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Return-enhancing strategies with international ETFs: Exploiting the turn-of-the-month effect

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Abstract

We show that the average return over the four-day period surrounding the turn of the month is significantly positive in eight out of the nine international exchange-traded funds (ETFs). The strategy of buying-and-holding an ETF during turn-of-the-month (TOM) period and switching to holding T-bills during non-TOM period produces significantly positive monthly average returns. This ETF-T-bills switching strategy also has the lowest risk and highest Sharpe ratio and Sortino ratio than the traditional strategy of buying-and-holding either an index fund or an ETF. Investors pursuing this switching strategy generate a terminal value twice larger than the next best strategy of buying-and-holding an ETF.

JEL classification: F3; G1

Keywords: ETF; International equity; Turn-of-the-month; Return; Risk

1. Introduction

Exchange-traded funds (ETFs) become a valuable tool for individual investors and financial advisors in the pursuit of higher returns and more effective diversification. In this article, we study whether investors can take advantage of the turn-of-the-month (TOM) effect

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in international ETFs. The TOM effect refers to the phenomenon that stock returns are higher surrounding the turn of the month. Early studies in Ziemba (1991) and Cadsby and Ratner (1992) document that the TOM effect exists in several international stock returns. Recently, McConnell and Xu (2008) reconfirm the existence of the TOM effect in 34 out of 38 international market indexes.

Hensel and Ziemba (1996) and Kunkel and Compton (1998) show that the trading strategy of investing in low risk fixed-income account during non-TOM period and switching to investing in stocks during TOM period produces a higher return than the traditional strategy of buying-and-holding stocks. However, Chen and Chua (2011) show that the trading strategy of holding a Standard & Poor's Depositary Receipt (SPDR), the corresponding ETF for the Standard & Poor's (S&P) 500 index, during TOM period and switching to holding T-bills during non-TOM period does not produce a higher return than the strategy of investing in SPDR throughout the month.

Given that ETFs have high liquidity and extremely low trading cost, can individual investors exploit the TOM effect in iShares? We examine the following markets: Australia, Brazil, Canada, France, Germany, Japan, Hong Kong, Sweden, and United Kingdom. All of them allow foreign investors without much restriction. We first show that the TOM effect exists in index returns in all markets except for the Japanese market, whereas the TOM effect exists in all nine ETF returns. When we control for other known confounding factors such as the January effect and the Weekend effect, the TOM effect still exists in all nine ETF returns except for the Japanese market and in six index returns. In addition, we find that the risk level is lower during TOM period than during non-TOM period for both index and ETF returns in all nine markets.

Following Chen and Chua (2011), we compare the performance of the following three strategies for individual investors. The first strategy is for investors who buy and hold an index fund mimicking a foreign stock market index throughout the month. The second strategy is for investors who buy and hold the corresponding ETF throughout the month. The third strategy is for investors who invest in the ETF during TOM period and switch to holding T-bills during non-TOM period. We show that this ETF-T-bills switching strategy produces the highest return and has the lowest risk compared to the other two strategies. Statistically, the mean monthly return from the switching strategy is significantly positive, whereas those from the other two strategies are not significant. Economically, this switching strategy produces a terminal value that is at least 50% higher than the other two strategies. Therefore, our results show that investors can exploit the TOM effect in international ETFs.

The following of the article is organized as follows. Section 2 reviews previous literatures on TOM calendar anomaly and ETFs. Section 3 describes data and methodology used in this study. Empirical results are presented in Section 4. Section 5 summarizes and concludes.

2. Related studies

2.1. Calendar anomaly

Ariel (1987) shows that the cumulative returns during a window of (−9, +9) around the first day of the month are non-negligible even after controlling for the impact of the January

effect. Examining the monthly Dow Jones Industrial Average (DJIA) returns over the period of 1987 through 1986, Lakonishok and Smidt (1988) find an average of 0.473% return cumulated during the four-day period at the turn of month, which is higher than the average cumulative return of 0.349% in the whole month. Similarly, Cadsby and Ratner (1992) document a TOM effect in Australia, Canada, Hong Kong, Germany, the United States, and the United Kingdom. Ziemba (1991) also finds a TOM effect in a (−5, +2) window for the Japanese stock market during 1949–1988.

Ogden (1990) hypothesizes that the standardization of payment system in the United States causes the TOM effect. At the turn of each month, the concentrated payment of wages, dividends, interests, and other liabilities give rise to a surge of cash flow that is used for subsequent investment, which in turn pushes up the stock returns.

More recently, McConnell and Xu (2008) reconfirm the existence of TOM effect in a four-day window starting from the last day of the month to the third day of the following month using the CRSP value-weighted and equal-weighted indexes for the period of 1987 through 2005. They also show that the TOM effect exists in index returns in 34 out of the 38 countries examined. They find that the TOM effect is not caused by the influence of stocks with small capitalization or low price, or higher volatility at the end of the month. However, they show that the trading volume and the net funds flows at the turn of the month are not significantly higher than those during the rest of the month, questioning the explanation by Odgen (1990).

Studies have been conducted to examine the performance of various trading strategies designed to exploit the TOM effect in stock returns. For example, Henzel and Ziemba (1996) show that the strategy of investing in a S&P 500 index fund during TOM period and switching to bonds during non-TOM period outperforms the strategy of investing in the stock index fund throughout the month. Similarly, Kunkel and Compton (1998) show that the strategy of investing in a stock fund during TOM period and switching to a money market account during non-TOM period within the Teachers Insurance and Annuity Association—College Retirement Equities Fund (TIAA-CREF) fund family with no transaction costs produces 2.1% higher return than the strategy of buy-and-hold stocks. Zwergel (2010) shows that the TOM effect also exists in the stock index and the corresponding futures in Germany, Japan, United Kingdom, and United States, and that trading strategies designed to exploit the TOM effect are profitable even after adjusting for transaction costs.

