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You Can Do Better than "Sell in May"

It Is not Halloween, but It May Be Passover and Hanukah

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Abstract

Sell in May, known also as the Halloween effect, continues to persist in many parts of the world and to puzzle researchers and practitioners. Prior research found that in a few certain countries this effect is not statistically significant or does not exist. This paper shows that although Halloween effect is not significant in Israel, it can be easily replaced by another profitable calendar strategy, holding the market index just for the months of April and December each year and investing the money in the risk-free asset for the rest of the year. This strategy may not persist in the future, however it is puzzling how it prevailed over 20 years since the inception of a prime Tel Aviv market index. We show that the superior performance of this strategy compared to its natural benchmarks is robust using risk-adjusted measures over multiple sub-periods in our sample.

Keywords: event studies, emerging markets, calendar anomalies, Sell-in-May, holiday effects, monthly effects

1. Introduction

There are numerous studies on calendar anomalies. The "sell in May" effect, also known as the Halloween effect, is probably the most stable, pervasive and enigmatic one. The related strategy is simply holding stocks in the period November 1st to the end of April and selling them for cash (or a risk-free asset) on May 1st, and so on. Prior prominent studies of this effect include Bouman and Jacobsen (2002), Jacobsen and Marquering (2008), Jacobsen and Zhang (2012), and Andrade, Chhaochharia, and Fuerst (2013). Most papers ignore the Israeli market. Jacobsen and Zhang (2012) study all 108 available stock market indices and find that the Halloween effect does not appear in Israel, India, and all the countries located in Central and South American area. Our work confirms this result about the Israeli market. However, unlike prior research, this work does not conclude with the known negative result. We aim to address this research gap and study whether another calendar year pattern persists. We find that instead of holding stocks over the complete six-month period of sell-in-May strategy, it is better to hold treasury bills over 10 months and invest in the market index just in the months of April and December. This 'April and December' strategy generates superior performance over each of the alternatives: Sell-in-May, 'Buy and Hold' of the index, or rolling investment in 30-day treasury bills (T-Bills) (Note 1). For example, an investment of \$1, for 20 years, on January 1st 1993 yields on 31 December 2012 approximately \$5 in 'Buy and Hold' and 'T-Bills', \$13 in 'Sell in May' and more than \$20 in 'April and December' strategy. We confirm the superior performance using risk-adjusted returns over different time periods in our sample.

We briefly present here some pertinent results of prior papers. Bouman and Jacobsen (2002) study 37 markets and find higher returns in 35 of these markets during the November to April half-year period compared to the May to October half-year period. November-April returns are statistically higher in 20 of the 37 markets. Bouman and Jacobsen (2002) discuss a wide range of plausible explanations for the Halloween effect without conclusive results, except, perhaps to its relation to vacation timing and length. As Bouman and Jacobsen (2002) sample ends on August 1998, Andrade et al. (2013) extend the study to 2012 on the same markets, with similar results. Using equally valuated and value weighted global portfolios of the 37 markets, they also show that the average global effect is not stable, though the excess returns of November-April period over the rest of the year is positive more frequently than negative. These two studies ignore the Israeli market.

Andrade, Chhaochharia, and Fuerst (2013) extend the sample period for the same markets analyzed by Bouman and Jacobsen (2002) and find that the 'Sell in May' effect is pervasive in financial markets even in the 10 years following the publication of Bouman and Jacobsen and in the same markets. Jacobsen and Marquering (2008) show that results of prior literature attempting to explain stock return patterns by weather induced mood shifts of investors, might be data-driven inference.

The main objective of this paper is to demonstrate another calendar-related phenomenon that to our knowledge is not documented in prior literature, the April and December significant positive returns (Note 2). Asking a few local investors, it seems that this effect is not known to practitioners. We provide an anecdotal explanation to the effect, yet we do not claim to have an economic explanation for the existence of the effect over some 20 years. Like Jacobsen and Marquering (2008) we remain doubtful whether finding an economic reason for such calendar effects is feasible.

