

Profitability of Trading Volume and Momentum in Jordanian Sub-indices

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ABSTRACT

The purpose of this paper is to examine whether there is a sub-index-level trading volume effect on expected returns. In addition, this paper addresses the role of trading volume in enhancing the momentum effect using the early-stage and late-stage strategies on Jordanian sub-indices. While the existence of trading volume effect and improving the momentum effect by trading volume have been investigated by previous research at the levels of individual stocks, industries and international market indices, this study is the first to investigate this role at the level of sub-indices. Using monthly data for all 23 Jordanian sub-indices from December 2009 until February 2017, this study found that trading volume is negatively related to expected return. Sub-indices with high (low) trading volume experience lower (higher) future returns over the next five years. The early-stage momentum strategy earns significant profits over the following five years, while the late-stage strategy achieves strong reversal starting in year 4. The findings show that past volume helps reconcile momentum effect “under reaction” and long-term contrarian “overreaction” effects. The CAPM of returns fails to explain the early-stage momentum strategy. These findings on sub-indices returns have important implications for academic researchers, practitioners and investors alike.

Keywords: Momentum, Trading volume, Early-stage strategy, Late-stage strategy, CAPM.

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ربحية حجم التداول والزخم في المؤشرات الفرعية الأردنية

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ملخص

تهدف هذه الدراسة إلى فحص ما إذا كان هناك تأثير لحجم التداول على العوائد المتوقعة في المؤشرات الفرعية الأردنية، كما تتناول هذه الدراسة دور حجم التداول في تعزيز تأثير الزخم Momentum Effect باستخدام استراتيجيات المرحلة المبكرة Early Stage والمرحلة المتأخرة Late Stage على المؤشرات الفرعية الأردنية. وبينما تظهر الدراسات السابقة وجود تأثير لحجم التداول وتعزيز حجم التداول على استراتيجية الزخم على مستوى الأسهم الفردية والصناعات ومؤشرات السوق الدولية، فإن هذه الدراسة هي الأولى التي تفحص تأثير حجم التداول وتعزيز حجم التداول لاستراتيجية الزخم على مستوى المؤشرات الفرعية الأردنية. وباستخدام بيانات شهرية لجميع المؤشرات الفرعية الأردنية "23 مؤشراً فرعياً" من ديسمبر 2009 حتى فبراير 2017، فقد أظهرت نتائج هذه الدراسة أن حجم التداول يرتبط بشكل سلبي بالعائد المتوقع، وقد حققت المؤشرات الفرعية ذات حجم التداول المرتفع (المنخفض) عوائد مستقبلية أقل (أعلى) خلال السنوات الخمس القادمة، كما أظهرت استراتيجية الزخم في المراحل المبكرة أرباحاً كبيرة على مدار السنوات الخمس التالية، في حين أظهرت استراتيجية المرحلة المتأخرة انعكاساً قوياً للعوائد بدءاً من السنة الرابعة. وخلصت النتائج إلى أن تأثير الحجم في السنوات الماضية يساعد على الانسجام في تأثيرات الزخم "تحت ردة الفعل underreaction" و"ردة الفعل المبالغ فيها overreaction" على المدى الطويل، كما خلصت الدراسة إلى عدم قدرة نموذج CAPM على تفسير استراتيجية الزخم في المرحلة المبكرة. هذه النتائج في عائدات المؤشرات الفرعية لها آثار هامة على الباحثين الأكاديميين والمستثمرين على حد سواء.

الكلمات الدالة: الزخم، حجم التداول، المرحلة المبكرة، المرحلة المتأخرة، CAPM.

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INTRODUCTION

Although the interaction between trading volume and momentum returns is used in explaining stock returns in the U.S. market and international market indices, the joint effect between trading volume and momentum returns in emerging markets is not considered, especially at the level of domestic sub-indices. Notably absent from study is any investigation of domestic sub-index returns and it remains unclear how trading volume and volume-based momentum strategies affect future returns at the level of Jordanian domestic sub-indices. So, the question is whether there is a trading volume effect at the level of Jordanian sub-indices and whether there is an important role of trading volume in improving the momentum returns across sub-indices. The reason for using sub-indices rather than general Amman index is utilizing building several diversified portfolios across these sub-indices. Therefore, the purpose of this study is to fill this gap by examining the existence of a trading volume effect, as well as whether the momentum effect can be improved by trading volume across 23 Jordanian sub-indices.

In their research on past trading volume, Lee and Swaminathan (2000) conducted a pioneering study to address the relationship between momentum and trading volume effects at the level of the U.S. stocks. They examined whether expected returns can be predicted by past trading volume and whether size and level of momentum profits can be predicted by past trading volume. Lee and Swaminathan (2000) proposed two strategies; the first strategy is the early-stage momentum strategy based on buying short-winners with low volume and selling short-losers with high volume. The second strategy is the late-stage momentum strategy based on buying short-winners with high volume and selling short-losers with low volume. Lee and Swaminathan (2000) demonstrated that trading volume, as measured by the turnover ratio, is negatively

related to expected returns. High (low) volume stocks earn lower (higher) returns. Lee and Swaminathan (2000) showed that momentum returns continued through 5 years based on the early-stage momentum strategy, while the late-stage momentum strategy reversed rapidly during the next five years.

This paper is motivated by the need to examine whether there is an existence of trading volume strategy and whether the early-stage momentum strategy improves the momentum profits. Furthermore, Lee and Swaminathan (2000) reported evidence of the early-stage strategy in a study of U.S. stocks, while Bornholt, Dou and Malin (2015) provided evidence of the same strategy in a study on markets around the world. Given that emerging markets are broadly considered to be less efficient and more volatile than established markets (Lam and Tam, 2011), the expectation is that the early-stage momentum strategy generates more profits when implemented to Jordanian indices, especially in Amman Stock Exchange (ASE). Furthermore, while Lee and Swaminathan (2000) and Bornholt, Dou and Malin (2015) provided evidence of the interaction between momentum returns and trading volume on firm stocks and international market indices, none of their studies investigated the interaction between these effects in improving momentum returns at the level of domestic sub-indices. Therefore, this paper is the first to examine the presence of trading volume strategy and the first to compare the performance of the early-stage and late-stage strategies in Jordanian sub-indices in ASE.

