Dynamics of the relation between fine wine market and financial markets

Olga Kutera[1]

Abstract

We study the dynamic relation between the global and European stock markets, fine wine market and GBP/USD exchange rate by using VAR-DCC-GARCH framework and daily closing prices of LIVX50, S&P500 and FTSE100 indices from 2010 to 2018. Three versions of univariate GARCH models, namely standard, exponential (Nelson, 1991) and GJR (Glosten, Jagannathan, Runkle, 1993) were used in order to build best fitted multivariate dynamic conditional correlation model. Results of this study reveal the long-term time-varying links in volatility between the global and European markets. We found evidence of negative correlation between fine wines market and global stock markets in few periods. Most important results provide empirical evidence that fine wines can be hedge against declines of British currency and can help investors minimize risk to build optimal portfolios.

Keywords: *DCC-GARCH, wine investment, hedge, safe haven*

JEL Classification: *C58, G10, G15*

1. Introduction

For the last couple of years, alternative investment assets such as gold, diamonds, fine wines, art have been gaining more and more popularity among investors whose are trying to protect their portfolios against adverse market conditions. Fine wines and gold obtained specific meaning in the literature and become defined as hedge or safe haven assets.

According to Baur and Lucey (2010) safe haven asset is defined as uncorrelated or negatively correlated with a conventional portfolio in times of market turmoil, not on average. If an investor adds the safe haven asset to his equity portfolio, it reduces losses in extreme adverse market conditions. A strong (weak) hedge is defined as an asset that is negatively correlated (uncorrelated) with another asset or portfolio on average. In case of gold, the volatility is asymmetric but, unlike other solid ingredients of the portfolio, responds more to positive than a negative shocks on stock market. Therefore, Baur and Lucey (2010) conclude that gold can act as a safe haven against the fall in prices on the traditional financial markets.

In our study, we want to analyse dynamics of the relationship between fine wines and global and European stock markets. Empirical results will help us verify property of fine wines to be hedge or safe haven asset.

A number of studies highlighted the benefits of portfolio diversification using alternative forms of investments. Some of them referred to the relationship between fine wines and traditional financial assets.

Masset and Henderson (2010) analysed evolution of high-end wines prices from 1996 to 2007 and studied their properties from an investor's viewpoint. Using a polynomial goal programming model, they investigated how investors' preferences affect the portfolio allocation

[1] Cracow University of Economics, Department of Econometrics and Operational Research, 27 Rakowicka St., 31-510 Cracow, Poland, olga.sobolak@gmail.com.

and the return distribution. Results have shown that wine returns are only slightly correlated with other assets and could be used to reduce the risk of an equity portfolio. They summarised wine market as heterogeneous, fragmentary and limited in liquidity, which makes it difficult to establish a precise market price for any bottle of wine.

In other studies, Masset and Weisskopf (2010) used auction hammer prices over the period 1996–2009 and analysed risk, return and diversification benefits of fine wine. Including different investor types, they confirmed that wine in a portfolio produced higher returns and lower risk than the Russell 3000 equity index during that interval. The protective property of wine emerged during times of stress on the financial markets when the wine prices drops were smaller in comparison to other equities. The authors suggested wine returns are unrelated to economic market conditions and risk.

Baur (2012) examined the volatility of gold returns for a 30-year period for daily, weekly, monthly and quarterly and different currency denominations. He demonstrated that positive shocks increased the gold returns volatility more than negative shocks which can be characterised as abnormal compared to the findings reported for the volatility in equity markets. Baur (2012) argued that this effect is related to the safe haven property of gold, because the usual explanations for asymmetric volatility such as financial leverage and volatility feedback, cannot be applied to commodities in general and precious metals in particular.

Bouri (2014) applied TGARCH model on monthly data to measure reactions of wine returns on its volatility to previous positive and negative shocks. Empirical results showed that positive shocks increased conditional volatility more than negative innovations, leading to an inverted asymmetric volatility phenomenon. That is opposite to what could be found on the stock market. Bouri (2014) followed the methodology initiated by Baur (2012) and proposed the safe haven effect. Furthermore, the evidence provided show that adding wine to an equity portfolio is rewarded by an increase in risk reduction effectiveness.

