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Did Brexit change the behaviour of the UK's financial markets?

By Bachar FAKHRY †

Abstract. The recent UK referendum results and subsequent initiation of Article 50 in the 2007 Lisbon Treaty set in motion the UK's withdrawal from the European Union, acknowledge as Brexit. The result and subsequent action were unprecedented and for many unforeseeable. Apart from the political instability and division of the country, the complicated and long process of Brexit have both economic and financial consequences. With this in mind, we analyse the impact of Brexit on four main British financial markets: Equity, Foreign Exchange, Gold and Sovereign Debt; using daily data. We extendthe variance bound test proposed by Fakhry & Richter (2018) underpinned by an asymmetrical C-GARCH-m model of volatility. Unlike many in the past, we placed the emphasis on the stable markets; thus introducing the stable marketpre-condition hypothesis. We analyse the long and short run effects of Brexit on the stability of the UK's financial market. Our results hint at a certain impact on the UK's financial market in both the long and short runs on the market stability and hence efficiency. This seems to be dictated by the reaction of market participants to uncertainty surrounding the future of the UK
Keywords. Volatility test, Asymmetrical C-GARCH-m, Financial markets, Brexit.
JEL. C12, C58, D81, G01, G14, G15, G18, G40.

1. Introduction

In an unprecedented move, on 23 June 2016, the UK voted to leave the European Union by a margin of 51.89% to 48.11%. The result signalled the start of the so-called Brexit process whereby the negotiations over the withdrawal of the UK from the European Union could start. This was initiated by the UK's government on 29 March 2017 when they invoked Article 500F0F[1] of the 2007 Lisbon Treaty1F1F[2] which set out the guidelines and conditions of a member state withdrawal from the European Union.

Conversely, according to Hobolt (2016), in the wake of the Brexit vote the financial markets reacted quickly with the pound plunging to a 31-year low against the dollar and the global stock markets losing over two trillion dollars. This would hint at the overreaction hypothesis being in play in the financial market in the aftermath of the Brexit vote. However, in recent years the global political and economic environment have changed, mainly due to the global financial crisis and ensuing economic downturn. The

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resulting Brexit vote was partly the product of this changed in the environment. In essence, this may have had an impact on the market participants making them highly reactive to any news that brings added uncertainty.

According to a number of articles including Dorling (2016), Hobolt (2016) and Inglehart & Norris (2016); the signs were there from the start. Inglehart & Norris (2016) state that two theories come into play as for the rise of populist policies: the economic insecurity perspective and culture backlash thesis. At the heart of both these theories are common grievances such as immigration, integration and globalisation, as hinted by Hobolt (2016) and Dorling (2016). A reflection of the Brexit vote would illustrate this, Dorling (2016) argues that the 59% of the middle classes voted to leave the EU as opposed to 24% from the poorer classes.

As stated by Hobolt (2016), in truth the Brexit vote highlight a divide not just among the British but across Europe which resulted in the results of recent general elections in Europe such as the French and German. It is worth remembering that financial markets react to political instability which goes to the heart of the increasingly reactive nature of the UK's financial markets in the aftermath of Brexit. The results of the Brexit vote highlighted major political issues and divisions in the UK, this instability was confounded by the following general election which produced a hang parliament at a time when the UK needs a strong government. As highlighted by Taylor (2009) and Carmassi & Micossi (2009), often financial markets tend to react to uncertainty and miscommunication by governments. In the run-up to the referendum and, to a certain extent, aftermath of the Brexit vote; the conflicting statements and confusions not only by members of the British government but also by members of the EU, as hinted by Hobolt (2016), led to a highly reactive financial market.

Was the Brexit result a shock to the market, in a way it should not have been as Hobolt (2016), Dorling (2016) and Inglehart & Norris (2016) identified, the indicators were there. However, even the politicians advocating Brexit were not sure of the results, as stated by Hobolt (2016), and many in the financial market as did many political commentators thought that the threat to economic stability and certainty would defer enough from voting for Brexit.

With this change in the environment across different aspects in mind, we analyse the UK's financial markets to determine the change in the market's environment in the aftermath of the Brexit vote in the long and short runs. We use the daily prices on four indices representing the Equity. FX, commodity and sovereign debt markets. Using an asymmetrical C-GARCH-m variance bound test based on the test used by Fakhry & Richter (2018) to analyse the feedback effect in addition.