2.2. ETFs and calendar anomaly

ETFs are created to mimic a stock index. Grossmann and Beach (2010) show that iShares in four out of six countries examined are more correlated with a sample of foreign stocks than with the sample of corresponding ADRs. For investors in the United States, ETFs also have the advantages of low costs and tax efficiency over the traditional index funds, as shown in Olienyk, Schwebach, and Zumwalt (1999) and in Poterba and Shoven (2002). Unlike index funds, ETFs are traded as regular stocks in the exchanges. Investors who invest with index funds have to wait until the end of the day to purchase or redeem shares at the net asset value, which is determined by the closing prices. In contrast, investors can buy or sell ETFs any time during the regular trading hours.

Several studies compare the performance of ETFs with the performance of other instruments. For example, Pennathur, Delcoure, and Anderson (2002) find that international iShares replicate the foreign index but also have a high degree of exposure to the U.S. market, which limits the diversification potential. Examining the performance of ETFs and closed-end funds for 14 countries, Harper, Madura, and Schnusenberg (2006) conclude that ETFs give investors better returns with a higher Sharpe ratio and a positive Jensen's α. Chu, Mazumder, Miller, and Prather (2007) show that a strategy designed to exploit the lead-lag relation between iShares delivers significantly higher returns in 7 out of 12 pairs.

Chen and Chua (2011), using a window of $(-1, +3)$, find that returns are significantly higher during the four-day TOM window than during the rest of the month for both SPDR and the S&P 500 index. They compare five trading strategies and conclude that the ETF-buy-and-hold strategy produces higher returns than the index-fund-buy-and-hold strategy. However, the strategy of holding T-bills during non-TOM period and then switching to investing in SPDR during TOM period produces the highest Sharpe ratio. Chen and Chua, therefore, suggest that investors should choose different strategies based on the consideration of their tax status and risk aversion.

There is no study examining the presence of the TOM effect in international ETF returns. As a result, we aim to fill this gap in the literature. By comparing the performance of trading strategies designed to exploit the TOM effect in the returns of ETFs and their domestic indexes, we provide guidance for U.S. investors interested in international diversification and return enhancement.

3. Data

We obtain from Datastream the daily data for the iShares for the following markets: Australia, Brazil, Canada, France, Germany, Hong Kong, Japan, Sweden, and the United Kingdom. Brazil is an emerging market with an active stock market and relatively less restriction on foreign investors. All others are developed markets. These ETFs are actively traded on the American Stock Exchange (AMEX). We also obtain the dollar returns for the nine stock market indexes from Datastream.[1] As shown in Table 1, except for the Brazilian market, the data range is from March 29, 1996 to August 10, 2012.

Because of different holiday scheduling by different exchanges, trading is not synchronized between an ETF in the U.S. market and its corresponding foreign index in an oversee market. There are more trading days from ETFs than from the underlying indexes. In this study, we merge the ETF and index time series by excluding missing value on either side of the pair, that is, an ETF and its corresponding foreign stock index.[2] Table 2 presents the summary statistics. For returns, we calculate the simple percentage changes in the underlying index/ETF level. Among the nine markets, Brazil has the largest average daily returns and the highest standard deviation for both market index and ETF. The mean daily dollar index return is significantly positive only in the German market. For ETFs, the mean daily dollar return is insignificant in all nine markets.

Table 1 ETFs and indexes

Country	Period	ETF/ticker	Market/index
Australia	3/29/1996 to 8/10/2012	EWA	S&P/ASX 200 Index
Brazil	7/31/2000 to 8/10/2012	EWZ	Brazil Bovespa Index
Canada	3/29/1996 to 8/10/2012	EWC	S&P/TSX Composite Index
France	3/29/1996 to 8/10/2012	EWQ	France CAC 40 Index
Germany	3/29/1996 to 8/10/2012	EWG	DAX 30 Index
Hong Kong	3/29/1996 to 8/10/2012	EWH	Hang Seng Index
Japan	3/29/1996 to 8/10/2012	EWJ	Nikkei 225 Index
Sweden	3/29/1996 to 8/10/2012	EWD	OMXS Index
U.K.	3/29/1996 to 8/10/2012	EWU	FTSE 100 Index

Data source: Datastream.

Table 2 Descriptive statistics

This table gives the brief statistic summary for ETFs daily dollar returns and their underlying indexes in nine countries. For returns, we calculate the simple percentage changes in the underlying index/ETF level. Difference is the difference between the returns on ETF and its corresponding index. Except for Brazil which starts from July 31, 2000, countries cover a sample period from March 29, 1996 to August 10, 2012. Return numbers in the table are in percentage.

Country	Variable	*N*	Mean	Median	Minimum	Maximum	*SD*
Australia	ETF	3,975	0.0395	0.0000	−12.3898	20.7495	1.8470
	Index	3,975	0.0358	0.0769	−14.7872	8.8817	1.5029
	Difference		0.0037	−0.0843			
Brazil	ETF	2,915	0.0884	0.1389	−19.6277	25.5807	2.6171
	Index	2,915	0.0796	0.1383	−16.4422	18.3611	2.4563
	Difference		0.0087	−0.0251			
Canada	ETF	3,969	0.0348	0.0000	−23.1213	12.3607	1.6084
	Index	3,969	0.0320	0.1088	−12.8809	10.4345	1.4125
	Difference		0.0028	0.0041			
France	ETF	3,977	0.0246	0.0000	−10.9457	13.0777	1.7342
	Index	3,977	0.0218	0.0566	−11.0744	12.9115	1.6497
	Difference		0.0027	−0.0129			
Germany	ETF	3,977	0.0191	0.0000	−11.2864	19.7896	1.8068
	Index	3,977	0.0274**	0.0271	−3.9172	5.8000	0.6510
	Difference		−0.0083	−0.0154			
Hong Kong	ETF	3,977	0.0185	0.0000	−12.3762	20.2381	2.0461
	Index	3,977	0.0313	0.0011	−13.6820	18.8512	1.7493
	Difference		−0.0030	−0.0040			
Japan	ETF	3,977	0.0075	0.0000	−10.4077	17.1817	1.6336
	Index	3,977	0.0051	−0.0088	−10.5827	13.3955	1.6183
	Difference		0.0024	−0.0021			
Sweden	ETF	3,941	0.0303	0.0028	−19.1579	13.2918	2.2152
	Index	3,941	0.0350	0.0054	−9.6050	13.3513	1.7941
	Difference		−0.0048	−0.0082			
UK	ETF	3,977	0.0215	0.0000	−12.0225	17.0642	1.6133
	Index	3,977	0.0200	0.0594	−10.0018	12.9967	1.4115
	Difference		0.0015	−0.0000			

** and * denote for significance levels at 1% and 5%, respectively.

Table 3 Return by day of the month
The table below presents the average return over the four-day turn of month (TOM) window, that is, from the last day of the month Day (−1) to the first three days of the following month: Day (+1), Day (+2), and Day (+3). Difference is the difference between returns in TOM period and non-TOM period. ΔReturn is the difference between ETF returns and the corresponding stock index returns. Numbers in the table are in percentage.