Le Fur et al. (2016) examined time-varying risk premium associated with wine investments. They used monthly calculated Liv-ex Fine Wine 1000 index from 2003 to 2010 and conditional CAPM and DCC-GARCH model to calculate time-varying betas and time-varying risk premiums for the fine wine market. The authors concluded that Bordeaux fine wines are the most traded, less volatile during no-crisis periods and more volatile in times of financial crisis.

Bouri and Roubaud (2016) applied ARMA-DCC-GARCH model and analysed time-varying correlation between the returns of fine wine and stocks in the United Kingdom using monthly data from January 2001 to February 2014. They showed that during periods of market turmoil fine wine was a very weak safe haven against the UK stock market, even though there was a negative dynamic conditional correlation between fine wine and British stocks. It suggested the effectiveness of using fine wine as hedge against movements on UK stock market.

Cardebat and Jiao (2018) analysed the long-term relationship between the fine wine market and stock markets. They applied a cointegration approach on monthly database, including the Liv-ex Fine Wine Investables Index. Results suggested significant cointegration between emerging markets and fine wine markets. The slowdown of economic growth in emerging countries, especially Asia, could be a risk to the fine wine market. It is mainly because China appeared to be one of the main drivers of fine wine markets.

Bouri, Gupta, Wong, Zhu (2018) used the mean-variance and stochastic-dominance approaches to understand the role of wine investment within a portfolio of different assets. Their main findings suggested that wine is the best investment among all individual examined assets. To gain higher expected utility when short selling is not allowed, investors preferred to invest in low-risk with-wine portfolios than equal-weighted portfolios. That study revealed the possibility of earning abnormal returns when wine was included in the investment.

In our research, we want to analyse whether fine wine is correlated with stock markets and British currency and how the correlation varies in time. Based on Baur and Lucey (2010) definitions of hedge and safe haven assets we describe hedging property of fine wine.

2. Methodology

Engle (2002) proposed a new class of multivariate GARCH models, namely the DCC model. It can be viewed as a generalisation of the Bollerslev (1990) constant conditional correlation (CCC) model in which a vector r_t of k assets returns is assumed to be distributed with mean vector of 0 and a conditional variance–covariance matrix

$$H_t = D_t R_t D_t,$$
$$D_t = \text{diag}\{\sigma_t\},$$
$$R_t = \rho_{ij},$$

where D_t is a diagonal matrix of time-varying standard deviation from the univariate GARCH model and R_t is a correlation matrix containing the conditional correlations, which do not vary over time. We denote $r_t = D_t\varepsilon_t$ where $\varepsilon_t \sim iidN\,(0,1)$ are residuals.

In contrast to constant conditional correlations, Engle (2002) allowed correlations to be dynamic and vary over time. Therefore, in (1) the correlation matrix R_t is not constant and the conditional variances of R_t must be equal to one. Other than this, requirements for the parameterisation of R_t, are the same as for H_t. The elements of D_t are modelled as univariate GARCH processes. DCC model offers a tractable way of modelling, simultaneously, both time-varying conditional volatilities and time-varying conditional correlations and the DCC-GARCH model for GARCH(M,N) order can be describe as

$$Q_t = \bar{Q}\left(1 - \sum_{m=1}^{M} a_m - \sum_{n=1}^{N} b_n\right) + \sum_{m=1}^{M} a_m\,(\varepsilon_{t-m}\varepsilon'_{t-m}) + \sum_{n=1}^{N} b_n Q_{t-n},$$
$$R_t = (Q_t^*)^{-1} Q_t (Q_t^*)^{-1},$$

where $Q_t = \{q_{ijt}\}$ is the conditional variance-covariance matrix of residuals and $\bar{Q}$ is its unconditional time-invariant variance-covariance matrix found in the first stage of the estimation process. The parameters a and b, respectively, determine the effects of shocks and dynamic correlations. (Q_t^*) is a diagonal matrix composed of the square root of the diagonal elements of Q_t.

In our examination, we use two stage estimation process (Engle, 2002). In the first step, residuals from VAR(1) are modelled by using three univariate GARCH models (basic, Bollerslev, 1986; exponential, Nelson, 1991; GJR, Glosten et al., 1993) with six different distributions (normal, t-Student, General Error Distribution, skewed normal, skewed t-Student, skewed General Error Distribution). We choose the best fitted models for each residuals series based on the information criteria. Later on, the standardised first-stage residuals are used to estimate the parameters of the dynamic conditional correlation equation (DCC-GARCH) by relying on chosen GARCH specifications. We use the R program for calculations.