The rest of the paper proceeds as follows: Section 2 presents the data and methodology, Section 3 presents the results and discusses them, and Section 4 concludes.

2. Methodology and Data

2.1 Data

For our equity market portfolio we use Tel Aviv's TA-100, a value-weighted index of the 100 largest firms (by market capitalization) traded on Tel Aviv Stock Exchange (TASE). To avoid over influence of a few large firms, the maximum weight of a single firm is limited to 10%. TA-100 began on 1 January 1992 with a base level of 100 (Note 3). For the risk-free asset we use a local market T-bill, the Israeli government 30 day MAKAM, a zero coupon short-term bond which is virtually risk-free and highly liquid asset in Israel. We have February 1st 1990 to December 31st 2012 monthly data for the index, however the T-bill data is available starting January 2nd 1992 (Note 4).

2.2 Methodology

We follow the common methodology used by many prior researchers, incorporating a dummy variable S_t to assess the seasonal effect in the regression:

$$r_t = \alpha + \beta \cdot S_t + \epsilon_t \tag{1}$$

where r_t is the monthly index return at time *t*, α is the intercept, S_t equals zero for months May-October and one otherwise, and ϵ_t is the usual error term. Similar to others we use log-returns for r_t. We then test whether β is significantly different from zero.

Similar to prior research, we find that we cannot reject the null hypothesis that $\beta = 0$. Hence, our next step is to assess monthly effects, for which we use a monthly dummy variable in the following regression:

$$r_t = \sum_{i=1}^{12} \mu_i \, M_i + \zeta_t \tag{2}$$

where M_i equals one for month *i* and zero otherwise, μ_i is the average estimated return for month *i*, and ζ_t is the error term. A statistically significant non-zero μ_i is a potential candidate for a calendar-based strategy.

For the Israeli market and our sample data, we select the months of April and December for their positive and statistically significant returns. We then construct four value paths (time series), each is 240-month long, starting with one-dollar investment on January 2nd 1992 and ending on December 31st 2012: 'Sell in May' strategy, 'April and December' strategy, 'Buy and Hold' strategy, and 'T–bills' strategy. We do not limit our analysis to the final value of each investment strategy at the end of the 20 years. In addition to the value paths of the four investments over the complete period, we first divide the period to two decades. Then, to assess the timing effect on the performance, we calculate and assess the performance of 120 decades, the first stating in January 1993, the second in February 1993, and so on, and the last in January 2003. To evaluate risk-adjusted performance, we use Sharpe Ratio (SR), Adjusted Sharpe Ratio (ASR), and Morningstar Risk Adjusted Returns (MRAR) as defined below.

The Sharpe Ratio for investment strategy *i* in the period starting on month *k* and ending on month *l* is the customary:

$$SR_i(k,l) = \frac{\frac{1}{(l-k+1)} \sum_{t=k}^{l} r_{i,t} - r_{f,t}}{\sigma_i(k,l)} \tag{3}$$

where $r_{i,t}$ and $r_{f,t}$ are month *t* strategy *i* and risk-free asset returns respectively, and $\sigma_i(k,l)$ is strategy *i* return standard deviation in the period $[k, l]$ (Note 5).

Since SR is limited to the first two moments of the returns we compute the ASR, which augments the SR by adding the effects of the third and fourth moments, m_3 and m_4 respectively (Note 6):

$$ASR_i(k,l) = SR_i(k,l) \cdot \left[1 + \frac{m_{i,3}(k,l)}{6} \cdot SR_i(k,l) - \frac{m_{i,4}(k,l)-3}{24} \cdot SR_i(k,l)^2\right] \tag{4}$$

where all the variables are for strategy *i* and period $[k, l]$.

Finally, as ASR is still relatively unknown to many practitioners and academics, we also use the widely adopted industry standard MRAR, see Morningstar (2009):

$$MRAR_i(k,l) = \left[\frac{1}{(l-k+1)} \sum_{t=k}^{l} \left(\frac{1+r_{i,t}}{1+r_{f,t}}\right)^{-\gamma}\right]^{-\frac{12}{\gamma}} - 1 \tag{5}$$

where γ is a risk-aversion parameter. Usually Morningstar and others use $\gamma = 2$.

