

Shipping factors - Uncovering the impact of imports and exports

November 2021

Research Signals

The IHS Markit Maritime & Trade division provides a real-time source for ship movements data and documents combined with trade data and commodity movements. Research Signals has tapped specifically into the Bill of Lading data, a source of detailed import and export data that can provide timely information on company economic activity measured by shipping trends. In total, we introduce 48 factors derived from four underlying import and export data items including shipping volume, shipping weight, shipping value and total shipments, along with measures of sector/industry relative shipping activities and the relationship of shipping levels to sales.

- Sector Relative Monthly Import Shipping Volume was a top performing factor in the US, with an average monthly spread of 0.26% between top and bottom ranked names, while Standardized Unexpected Quarterly Export Shipping Volume was a key contributor in Developed Europe (0.13%) and Developed Pacific (0.51%)
- Rank correlations between three representative Shipping factors and key style measures from the Research Signals factor library indicate very low commonality, demonstrating the uniqueness of this alternative data source and its added value to quantitative strategies
- In a portfolio application using two newly introduced factors, we screen for stocks with a strong link between imports and sales and demonstrate 1.9% annual outperformance since 2010 for those stocks with increasing imports relative to those with a decline

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Maritime & Trade background

With over 90% of the world’s trade carried by sea, the IHS Markit Maritime & Trade division is a valuable resource as the only data provider with access to a complete history of US import and export waterborne trade data, including both containerized and non-containerized vessels. The Maritime & Trade division includes four primary data assets:

- Sea-Web’s comprehensive ship and ownership data – comprises a database of 200,000+ ships and over 600 data points associated to each of those ships
- AISLive’s vessel tracking – provides terrestrial and satellite ship movement intelligence of over 130,000 ships at any given moment in time
- Global Trade Atlas database – compiles official import and export statistics from sources around the world into a comprehensive database of merchandise trade
- Bill of Lading data – includes transactional level details about waterborne trade for 17 countries, detailing import and export activities of companies

Focusing specifically on the Bill of Lading data, IHS Markit provides the leading data solution for the global shipping industry, spanning over 10 years of history with comprehensive coverage. The United States Customs and Border Protection (CBP) requires disclosure of shipment details for all vessels coming into or going out of US ports. IHS Markit captures this data and gathers additional data on-site at major US shipping ports. It employs a rigorous process to clean and validate the data to improve the timeliness, depth and accuracy of Bill of Lading data.

The US Bill of Lading data set contains over 100 data points, including data as filed on the Bill of Lading and additional value-added fields derived or calculated by the data processing system.

SAMPLE EXPORT BILL OF LADING:

		1.- NAME OF SHIP ANL BINDAREE (9732)		16.- VOYAGE 4355		DEPARTURE DATE 13 Jun 2015		Page 4 of 4			
		3.- NATIONALITY OF SHIP Liberia		PLACE OF RECEIPT		1a. PORT OF LOADING OAKLAND CA, United States		1b. PORT OF DISCHARGE MELBOURNE V, Australia		FINAL DESTINATION (not required in U.S.)	
SHIPPER (SH); CONSIGNEE (CO); NOTIFY ADDRESS (NF)		BL NR. Service Contract		6.- MARKS AND NRS. (M/N) CONTAINER NRS. (CN) SEAL NRS. (SN)		7.- NUMBER AND KIND OF PACKAGES DESCRIPTION OF GOODS		8.- GROSS WEIGHT (GROSS WT.)		9.- MEASUREMENT (NET WT.)	
SH: PANALPINA INC. Yusuko CARTER 401 E. Grand Ave. South San Francisco, CA 94080 Phone No. : 1 650 315 3940 Fax No. : 650 825 9440		MSCUPT206963 14-373WW		CN: CXDU74919 SN: ULH14575 Tare Weight: 2,250 kgs		20 DRY VAN 7 Package(s) of FURNITURES (5 CRATES, 3 CINS) HS CODE: 700991 700991 760421 940660 SHIPPED ON BOARD AS PER BELOW ON BOARD DATE FREIGHT PREPAID (Harmonized Code: 9403)		2,771.00 kgs. 51,000 lbs.		15.00 cu. m. 512.56 cu. ft.	
CO: PANALPINA WORLD TRANSPORT 1 MACE WAY Melbourne Intl Airport, Australia 3045 Phone No. : +61 (3) 9230 0444 Fax No. : +61 (3) 9338 5850		THESE COMMODITIES, TECHNOLOGY, OR SOFTWARE WERE EXPORTED FROM THE UNITED STATES IN ACCORDANCE WITH THE EXPORT ADMINISTRATION REGULATIONS. DIVERSION CONTRARY TO U.S. LAW PROHIBITED. SHIPPER'S LOAD, STOW, AND COUNT		Total number of containers: 1 x 20' DRY VAN		Total on this bill of lading: 7 Package(s) packages		2,771.00 kgs.		15.00 cu. m.	
				ITN: XN215069632075							

Some key Bill of Lading data fields include:

- Company name
- TEU's (twenty-foot equivalent units) - a common transportation industry measurement for the number of containers that are being shipped; containers can be various sizes including 20 foot, 40 foot and 53 foot
- Metric tons - a unit of mass equal to 1,000 kilograms
- Shipments - count of distinct bills of lading filed by a particular entity

US import and export data are lagged over two different periods. Given that US import data is sourced directly from CBP in a semi-automated fashion on an advanced filing system, the majority of the data on an import data file contains shipment information from 1-5 days prior to the current day. For a given month, all records are expected to have been collected and processed approximately 10 days after the end of the month, at which point they are certified as complete and accurate.

US export data is sourced via multiple means due to the manual nature of the filing process. Primarily data is made available and processed based on CBP's requirement of major oceans carriers to email Bill of Lading data approximately 7-10 days after a vessel calls a port. Additional Bill of Lading documentation is filed manually via paper at over two dozen ports across the US. Lastly, weekly or monthly data feeds are obtained from many of the top ocean carriers who are also IHS Markit customers. Thus, for a given month of export data, all records in that month are anticipated to have been collected and processed approximately 35 days after the end of the month.

Here we display an example of aggregated data for Abbot Laboratories for the month of January 2019 (Table 1). We observe that by the end of month $t+0$, we already have record of 29 import shipments in the data set. We see the number of shipments, volume, weight and volume increasing over time.

In an effort to balance timing and accuracy, we choose a lag of $t+0$ for imports in our factor calculations and a lag of $t+1$ for exports. Based on our analysis of the data, we find on average that 46% of imports for a given month are reported in month $t+0$ and 66% of exports are reported in month $t+1$. The remaining are reported over the following months. In addition, we provide supplemental aggregated data to capture the trend in each of the underlying items for the subsequent 12 months. This allows users of the data set to create their own versions of the factors based on different lags.

Table 1

Abbot Laboratories shipping data for January 2019, as reported by month						
Attribute		t+0	t+1	t+2	t+3	t+4
		Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019
Imports	Shipping volume (TEUs)	46.15	68.09	73.84	79.84	79.84
	Shipping weight (mTons)	118.42	196.13	203.06	221.28	221.28
	Estimated \$ value	\$2,214,662	\$3,102,040	\$3,159,295	\$3,444,601	\$3,444,601
	Number of shipments	29	49	51	54	54
Exports	Shipping volume (TEUs)	0	252.05	266.05	408.05	423.05
	Shipping weight (mTons)	0	2336.04	2455.25	3797.73	3925.54
	Estimated \$ value	-	\$11,575,682	\$12,287,151	\$15,452,954	\$15,754,407
	Number of shipments	0	64	69	89	97

Source: IHS Markit

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Factor introduction and methodology

Using this resource for import and export data, Research Signals cleans, aggregates and maps the shipping data to companies and their subsidiaries, then ultimately to equity securities to construct stock selection signals. The mapping process is complicated by the significant amount of variation in company names that show up on a Bill of Lading due to the often decentralized process for an organization that is performing the filing, where company names can appear as the US Consignee (US buyer) and Foreign Supplier (imports only) on the documentation used in the maritime import/export filing process.

The name grouping process is part of the overall reference data consolidation process. It is based on similarity by programmatically scoring names and measuring the similarity between each pair of names that are scored based on the number of words they have in common. The process then focuses on “high quality matches” that exceed a determined quality threshold. “Clusters” of the company names are then grouped together using a statistical programming language. The group’s display name is then determined by choosing the representative name that has appeared the most frequently over the last five years of data. The overall reference data consolidation process is mostly automated through a machine learning algorithm, but manual intervention is needed for additional validation of selected names and removal of false positives. For further matches, Research Signals adds another layer of company name mapping using public records from the LexisNexis database.

An additional challenge faced working with the data set is that companies can petition the US government to redact their names from Bill of Lading documents for privacy purposes. This limits our ability to map the data and, when we detect that a company is redacted from the data set, we remove the company from our analysis.