This study is also directed by another motivation, which is that Jordan has one of the most competitive Arab economies. The Jordanian sub-indices are gradually becoming familiar in the beginning of this century. For example, the mining sub-index is

one of the pillars of the Jordanian economy. The main mining exports of Jordan are comprised of potash and phosphates. It is one of the largest suppliers of raw phosphates in the world. In addition, Jordan is considered as a stable environment with a robust services-oriented workforce. Given that the ASE in Jordan is an important stock market that was ranked among the top 60 in the world by market capitalization at the end of 2015 and that Jordanian sub-index turnover ratios range from 31% to 0.20%, this can help us determine whether the momentum strategy can be reinforced by trading volume in emerging markets, since the ASE is dominated by a few sub-indices, which are bank as well as mining and extraction indices.

A sub-index appreciation may appeal other investors and increase liquidity that underpins its future projections. If investors recognize that momentum and trading volume exist in Jordanian sub-indices, high (low) past short-term returns and low (high) trading volumes are tracked by high (low) expected returns. This potential improvement to sub-index-level return momentum has crucial implications for researchers and investors applying momentum strategies to examine continuation among sub-indices. In order to determine sub-indices with extreme performance, 'winner' and 'loser' sub-indices may require being determined by their past returns computed over short-term periods. In contrast, if the cross-section returns are evident over long post-formation periods extending from two years to five years, return continuation is unlikely to be based on trading volume as only a short-term liquidity sub-index; this finding instead demonstrates that historical trading volume might be associated with different sub-index characteristics.

Combining momentum with trading volume effects can be conducted at the level of stocks, indices and market indices. Consequently, in the absence of an investigation of sub-indices in common asset pricing models, the dynamics of sub-index returns do not take much academic consideration in finance. One gap in the literature is that

there seems to be no studies that examined the role of trading volume in enhancing the momentum effect at the level of sub-index returns. This paper addresses this gap by using trading volume to enhance sub-index-level momentum effect.

The rest of the article is structured as follows. The next section reviews the relevant literatures. Then, the data is presented and the portfolio construction for traditional momentum, trading volume, early-stage and late-stage momentum strategies is outlined. Thereafter, the main empirical results are presented and lastly, the research conclusions are provided.

LITERATURE REVIEW

Many academic researchers provided evidence that future returns can be predicted by past returns. For example, Jegadeesh and Titman (1993) first documented that, on average, past winners based on 3 to 12 months persist to outperform past losers over the next 3 to 12 months, which is known as the momentum effect. There are many competing explanations proposed for the momentum effect. Fama and French (1996) conducted an important study to explain momentum profits. Fama and French (1996) found that 3-factor model is unable to capture the momentum effect. Chan, Jegadeesh and Lakonishok (1996) re-examined the momentum effect concluded that underreaction to earning news can partially explain the momentum effect. Conrad and Kaul (1998) showed strong evidence of the momentum effect, suggesting that cross-sectional variation in the average stock returns could affect the momentum profits.

For trading volume effect, using a model focusing on short-term liquidity, Campbell, Grossman, and Wang (1993) conducted an essential study and

showed that trading volume indexes for the total demand of liquidity dealers. Blume, Easley and O'hara (1994) provided a model that presented important information about stocks based on past return and past volume information. Datar, Naik and Radcliffe (1998) revealed that low turnover stocks experience larger returns than high turnover stocks and their finding is consistent with previous literature related to the liquidity hypothesis of Amihud and Mendelson (1986).

In regard to the liquidity hypothesis, Amihud and Mendelson (1986) showed that there is a negative relationship between liquidity and expected returns. That is; companies with fairly low trading volume implicitly have low liquid; consequently, companies have a greater expected return. The current study examines the cross-section return horizons over a three-month extending to five years post-formation period. Considering the longer time period, this momentum return effect is not attributed to short-term liquidity shocks. In addition, the current study builds on the result of Datar et al. (1998) through investigating the joint momentum returns with trading volume to understand future returns.

In an important paper, Bornholt, Dou and Malin (2015) re-examined the relationship between momentum and trading volume, as well as whether the performance of momentum effect can be enhanced by trading volume in international market indices, implementing a sample of 37 countries for 38,273 stocks. Following the methodology of Lee and Swaminathan (2000), Bornholt, Dou and Malin (2015), consistent with earlier work, found that low trading volume produces high returns, while high trading volume stocks generate low returns and early-stage strategy experiences superior returns. They revealed that the largest momentum profit is based on the early-stage momentum strategy having a strong momentum over the following five years, while late-stage momentum strategy has large reversals. Their findings support those of Lee and

Swaminathan (2000) in terms of that past volume helps reconcile momentum effect “underreaction” and long-term contrarian “overreaction” effects.

In the Indian stock market, Maheshwari and Dhankar (2017) examined the role of trading volume in enhancing the profitability of momentum and contrarian strategies. They found that momentum and contrarian returns are strongly related to the trading activity level in the stocks. In addition, they showed that either volume-based momentum or volume-based contrarian strategies earn higher return as compared to traditional momentum and contrarian strategies. Their findings support those of Lee and Swaminathan's (2000) and of Bornholt et al. (2015).

In Jordan, Al-Jafari and Tliti (2013) examined the dynamic relationship between trading volume and stock return at the level of banking sector in Amman Stock Exchange (ASE). While their study showed that there is no significant relationship between trading volume and stock return, they found a significant relationship between trading volume and return volatility. Using ASE data including 27 individual stocks from 2002-2012, Ananzeh, Jdaitawi and Al-Jayousi (2013) examined the relationship between trading volume and return volatility. They found that trading volume plays an important role in return volatility and this finding is consistent with that of Al-Jafari and Tliti (2013). Gharaibeh (2015) investigated the interaction of size and momentum effects in Jordan's firm market for the period (2005-2014). Gharaibeh (2015) showed no momentum effect in ASE. However, he found a strong proof of momentum for the large-sized portfolios at Jordan's firm returns. Recently, Gharaibeh (2017) found economically larger momentum returns at the level of 23 Jordanian sub-indices over the period (2005-2015). Given the previous studies in Jordan, there is no study

that addressed the trading volume effect on expected returns and whether momentum strategy can be enhanced by trading volume effect. This study attempts to fill this gap.