A major contributory factor to this paper is as hinted in Fakhry (2016), since the variance bound test indicates that if a market is inefficient then it is deemed to be too volatile to be efficient. Simply put, this means that for a market to be efficient the pre-condition is a measurable stability status.

Hence in short, the variance bound test is a test of this stability pre-condition. Therefore, we differ from many in the past by using the variance bound test to analyse the stablemarketpre-condition hypothesis and hence the efficiency of the market, whereas most have used the variance bound test to analyse the efficiency of the market, examples are Fakhry & Richter (2015, 2016a, 2016b, 2018) and Fakhry *et al.*, (2016, 2017). Thus the key to our analysis is using the variance bound test to analyse the stability of the markets which is of greater importance than the efficiency. However, the stability status of any market during any observational period would naturally indicate the efficiency of the market.

There are a number of further contributions, we make to the literature on financial econometrics and the Brexit debate. The first and most important of which is that this paper is unique in that it is the only, thus far, to analyse the impact from Brexit on the reaction of the market participants in the UK's financial markets. For this extent, we extend the variance bound test first proposed by Fakhry & Richter (2018) to also analyse the feedback effect, thus using an asymmetrical C-GARCH-m model to analyse the different behaviour of price volatility and the impact of Brexit on the stability of the market. Furthermore, the paper also contributes in using four major UK markets to determine the true extent of the impact from Brexit on the UK's financial market, following from Fakhry & Richter (2018). Finally, the paper is thus far the only paper to carry out a timeline analysis on the impact of Brexit on the UK's financial market.

We found evidence suggesting that there were some changes in the general behaviour of the financial markets in the aftermath of the Brexit vote, especially in the short run. However, as we suspected, the evidence did point to a limited change in the behavioural factors of the price volatility which suggests that the markets have not fully recovered from the recent financial crises including the sovereign debt crises. Yet our analysis seems to hint at a hike in volatility across all four financial markets in the immediate aftermath of the Brexit vote.

We conclude while the Brexit vote did impact the UK's financial market in the short run and slightly in the long run. However, a big question is whether this was a continuation of the market participants reaction to uncertainty during the recent financial crises or a new period of uncertainty bought about by Brexit. Certainly, there is some evidence pointing to the existence of the continuation factor. The issues of miscommunication and confusion from the government illustrate that policy makers have not learnt the lessons of the recent financial crises. Based on our findings, we advise the policy makers to make clear and decisive statements. We also recommend an agreement among all the policy makers to put forward a unified voice and plan. It is essential not to repeat the same mistakes made during the financial crises and early parts of the Brexit process.

The rest of this paper is divided into six sections; the first two sections are reviews into the impact of Brexit on the economy and financial markets. The third section is the methodology which precedes the data description.

We then provide our empirical evidence of the impact of Brexit on the financial market. Concluding the paper with the conclusion.

2. A literature review of the impact of Brexit on the UK's economy

Although this paper is essentially about the behaviour of financial markets during the uncertainty of Brexit. It is important to observe that the real impact of Brexit on the UK's financial markets comes not from the UK leaving the EU but from the effect of Brexit on the UK's economy. As we will see, the UK's economy is predicted to contract by anything up to 5% in the aftermath of Brexit in accordance with reliable sources. Of course, these predicted statistics are based on a number of scenarios made before the UK's government decision on which policy to pursue, we now know that the UK is heading to an EU/UK free trade Agreement or failing that a hard Brexit on the 31st March 2019. So, the economy is likely to be the major source of price volatility and uncertainty in the short run, this is confirmed by the UK's Economic Policy Uncertainty[3]I as illustrated by Figure 1, especially in the aftermath of the actual Brexit. Additionally, much of the uncertainty in the financial market comes from the confusions and miscommunication about the economy. Hence a review of the literature on the economy is vital in understanding this main source of uncertainty and volatility in the aftermath of the referendum.

