

Overnight Returns

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Background and Motivation

Most empirical studies of financial market returns only consider prices when the markets are open. While considerable research has examined the return process when markets are closed, this has been restricted to comparisons of means and variances. Little has considered the higher moments or the shape of the distributions of the returns.

In this research, we decompose returns estimated on the usual close-to-close basis into the returns from the close to the open and the open to the close. We consider a wide range of stock markets in this study and examine the distributional properties of the alternative returns periods.

Literature Review Returns

Weekend Effects - US

Cross (1973), French (1980), Gibbons and Hess (1981), and Lakonishok and Levi (1982).

Weekend Effects – International

Jaffe and Westerfield (1985), Jaffe, Westerfield, and Ma (1989), Agrawal and Tandon (1994).

Day of the Week Effects

Rogalski (1984), Smirlock and Starks (1986), and Harris (1986).

Literature Review Returns and Variances

Holiday Effects - US

Cross (1973), French (1980), Gibbons and Hess (1981), and Lakonishok and Levi (1982).

Close to Close versus Close to Open

Bessembinder and Hertzog (1993), Blandon (2003)

C/C versus C/O versus O/C

Compton and Kunkel (2002)

Close to Open versus Open to Close Variances

Fama (1965), French (1980), French and Roll (1993)

Literature Review - Results

Several studies have identified calendar patterns in daily returns in the U.S. stock markets. The weekend (or Blue Monday) effect first identified over twenty years ago is a calendar pattern that continues to draw much interest. In this study, we examine the international evidence for a weekend, or Blue Monday, effect.

Literature Review - Results

French (1980) first identified the weekend effect while studying daily stock returns from 1953 to 1977. French finds a “weekend effect” where Monday’s mean return is significantly less than zero, while the other weekday returns are significantly greater than zero.

Literature Review - Results

Lakonishok and Smidt (1989) test the weekend effect using ninety years of data from 1897 to 1987. Like French, they find a strong weekend effect where Monday's mean return is significantly negative. French's weekend effect has also been found in many other asset groups including futures, Treasury securities, investment grade corporate bonds, and junkbonds.

Literature Review - Results

Several intraday studies have found that most of Monday's negative return occurs over the weekend, from Friday's close to Monday's open.

Rogalski (1984) examines the U.S. stock market from 1974 to 1984 to see whether the weekend effect is a closed market effect by decomposing daily close-to-close returns into: (i) a non-trading (or close-to-open) return and (ii) a trading (or open-to-close) return.

Rogalski finds a unique twist to the weekend effect where the Monday non-trading return (Friday close-to-Monday open) is negative while the Monday trading return (Monday open-to-Monday close) is similar to the trading returns of other weekdays.

Rogalski concludes that the weekend effect is generated over the weekend when the stock market is closed.

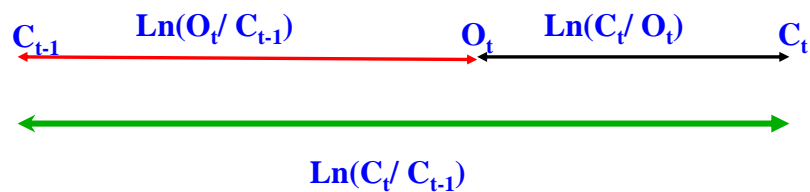
Literature Review - Results

Researchers have identified a weekend effect in international markets.

1. Jaffe, Westerfield, and Ma (1989) find a weekend effect in the stock markets of Australia, Canada, Japan, and the United Kingdom.
2. Agrawal and Tandon (1994) examine stock data from eighteen countries and find that nine countries have their lowest, and negative, returns on Monday.

