

Alpha in shorts: Shorting activities and the cross-section of stock returns around the world

By Hao Zou, Ph.D., and Jerry Sun, Ph.D.



In its 34th year, Risk and Reward provides a platform for Invesco's investment professionals to produce original research and investment strategy content. This Q2 2023 edition contains four additional articles. Contact your local Invesco representative for the full edition.

Short sellers convey information through their bearish view on the securities they short. Using various metrics, we've constructed a 'shorting signal' to reflect in a timely manner and measure shorting activities which could unlock robust return premiums across regions and market capitalization group.

Short sellers are important for price discovery: Because short selling is riskier (theoretically, the downside potential is unlimited) and more costly (due to additional borrowing costs), their trading activities are often perceived to convey greater conviction, and short sellers are often believed to be more informed than long investors.

Academics have argued that short selling theoretically improves price discovery and market liquidity.¹ Empirical studies have found that heavily shorted stocks tend to underperform, and stocks with minimal shorting tend to outperform. This is consistent with the notion that short sellers express a bearish view that is informative with respect to the stocks they short. One potential issue with many of these empirical studies is that they rely on data reported by stock exchanges, which can be heavily delayed,² are only available in a

small number of countries (such as the US and Canada) and do not account for the supply side of the shorting market. In this study, we use data from the securities lending market, which captures shorting activities more comprehensively and in a timelier manner than exchange data.

Data from the securities lending market

Short selling normally involves a short seller borrowing a security, selling it and eventually buying back the security to 'cover the short' position. Consequently, there exists a securities lending market, where the owner of a stock or bond transfers ownership temporarily to a borrower. To mitigate the counterparty risk faced by the lender, a cash or non-cash collateral³ is required. The borrower is also charged a fee for borrowing the security.

Data from the securities lending market is provided by IHS Markit, which sources



About risk: The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested.

This publication is intended only for Professional Clients and Financial Advisers in Continental Europe (as defined on the back cover); for Qualified Clients/Sophisticated Investors in Israel, for Professional Clients in Dubai, Ireland, the Isle of Man, Jersey and Guernsey, and the UK; for Sophisticated or Professional Investors in Australia; for Professional Investors in Hong Kong; for Institutional Investors and/or Accredited Investors in Singapore; for certain specific sovereign wealth funds and/or Qualified Domestic Institutional Investors approved by local regulators only in the People's Republic of China; for certain specific Qualified Institutions and/or Sophisticated Investors only in Taiwan; for Qualified Professional Investors in Korea; for certain specific institutional investors in Brunei; for Qualified Institutional Investors and/or certain specific institutional investors in Thailand; for certain specific institutional investors in Indonesia; for qualified buyers in Philippines for informational purposes only; for Qualified Institutional Investors, pension funds and distributing companies in Japan; and for one-on-one Institutional Investors in the USA. This document is restricted to investors who are (i) Accredited Investors as such term is defined in National Instrument 45-106, and (ii) Permitted Clients as such term is defined in National Instrument 31-103. It is not intended for and should not be distributed to, or relied upon, by the public or retail investors.

daily shorting activities data from market participants, including custodians, prime brokers, asset managers and other financial intermediaries. More than 3 million intraday transactions encompassing USD 12 trillion in securities are covered.⁴ Compared to the data from stock exchanges, IHS Markit data has the following advantages: (1) It is timelier, because the data is recorded daily and delivered with only a two-day lag; (2) it provides broader coverage over many different regions and countries; (3) it captures information not only from the demand side (e.g., short interest), but also from the supply side (e.g., available inventory for lending), plus shorting costs. In this research, we aggregate the daily data to monthly and perform analysis at monthly frequency.

Four variables form the shorting signal

After reviewing and analyzing the IHS Markit securities lending market dataset, we focus on four variables to capture different facets of shorting:

- (1) short interest ratio,
- (2) days to cover ratio,
- (3) utilization and
- (4) active utilization by quantity.