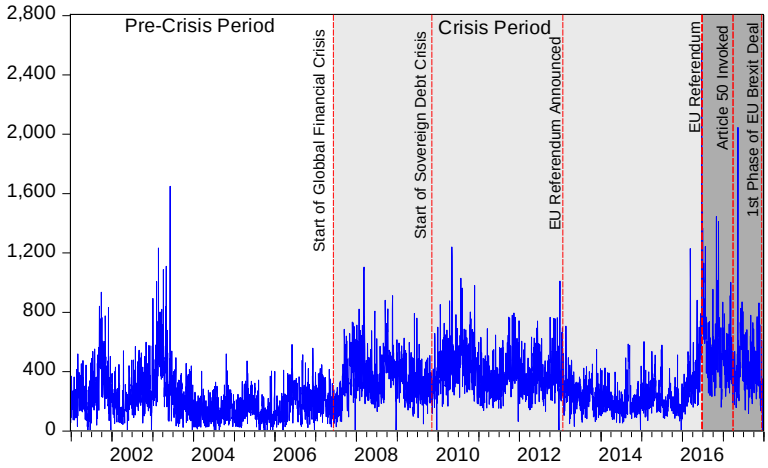

Figure 1. *UK Economic Policy Uncertainty Index*

A review of the options would suggest that there were only three realistic options available for the UK and EU. As highlighted by a number of articles such as Erken *et al.,* (2017) and Sampson (2017), the options included: Soft Brexit, Hard Brexit and an EU/UK free trade agreement. As hinted by Brakman *et al.,* (2017), the problem is that negotiations between the UK and EU on a new trade deal are likely to be confrontational and difficult, mainly due to politics on both sides. And as stated by Niederjohn *et al.* (2017, p.86), a key issue is that members of the EU:

> "seem determined to make an example of Britain for fear that if the UK negotiates too good a deal, other nations will vote to leave too"

This was illustrated on 6th December 2016 by a speech from the EU's chief negotiator, Michel Barnier, in a press conference on Brexit in which he said:

"Cherry picking is not an option"

According to Erken (2017), the soft Brexit option would mean that the UK retains its membership in the single market under the European Economic Area or EEA agreement but leave the Custom Union. As Sampson (2017) states, this would mean the UK would continue to get free market access for goods, services and capital across the EU. However as illustrated by Sampson (2017), this would also mean having to sign to a free movement of labour, which was one of the main reason for the Brexit vote according to Hobolt (2016) and Dorling (2016) and contributing to the EU budget. Conversely, the EEA also entails the adoption of all EU legislation regarding the single market as hinted by Sampson (2017). And the UK has already signalled that it will not pursue this avenue as confirmed by the secretary for the Department of Exiting the EU, David Davis MP in a speech to the House of Commons on 7th September 2017:

> "The UK will no longer participate in the EEA agreement once it leaves the European Union"

Adopting the hard Brexit option would mean a complete and total divorce between the EU and UK without any trade agreement, as hinted by Erken *et al.,* (2017). According to Sampson (2017) and Erken *et al.,* (2017), this would result in a World Trade Organisation's trade agreement between the EU and UK, along the lines of the agreement which both the US and China have withthe EU. Under the agreement goods would be subject to most favoured-nation tariffs. As indicated by Sampson (2017), the average EU tariff as of 2015 was 4.4%. However, as hinted by Sampson (2017), there has not been a similar agreement for the trade in servicesincluding the financial sector. Conversely, as hinted by Chang (2017), the WTO trade agreement forms the basis of the argument that the UK could do better outside the EU put forwards by the EFT3F3F[4].

The third option is to negotiate a new trade agreement with the EU as hinted by Erken *et al.*, (2017) and Sampson (2017). As illustrated by Sampson (2017), the agreement could take a number of shapes. However, as illustrated by Sampson (2017), in order to maintain the advantage of being part of the single market; most EU trade deals, such as the EU-Canada agreement, do much less to harmonize economic regulations and do not include free or reduced tariff access for service providers. Consequently, any free trade agreement would come with a higher trade cost to the UK. And as Sampson (2017) and Kierzenkowski *et al.,* (2016) hint negotiations for a free trade agreement are unlikely to be concluded before March 2019, the EU/Canada negotiations took 8 years. This point is also alluded to by Busch & Matthes (2016) who states that any negotiation on a new trade deal with the EU or any other country could take a long period

of time. Conversely, in an interview with Belgian newspaper, De Tijd on 24th October 2017, Michel Barnier warned that a trade deal between the EU and U.K. would take three years to negotiate and may unravel, stating:

> "Three years if we start talking in December. It comes with risks too, because all parliaments have to give approval [to a new deal]."

However, the negotiations for a new trade agreement between the EU and UK could follow existing templates with other countries. As illustrated by Sampson (2017), the UK could follow the Turkish template and join the custom union, this would alone would not solve the key issues of inner-border barriers and services trade. It would also have the disadvantage of preventing the UK from negotiating with non- EU nations. Another option would be to follow the Swiss template with tighter integration, effectively meaning that Switzerland is in a single market in terms of goods. However, this again means that the UK will have to adopt EU economic legislations, freelabour movement and contribute to the EU budget. Despite these concessions, EU/Switzerlandagreement didn't include services; in essence putting a block on the Swiss banking industry within the EU.