Return Estimation

-24:00 -21:00 -18:00 -15:00 -12:00 -9:00 -6:00 -3:00 0:00



Compton & Kunkel (2002)

Table 1. Countries and Summary Data¹

Country	Index	Stocks in Index	Market Capitalization ²	N	Mean (%)	Median (%)	Standard Deviation (%)
Austria	ATX	22	34	873	-0.016	0.014	1.148
Belgium	BEL-20	20	246	823	0.030	0.054	1.151
Czech Republic	PX50	50	12	899	-0.031	-0.059	1.459
France	CAC 40	40	991	908	0.032	0.060	1.438
Germany	DAX	30	1,094	913	0.009	0.053	1.546
Netherlands	AEX General	25	603	916	0.006	0.026	1.380
Russia	Moscow Times	28	21	849	0.193	0.017	4.076
Switzerland	Swiss Market	20-24	689	878	0.001	0.028	1.270

¹ Each index is a market-value weighted index. All results are for the period: 1/1/98-9/10/01.
² Market-capitalization is in billions of U.S. dollars as of 1998 (Eun and Resnick 2001).

Compton & Kunkel (2002)

Table 2. General Statistics on Non-Trading and Trading Returns

Country	Non-trading Returns ¹		Trading Returns ¹		Tests of Differences	
	Mean (%)	Standard Deviation (%)	Mean (%)	Standard Deviation (%)	T-test ²	Wilcoxon ³
Austria	-0.007	0.149	-0.008	1.139	-0.02 (.983)	5420 (.467)
Belgium	0.068	0.615	-0.038	0.945	-2.76 (.006)	-16233 (.017)
Czech Republic	-0.001	1.090	-0.030	0.951	-0.60 (.549)	-9467 (.224)
France	0.046	0.895	-0.013	1.227	-1.10 (.271)	-8088 (.306)
Germany	0.083	0.565	-0.074	1.410	-3.18 (.001)	-22219 (.005)
Netherlands	0.034	0.894	-0.027	1.124	-1.24 (.215)	-13617 (.089)
Russia	0.025	3.007	0.168	2.757	1.02 (.308)	2705 (.704)
Switzerland	0.062	0.636	-0.061	1.102	-2.86 (.004)	-21521 (.004)

¹ The assumption of normally distributed returns is rejected for all countries with the Shapiro-Wilks test.
² T-test (p-value) of the trading return minus the non-trading return; A negative value indicates a larger non-trading return.
³ The Wilcoxon test statistic (p-value) for the paired difference test of the trading return minus the non-trading return.

Compton & Kunkel (2002)

Table 3. Average daily percent returns for the days of the week.

Panel A: Daily Returns (Close-to-Close)					
Countries	Monday	Tuesday	Wednesday	Thursday	Friday
Austria	0.031	0.050	-0.124	-0.140	0.114
Belgium	0.065	0.056	0.039	-0.058	0.055
Czech Republic	-0.034	0.023	-0.190	-0.046	0.096
France	0.171	0.037	-0.199	0.030	0.132
Germany	0.103	0.115	-0.215	-0.102	0.162
Netherlands	0.119	0.073	-0.083	-0.181	0.120
Russia	0.319	0.491	-0.385	0.179	0.380
Switzerland	0.071	0.029	-0.061	-0.010	0.073

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Compton & Kunkel (2002)

Panel B: Non-Trading Returns (Close-to-Open)					
Countries	Monday	Tuesday	Wednesday	Thursday	Friday
Austria	0.004	0.001	-0.017	-0.001	-0.023
Belgium	0.085	0.104	0.045	0.057	0.052
Czech Republic	0.029	0.081	-0.018	-0.127	0.035
France	0.049	0.068	0.010	0.057	0.044
Germany	0.092	0.110	0.057	0.056	0.101
Netherlands	0.119	0.045	-0.005	-0.006	0.023
Russia	0.250	0.279	-0.485	0.143	-0.038
Switzerland	0.083	0.106	0.027	0.025	0.072

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Compton & Kunkel (2002)

Panel C: Trading Returns (Open-to-Close)

