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Measuring Predictability of Oil and Gas Stock Returns and Performance of Moving Average Trading Rules

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Abstract

The paper re-examines whether investors can predict oil and gas stock prices for abnormal returns using autocorrelation-based trading and filter rules and moving average strategies. In this paper, short and long lengths moving averages are employed and their performances are measured against the returns from simple buy and hold investment strategy. As a result, the paper finds that employed trading rules do not indicate that investors can make abnormal returns in oil and gas stocks. Moreover, the performances of short and long moving averages in predicting abnormal returns also do not suggest a conclusive evidence that any of the moving averages can result in more returns compared to others.

Keywords: Trading and Filter Rules; Moving Average Trading Rule; Buy and Hold Investment Strategy; Oil and Gas Stock Returns.

JEL Classification: G100, G120.

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1. Introduction

Technical trading rules are employed by traders to generate buy or sell signals on their investment based on the behaviour of past stock prices. According to Fama (1970), the theory of efficient market hypothesis postulates that trading rules cannot provide any credible signals to the advantage of investors because prices already reflect all relevant information. However, the popularity of the trading rules in the marketplace suggests the possibility of their power in predicting abnormal returns. The presence of serial correlation in return series could be an indication of non-randomness of stock returns, but it is not enough to classify a market as inefficient. A market can only be classified as inefficient if past autocorrelation in prices can be used by traders to earn an abnormal profit after considering transaction costs. Oil and gas industry remains one of the important sectors of every economy, and it will be interesting to see if investors can use technical trading rules to earn more than risk-adjusted returns in the oil and gas stocks.

2. Literature Review

Brock et al (1992) have tested the performance of simple trading rules using a moving average on the Dow Jones index ranging from 1897 to 1986. Their results showed the possibility of realising an abnormal profit from the movement of stock prices. It proves the usefulness of technical trading rules and their predictive ability regarding trading in stocks. Hudson et al (1996) did a similar study on the UK data employing the methodology used in Brock et al (1992). Their results also showed the predictive power of trading rules, but concluded that it was difficult to make any abnormal profit due to high transaction costs in the market. Mills (1997) investigated the predictive ability of simple trading rules, moving average, on the FTSE 30 share index for the period 1935-1994, and reported higher returns as compared to buy and hold investment strategy for most of the study period. It was noted that trading rules performed well in the period prior to 1980. Overall, the results of these studies were consistent with that of Brock et al (1992).

Ratner and Leal (1999) applied technical trading strategies to the emerging markets of Latin America and Asia. They also used variable length moving average (VMA) trading rules to ten emerging markets over the period 1982 to 1995. Total trading returns after transaction costs were compared with returns from a buy and hold strategy. Trading rules performed well in Mexico, Thailand, and Taiwan only. The study used inflation-adjusted stock returns instead of the nominal

returns used by many scholars. Gunasekarage and Power (2001) tested and compared the profitability of moving average trading rules in South-Asian markets of Bombay, Colombo, Dhaka and Karachi Stock Exchanges. The findings of their study suggested a strong predictive ability of trading rules except for the Bombay Stock Exchange. Yu et al (2003), Park and Irwin (2007), Loh (2007), Sehgal and Gupta (2005) also found evidence of predictive ability and profitability of trading rules in various Asian markets.

Coutts and Cheung (2000) investigated whether the moving average oscillator and the trading range break-out trading rules have predictive power in the Hang Seng Index of the Hong Kong Stock Exchange for the period 1985 to 1997. Although, the trading range break-out rule was found to be stronger than the moving average oscillator, both rules would fail to provide an abnormal profit if transaction costs are taken into consideration. Milionis and Papanagiotou (2008) have conducted a study on the variation of the moving average trading rules performances based on the length of longer moving average periods. The analysis was carried out on the NYSE and the Athens Stock Exchange daily data for the period April 1993 to April 2005. Significant variability of performance between the different lengths of the moving average trading rules was observed. Shorter length moving averages had enhanced-performance compared to longer length moving average trading rules. It was also discovered that seventy-five percent of the trading signals by moving average trading rules are not realistic.

3. Methodology and Results

This study will apply trading and filter-based rules that have been developed to trade in the presence of autocorrelation or persistence in the returns of oil and gas stocks in the UK market. It will also employ various combinations of moving averages to see the performances of these strategies as compared to buy and hold returns. The results from the moving averages trading rules are subjected to further tests to assess their individual performance in predicting the oil and gas related stock returns.

3.1. Trading and Filter Rules

A trading and filter rule strategy has been developed to exploit the presence of autocorrelation (or persistence) in stock returns in order to assess the power of the strategies in predicting the oil and gas stock returns. For example, if there is a high positive autocorrelation at the first lag in the past data, and if this behaviour is expected to continue in the future, investors can make a simple trading rule to exploit this persistence in returns. Here, the trading strategy would be to buy any

stock that has a given positive return, and sell the stock if the return changes to negative, investing the proceeds (cash) in a risk-free asset such as treasury bills. The trading rule will be tested using a hypothetical initial investment of £1, and the closing value of the investment over the sample period is given by:

$$J_T(Active) = e^{(\sum_{t=1}^T \alpha_t r_t + (1-\alpha_t) r_{f_t})} \quad (1)$$

where $J_T(Active)$ is closing value of £1 hypothetical investment using the trading rule; e is Exponential (or investment); r_t and r_{f_t} are return and risk-free rate of return at period t respectively. The α is as following.

$$\alpha_t = \begin{cases} 1, & \text{if } r_{t-1} > 0 \\ 0, & \text{if } r_{t-1} < 0 \\ \alpha_{t-1}, & \text{if } r_{t-1} = 0 \end{cases}$$

This shows that whenever r_{t-1} is positive, there will be no investment in the risk-free asset because of the buy signal (investment in stock), and if r_{t-1} is negative there will be an investment in the risk-free asset because of the sell signal (cash from sale). The previous action will be maintained (no present action) if r_{t-1} is equalled to zero. The strategy generates a high number of trading transactions in each stock over the sample period. In order to reduce the trading transactions, filters to return thresholds are introduced to the trading rule (see also the work of Alexander (1961)), where signals are only generated if return limits are reached. The filters used are 0.05%, 0.1%, 0.15%, 0.2%, 0.3%, 0.4%, 0.5%, 0.6%, 0.7%, 0.8%, 0.9%, and 1%. In each of the filters, the number of trading transactions, trading profit, and break-even cost are calculated for assessment.

The trading profit from the employed trading strategy or rule is compared with that from an ordinary buy and hold strategy to assess the power of the trading rule and weak form market efficiency. The buy and hold investment strategy is represented by the ' $J_T(Static)$ ' which is given as:

$$J_T(Static) = e^{(\sum_{t=1}^T r_t)} \quad (2)$$

where $J_T(Static)$ is buy and hold investment strategy and other parameters are as defined above.

Break-even cost is also calculated by dividing the difference between the terminal values of $J_T(Active)$ and $J_T(Static)$ by the number of trading transactions. For any trading profit to be considered higher than that of the buy and hold strategy, the break-even cost must be higher than the relevant transaction cost. In other words, transaction cost must not exceed the break-even cost which is given by:

$$BC = \frac{\ln(J_T (Active)) - \ln(J_T (Static))}{s} \tag{3}$$

where *BC* stands for the break-even cost; *ln* represents the natural logarithm and *s* indicates the number of trading transactions. The strategy is employed on the FTSE indices and all of the oil and gas stock series for three years from January 2014 to December 2016. Stocks that have less than three years series are excluded from the analysis and the results are presented in Table 1.

Table 1. Trading and Filter Rules based on Autocorrelation Persistence for Indexes/Series

		<i>J_T</i> (Static)	<i>J_T</i> (Active)	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.01
FTSE All-share Index	TV	1.1017	1.1843	1.1802	1.1273	1.0749	1.1209	1.1918	1.2143	1.166	1.2142	1.2217	1.1637	1.0576	1.105
	BC		0.0002	0.0002	0.0001	-0.0001	0.0001	0.0003	0.0004	0.0003	0.0005	0.0006	0.0003	-0.0003	0.0001
	TR		375	351	339	331	317	282	245	217	187	169	157	145	129
FTSE 100 Share Index	TV	1.073	1.0683	1.0486	1.0939	1.1277	1.072	1.0654	1.2109	1.0899	1.0899	1.1249	1.1072	1.1248	1.1113
	BC		-0.0001	-0.0001	0.0001	0.0002	-0.0001	-0.0001	0.0005	0.0001	0.0001	0.0003	0.0002	0.0003	0.0003
	TR		381	365	341	325	315	292	247	233	203	179	163	151	135
FTSE Oil and Gas Index	TV	0.9126	0.9862	0.9397	0.9543	1.02	1.0358	1.0326	1.026	1.0882	1.083	1.1611	1.1244	1.0543	1.0335
	BC		0.0002	0.0001	0.0001	0.0003	0.0004	0.0004	0.0004	0.0007	0.0007	0.0011	0.0011	0.0008	0.0007
	TR		382	376	364	345	331	299	289	260	234	214	197	188	174
FTSE Oil and Gas Producer Index	TV	0.9004	0.9771	0.9738	0.9772	1.0387	1.0238	1.0297	1.0174	1.0493	1.0842	1.107	1.0865	1.0406	1.0411
	BC		0.0002	0.0002	0.0002	0.0004	0.0004	0.0004	0.0004	0.0006	0.0008	0.0009	0.0009	0.0008	0.0008
	TR		384	372	362	344	333	303	291	264	238	220	199	193	172
FTSE Aim SS Oil and Gas	TV	0.9223	1.8469	1.726	1.6312	1.689	1.808	1.6885	1.6603	1.6851	1.5706	1.4936	1.3111	1.5105	1.7699
	BC		0.0019	0.0018	0.0017	0.0019	0.0023	0.0022	0.0023	0.0026	0.0025	0.0025	0.0019	0.003	0.0044
	TR		363	347	333	311	289	269	251	231	209	193	183	163	147
Amec	TV	1.2612	1.2401	1.2401	1.2487	1.3152	1.4217	1.3689	1.3667	1.3488	1.2214	1.1779	1.1198	1.1081	1.0514
	BC		-0.0001	-0.0001	-0.0001	0.0001	0.0004	0.0003	0.0003	0.0003	-0.0001	-0.0003	-0.0005	-0.0006	-0.0009
	TR		343	343	331	319	309	283	269	253	239	225	219	207	196
BG Group	TV	0.8652	0.8008	0.8008	0.8128	0.8389	0.8503	0.8305	0.9749	0.904	0.8362	0.8297	0.7664	0.7608	0.7971
	BC		-0.0002	-0.0002	-0.0002	-0.0001	-0.0001	-0.0001	0.0004	0.0002	-0.0001	-0.0002	-0.0005	-0.0006	-0.0004
	TR		368	368	352	342	336	316	292	272	260	244	230	220	206
BP	TV	0.6855	0.7692	0.7692	0.7692	0.7607	0.7767	0.8183	0.764	0.6573	0.6652	0.6932	0.6808	0.7107	0.7775
	BC		0.0003	0.0003	0.0003	0.0003	0.0004	0.0005	0.0004	-0.0001	-0.0001	0.0001	-0.0001	0.0002	0.0005
	TR		358	358	358	358	352	330	310	308	292	274	258	246	232
Cairn Energy	TV	0.6709	0.8161	0.8161	0.8161	0.8099	0.8481	0.8617	0.7977	0.8616	0.9024	1.0168	0.9547	0.9965	0.8459
	BC		0.0005	0.0005	0.0005	0.0005	0.0007	0.0007	0.0005	0.0008	0.001	0.0016	0.0014	0.0017	0.001
	TR		365	365	365	363	349	341	327	305	288	264	254	238	230
Dragon Oil	TV	1.3544	2.059	2.059	2.059	1.9036	1.7404	1.6645	1.6783	1.3546	1.3791	1.2927	1.171	1.1598	1.1157
	BC		0.0013	0.0013	0.0013	0.001	0.0008	0.0007	0.0008	0.0001	0.0001	-0.0002	-0.0006	-0.0008	-0.001
	TR		333	333	333	325	311	291	273	265	250	244	230	208	198
Fortune Oil	TV	1.5714	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057
	BC		-0.0435	-0.0435	-0.0436	-0.0435	-0.0435	-0.0435	-0.0435	-0.0435	-0.0436	-0.0435	-0.0435	-0.0436	-0.0435
	TR		129	129	129	129	129	129	129	129	129	129	129	129	129
Hunting	TV	1.3221	1.3677	1.3677	1.4232	1.3466	1.5176	1.4453	1.499	1.6019	1.5532	1.5387	1.7335	1.6948	1.4314
	BC		0.0001	0.0001	0.0002	0.0001	0.0004	0.0003	0.0004	0.0007	0.0006	0.0006	0.0012	0.0011	0.0004
	TR		373	373	359	353	337	321	299	273	259	251	229	221	217
Premier Oil	TV	1.106	0.7045	0.7045	0.7045	0.6755	0.6872	0.5751	0.6479	0.7333	0.8019	0.7731	0.8941	0.9097	0.8246
	BC		-0.0012	-0.0012	-0.0012	-0.0014	-0.0014	-0.002	-0.0017	-0.0014	-0.0012	-0.0014	-0.0009	-0.0009	-0.0015
	TR		371	371	371	363	349	333	309	287	267	249	227	211	201
Royal Dutch Shell-A	TV	1.0385	1.1358	1.0996	1.1004	1.1071	1.1127	1.0821	1.0685	1.1643	1.1474	1.0687	1.046	1.2351	1.1462
	BC		0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0005	0.0005	0.0001	0.0001	0.0011	0.0006
	TR		380	346	346	334	322	291	263	237	221	203	187	161	155
Royal Dutch Shell-B	TV	1.1662	1.1215	1.1008	1.0296	1.0546	1.0084	1.0269	1.1148	1.2253	1.1483	1.2234	1.2163	1.1556	1.1698
	BC		-0.0001	-0.0002	-0.0004	-0.0003	-0.0005	-0.0004	-0.0002	0.0002	-0.0001	0.0002	0.0002	-0.0001	0.0001
	TR		367	361	355	339	317	293	267	243	223	199	177	169	155