Our newly defined factors are derived specifically from four underlying import and export data items including shipping volume measured by TEUs, shipping weight measured by metric tons, shipping value estimated by weight and average price of shipped goods, and shipments. We introduce 16 factors that aggregate monthly values and changes in shipping activity, along with factors that detail the trends in shipping:

- Monthly Export Shipping Volume
- Monthly Export Shipping Weight
- Monthly Export Shipping Value
- Monthly Export Shipment
- Monthly Import Shipping Volume
- Monthly Import Shipping Weight
- Monthly Import Shipping Value
- Monthly Import Shipment
- 1-month Change in TTM Export Shipping Volume
- 1-month Change in TTM Export Shipping Weight
- 1-month Change in TTM Import Shipping Volume
- 1-month Change in TTM Import Shipping Weight
- Standardized Unexpected Quarterly Export Shipping Volume
- Standardized Unexpected Quarterly Export Shipping Volume
- Standardized Unexpected Quarterly Export Shipping Volume
- Standardized Unexpected Quarterly Export Shipping Volume

Given the varying significance levels of import and export activity across business categories, we also include 24 measures of sector/industry relative shipping activities:

- Sector Relative Monthly Export Shipping Volume
- Sector Relative Monthly Export Shipping Weight
- Sector Relative Monthly Export Shipping Value
- Sector Relative Monthly Export Shipment
- Sector Relative Monthly Import Shipping Volume
- Sector Relative Monthly Import Shipping Weight
- Sector Relative Monthly Import Shipping Value
- Sector Relative Monthly Import Shipment

- Sector Relative 1-month Change in TTM Export Shipping Volume
- Sector Relative 1-month Change in TTM Export Shipping Weight
- Sector Relative 1-month Change in TTM Import Shipping Volume
- Sector Relative 1-month Change in TTM Import Shipping Weight
- Industry Relative Monthly Export Shipping Volume
- Industry Relative Monthly Export Shipping Weight
- Industry Relative Monthly Export Shipping Value
- Industry Relative Monthly Export Shipment
- Industry Relative Monthly Import Shipping Volume
- Industry Relative Monthly Import Shipping Weight
- Industry Relative Monthly Import Shipping Value
- Industry Relative Monthly Import Shipment
- Industry Relative 1-month Change in TTM Export Shipping Volume
- Industry Relative 1-month Change in TTM Export Shipping Weight
- Industry Relative 1-month Change in TTM Import Shipping Volume
- Industry Relative 1-month Change in TTM Import Shipping Weight

Finally, eight factors capture the relationship of shipping levels to sales, a key indication of whether shipment trends have a meaningful impact on revenues:

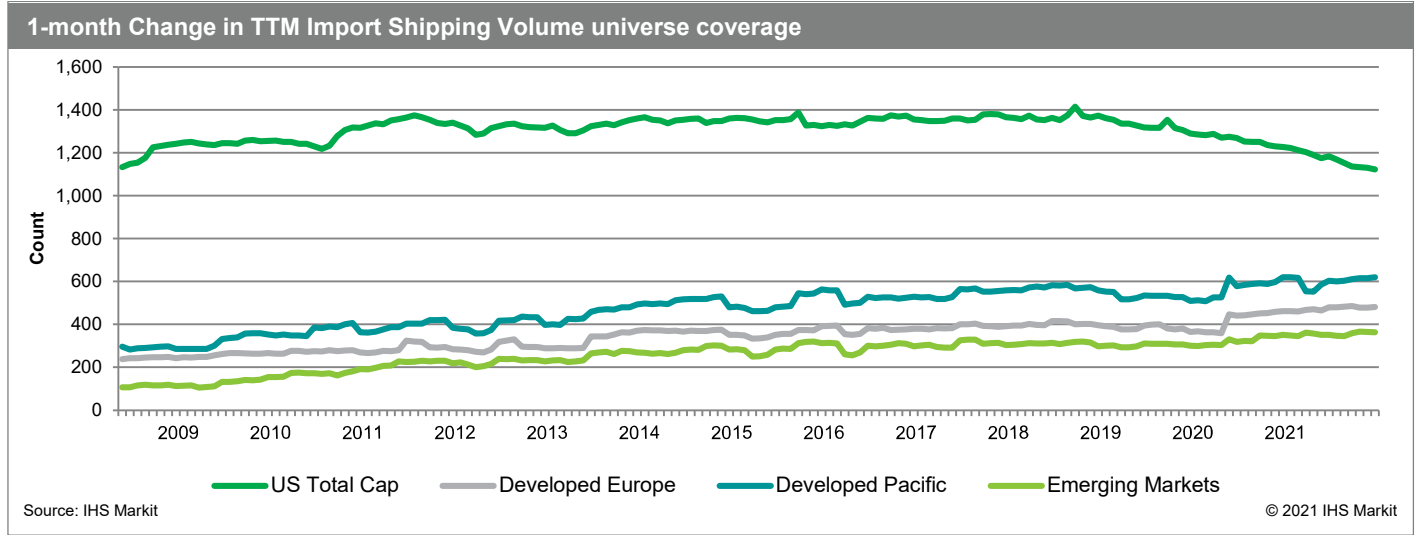
- R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales
- R-Sqr of 3-yr TTM Export Shipping Weight vs TTM Sales
- R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales
- R-Sqr of 3-yr TTM Import Shipping Weight vs TTM Sales
- R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales
- R-Sqr of 3-yr TTM Export Shipping Weight vs 3-month Ahead TTM Sales
- R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales
- R-Sqr of 3-yr TTM Import Shipping Weight vs 3-month Ahead TTM Sales

Full definitions for our 48 newly introduced factors are included in the Appendix. In the following sections, we present backtest results and correlations with standard factors from our factor library, along with an application creating portfolios based on the relationship between shipping activity with revenues.

To test factor efficacy, we calculate simulated long-short decile portfolio returns using the following method. First, percentile ranks for each factor are computed across each universe by sorting according to the underlying factor interpretation. We begin with the percentile ranks at the beginning of each month and divide the universe into ten deciles, with the top ranked, or buy-rated, names assigned to decile 1 (D1) and the bottom ranked, or sell-rated, names in decile 10 (D10). At the end of each month, we then compute the equal-weighted decile return using USD total returns and report the return spread between D1 and D10, simulating a long-short portfolio. (For universes with low coverage, we use quintiles rather than deciles.) A second measure of factor efficacy, the information correlation (IC), provides a cross-sectional view of performance measuring the correlation between factor ranks and subsequent returns.

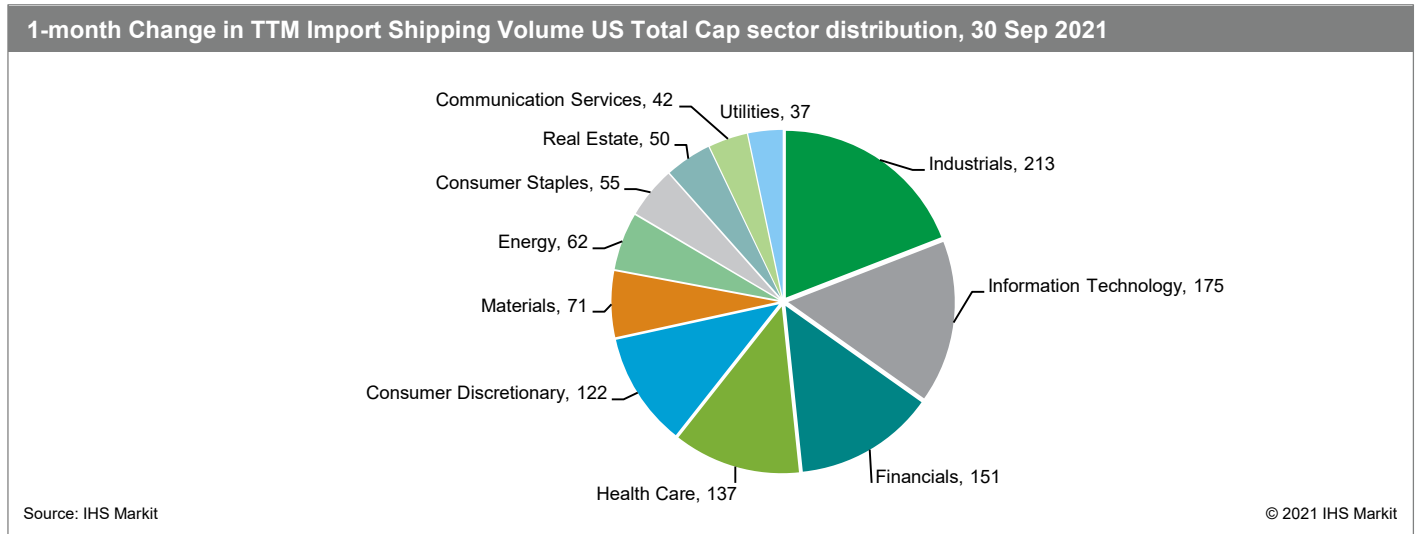
Factors were backtested over the Research Signals standard universes beginning in January 2007. The US Total Cap universe represents 98% of the cumulative market cap, or approximately 3,000 names, while the developed and emerging markets universes represent 95% of cumulative market cap for each member country subject to minimum market caps of USD 250 million and 100 million, respectively. Looking at 1-month Change in TTM Import Shipping Volume as an example (Figure 1), coverage (percent of universe) has averaged around 1304 (40%) for US Total Cap, 350 (26%) for Developed Europe, 474 (23%) for Developed Pacific and 259 (10%) for Emerging Markets.