Table 1 provides a description.

The selection of these variables is based on their underlying economic rationale, data coverage⁵ and univariate return predictability. They collectively capture both the supply and demand sides of the shorting market and are calculated based either on quantity of shares or value of shares. This selection provides more diversified exposure to the shorting market than a single-variable construct.

The eventual shorting signal is constructed as a combo signal of these four variables. Specifically, we follow our standard signal construction process and first standardize the raw value of each variable into industry-neutral z-scores. After combining the four z-scores by taking their simple average, we then neutralize the average score by market. These steps are done so that the efficacy of the shorting signal is not impacted by taking unintentional market or industry bets. Finally, we form a unit leverage signal portfolio based on the negated scores such that the signal takes long positions in stocks with low shorting activity and short positions in stocks with high shorting activity. The results here presented are based on this combo shorting signal.

Empirical results

We conduct empirical tests for various regions – Australia, Emerging Markets, Continental Europe, Japan, the UK and the US. With the exception of Australia, where our test is based on the all cap universe,⁶ we look at large-mid and small caps separately. The testing period is from January 2007 (when the shorting data became available) to October 2022, based on monthly data.

We start with the coverage analysis. Table 2 shows the time series average coverage by number of names and coverage by market cap,⁷ along with the average universe sizes for the large-mid and small caps. Not surprisingly, the US is the largest universe for both the large-mid and small caps, whereas Australia and the UK are among the smallest. In terms of signal coverage, all are satisfactory except the Emerging Markets, where coverage is about 50%. This low coverage is not surprising due to regulations prohibiting short selling in some countries and/or inadequate reporting.⁸

Next, we analyze signal performance: Table 3 shows the performance statistics of the shorting signal, including the annualized returns, risk and information ratios (IR), as well as market betas. We can see that, in all regions and market cap groups, IRs are quite strong and can go as high as 1.7. Risk is on average a little above 5%, with slightly higher in Australia (all cap), as well as the United Kingdom and US (small cap). Since the shorting signal is constructed to be industry and market neutral, the signal betas⁹ are very close to zero, suggesting that signal performance is not driven by the market. This beta-neutral construction is consistent with our portfolio construction process.

There is also some evidence that the signal performs even better for small caps than for large to mid caps. For example, the IR for US large to mid caps is 0.77, but for US small caps it is almost double, at 1.50. One explanation is that there is more need to borrow small caps in the wholesale securities lending market, whereas there are generally sufficient large-mid caps available to be borrowed through rehypothecation.¹⁰ In this regard, the shorting data for small caps is likely more complete and accurate. Nevertheless, the large cap results are still solid in our view – and they demonstrate the signal's efficacy.



There is some evidence that the signal performs even better for small caps than for large to mid caps.

Table 1
Shorting signal variables for our analysis

Type	Tested variable	Definition and data used
Demand	Short interest ratio	Number of shares borrowed / shares outstanding
Demand	Days to cover ratio	Value of shares borrowed / trading volume
Demand + supply	Utilization	Value of shares lent out divided by share available for lending
Demand + supply	Active utilization by quantity	Quantity of shares lent out divided by shares actively available for lending

Source: Invesco.

Table 2
Data coverage (averages over time)

	Names in the universe	Observations	Coverage (by names)	Coverage (by market cap)	
Panel A: Large-mid caps	Australia (all cap)	290	273	94.0%	97.2%
	Emerging Markets	1162	582	51.7%	51.4%
	Continental Europe	525	484	92.1%	94.2%
	Japan	704	661	93.9%	96.4%
	UK	263	228	86.7%	88.7%
	US	1217	1140	93.7%	95.6%
Panel B: Small caps	Emerging Markets	2040	1043	50.3%	49.6%
	Continental Europe	850	759	89.4%	90.3%
	Japan	1026	969	94.4%	93.7%
	UK	431	370	86.1%	86.1%
	US	2454	2219	90.4%	92.1%

The large/mid and small cap universes in each region are defined according to commonly used research universes. Based on monthly data from January 2007 to October 2022. Source: Invesco.