Table 1. (continues)

		J_T (Static)	J_T (Active)	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.01
Tullow Oil	TV	0.9561	1.2443	1.2443	1.224	1.2347	1.07	0.9856	0.8255	0.7792	0.8239	0.9394	0.8531	0.7901	0.8693
	BC		0.0007	0.0007	0.0007	0.0007	0.0003	0.0001	-0.0004	-0.0007	-0.0005	-0.0001	-0.0004	-0.0007	-0.0004
	TR		369	369	365	361	357	345	333	309	295	271	257	255	239
Aminex	TV	0.3077	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092	0.0092
	BC		-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358	-0.0358
	TR		98	98	98	98	98	98	98	98	98	98	98	98	98
JKX Oil and Gas	TV	0.2596	1.2644	1.2644	1.2644	1.2644	1.2644	1.3501	1.2073	1.1649	1.1618	1.1465	1.1465	1.0975	0.9521
	BC		0.0049	0.0049	0.0049	0.0049	0.0049	0.0053	0.0052	0.0051	0.0053	0.0056	0.0056	0.0057	0.0052
	TR		321	321	321	321	321	311	297	295	283	267	267	255	249
Soco International	TV	1.0346	0.8521	0.8521	0.8521	0.8521	0.847	0.8098	0.986	0.9559	1.0091	1.0509	0.9242	0.9438	0.8928
	BC		-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0007	-0.0002	-0.0003	-0.0001	0.0001	-0.0004	-0.0004	-0.0006
	TR		353	353	353	353	349	329	313	303	283	273	261	247	241
Wood Group	TV	2.284	1.6436	1.6436	1.6759	1.6631	1.6235	1.4991	1.3401	1.4423	1.4525	1.6917	1.5042	1.6311	1.7665
	BC		-0.0009	-0.0009	-0.0009	-0.001	-0.0011	-0.0014	-0.0019	-0.0018	-0.0019	-0.0014	-0.002	-0.0018	-0.0015
	TR		355	355	339	329	321	301	279	258	235	215	209	189	177
Afren	TV	1.4444	1.4769	1.4769	1.4769	1.4769	1.4769	1.4769	1.5052	1.2979	1.3638	1.2256	1.3385	1.0909	1.1956
	BC		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	-0.0004	-0.0002	-0.0006	-0.0003	-0.0011	-0.0008
	TR		315	315	315	315	315	315	311	305	285	281	267	259	241
Hardy Oil and Gas	TV	0.3699	0.3009	0.3009	0.3009	0.3009	0.3009	0.3009	0.3009	0.2886	0.383	0.3966	0.38	0.3956	0.4068
	BC		-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0007	0.0001	0.0002	0.0001	0.0002	0.0003
	TR		362	362	362	362	362	362	362	358	342	336	332	328	324
Petrofac	TV	1.7135	1.1803	1.1085	1.1813	1.1027	1.0625	1.1365	1.0301	1.0178	0.9887	0.9356	1.0619	1.0623	1.0593
	BC		-0.001	-0.0012	-0.0011	-0.0013	-0.0014	-0.0013	-0.0017	-0.0018	-0.002	-0.0023	-0.002	-0.0021	-0.0023
	TR		365	361	351	339	331	311	303	291	275	261	235	225	207
Salamander Energy	TV	0.786	1.4185	1.4185	1.4185	1.4185	1.4185	1.4185	1.4354	1.4463	1.519	1.521	1.337	1.3098	1.2538
	BC		0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0019	0.0019	0.0022	0.0024	0.002	0.0021	0.002
	TR		329	329	329	329	329	329	323	313	297	271	260	248	238
Lamprell	TV	0.5	0.7235	0.7235	0.7235	0.7348	0.7451	0.8392	1.0267	1.1096	0.9859	0.9628	0.8847	0.8305	0.8132
	BC		0.0011	0.0011	0.0011	0.0011	0.0012	0.0016	0.0024	0.0028	0.0024	0.0025	0.0022	0.002	0.0019
	TR		349	349	349	347	341	321	297	283	279	267	261	253	251
Endeavor Int. Corp.	TV	0.3467	0.644	0.644	0.644	0.6389	0.6399	0.6779	0.4576	0.3431	0.2064	0.1989	0.209	0.2202	0.2958
	BC		0.0018	0.0018	0.0018	0.0018	0.0019	0.0022	0.001	0	-0.0022	-0.0026	-0.0027	-0.0027	-0.0011
	TR		343	343	343	335	325	307	267	247	231	215	189	167	151
Cadogan Petroleum	TV	0.8235	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0848	0.0882
	BC		-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0093	-0.0092
	TR		244	244	244	244	244	244	244	244	244	244	244	244	242
Heritage Oil	TV	0.5369	1.2469	1.2469	1.2469	1.2469	1.2166	1.2077	1.2343	1.2152	0.7997	0.7628	0.7413	0.7283	0.8525
	BC		0.0027	0.0027	0.0027	0.0027	0.0026	0.0027	0.0028	0.0028	0.0014	0.0013	0.0012	0.0012	0.0018
	TR		311	311	311	311	309	305	297	291	285	279	271	265	253
Kentz	TV	1.9403	3.6933	3.6933	3.6933	2.7518	2.8494	2.6795	2.2808	2.0159	2.0635	2.2498	2.2096	2.3077	2.2371
	BC		0.0023	0.0023	0.0023	0.0013	0.0015	0.0014	0.0007	0.0002	0.0003	0.0009	0.0009	0.0014	0.0012
	TR		278	278	278	268	258	238	218	198	182	166	144	126	122
Exillon Energy	TV	0.85	3.0368	3.0368	3.0368	3.2219	3.1274	3.6215	3.803	3.3837	3.3185	3.2556	3.0489	2.8989	2.673
	BC		0.0045	0.0045	0.0045	0.0049	0.0048	0.0056	0.0058	0.0055	0.0057	0.0057	0.0055	0.0056	0.0054
	TR		285	285	285	271	271	261	259	251	241	235	233	221	213

Notes: TV is terminal value of initial £1 investment. J_T (Static) represents the terminal value of investment using buy and hold strategy, whereas J_T (Active) represents the terminal value of investment using trading rule without any filter. Subsequent columns present the terminal investments using the trading rules at various filters. BC is the breakeven cost which is a limit that transaction cost must not exceed for profit to be considered as abnormal. TR presents the number of transactions which reduces as filters increase under normal circumstance.

Table 1 presents the results of trading and filter rules applied to the oil and gas stock returns. Breakeven costs are used to assess whether the generated profit from the technical trading rule is higher than that from the simple buy and hold strategy on the assumption that transaction cost or commission must be paid on every transaction (see notes attached to the Table). It is interesting to note from the results that the breakeven cost per transaction in most of the stock series is very negligible (in some cases negative) which will be lower than transaction costs of trading in these stocks. In that case, the trading profit cannot be higher than that from the simple buy and hold strategy after considering the transaction costs. The application of simple trading rules on the FTSE market indices does not indicate the possibility of earning abnormal returns due to meagre breakeven cost except in the FTSE UK AIM SS Oil and Gas index which has comparatively high breakeven costs, which signifies the possibility of profits from trading rule-based strategies. Dragon Oil, JKN Oil and Gas, Salamander Energy, Endeavor International Corporation, Heritage Oil, Kentz and Exillon Energy also show results similar to that of the FTSE AIM SS Oil and Gas index. The common factor in these observations is the low level of liquidity in these stocks. The very low number of transactions in these stocks will hinder the scope of applying these trading rules due the lack of active buyers and sellers in these stocks.

3.2. Moving Average-based strategies

The moving average trading rule is one of the simplest technical trading rules used by chartists to generate 'buy' and 'sell' signals based on the history of stock prices. According to Achelis (1995), a simple moving average is calculated as an average of stock prices over a given period 't' and changes over time due to the inclusion of new daily stock prices. He also described the moving average as an agreement or consensus of investors' expectation over the averaging time. Moving averages could be simple (arithmetic), exponential, triangular, variable and weighted. The difference between the various types of moving average depends on the weight given to the new variable (stock price) added to the moving average. In this study, the simple moving average will be considered which seems to be one of the most prominent trading strategies in the literature.