Figure 1



Drilling down to coverage by sector as of 30 September 2021, in the US Total Cap universe (Figure 2) we find the highest representation associated with Industrials, followed by Information Technology and Financials. Industrials was also the most broadly covered sector in Developed Europe (Figure A1) and Developed Pacific (Figure A2), while Information Technology had the highest exposure in Emerging Markets (Figure A3).

Figure 2



Results

We turn now to performance statistics across a representative group of import- and export-based factors, while full results can be found on our website. First, we summarize cross-sectional quantile spread and IC performance for the US Total Cap, Developed Europe, Developed Pacific and Emerging Markets universes (Table 2). Note that the factors may have different start dates as listed with the factor definitions in the Appendix.

Table 2

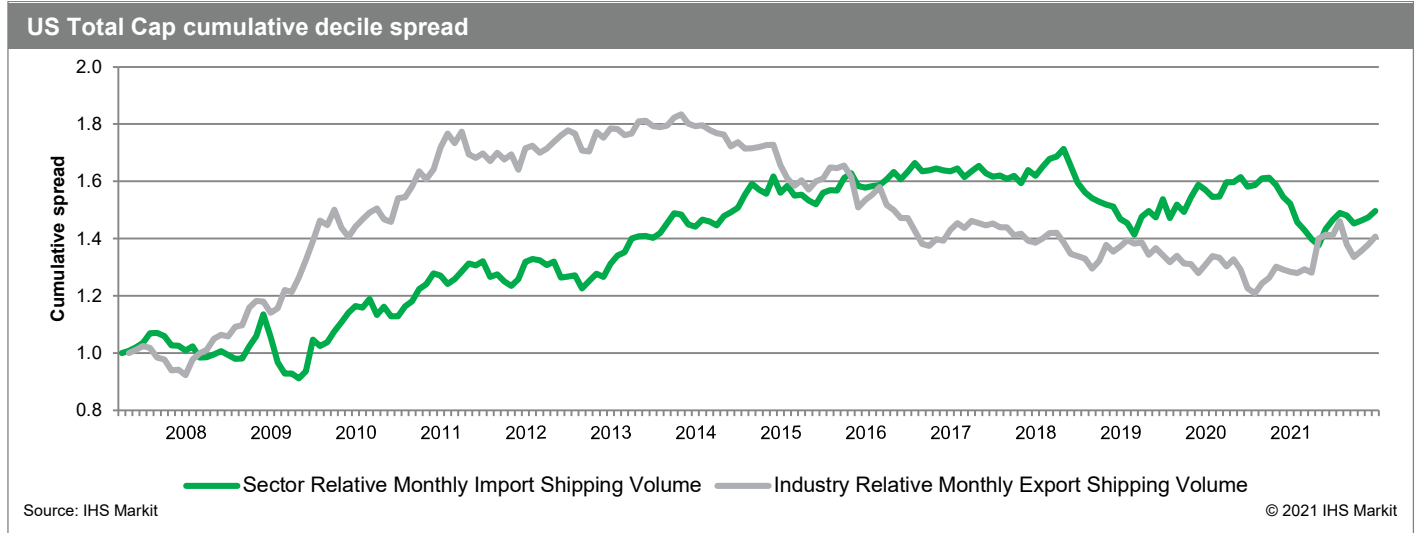
Factor performance by universe, through Oct 2021								
Factor	US Total Cap		Developed Europe		Developed Pacific		Emerging Markets	
	Decile spread (%)	IC	Decile spread (%)	IC	Decile spread (%)	IC	Quintile spread (%)	IC
Monthly Import Shipping Volume	0.13	0.002	0.12	-0.004	-0.21	-0.002	0.08	0.001
Sector Relative Monthly Import Shipping Volume	0.26	0.003	-0.34	-0.011	-0.29	-0.005	-0.06	0.000
Industry Relative Monthly Import Shipping Volume	0.09	0.005	-0.29	-0.010	0.00	-0.004	-0.06	-0.002
1-month Change in TTM Import Shipping Volume	-0.33	-0.007	-0.03	-0.002	-0.33	-0.008	-0.06	-0.005
Sector Relative 1-month Change in TTM Import Shipping Volume	-0.23	-0.004	-0.18	-0.002	-0.47	-0.012	0.04	0.003
Industry Relative 1-month Change in TTM Import Shipping Volume	-0.18	-0.002	-0.11	0.003	-0.31	-0.008	-0.02	0.005
Standardized Unexpected Quarterly Import Shipping Volume	-0.37	-0.003	-0.10	-0.007	-0.24	-0.009	0.55	0.019
R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales	-0.04	0.006	0.11	0.006	0.01	-0.002	0.03	-0.006
R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales	0.15	0.007	0.01	-0.001	0.25	0.002	-0.13	-0.007
Monthly Export Shipping Volume	0.15	0.005	-0.06	0.005	0.11	0.001	-0.98	-0.043
Sector Relative Monthly Export Shipping Volume	-0.03	0.001	-0.42	0.000	-0.02	0.003	-1.04	-0.051
Industry Relative Monthly Export Shipping Volume	0.22	-0.002	-0.05	0.004	-0.13	0.005	-0.91	-0.046
1-month Change in TTM Export Shipping Volume	0.04	0.003	-0.41	-0.005	-0.27	-0.006	0.17	0.008
Sector Relative 1-month Change in TTM Export Shipping Volume	0.13	0.008	-0.15	0.001	-0.25	-0.009	0.31	0.006
Industry Relative 1-month Change in TTM Export Shipping Volume	0.09	0.006	-0.27	-0.001	-0.22	-0.008	0.19	0.004
Standardized Unexpected Quarterly Export Shipping Volume	-0.20	0.004	0.13	0.002	0.51	0.011	--	--
R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales	-0.15	0.001	0.09	0.006	0.04	-0.002	0.32	0.002
R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales	0.13	0.004	0.00	-0.001	0.11	0.000	0.18	-0.002

Source: IHS Markit

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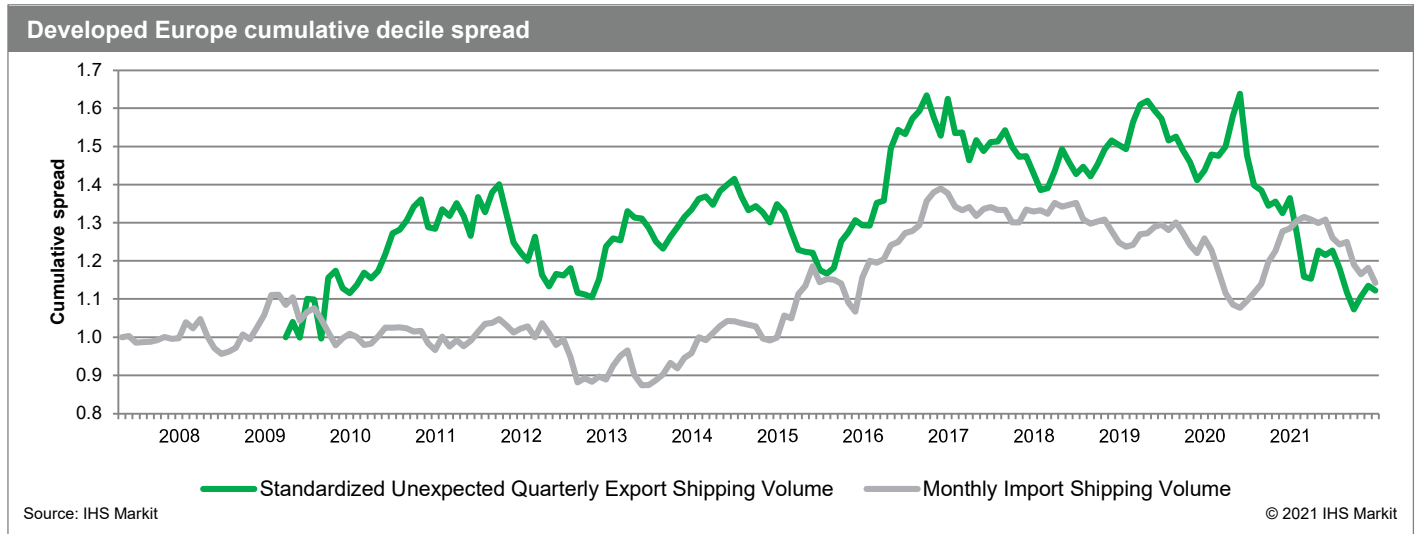
We highlight several factors of interest across each region. In the US Total Cap universe (Figure 3), Sector Relative Monthly Import Shipping Volume was a top performing factor on average over the backtest period. The average monthly decile spread was 0.26%, double that of the underlying base factor. Similarly, export-based factors were also enhanced by ranking within industry, with Industry Relative Monthly Export Shipping Volume reporting an average spread of 0.22% and 52% hit rate (percent of months with a positive spread). Its performance was especially strong in the first half of the backtest period, while Sector Relative Monthly Import Shipping Volume performance was steadier over the analysis period with a hit rate of 56%, resulting in a cumulative spread of 49.6%. However, we remark on a downtrend in 2018 perhaps related to uncertainty driven by the Trump tariffs enacted around that time. We also note that performance of both factors picked up since July 2021 despite acute supply chain issues in the second half of 2021.