In many cases, the shorting signal generates significantly positive intercepts.

Figure 1 shows the cumulative returns of the signals for all regions and both market cap groups. Generally, they are trending upwards without large drawdowns, and the small cap performance appears stronger over time.

But how much does the shorting signal improve performance? We analyzed its effect on the market portfolio, three factor portfolios (momentum, quality, value) and a risk-weighted multi-factor portfolio. We regressed the returns of the shorting signal portfolio against the respective portfolio returns. Significantly positive intercepts indicate that the shorting signal adds value.

Table 4 shows the results, with the t-statistics in parentheses. Intercepts that are statistically significant at 5% have their t-statistics in bold. In many cases, the shorting signal generates significantly positive intercepts, even on the multi-

factor model returns. This pattern is even stronger in small caps.

A closer look at long and short legs of the signal

Our last set of empirical results breaks down the effect of the shorting signal on the long and the short leg. In principle, a signal's efficacy could come from both its long and short legs. Figure 2 shows the IRs for each, as well as the overall signal.¹¹ We see that both the long and short legs contribute to performance in most regions and market cap groups and that the overall IRs are usually higher than the standalone IRs of both the long and short legs.

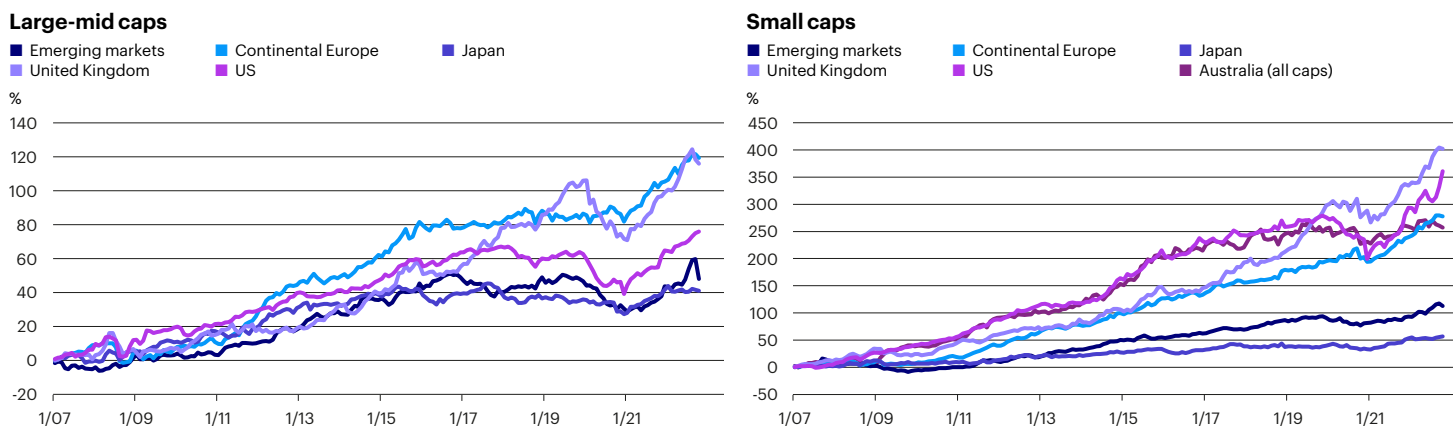
The signal portfolio is constructed such that stocks on the long leg are those experiencing minimal shorting and stocks on the short leg are those with a high level of shorting activity. In other words, stocks in the short leg indicate a more bearish view, whereas those in the long