Countries	Monday	Tuesday	Wednesday	Thursday	Friday
Austria	0.027	0.049	-0.106	-0.139	0.137
Belgium	-0.020	-0.049	-0.006	-0.116	0.004
Czech Republic	-0.063	-0.058	-0.172	0.082	0.060
France	0.124	-0.031	-0.209	-0.026	0.091
Germany	0.011	0.004	-0.273	-0.159	0.060
Netherlands	0.000	0.027	-0.077	-0.174	0.099
Russia	0.066	0.199	0.103	0.036	0.427
Switzerland	-0.013	-0.077	-0.089	-0.126	0.004

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Compton & Kunkel (2002)

**Table 4. Tests of the Difference
Between each Day's Non-trading and Trading Return.**

Panel A: Paired T-test¹

Country	Monday	Tuesday	Wednesday	Thursday	Friday
Austria	0.24 (.810)	0.54 (.592)	-1.21 (.226)	-1.58 (.115)	1.82 (.070)
Belgium	-1.12 (.260)	-2.13 (.035)	-0.59 (.557)	-2.09 (.038)	-0.50 (.615)
Czech Republic	-0.88 (.379)	-1.34 (.181)	-1.48 (.140)	1.68 (.094)	0.27 (.786)
France	0.62 (.539)	-0.85 (.397)	-2.20 (.029)	-0.69 (.491)	0.36 (.716)
Germany	-0.80 (.428)	-0.96 (.336)	-3.18 (.002)	-1.82 (.071)	-0.35 (.725)
Netherlands	-1.06 (.288)	-0.19 (.852)	-0.74 (.459)	-1.50 (.135)	0.59 (.555)
Russia	-0.50 (.618)	-0.26 (.795)	1.88 (.062)	-0.40 (.693)	1.56 (.120)
Switzerland	-1.06 (.292)	-2.03 (.044)	-1.44 (.151)	-1.59 (.113)	-0.55 (.580)

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Summary Statistics – C/C

Markets	Mean (annualised)	Close to Close		Kurtosis
		Std Dev (annualised)	Skew	
Dax	7,59%	23,47%	-0,2452	6,5915
CAC	4,82%	22,13%	-0,0930	5,5046
Nikkei	-2,63%	23,42%	-0,0769	9,9468
Shanghai A	4,03%	22,96%	0,3137	8,9321
Dow Jones	3,70%	19,94%	-0,1099	5,7406
S&P Futures	3,32%	18,16%	-0,2346	7,2567

Summary Statistics – C/O

Markets	Mean (annualised)	Close to Open		Kurtosis
		Std Dev (annualised)	Skew	
Dax	15,15%	9,89%	-2,829	62,004
CAC	4,33%	13,18%	-1,027	18,681
Nikkei	8,32%	6,30%	2,481	68,673
Shanghai A	14,92%	8,07%	7,291	105,692
Dow Jones	2,80%	5,40%	-1,252	53,704
S&P Futures	2,26%	8,36%	-1,163	14,578

Summary Statistics – O/C

Markets	Open to Close		Skew	Kurtosis
	Mean (annualised)	Std Dev (annualised)		
Dax	-7,57%	20,44%	-0,0049	7,3740
CAC	0,49%	18,54%	0,0953	6,1430
Nikkei	-10,94%	21,17%	-0,1548	11,9910
Shanghai A	-10,90%	21,41%	-0,0738	6,6907
Dow Jones	0,90%	18,96%	0,0133	5,5713
S&P Futures	1,07%	16,24%	-0,0947	9,9930

Summary of Results

We find that from the close to open (overnight when markets are closed), the statistical properties of returns differ significantly compared to those during the trading day.

