



UNIVERSITATEA  
LUCIAN BLAGA  
— DIN SIBIU —

Doctoral school of Social Sciences  
Field: **ECONOMICS**

Thesis

**Modelling and forecasting Sterling Pound (GBP) and Euro (EUR) exchange rates volatility using ARCH/GARCH models in the Brexit context**

PhD student:

**Darie Flavius-Cosmin**

PhD coordinator:

**Prof. Tache Ileana**

## Table of Contents

Abstract .....	3
Acknowledgements .....	4
Chapter 1: Introduction .....	10
1.1 Background .....	11
1.2 Research Questions .....	18
Chapter 2: Literature Review .....	20
2.1 Theoretical Framework .....	21
2.1.1 Statistical Nature of Volatility and Correlation .....	23
2.1.2 Constant and Time-Varying Volatility Models .....	26
2.1.3 Constant and Time-Varying Correlation Models .....	31
2.1.4 Implementation of Volatility and Correlation Models .....	32
2.2 Critical Empirical Literature .....	34
2.2.1 Introduction .....	34
2.2.2 Suitability of advanced Volatility Forecasting Methods .....	39
2.2.3 Modelling and measuring volatility of foreign exchange-rates .....	44
2.2.4 Literature Review Summary and gaps in the existing literature .....	62
Chapter 3: Methodology and Data .....	63
3.1 Introduction to Generalized Autoregressive Heteroskedasticity (GARCH) .....	67
3.2 Volatility clustering .....	73
3.3 The Leverage Effect .....	74
3.4 Data .....	74

<b>3.5 Methodology Summary .....</b>	<b>75</b>
<b>Chapter 4: Empirical Results and Analysis .....</b>	<b>76</b>
<b>4.0 Introduction and Preliminary Analysis .....</b>	<b>77</b>
<b>4.1 The GARCH (1, 1) volatility estimates of GBP/USD and EUR/USD exchange-rates pairs between September 2008 to November 2019 .....</b>	<b>84</b>
<b>4.2 The GJR-GARCH volatility estimates of GBP/USD and EUR/USD exchange-rates pairs between September 2008 to November 2019 .....</b>	<b>97</b>
<b>4.3 The EGARCH volatility estimates of GBP/USD and EUR/USD exchange-rates pairs between September 2008 to November 2019 .....</b>	<b>109</b>
<b>4.4 Summary of Empirical Results .....</b>	<b>121</b>
<b>Chapter 5: Conclusion .....</b>	<b>122</b>
<b>References .....</b>	<b>128</b>

**Keywords:** GARCH (1, 1), EGARCH, GJR-GARCH, modelling and forecasting, exchange rates

**Abstract**

This thesis examines the movements of the GBP/USD and EUR/USD exchange rates during major economic and political distress namely the 2008 financial crisis which influenced the worldwide economics and Brexit. Also, with regards to Brexit, this thesis emphasizes the causes which dramatically decreased the value of the pound to the lowest historical value by

providing answers to the following research questions and objectives: 1) An examination of the behaviour of volatility considering GBP/USD and EUR/USD exchange rates from September 2008

to December 2015 in order to assess the impact of the financial crisis and further, to compare the results with period before the Brexit vote; 2) assess the effectiveness of the univariate GARCH models used namely GARCH (1, 1), EGARCH and GJR-GARCH; 3) a comparison between the results of these 3 models from September 2008 to December 2015 and January 2016 to November 2019 will be made in order to verify how the Brexit vote from May 2016 influenced the volatility of GBP/USD and EUR/USD exchange rates; and 4) to analyse the impact of sterling's fall on the UK equities, gilts and UK current account. Furthermore, the answers to these questions will help identifying whether the slump in the value of GBP was a domestic problem or could spread internationally, especially within the European Union.

Furthermore, this thesis investigates whether different specifications of univariate GARCH models can usefully forecast the volatility in the foreign exchange market. The study compares forecasts from both symmetric and asymmetric GARCH models for GBP/USD exchange-rate and EUR/USD exchange-rate with the realized volatility for the same currency pairs obtained from Bloomberg and Investing. The data set covers the period between September 2008 to November 2019. The data is divided into two periods; one for the period between September 2008 to December 2015 encompassing the 2008 Great Recession as the major event and the other for the period between January 2016 to November 2019 encompassing the slump of the pound to a 31-year low as the major event. The results of this paper reveal that the GARCH (1, 1) and EGARCH estimations are close to the realized volatility. However, the EGARCH model provides the best fit for the sample used while the GJR-GARCH provides the worst. The results strongly suggest that the EGARCH is the best model out of the three presented above to forecast exchange-rate volatility followed by the GARCH (1, 1) model.