Table 3
Signal performance

	Return p.a.	Risk p.a.	Information ratio	Beta	
Panel A: Large-mid caps	Australia (all cap)	8.37%	7.76%	1.08	0.05
	Emerging Markets	2.42%	4.96%	0.49	-0.06
	Continental Europe	5.08%	4.98%	1.02	-0.02
	Japan	2.24%	4.24%	0.53	-0.00
	UK	4.98%	5.95%	0.84	0.04
	US	3.84%	5.01%	0.77	0.01
Panel B: Small caps	Emerging Markets	4.80%	5.18%	0.93	-0.04
	Continental Europe	8.91%	5.31%	1.68	-0.10
	Japan	2.98%	5.04%	0.59	-0.07
	UK	10.70%	6.95%	1.54	-0.13
	US	10.72%	7.17%	1.50	-0.09

The large-mid and small cap universes in each region are defined according to commonly used research universes. Based on monthly data from January 2007 to October 2022. Source: Invesco.

Figure 1
Cumulative returns



The large/mid and small cap universes in each region are defined according to commonly used research universes. Based on monthly data from January 2007 to October 2022. Source: Invesco. Past performance does not guarantee future results.



Our empirical results suggest that shorting signal performance is solid.

leg could be more neutral and not necessarily positive. Accordingly, one would expect the short leg to carry more information content and hence have greater efficacy compared to the long leg. And the results we observe are consistent with this hypothesis in a number of markets, such as the US, the UK and Australia.

Overall, our empirical results suggest that shorting signal performance is solid and not dominated by either the long or the short leg.

Short squeeze

A ‘short squeeze’ occurs when a significant number of short sellers scramble to cover their positions, which leads to surging demand-side pressure and a sharp rise in stock prices. This, in turn, triggers even more margin calls and short covering. Although an unusual occurrence, short squeeze events have happened in the past, most notably as a result of a gaming stock frenzy in early 2021.

We did not specifically control for short squeeze situations in the construction of our shorting signal because we believe it is not a systemic phenomenon that needs to be priced into a factor – a short squeeze usually affects an individual stock and its short-term price dynamics, whereas factor investing relies on harvesting long-term factor premia and diversifying idiosyncratic risk. We did, however, examine the potential impacts from a short squeeze and explored whether controlling for variables that are likely indicative of a short squeeze (such as a spike in shorting cost) can improve performance. We found nothing significant, which reinforces our assertion that short squeeze events would likely have limited impact on our shorting signal.

Conclusion

We have developed a shorting signal based on market theories of price discovery and build it out on a set of variables that capture the array of short selling activities. Our empirical results indicate that using