3. Data and descriptive statistics

Analysis includes daily calculated rates of return of three indices and GBP/USD exchange rates over the period between March 1st, 2010 and December 28th, 2018. LVX50 index represents wine market, S&P500 and FTSE100 respectively represent changes on global stock market and European stock market.

The average rates of return are positive (FTSE100 = 0.0001, S&P500 = 0.0004, LVX50 = 0.0001). Due to several large drops in exchange rate related to United Kingdom European Union membership referendum, average return on GBP/USD is negative (-0.0001). Analysed data are skewed to the left and have asymmetric distributions with fat tail. Results of the Augmented Dickey-Fuller test show that all data series are stationary. Based on the Jarque and Bera test we can reject the null hypothesis of normality distribution at a significance level 0.01.

4. Estimation results

Kilian and Lütkepohl (2017) pointed that the appropriate choice of number of lags depends not only on the information criteria but also on the number of variables included, economic context and data frequency. Based on Shibata Information Criteria, daily frequency of our data and property to quickly respond for previous shock and we chose VAR(1) for modelling our data set.

At the first stage of the multivariate model building, we chose the optimal univariate GARCH models for every residuals data series based on the information criteria Accordingly, VAR(1)-EGARCH(1,1) model with skewed t-Student distribution was the best fit for S&P500 and exchange rates, VAR(1)-EGARCH(1,1) model with skewed GED distribution for FTSE100 and VAR(1)-GARCH(1,1) model with t-Student distribution for fine wines market.

We include these univariate GARCH model specifications in DCC-GARCH modelling. Based on a comparison of the log-likelihood values and information criteria across alternative lags and distribution specification we imply that the DCC(1,1) model with multivariate t-Student distribution as it was the best choice.

For the DCC-GARCH model, the estimated coefficients and are each positive and statistically significant respectively at level 1% (Table 1). Parameters sum to a value less than 1, indicating that the conditional correlations are dynamic and imply a persistence correlation. The volatility of recent returns has influence on the dynamic relationship between stock markets and fine wine market due to the value of the coefficient a_1. Value of the coefficient b_1 is slightly less than 1, meaning that the dynamic linkages between analysing markets can be long-term.

Table 1. Results of VAR(1)-DCC(1,1) estimation (rounded to at most four decimal places)

		Estimate	Std. Error	t value	Pr(>|t|)
FTSE100	ω	–0.3800	0.0039	–97.246	<0.0001
	α_1	–0.1395	0.0157	–8.8591	<0.0001
	β_1	0.9608	0.0035	277.083	<0.0001
	γ_1	0.1787	0.0242	7.3863	<0.0001
	skewness	0.8963	0.0251	35.754	<0.0001
	shape	1.4998	0.0641	23.402	<0.0001
S&P500	ω	–0.4293	0.0043	–100.61	<0.0001
	α_1	–0.2182	0.0178	12.241	<0.0001
	β_1	0.9557	0.0007	1399.18	<0.0001
	γ_1	0.1747	0.0087	20.1778	<0.0001
	skewness	0.8713	0.0242	35.959	<0.0001
	shape	5.8312	0.6767	8.6170	<0.0001
LXV50	ω	<0.0001	<0.0001	0.2976	0.7666
	α_1	0.0468	0.0076	6.16485	<0.0001
	β_1	0.9487	0.0066	144.649	<0.0001
	df	6.0806	0.6829	8.9047	<0.0001
GBP/USD	ω	–0.0776	0.0012	–65.282	<0.0001
	α_1	–0.0262	0.0091	–2.8976	0.0004
	β_1	0.9926	<0.0001	23589.44	<0.0001
	γ_1	0.0639	0.0022	28.4774	<0.0001
	skewness	0.9491	0.0278	34.091	<0.0001
	shape	7.1033	1.2401	5.7280	<0.0001
DCC	a_1	0.0095	0.0020	4.8054	<0.0001
	b_1	0.9843	0.0040	247.56	<0.0001
	mshape	8.5622	0.6658	12.861	<0.0001