Brock et al (1992) employed the simple moving average and trading range break-out to investigate the predictive power of trading rules on the 90-year series of the Dow Jones Industrial Average (DJIA) index. Using the simple moving average, two moving averages of long and short periods were used to generate

'buy' and 'sell' signals. The strategy signals a 'buy' transaction if the short period moving average rises or crosses above the long period moving average and a 'sell' transaction if the short period moving average falls or crosses below the long period moving average. The simple moving average adopted by Brock et al (1992) encompasses the variable moving average (VMA) and the fixed moving average (FMA). In the variable moving average (VMA), a day is classified as buy (sell) if the short moving average lies above (below) the long moving average. The fixed moving average designates a buy (sell) signal immediately the short moving average crosses the long moving average from below (above). The use of both short and long period moving averages at the same time was justified by the scholars as an attempt to stabilise any high volatility in the series. Although, various combinations of short and long period moving averages such as 1-200, 2-200, 5-150 and 1-150 were used in the literature, Brock et al (1992) had emphasised the short and long periods to be ' $S \leq 5$ ' and ' $L \geq 50$ ' respectively as the most popular range employed by scholars, as cited by Taylor (2005).

This paper employs the same moving average (Fixed Moving Average) methodology employed by Brock et al (1992) to test whether an abnormal profit can be obtained from our series that show evidence of serial correlation. The parameters of short and long moving averages and the yardstick for investment decisions (buy and sell) are defined according to the representation of Mills (1998) as follows:

$$S_t(n) = \frac{1}{n} \sum_{i=0}^{n-1} x_{t-i} \quad (4)$$

$$L_t(m) = \frac{1}{m} \sum_{i=0}^{m-1} x_{t-i} \quad (5)$$

$$S_t(n) > L_t(m) = Buy \quad (6)$$

$$S_t(n) < L_t(m) = Sell \quad (7)$$

where $S_t(n)$ is short period (n) moving average; $L_t(m)$ is long period (m) moving average in which ($m > n$); and x_t is variable at period t which represents stock price in this study.

Brock et al (1992) tested the significance of the difference between the trading rule and the buy and hold strategy returns using t-statistics defined as:

$$t - \text{statistics for the buy and sell mean returns} = \frac{\mu_r - \mu}{\left(\frac{\sigma^2}{N} + \frac{\sigma^2}{N_r}\right)^{1/2}} \quad (8)$$

where ;

μ_r = Mean return for the 'buy' or 'sell' transactions

μ = Mean return for the buy and hold strategy (mean of the full sample)

σ^2 = Variance of the full sample

N = Number of full sample

N_r = Number of signals (days) for the 'buy' or 'sell' transaction

$$t - \text{statistics for the (buy - sell) mean returns} = \frac{\mu_b - \mu_s}{\left(\frac{\sigma^2}{N_b} + \frac{\sigma^2}{N_s}\right)^{1/2}} \quad (9)$$

where ;

μ_b = Mean return for the 'buy' transactions

μ_s = Mean return for the 'sell' transactions

σ^2 = Variance of the full sample

N_b = Number of signals (days) for the 'buy' transactions

N_s = Number of signals (days) for the 'sell' transactions

The critical values of the t-statistics calculated are used to assess the significance of the difference between the returns generated from the trading rules and the buy and hold investment strategy. If the t-statistics value is greater than its critical value, the difference between the trading rule and the buy and hold returns is assumed to be significant. In simple terms, the null hypothesis that the returns from trading rules (moving averages) are equal to those from the buy and hold strategy will be rejected if the t-statistics value is greater than its critical value. In that case, the trading rules investment strategy can result in an abnormal gain. The number of buy and sell signals (days) are also used to determine whether the market is bullish or bearish. If the 'buy' signals (days) are greater than the 'sell' signals (days) the market is considered as bullish and bearish if vice versa. The test of significance of the difference between buy and sell mean returns assesses whether the opposing signals (days) are meaningful or not.

Similarly, t-statistics (and critical values) are used to accept or reject the null hypothesis of equality. Rejection of the null hypothesis will mean that the values (buy and sell mean returns) are significantly different which demonstrates that the signals are meaningful.

We specifically employed ten combinations of short moving average, long moving average, and zero bandwidth or threshold ranging from (5,10,0) to (5,100,0) as fixed moving averages (FMA) on the FTSE indices and oil and gas stock series for three years from January 2014 to December 2016.

Table 2. Moving Averages Trading Rules on Daily Returns Series from 2014 to 2016

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
FTSE All Share Index	Buy Mean	0.0006 (0.7263)	0.0003 (0.2496)	0.0002 (0.1297)	0.0003 (0.2287)	0.0002 (0.0920)	0.0003 (0.2512)	0.0002 (0.0976)	0.0001 (0.1509)	0.0001 (0.0849)	0.0001 (0.0077)
	Sell Mean	0.0005 (0.4545)	0.0000 (0.2181)	-0.0001 (-0.2807)	0.0008 (0.8424)	0.0001 (0.1467)	0.0002 (0.0784)	-0.0001 (-0.305)	-0.0004 (-0.6615)	-0.0004 (-0.5858)	-0.0002 (-0.4322)
	Buy-Sell	0.0002 (0.1983)	0.0003 (0.3992)	0.0003 (0.3585)	-0.0005 (-0.5768)	0.0002 (0.2044)	0.0001 (0.1224)	0.0003 (0.3531)	0.0004 (0.4847)	0.0004 (0.4816)	0.0004 (0.3934)
	Trade Rule	0.4230	0.1290	0.0840	0.1720	0.0970	0.1870	0.0670	-0.0740	-0.0330	0.1430
	Buy & Hold	0.1140	0.1140	0.1140	0.1140	0.1140	0.1140	0.1140	0.1140	0.1140	0.1140
FTSE 100 Share Index	Buy Mean	0.0006 (0.7341)	0.0002 (0.1054)	0.0002 (0.1526)	0.0002 (0.1488)	0.0002 (0.1527)	0.0002 (0.1276)	0.0002 (0.1508)	0.0001 (0.0465)	0.0001 (0.0583)	0.0001 (0.0209)
	Sell Mean	0.0005 (0.5383)	-0.0001 (-0.3007)	-0.0001 (-0.2404)	0.0001 (0.0013)	0.0001 (0.0454)	0.0000 (0.1313)	0.0000 (0.1224)	-0.0002 (-0.3856)	-0.0004 (-0.5978)	-0.0002 (-0.3993)
	Buy-Sell	0.0001 (0.1379)	0.0003 (0.3557)	0.0003 (0.3400)	0.0001 (0.1185)	0.0001 (0.0784)	0.0002 (0.2180)	0.0002 (0.2273)	0.0003 (0.3133)	0.0005 (0.5070)	0.0003 (0.3509)
	Trade Rule	0.4250	0.0380	0.0910	0.1170	0.1290	0.1050	0.0930	-0.0190	-0.0550	-0.0100
	Buy & Hold	0.0860	0.0860	0.0860	0.0860	0.0860	0.0860	0.0860	0.0860	0.0860	0.0860
FTSE Oil and Gas Index	Buy Mean	0.0009 (1.2045)	0.0006 (0.8866)	0.0004 (0.6501)	0.0000 (0.1293)	0.0001 (-0.2395)	0.0003 (0.4247)	0.0004 (0.5780)	0.0005 (0.7474)	0.0005 (0.7045)	0.0004 (0.6148)
	Sell Mean	0.0012 (1.5380)	0.0009 (1.0893)	0.0007 (0.9122)	0.0002 (0.3525)	0.0004 (0.5430)	0.0006 (0.7506)	0.0006 (0.7868)	0.0007 (0.9550)	0.0005 (0.5534)	0.0004 (0.4680)
	Buy-Sell	-0.0003 (-0.318)	-0.0002 (-0.2286)	-0.0003 (-0.2786)	-0.0002 (-0.2107)	-0.0003 (-0.278)	-0.0003 (-0.3069)	-0.0002 (-0.2096)	-0.0002 (-0.2036)	0.0000 (0.0300)	0.0001 (0.0465)
	Trade Rule	0.7980	0.5500	0.4130	0.0830	0.1690	0.2840	0.3410	0.4420	0.2950	0.2460
	Buy & Hold	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611	-0.0611
FTSE Oil&Gas Producers	Buy Mean	0.0009 (-1.1985)	0.0007 (-0.9810)	0.0005 (-0.6962)	0.0000 (0.1206)	0.0002 (0.3947)	0.0003 (0.4385)	0.0004 (0.6272)	0.0005 (0.7588)	0.0006 (0.7953)	0.0005 (0.6872)
	Sell Mean	0.0012 (1.5820)	0.0010 (1.2399)	0.0008 (0.9936)	0.0003 (0.4027)	0.0006 (0.7464)	0.0006 (0.7963)	0.0007 (0.8733)	0.0008 (0.9948)	0.0005 (0.6404)	0.0005 (0.5606)
	Buy-Sell	-0.0003 (-0.3657)	-0.0003 (-0.2888)	-0.0003 (-0.3079)	-0.0003 (-0.2622)	-0.0003 (-0.3246)	-0.0003 (-0.3324)	-0.0002 (-0.2419)	-0.0002 (-0.2272)	0.0000 (0.0264)	0.0000 (0.0192)
	Trade Rule	0.7960	0.6060	0.4390	0.0810	0.2630	0.2900	0.3700	0.4450	0.3320	0.2790
	Buy & Hold	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738	-0.0738

Table 2. (continues)