For all markets considered, the overnight mean return is significantly higher than during the trading day

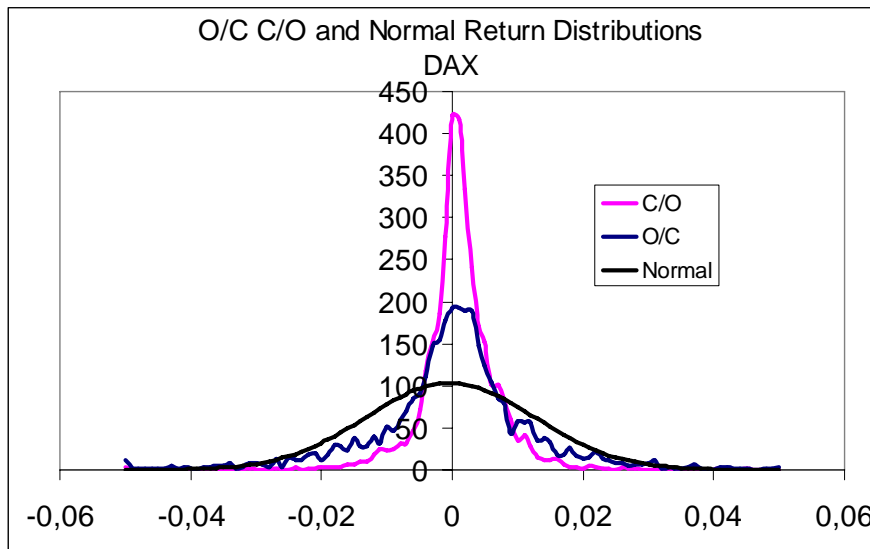
The overnight variance is also significantly lower than during the trading day.

Summary of Results

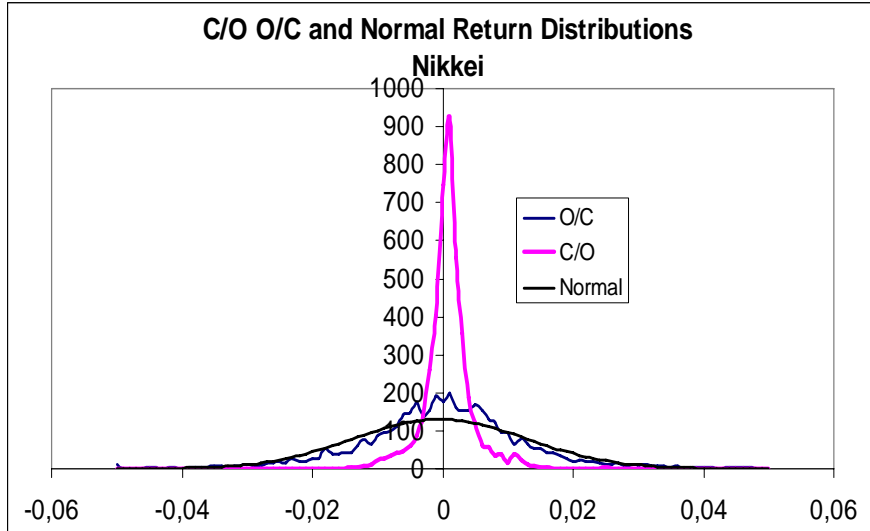
When higher moments of returns for the two alternative time periods are compared, overnight returns display significant non-zero skewness and the highest levels of excess kurtosis.

During the trading day, the return series do not display a significant skew and have relatively low levels of kurtosis approaching a mesokurtic (normal) distribution.