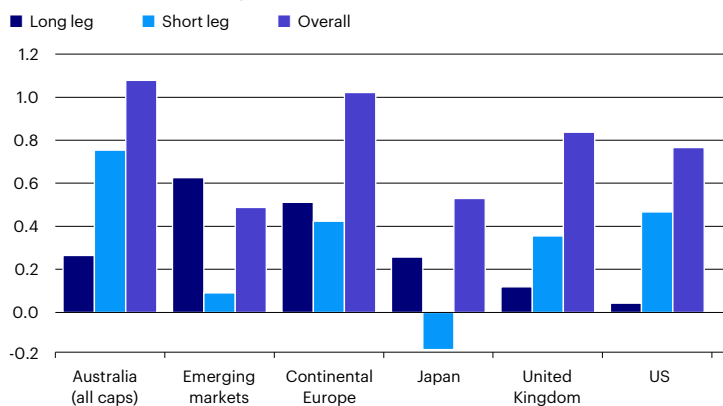
Table 4
Spanning test results

		Market portfolio	Momentum	Quality	Value	Multi-factor portfolio
Panel A: Large-mid caps	Australia (all cap)	8.33% (4.09)	4.82% (2.32)	7.07% (3.39)	7.97% (3.93)	3.62% (1.74)
	Emerging Markets	3.02% (2.42)	1.31% (1.03)	2.46% (1.88)	2.59% (2.03)	0.17% (0.13)
	Continental Europe	5.32% (4.13)	3.79% (3.17)	5.35% (4.12)	5.46% (4.20)	3.89% (3.21)
	Japan	2.36% (2.18)	2.03% (1.94)	1.87% (1.73)	2.05% (1.92)	1.23% (1.19)
	UK	4.92% (3.19)	1.88% (1.32)	3.82% (2.35)	4.87% (3.16)	1.31% (0.90)
	US	3.86% (2.98)	3.09% (2.44)	4.01% (3.03)	3.95% (3.10)	3.63% (3.08)
Panel B: Small caps	Emerging Markets	5.34% (4.00)	3.03% (2.23)	4.66% (3.45)	5.39% (3.92)	2.42% (1.72)
	Continental Europe	9.73% (7.39)	8.26% (7.15)	9.61% (7.18)	9.92% (7.51)	8.16% (6.90)
	Japan	3.51% (2.78)	2.92% (2.37)	3.57% (2.79)	3.45% (2.73)	2.96% (2.37)
	UK	12.03% (6.84)	11.42% (6.61)	11.98% (6.72)	11.75% (6.72)	11.20% (6.38)
	US	11.83% (6.38)	10.74% (5.79)	11.45% (6.19)	11.68% (6.46)	10.27% (5.73)

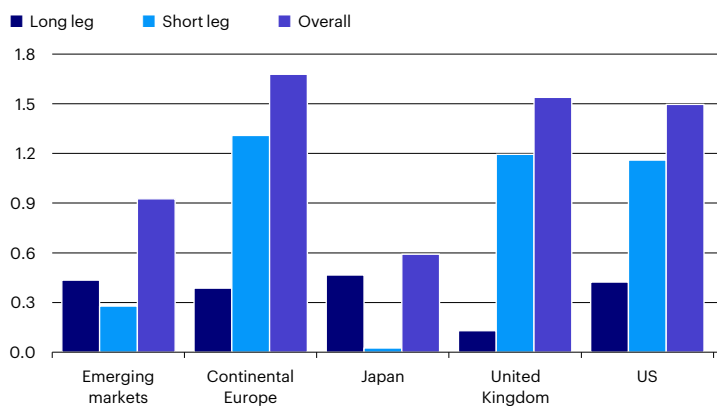
The large/mid and small cap universes in each region are defined according to commonly used research universes. Based on monthly data from January 2007 to October 2022. T-statistics in brackets (bolded if significant at the 5% level). Source: Invesco.

Figure 2
Comparison of long and short leg performance

Information ratios: Large-mid caps



Information ratios: Small caps



The large/mid and small cap universes in each region are defined according to commonly used research universes. Based on monthly data from January 2007 to October 2022. Source: Invesco. **Past performance does not guarantee future results.**

the shorting signal could possibly improve portfolio performance in all regions around the world. The alpha potential in the signal is stronger among small cap stocks, exists in both long and short legs and is not

significantly impacted by short squeeze events. We further find that this signal adds alpha to our multi-factor model based on quality, momentum and value.

Notes

- 1 see: Miller (1977).
- 2 e.g., the data reported by Compustat in the US suffers from a 14-day delay.
- 3 Can be other securities of similar value.
- 4 see: "Shining the Light on Short Interest", Markit Factor Insights.
- 5 e.g., we did not use fee-related variables because their coverage is less ideal in regions outside the US.
- 6 Australia is a relatively small market, and we want to ensure enough breadth in constructing the shorting signal.
- 7 Coverage by market cap is calculated by the total market cap of stocks covered by the shorting signal, divided by the total market cap of stocks in the universe.
- 8 Our Emerging Market universe contains a large percentage of Chinese A shares, which have limited shorting capacity (and hence limited shorting data) due to regulations. This further contributes to the relatively low data coverage.
- 9 These can be called "ex-post" betas, which differ from "ex-ante" betas that we use to neutralize the shorting signals. In practice, ex-post betas can almost never be completely turned to zero – this just reflects the discrepancy between prediction (ex-ante) and what actually happens (ex-post).
- 10 A practice that occurs where a bank or other broker-dealer reuses the collateral pledged by its clients. It may be cheaper to borrow from its own long book than pay a higher rate to borrow from the wholesale market.
- 11 The IRs for the long and short legs are calculated using market adjustment. For example, we subtract the market return from the long leg returns, so what remains is attributable to the long leg signal itself.