The aim of the current study is to examine whether there is a sub-index-level trading volume effect. In addition, based on a double sort, this paper investigates the importance of combining momentum returns with trading volume in order to enhance the momentum effect at the level of Jordanian sub-indices. Based on Lee and Swaminathan (2000) and Bornholt, Dou and Malin (2015), the opposing performances between early and late-stage momentum strategies show important attributes of combining momentum with trading volume. Is there a benefit from jointing momentum returns and trading volume in enhancing the momentum effect? Investigating the relationship between strategies in Jordan provides researchers with much more understanding of momentum profit strategies.

This study contributes to the financial literature in two ways. Firstly, while previous studies examined trading volume effect at the level of international market indices, industries or individual stocks, the current study investigates this topic at the sub-index level using a sample of 23 Jordanian sub-indices. This study documents that there is an ample proof of trading volume effect at the sub-index level. Secondly, another contribution offered by this paper is comparing the momentum strategy based on single sort with the early-stage and late-stage momentum strategies suggested by Lee and Swaminathan (2000) in a study of the U.S. stocks. The current study finds that the early-stage momentum strategy generates steadily superior profits. In addition, the early-stage momentum strategy experiences significant profits over the following five years, while the late-stage momentum strategy experiences strong reversal starting in year 4.

METHOD

Data

The sub-indices data implemented in the current paper is monthly returns based on value-weighted and turnover ratio for all twenty three Jordanian sub-indices taken from the ASE. The current article applies value-weighted monthly market returns as a proxy for market returns downloaded from ASE. The risk-free rate is one month. Treasury bill rate reported at the beginning of each month was downloaded from the Jordanian Central Bank (JCB). The analysis for momentum and trading volume portfolios pertains to ASE over the period from December 2009 until February 2017. This study begins from December 2009, because the ASE database has a less inclusive coverage of Jordanian sub-indices prior to December 2009. The final sample is collected of 87 monthly value-weighted returns on each sub-index, the turnover ratio as a proxy for trading volume of each sub-index, on the risk-free asset and the market index. The advantage of value-weighted monthly returns is that sub-indices are represented according to their market capitalization, which is a relatively good indicator of importance in the economy and in the stock market.

Table 1 details descriptive statistics over the time period from December 2009 until February 2017 for the Jordanian sub-index monthly returns, representing average returns, standard deviation, maximum and minimum returns, while the last two columns reported average turnover ratios and size for each sub-index. There is a great difference between average and standard deviation shown in Table 1. Food & Beverages, Tobacco & Cigarettes and Printing & Packaging have the largest averages (above 2 percent per month). Conversely, Paper & Cardboard and Media sub-indices have the lowest monthly averages (lower than -2%).

In addition, Table 1 details big differences in the

turnover ratios among Jordanian indices. Glass and Ceramics sub-index has the biggest average turnover ratio (31.12%), while Technology and Communication sub-index has the lowest monthly average turnover ratio (0.20%). These large differences in average turnover ratios among Jordanian sub-indices can help determine whether momentum effect can be reinforced by trading volume in Jordan. The Jordanian sub-index provides a return of 0.68% on average per month, a standard deviation of 12.94% on

average and an average turnover ratio of 4.88%. The last two columns in Table 1 it detail market capitalization and number of firms for each sub-index. Clearly, ASE is dominated by a few main sub-indices, such as those of Banks, Mining and Extraction and Technology & Communication indices. The next two sections detail the momentum, trading volume and volume-based momentum strategies employed in this paper.

Table 1. Summary Statistics of 23 ASE Sub-Indices, Turnover Ratios and Market Capitalization during the Period Dec.2007- Feb. 2017

Sub-index Names	Average %	S.D. %	Max.	Min.	Turnover Ratio %	Size (\$)	No. of Firms
Food and Beverages	14.23	97.48	6.59	-0.87	1.3	195,176,596	11
Tobacco and Cigarettes	6.33	39.76	3.27	-0.8	2.32	341,780,358	2
Printing and Packaging	2.17	17.91	1	-0.46	0.79	10,392,849	1
Engineering and Construction	1.19	9.14	0.42	-0.3	5.45	108,502,103	7
Glass and Ceramics	0.95	15.74	0.7	-0.34	31.12	5,679,349	1
Educational Services	0.36	2.74	0.07	-0.07	0.33	384,226,919	6
Pharmaceutical and Medical Services	0.33	5.74	0.2	-0.18	1.01	139,345,312	6
Health Care Services	0.3	3.22	0.08	-0.11	1.14	69,266,272	4
Banks	0.25	2.58	0.12	-0.06	0.67	9,319,844,400	15
Textiles, Leathers and Clothings	0.18	14.98	0.81	-0.47	8.41	109,226,748	6
Chemical Services	-0.02	3.04	0.1	-0.07	7.15	82,165,966	9
Mining and Extraction Services	-0.04	15.18	0.84	-0.45	1.01	3,740,993,528	15
Insurance	-0.35	2.11	0.06	-0.08	2.1	339,433,542	24
Commercial Services	-0.37	5.85	0.19	-0.15	5.67	447,187,396	13
Utilities and Energy	-0.38	6.26	0.26	-0.15	1.05	530,547,945	4
Real Estate	-0.38	6.22	0.29	-0.18	10.14	660,612,361	34
Hotels and Tourism	-0.65	2.53	0.05	-0.07	3.17	575,062,896	11
Technology and Communication	-0.68	5.6	0.23	-0.2	0.2	1,022,543,401	2
Diversified Financial Services	-0.79	6.44	0.3	-0.18	7.85	446,814,407	36
Transportation	-1.13	4.47	0.11	-0.11	7.04	196,102,853	12
Electrical Services	-1.25	8.39	0.27	-0.22	7.17	71,224,897	4
Paper and Cardboard Services	-2.2	10.45	0.43	-0.3	6.28	13,009,402	3
Media	-2.5	11.71	0.61	-0.27	0.86	47,267,587	2
Average	0.68	12.94			4.88		

Notes: This table details summary statistics of the 23 Jordanian sub-indices data from their first offered month (December 2009) through February 2017, taken from ASE. 23 Jordanian indices are detailed in the first column, the second column "Average" represents the average monthly returns, followed by S.D. which refers to the standard deviation related to monthly returns, while the fourth and fifth columns detail kurtosis and skewness and the last three columns report average turnover ratio, each sub-index capitalization and number of firms.