Country	Day (−1)	Day (+1)	Day (+2)	Day (+3)	TOM	Non-TOM	Difference
Australia							
ETF	0.255*	0.354**	0.168	−0.095	0.171**	0.005	0.166**
Index	0.218*	0.174	0.231*	−0.108	0.129*	0.012	0.117
ΔReturn	0.037	0.181	−0.063	0.013	0.027	−0.003	
Brazil							
ETF	0.600**	0.810**	0.103	−0.063	0.363**	−0.023	0.340**
Index	0.610**	0.676**	0.140	0.065	0.372**	0.007	0.365**
ΔReturn	−0.010	0.134	−0.037	−0.128	−0.026	0.006	
Canada							
ETF	0.210*	0.295**	0.122	0.063	0.173**	0.001	0.172**
Index	0.199*	0.312**	0.056	−0.009	0.140**	0.005	0.135*
ΔReturn	0.011	−0.018	0.066	0.072	0.002	−0.004	
France							
ETF	0.312**	0.262*	−0.037	0.063	0.150**	−0.006	0.156*
Index	0.324**	0.108	0.036	0.008	0.119*	−0.003	0.122
ΔReturn	−0.013	0.154*	−0.073	0.055	0.030	−0.006	
Germany							
ETF	0.268*	0.253	0.066	−0.031	0.139*	−0.012	0.151*
Index	0.112*	−0.004	0.058	0.035	0.005*	0.021	0.029
ΔReturn	0.156	0.257	0.008	−0.066	0.140**	−0.029	
Hong Kong							
ETF	0.244	0.501**	−0.038	0.038	0.186**	−0.023	0.209**
Index	0.231*	0.247	0.322**	−0.128	0.168**	−0.002	0.170*
ΔReturn	0.013	0.254	−0.359*	0.166	0.038	−0.012	
Japan							
ETF	0.122	0.443**	0.090	−0.067	0.102	−0.015	0.117
Index	0.047	0.175	0.088	−0.108	0.051	−0.005	0.006
ΔReturn	0.074	0.267*	−0.178	0.041	0.062	−0.013	
Sweden							
ETF	0.108	0.318*	0.143	0.057	0.156*	0.000	0.156*
Index	0.240*	0.215	0.364	0.031	0.162**	0.004	0.159*
ΔReturn	−0.131	0.104	−0.021	0.025	0.032	−0.009	
UK							
ETF	0.210	0.384**	0.051	−0.042	0.151**	−0.011	0.162**
Index	0.178*	0.237*	0.130	0.002	0.137**	−0.010	0.147**
ΔReturn	0.033	0.147	−0.079	−0.044	0.036	−0.009	

** and * denote for significance levels at 1% and 5%, respectively.

4. Empirical results

4.1. The TOM effect

Following McConnell and Xu (2008) and Chen and Chua (2011), we use the (−1, +3) four-day TOM window at the turn of the month. Table 3 presents the mean daily returns. As

can be seen in the table, the TOM effect is most pronounced during the first two days for both ETFs and the indexes. More important, as shown in the TOM column, the average daily return during TOM period is significantly positive for both index and ETF in all markets except for the Japanese market. Our findings are consistent with those in McConnell and Xu (2008) and Chen and Chua (2011).

As the last column in Table 3 shows, the return difference between TOM period and non-TOM period is significantly positive for ETFs in all markets except for the Japanese market. On the other hand, for index returns, the return difference between TOM period returns and non-TOM period is significantly positive only in five markets. Table 3 also reports the return differences on each of the four days at the turn of each month. The differences are largely insignificant for most of the days. For all nine markets, there is no statistical difference between the index returns and the ETF returns, indicating that ETFs track the underlying market index very closely even though there is a difference in trading hours.[3]

To account for known factors such as the January effect and the Weekend effect, we conduct a regression analysis to test whether the TOM effect still exists in return after controlling for these factors. As shown in Eq. (1), we include the two additional control variables.

$$R_{it} = a_0 + a_1 TOM_{it} + a_2 January_{it} + a_3 Weekend_{it} + e_{it}$$

where R_{it} denotes the daily returns of ETFs or stock indexes. TOM is a dummy variable that takes a value of 1 if a trading day belongs to the four-day TOM window and otherwise 0. Other control variables such as *January* and *Weekend* are also dummy variables. *January* takes a value of 1 if a day is in January and 0 otherwise. Similarly, *Weekend* takes a value of 1 if it is a Monday and 0 otherwise. The null hypothesis is that there is no TOM effect, that is, $\alpha_1 = 0$.

As shown in Table 4, the ETF regression shows that the coefficient for TOM is significantly positive in all markets except for the Japanese market and the Swedish market. The index regression shows that the coefficient for TOM is significantly positive in six markets but not in the French, Germany, and Japanese markets. Therefore, after controlling for other factors, the results in Table 4 are largely consistent with those in Table 3, confirming that the TOM effect exists in the returns of both index and ETFs in most of the markets examined.

Fig. 1 presents a comparison of the cumulative returns during the four-day TOM period and those during the rest of the month for the nine ETFs. As can be seen, the average cumulative returns in non-TOM period are negative in five markets; in contrast, the average cumulative return over TOM period is positive in all markets. The sheer magnitude indicates the importance of the TOM effect in determining the overall performance for the whole month.