Figure 3



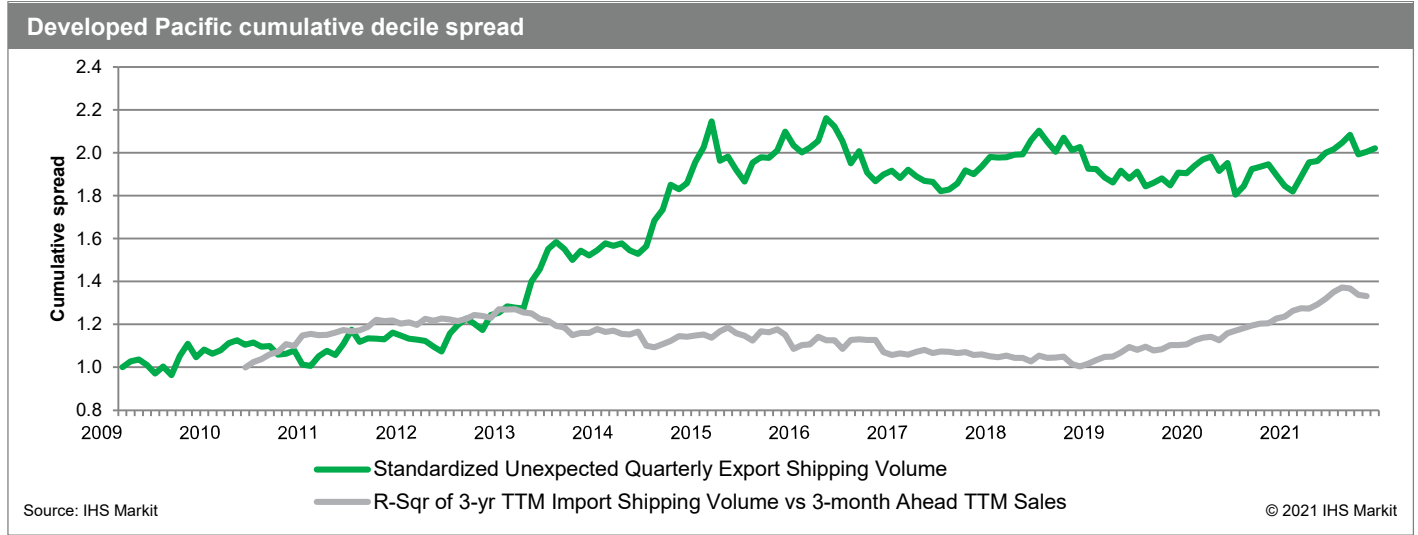
In Developed Europe (Figure 4), strong performance was recorded by Standardized Unexpected Quarterly Export Shipping Volume and Monthly Import Shipping Volume. The former posted an average spread of 0.14% and hit rate of 50%, while the latter posted an average spread of 0.11% and 55% hit rate. We observe a more cyclical trend in performance over both factors, with cumulative spreads of 12% and 14%, respectively, as of the latest reading.

Figure 4



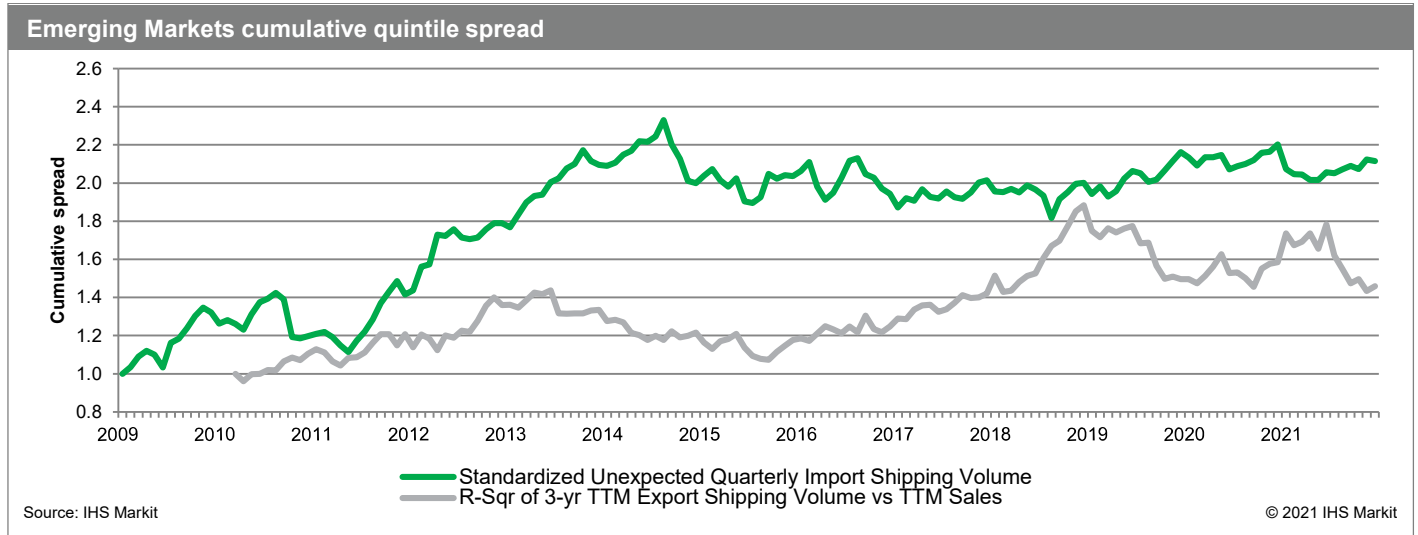
Standardized Unexpected Quarterly Export Shipping Volume was a robust performer in Developed Pacific markets (Figure 5) during our backtest period, with an average monthly decile spread of 0.51% and hit rate of 57%. The cumulative spread reached 102% over the full period, or 5.7% annualized. R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales was also an above average performer, with a hit rate of 58% and whose 0.22% average monthly spread resulted in a 33.2% cumulative spread over the factor’s available history.

Figure 5



Lastly, we draw attention to two notable factors in Emerging Markets (Figure 6), Standardized Unexpected Quarterly Import Shipping Volume and R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales. Both factors turned in relatively consistent outperformance with hit rates of 57% and 59%, respectively. Standardized Unexpected Quarterly Import Shipping Volume recorded an average monthly quintile spread of 0.55%, or 6.0% annualized (cumulative spread: 112%). R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales, on the other hand, saw a bit more cyclicity since 2019, with the cumulative spread ending the backtest period at 46%, with an average spread of 0.32%.

Figure 6



Given the greater importance of import and export data across certain sectors, we also report on performance statistics summarized by key sectors – Industrials, Basic Materials, Technology and Cyclical Goods & Services. In this case, we focus our results only on developed markets due to the limited coverage in emerging markets. In the US (Table 3), four factors logged prominent average quintile spreads over the Basic Materials sector, including Monthly Import Shipping Volume (0.53%), Industry Relative Monthly Import Shipping (0.41%), R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales (0.41%) and Monthly Export Shipping Volume (0.46%).

In Developed Europe (Table A1), the Technology sector saw strong spreads for R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales (0.61%) and R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales

(0.52%). Standardized Unexpected Quarterly Export Shipping Volume also displayed solid performance in the region for Industrials (0.56%) and Cyclical Goods & Services (0.54%) and was similarly effective in Developed Pacific (Table A2) for Industrials (0.53%), Basic Materials (0.44%) and Technology (0.58%). Lastly, we highlight other notable factors in the latter region's Technology sector, including Monthly Import Shipping Volume (0.37%), Monthly Export Shipping Volume (0.60%) and Industry Relative Monthly Export Shipping Volume (0.99%).

