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Persistence in European Stock Market Returns and Volatility

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Abstract

This paper

1. Introduction

Investors are interested in both stock market returns and their volatility. The latter is a measure of the uncertainty or risk associated with the value of an investment and can be caused by a range of factors, including the overall economic environment, shifts in market sentiment, changes in interest rates, and unexpected events such as natural disasters, geopolitical tensions, and financial crises.

An important issue for understanding the long-run behaviour of both returns and their volatility is whether or not they exhibit long memory, which

DAX 30

The Deutscher Aktienindex (DAX 30) is the German stock index for the Frankfurt Stock Exchange. It includes the 30 most influential German companies (such as BMW, Adidas, Bayer, and Allianz), again from various sectors, but it is especially well-known for those in the automotive, textile, and chemical sectors. It is weighted by market capitalization, and the list of stocks included is subject to a quarterly review. To qualify for index membership, a company must be included in the German Prime Standard market, and none can have a weight greater than 20%. The composition of the index is reviewed annually in September.

CAC 40

CAC stands for Continuous Assisted Quotation - its value varies continuously every working day every 15 seconds, and it is made up of 40 stocks of companies belonging to the top 100 in terms of capitalization. Many of those included are multinationals, and thus 45% of the index is represented by companies whose headquarters are in other countries, with German ones accounting for 21% of the index, followed by British, Japanese, and American ones. The top 10 companies included in this index are LVMH, Total Energies, Sanofi, L'Oréal, Schneider Electric, Air Liquide, Airbus, BNP Paribas Act, Essilor Luxottica, and Vinci.

FTSE 100

FTSE 100 is an acronym for Financial Times Stock Exchange 100. It is colloquially known as the Footsie 100 and is the benchmark index of the London Stock Exchange and one of the top 5 European stock indices. It began operating in 1984 including a total of 1,000 UK companies, but now only comprises the top 100 in terms of market capitalization (representing 70% of the total value of the London stock market

Table 3: Descriptive statistics for the European stock indices at the daily frequency

Index	Maximum	Minimum	Std. Deviation	Mean
CAC	0.0568854	-0.03499	0.005656	-0.00008
DAX	0.0566965	-0.04523	0.005869	-0.00004

1) without deterministic terms (i.e., setting α = β = 0 in Equation (4)),

2) with an intercept only (i.e., setting β = 0)

3) with both an intercept and a linear time trend

The values in bold in the tables are those for the specification selected on the basis of the statistical significance of the regressors.

Concerning the monthly results (Table 4), the selected model for returns includes both deterministic terms in the case of the CAC, FTSE 100, and IBEX 35 indices, and an intercept only in the case of DAX and EuroStokk50 ones. Further, the estimated coefficients for the differencing parameter d are in all cases in the I(0) interval, i.e., their confidence intervals include the value 0, which supports the null hypothesis of short-memory or I(0) returns. This implies that stock prices are I(1) and thus follow a random walk, consistently with the Efficiency Markets Hypothesis (EMH). As for volatility persistence, for both absolute and squared returns the estimates of d are all negative, and once more all of them are within the I(0) interval, and thus there is no evidence of long-memory behaviour in the volatility series.

Table 4: Estimates of d. Monthly data

i) Stock market returns			
Series	No terms	An intercept	An intercept and a linear time trend
CAC	-0.28 (-0.59, 0.16)	-0.28 (-0.59, 0.17)	**-0.43 (-0.78, 0.10)**
DAX	-0.39 (-0.64, 0.13)	**-0.42 (-0.78, 0.13)**	-0.41 (-0.79, 0.16)
EURO STOKK50	-0.38 (-0.69, 0.24)	**-0.42 (-0.83, 0.24)**	-0.42 (-0.94, 0.25)
FTSE 100	-0.28 (-0.55, 0.16)	-0.28 (-0.56, 0.17)	**-0.42 (-0.76, 0.12)**
IBEX 35	-0.39 (-0.81, 0.17)	-0.39 (-0.76, 0.17)	**-0.49 (-1.91, 0.14)**
ii) Absolute returns			
CAC	-0.17 (-0.31, 0.29)	**-0.17 (-0.42, 0.20)**	-0.23 (-0.54, 0.16)
DAX	-0.16 (-0.30, 0.18)	**-0.32 (-0.65, 0.15)**	-0.27 (-0.64, 0.20)