References

Invesco Quantitative Strategies (2022): Practical factor portfolio implementation: The importance of transparency and control. Invesco Whitepaper Series.

Markit Factor Insights (2012): Shining the Light on Short Interest.

Miller, Edward M. (1977): Risk, uncertainty, and divergence of opinion. *Journal of Finance*, 32(4), 1151-1168.



About the authors



Jerry Sun, Ph.D.
 Senior Researcher at Invesco Systematic and Factor Investing
 Jerry Sun focuses on developing quantitative models and processes to improve the performance of SFI equity strategies.



Hao Zou, Ph.D.
 Research Analyst at Invesco Systematic and Factor Investing
 Hao Zou conducts quantitative research on alpha factors, portfolio construction, transaction cost and risk modeling.

About risk

The value of investments and any income will fluctuate (this may partly be the result of exchange rate fluctuations) and investors may not get back the full amount invested.

Important information

This publication is intended only for Professional Clients and Financial Advisers in Continental Europe (as defined below); for Qualified Clients/Sophisticated Investors in Israel, for Professional Clients in Dubai, Ireland, the Isle of Man, Jersey and Guernsey, and the UK; for Sophisticated or Professional Investors in Australia; for Professional Investors in Hong Kong; for Institutional Investors and/or Accredited Investors in Singapore; for certain specific sovereign wealth funds and/or Qualified Domestic Institutional Investors approved by local regulators only in the People's Republic of China; for certain specific Qualified Institutions and/or Sophisticated Investors only in Taiwan; for Qualified Professional Investors in Korea; for certain specific institutional investors in Brunei; for Qualified Institutional Investors and/or certain specific institutional investors in Thailand; for certain specific institutional investors in Indonesia; for qualified buyers in Philippines for informational purposes only; for Qualified Institutional Investors, pension funds and distributing companies in Japan; and for one-on-one Institutional Investors in the USA. This document is restricted to investors who are (i) Accredited Investors as such term is defined in National Instrument 45-106, and (ii) Permitted Clients as such term is defined in National Instrument 31-103. It is not intended for and should not be distributed to, or relied upon, by the public or retail investors. By accepting this document, you consent to communicate with us in English, unless you inform us otherwise.

The publication is marketing material and is not intended as a recommendation to invest in any particular asset class, security or strategy. Regulatory requirements that require impartiality of investment/investment strategy recommendations are therefore not applicable nor are any prohibitions to trade before publication. The information provided is for illustrative purposes only, it should not be relied upon as recommendations to buy or sell securities.

For the distribution of this document, Continental Europe is defined as Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Romania, Spain, Sweden and Switzerland.

All articles in this publication are written, unless otherwise stated, by Invesco professionals. The opinions expressed are those of the author or Invesco, are based upon current market conditions and are subject to change without notice. This publication does not form part of any prospectus. This publication contains general information only and does not take into account individual objectives, taxation position or financial needs. Nor does this constitute a recommendation of the suitability of any investment strategy for a particular investor. Neither Invesco Ltd. nor any of its member companies guarantee the return of capital, distribution of income or the performance of any fund or strategy. Past performance is not a guide to future returns.

This publication is not an invitation to subscribe for shares in a fund nor is it to be construed as an offer to buy or sell any financial instruments. As with all investments, there are associated inherent risks. This publication is by way of information only. This document has been prepared only for those persons to whom Invesco has provided it. It should not be relied upon by anyone else and you may only reproduce, circulate and use this document (or any part of it) with the consent of Invesco. Asset management services are provided by Invesco in accordance with appropriate local legislation and regulations.