Table 3

US Total Cap factor performance by sector, Jan 2007 - Oct 2021

Factor	Industrials		Basic Materials		Technology		Cyclical Goods & Services	
	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC
Monthly Import Shipping Volume	0.19	0.008	0.53	0.016	0.12	0.001	-0.37	-0.015
Industry Relative Monthly Import Shipping Volume	-0.10	-0.001	0.41	0.010	0.03	0.011	-0.29	-0.005
1-month Change in TTM Import Shipping Volume	-0.32	-0.014	-0.19	-0.011	-0.17	-0.009	-0.30	-0.008
Industry Relative 1-month Change in TTM Import Shipping Volume	-0.41	-0.007	-0.10	-0.003	-0.21	-0.011	0.15	-0.002
Standardized Unexpected Quarterly Import Shipping Volume	0.12	0.007	0.15	0.005	-0.04	-0.010	-0.61	-0.003
R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales	-0.19	0.001	0.41	0.014	-0.15	0.000	0.27	0.010
R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales	-0.05	0.006	-0.12	0.000	0.02	0.003	0.19	0.012
Monthly Export Shipping Volume	0.30	-0.002	0.46	0.010	-0.02	-0.011	-0.05	0.000
Industry Relative Monthly Export Shipping Volume	-0.10	-0.009	0.33	0.013	0.28	-0.014	0.31	0.007
1-month Change in TTM Export Shipping Volume	-0.24	-0.004	-0.38	-0.011	-0.31	-0.006	0.43	0.012
Industry Relative 1-month Change in TTM Export Shipping Volume	-0.22	0.000	-0.54	-0.010	-0.27	-0.008	0.26	0.007
Standardized Unexpected Quarterly Export Shipping Volume	0.11	0.009	-0.11	-0.001	0.31	0.006	0.23	-0.005
R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales	-0.08	-0.008	-0.02	0.007	-0.02	0.000	-0.13	-0.004
R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales	-0.25	-0.006	0.03	0.006	0.23	0.010	-0.17	-0.001

Source: IHS Markit

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Correlations

Next, we review the relationship between select members of our newly introduced Shipping factors and key indicators from the Research Signals factor library, across a broad spectrum of value, quality, growth, risk, momentum and short sentiment measures. To begin with, in Table 4 we report the average rank correlations of three representative factors - Monthly Import Shipping Volume, Standardized Unexpected Quarterly Export Shipping Volume and R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales - for the developed universes.

Overall, we find low correlations between the Shipping factors and the various style factors, demonstrating the uniqueness of the new signals as an alternative data source. This feature is also a desirable quality in many settings including quantitative multifactor frameworks and fundamental analysis.

We note a few correlations that are common across each region which are associated with Monthly Import Shipping Volume. First, Net Operating Asset Turnover had low double-digit correlations in the US Total Cap (0.14), Developed Europe (0.10) and Developed Pacific (0.12) universes. Another Quality measure, Change in TTM COGS vs Inventory

Level, recorded correlations of similar magnitude in factor rankings. Lastly, we remark on the negative correlations associated with Natural Logarithm of Market Capitalization (US Total Cap: -0.10; Developed Europe: -0.17; Developed Pacific: -0.29), which is expected given the factor's positioning to smaller cap names that tend to be more domestically oriented and, thus, have lower exposure to import and export activity.

Table 4

Average monthly rank correlations, through Oct 2021										
Style	Factor	US Total Cap			Developed Europe			Developed Pacific		
		Monthly Import Ship Vol	Std Unexp Qtrly Export Ship Vol	R ² 3-yr Import Ship Vol vs 3-m Sales	Monthly Import Ship Vol	Std Unexp Qtrly Export Ship Vol	R ² 3-yr Import Ship Vol vs 3-m Sales	Monthly Import Ship Vol	Std Unexp Qtrly Export Ship Vol	R ² 3-yr Import Ship Vol vs 3-m Sales
Value	Book-to-Market	-0.03	-0.01	-0.05	0.00	-0.01	-0.04	0.10	-0.01	-0.02
	Forward 12-M EPS-to-Enterprise Value	0.08	0.03	0.02	0.08	0.07	0.00	0.05	-0.01	0.01
	TTM EBITDA-to-Enterprise Value	0.03	0.01	0.00	0.07	0.02	-0.03	0.11	-0.04	0.01
	TTM Free Cash Flow-to-Enterprise Value	0.02	0.02	0.02	-0.01	0.00	-0.02	-0.01	0.00	-0.01
	Industry Relative Leading 4-QTRs EPS to Price	-0.01	0.02	0.02	-0.02	0.06	-0.02	0.04	0.00	0.00
	Industry Relative TTM Dividend Yield	0.05	0.00	-0.03	0.02	0.01	-0.05	0.02	-0.01	0.00
Quality	Fixed Assets Turnover Ratio	0.04	0.03	0.05	-0.09	0.03	0.02	0.03	-0.02	0.01
	Inventory Turnover Ratio	-0.04	0.00	-0.03	-0.14	0.00	0.00	-0.02	0.02	0.00
	Net Operating Asset Turnover	0.14	0.01	0.05	0.10	0.03	0.02	0.12	-0.04	0.03
	Change in Accruals to Assets	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.01	0.00
	Change in TTM COGS vs. Inventory Level	0.12	0.03	0.04	0.12	0.01	0.00	0.13	-0.03	-0.02
	Change in TTM Sales vs. Accounts Receivable	0.00	-0.03	0.01	0.00	0.01	0.02	-0.02	-0.01	-0.01
Growth	Working Capital Accruals	0.00	0.00	0.01	0.00	-0.03	0.04	0.03	0.02	0.02
	1-yr Growth in TTM Free Cash Flow	0.02	0.03	0.04	-0.01	0.00	-0.01	-0.01	0.03	0.00
Risk	Reinvestment Rate	0.07	0.03	0.06	0.00	0.03	0.04	0.03	0.02	0.02
	Average Monthly Trading Volume-to-Market Cap	-0.03	-0.02	-0.01	-0.14	0.01	0.01	-0.10	0.01	0.03
	60-Month Beta	-0.02	0.04	-0.01	-0.02	0.00	-0.03	-0.09	0.04	-0.01
	Asset Quality Index	0.00	-0.01	0.00	0.00	-0.02	0.02	-0.02	0.01	0.02
	Operating Leverage	0.01	0.00	0.01	-0.02	0.01	0.02	0.03	0.00	0.00
Momentum	Natural Logarithm of Market Capitalization	-0.10	-0.01	-0.03	-0.17	0.02	0.04	-0.29	0.02	0.02
	2-Year Ahead EPS Growth	-0.01	-0.02	0.00	0.02	-0.03	0.02	0.08	-0.02	0.02
	3-M Revision in FY2 EPS Forecasts	0.00	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.00
	Real Earnings Surprise	0.00	-0.01	0.00	0.00	0.06	-0.01	-0.03	0.02	0.00
	24-Month Value at Risk	0.03	0.02	0.00	0.07	0.01	-0.02	0.02	0.01	-0.02
	5-day Industry Relative Return	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Industry-adjusted 12-month Relative Price Strength	0.01	0.00	0.01	0.01	-0.01	0.02	0.00	0.00	-0.01
	Rational Decay Alpha	0.00	0.01	0.00	-0.01	0.01	0.02	-0.03	0.00	0.01
ShSt	Demand Supply Ratio	0.02	0.01	-0.01	0.00	0.02	-0.02	0.09	0.00	0.00
	Implied Loan Rate	0.02	0.02	0.01	-0.01	0.02	0.01	0.15	0.01	-0.01

Source: IHS Markit

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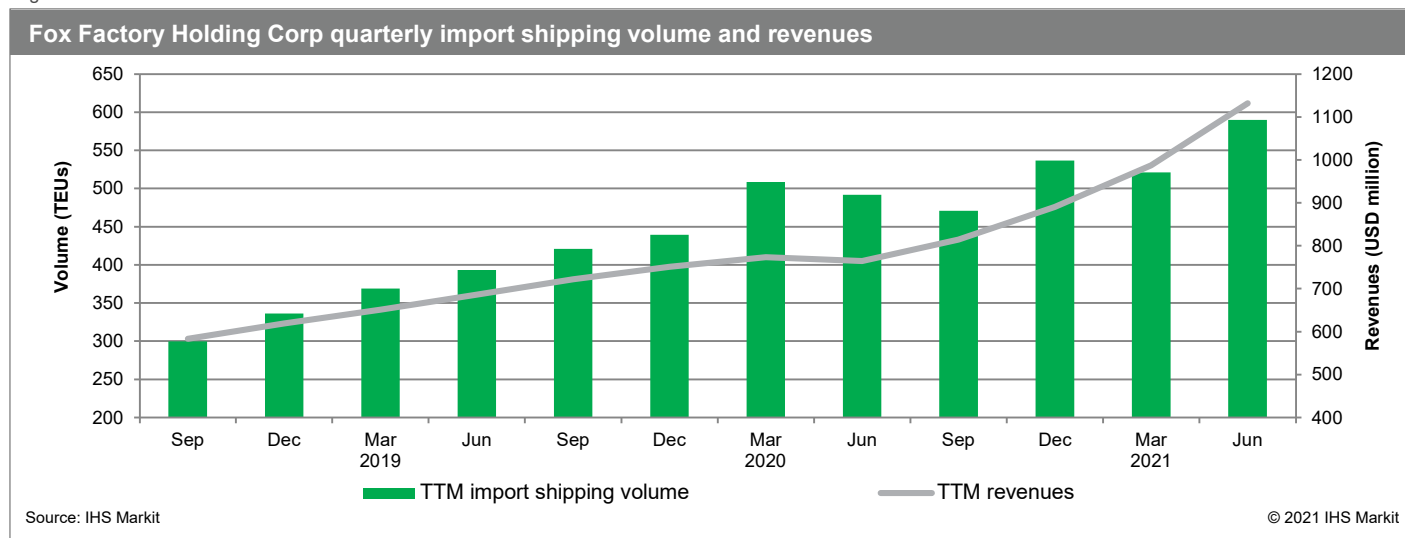
Single stock analysis

To further illustrate the value of the Bill of Lading data, we take a look at an example of how to use the data set to identify trends in shipping activity that is tied to revenues. For this illustration, we present quarterly time series of trailing 12-month (TTM) import shipping volume and revenues over a three-year period for Fox Factory Corp (Figure 7) to demonstrate the underlying data used to compute R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales.

