.8	13.6
Top 10 constituents weight (%)	11.7	14.9	16.3	18.1	13.7
<b>Size family exposures**</b>					
Large (%)	82.7	50.2	53.2	60.3	43.0
Mid (%)	17.3	49.8	46.8	39.7	57.0
Small (%)	0.0	0.0	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>					
Average (%)	0.00	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>					
Average (%)	0.00	0.02	0.02	0.02	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>					
Active share (%)	0.0	89.0	89.0	87.7	89.0
Average weight multiplier	1.0	9.8	9.9	9.6	9.9
Maximum weight multiplier	1.0	10.9	10.0	10.0	10.0
Maximum weight (%)	2.4	2.5	2.6	2.7	2.4

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020



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Information Classification: GENERAL

# Size $\geq -0.5$ : Active GEMLT factor exposures

Factor	w.r.t MSCI World Index				w.r.t Live DMF Index		
	World DMF	World Sim DMF	Case 11 (C6 + SZ $\geq -0.5$ )	Case 12 (C3 + risk aversion adj)	World Sim DMF	Case 11 (C6 + SZ $\geq -0.5$ )	Case 12 (C3 + risk aversion adj)
Value	0.31	0.37	0.30	0.29	0.05	-0.01	-0.02
Size	-0.76	-0.73	-0.57	-0.88	0.03	0.19	-0.12
Momentum	0.14	0.14	0.23	0.24	0.00	0.09	0.11
Quality	0.34	0.54	0.58	0.49	0.20	0.24	0.15
BtoP	0.15	0.22	0.16	0.17	0.07	0.01	0.02
Earn. yield	0.34	0.36	0.31	0.28	0.02	-0.03	-0.07
Size	-0.66	-0.64	-0.50	-0.76	0.02	0.16	-0.10
Momentum	0.14	0.14	0.23	0.24	0.00	0.09	0.11
Leverage	-0.31	-0.37	-0.37	-0.34	-0.06	-0.06	-0.03
Earn. qlty	-0.02	0.10	0.10	0.07	0.11	0.11	0.08
Inv. qlty	0.25	0.37	0.36	0.33	0.12	0.12	0.09
Profitability	0.32	0.45	0.50	0.42	0.13	0.18	0.10
Earn. var.	-0.01	-0.06	-0.10	-0.06	-0.04	-0.09	-0.04

Average monthly active exposures over Nov 2014 – Sep 2020

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Information Classification: GENERAL



# Key metrics : Size controls in IMI universe

## Key metrics

	MSCI World IMI Index	World IMI Sim DMF	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 11 (C6 + SZ>-0.5)
<b>Total return* (%)</b>	7.9	8.0	8.5	9.1	8.7
<b>Total risk (%)</b>	14.4	14.9	13.8	13.9	13.7
<b>Return / risk</b>	0.55	0.54	0.62	0.65	0.63
<b>Sharpe ratio</b>	0.48	0.47	0.55	0.59	0.56
<b>Active return (%)</b>	0.0	0.1	0.7	1.2	0.8
<b>Tracking error (%)</b>	0.0	3.6	2.9	2.7	2.9
<b>Information Ratio</b>	nan	0.03	0.23	0.46	0.27
<b>Historical beta</b>	1.00	1.00	0.94	0.95	0.93
<b>Number of constituents***</b>	5942	2310	1234	2844	2243
<b>Turnover** (%)</b>	2.2	39.1	40.0	40.0	40.0
<b>Price to book***</b>	2.2	1.9	1.9	2.0	1.9
<b>Price to earnings***</b>	20.2	16.1	14.9	15.9	14.8
<b>Dividend yield*** (%)</b>	2.4	2.0	2.2	2.1	2.3

Period: Nov 28, 2014 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

## Performance (%)

	MSCI World IMI Index	World IMI Sim DMF	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 10 (C6 + SZ>-0.5)
<b>YTD</b>	1.1	-4.7	-2.5	-1.4	-2.2
<b>1 Yr</b>	10.0	3.5	5.9	6.9	6.6
<b>3 Yr</b>	7.6	3.6	5.8	6.7	6.3
<b>5 Yr</b>	10.8	9.3	10.7	11.2	10.6

Gross returns for the period ending Sep 30, 2020

Returns are annualized for periods longer than a year



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Information Classification: GENERAL

# Active GEMLT factor exposures

- Controlling Size exposure resulted in high exposure to Value and Quality factors.