Are returns more volatile during TOM period than during non-TOM period? Table 5 presents the return standard deviations on (1) each day of the four-day TOM period, (2) during TOM period, and (3) during the rest of the month for both ETFs and stock indexes. The results show several patterns. First, return standard deviation is higher for ETFs than for the indexes in all markets, a finding consistent with those in Chen and Chua (2011), which

Table 4 Regression analysis
For each market, the dependent variable is the daily return of the ETF and the stock index, respectively. TOM, January, and Weekend are dummy variables if a trading day is during the turn of the month period, in January, and a Monday, respectively. Regression coefficients use a Newey-West correction of standard errors for heteroscedasticity and autocorrelation.

Country	Constant	TOM	January	Weekend	N	R^2
Australia						
ETF	0.0003	0.0016*	−0.0008	−0.0006	3,975	0.001
Index	0.0002	0.0012*	−0.0008	−0.0000	3,975	0.001
Brazil						
ETF	0.0008	0.0034**	−0.0010	0.0028	2,915	0.004
Index	0.0004	0.0036**	−0.0001	0.0015	2,915	0.003
Canada						
ETF	−0.0000	0.0017**	−0.0001	0.0000	3,969	0.001
Index	0.0002	0.0014*	−0.0005	0.0005	3,969	0.001
France						
ETF	0.0003	0.0016*	−0.0015	−0.0012	3,977	0.002
Index	0.0002	0.0012	−0.0014	−0.0005	3,977	0.001
Germany						
ETF	0.0001	0.0015**	−0.0015	−0.0006	3,977	0.002
Index	0.0004**	0.0003	−0.0011*	−0.0005	3,977	0.002
Hong Kong						
ETF	0.0002	0.0021**	−0.0010	−0.0017	3,977	0.004
Index	0.0001	0.0018*	−0.0018	0.0002	3,977	0.003
Japan						
ETF	0.0001	0.0012	−0.0008	−0.0010	3,977	0.002
Index	0.0000	0.0006	−0.0001	−0.0014*	3,977	0.002
Sweden						
ETF	0.0002	0.0016	−0.0013	0.0005	3,941	0.002
Index	0.0002	0.0016*	−0.0012	−0.0004	3,941	0.001
U.K.						
ETF	0.0001	0.0016*	−0.0011	−0.0005	3,977	0.003
Index	0.0000	0.0015**	−0.0013	0.0002	3,977	0.002

** and * denote for significance levels at 1% and 5%, respectively.

reports that SPDR has a higher standard deviation during both TOM period and the rest of the month than its underlying S&P 500 index. Second, the standard deviation is no higher during TOM period than during the rest of the month for both indexes and ETFs. In the Australian market, returns are less volatile during TOM period than during non-TOM period for both the ETF and the index. Similarly, risk is significantly lower during TOM period than during non-TOM period for the Swedish ETF returns and the Japanese index returns.

4.2. TOM effect: Robustness check

4.2.1. Tests on subsamples

Does the TOM effect exist in recent data? As a robustness check, we evenly divide our whole sample into two subsamples and retest the TOM effect in each subsample. As shown in Table 6, in the early sample, the TOM effect exists in both ETF and index returns only in the Brazilian market. In contrast, in the more recent subsample, returns are significantly

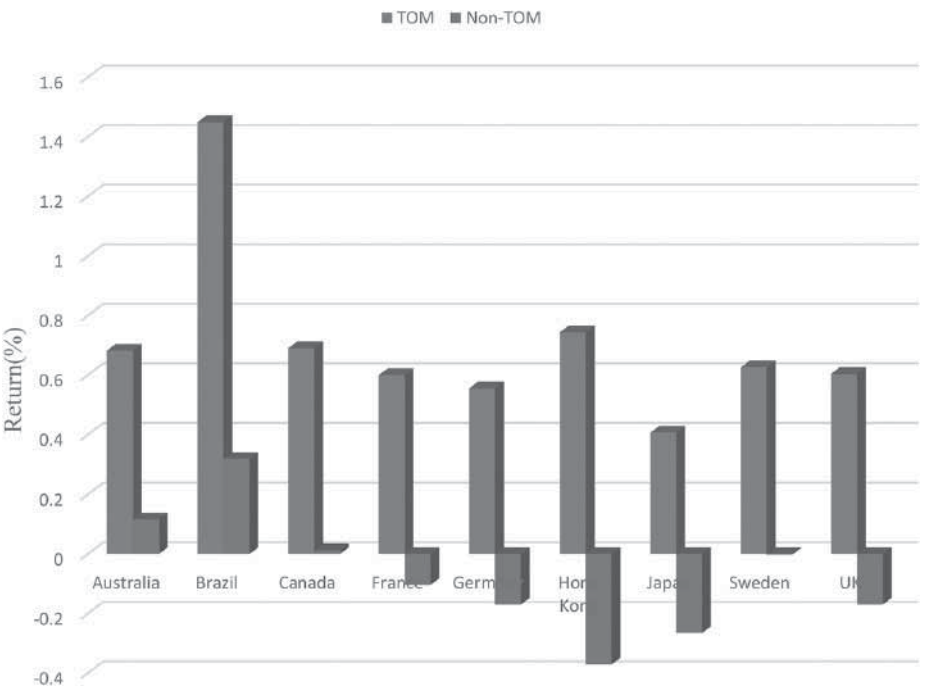

Fig. 1. Cumulative returns during TOM period and non-TOM period for ETFs.

higher during TOM period than during non-TOM for ETFs in four markets. Similarly, index returns are significantly higher during TOM period than during non-TOM period in four markets. It is an open question whether publicity from the researches on this phenomenon and subsequent trading by investors to exploit such return anomaly contributes to a more recent prevalence of the TOM effect in data.