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
FTSE AIM 50 Oil & Gas	Buy Mean	0.0016 (1.5868)	0.0011 (1.0293)	0.0012 (1.1428)	0.0009 (0.8890)	0.0015 (1.4212)	0.0017 (1.5332)	0.0015 (1.3860)	0.0012 (1.0923)	0.0010 (0.8860)	0.0016 (1.4598)
	Sell Mean	0.0019* (1.8613)	0.0012 (1.1613)	0.0012 (1.219)	0.0010 (1.0036)	0.0016 (1.5284)	0.0015 (1.4391)	0.0013 (1.2687)	0.0010 (1.0237)	0.0010 (1.0231)	0.0014 (1.4215)
	Buy-Sell	-0.0003 (-0.2409)	-0.0001 (-0.1066)	0.0000 (0.0363)	-0.0001 (-0.0846)	-0.0001 (-0.0538)	0.0002 (0.1670)	0.0003 (0.1976)	0.0002 (0.1346)	0.0002 (-0.0497)	0.0002 (0.1478)
	Trade Rule	1.3500	0.8350	0.8940	0.7090	1.1100	1.0800	0.9660	0.7650	0.6910	1.0400
	Buy & Hold	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280	-0.0280
AMEC	Buy Mean	0.0009 (0.5988)	0.0007 (0.3865)	0.0007 (0.4080)	0.0009 (0.5760)	0.0012 (0.7979)	0.0007 (0.3961)	0.0012 (0.8157)	0.0010 (0.6107)	0.0009 (0.5285)	0.0007 (0.4070)
	Sell Mean	0.0004 (0.0996)	0.0002 (0.1077)	0.0003 (0.0417)	0.0004 (0.0931)	0.0008 (0.3965)	0.0003 (0.0169)	0.0010 (0.5867)	0.0006 (0.2377)	0.0003 (0.0120)	0.0001 (0.1472)
	Buy-Sell	0.0005 (0.3950)	0.0005 (0.4119)	0.0005 (0.3651)	0.0005 (0.3794)	0.0004 (0.2771)	0.0004 (0.3244)	0.0001 (0.1029)	0.0004 (0.2694)	0.0006 (0.4274)	0.0006 (0.4498)
	Trade Rule	0.5400	0.3700	0.4000	0.5200	0.7300	0.4000	0.7800	0.5600	0.4300	0.3400
	Buy & Hold	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400
BG GROUP	Buy Mean	0.0004 (0.4418)	0.0000 (0.1379)	0.0001 (0.1760)	0.0003 (0.3674)	0.0002 (0.2843)	0.0000 (0.1221)	0.0003 (0.3902)	0.0005 (0.5061)	0.0005 (0.5033)	0.0007 (0.7074)
	Sell Mean	0.0008 (0.7527)	0.0004 (0.4603)	0.0005 (0.5437)	0.0008 (0.7285)	0.0006 (0.6276)	0.0004 (0.4516)	0.0008 (0.7445)	0.0009 (0.7893)	0.0009 (0.7810)	0.0011 (0.9357)
	Buy-Sell	-0.0004 (-0.2867)	-0.0004 (-0.2934)	-0.0005 (-0.3286)	-0.0005 (-0.3282)	-0.0004 (-0.3124)	-0.0004 (-0.2957)	-0.0004 (-0.3128)	-0.0004 (-0.2676)	-0.0004 (-0.2588)	-0.0004 (-0.2351)
	Trade Rule	0.4250	0.1570	0.2130	0.3760	0.2910	0.1450	0.3880	0.4350	0.4310	0.5520
	Buy & Hold	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020	-0.1020
BP	Buy Mean	0.0007 (0.9566)	0.0006 (0.9090)	0.0006 (0.9130)	0.0001 (0.4961)	0.0005 (0.8243)	0.0005 (0.8668)	0.0005 (0.8569)	0.0004 (0.7674)	0.0003 (0.6455)	0.0001 (0.4668)
	Sell Mean	0.0014* (1.7170)	0.0015* (1.6688)	0.0017* (1.7988)	0.0011 (1.3577)	0.0017* (1.8063)	0.0016* (1.6956)	0.0015* (1.6512)	0.0013 (1.5503)	0.0003 (0.5895)	0.0000 (0.3141)
	Buy-Sell	-0.0007 (-0.5351)	-0.0009 (-0.6821)	-0.0011 (-0.8214)	-0.0010 (-0.7666)	-0.0012 (-0.8571)	-0.0010 (-0.7379)	-0.0009 (-0.6806)	-0.0009 (-0.6608)	0.0000 (0.0067)	0.0002 (0.1020)
	Trade Rule	0.8430	0.7500	0.791	0.438	0.746	0.716	0.702	0.628	0.188	0.024
	Buy & Hold	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440	-0.3440
CAIRN ENERGY	Buy Mean	-0.0002 (-0.2216)	-0.0002 (-0.1654)	0.0004 (0.6439)	0.0000 (0.3163)	-0.0007 (-0.1530)	-0.0001 (-0.2174)	-0.0007 (-0.1827)	-0.0004 (-0.0445)	-0.0008 (-0.2168)	-0.0012 (-0.4465)
	Sell Mean	0.0009 (1.0491)	0.0007 (0.9002)	0.0013 (1.3587)	0.0009 (1.0994)	0.0008 (0.9749)	0.0011 (1.2237)	0.0007 (0.9099)	0.0009 (1.0608)	0.0012 (1.2219)	0.0009 (1.0363)
	Buy-Sell	-0.0011 (-0.6977)	-0.0010 (-0.6212)	-0.0008 (-0.5357)	-0.0009 (-0.5873)	-0.0015 (-0.8723)	-0.0012 (-0.7317)	-0.0014 (-0.8775)	-0.0013 (-0.8188)	-0.0020 (-1.1083)	-0.0021 (-1.1689)
	Trade Rule	0.3080	0.2000	0.6860	0.4110	0.1720	0.4440	0.0950	0.2450	0.2550	0.0870
	Buy & Hold	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520	-0.3520
DRAGON OIL	Buy Mean	0.0012 (0.6020)	0.0006 (0.1065)	0.0009 (0.3220)	0.0006 (0.0716)	0.0008 (0.2842)	0.0007 (0.1522)	0.0004 (0.0730)	0.0001 (0.2866)	0.0002 (0.1954)	0.0005 (0.018)
	Sell Mean	0.0008 (0.2806)	0.0000 (0.3322)	0.0006 (0.0778)	0.0002 (0.2086)	0.0004 (0.0075)	0.0000 (0.3003)	-0.0003 (-0.5552)	-0.0006 (-0.7757)	-0.0004 (-0.6652)	-0.0002 (-0.4435)
	Buy-Sell	0.0004 (0.2442)	0.0006 (0.3827)	0.0003 (0.1985)	0.0004 (0.2411)	0.0004 (0.2463)	0.0006 (0.3838)	0.0006 (0.4127)	0.0007 (0.4176)	0.0006 (0.3974)	0.0007 (0.3971)
	Trade Rule	0.7940	0.2490	0.5160	0.2640	0.4450	0.2420	0.0190	-0.1690	-0.0770	0.1140
	Buy & Hold	0.3570	0.3570	0.3570	0.3570	0.3570	0.3570	0.3570	0.3570	0.3570	0.3570

Table 2. (continues)

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
FORTUNE OIL	Buy Mean	0.0001 (0.0585)	0.0025 (0.6320)	0.0015 (0.3433)	0.0022 (0.4924)	0.0013 (0.2866)	0.0011 (0.2315)	0.0009 (0.1716)	0.0010 (0.1936)	0.0017 (0.3950)	0.0016 (0.3855)
	Sell Mean	-0.0012 (-0.3934)	0.0015 (0.3786)	0.0002 (0.0383)	0.0003 (0.0200)	0.0001 (0.0493)	0.0001 (0.0688)	-0.0002 (-0.147)	-0.0002 (-0.1626)	0.0004 (0.0482)	0.0005 (0.0515)
	Buy-Sell	0.0013 (0.3292)	0.0009 (0.2388)	0.0014 (0.3417)	0.0018 (0.4440)	0.0012 (0.2943)	0.0010 (0.2572)	0.0011 (0.2720)	0.0011 (0.3007)	0.0012 (0.2994)	0.0012 (0.2849)
	Trade Rule	-0.2380	1.3800	0.5000	0.6850	0.4590	0.3980	0.2080	0.1620	0.6650	0.6650
	Buy & Hold	0.2231	0.2231	0.2231	0.2231	0.2231	0.2231	0.2231	0.2231	0.2231	0.2231
	HUNTING	Buy Mean	0.0012 (0.5855)	0.0017 (0.9304)	0.0015 (0.8573)	0.0013 (0.6755)	0.0012 (0.5825)	0.0010 (0.4546)	0.0008 (0.2948)	0.0010 (0.4153)	0.0006 (0.1579)
Sell Mean		0.0003 (0.0723)	0.0010 (0.4095)	0.0009 (0.3698)	0.0009 (0.3519)	0.0007 (0.2251)	0.0005 (0.0534)	0.0002 (0.1490)	0.0004 (0.0052)	-0.0006 (-0.6158)	-0.0002 (-0.3510)
Buy-Sell		0.0009 (0.5616)	0.0007 (0.4300)	0.0006 (0.3768)	0.0004 (0.2331)	0.0004 (0.2601)	0.0005 (0.3116)	0.0006 (0.3679)	0.0006 (0.3249)	0.0012 (0.6756)	0.0011 (0.5815)
Trade Rule		0.5770	1.0000	0.9560	0.8110	0.7040	0.5550	0.3710	0.5070	0.0940	0.2920
Buy & Hold		0.3060	0.3060	0.3060	0.3060	0.3060	0.3060	0.3060	0.3060	0.3060	0.3060
PREMIER OIL		Buy Mean	0.0020 (1.4561)	0.0018 (1.2679)	0.0011 (0.6977)	0.0012 (0.7759)	0.0016 (1.0162)	0.0015 (0.9774)	0.0013 (0.7980)	0.0012 (0.7639)	0.0011 (0.6574)
	Sell Mean	0.0020 (1.3805)	0.0012 (0.7930)	0.0007 (0.3395)	0.0010 (0.5909)	0.0011 (0.6539)	0.0011 (0.6710)	0.0008 (0.4440)	0.0010 (0.5740)	0.0008 (0.4391)	0.0006 (0.2328)
	Buy-Sell	0.0000 (0.0320)	0.0006 (0.4019)	0.0004 (0.2898)	0.0001 (0.0985)	0.0005 (0.3148)	0.0004 (0.2490)	0.0004 (0.2776)	0.0002 (0.1207)	0.0002 (0.1559)	0.0004 (0.2776)
	Trade Rule	1.5400	1.1500	0.6800	0.8300	0.9100	0.9050	0.7290	0.7690	0.6630	0.5320
	Buy & Hold	0.1970	0.1970	0.1970	0.1970	0.1970	0.1970	0.1970	0.1970	0.1970	0.1970
	ROYAL DUTCH SHELL-B	Buy Mean	0.0010 (0.9722)	0.0008 (0.7713)	0.0005 (0.2848)	0.0005 (0.2835)	0.0003 (0.0511)	0.0005 (0.3406)	0.0005 (0.3417)	0.0005 (0.3051)	0.0003 (0.1194)
Sell Mean		0.0005 (0.2891)	0.0003 (0.1108)	-0.0001 (-0.4314)	-0.0001 (-0.3286)	-0.0003 (-0.5670)	-0.0001 (-0.3260)	0.0000 (0.2420)	0.0000 (0.2538)	-0.0002 (-0.4785)	-0.0002 (-0.4590)
Buy-Sell		0.0005 (0.5525)	0.0005 (0.5384)	0.0006 (0.6188)	0.0005 (0.5252)	0.0005 (0.5373)	0.0006 (0.5649)	0.0005 (0.4937)	0.0005 (0.4737)	0.0005 (0.5140)	0.0007 (0.6126)
Trade Rule		0.5770	0.4610	0.1480	0.1730	0.0190	0.1760	0.1970	0.1690	0.0640	0.1170
Buy & Hold		0.1830	0.1830	0.1830	0.1830	0.1830	0.1830	0.1830	0.1830	0.1830	0.1830
TULLOW OIL		Buy Mean	0.0009 (0.6719)	0.0005 (0.4303)	0.0005 (0.4436)	0.0003 (0.2870)	0.0002 (0.1931)	0.0005 (0.4180)	0.0002 (0.1598)	-0.0002 (-0.1125)	0.0000 (0.0072)
	Sell Mean	0.0011 (0.8539)	0.0005 (0.3627)	0.0006 (0.4522)	0.0004 (0.3242)	0.0001 (0.1284)	0.0005 (0.3599)	0.0001 (0.1052)	0.0000 (0.0097)	-0.0003 (-0.1703)	-0.0005 (-0.3025)
	Buy-Sell	-0.0003 (-0.1687)	0.0001 (0.0425)	-0.0001 (-0.0353)	-0.0001 (-0.0478)	0.0001 (0.0535)	0.0001 (0.0498)	0.0001 (0.0443)	-0.0001 (-0.1026)	0.0003 (0.1569)	0.0002 (0.1240)
	Trade Rule	0.7610	0.3740	0.4220	0.2760	0.1270	0.3500	0.0990	-0.1790	-0.0930	-0.2460
	Buy & Hold	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340	-0.0340
	AMINEX	Buy Mean	-0.0015 (-0.0303)	-0.0067 (-0.2053)	-0.0013 (-0.0119)	-0.0039 (-0.1226)	-0.0005 (-0.0262)	-0.0013 (-0.0118)	-0.0032 (-0.1122)	-0.0023 (-0.0619)	-0.0048 (-0.1987)
Sell Mean		0.0019 (0.1631)	0.0008 (0.1342)	0.0017 (0.2011)	0.0011 (0.1491)	0.002 (0.2122)	0.0016 (0.1829)	0.0002 (0.0758)	0.0008 (0.1200)	-0.0009 (-0.0098)	-0.0013 (-0.0195)
Buy-Sell		-0.0034 (-0.1747)	-0.0075 (-0.2688)	-0.0031 (-0.1220)	-0.0050 (-0.2067)	-0.0025 (-0.1194)	-0.0029 (-0.1348)	-0.0034 (-0.1582)	-0.0031 (-0.1414)	-0.0039 (-0.1857)	-0.0058 (-0.2622)
Trade Rule		-0.1890	-0.1350	0.9190	0.0660	0.9740	0.5950	-0.6800	-0.1060	-1.4900	-1.9600
Buy & Hold		-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100