In addition to charting the decade performances versus their starting month, we compare the AR, ASR, and MRAR of the strategies, over 120 observations, and test for significant differences using a non-parametric sign test, assessing whether there is a statistically significant performance superiority among ‘April and December’, ‘Sell in May’, and ’Buy and Hold’ alternative strategies.

3. Results, Analysis and Discussion

3.1 Testing Halloween Effect

We start by testing the existence of the Halloween effect in the Israeli market, using the regression in equation 0 and the monthly data from the inception of the TA-100 index in February 1990 until the end of 2012. The results are summarized in Table 1. Both the intercept (α) and the coefficient of the effect dummy (β) are positive, yet we cannot reject the null hypothesis that they are statistically insignificantly different from zero (both p-values are higher than 10%). Furthermore, the R^2 of the regression is negligible and its F-value is very high. Nevertheless, numerically the Sell-in-May effect is traceable in β, which equals 1.3%. This is the average monthly return difference of the period November to April, above the average monthly return during the rest of the year, which is less than 0.5% in the sample period.

Table 1. The regression results of equation 0 for TA-100 index monthly returns in the period February 1st 1990 to December 31st 2012

	value	**stdev.**	**p-value**
$\boldsymbol{\alpha}$	0.0046	0.0058	0.4234
$\boldsymbol{\beta}$	0.0131	0.0082	0.1117
observations	275		
$\mathbf{R^2}$	0.0092		
F-value	0.2829		

Note. α is the intercept and β is the coefficient of the dummy S_t which equals zero for months May-October and one otherwise.

3.2 The Monthly Effect

Using the regression of equation 0 we calculate the average monthly returns for each of the calendar 12 months and their respective p-values. Table 2 summarizes the results and undoubtedly shows that since TA-100 inception, on average, only two months have statistically significant non-zero returns: April and December. Moreover, the returns are relatively high – 4.1% and 3.7% respectively – and both are significant in the 1% level. These two months clearly standout and lead us to evaluate the ‘April and December’ strategy as an alternative strategy to ‘Sell in May’. Explicitly: invest in the market index during April and December and hold a risk-free asset otherwise. The rationale is quite elementary – do not take the risk when the reward is not significantly positive. The hypothesis underlying this strategy is that even when its holding period return is not higher than that of ‘Buy and Hold’, its volatility and risk-adjusted returns would be superior. We test this hypothesis below.

Table 2. The regression results of equation 0 for TA-100 index monthly returns in the period February 1st 1990 to December 31st 2012

Month (i)	1	2	3	4	5	6	7	8	9
μ_i	0.0115	-0.0037	0.0089	0.0409	0.0134	0.0004	0.0075	-0.0014	-0.0020
stdev.	0.0145	0.0142	0.0142	0.0142	0.0142	0.0142	0.0142	0.0142	0.0142
p-value	0.4268	0.7957	0.5312	***0.0042	0.3466	0.9787	0.5987	0.9231	0.8886

Month (i)	10	11	12		
μ_i	0.0099	0.0108	0.0373	Observations	275
stdev.	0.0142	0.0142	0.0142	R^2	0.0410
p-value	0.4847	0.4452	***0.0089	F-value	0.5130

Note. The 12 estimated parameters (μ_i) are the average returns of the months during the sample period (*** significant at 1% level).

3.3 Alternative Investment Strategy Comparison

We compare four investment strategy alternatives: 'Buy and Hold', 'Sell in May', 'April and December', and the trivial baseline 'T-bills'. We start with the simplest test. To allow for complete overlap of the T-bill and TA-100 data sets over complete decades, we construct 'Buy and Hold' and 'T-Bills' value paths (prices versus time), in steps of one month, starting with $1 each on 1 January 1993 and ending on 31 December 2012 (Note 7). Combining properly these two time series, we calculate the corresponding value paths of 'Sell in May' and 'April and December' strategies. Figure 1 shows these four value paths. In this example, an investment of $1, for 20 years, on January 1st 1993 yields on 31 December approximately $5 in 'Buy and Hold' and 'T-Bills', $13 in 'Sell in May' and more than $20 in 'April and December'.