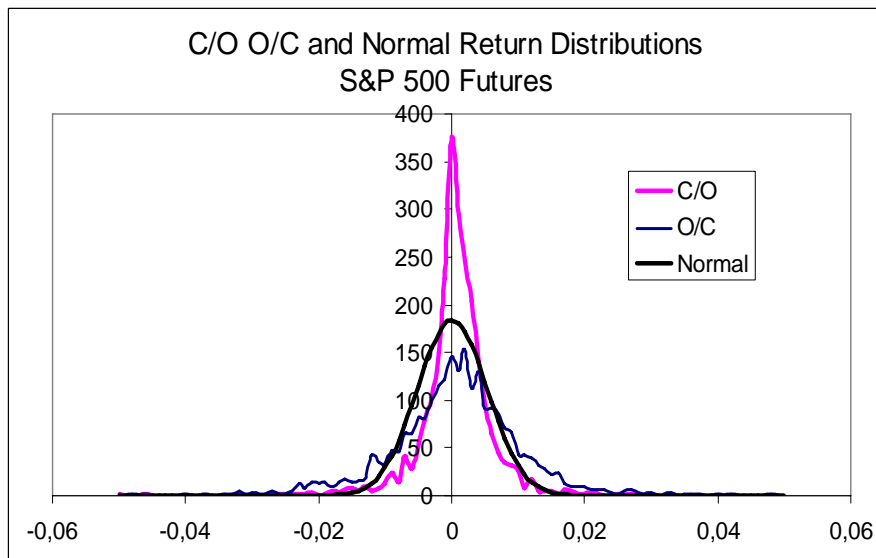
Distributions of Returns



Distributions of Returns



Distributions of Returns



Mean Decomposition

Markets	Close to Close		Close to Open		Open to Close	
	Mean		Mean		Mean	
	(annualised)	% of Total	(annualised)	% of Total	(annualised)	% of Total
Dax	7,59%	100,00%	15,15%	199,70%	-7,57%	-99,70%
CAC	4,82%	100,00%	4,33%	89,73%	0,49%	10,27%
Nikkei	-2,63%	100,00%	8,32%	316,72%	-10,94%	-416,72%
Shanghai A	4,03%	100,00%	14,92%	370,65%	-10,90%	-270,65%
Dow Jones	3,70%	100,00%	2,80%	75,61%	0,90%	24,39%
S&P Futures	3,32%	100,00%	2,26%	67,90%	1,07%	32,10%

Variance Decomposition

Markets	Close to Close		Close to Open		Open to Close	
	Variance	% of Total	Variance	% of Total	Variance	% of Total
	Dax	0,0002186	100%	3,884E-05	17,77%	0,0001658
CAC	0,0001944	100%	6,895E-05	35,47%	0,0001365	70,19%
Nikkei	0,0002177	100%	1,573E-05	7,23%	0,0001779	81,71%
Shanghai A	0,0002177	100%	2,587E-05	11,89%	0,0001818	83,54%
Dow Jones	0,0001577	100%	1,159E-05	7,35%	0,0001426	90,39%
S&P Futures	0,0001309	100%	2,775E-05	21,21%	0,0001047	80,02%

„Sharpe Ratios“

Markets	Close to Close	Close to Open	Open to Close
Dax	0,3233	1,5318	-0,3702
CAC	0,2178	0,3282	0,0267
Nikkei	-0,1121	1,3209	-0,5169
Shanghai A	0,1754	1,8482	-0,5091
Dow Jones	0,1856	0,5176	0,0476
S&P Futures	0,1830	0,2698	0,0657

Investment Performance

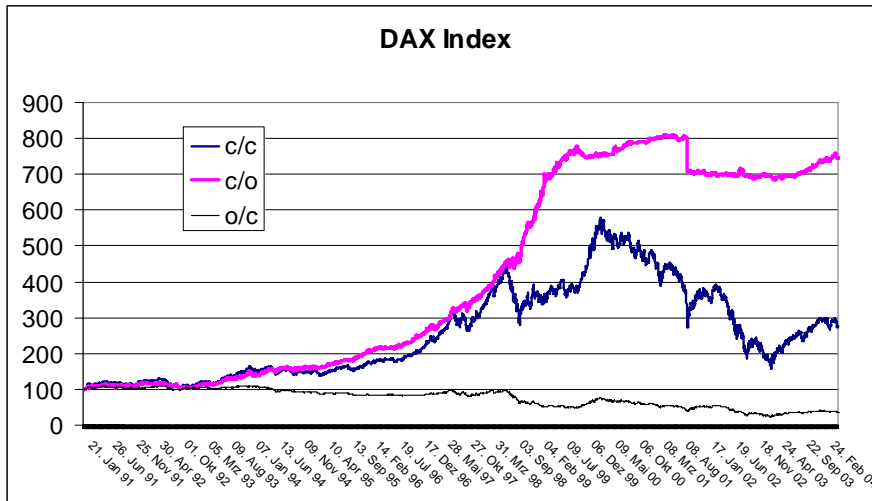
Clearly, the results suggest an “anomaly” exists in the stock markets.