Table 2. (continues)

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
AMINEX	Buy Mean	-0.0015 (-0.0303)	-0.0067 (-0.2053)	-0.0013 (-0.0119)	-0.0039 (-0.1226)	-0.0005 (-0.0262)	-0.0013 (-0.0118)	-0.0032 (-0.1122)	-0.0023 (-0.0619)	-0.0048 (-0.1987)	-0.0072 (-0.2973)
	Sell Mean	0.0019 (0.1631)	0.0008 (0.1342)	0.0017 (0.2011)	0.0011 (0.1491)	0.002 (0.2122)	0.0016 (0.1829)	0.0002 (0.0758)	0.0008 (0.1200)	-0.0009 (-0.0098)	-0.0013 (-0.0195)
	Buy-Sell	-0.0034 (-0.1747)	-0.0075 (-0.2688)	-0.0031 (-0.1220)	-0.0050 (-0.2067)	-0.0025 (-0.1194)	-0.0029 (-0.1348)	-0.0034 (-0.1582)	-0.0031 (-0.1414)	-0.0039 (-0.1857)	-0.0058 (-0.2622)
	Trade Rule	-0.1890	-0.1350	0.9190	0.0660	0.9740	0.5950	-0.6800	-0.1060	-1.4900	-1.9600
	Buy & Hold	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100	-0.8100
	JKX OIL AND GAS	Buy Mean	0.0006 (1.2652)	-0.0012 (-0.2478)	-0.0004 (-0.7126)	-0.0008 (-0.5041)	0.0004 (-1.1205)	-0.0004 (-0.6035)	-0.0008 (-0.4156)	-0.0005 (-0.5768)	-0.0009 (-0.3841)
Sell Mean		0.0031*** (3.1925)	0.0019** (2.3510)	0.0024*** (2.7120)	0.0023*** (2.6133)	0.0029*** (3.0766)	0.0023*** (2.7059)	0.0022*** (2.6032)	0.0023*** (2.6908)	0.0025*** (2.7173)	0.0026*** (2.7751)
Buy-Sell		-0.0025 (-1.2946)	-0.0031 (-1.5943)	-0.0028 (-1.3988)	-0.0031 (-1.5691)	-0.0025 (-1.2385)	-0.0027 (-1.2638)	-0.0030 (-1.3764)	-0.0028 (-1.2704)	-0.0033 (-1.4983)	-0.0032 (-1.4385)
Trade Rule		1.6700	0.5300	1.0400	0.8300	1.5200	1.0900	0.9360	1.0700	0.9600	1.0400
Buy & Hold		-1.2900	-1.2900	-1.2900	-1.2900	-1.2900	-1.2900	-1.2900	-1.2900	-1.2900	-1.2900
SOCO INTERNATIONAL		Buy Mean	0.0003 (0.1523)	0.0002 (0.0807)	0.0000 (0.0757)	0.0001 (0.0076)	-0.0005 (-0.3997)	-0.0002 (-0.2122)	-0.0002 (-0.2135)	-0.0005 (-0.3931)	-0.0002 (-0.1920)
	Sell Mean	0.0004 (0.2432)	0.0002 (0.1098)	0.0004 (0.2250)	0.0005 (0.2642)	-0.0002 (-0.2022)	0.0000 (0.0244)	0.0001 (0.0203)	-0.0002 (-0.2216)	0.0001 (0.0198)	-0.0004 (-0.3194)
	Buy-Sell	-0.0001 (-0.0886)	0.0000 (0.0280)	-0.0004 (-0.2568)	-0.0004 (-0.2315)	-0.0003 (-0.1641)	-0.0003 (-0.1565)	-0.0003 (-0.1610)	-0.0002 (-0.1441)	-0.0003 (-0.1459)	-0.0002 (-0.0948)
	Trade Rule	0.2740	0.1650	0.1350	0.1910	-0.2500	-0.0600	-0.0610	-0.2400	-0.0470	-0.3100
	Buy & Hold	0.0660	0.0660	0.0660	0.0660	0.0660	0.0660	0.0660	0.0660	0.0660	0.0660
	WOOD GROUP	Buy Mean	0.0017 (0.4261)	0.0018 (0.5160)	0.0021 (0.7840)	0.0019 (0.6526)	0.0019 (0.6242)	0.0018 (0.5474)	0.0015 (0.3102)	0.0015 (0.3358)	0.0013 (0.1862)
Sell Mean		-0.0001 (-0.8259)	0.0003 (0.4998)	0.0009 (0.0878)	0.0010 (0.0500)	0.0011 (0.0344)	0.0010 (0.0589)	0.0000 (0.6059)	0.0001 (0.5874)	0.0000 (0.5948)	-0.0001 (-0.6160)
Buy-Sell		0.0018 (1.0897)	0.0014 (0.8670)	0.0012 (0.6855)	0.0009 (0.5254)	0.0008 (0.4106)	0.0008 (0.4400)	0.0014 (0.7881)	0.0014 (0.7886)	0.0013 (0.6892)	0.0015 (0.7080)
Trade Rule		0.6500	0.8900	1.2500	1.1200	1.1400	1.0600	0.7130	0.7360	0.6270	0.6170
Buy & Hold		0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
AFREN		Buy Mean	0.0014 (0.4160)	0.0022 (0.8581)	0.0012 (0.3219)	0.0010 (0.2154)	0.0016 (0.5555)	0.0021 (0.7845)	0.0022 (0.8407)	0.0017 (0.5938)	0.0019 (0.6870)
	Sell Mean	0.0010 (0.1960)	0.0018 (0.6210)	0.0005 (0.0482)	0.0001 (0.2242)	0.0013 (0.3172)	0.0017 (0.5141)	0.0018 (0.5835)	0.0012 (0.2732)	0.0017 (0.5280)	0.0013 (0.3320)
	Buy-Sell	0.0004 (0.1742)	0.0004 (0.1519)	0.0007 (0.3064)	0.0009 (0.3769)	0.0004 (0.1409)	0.0004 (0.1667)	0.0004 (0.1496)	0.0006 (0.2311)	0.0002 (0.0661)	0.0003 (0.1200)
	Trade Rule	0.8900	1.5600	0.6300	0.3970	1.0300	1.3300	1.4200	1.0300	1.2500	1.0000
	Buy & Hold	0.4320	0.4320	0.4320	0.4320	0.4320	0.4320	0.4320	0.4320	0.4320	0.4320
	HARDY OIL AND GAS	Buy Mean	0.0021* (1.7412)	0.0008 (1.0412)	0.0006 (0.9478)	-0.0001 (-0.5655)	-0.0002 (-0.4975)	0.0000 (0.5922)	-0.0015 (-0.0948)	-0.0006 (-0.3334)	-0.0011 (-0.1029)
Sell Mean		0.0044*** (3.0280)	0.0029** (2.2463)	0.0028** (2.2036)	0.0020* (1.8725)	0.0014 (1.4264)	0.0016 (1.5307)	0.0014 (1.3352)	0.0016 (1.3916)	0.0011 (1.2439)	0.0006 (0.9727)
Buy-Sell		-0.0022 (-1.0062)	-0.0021 (-0.9370)	-0.0022 (-0.9589)	-0.0021 (-0.8967)	-0.0016 (-0.6393)	-0.0016 (-0.6322)	-0.0029 (-1.1613)	-0.0022 (-0.8864)	-0.0022 (-0.8668)	-0.0029 (-1.1345)
Trade Rule		0.0250	1.4500	1.3700	0.9500	0.5000	0.6300	0.0300	0.2900	0.1300	-0.3600
Buy & Hold		-1.0200	-1.0200	-1.0200	-1.0200	-1.0200	-1.0200	-1.0200	-1.0200	-1.0200	-1.0200

Table 2. (continues)