Fox Factory¹ is a US based company that manufactures and sells motor bikes, ATVs, snowmobiles and other specialty vehicles. During fiscal year 2020, 67% of their revenues came from the North America region. The company experienced a relatively steady increase in TTM import shipping volume from September 2018 through June 2021, though levels declined somewhat in early 2020. At the same time, revenues grew at a similar pace, with a slight decline in the June 2020 quarter.

The similar trend in import shipping volume and revenues is captured in the R-squared statistic which measures the percentage of variance in a dependent variable explained by the independent variable, and thus ranges between 0% and 100%. In this case, 84% of the variation in revenues is predicted by movements in import shipping volume, indicating a strong dependence between the two variables and resulting in a percentile rank of 6 (decile 1) in the US Total Cap universe as of 30 September 2021.

Figure 7



Application

We round out the report with an application based on the relationship between sales and import data. Our strategy begins with R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales and filters for stocks in the US Total Cap universe with a value of at least 0.5, in other words, stocks with a strong correlation between imports and sales over the same time period. We then create portfolios of stocks with positive and negative Industry Relative 1-month Change in TTM Import Shipping Volume. Thus, we focus on stocks which have exhibited a strong link between imports and sales

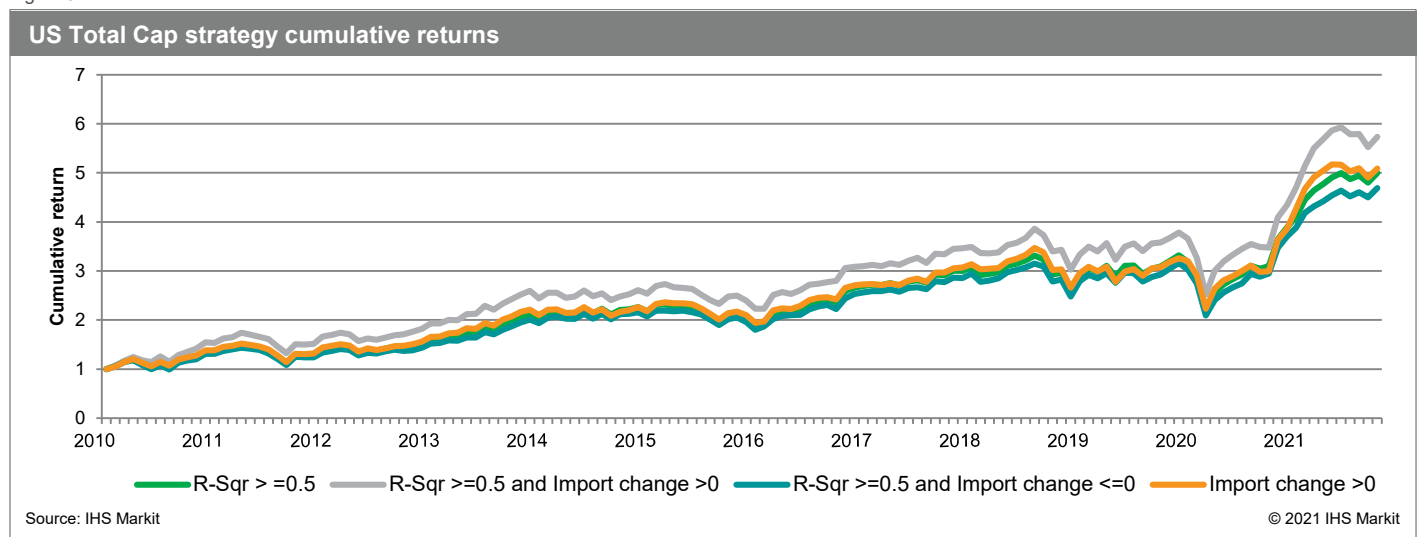
¹ <https://annualreport.stocklight.com/NASDAQ/FOXF/21680582.pdf>

and look for an improvement in price action for those with an increasing trend in imports relative to those with a decreasing or stable trend.

In Figure 8, we plot the cumulative returns for each portfolio and compare those results to the base case of stocks with R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales ≥ 0.5 and to the underlying group of stocks with Industry Relative 1-month Change in TTM Import Shipping Volume > 0 . Our results indeed point to the highest cumulative return of 473%, or 15.9% annualized, over the backtest period for the portfolio of stocks with a high r-squared and increasing imports. Furthermore, we find a spread of 1.9% annually over the alternate portfolio of stocks with decreasing imports, which also trailed both base portfolios.

In summary, our strategy provides an example demonstrating benefits from using our newly constructed R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales factor to screen for stocks with improving trends in imports.

Figure 8



Conclusion

While typically used by participants in the global shipping industry, Bill of Lading data from the IHS Markit Maritime & Trade division can also be used as a means to monitor shipping activity of companies to better understand shipping trends that may help identify unforeseen risks and opportunities. Using this proprietary data set sourced from US Customs and Border Protection's required disclosures and additional on-site data at major US shipping ports, we introduce 48 Shipping factors capturing shipping volume, shipping weight, shipping value and total shipments, along with measures of sector/industry relative shipping activities and the relationship of shipping levels to sales.

Focusing on factor performance, factors ranked relative to business group turned in the top average monthly decile spreads in the US Total Cap over the backtest period, including Sector Relative Monthly Import Shipping Volume (0.26%) and Industry Relative Monthly Export Shipping Volume (0.22%). Standardized Unexpected Quarterly Export Shipping Volume was the most successful signal in Developed Europe (0.14%) and Developed Pacific (0.51%), while, in Emerging Markets, two notable factors were Standardized Unexpected Quarterly Import Shipping Volume (0.54%) and R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales (0.33%).

We also examine rank correlations of three representative Shipping factors - Monthly Import Shipping Volume, Standardized Unexpected Quarterly Export Shipping Volume and R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales - with other style factors in our factor library. Correlations with our newly introduced factors

were generally in the low single-digit range, demonstrating the uniqueness of the alternative data signals and a beneficial feature in many quantitative and fundamental settings.

Lastly, we provide an example of the application of R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales to filter for stocks which have exhibited a strong relationship between sales and imports. We then create portfolios of stocks with an increasing trend in imports relative to those with a decreasing trend, based on Industry Relative 1-month Change in TTM Import Shipping Volume. Our results demonstrate an improvement in return of 1.9% annually for those stocks with increasing imports relative to those with a decline.