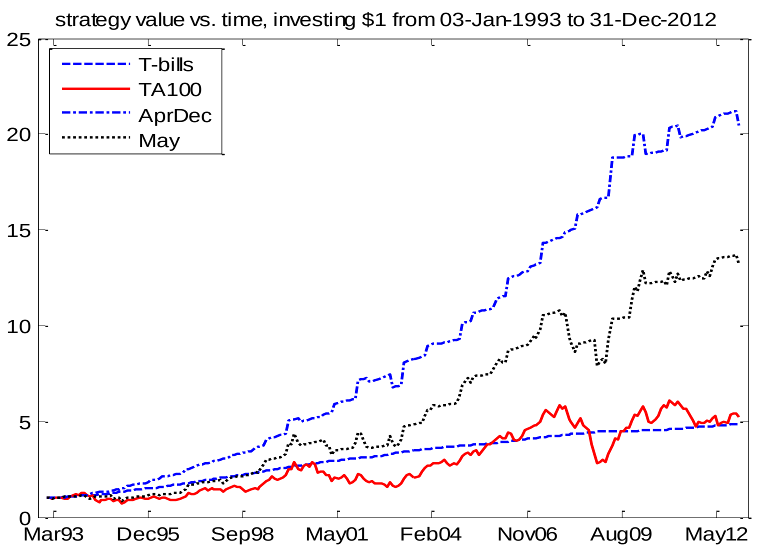

Figure 1. Value paths of $1 investment on 3 January 1993 in the four alternative strategies, until 31 December 2012

Note. The vertical axis is in dollars. The blue dashed line is 'T-Bills', the red solid line is 'Buy and Hold', the dotted black line is 'Sell in May', and the blue dash-dot line is 'April and December' value path.

As one may expect that this 20-year investment period is not economically homogeneous, we split the period into two decades, one starts on 3 January 1993 and the second starts on 1 January 2003 and repeated the comparison of value path for the four alternative strategies, each starts at $1 investment and ends after 120 months. The results are presented graphically in Figure 2. The two decades indeed exhibit different value paths. In the first decade (starting in 1993), 'T-Bills' more than triple its value, 'Buy and Hold' has the lowest performance, less than double its value, in a very volatile path. 'April and December' is the clear winner multiplying the initial investment by close to seven and less volatility than 'Sell in May' and 'Buy and Hold'. 'Sell in May' performance is interim between 'Buy and Hold' and 'April and December'. The second decade, starting in 2003 depicts a set of very different results. 'T-Bills' has the lowest return, multiply the initial investment by 1.5 only. The three risky strategies seem to result in very similar final values, all lie in the range of 3-3.5 dollars for an initial investment of $1. 'Buy and Hold' seems by far the most volatile, the least volatile is 'April and December' and an interim volatility is exhibited by 'Sell in May'.