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
ROYAL DUTCH SHELL-A	Buy Mean	0.0010 (1.1064)	0.0008 (0.8381)	0.0006 (0.5924)	0.0002 (0.0712)	0.0003 (0.2122)	0.0004 (0.3220)	0.0004 (0.3506)	0.0004 (0.3229)	0.0004 (0.3269)	0.0005 (0.4258)
	Sell Mean	0.0007 (0.6996)	0.0004 (0.3726)	0.0003 (0.1298)	-0.0002 (-0.3704)	0.0000 (0.1794)	0.0000 (0.1344)	0.0001 (0.1084)	0.0001 (0.0393)	0.0001 (0.0269)	0.0001 (0.0010)
	Buy-Sell	0.0003 (0.2788)	0.0003 (0.3638)	0.0003 (0.3642)	0.0004 (0.3887)	0.0003 (0.3312)	0.0004 (0.3804)	0.0004 (0.3821)	0.0003 (0.3014)	0.0003 (0.2925)	0.0003 (0.3178)
	Trade Rule	0.6420	0.4690	0.3310	0.0350	0.1170	0.1640	0.1770	0.1850	0.1900	0.2130
	Buy & Hold	0.1160	0.1160	0.1160	0.1160	0.1160	0.1160	0.1160	0.1160	0.1160	0.1160
PETROFAC	Buy Mean	0.0018 (0.8597)	0.0017 (0.7823)	0.0013 (0.5265)	0.0007 (0.0542)	0.0008 (0.0980)	0.0006 (0.0352)	0.0004 (0.2162)	0.0008 (0.1374)	0.0008 (0.0843)	0.0008 (0.1024)
	Sell Mean	0.0007 (0.0056)	0.0005 (0.1301)	0.0001 (0.3563)	0.0000 (0.4014)	0.0001 (0.3546)	-0.0005 (-0.7333)	-0.0013 (-1.1712)	-0.0003 (-0.5942)	-0.0004 (-0.6475)	-0.0004 (-0.6386)
	Buy-Sell	0.0011 (0.7089)	0.0012 (0.7519)	0.0012 (0.7385)	0.0007 (0.4096)	0.0007 (0.4011)	0.0012 (0.6604)	0.0017 (0.9492)	0.0011 (0.6527)	0.0012 (0.6636)	0.0012 (0.6674)
	Trade Rule	0.9900	0.8840	0.6560	0.3150	0.3430	0.1760	-0.0770	0.3230	0.2700	0.2790
	Buy & Hold	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200	0.5200
SALAMANDER ENERGY	Buy Mean	0.0028** (2.2179)	0.0006 (0.6306)	0.0004 (0.4822)	-0.0015 (-0.7665)	-0.0012 (-0.5578)	-0.0005 (-0.1222)	-0.0004 (-0.0412)	-0.0002 (-0.0791)	0.0004 (0.4487)	0.0002 (0.3326)
	Sell Mean	0.0035*** (2.5590)	0.0009 (0.8582)	0.0008 (0.7282)	-0.0007 (-0.3076)	-0.0005 (-0.1507)	-0.0001 (-0.1616)	0.0001 (0.2527)	0.0001 (0.2485)	0.0005 (0.5008)	0.0003 (0.3866)
	Buy-Sell	-0.0007 (-0.3950)	-0.0003 (-0.1828)	-0.0003 (-0.2028)	-0.0008 (-0.4484)	-0.0007 (-0.3959)	-0.0004 (-0.2413)	-0.0004 (-0.2424)	-0.0003 (-0.1400)	-0.0001 (-0.0423)	-0.0001 (-0.0482)
	Trade Rule	2.3600	0.5800	0.4300	-0.7700	-0.7700	-0.5600	-0.1800	-0.0900	-0.0300	0.2700
	Buy & Hold	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370	-0.2370
LAMPRELL	Buy Mean	0.0017 (0.7864)	0.0021 (0.9256)	0.0019 (0.8440)	0.0006 (0.4252)	-0.0001 (-0.2032)	0.0006 (0.3988)	0.0004 (0.3444)	0.0002 (0.2830)	-0.0004 (-0.1009)	-0.0003 (-0.1229)
	Sell Mean	0.0037 (1.3877)	0.0047 (1.6096)	0.0051* (1.7361)	0.0035 (1.2534)	0.0025 (0.9710)	0.0028 (1.1115)	0.0027 (1.0564)	0.0023 (0.9558)	0.0020 (0.8414)	0.0023 (0.8942)
	Buy-Sell	-0.0020 (-0.5559)	-0.0026 (-0.7006)	-0.0032 (-0.8333)	-0.0029 (-0.7597)	-0.0026 (-0.6688)	-0.0023 (-0.5916)	-0.0023 (-0.5890)	-0.0022 (-0.5601)	-0.0024 (-0.6154)	-0.0026 (-0.6497)
	Trade Rule	2.0370	2.3850	2.3450	1.3150	0.7880	1.2130	1.0910	0.9030	0.5740	0.6160
	Buy & Hold	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800	-0.5800
ENDEAVOR INT. CORP.	Buy Mean	0.0037 (1.5906)	0.0038 (1.5297)	0.0034 (1.3778)	0.0039 (1.475)	0.0028 (1.1576)	0.0027 (1.1439)	0.0030 (1.1152)	0.0027 (-1.0506)	0.0014 (-0.6997)	-0.0011 (-0.0639)
	Sell Mean	0.0083*** (2.7343)	0.0065** (2.3432)	0.0040 (1.5998)	0.0039 (1.5989)	0.0038 (1.5757)	0.0039 (1.5932)	0.0040 (1.6183)	0.0039 (1.5974)	0.0019 (0.9874)	0.0004 (0.5097)
	Buy-Sell	-0.0046 (-1.1791)	-0.0027 (-0.6909)	-0.0006 (-0.1591)	0.0000 (0.0032)	-0.0009 (-0.2312)	-0.0011 (-0.2863)	-0.0009 (-0.2097)	-0.0012 (-0.2791)	-0.0005 (-0.1196)	-0.0014 (-0.3362)
	Trade Rule	4.3270	3.8960	2.7070	2.8090	2.4280	2.4240	2.3350	2.2370	1.1050	-0.1390
	Buy & Hold	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380	-1.0380
CADOGAN PETROLEUM	Buy Mean	0.0048 (1.5215)	0.0008 (0.4055)	0.0016 (0.5856)	0.0009 (0.4019)	0.0020 (0.7946)	0.0021 (0.8345)	0.0015 (0.6244)	0.0010 (0.4163)	0.0021 (0.8380)	0.0019 (0.7596)
	Sell Mean	0.0022 (1.0229)	0.0017 (0.6919)	0.0009 (0.4829)	0.0009 (0.4408)	0.0017 (0.7490)	0.0019 (0.8008)	0.0015 (0.6601)	0.0012 (0.5177)	0.0023 (0.9094)	0.0021 (0.8534)
	Buy-Sell	0.0026 (0.7562)	-0.0009 (-0.2991)	0.0006 (0.1900)	0.0000 (0.0126)	0.0003 (0.1016)	0.0003 (0.0865)	0.0000 (0.0089)	-0.0002 (-0.0552)	-0.0002 (-0.0599)	-0.0002 (-0.0488)
	Trade Rule	2.2170	0.8770	0.8500	0.6480	1.3290	1.3750	1.0470	0.6920	1.4820	1.3040
	Buy & Hold	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940	-0.1940

Table 2. (continues)

	Moving Average	(5,10,0)	(5,20,0)	(5,30,0)	(5,40,0)	(5,50,0)	(5,60,0)	(5,70,0)	(5,80,0)	(5,90,0)	(5,100,0)
HERITAGE OIL	Buy Mean	0.0030* (1.7854)	0.0002 (0.4692)	0.0011 (0.8813)	0.0012 (0.8656)	0.0014 (0.8925)	0.0016 (0.9957)	-0.0003 (-0.1908)	-0.0004 (-0.1583)	-0.0001 (-0.2593)	-0.0004 (-0.1164)
	Sell Mean	0.0040** (2.4701)	0.0022 (1.4286)	0.0025* (1.6870)	0.0024* (1.6411)	0.0024* (1.6480)	0.0024* (1.6968)	0.0014 (1.1569)	0.0014 (1.1358)	0.0014 (1.0940)	0.0013 (1.0373)
	Buy-Sell	-0.0010 (-0.4386)	-0.0020 (-0.8642)	-0.0014 (-0.5921)	-0.0012 (-0.5087)	-0.0010 (-0.4025)	-0.0008 (-0.3193)	-0.0017 (-0.6622)	-0.0017 (-0.6698)	-0.0015 (-0.5411)	-0.0018 (-0.6399)
	Trade Rule	2.7340	0.8520	1.4320	1.4000	1.4210	1.5270	0.6060	0.5750	0.5610	0.4190
	Buy & Hold	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780	-0.5780
	KENTZ	Buy Mean	0.0028 (1.5756)	0.0020 (0.8838)	0.0016 (0.5683)	0.0009 (0.0743)	0.0005 (0.3018)	0.0004 (0.3440)	0.0006 (0.1845)	0.0007 (0.1060)	0.0010 (0.0929)
Sell Mean		0.0013 (0.3273)	0.0003 (0.4628)	0.0006 (0.1887)	-0.0004 (-0.9361)	-0.0010 (-1.3778)	-0.0012 (-1.4586)	-0.0009 (-1.2344)	-0.0007 (-1.0502)	-0.0004 (-0.8372)	-0.001 (-1.1978)
Buy-Sell		0.0015 (1.0693)	0.0017 (1.1639)	0.0010 (0.6228)	0.0014 (0.8791)	0.0015 (0.9648)	0.0016 (1.0291)	0.0016 (0.9816)	0.0015 (0.8967)	0.0014 (0.8391)	0.0017 (1.0039)
Trade Rule		1.5840	0.8270	0.7920	0.2290	-0.1280	-0.1640	0.0279	0.1610	0.3230	0.0820
Buy & Hold		0.6670	0.6670	0.6670	0.6670	0.6670	0.6670	0.6670	0.6670	0.6670	0.6670
EXILLON ENERGY		Buy Mean	0.0035* (1.7271)	0.0014 (0.7145)	0.0023 (1.1654)	0.0025 (1.2916)	0.0032 (1.5953)	0.0026 (1.2469)	0.0024 (1.1745)	0.0023 (1.1351)	0.0030 (1.4378)
	Sell Mean	0.0041** (1.9846)	0.0018 (0.8463)	0.0032 (1.4663)	0.0036* (1.6514)	0.0043* (1.9806)	0.0028 (1.3446)	0.0027 (1.2774)	0.0025 (1.1932)	0.0035 (1.6282)	0.0036* (1.7111)
	Buy-Sell	-0.0007 (-0.2800)	-0.0004 (-0.1575)	-0.0009 (-0.3779)	-0.0011 (-0.4477)	-0.0011 (-0.4544)	-0.0003 (-0.1105)	-0.0003 (-0.1176)	-0.0001 (-0.0582)	-0.0005 (-0.1799)	-0.0003 (-0.0983)
	Trade Rule	2.8580	1.1420	1.9430	2.1690	2.6560	1.8720	1.7680	1.6780	2.2050	2.3890
	Buy & Hold	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571	-0.0571

Notes: The table show returns of combinations of short- and long-moving averages and zero bandwidth (5,10,0 ... 5,100,0). The Buy and Sell Mean returns are daily averages of the total return generated from the buy and sell transactions, while the values in parenthesis under them are t-statistics to be used in rejecting or accepting the null hypothesis of equality at *: 10%, **: 5%, and ***: 1% significance levels. The Buy-Sell represents difference between Buy and Sell mean returns. The "Trading Rule" and "Buy and Hold" are total trading returns from each rule (moving average) and corresponding buy and hold investment strategy returns over the same period. Number of days in a buy decision ranges between 98 and 521 with average of 362 days. Likewise, number of days in a sell decision ranges between 156 and 664 with average of 342 days.

The results in Table 2 show that the indices except the FTSE UK AIM SS Oil and Gas index have more buy decisions (signals) than sell decisions (signals) which is a sign of the bullish condition. The FTSE UK AIM SS Oil and Gas index shows a sign of bearish condition due to higher sell-days than buy-days. The t-statistics generated in relation to the buy and sell mean returns of the indices are not more than their critical values to reject the null hypothesis. Based on these results, the moving average trading rule cannot provide returns that are significantly different from the simple buy and hold strategy even without considering the transaction costs.

In the case of BP, JKN Oil and Gas, Hardy Oil and Gas, Heritage Oil and Exxon Energy, the null hypothesis is rejected. However, it cannot be concluded that the trading rules are influential since the buy mean returns are not significantly different from the buy and hold returns.