The dynamic conditional correlations between FTSE100 and S&P500 over the sample period are consistently positive (Fig. 1). We can assume that there is positive relationship between global and European stock markets. Dynamic relationships between British currency and FTSE100 index are different (Fig. 2). It can be divided into five periods, namely from 2010 to 2013, 2013-2H2015, 2H2015-2H2016, 2H2016-2017, 2017-end of 2018. In first and fourth periods, correlation is positive and react asymmetric on index movements. When FTSE100 index is declining, dynamic condition correlation raised and in opposite case – correlation fall, when index is growing. In second and fifth periods, correlation is negative or there is no correlation. The correlation pattern is similar to FTSE100 index movements but has larger amplitude of fluctuations. Third period covers one year gap before Brexit referendum. It is easy to see that correlation is negative, although in the beginning of 2016 correlation approaches 0 in response to decline of FTSE100 index. The average correlation coefficient is close to 0 and we might assume that British currency act as a neutral asset against FTSE100 index on average.

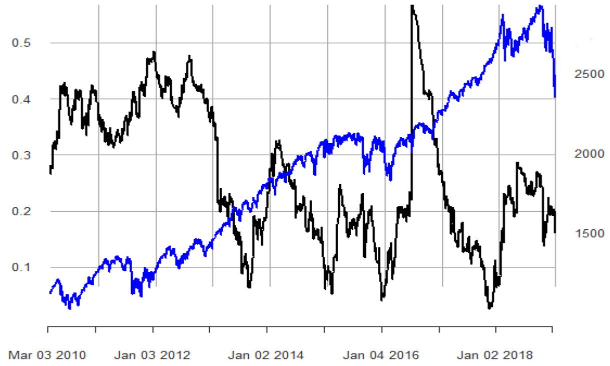

Fig. 1. DCC conditional correlations S&P500-GBP/USD (black); S&P500 index (blue)

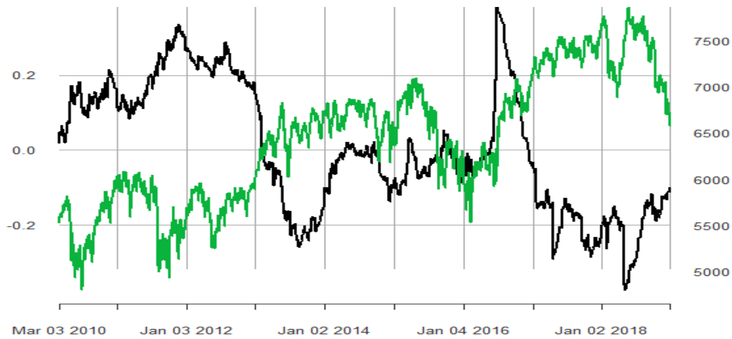

Fig. 2. DCC conditional correlations FTSE100-British currency (black); FTSE100 (green)

Correlations between fine wines and stock markets showed that there are periods when wines are negatively correlated or uncorrelated with FTSE100 and S&P500. From 2010 to 2013 fine wine market was mostly positively correlated with global stock market (Fig. 3), even though in period 2015-1H2018 correlation was negative. It is easy to capture that correlation movements are linked to S&P500 index. When stock index went down, the correlation changed from positive to negative or zero with a slightly delay. The average correlation coefficient is negative (-0.02), therefore we can assume that fine wine can be a hedge or act as safe haven asset against S&P500 index movements.

The correlation of fine wine and FTSE100 shows more periods when there is positive linkage between LVX50 index and European stock market (Fig. 4). It can be explained by the fact that both indices are quoted in pounds sterling and both listed on exchange located in London. The correlation movements are similar to FTSE100 index fluctuations as in the case of S&P500 index. When there is a drop on European stock market, the correlation changed from positive to negative or zero. Although, the average correlation coefficient is positive (0.02), fine wine cannot be a hedge or a safe haven asset. We might assume that it can act as a neutral asset against FTSE100 index movements.

Correlation of LVX50 and Pound sterling to American dollar exchange rate is mostly negative (average correlation coefficient is -0.09). Conditional correlations vary over time and are positive in periods of British currency appreciation and negative when GBP/USD exchange rate is declining (Fig. 5). We can assume that fine wine can be a hedge or act as safe haven against depreciation of the British currency.