To assess it this is a “real” versus a “statistical” artifact, investment strategies were employed investing in three strategies:

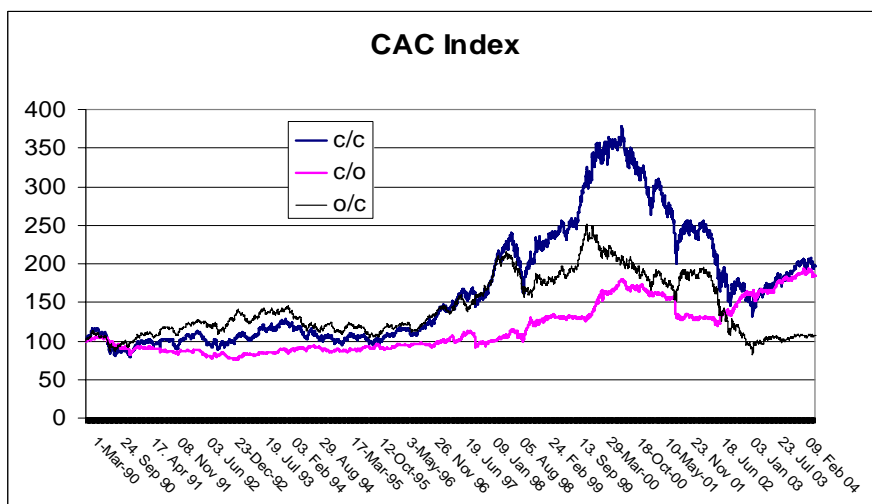
- 1) Buy and hold the Stock Index over the Period
- 2) Buy the Index at the Close and Sell at the Open
- 3) Buy the Index at the Open and Sell at the Close.

No transaction costs were assumed and no impact costs.