Methodology

This paper investigates traditional momentum, trading volume strategies and two different categories of improved momentum strategies: the early-stage and the late-stage strategies based on combining momentum with trading volume. In the following section, these strategies are presented in detail.

Traditional Momentum Strategy

To form the traditional momentum strategy, the current study tracks the methodology employed by Jegadeesh and Titman (1993). Every month, the sub-index returns are sorted into two portfolios based on their past three-, six-, nine- and twelve-month returns. The current study assigns the first 50% of sub-index including the bottom short-term returns named short-loser portfolio (*SL*) and the second 50% of sub-index including the top short-term returns called short-winner portfolio (*SW*). There are about 12 sub-indices in each of winner portfolio and loser portfolio. The traditional momentum strategy is formed by buying long short-term winners and selling short-term losers (*SW-SL*). To be consistent with previous research, the current study applies a method in all strategies by skipping one month before the holding period. To reinforce the stability of our technique, this paper uses the overlapping portfolios approach of Jegadeesh and Titman (1993, 2001). The traditional momentum strategy has been examined to compare its performance with the early-stage or momentum strategies proposed by Lee and Swaminathan (2000).

Trading Volume Strategy

To construct the trading volume strategy, this paper sorts in the beginning of every month all eligible sub-indices on the basis of past trading volume. The sub-indices are assigned into two portfolios; the first 50% of sub-index including the lowest turnover ratio portfolio (*LV*) and the second 50% of sub-index including the greatest turnover

ratio portfolio (*HV*). There are about 12 sub-indices in each of winner portfolio and loser portfolio. The trading volume strategy is constructed by long low trading volume and selling high trading volume (*LV-HV*). The current study focuses on the monthly returns of high trading volume and low trading volume through the following *K* months (*K* = 3, 6, 9 or 12) and through the following five years.

Early- and Late-stage Strategies

This paper combines the momentum with trading volume strategies on a two-way basis dependent on independent rank. Every month, this paper ranks sub-indices into two portfolios (*SL* and *SW*), equal to weighted 50% of each portfolio and consequently traditional momentum strategy is constructed depending on their prior six-month returns. Following Bornholt et al. (2015) and Lee and Swaminathan (2000), this study employs trading volume, which is determined as the percentage of average monthly turnover for the three-, six-, nine- and twelve-month formation period. Monthly turnover represents the ratio of the number of stocks traded in that month to the number of stocks outstanding at the end of the month within each sub-index. The current study then ranks the same indices into two portfolios (*LV* and *HV*) due to their trading volume: the portfolio denoted by *LV* includes those 50% of sub-index containing the lowest turnover ratios, while the portfolio denoted by *HV* contains 50% of sub-index including the highest turnover ratios. This paper then combines the momentum with trading volume portfolios by joining these ranks. The early-stage strategy is due to combining short-term winner, with low trading volume (*SWLV*) minus short-term losers with high trading volume (*SLHV*). The late-stage strategy is due to combining short-term winners with high trading volume (*SWHV*) minus short-term losers with low trading

volume (*SLLV*), held for three-, six-, nine- and twelve- months holding periods employing similar overlapping portfolio method in traditional momentum strategy.

Lee and Swaminathan (2000) propose two strategies: the first strategy is the early-stage momentum strategy, which includes buying short-term winners with low trading volume and selling short-term losers with high trading volume (*SWLV-SLHV*) to determine those firms that show momentum over a longer time. The second strategy is the late-stage strategy, which includes buying short-term winners with high trading volume and selling short-term losers with low trading volume (*SWHV-SLLV*) to determine firms that involve quicker contrarians of momentum. These strategies are used in the current study at the level of Jordanian sub-indices rather than firms.

RESULTS

This section shows the momentum results across Jordanian sub-index returns over 3-, 6-, and 9-month formation periods, followed by findings for the trading volume strategy. Next, the early-and late-stage momentum strategies together with the results of the post-holding period are presented. Finally, the current study details the results obtained from the CAPM regression.

Traditional Momentum Strategy

Table 2 details the average monthly returns for the buying, selling and buying minus selling portfolios of the pure momentum strategy when implemented on 23 Jordanian sub-index returns. Columns two to six demonstrate the equal-weighted average monthly returns from portfolio strategies based on past returns for the K -month holding period, where $K=3, \dots, 12$ months.

The pure momentum outcomes in Table 2 point out that

the strategy (SW-SL) produces economically significant returns through all holding periods except for $K=3$ months for J -formation periods ($J=3, 6$ or 9). For example, over six-month holding period, loser portfolios generate an average of 0.28% per month, whereas winner portfolios experience an average of 1.52% monthly through the same period. The SW-SL differences represent a pure momentum strategy which provides 1.24% monthly using 6-month holding period ($K=6$). Overall, the momentum profits are economically significant through all K -month holding periods except for $K=3$ months for J -month formation periods ($J=3, 6$ or 9). This finding is consistent with that of Gharaibeh (2017). The absence of short-term momentum at the level of Jordanian sub-indices may be attributed to the January effect. Yao (2012) found that January loss decreases in intermediate-run momentum strategy, while it increases in short-run momentum strategy.