EUROSTOKK50 -

CAC	0.39 (0.23, 0.63)	**0.37 (0.22, 0.61)**	0.37 (0.22, 0.61)
DAX	0.45 (0.29, 0.69)	**0.43 (0.28, 0.66)**	0.43 (0.28, 0.67)
EURO STOKK50	0.42 (0.26, 0.66)	**0.42 (0.25, 0.63)**	0.42 (0.25, 0.63)
FTSE 100	0.39 (0.22, 0.62)	**0.37 (0.23, 0.62)**	0.39 (0.22, 0.62)
IBEX 35	0.37 (0.22, 0.58)	**0.35 (0.22, 0.56)**	0.35 (0.22, 0.57)
iii) Squared returns			
CAC	**0.35 (0.19, 0.60)**	0.35 (0.20, 0.60)	0.35 (0.20, 0.60)
DAX	**0.36 (0.19, 0.62)**	0.36 (0.20, 0.60)	0.36 (0.20, 0.60)
EURO STOKK50	**0.34 (0.20, 0.59)**	0.35 (0.20, 0.59)	0.35 (0.20, 0.59)
FTSE 100	**0.42 (0.23, 0.67)**	0.42 (0.23, 0.70)	0.42 (0.23, 0.70)
IBEX 35	**0.26 (0.11, 0.47)**	0.26 (0.12, 0.47)	0.26 (0.12, 0.47)

ii) Absolute returns			
CAC	0.41 (0.36, 0.47)	**0.41 (0.36, 0.48)**	0.41 (0.36, 0.48)
DAX	0.38 (0.32, 0.44)	**0.38 (0.32, 0.42)**	0.36 (0.32, 0.42)
EURO STOKK50	0.39 (0.33, 0.45)	**0.39 (0.33, 0.44)**	0.39 (0.33, 0.44)
FTSE 100	0.34 (0.28, 0.39)	**0.33 (0.29, 0.39)**	0.33 (0.29, 0.39)
IBEX	0.39 (0.33, 0.45)	**0.38 (0.33, 0.45)**	0.38 (0.33, 0.45)
iii) Squared returns			
CAC	**0.45 (0.38, 0.51)**	0.43 (0.38, 0.51)	0.43 (0.38, 0.51)
DAX	**0.36 (0.30, 0.42)**	0.36 (0.30, 0.42)	0.36 (0.30, 0.42)
EURO STOKK50	**0.41 (0.34, 0.47)**	0.41 (0.35, 0.47)	0.41 (0.35, 0.47)
FTSE 100	**0.33 (0.28, 0.40)**	0.33 (0.28, 0.40)	0.33 (0.28, 0.40)
IBEX	**0.44 (0.35, 0.53)**	0.44 (0.35, 0.54)	0.44 (0.35, 0.54)

In bold the estimates and confidence intervals for the selected model for each series.

5. Conclusions

This paper applies fractional integration methods to analyse persistence in stock market returns and volatility at different frequencies in the case of various European indices, specifically the French CAC, the Spanish IBEX 35, the German DAX, the British FTSE 100, and the Euro Stoxx 50, over the period from January 2018 to January 2023. Returns are calculated as the first differences of the logged prices, whilst absolute and squared returns are used as volatility proxies. The results vary depending on the data frequency. MoMore 595.32 841.92 re79u99.4.1[()4(ies)-118(in)-121(the)-117(c)4(a)4(se)3( )-119(of)297.891.23 T in time of Hamming (1973) and Bierens (1997) in the context of fractional integration as in Cuestas and Gil-Alana (2016), or the Fourier functions in time as in Gil-Alana and Yaya (2021), or neural networks as in Yaya et al. (2021). To test for the latter, both the Bai and Perron (2003) approach and the methods proposed by Gil-Alana (2008) and Hassler and Meller (2014) can be used, the latter being specifically designed for the case of fractional integration. Future work will address these issues.

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