4.2.2. The TOM effect in local ETFS[4]

Previous results are for ETFs traded on the U.S. exchanges. Because iShares also issue ETFs aboard, we examine if the TOM effect also exists in local ETFs returns. Only three local ETFs, that is, Germany, Hong Kong, and United Kingdom, have daily prices longer than three years.[5] As a result, we examine only these three markets and the results are shown in Table 7. Returns during TOM period are insignificant for the local ETF in Germany, whereas they are significantly positive in both Hong Kong and United Kingdom. For United Kingdom's local ETF, daily returns on the first and the second day of each month are significantly positive. However, only United Kingdom's local ETF returns statistically exhibit the TOM effect.

Fig. 2 plots the cumulative returns of both the four-day TOM period and the remainder of the same month. Similar to the results in Fig. 1, the returns generated from the four days at the turn of the month are all positive and account for a large portion of the total returns of the entire month.

Because these local ETFs are most likely traded by domestic investors, the lack of evidence for the TOM effect in local ETF returns in Hong Kong and Germany could be a result of differences in the payment systems or investor behavioral difference. Although it

Table 5 Risk by day of the month
The table below presents the risk as measured by daily return standard deviation at the turn of the month from the last day of the month to the first three days of the following month: Day (+1), Day (+2), and Day (+3). TOM and non-TOM stand for TOM period and the remainder of the month period, respectively. Difference is the difference between returns in TOM period and non-TOM period. Numbers in the table are in percentage.

Country	Day (−1)	Day (+1)	Day (+2)	Day (+3)	TOM	Non-TOM	Difference
Australia							
ETF	1.601	1.882	1.847	1.683	1.762	1.870	−0.152*
Index	1.406	1.506	1.426	1.238	1.402	1.526	−0.145**
Brazil							
ETF	2.212	2.722	2.623	2.478	2.525	2.633	−0.167
Index	1.946	2.555	2.766	2.259	2.412	2.462	−0.070
Canada							
ETF	1.371	1.554	1.820	1.439	1.555	1.620	−0.087
Index	1.208	1.473	1.541	1.278	1.385	1.418	−0.027
France							
ETF	1.591	1.802	1.834	1.774	1.755	1.728	0.011
Index	1.509	1.686	1.670	1.679	1.639	1.652	0.006
Germany							
ETF	1.606	1.930	1.926	1.838	1.831	1.800	0.000
Index	0.673	0.643	0.646	0.659	0.655	0.650	0.007
Hong Kong							
ETF	1.867	2.187	2.048	1.966	2.027	2.049	−0.096
Index	1.513	1.923	1.692	1.609	1.697	1.761	−0.091
Japan							
ETF	1.513	1.843	1.674	1.346	1.616	1.638	−0.004
Index	1.681	1.553	1.579	1.272	1.529	1.640	−0.100*
Sweden							
ETF	1.872	2.265	2.144	2.082	2.094	2.244	−0.125*
Index	1.531	1.877	1.803	1.731	1.739	1.806	−0.057
U.K.							
ETF	1.546	1.738	1.591	1.561	1.612	1.611	−0.003
Index	1.117	1.639	1.391	1.348	1.397	1.414	−0.012

** and * denote for significance levels at 1% and 5%, respectively.

may be difficult to document the difference in investor behavior, it will be interesting to examine how the three countries differ in the payment system, for example, the frequency by which wages and salary are distributed to employees.

4.3. The performance of three trading strategies

Chen and Chua (2011) document that the trading strategy of buying-and-holding SPDR significantly outperforms the strategy of buying-and-holding a S&P 500 index fund by 0.145%. They also show that the strategy of holding a S&P 500 index fund during non-TOM period and then switching to holding SPDR during TOM period outperforms the traditional strategy of buying-and-holding a S&P 500 index fund by 0.068%. In this article, we examine the performances and risks of the following three trading strategies:[6]

Table 6 Robustness check–TOM effect in two subsamples
The table presents the average daily return at the turn of the month (TOM) defined as from the last day of the month to the first three days of the following month, and the rest of the month (non-TOM), respectively. Panel A is for the first subsample (before 2006 for Brazil and before 2002 for the other markets). Numbers in the table are in percentage.

Country	TOM	Non-TOM	Difference
Panel A			
Australia			
ETF	0.128	0.039	0.089
Index	0.122	0.040	0.082
Brazil			
ETF	0.372**	0.059	0.313*
Index	0.425**	0.051	0.374**
Canada			
ETF	0.127	0.036	0.091
Index	0.098	0.032	0.066
France			
ETF	0.143	0.004	0.139
Index	0.133	0.004	0.108
Germany			
ETF	0.127	0.028	0.009
Index	0.039	0.030	0.009
Hong Kong			
ETF	0.158	0.008	0.149
Index	0.143*	0.022	0.121
Japan			
ETF	0.072	0.007	0.065
Index	0.067	0.024	0.042
Sweden			
ETF	0.147	0.042	0.105
Index	0.153	0.027	0.125
U.K.			
ETF	0.160*	−0.004	0.164
Index	0.149*	−0.008	0.156
Panel B			
Australia			
ETF	0.232*	−0.038	0.270**
Index	0.138*	−0.026	0.164*
Brazil			
ETF	0.323	−0.138	0.461
Index	0.171	−0.173	0.344
Canada			
ETF	0.238**	−0.049	0.288**
Index	0.199**	−0.033	0.233**
France			
ETF	0.160	−0.021	0.181
Index	0.128	−0.011	0.139
Germany			
ETF	0.156	−0.066	0.221*
Index	0.066*	0.010	0.056
Hong Kong			
ETF	0.226	0.068	0.295*
Index	0.204	−0.037	0.240*

(continued on next page)

Table 6 Continued

Country	TOM	Non-TOM	Difference
Japan			
ETF	0.144	−0.048	0.192
Index	0.028	−0.049	0.077
Sweden			
ETF	0.170	−0.065	0.235
Index	0.176*	−0.032	0.208*
U.K.			
ETF	0.138	−0.019	0.158
Index	0.119	−0.011	0.130

** and * denote for significance levels at 1% and 5%, respectively.

Strategy 1: Buy and hold a stock index fund each month.
Strategy 2: Buy and hold a corresponding ETF each month.
Strategy 3: Invest in the ETF during TOM period and then switch to investing in T-bills during non-TOM period.