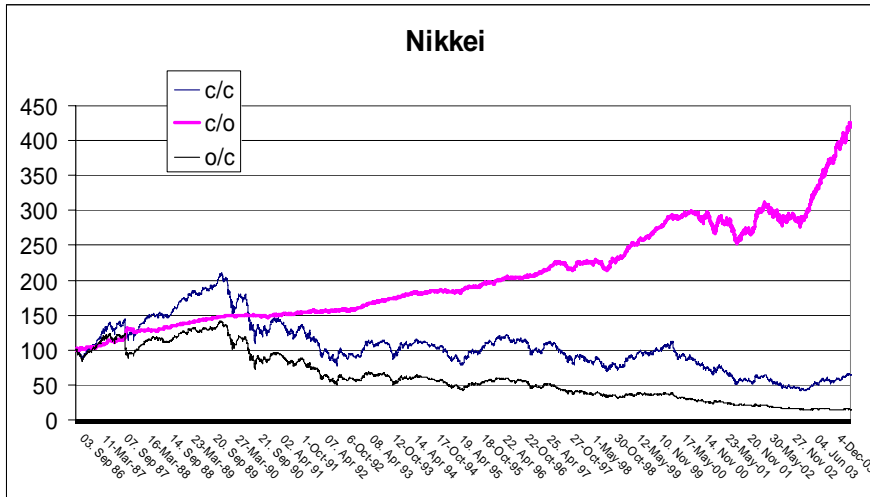
Investment Performance



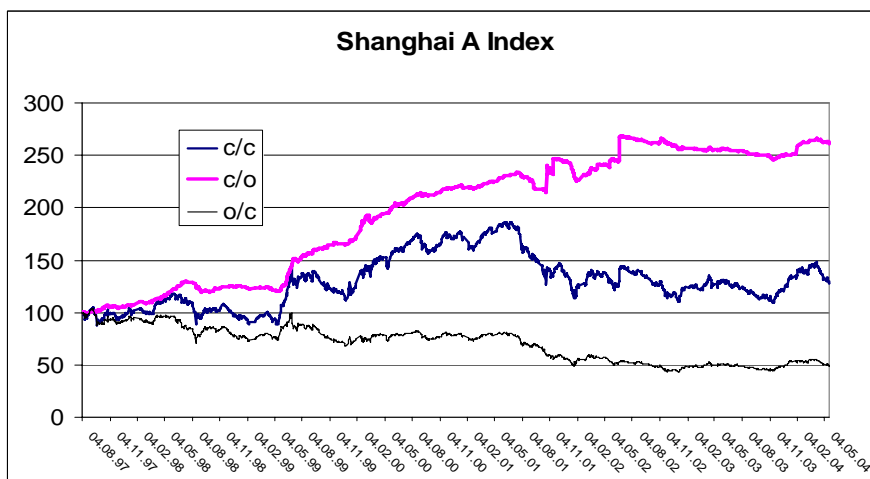
Investment Performance



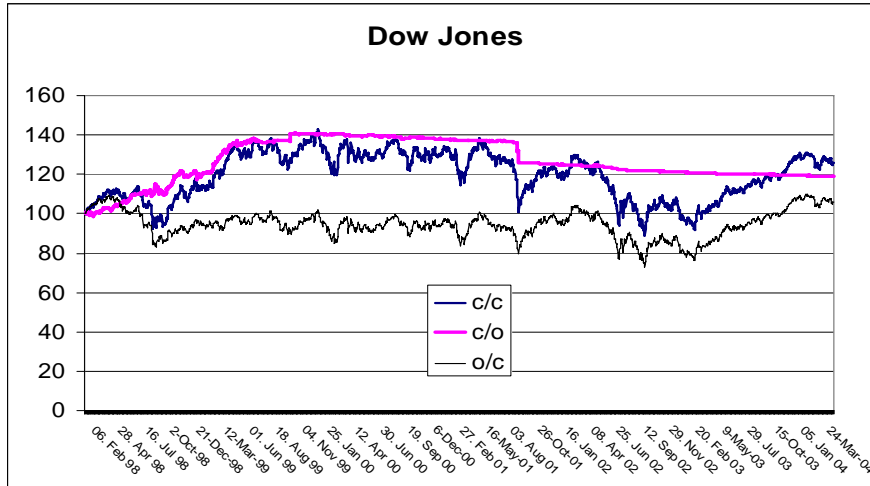
Investment Performance



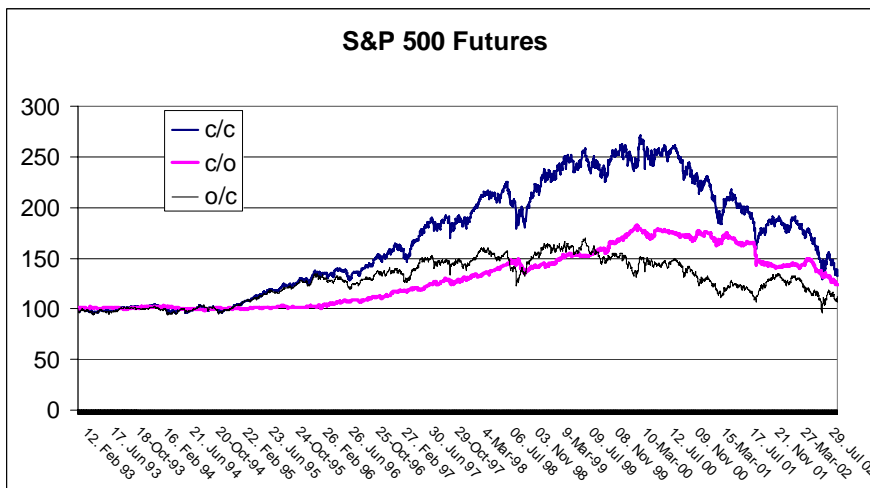
Investment Performance



Investment Performance



Investment Performance



International Overlaps

One possible explanation for the positive return when stock markets are closed is that these returns are associated with positive returns for those markets which are open.