Factor	w.r.t World IMI Index			
	World IMI Sim DMF	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 11 (C6 + SZ>-0.5)
Value	0.26	0.37	0.27	0.34
Size	-1.37	-0.60	-0.80	-0.55
Momentum	0.24	0.23	0.22	0.27
Quality	0.43	0.62	0.51	0.67
BtoP	0.20	0.21	0.15	0.17
Earn. yield	0.24	0.37	0.27	0.37
Size	-1.25	-0.54	-0.73	-0.50
Momentum	0.24	0.23	0.22	0.27
Leverage	-0.44	-0.43	-0.37	-0.46
Earn. qlty	0.05	0.11	0.09	0.13
Inv. qlty	0.22	0.38	0.28	0.35
Profitability	0.42	0.52	0.45	0.61
Earn. var.	0.03	-0.10	-0.10	-0.10

# Capacity and concentration

## Capacity and concentration metrics

	MSCI World IMI Index	World IMI Sim DMF	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 11 (C6 + SZ>-0.5)
<b>Concentration*</b>					
Average number of constituents	5942	2310	1234	2844	2243
Effective number of constituents	415	409	171	205	156
Parent index coverage (%)	100.0	11.8	12.8	18.0	32.8
Top 10 constituents weight (%)	10.1	10.5	16.1	15.8	18.0
<b>Size family exposures**</b>					
Large (%)	71.9	19.7	56.9	45.8	52.3
Mid (%)	15.0	25.4	25.0	20.0	20.7
Small (%)	13.1	54.9	18.1	34.2	27.0
Micro (%)	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>					
Average (%)	0.00	0.02	0.02	0.01	0.01
95th percentile (%)	0.00	0.02	0.02	0.01	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>					
Average (%)	0.00	0.01	0.01	0.01	0.00
95th percentile (%)	0.00	0.02	0.02	0.01	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>					
Active share (%)	0.0	89.5	88.6	83.1	87.8
Average weight multiplier	1.0	10.0	9.9	5.1	6.5
Maximum weight multiplier	1.0	10.1	10.0	10.0	10.0
Maximum weight (%)	2.1	1.9	2.6	2.8	2.6

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020

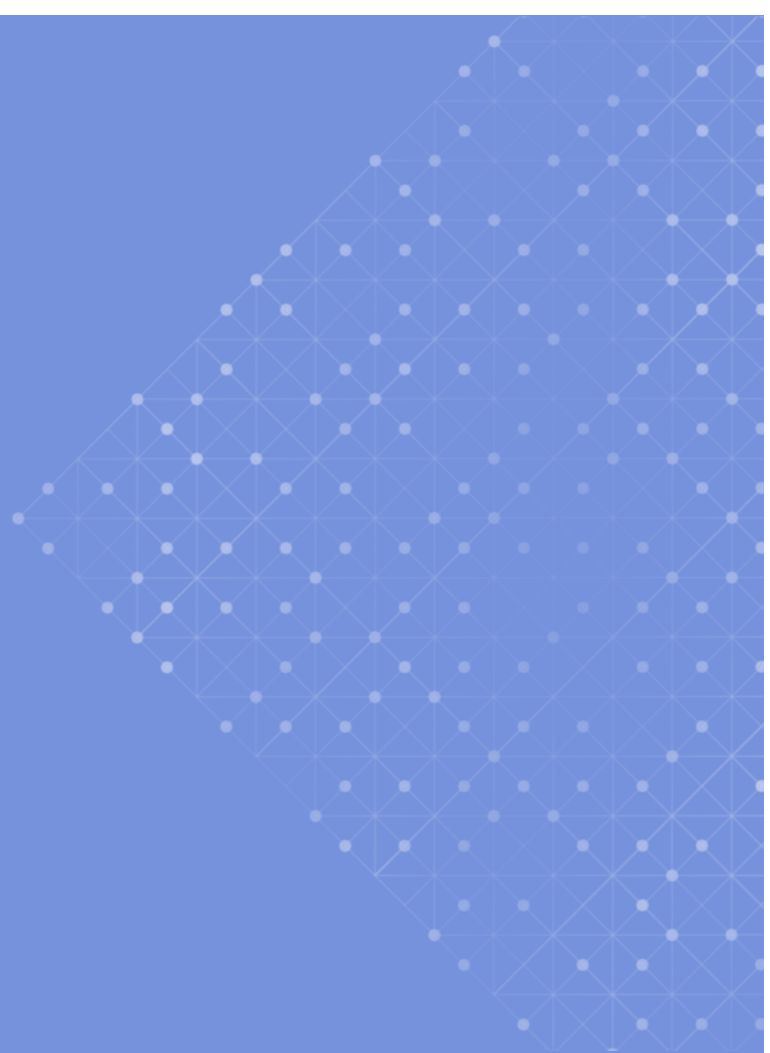
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# Appendix II