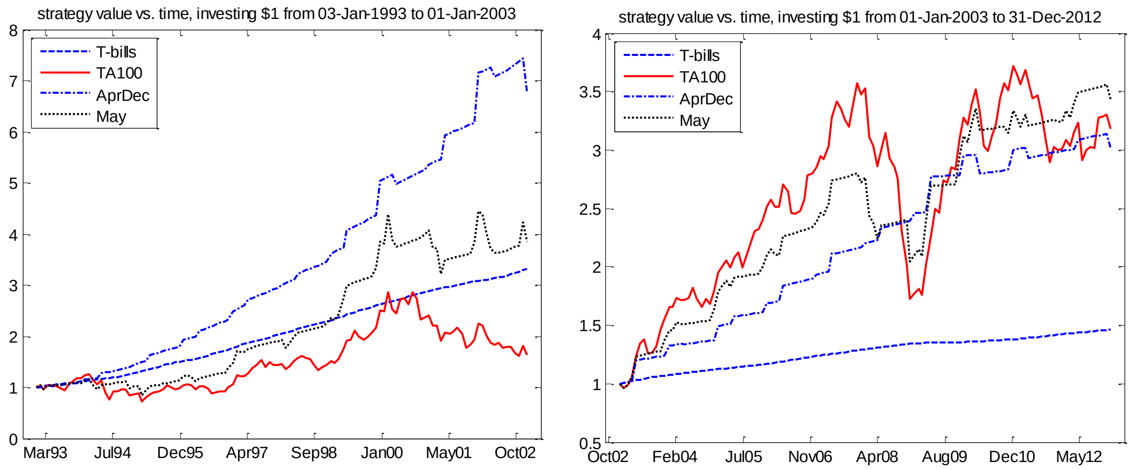

Figure 2. Value paths of $1 investment in the four alternative strategies for a period of 10 years

Note. The left hand side chart paths start on 3 January 1993 and the right hand chart paths start on 1 January 2003. The vertical axis is in dollars, using the same color and line types as in Figure 1.

Though this is not surprising, Figure 2 vividly shows that drawing conclusions from a single path strongly depends on the specific realization and might be misleading. Furthermore, observing the final value at the end of the investment horizon ignores the volatility and thus the perceived risk of the strategy. Since we use real market data and the market index history is limited, we use 120 "sliding" decade investment horizon, the first starts in January 1993, the second in February 1993, and so on, and the last in January 2003. This resampling of the available historical data generates 120 realizations, allowing us to gain insight into the dependence on the starting date and to enhance the robustness of the four alternative strategies comparison. For each of the strategies we repeat the calculations of investment returns per decade, the four paths are depicted in Figure 3 (the top left corner).

Adding the riskiness of the strategies to our analysis, we calculate risk-adjusted performance measures for each of the three strategies that invest in the risky asset (the index) for each of the 120 decades. The Sharpe Ratio of these returns (SR, Figure 3 top-right), Adjusted Sharpe Ratio (ASR, Figure 3 bottom-left), and Morningstar Risk Adjusted Return (MRAR, Figure 3 bottom -right). While the returns of the 120 decades show a close competition between 'April and December' and 'Sell in May' and these seem to converge to similar returns of the 'Buy and Hold', the risk-adjusted performances reveal a clearer distinction between the various alternatives. The SR, ASR, and MRAR of 'April and December' seem quite high and stable over the entire 120 decades, with a slight decline is recent decades. 'Buy and Hold' exhibits the poorer performances of the three strategies and the most volatile. 'Sell in May' is again an intermediate performer and its MRAR is comparable to that of 'April and December' in recent decades. To further rate the risky alternatives we compare their relative performance evolution using a non-parametric sign-test. Indeed, we cannot reject the null hypothesis that the 120 decade returns of 'April and December' are not significantly higher than those of 'Sell in May' (p-value = 0.523). We test a similar null hypothesis comparing 'April and December' to 'Buy and Hold' and find that it can be rejected ($p < 0.01$) at the 1% level. Focusing on risk-adjusted performance measures, we reject the null hypothesis that 'April and December' is not performing better than 'Sell in May' ($p < 0.01$ for MRAR (Note 8)).

We find the above results an overwhelming evidence for the superiority of 'April and December' over the other tested strategies in our sample period. Obviously, we do not claim that such an advantage would prevail in the future, as we do not have a proven explanation for the superior performance of TA-100 in the specific months of

April and December. We consider a few alternative explanations which all seem to be far-fetched, hence we remain with a folkloristic explanation that we regard as a funny anecdote – Passover and Hanukah. These are prominent holidays in Israel, both related to happy ending of a difficult saga in the Jewish tradition. Both are relatively long vacation periods for kids and thus for family recreational activities and get-together (Note 9).