Empirical evidence suggests that stock markets follow movements in the Asian Markets, the American markets follow the European Markets and the Asian Markets follow the American Markets.

To evaluate this, we consider the relationships between returns for three major stock markets during a typical trading day.

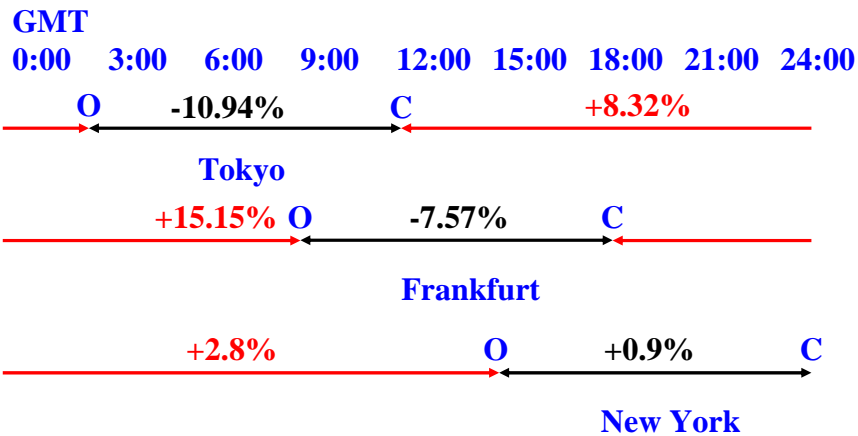
International Overlaps

Eun and Shim (1989), Koch and Koch (1991), Fischer and Palasvirta (1990), Becker, Finnerty and Gupta (1989) and Von Furstenberg and Jeon (1989) have all found that the daily stock market innovations impact the rest of the world. But the rest of the world has a slight impact on the US market.

Connolly and Wang (2000) finds the US markets exert the greatest influence on both the UK and Japanese markets, while the UK market influences the US market more than the Japanese market.

However, this represents the correlation of daily returns and does not take into account the long-term returns in each market.

International Overlaps



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Implications of the Results

Clearly, an “anomaly” exists in the stock markets.

The next question is why?

- 1) A mixture of alternative processes
 - i. **Trading Day – Diffusion**
 - i. Geometric Brownian Motion
 - ii. Stochastic Volatility – Heston (1993)
 - ii. **Over Night – Jump Process**
 - i. Cox and Ross (1976)
 - ii. Bell (1996)

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Implications of the Results

- 2) Behavioural Finance Explanation
 - i. **Trading Day – Continuous Trading**
 - i. Risks can be Hedged Away
 - ii. Over Confidence /Over Trading (Kahneman & Tversky)
 - iii. French and Roll (1986) trading causes volatility
 - ii. **Over Night – No Trading**
 - i. Stock Investors are “Trapped”
 - ii. Skewness Preferences, Return vs. Skewness
– Harvey (2003) Skewness Preferences

Implications of the Results

Clearly, an “anomaly” exists in the stock markets.

The next question is why?

- 3) Market Micro-Structure Explanation
 - i. **Trading Day – Good News**
 - i. If news tends to be positive, why are returns negative?
 - ii. Traders tend to sell out at the close to reduce risk
 - ii. **Over Night – Bad News**
 - i. If the news tends to be negative, why are returns positive?
 - ii. Day traders buy at the Opening.