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LONG HISTORY – DEC 2000 TO SEP 2020



# Key metrics

## Key metrics

	MSCI World Index	MSCI World DMF Index	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)
Total return* (%)	6.0	8.9	9.0	9.0	8.7	9.1
Total risk (%)	15.4	15.4	15.8	15.4	15.5	15.6
Return / risk	0.39	0.58	0.57	0.58	0.56	0.59
Sharpe ratio	0.30	0.48	0.49	0.49	0.47	0.50
Active return (%)	0.0	2.9	3.1	3.0	2.7	3.2
Tracking error (%)	0.0	3.7	3.5	3.1	3.2	3.4
Information Ratio	nan	0.79	0.89	0.97	0.85	0.93
Historical beta	1.00	0.97	1.00	0.98	0.98	0.98
Number of constituents***	1648	427	447	345	568	448
Turnover** (%)	3.6	39.7	40.6	40.6	40.3	40.6
Price to book***	2.2	1.9	1.9	1.9	1.9	1.9
Price to earnings***	18.1	13.5	15.0	14.4	14.9	15.1
Dividend yield*** (%)	2.4	2.4	2.1	2.2	2.2	2.1

Period: Dec 29, 2000 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

## Performance (%)

	MSCI World Index	MSCI World DMF Index	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)
YTD	2.1	-2.2	-0.8	-0.6	-0.5	-1.0
1 Yr	11.0	5.9	6.4	7.1	7.8	6.1
3 Yr	8.3	4.6	6.2	6.5	6.9	6.1
5 Yr	11.1	8.8	10.5	11.0	11.0	10.4
10 Yr	10.0	10.3	11.6	12.1	11.8	11.6

Gross returns for the period ending Sep 30, 2020

Returns are annualized for periods longer than a year

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Information Classification: GENERAL



# Key metrics (compared with Live DMF Index)

Key metrics	World DMF	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)
Total return* (%)	8.9	9.0	9.0	8.7	9.1
Total risk (%)	15.4	15.8	15.4	15.5	15.6
Return / risk	0.58	0.57	0.58	0.56	0.59
Sharpe ratio	0.48	0.49	0.49	0.47	0.50
Active return (%)	0.0	0.2	0.1	-0.2	0.3
Tracking error (%)	0.0	2.3	2.4	2.4	2.3
Information Ratio	nan	0.08	0.05	-0.09	0.11
Historical beta	1.00	1.01	0.99	1.00	1.00
Number of constituents***	427	447	345	568	448
Turnover** (%)	39.7	40.6	40.6	40.3	40.6
Price to book***	1.9	1.9	1.9	1.9	1.9
Price to earnings***	13.5	15.0	14.4	14.9	15.1
Dividend yield*** (%)	2.4	2.1	2.2	2.2	2.1

Period: Dec 29, 2000 to Sep 30, 2020. \* Gross returns annualized in USD \*\* Annualized one-way index turnover over index reviews \*\*\* Monthly averages