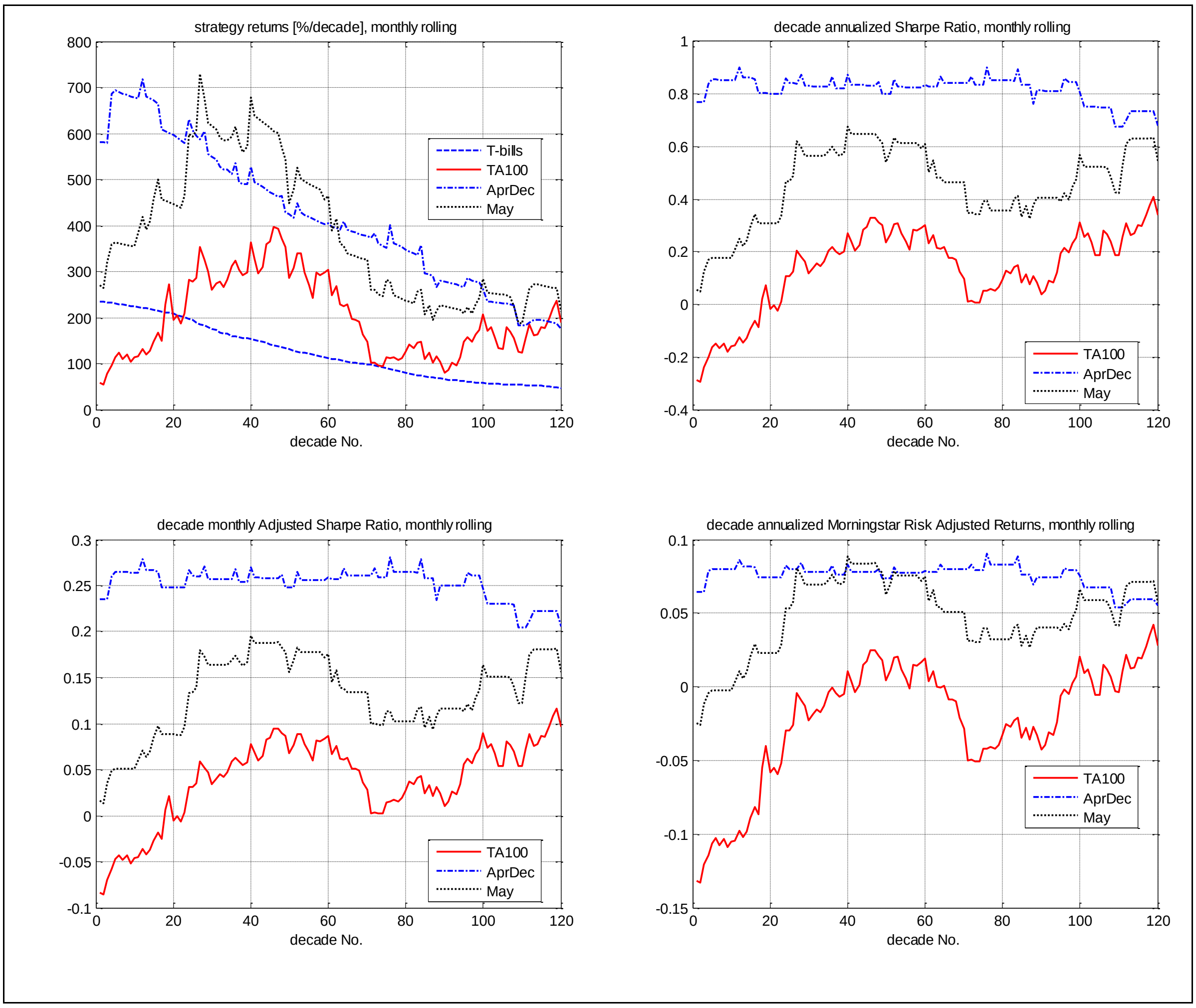

Figure 3. Performance measures of 120 sliding decades versus decade number

Note. The first decade starts in January 1993, the second in February 1993, and so on, the last starts in January 2003. The top left chart shows the decade net returns (in %) for the four strategies. Color and line codes are those used in Figure 1. The top-right chart shows the evolution of the annualized Sharpe ratio for the three risky asset investment strategies, the bottom left is the corresponding evolutions of the Adjusted Sharpe Ratios (monthly, not annualized), and the bottom right is the corresponding chart of the Morningstar Risk Adjusted Returns (annualized). These charts use the same color and line types as in Figure 1.