Trading Volume Strategy

The trading volume outcomes in Table 3 demonstrate that the profits of the strategy (*LV-HV*) are weakly significant for all K -month holding periods excluding $K=3$, where the profit is statistically significant. For example, over six-month holding period, low trading volume portfolios produce an average of 1.54% per month, whereas high trading volume portfolios provide an average of 0.04% monthly through the same period. The *LV-HV* differences trading volume strategy earns 1.50% per month with 6-month holding period. In general, the trading volume strategy provides positive and economically significant profits over all K -month holding periods.

Table 2. Returns of the Traditional Momentum Strategy

<i>J</i>	Portfolios	Holding Period Returns			
		(K)			
		3	6	9	12
3	<i>SW</i>	0.55%	1.04%	1.38%	1.35%
		(0.99)	(1.92)	(2.24)	(2.5)
	<i>SL</i>	1.04%	0.55%	0.41%	0.75%
		(1.26)	(0.94)	(0.87)	(1.35)
	<i>SW-SL</i>	-0.49%	0.49%	0.97%	0.60%
		(-0.44)	(0.76)	(1.85)	(1.17)
6	<i>SW</i>	0.85%	1.52%	1.61%	1.44%
		(1.27)	(2.06)	(2.16)	(2.19)
	<i>SL</i>	0.72%	0.28%	0.51%	0.79%
		(0.97)	(0.52)	(0.91)	(1.25)
	<i>SW-SL</i>	0.13%	1.24%	1.09%	0.65%
		(0.12)	(1.44)	(1.24)	(0.8)
9	<i>SW</i>	0.83%	1.41%	1.43%	1.46%
		(1.31)	(1.84)	(1.99)	(2.1)
	<i>SL</i>	0.87%	0.54%	0.66%	0.88%
		(1.21)	(0.87)	(1.06)	(1.33)
	<i>SW-SL</i>	-0.04%	0.87%	0.76%	0.58%
		(-0.04)	(0.87)	(0.85)	(0.65)
12	<i>SW</i>	0.59%	0.97%	1.06%	1.24%
		(1.05)	(1.44)	(1.54)	(1.85)
	<i>SL</i>	1.30%	1.08%	1.25%	1.34%
		(1.35)	(1.19)	(1.38)	(1.49)
	<i>SW-SL</i>	-0.72%	-0.11%	-0.20%	-0.10%
		(-0.57)	(-0.08)	(-0.16)	(-0.08)

Notes: This table reports average monthly holding returns from portfolio strategies based on past returns for the December 2009 to February 2017 time period. 23 Jordanian sub-indices in the beginning of every month are classified depending on past returns for *J* formation period and divided into two portfolios. *SL* indicates the low past return portfolio, which is the loser portfolio, while *SW* indicates the high past return portfolio, which is the winner portfolio. *K* stands for monthly holding periods. Simple *t*-statistics are employed in parentheses.

Columns six to ten of Table 3 report annual profits. It is clear that the first three years after *J* formation period have

positive *LV-HV* returns. They are statistically significant except for year 1. Overall, all first three

post-formation periods earn economically large returns. Thus, the commonly positive trading volume event-time

returns propose that trading volume effect persists throughout the first three years post-formation.

Table 3. Returns to Trading Volume Portfolios

Portfolio	Holding Period Returns (K)				Annual Returns (Year)				
	3	6	9	12	1	2	3	4	5
<i>LV</i>	1.50 (2.22)	1.54 (2.14)	1.64 (2.1)	1.68 (2.04)	0.98 (0.42)	2.13 (0.75)	3.88 (1.32)	0.73 (0.25)	-0.56 (-0.16)
<i>HV</i>	-0.12 (-0.26)	0.04 (0.09)	-0.12 (-0.25)	0.01 (0.02)	-4.55 (-1.09)	-1.57 (-0.68)	0.35 (0.15)	0.82 (0.26)	-3.88 (-2.37)
<i>LV-HV</i>	1.62 (2.07)	1.50 (1.74)	1.76 (1.91)	1.67 (1.73)	5.53 (1.57)	3.70 (2.28)	3.54 (2.65)	-0.09 (-0.04)	3.31 (0.93)

Notes: This table shows the percentage of average monthly holding period profits and the annual event-time profits for portfolio strategies due to the past average monthly turnover for the December 2009 to February 2017 time period. In the beginning of every month, twenty three Jordanian sub-indices are arranged due to the past average monthly turnover and sorted into two portfolios. *LV* is the low trading volume portfolio, while *HV* is the high trading volume portfolio. *K* indicates monthly holding periods. Annual event-time returns (year 1, ..., 5) indicate the annual returns on average for the early 5 years subsequent to the portfolio formation date. The *t*-statistics are computed based on simple *t*-statistics in the holding period, but *t*-statistics in annual time are calculated due to the Newey-West (1987) adjustment for autocorrelation up to lag eleven.

Given the outcomes in Table 3 as a whole, low trading volume sub-indices generally experience higher returns than high trading volume indices. This fact supports the liquidity effect. Moreover, trading volume strategy provides significant returns up to the third year. These findings are consistent with those of Lee and Swaminathan (2000) and Bornholt, Dou and Malin (2015).

Late-and Early-stage Strategies

Table 4 demonstrates that the average monthly returns of late-stage strategy *SWHV* – *SLLV* is negative for all holding periods. For example, based on the $J = 6$ case with a six-month holding period, high volume winner *SWHV* generates an average of 0.58 per month, whereas *SLLV* earns an average of 0.69 monthly through the same period. The late-stage strategy *SWHV* – *SLLV* provides a return of -0.10 per month. Looking at the annual event-time returns, the late-stage momentum strategy in Table 4 reveals strong

sub-index-level return reversal starting in year 4. In summary, the current study demonstrates that past trading volume forecasts the size and timing sub-index-level return reversal.