Some brokerage firms such as Fidelity and Vanguard have launched their own ETFs and allow their customers to trade ETFs commission-free (with some restriction, of course). Therefore, we do not take transaction costs into consideration.[7]

Table 8 reports the mean returns and the standard deviation for each of the three trading strategies in nine countries. The strategy of buying-and-holding an index fund does produce a positive but statistically insignificant return—except for the German market. Similarly, the strategy of buying-and-holding a corresponding ETF produces a positive but statistically insignificant average return in all but the Brazilian market. Such a result reflects the fact that returns are negative during non-TOM period as shown in Table 6, which offsets the positive

Table 7 Return by day of the month–Local ETFs
The table below presents the average daily return of ETFs at the turn of month (TOM) from the last day of the month, Day (−1), to the first three days of the following month, Day (+1), Day (+2), and Day (+3). Only these three local ETFs have sufficient data. Return stands for the mean daily return of corresponding period, and Risk is measured by the standard deviation of daily returns. TOM and non-TOM stand for the mean return during TOM period and the remainder of the month period, respectively. Difference in the last column is the difference between returns in TOM and non-TOM period. Numbers in the table are in percentage.

Country	Day (−1)	Day (+1)	Day (+2)	Day (+3)	TOM	Non-TOM	Difference
Germany							
Return	0.169	0.037	0.037	0.153	0.118	−0.003	0.122
Risk	1.421	1.789	1.789	1.553	1.594	1.525	0.069
Hong Kong							
Return	0.207	0.037	0.469**	−0.026	0.225**	0.024	0.201
Risk	1.418	1.789	1.987	1.902	1.759	2.022	−0.263
U.K.							
Return	−0.056	0.271*	0.271**	−0.028	0.109*	−0.011	0.119*
Risk	1.161	1.303	1.303	1.224	1.261	1.306	−0.045

** and * denote for significance levels at 1% and 5%, respectively.

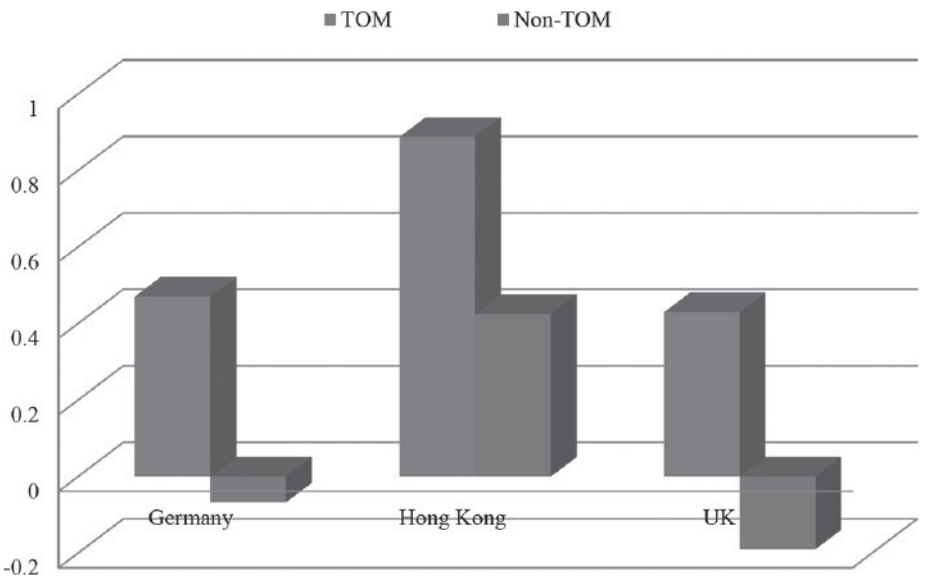

Fig. 2. Cumulative return between four-day TOM and non-Tom period for three local ETFs.

returns during TOM period. In contrast, the ETF-T-bills switching produces significantly positive returns in all nine markets.[8]

Equally important, as shown in Table 8, returns from the ETF-T-bills switching strategy have a much lower standard deviation than those from the other two strategies—again across all nine markets. In Australia, Canada, German, and Sweden, the standard deviation of returns from this switching strategy is more than twice lower than that from the other two strategies.

As shown in Fig. 3, we use the monthly returns to calculate the Sharpe ratio for these three strategies in all markets. The Sharpe ratio provides a measure for the risk-adjusted performance of an investment. Fig. 3 shows that the ETF-T-bills switching strategy has the highest Sharpe ratio, easily beating the two buy-and-hold strategies. In France, Hong Kong, Japan, and United Kingdom, the Sharpe ratio from this switching strategy is almost three times higher than that from the two buy-and-hold strategies. In other markets, the Sharpe ratio from this ETF-T-bills switching strategy is about twice larger than that from the other two strategies. Therefore, on a risk adjusted basis, investors are better off pursuing a strategy of investing in T-bills in non-TOM period and switching to holding ETF during TOM period than simply buying and holding either an index fund or an ETF.

We also calculate the Sortino ratio, which differs from the Sharpe ratio by replacing the standard deviation with the downside risk. The downside risk is defined as the standard deviation of returns below the target return. By using the downside risk, the Sortino ratio focuses on the risk that an investor may be short of reaching the investment target. We use the S&P 500 index return as the target return in each month in the calculation of the downside risk. Fig. 4 exhibits the Sortino ratio for the three strategies. Consistent with the Sharpe ratio in Fig. 3, the ETF-T-bills switching strategy has the highest Sortino ratio, outperforming the other two buy-and-hold strategies on a risk-adjusted basis.

Although the return difference between the three strategies is statistically insignificant, different strategies can still generate returns that are economically significant. To

Table 8 Trading strategies comparison
This table shows the monthly mean return and standard deviation for three trading strategies: Strategy 1 of buy-and-hold a stock index fund throughout each month, Strategy 2 of buy-and-hold an ETF throughout each month, and Strategy 3 of investing in the corresponding ETF during TOM period and then switching to investing in T-bills during non-TOM period. Numbers in the table are in percentage.