Certain products mentioned are available via other affiliated entities. Not all products are available in all jurisdictions.

Canada: In Canada this document is restricted to investors who are (i) Accredited Investors as such term is defined in National Instrument 45-106, and (ii) Permitted Clients as such term is defined in National Instrument 31-103.

Israel: This document may not be reproduced or used for any other purpose, nor be furnished to any other person other than those to whom copies have been sent. Nothing in this document should be considered investment advice or investment marketing as defined in the Regulation of Investment Advice, Investment Marketing and Portfolio Management Law, 1995 ("the Investment Advice Law"). Investors are encouraged to seek competent investment advice from a locally licensed investment advisor prior to making any investment. Neither Invesco Ltd. nor its subsidiaries are licensed under the Investment Advice Law, nor does it carry the insurance as required of a licensee thereunder.

This publication is issued:

- In **Australia** by Invesco Australia Limited (ABN 48 001 693 232), Level 26, 333 Collins Street, Melbourne, Victoria, 3000, Australia which holds an Australian Financial Services Licence number 239916.
The information in this document has been prepared without taking into account any investor's investment objectives, financial situation or particular needs. Before acting on the information the investor should consider its appropriateness having regard to their investment objectives, financial situation and needs.
This document has not been prepared specifically for Australian investors. It:
 - may contain references to dollar amounts which are not Australian dollars;
 - may contain financial information which is not prepared in accordance with Australian law or practices;
 - may not address risks associated with investment in foreign currency denominated investments; and - does not address Australian tax issues.
- In **Austria and Germany** by Invesco Asset Management Deutschland GmbH, An der Welle 5, 60322 Frankfurt am Main, Germany.
- In **Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain and Sweden** by Invesco Management S.A., President Building, 37A Avenue JF Kennedy, L-1855 Luxembourg, regulated by the Commission de Surveillance du Secteur Financier, Luxembourg.
- In **Jersey, Guernsey, the Isle of Man, Israel and the UK** by Invesco Asset Management Limited, Perpetual Park, Perpetual Park Drive, Henley-on-Thames, Oxfordshire, RG9 1HH, United Kingdom. Authorised and regulated by the Financial Conduct Authority.
- In **Dubai** Invesco Asset Management Limited, Index Tower Level 6 - Unit 616, P.O. Box 506599, Al Mustaqbal Street, DIFC, Dubai, United Arab Emirates. Regulated by the Dubai Financial Services Authority.
- In **Hong Kong** by INVESCO HONG KONG LIMITED 景順投資管理有限公司, 45/F Jardine House, 1 Connaught Place, Central, Hong Kong.
- In **Japan** by Invesco Asset Management (Japan) Limited, Roppongi Hills Mori Tower 14F, 6-10-1 Roppongi, Minato-ku, Tokyo 106-6114; Registration Number: The Director-General of Kanto Local Finance Bureau (Kin-sho) 306; Member of the Investment Trusts Association, Japan and the Japan Investment Advisers Association.
- In **Singapore** by Invesco Asset Management Singapore Ltd, 9 Raffles Place, #18-01 Republic Plaza, Singapore 048619.
- In **Switzerland** by Invesco Asset Management (Schweiz) AG, Talacker 34, 8001 Zurich, Switzerland.
- In **Taiwan** by Invesco Taiwan Limited, 22F, No.1, Songzhi Road, Taipei 11047, Taiwan (0800-045-066). **Invesco Taiwan Limited is operated and managed independently.**
- In **Canada** by Invesco Canada Ltd., 120 Bloor Street East, Suite 700, Toronto, Ontario, M4W 1B7.
- In the **US** by Invesco Advisers, Inc., 1331 Spring Street NW, Suite 2500, Atlanta, GA 30309.

Data as of June 30, 2023 unless otherwise stated.

Copyright © 2023 Invesco. All rights reserved.

www.invesco.com