Table 5 reveals that the average monthly returns of the early-stage momentum strategy *SWLV* – *SLHV* is positive for all holding periods. Due to $J = 6$ example with 6-month holding period, for instance, low volume winner *SWLV* earns an average of 2.87 percent per month, whereas *SLHV* provides an average of -0.04 per month during the same period. The early-stage strategy *SWLV*–*SLHV* earns a return of 2.71 percent per month, which is statistically significant (t -stat. = 2.39). Overall, a comparison of Table 5 with Table 2 reveals that the early-stage momentum strategy is superior for all holding periods.

Table 4. Monthly Returns Based on Late-stage Strategy

J	Portfolio	Holding Period Returns				Annual Returns				
		(K)				(Year)				
		3	6	9	12	1	2	3	4	5
3	SWHV	0.17	0.38	0.49	0.55	-0.95	0.64	5.54	1.64	0.57
		(0.27)	(0.5)	(0.75)	(0.9)	(-0.21)	(0.26)	(1.47)	(0.65)	(0.24)
	SLLV	1.63	1.46	1.04	1.33	-1.60	1.20	5.23	-3.76	-4.73
		(1.51)	(1.5)	(1.34)	(1.52)	(-0.62)	(0.33)	(1.12)	(-2.01)	(-2.22)
	SWHV – SLLV	-1.46	-1.08	-0.55	-0.78	0.65	-0.56	0.31	5.40	5.29
		(-1.04)	(-0.79)	(-0.48)	(-0.65)	(0.17)	(-0.17)	(0.11)	(3.33)	(1.46)
6	SWHV	0.06	0.58	0.76	0.69	0.55	2.62	3.04	9.64	3.85
		(0.1)	(0.84)	(1.23)	(1.11)	(0.12)	(0.79)	(0.88)	(1.21)	(1.22)
	SLLV	1.14	0.69	0.95	1.30	-2.03	3.60	13.62	-7.32	-5.24
		(1.13)	(0.75)	(0.97)	(1.18)	(-0.78)	(0.76)	(0.95)	(-4.75)	(-4.64)
	SWHV – SLLV	-1.08	-0.10	-0.19	-0.61	2.59	-0.99	-10.58	16.95	9.09
		(-0.8)	(-0.08)	(-0.14)	(-0.41)	(0.65)	(-0.26)	(-0.78)	(1.85)	(2.45)
9	SWHV	0.90	0.89	0.83	0.84	2.53	2.44	3.76	3.13	6.62
		(1.08)	(1.29)	(1.31)	(1.31)	(0.55)	(0.83)	(0.8)	(1.37)	(1.42)
	SLLV	1.66	1.16	1.40	1.59	-6.53	2.67	-6.74	-5.54	-8.98
		(1.51)	(1.05)	(1.18)	(1.26)	(-3.08)	(0.58)	(-2.18)	(-4.61)	(-3.11)
	SWHV – SLLV	-0.76	-0.27	-0.57	-0.75	9.06	-0.23	10.50	8.66	15.60
		(-0.57)	(-0.18)	(-0.38)	(-0.46)	(2.03)	(-0.07)	(1.55)	(5.14)	(3.94)
12	SWHV	0.42	0.73	0.77	0.75	4.13	2.45	3.64	5.06	8.79
		(0.68)	(1.07)	(1.18)	(1.08)	(0.97)	(0.71)	(0.81)	(1.53)	(1.61)
	SLLV	1.97	2.02	2.29	2.13	-6.78	-1.17	-6.65	-8.59	-12.33
		(1.49)	(1.38)	(1.42)	(1.39)	(-2.49)	(-0.26)	(-1.78)	(-4.73)	(-3.24)
	SWHV – SLLV	-1.55	-1.28	-1.52	-1.38	10.91	3.62	10.29	13.65	21.12
		(-0.95)	(-0.68)	(-0.76)	(-0.7)	(2.43)	(0.84)	(1.58)	(3.38)	(4.98)

Notes: This table details average monthly return from selling, buying and buying-selling portfolios depending on returns and trading volume for the December 2009 to February 2017 time period. All these portfolios are of independent sort. In the beginning of every month, twenty three Jordanian sub-indices are ranked based on past average monthly returns and divided into two portfolios. SL indicates the low past return portfolio, which is the loser portfolio, while SW indicates the high past return portfolio, which is the winner portfolio. Then, the sub-indices are independently ranked based on double sort according to average monthly volume over the past J month and classified into two portfolios. SWHV represents high-volume winner portfolio and SLLV indicates low-volume loser portfolio. The arbitrage portfolio SWHV-SLLV refers to long high volume winner portfolio and short low-volume loser portfolio. K stand for monthly holding periods. Annual event-time returns (year 1,...,5) indicate the average annual returns for the initial five years following the portfolio formation date. Holding period t-statistics represent simple t-statistics, but annual event-time and t-statistics are due to the Newey-West (1987) adjustment for autocorrelation up to lag 11.

Given the annual event-time returns by employing the early-stage momentum strategy in Table 5, all five years provide positive SWLV–SLHV returns. The early-stage momentum profits are mostly statistically significant. Overall, it is necessary to detail the observed fact of this

stage. The early-stage momentum strategy at the sub-index level provides significant profits up to the fifth year. This evidence reveals that the magnitude and duration of momentum effect can be expected due to trading volume.