Country	Strategy 1 (index buy-and-hold)	Strategy 2 (ETF buy-and-hold)	Strategy 3 (ETF-T-bills switching)
Australia			
Mean	0.722	0.798	0.806**
SD	6.17	6.40	3.19
Brazil			
Mean	1.590	1.764*	1.532**
SD	10.67	10.24	4.50
Canada			
Mean	0.645	0.702	0.813**
SD	6.23	6.49	2.91
France			
Mean	0.438	0.43	0.723**
SD	6.322	6.396	3.22
Germany			
Mean	0.554*	0.386	0.790**
SD	3.64	6.75	3.37
Hong Kong			
Mean	0.632	0.373	0.868**
SD	7.32	7.27	3.62
Japan			
Mean	0.103	0.151	0.530*
SD	6.32	5.74	2.99
Sweden			
Mean	0.701	0.605	0.748**
SD	7.10	7.98	3.82
U.K.			
Mean	0.403	0.434	0.727**
SD	4.79	4.96	2.89

** and * denote for significance at 1% and 5%, respectively.

assess the economic significance, we calculate the terminal value of one dollar invested following each of the three strategies. As Fig. 5 shows, the ETF-T-bills switching strategy produces a higher terminal value than the other two traditional buy-and-hold strategies in all markets. This ETF-T-bills switching strategy produces a terminal value twice larger than the ETF-buy-and-hold strategy, the next best strategy, in Canada, France, Hong Kong, Japan, and United Kingdom. In the other four markets, this ETF-T-bills switching strategy produces a terminal value about 50% larger than the next best strategy. Notice that the ETF-buy-and-hold strategy underperforms the index-fund-buy-and-hold strategy in German, Hong Kong, and Sweden. In these three markets, the index-fund-buy-and-hold strategy has a higher Sharpe ratio and Sortino ratio than the ETF-buy-and-hold strategy. Overall, Fig. 5 demonstrates the economic significance of exploiting the TOM effect in ETFs.

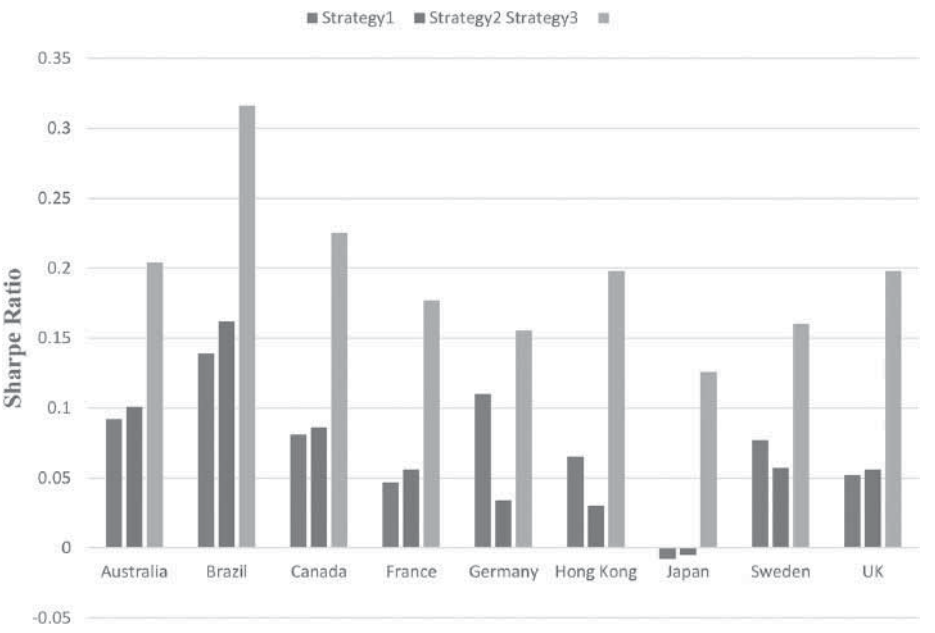

Fig. 3. Sharpe ratios for the three strategies. *Note:* In Strategy 1, investors buy and hold the index fund. In Strategy 2, investors buy and hold the ETF. In Strategy 3, investors hold the ETF during TOM period and switch to holding the T-bills during non-TOM period. In calculating the Sharpe ratio, the excess return is defined as the difference between the monthly strategy return and the monthly T-bills return.

5. Summary and conclusion

This article documents that ETF returns are higher during the four-day TOM window than the rest of the month in eight out of the nine markets examined. Regression analysis shows that such an effect is still present in ETF returns after controlling for known factors such as the January effect and the Weekend effect. The four-day window accounts for most of the positive returns of the month. The rest of the month typically has either lower returns or negative returns. We also find that there is generally no difference between the ETF returns and the underlying index returns across the different days of the month. However, ETF returns have a higher standard deviation than the index returns. These findings are consistent with the previous literature.

For investors interested in exploiting the TOM effect, we compare the strategy of holding T-bills during non-TOM period and then switching to ETFs during TOM period against the two strategies of buy-and-hold either an index fund or an ETF, respectively. It is shown that only this ETF-T-bills switching strategy produces significantly positive average monthly returns. The other two buy-and-hold strategies generate positive but insignificant monthly average returns. We further show that this switching strategy produces the highest risk-adjusted returns as indicated by a higher Sharpe ratio and a higher Sortino ratio.

In terms of economic significance, investors pursuing this ETF-T-bills switching strategy on average achieve a terminal value that is at least 50% larger than the traditional buy-and-hold strategy, in either an index fund or an ETF. Because investors can trade ETFs on the exchange at extremely low transaction costs and with high liquidity, investing in ETFs is an attractive alternative to investing in traditional mutual funds. Our results show that U.S.