The reliability of the trading rule results presented in Table 2 has been tested by a stationarity test conducted on the moving average (10) trading rule return series (as a sample) to assess whether the series is stationary. If the series is non-stationary, then the 'buy' and 'sell' mean returns used as a yardstick for assessing the performance of a trading rule strategy would not be realistic since the series is generated from a stochastic process. On the contrary, if the series is found to be stationary by rejecting the null hypothesis of a unit root, then the trading rule buy or sell mean returns can be assumed to be constant over which it can be compared with the unconditional mean return of the buy and hold investment strategy. Results of the stationarity test are presented in Table 3.

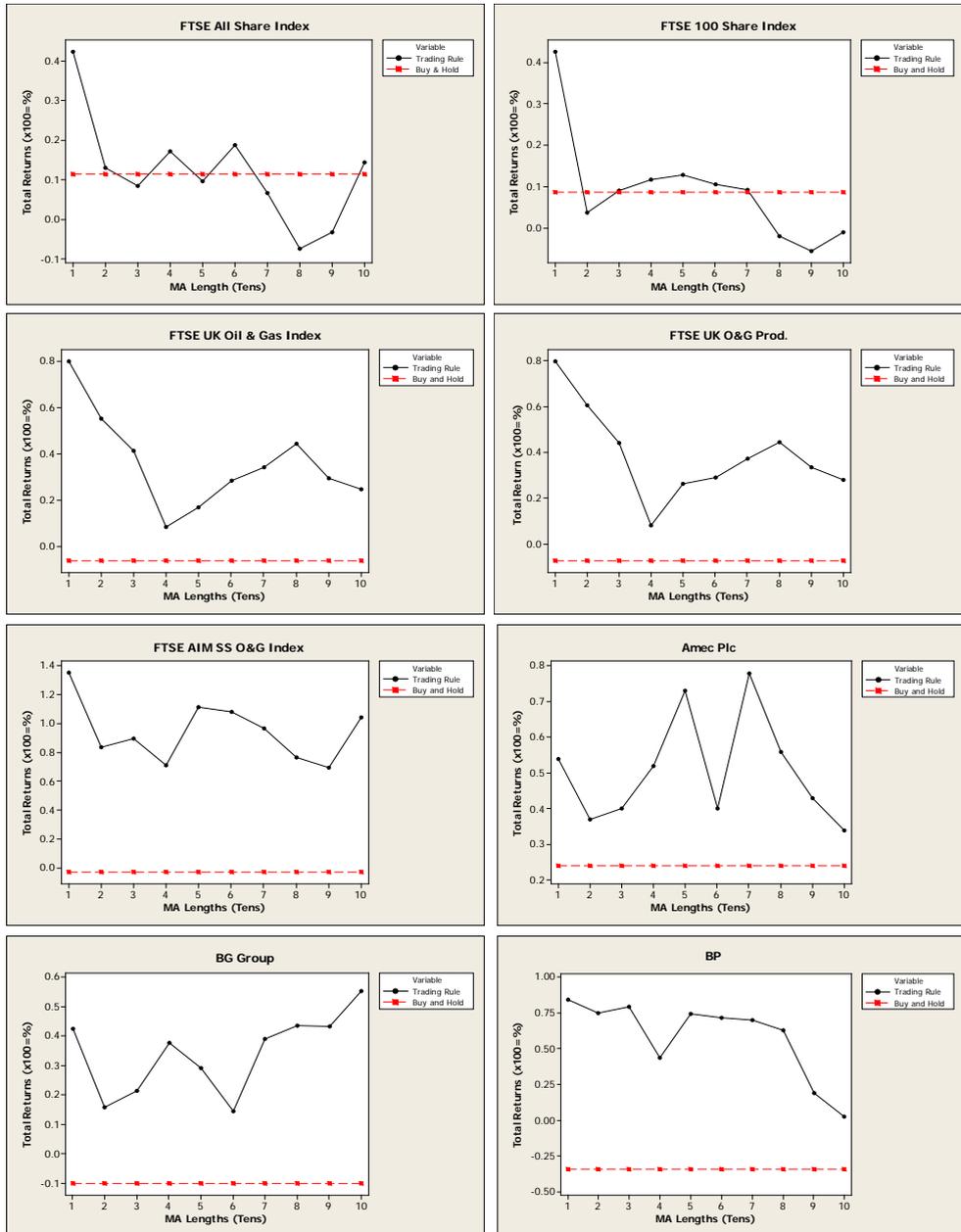
Table 3 shows the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests results on the return series generated from the moving average (10) trading rule. As mentioned earlier, the test was meant to assess whether the statistical properties used to measure the performance of a trading rule are generated from a stationary process or not. The null hypothesis that the 'series has a unit root' is rejected or accepted by the t-statistics and p-values of the ADF and PP tests generated. Based on the results presented in Table 3, both the t-statistics and p-values are highly significant even at 1% significance level, in which the null hypothesis of unit root is strongly rejected. It is therefore concluded that the moving average trading rule return series is stationary and its constant mean can be compared with the unconditional mean return of the buy and hold investment strategy.

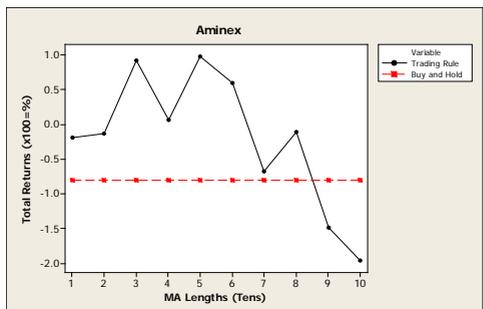
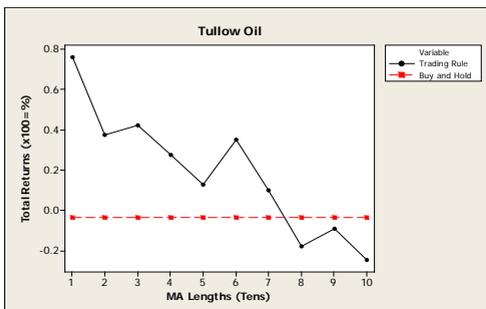
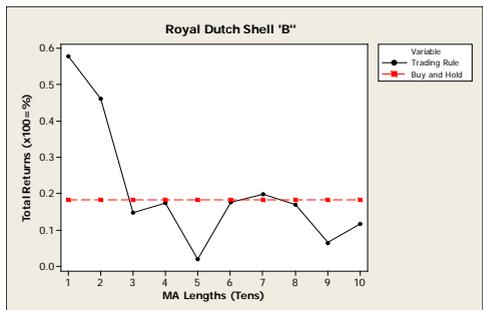
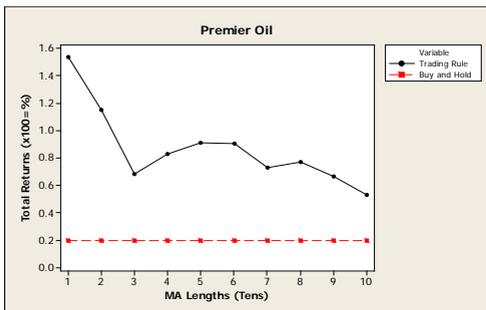
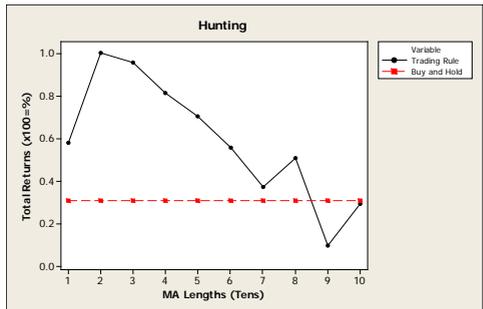
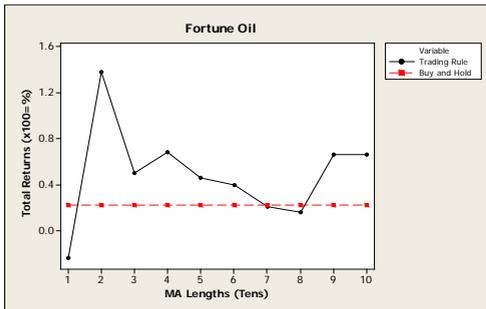
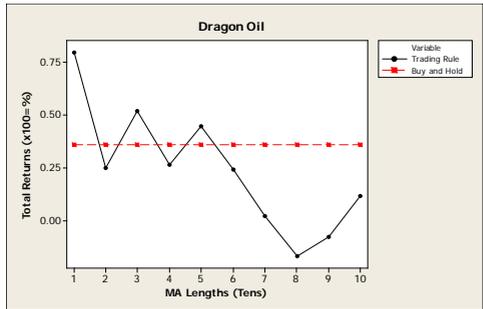
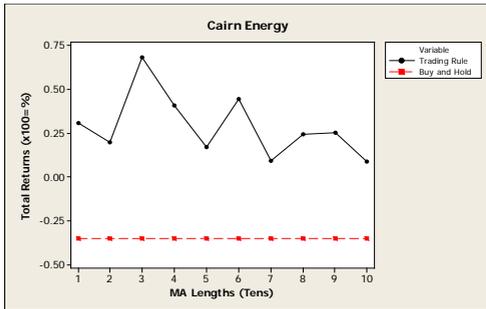
Table 3. Stationarity Test for Moving Average (10) Trading Rule Return Series