Table 5. Monthly Returns Based on Early-stage Strategy

<i>J</i>	Portfolio	Holding Period Returns				Annual Returns				
		(K)				(Year)				
		3	6	9	12	1	2	3	4	5
3	<i>SWLV</i>	1.10 (1.36)	1.76 (2.74)	2.37 (2.22)	2.31 (2.43)	0.69 (0.36)	5.76 (1.48)	3.76 (1.44)	6.53 (1.32)	-0.51 (-0.26)
	<i>SLHV</i>	0.61 (0.71)	-0.09 (-0.17)	-0.04 (-0.1)	0.31 (0.7)	-2.07 (-0.34)	-1.67 (-0.82)	-1.57 (-0.81)	-4.90 (-2.33)	-7.75 (-2.98)
	<i>SWLV – SLHV</i>	0.48 (0.35)	1.84 (2.59)	2.41 (2.31)	2.00 (2.39)	2.77 (0.44)	7.42 (1.93)	5.33 (3.47)	11.43 (3.11)	7.24 (3.14)
6	<i>SWLV</i>	1.94 (1.73)	2.67 (2.25)	2.87 (2.08)	2.60 (2.17)	1.51 (0.76)	4.71 (1.42)	5.10 (1.53)	4.39 (0.84)	-2.69 (-2.84)
	<i>SLHV</i>	0.38 (0.53)	-0.04 (-0.09)	0.07 (0.17)	0.30 (0.75)	-2.17 (-0.44)	-1.68 (-0.69)	-2.06 (-1.25)	-4.50 (-1.66)	-8.57 (-3.99)
	<i>SWLV – SLHV</i>	1.55 (1.12)	2.71 (2.39)	2.80 (2.06)	2.30 (2.14)	3.68 (0.7)	6.39 (1.55)	7.16 (2.84)	8.89 (2.09)	5.87 (2.79)
9	<i>SWLV</i>	0.77 (1.24)	1.99 (1.81)	2.15 (2.04)	2.32 (2.12)	5.64 (1.66)	6.12 (1.89)	7.57 (1.43)	2.36 (0.51)	-3.25 (-3.32)
	<i>SLHV</i>	0.10 (0.17)	-0.05 (-0.1)	-0.05 (-0.12)	0.21 (0.57)	-2.95 (-0.69)	-1.51 (-0.67)	-1.47 (-1.11)	-5.20 (-1.96)	-10.21 (-11.73)
	<i>SWLV – SLHV</i>	0.67 (0.76)	2.03 (1.67)	2.20 (1.98)	2.11 (2.04)	8.59 (2.03)	7.63 (1.96)	9.05 (2.02)	7.56 (2.07)	6.97 (5.51)
12	<i>SWLV</i>	0.73 (0.9)	1.24 (1.63)	1.50 (1.48)	1.90 (1.86)	5.76 (1.88)	8.21 (2.35)	5.84 (1.15)	0.80 (0.17)	-2.06 (-1.94)
	<i>SLHV</i>	0.56 (0.73)	0.08 (0.16)	0.18 (0.41)	0.46 (1.12)	-1.85 (-0.39)	-1.87 (-0.75)	-3.08 (-1.98)	-8.03 (-3.55)	-10.80 (-22.37)
	<i>SWLV – SLHV</i>	0.17 (0.15)	1.16 (1.33)	1.32 (1.45)	1.45 (1.53)	7.61 (1.59)	10.08 (2.3)	8.92 (2.4)	8.83 (3.2)	8.74 (6.14)

Notes: This table shows the percentage of average monthly return due to the selling, buying and buying-selling portfolios depending on short-term returns and trading volume for the December 2009 to February 2017 time period. All these portfolios are computed based on independent sort. In the beginning of every month, twenty three Jordanian sub-indices are arranged due to the past average monthly returns and classified into two portfolios. SL denotes the loser portfolio, which represents the low past return portfolio, while SW I the winner portfolio, which represents the high past return portfolio. Then, the sub-indices are independently arranged due to the average monthly volume over the past *J* month and classified into two portfolios. *SWLV* is low volume winner portfolio and *SLHV* is high volume loser portfolio. The arbitrage portfolio *SWLV-SLHV* represents long low volume winner portfolio and short high volume loser portfolio. *K* refers to the monthly holding periods. Annual event-time returns (year 1, ..., 5) indicate the average annual returns for the primary 5 years subsequent to the portfolio formation date. The *t*-statistics are computed based on simple *t*-statistics in the holding period, but *t*-statistics in annual time are calculated due to the Newey-West (1987) adjustment for autocorrelation up to lag eleven.

Figure 1 illustrates the post-formation behavior of the traditional momentum, the late-stage and the early-stage momentum strategy profits. Figure 1 graphs the post-formation accumulative profits of the momentum, late-

stage and early-stage momentum strategies (*SW-SL*, *SWHV-SLLV* and *SWLV-SLHV*), respectively, for the 5 years subsequent to the end of the formation period. Given the late-stage momentum strategy in

separation, Figure 1 shows that the late-stage sub-indices are “overreact” to important news. The same figure demonstrates that the early-stage sub-indices show continuation in returns over the next five years. The current study might suggest that momentum effect is “underreact”

to information. The existence of this effect highlights that the level and size of return momentum are not attributed to the liquidity explanation and can be determined by trading volume.

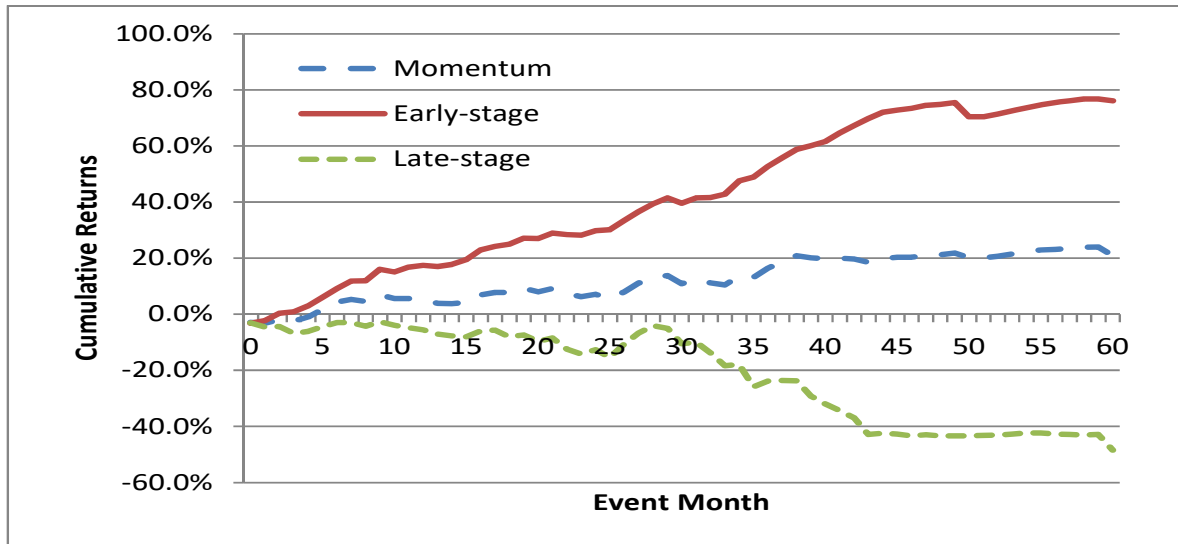


Figure 1. Cumulative Strategy Returns

Notes: The chart shows the cumulative returns to three strategies; momentum (SW-SL), early-stage (SWLV-SLHV) and late-stage (SWHV-SLLV) strategies; employing non-overlapping portfolios ($K = 1$) for the sixty months subsequent to the end of the formation period.