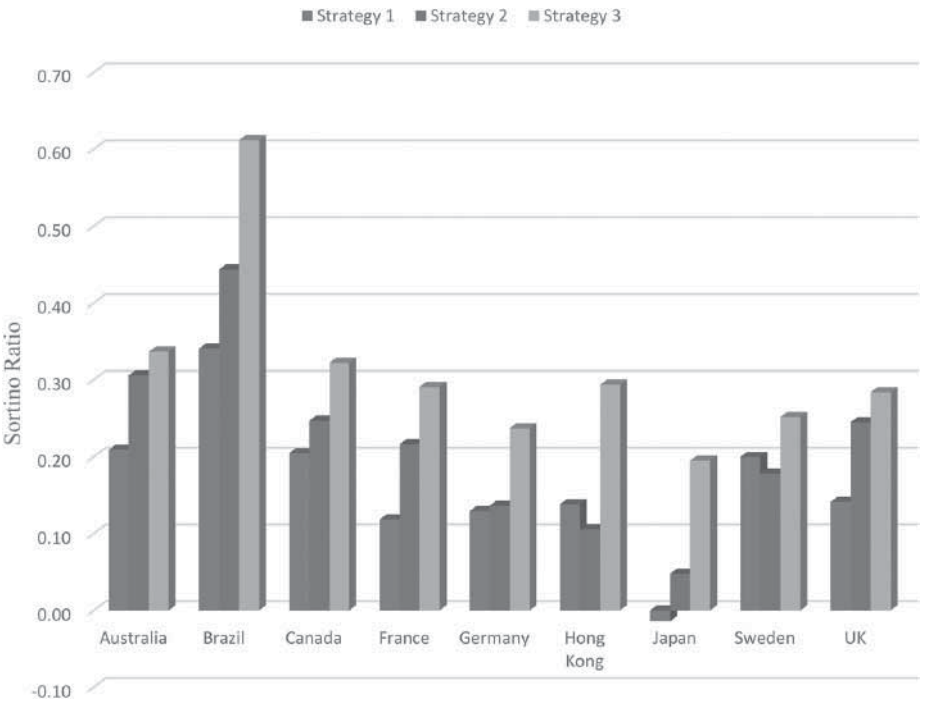

Fig. 4. Sortino ratio for different strategies. *Note:* In Strategy 1, investors buy and hold the index fund. In Strategy 2, investors buy and hold the ETF. In Strategy 3, investors hold the ETF during TOM period and switch to holding the T-bills during non-TOM period. In calculating the Sortino ratio, the monthly S&P 500 index return is used as the target return and the excess return is defined as the difference between the monthly strategy return and the monthly T-bills return.

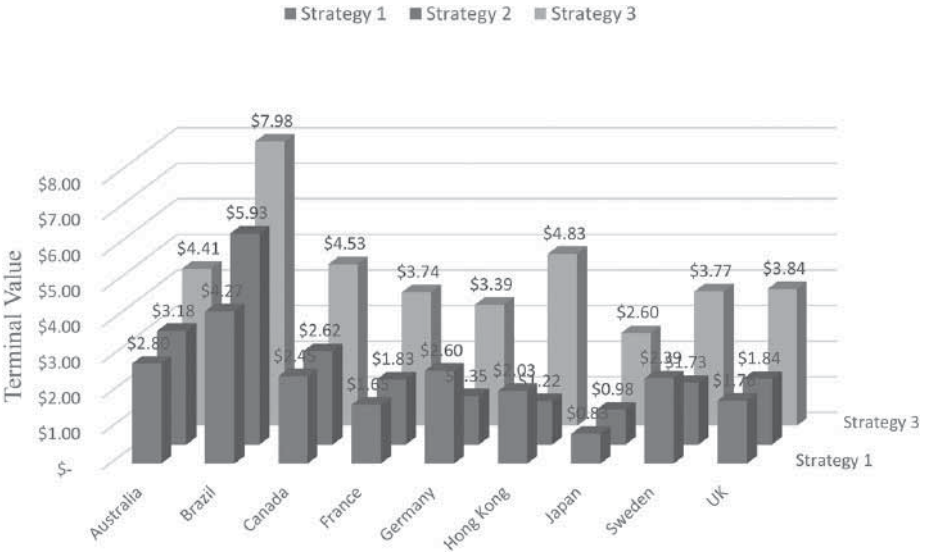

Fig. 5. Terminal values for the ETF investment strategies. *Note:* This figure exhibits the ending balance of one dollar invested under the three strategies over the sample period. In Strategy 1, investors buy and hold the index fund. In Strategy 2, investors buy and hold the ETF. In Strategy 3, investors hold the ETF during TOM period and switch to holding the T-bills during non-TOM period.

investors can benefit from using iShares to exploit the well-known TOM effect in their pursuit of higher return and more effective international diversification.

Notes

1 We check for holidays in those markets to avoid the "holiday return effect" as pointed out in Klein, Zwergel, and Fock (2009).
2 We also conduct analyses separately for an ETF and its corresponding index. Results remain the same for ETFs in that the TOM effect exits on all markets except for the Japanese market, which is consistent with the results reported in Table 3. For index returns, the TOM effect exists in all markets except for the Japanese market, which shows more a potent TOM effect since Table 3 shows no TOM effect in the German market. There is no significant qualitative changes for results in other tables. As a result, they are not reported for brevity and are available upon request.
3 See http://www.ishares.com/us/products/product-list#categoryId=129&lvl2=overview, for more about the underlying index.
4 We thank Stephen Spathe for pointing out to us and for suggesting this robustness check.
5 Specifically, data is available since January 2001 for Germany, November 2001 for Hong Kong, and May 2000 for United Kingdom, respectively.
6 Although not reported in the article, the strategy of holding T-bills during non-TOM period and switching to holding an index fund underperforms the ETF-T-bills switching strategy.
7 There can be other costs such as slippage. We thank an anonymous referee for pointing out this cautionary note.
8 There are some mutations in the results in the subsamples. For the index-T-bill switching strategy, significantly positive returns are found in Australian, Brazilian, Canadian, and German markets in the first subsample, but only in markets in Hong Kong, Sweden, and United Kingdom in the second subsample. For the ETF-T-bill switching strategy, significantly positive returns are found in markets in Australia, Brazil, Canada, and United Kingdom in the first subsample, but in Canada, France, Germany, Hong Kong, Sweden, and United Kingdom in the second subsample. It is the same pattern when the strategies are applied to ETFs and indexes separately without merging the data. As a result, it seems that the ETF-switching strategy is consistently profitable in the more recent period.

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