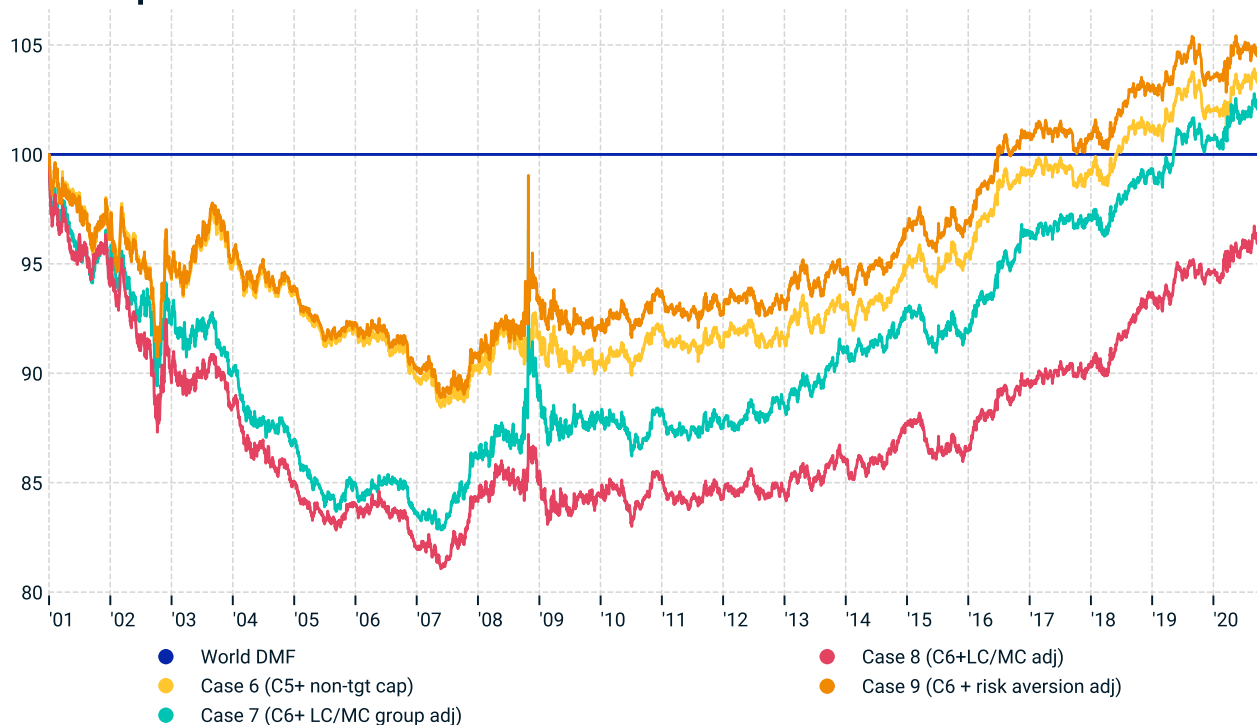


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Information Classification: GENERAL

# Key metrics (compared with Live DMF Index)

## Relative performance



# Capacity and concentration

	MSCI World Index	MSCI World Diversified Multiple-factor Index	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6 + risk aversion adj)
<b>Concentration*</b>						
Average number of constituents	1648	427	447	345	568	448
Effective number of constituents	322	185	194	144	163	194
Parent index coverage (%)	100.0	12.5	13.2	13.7	17.2	13.2
Top 10 constituents weight (%)	11.3	14.8	14.4	16.9	16.5	14.3
<b>Size family exposures**</b>						
Large (%)	82.9	48.2	47.1	68.0	64.9	47.0
Mid (%)	17.1	51.8	52.9	32.0	35.1	53.0
Small (%)	0.0	0.0	0.0	0.0	0.0	0.0
Micro (%)	0.0	0.0	0.0	0.0	0.0	0.0
<b>Index capacity - float market cap ownership***</b>						
Average (%)	0.00	0.02	0.02	0.02	0.01	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02
<b>Index capacity - full market cap ownership***</b>						
Average (%)	0.00	0.02	0.02	0.02	0.01	0.02
95th percentile (%)	0.00	0.02	0.02	0.02	0.02	0.02
Maximum (%)	0.00	0.02	0.02	0.02	0.02	0.02
<b>Degree of index tilt*</b>						
Active share (%)	0.0	88.8	88.5	87.8	84.4	88.4
Average weight multiplier	1.0	9.7	9.6	9.5	5.8	9.6
Maximum weight multiplier	1.0	10.2	10.0	10.0	10.0	10.0
Maximum weight (%)	2.0	2.5	2.4	2.6	2.6	2.4