Risk Adjustments

In order to answer the question whether the returns of the preceding strategies are based on risk compensation, the returns of the momentum, early-stage and late-stage strategies are taken into account risk-adjusted through the CAPM model as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt} \quad (1)$$

where

$R_{pt} - R_{ft}$: Monthly excess return related to strategy portfolio p ,

R_{pt} : Portfolio p based on monthly return at time t ,

R_{mt} : Independent variable which is the general market sub-

index monthly return for month t .

The monthly market return, which is the independent variable, extends the full sample period from December 2009 until February 2017. The coefficient β_p means the regression loading equivalent with the market return variable of the model, α_p stands for the risk-adjusted abnormal profits of the pervious strategies over the estimation period. The evidence of abnormal profits is provided only when alpha is statistically significant. This model corrects t -values of regression coefficient for heteroskedasticity through White’s (1980) test.

Based on 6-month holding periods Table 6 demonstrates the estimated regression coefficients, as well as t -statistics for the previous three strategies. The alpha values of the traditional momentum and late-stage strategy zero-cost portfolios ($SW-SL$ and $SWHV-SLLV$, respectively) in panels A and C are relatively very slight and statistically

insignificant (-0.036 and -0.005 per month), while alpha of the early-stage momentum strategy is much larger (0.047 per month), but it is still weakly significant (t -stat.=1.69). Therefore, CAPM fails to fully explain the early-stage momentum strategy. This is; the early-stage strategy generates abnormal profits.

Table 6. Risk-adjusted Strategy Profits

Portfolios	α	β_m	Adj R ²
Panel A: Momentum Strategy			
<i>SW-SL</i>	-0.036	-0.096	40.11%
	(-0.43)	(-1.93)	
Panel B: Early-stage Strategy			
<i>SWLV-SLHV</i>	0.047	0.033	17.12%
	(1.69)	(1.01)	
Panel C: Late-stage Strategy			
<i>SWHV-SLLV</i>	-0.005	-0.094	7.30%
	(-0.14)	(-0.15)	

Notes: Table 6 details the CAPM regression outcomes for the returns per month of the traditional momentum strategy (Panel A), the early-stage strategy (Panel B) and the late-stage strategy (Panel C). These three strategies are detailed in previous Tables 2, 4 and .5. The CAPM regression model is as follows:

$$R_{pt} - R_{ft} = \alpha_p - \beta_p (R_m - R_{ft}) + \varepsilon_{pt}$$

where $R_{pt} - R_{ft}$ is the excess return portfolio's profits and $(R_m - R_{ft})$ is the excess profit for the market. The t -statistics have been modified for heteroscedasticity based on White's (1980) test. All of these t -statistics are in parentheses.

CONCLUSIONS

Although previous studies have recognized numerous sub-index-related return patterns, it remains unclear how sub-indices impact asset prices. Generally, we do not recognize whether there is a trading volume effect at the

sub-index level and how sub-indices interact with past returns and trading volume to explain the sub-index returns. This paper examines the existence of trading volume effect at the Jordanian sub-index level and the robustness of trading volume in enhancing momentum returns at the level of sub-index returns.

Therefore, this paper investigates whether the early-stage momentum strategy produces superior returns.

For 23 Jordanian sub-indices, this paper shows that trading volume (turnover ratio) is negatively related to future returns. That is; low trading volume sub-indices earn high expected returns and *vice versa*. A parallel result was also reported by Lee and Swaminathan (2000) and Bornholt, Dou, and Malin (2015). Furthermore, consistent with findings in the literature, the current study demonstrates that trading volume strategy improves the momentum profitability. Using the U.S. stocks and international market indices, Lee and Swaminathan (2000) and Bornholt, Dou and Malin (2015) showed that the early-stage momentum strategy which is based on buying low-volume winners and selling high volume losers, provides larger profits than the traditional momentum and late-stage momentum strategy. Consistent with results in the literature, the late-stage momentum strategy, which is based on buying high-volume winners and selling low volume losers, earns strong sub-index-level return reversal starting in year 4. CAPM fails to explain the abnormal profits for the early-stage momentum strategy.

These findings point out that it is possible to forecast the expected performance of Jordanian sub-indices that have low turnover ratios and have experienced extreme past short-term returns. These previous findings related to Jordanian sub-index returns present essential implications

for researchers, practitioners and investors. For researchers, CAPM cannot explain the returns at the sub-index level of the early-stage momentum strategy. In addition, this likely improvement to sub-index-level short-term return momentum has a crucial implication for researchers applying momentum strategies to examine continuation among indices. Therefore, the early-stage momentum strategy requests additional examination to determine the reason behind this effect. Is this due to changing fundamentals for the companies across the sub-indices or due to mispricing of indices? It is clear that the presence of trading volume, in addition to late-stage and early-stage momentum effects in sub-index returns should be valuable to professional investors. They should keep in mind whether the stocks that they invest in the sub-indices take into account the trading volume and momentum effects. In particular, if investors recognize that momentum and trading volume exist in Jordanian sub-indices, they will buy stocks within sub-indices that have high past short-term returns and low trading volume. In addition, they will sell stocks within sub-indices that have low past short-term returns and high trading volume in order to achieve high future returns.

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