Appendix

Factor definitions

1-month Change in TTM Export Shipping Volume - 1-month change in trailing 12-month export shipping volume measured by twenty-foot equivalent units (TEUs), sorted in descending order, start date January 2008

1-month Change in TTM Export Shipping Weight - 1-month change in trailing 12-month export shipping weight measured by metric tons, sorted in descending order, start date January 2008

1-month Change in TTM Import Shipping Volume - 1-month change in trailing 12-month import shipping volume measured by twenty-foot equivalent units (TEUs), sorted in descending order, start date January 2008

1-month Change in TTM Import Shipping Weight - 1-month change in trailing 12-month import shipping weight measured by metric tons, sorted in descending order, start date January 2008

Monthly Export Shipment - 1-month aggregated export shipments, sorted in descending order, start date February 2007

Monthly Export Shipping Value - 1-month aggregated export shipping value estimated by the weight and average price of shipped goods, sorted in descending order, start date February 2007

Monthly Export Shipping Volume - 1-month aggregated export shipping volume measured by twenty-foot equivalent units (TEUs), sorted in descending order, start date February 2007

Monthly Export Shipping Weight - 1-month aggregated export shipping weight measured by metric tons, sorted in descending order, start date February 2007

Monthly Import Shipment - 1-month aggregated import shipments, sorted in descending order, start date January 2007

Monthly Import Shipping Value - 1-month aggregated import shipping value estimated by the weight and average price of shipped goods, sorted in descending order, start date January 2007

Monthly Import Shipping Volume - 1-month aggregated import shipping volume measured by twenty-foot equivalent units (TEUs), sorted in descending order, start date January 2007

Monthly Import Shipping Weight - 1-month aggregated import shipping weight measured by metric tons, sorted in descending order, start date January 2007

R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales - conditional square of the correlation between trailing 12-month export shipping volume measured by twenty-foot equivalent units (TEUs) and the trailing 12-month sales in the prior 12 quarters, sorted descending order, start date January 2010

R-Sqr of 3-yr TTM Export Shipping Weight vs TTM Sales - conditional square of the correlation between trailing 12-month export shipping weight measured by metric tons and the trailing 12-month sales in the prior 12 quarters, sorted descending order, start date January 2010

R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales - conditional square of the correlation between trailing 12-month import shipping volume measured by twenty-foot equivalent units (TEUs) and the trailing 12-month sales in the prior 12 quarters, sorted descending order, start date January 2010

R-Sqr of 3-yr TTM Import Shipping Weight vs TTM Sales - conditional square of the correlation between trailing 12-month import shipping weight measured by metric tons and the trailing 12-month sales in the prior 12 quarters, sorted descending order, start date January 2010

R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales - conditional square of the correlation between trailing 12-month export shipping volume measured by twenty-foot equivalent units (TEUs) and the 3-month ahead trailing 12-month sales in the prior 12 quarters, sorted descending order, start date April 2010

R-Sqr of 3-yr TTM Export Shipping Weight vs 3-month Ahead TTM Sales - conditional square of the correlation between trailing 12-month export shipping weight measured by metric tons and the 3-month ahead trailing 12-month sales in the prior 12 quarters, sorted descending order, start date April 2010

R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales - conditional square of the correlation between trailing 12-month import shipping volume measured by twenty-foot equivalent units (TEUs) and the 3-month ahead trailing 12-month sales in the prior 12 quarters, sorted descending order, start date April 2010

R-Sqr of 3-yr TTM Import Shipping Weight vs 3-month Ahead TTM Sales - conditional square of the correlation between trailing 12-month import shipping weight measured by metric tons and the 3-month ahead trailing 12-month sales in the prior 12 quarters, sorted descending order, start date April 2010

Standardized Unexpected Quarterly Export Shipping Volume - 3-month aggregated export shipping volume measured by twenty-foot equivalent units (TEUs) minus that of 4 quarters ago, divided by the standard deviation of this difference over the preceding 8 quarters, sorted in descending order, start date December 2008

Standardized Unexpected Quarterly Export Shipping Weight - 3-month aggregate export shipping weight measured by metric tons minus that of 4 quarters ago, divided by the standard deviation of this difference over the preceding 8 quarters, sorted in descending order, start date December 2008

Standardized Unexpected Quarterly Import Shipping Volume - 3-month aggregated import shipping volume measured by twenty-foot equivalent units (TEUs) minus that of 4 quarters ago, divided by the standard deviation of this difference over the preceding 8 quarters, sorted in descending order, start date October 2008

Standardized Unexpected Quarterly Import Shipping Weight - 3-month aggregate import shipping weight measured by metric tons minus that of 4 quarters ago, divided by the standard deviation of this difference over the preceding 8 quarters, sorted in descending order, start date December 2008

Industry Relative 1-month Change in TTM Export Shipping Volume - 1-month change in trailing 12-month export shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Industry Relative 1-month Change in TTM Export Shipping Weight - 1-month change in trailing 12-month export shipping weight measured by metric tons less the average of the changes of all companies in the same industry divided

by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Industry Relative 1-month Change in TTM Import Shipping Volume - 1-month change in trailing 12-month import shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Industry Relative 1-month Change in TTM Import Shipping Weight - 1-month change in trailing 12-month import shipping weight measured by metric tons less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Industry Relative Monthly Export Shipment - 1-month aggregated export shipments less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Industry Relative Monthly Export Shipping Value - 1-month aggregated export shipping value estimated by the weight and average price of shipped goods less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Industry Relative Monthly Export Shipping Volume - 1-month aggregated export shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

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Industry Relative Monthly Import Shipping Weight - 1-month aggregated import shipping weight measured by metric tons less the average of the changes of all companies in the same industry divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2007

Sector Relative 1-month Change in TTM Export Shipping Volume - 1-month change in trailing 12-month export shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in

the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Sector Relative 1-month Change in TTM Export Shipping Weight - 1-month change in trailing 12-month export shipping weight measured by metric tons less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Sector Relative 1-month Change in TTM Import Shipping Volume - 1-month change in trailing 12-month import shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Sector Relative 1-month Change in TTM Import Shipping Weight - 1-month change in trailing 12-month import shipping weight measured by metric tons less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2008

Sector Relative Monthly Export Shipment - 1-month aggregated export shipments less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Sector Relative Monthly Export Shipping Value - 1-month aggregated export shipping value estimated by the weight and average price of shipped goods less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Sector Relative Monthly Export Shipping Volume - 1-month aggregated export shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Sector Relative Monthly Export Shipping Weight - 1-month aggregated export shipping weight measured by metric tons less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date February 2007

Sector Relative Monthly Import Shipment - 1-month aggregated import shipments less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2007

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Sector Relative Monthly Import Shipping Volume - 1-month aggregated import shipping volume measured by twenty-foot equivalent units (TEUs) less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2007

Sector Relative Monthly Import Shipping Weight - 1-month aggregated import shipping weight measured by metric tons less the average of the changes of all companies in the same sector divided by the standard deviation of the changes of all companies in the same relative universe, sorted in descending order, start date January 2007