Back to real economic reasoning, both ‘Sell in May’ and ‘April and December’ benefit from high yields on Treasury bills, especially during the 90s (see Figure 4 for historical 30-day MAKAM yields). The relatively long period of low yields on Treasury bills in the recent half of our sample have reduced the advantage of these strategies compared to ‘Buy and Hold’ (see Figure 2). It remains to be seen, in the future, whether April and December would retain their outstanding positive returns and whether, when Treasury bills rates would revert to normal levels, ‘April and December’ strategy would regain its historical big advantage over ‘Sell In May’ strategy.

We ignore tax effects as these are often specific to an investor. We also ignore transaction costs which are considered in prior papers to be insignificant for the ‘Sell in May’ strategy, see for example Bouman and Jacobsen (2002). They estimate the round-trip cost at 1% for the index and suggest using futures instead, which lower the round-trip cost to 0.1%. This alternative is not available in the Israeli market. However, it can be mimicked using a simple long-call and short-put options, especially for ‘April and December’ strategy whose holding period of one month seems ideal for such option trading operation. Presently the highly liquid, exchange traded options on TASE are on TA-25 index which is a value-weighted index of the 25 largest firms traded on TASE. TA-25 capitalization is often double that of the remaining 75 firms in TA-100 and the two indices are highly correlated (Note 10). We therefore propose that the actual execution of the ‘April and December’ strategy would be rolling one-year T-bills and synthetically hold the index in the months of April and December by one-month futures constructed using calls and puts on TA-25 (Note 11).

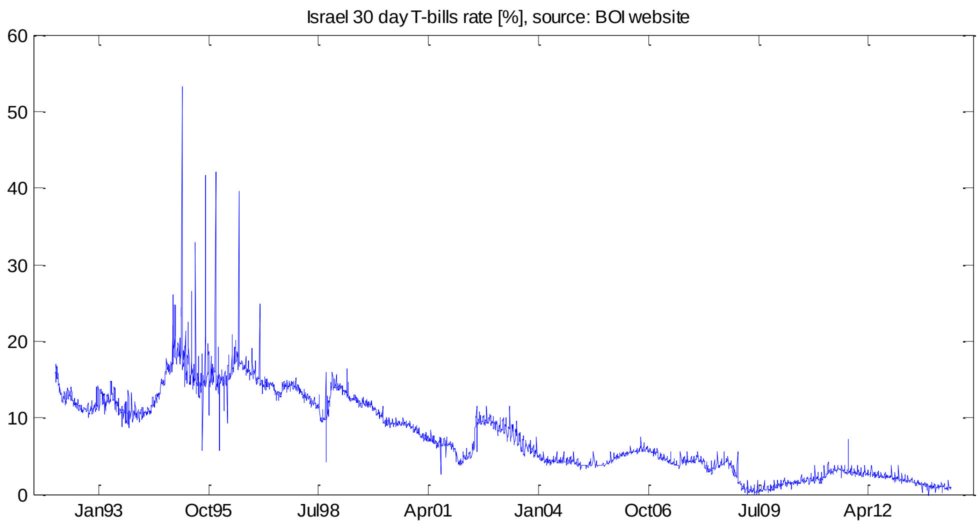

Figure 4. Israel government 30-day T-bill MAKAM historical yields (in %)

Source: Bank of Israel website.