\* Monthly averages

\*\* Monthly averages, size family data available from June 2008

\*\*\* Assuming a fund size of USD 1.0 bn as of the latest index review on August 31, 2020

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# Active GEMLT factor exposures

Factor	w.r.t MSCI World Index					w.r.t Live DMF Index			
	World DMF	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6+ risk aversion adj)	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6+ risk aversion adj)
Value	0.29	0.25	0.32	0.27	0.25	-0.04	0.03	-0.02	-0.04
Size	-0.89	-0.88	-0.64	-0.66	-0.88	0.01	0.24	0.22	0.01
Momentum	0.22	0.26	0.25	0.23	0.26	0.04	0.03	0.01	0.04
Quality	0.23	0.49	0.54	0.48	0.49	0.25	0.30	0.25	0.26
BtoP	0.16	0.18	0.19	0.16	0.18	0.01	0.03	0.00	0.01
Earn. yield	0.30	0.23	0.31	0.26	0.23	-0.06	0.01	-0.04	-0.07
Size	-0.76	-0.75	-0.55	-0.57	-0.75	0.01	0.21	0.19	0.01
Momentum	0.22	0.26	0.25	0.23	0.26	0.04	0.03	0.01	0.04
Leverage	-0.19	-0.28	-0.30	-0.26	-0.28	-0.09	-0.11	-0.07	-0.09
Earn. qlty	0.02	0.12	0.14	0.13	0.12	0.11	0.13	0.12	0.11
Inv. qlty	0.17	0.34	0.38	0.34	0.34	0.16	0.21	0.17	0.16
Profitability	0.21	0.36	0.38	0.34	0.36	0.15	0.17	0.13	0.15
Earn. var.	0.02	-0.10	-0.10	-0.10	-0.10	-0.12	-0.12	-0.12	-0.12



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Average monthly active exposures over Dec 2000 – Sep 2020

# GEMLT active performance attribution

Factor	w.r.t MSCI World Index				
	World DMF	Case 6 (C5+ non-tgt cap)	Case 7 (C6+ LC/MC group adj)	Case 8 (C6+LC/MC adj)	Case 9 (C6+ risk aversion adj)
Active	2.90%	3.09%	3.03%	2.70%	3.16%
Asset selection	-0.70%	-0.69%	-0.70%	-0.65%	-0.68%
Common factor	3.53%	3.50%	3.48%	3.21%	3.55%
Countries	0.15%	-0.07%	-0.06%	-0.04%	0.00%
Industries	-0.12%	-0.25%	-0.20%	-0.23%	-0.26%
Styles	3.50%	3.82%	3.75%	3.48%	3.81%
BtoP	0.31%	0.37%	0.36%	0.32%	0.36%
Earn. Yield	0.38%	0.36%	0.45%	0.36%	0.36%
Size	0.42%	0.41%	0.30%	0.31%	0.42%
Momentum	1.06%	1.15%	1.08%	1.02%	1.15%
Leverage	0.05%	0.05%	0.05%	0.04%	0.05%
Earn. qlty	0.03%	0.15%	0.16%	0.16%	0.15%
Inv. qlty	0.18%	0.42%	0.46%	0.42%	0.42%
Profitability	0.30%	0.43%	0.43%	0.39%	0.44%
Earn. var.	0.01%	0.06%	0.06%	0.06%	0.06%

Performance attribution using Barra GEMLT model over Dec 2000 – Sep 2020



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