Figures and tables

Figure A1

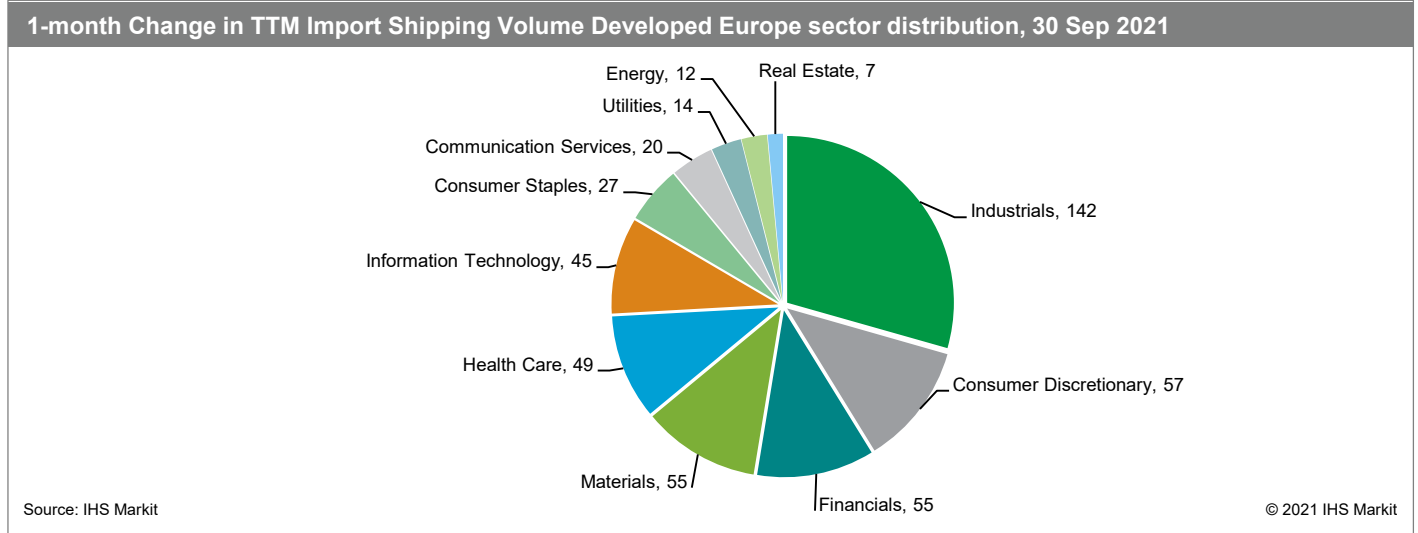


Figure A2

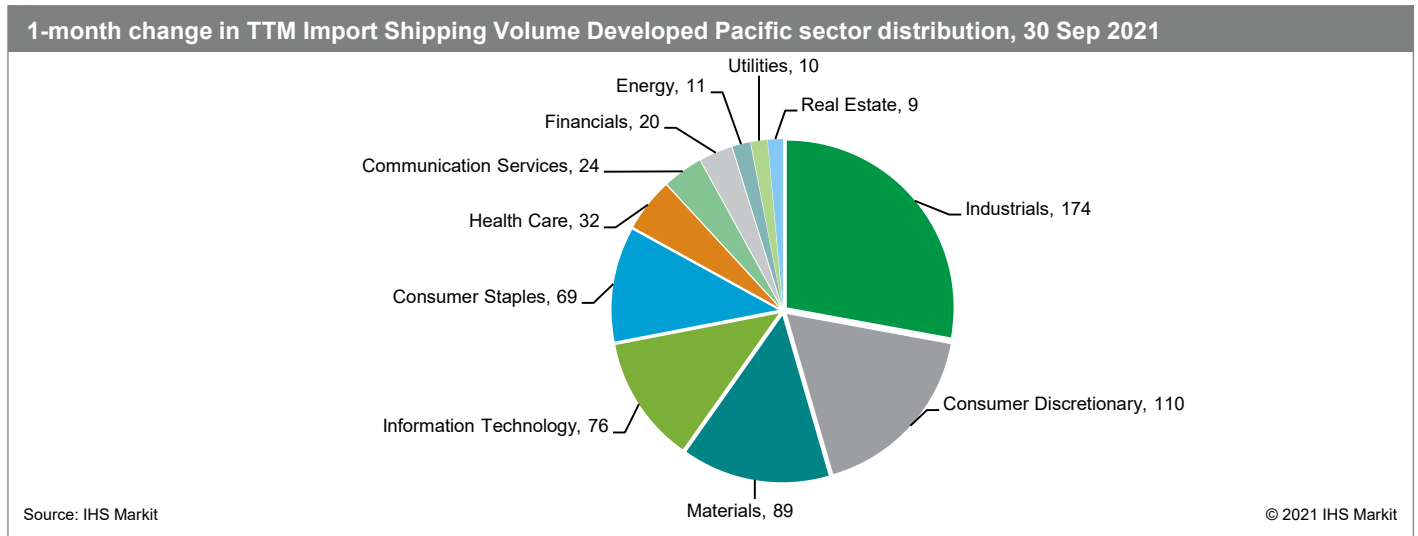


Figure A3

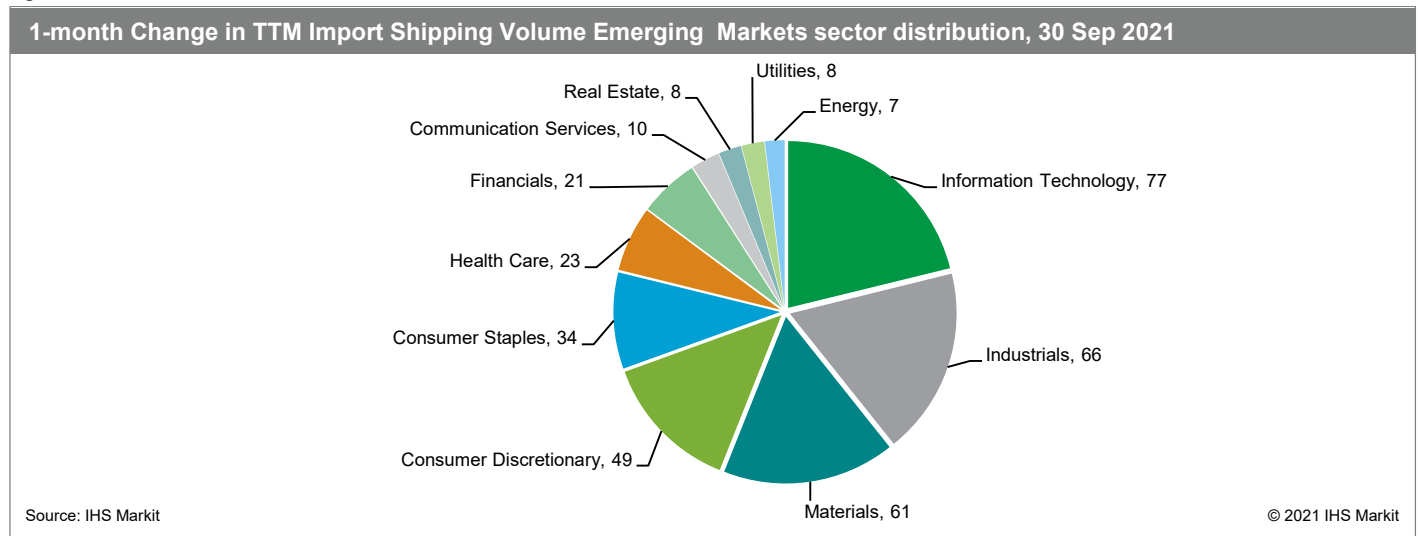


Table A1

Developed Europe factor performance by sector, Jan 2007 - Oct 2021

Factor	Industrials		Basic Materials		Technology		Cyclical Goods & Services	
	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC
Monthly Import Shipping Volume	-0.32	-0.012	-0.64	-0.019	-0.28	-0.003	0.36	0.006
Industry Relative Monthly Import Shipping Volume	-0.17	-0.010	-0.72	-0.019	-0.69	0.007	-0.09	-0.005
1-month Change in TTM Import Shipping Volume	-0.17	-0.007	0.02	-0.002	-0.17	-0.003	-0.52	-0.010
Industry Relative 1-month Change in TTM Import Shipping Volume	0.09	0.009	-0.02	0.002	-0.75	-0.002	-0.14	-0.011
Standardized Unexpected Quarterly Import Shipping Volume	-0.06	0.001	-0.33	-0.021	-0.51	-0.037	0.21	0.003
R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales	-0.28	-0.010	0.08	0.017	0.61	0.040	0.16	0.028
R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales	-0.28	-0.013	0.23	0.015	0.52	0.031	-0.24	0.005
Monthly Export Shipping Volume	0.07	-0.009	-0.22	0.006	-8.56	0.074	-0.95	-0.019
Industry Relative Monthly Export Shipping Volume	0.27	-0.006	-0.35	-0.002	-11.49	0.103	-0.01	-0.008
1-month Change in TTM Export Shipping Volume	0.04	0.005	-0.20	-0.025	-0.75	-0.045	-0.48	0.001
Industry Relative 1-month Change in TTM Export Shipping Volume	0.13	0.002	-0.16	-0.025	-0.01	0.036	-0.37	0.001
Standardized Unexpected Quarterly Export Shipping Volume	0.56	0.022	-0.97	-0.030	--	0.237	0.54	0.005
R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales	0.19	0.008	0.08	0.004	-1.42	0.003	0.06	0.013
R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales	-0.04	0.001	-0.09	-0.005	-1.40	-0.085	0.14	-0.003

Source: IHS Markit © 2021 IHS Markit

Table A2

Developed Pacific factor performance by sector, Jan 2007 - Oct 2021								
Factor	Industrials		Basic Materials		Technology		Cyclical Goods & Services	
	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC	Quintile spread (%)	IC
Monthly Import Shipping Volume	-0.08	0.000	-0.30	-0.005	0.37	-0.004	-0.21	-0.005
Industry Relative Monthly Import Shipping Volume	-0.19	-0.007	-0.38	-0.011	-0.20	-0.008	0.24	0.003
1-month Change in TTM Import Shipping Volume	-0.25	-0.010	-0.37	-0.011	-0.65	-0.009	-0.38	-0.012
Industry Relative 1-month Change in TTM Import Shipping Volume	0.01	-0.002	-0.32	-0.010	-0.49	-0.020	0.04	-0.007
Standardized Unexpected Quarterly Import Shipping Volume	-0.06	-0.013	-0.37	-0.014	0.28	-0.016	-0.06	0.000
R-Sqr of 3-yr TTM Import Shipping Volume vs TTM Sales	0.01	-0.002	0.08	0.007	0.25	-0.009	0.06	-0.005
R-Sqr of 3-yr TTM Import Shipping Volume vs 3-month Ahead TTM Sales	0.17	-0.002	-0.10	0.006	-0.34	-0.017	0.21	0.006
Monthly Export Shipping Volume	0.30	0.009	-0.26	0.009	0.60	0.010	0.05	-0.017
Industry Relative Monthly Export Shipping Volume	0.12	0.014	-0.09	0.026	0.99	0.014	-0.30	-0.009
1-month Change in TTM Export Shipping Volume	0.01	-0.007	-0.51	-0.015	-0.10	0.002	-0.16	-0.003
Industry Relative 1-month Change in TTM Export Shipping Volume	-0.07	-0.010	-0.55	-0.019	0.22	0.015	-0.07	-0.008
Standardized Unexpected Quarterly Export Shipping Volume	0.53	0.019	0.44	0.018	0.58	0.009	0.01	0.007
R-Sqr of 3-yr TTM Export Shipping Volume vs TTM Sales	-0.09	-0.016	0.12	0.024	-0.13	-0.020	0.41	0.018
R-Sqr of 3-yr TTM Export Shipping Volume vs 3-month Ahead TTM Sales	0.08	-0.004	-0.35	0.008	-0.79	-0.023	0.14	0.014

Source: IHS Markit

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