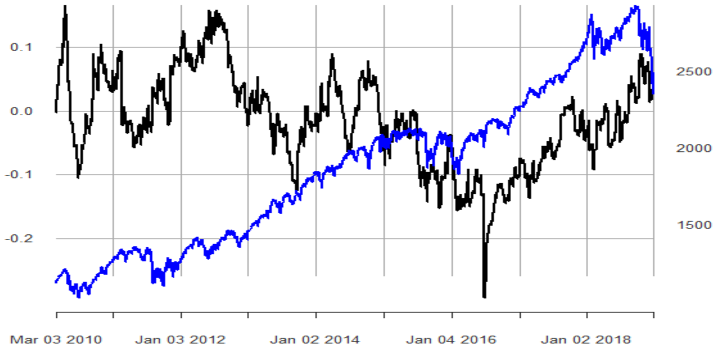

Fig. 3. DCC Conditional correlations S&P500-LVX50 (black); S&P500 index (blue)

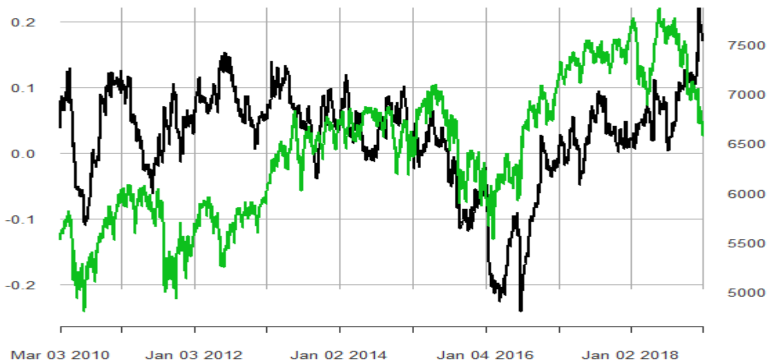

Fig. 4. DCC conditional correlations FTSE100-LVX50 (black); FTSE100 index (green)

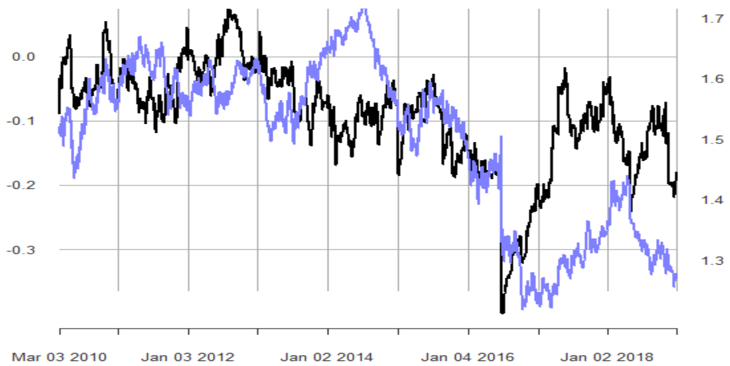

Fig. 5. DCC conditional correlations British currency-LVX50 (black); GBP/USD exchange rate (light blue)

5. Conclusions

This article examines the dynamics of the relation between daily fine wine prices, two stock indices and GBP/USD exchange rate using the dynamic conditional correlation approach.

First we used a VAR(1)-GARCH(1,1) to model the different error distribution margins. The adoption of this filtering method is motivated by the stylized facts of our data including serial dependence and volatility clustering. Estimated univariate GARCH models were used to build multivariate GARCH model, namely DCC model. Parameters of dynamic correlation were statistically significant in all cases indicating the importance of time varying co-movements. Results of our study reveal the long-term time-varying links in volatility between the global and European markets. We found evidence of property of fine wine to be hedge to global market and British currency. Moreover, fine wine can act as safe haven asset against S&P500 index and GBP/USD exchange rate declines. In the case of European stock market, both British currency and fine wine cannot be hedge and they can have only status of neutral assets which is opposite to Bouri and Roubaud (2016).

Our studies are an important contribution to the study of wine hedging properties. As investors tend to diversify their investment across different assets, results of our analysis would be crucial input for investors in portfolio diversification and hedging their stock positions in traditional financial assets by investing in fine wines.

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