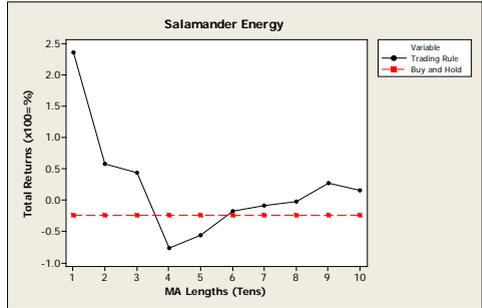
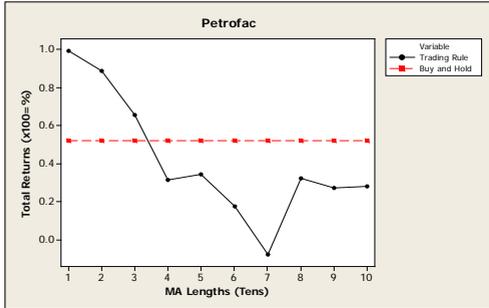
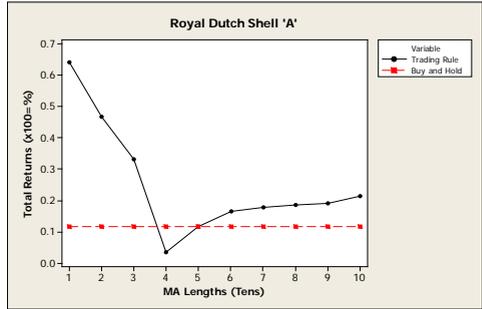
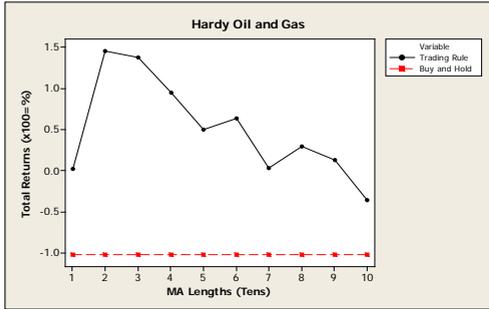
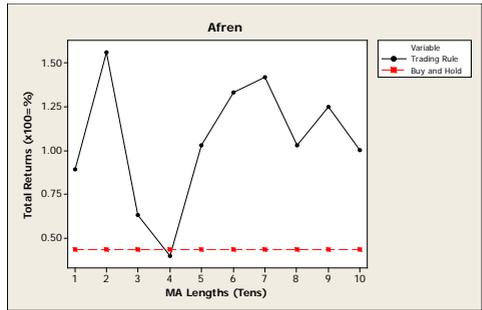
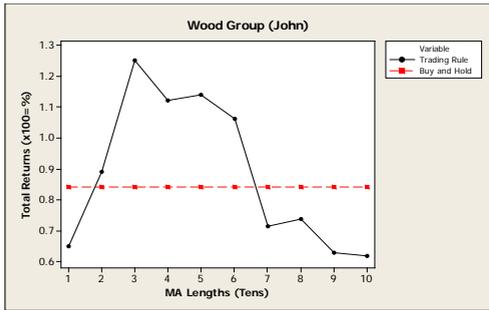
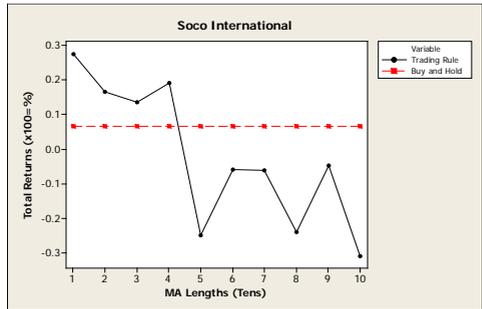
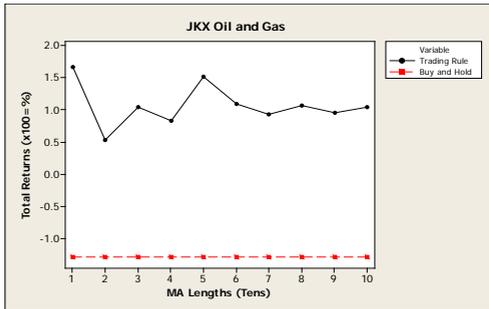
		Augmented Dickey Fuller (ADF) Test		Phillips-Perron (PP) Test	
		T-Stat	P-Value	T-Stat	P-Value
1	FTSE All Share	-26.9298	0.0000	-27.8016	0.0000
2	FTSE 100	-27.0434	0.0000	-27.6492	0.0000
3	FTSE UK Oil & Gas	-27.5932	0.0000	-27.7400	0.0000
4	FTSE UK O&G Prod.	-27.6836	0.0000	-27.7423	0.0000
5	FTSE AIM SS O&G	-25.5402	0.0000	-25.5194	0.0000
6	Amec Plc	-27.8926	0.0000	-28.7138	0.0000
7	BG Group	-22.0363	0.0000	-21.4690	0.0000
8	BP	-14.0095	0.0000	-14.0435	0.0000
9	Cairn Energy	-25.0875	0.0000	-24.5480	0.0000
10	Dragon Oil	-13.4671	0.0000	-12.2605	0.0000
11	Fortune Oil	-35.6595	0.0000	-37.9720	0.0000
12	Hunting	-20.2925	0.0000	-18.7155	0.0000
13	Premier Oil	-9.3436	0.0000	-9.3484	0.0000
14	Royal Dutch Shell-B	-13.6467	0.0000	-13.2590	0.0000
15	Tullow Oil	-17.0608	0.0000	-17.0695	0.0000
16	Aminex	-34.3535	0.0000	-35.6511	0.0000
17	JKX Oil and Gas	-11.7874	0.0000	-12.0803	0.0000
18	Soco International	-25.9464	0.0000	-25.8425	0.0000
19	Wood Group (John)	-19.7088	0.0000	-18.4200	0.0000
20	Afren	-18.8397	0.0000	-18.0106	0.0000
21	Hardy Oil and Gas	-8.8730	0.0000	-8.8302	0.0000
22	Royal Dutch Shell-A	-11.6946	0.0000	-11.5412	0.0000
23	Petrofac	-15.3649	0.0000	-15.2286	0.0000
24	Salamander Energy	-7.7000	0.0000	-7.0001	0.0000
25	Lamprell	-16.1638	0.0000	-16.1279	0.0000
26	Endeavor International Corp.	-8.9413	0.0000	-8.8794	0.0000
27	Cadogan Petroleum	-14.6592	0.0000	-14.2911	0.0000
28	Heritage Oil	-8.2063	0.0000	-8.1915	0.0000
29	Kentz	-8.7057	0.0000	-7.9914	0.0000
30	Exillon Energy	-8.4078	0.0000	-7.4121	0.0000

We also employed the methodology of Milionis and Papanagiotou (2008) to assess the performance of the various combinations of the moving averages used as a trading rule. The graphical presentation of the returns generated by various moving average trading rules and a simple buy and hold investment strategy is made in figure 1 for qualitative observations.

Figure 1. Performances of Moving Averages Trading Rules Returns against the Return from Simple Buy and Hold Investment Strategy







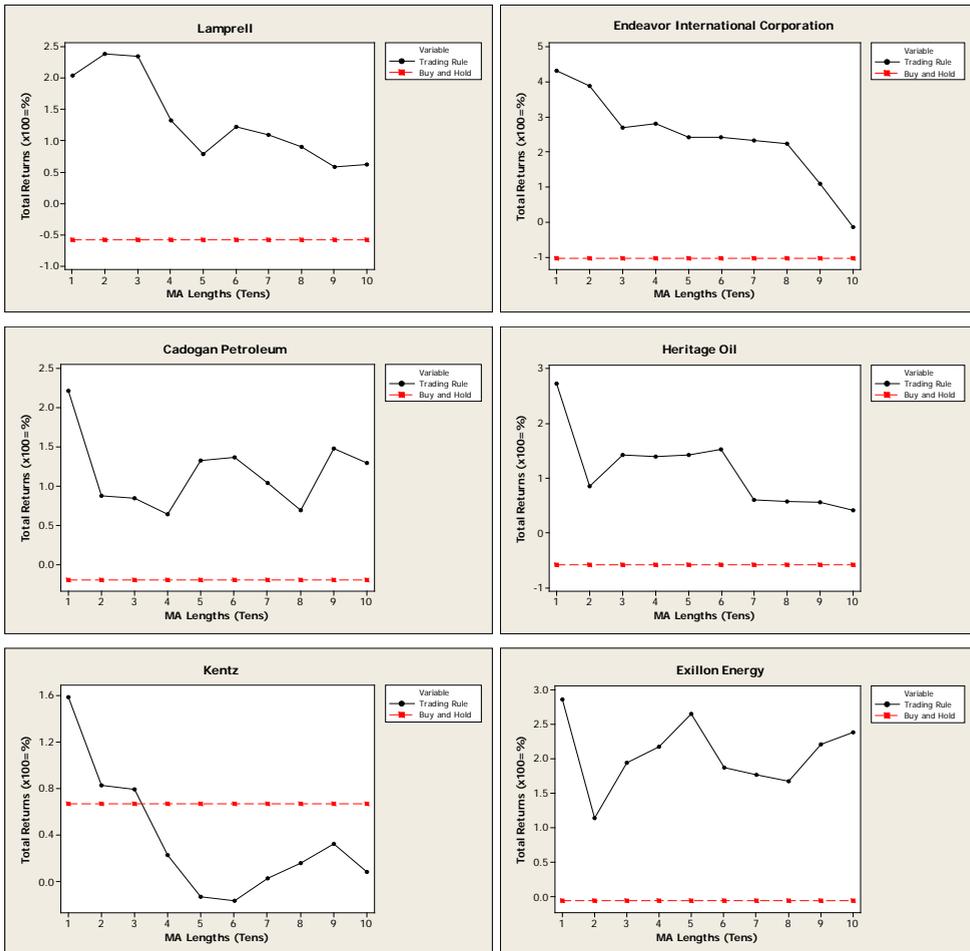


Figure 1 showed the total returns generated by every moving average trading rule (ranging from '5,10,0' to '5,100,0') against the total return from the buy and hold strategy. It is obvious from the graphs that the shorter moving average trading rule of '5,10,0' produced higher returns compared to the other longer moving average trading rules on the charts in all the FTSE share indices and the stocks of BP, Dragon oil, Premier Oil, Royal Dutch Shell 'B', Tullow Oil, JKC Oil and Gas, Soco International, Royal Dutch Shell 'A', Petrofac, Salamander Energy, Endeavor International, Cadogan Petroleum, Heritage Oil, Kentz and Exillon Energy. Other stocks such as Amec, BG Group, Cairn Energy and Wood Group that have not been mentioned above do not show superior performance of the shorter moving average trading rule. The moving average trading rules seem to outperform a simple buy and hold investment strategy in the FTSE UK Oil and Gas

index, the FTSE UK Oil and Gas Producers index, the FTSE AIM SS Oil and Gas index and in the stocks of Amec, BG Group, BP, Cairn Energy, Premier Oil, JKN Oil and Gas, Hardy Oil and Gas, Lamprell Plc, Endeavor International Corporation, Cadogan Petroleum, Heritage Oil and Exillon Energy.

4. Findings

Technical trading rules were employed on the UK oil and gas stocks to see the possibility of making returns higher than that from buy and hold strategy. Our findings in all the series suggested that the trading rule cannot provide sufficient profit to cover the brokerage cost associated with every transaction. We also employed moving average trading rules in a similar way as used by Brock et al (1992) to assess whether our findings are going to be different. However, despite the application of the ten different combinations of the moving average trading rule, it was not possible to reject the null hypothesis that the returns generated from the moving average trading rule are not different from the returns of the buy and hold investment strategy. To confirm the authenticity of our results, we tested whether the return series generated from the moving average trading rule is stationary. The results from the unit root tests conducted on the moving average (10) trading rule return series confirmed that the series are stationary and therefore authenticate the use of constant statistical properties such as the mean to assess the power of the trading rule. We also tested the assertion of Milionis and Papanagiotou (2008) that shorter moving average trading rules perform better than longer moving average trading rules. We found this trend in some of the series, but it could not be generalised to all the oil and gas stocks.

5. Conclusion

The performance of technical trading rules relative to buy and hold strategy has been an active area of research in the field of finance. The application of trading and filter rules developed to exploit the persistence in oil and gas stock returns does not provide returns which are significantly different from buy and hold strategy. Moving averages-based rules were also tested and again the application of these strategies did not provide returns which are significantly different from the buy and hold strategy. The performance of the short and long moving averages-based strategies was also measured and there was not any significant evidence to conclude on whether short moving averages perform better than the long moving averages or vice versa.

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