4. Conclusion

This paper confirms prior literature results that the Halloween effect is not statistically significant in Israel. However, this paper is the first to identify that just two months every year, April and December, yield on average positive returns that are statistically significant. This finding allows a profitable investment strategy, based on historical data. The strategy is simply to hold the market index (TA-100 in our analysis) during the months of April and December. In the rest of the year (10 months) invest the money in a risk-free asset (MAKAM T-bill in our analysis). We show that this strategy is superior to the alternatives of sell-in May buy-and-hold of the index using risk-adjusted measures including Sharpe Ratio, Adjusted Sharpe Ratio, and Morningstar Risk Adjusted Returns. This result is confirmed on all 240 ten-year holding periods in 1993-2012, starting at the beginning of each calendar month, the fist in January 1993, the second in February 1993, and so on, and the last in January 2003.

Trying to find an economic reason for the lasting existence of such simple calendar investment opportunity, we have to admit that we find none convincing. We adopt Jacobsen and Marquering (2008) conclusion regarding weather and season effects on market returns: “Lots of things are correlated with the seasons and it is hard to distinguish between them when trying to ‘explain’ seasonal patterns in stock returns.”

We believe that our paper augments the existing literature in two ways. We believe it is the first to present the ‘April and December’ calendar effect. Second, it applies a set of tests to robustly assess the effect and the viability of its related investment strategy in two key manners. First, it does not focus on a single period or a few investment periods, which might be sensitive to the arbitrary choice of the starting date and a particular market timing. We do that by using the “sliding” decade investment procedure. Second, we use four performance measures, three of them are risk-adjusted of which one even explicitly include the third and fourth moments of the result distribution. Furthermore, we use a non-parametric test to assess the raking of the alternative strategies.

We do not know whether the recent convergence of decade investment returns is a passing phenomenon or a persistent one. In either case, it seems that the attractiveness of the ‘April and December’ (and to a lesser degree of ‘Sell in May’) strongly depends on the available risk-free rates. When Treasury bills yields are low, ‘April and

December' returns are reduced and its advantage is merely its reduced volatility.

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Notes

Note 1. The index is TA-100 in our case (more details about this index follow). The 'T-Bills is buying the Israeli government Treasury bill MAKAM with one month to maturity, holding it to maturity and using the payouts to purchase MAKAM at the beginning of the following month.

Note 2. In a recent paper, Afik and Lahav (2015) show that although the Halloween effect is significant in the U.S., it can be quite easily replaced by another profitable calendar strategy: holding the market index just for the months of March and November each year and investing the money in the risk-free asset for the rest of the year.

Note 3.The calculated returns in our analysis are adjusted for dividends. More information, including historical data, can be found at TASE website: http://www.tase.co.il/Eng/Pages/Homepage.aspx.

Note 4. Our data sources are 'Praedicta' (a database available at Ben-Gurion University library) for TA-100 and the Bank of Israel website for the MAKAM T-bill. Although the TA-100 index began officially only in January 1992, Praedicta's database provides its adjusted data based on the index composition at its inception and the historical data of its components.

Note 5. This actually conforms to the original definition of Sharpe (1966) which is often used. An alternative definition to the denominator, proposed by Sharpe (1994), is the standard deviation of the excess returns, however the results usually do not differ materially.

Note 6. See for example Alexander and Sheedy (2004).

Note 7. As we use real market data and the exchange is closed on weekends, some holidays, and special dates, when this happens on a desired trading day, our MatLab procedure seeks the nearest following day for inclusion in the value path.

Note 8. The very low p-value for SR and ASR is trivial as there is an absolute hierarchy in these measures as can be seen in Figure 3.

Note 9. But more than that, on the anecdotal side – in both holidays, as part of tradition, kids are given money by their parents and grandparents. These are called "Dmey Hanukah" and "Afikoman" payments respectively.

Note 10. For example, on 17 April 2014 TA-25 market capitalization was 78% of TA-100 market cap and some 73% of TA-Composite Index capitalization (which includes all the shares traded on the exchange).

Note 11. The annual cost of such 'April and December' synthetic holding of the index is estimated at less than 0.02%, assuming bid-ask spread of some NIS10 per contract and NIS0.5 transaction cost per contract (some large players pay less than NIS0.4 per contract). The underlying asset value for a TASE contract on TA-25 is NIS100 times the index whose recent value is 1,397 (25 May, 2014).