The importance of this last statement is underlined by analysing the dependency of the UK's economy on the financial services industry. According to Armour (2017), the financial services sector generates between 7 to 12 percent of GDP, it also accounts for 11% of total tax receipt and employs 7-12 percent of the total workforce. Additionally, the financial service sector is responsible for the biggest trade surplus of any sector as highlighted by Armour (2017). The issue, as illustrated by Armour (2017), isthat about 24% of the total revenue is dependent on intra-EU operations. Hence a free trade agreement without including services or at the very least financial services would be detrimental to the UK's economy. However, in a speech by Michel Barnier in a press conference on Brexit negotiations dated 18th December 2017, he said:

> "There is no place (for financial services). There is not a single trade agreement that is open to financial services"

Nevertheless, it is dangerous to understate the importance of the UK's financial services to the EU as illustrated by Armour (2017). Furthermore, a disagreement on whether to include financial services in the final deal has the potential to cause high levels of uncertainty and volatility in the EU's economy as Belke *et al.*, (2016) hints, hitting the GIPS countries the most.

The literature on the estimated impact of Brexit on the economy of the UK varies with each option and depends on the initial view point of the author, a point illustrated by Busch & Matthes (2016) and Chang (2017). As Busch & Matthes (2016) argue a large amount of research have been done on the economic impact of Brexit on the UK, the results range from significant benefits to marked losses. With the more reliable researches predicting a loss of between 1 and 5 percent of GDP. Brakman *et al.*, (2017) also alludes to this variety of results,the rebalancing of trade will more likely reduce trade and economic welfare, estimates range from 1.5% to 7.0% of GDP depending on the type of Brexit. Chang (2017) states there are

a number of estimates of the impact of Brexit on long-term economic growth, ranging from pessimistic to optimistic:

- the LSE and HM Treasury predict a decrease in growth of 7%
- OCED with a negative growth rate of 5%
- CBI/PwC, NIESR and Oxford Economics hint at a 3% decrease.
- The only optimistic view was from the EFT with an increase in growth rate of 4%. It must be stated that this optimistic view relies on the full uniliteral adoption of the WTO free trade agreement which many critics have slated as "*far removed from reality*", Chang (2017, p. 13).

Dhingra *et al.,* (2016) states that depending on the type of Brexit, the short run loses would be between 1.3% and 2.6% on economic growth. If the UK decides to unilaterally adopt the FTA, economic growth would be reduced by 1% to 2.3%. In the long run the cumulative effect on economic growth from Brexit could be around -6.3% to -9.5%.

Erken *et al.,* (2017) show that in all three options the UK will experience a recession immediately after Brexit. The different is that in the long run the decrease would vary in size with a free trade agreement the reduction would be 2.5%, soft Brexit would produce a fall of 10% and hard Brexit would decrease the growth by 18%.

As put by Chang (2017), the reality of the situation is unless the UK can somehow maintain full access to the EU market without a high price, Brexit could have a sustained negative impact on the economy. However, as suggested by Gudgin *et al.,* (2017) while the losses in the UK economic growth are inevitable, the size of these losses could be offset by three factors: a lower sterling FX rate, fiscal stimulus policies and monetary expansionary policies.

A further consequence of Brexit, as Emerson *et al.,* (2017) hints, is that many companies, especially those in the services industry, are considering redirecting their investment from the UK to the EU to benefit from being inside the EU. Hence, Emerson *et al.,* (2017) points to studies by HM Treasury and the OCED hinting that when accounting for Foreign Direct Investment, the economic growth loss could be even greater at 7.5% in the long run that is an average of 0.75% annually.

3. A Literature review on the reactions of market participants to Brexit

The financial markets are highly reactive to any event inducing uncertainty. The key here is the interpretation of events during the Brexit negotiations and the economic statistics. As elegantly put by Bernard Baruch (Lee *et al.,* 2002, p.2277),

> "What is important in market fluctuations are not the events themselves but the human reaction to those events."

On 20 February 2016, the UK's prime minister announced the date of the EU referendum, the following Monday the pound fell by approximately 2% and 1.5% against the dollar and euro respectively. As Haan *et al.,* (2016) points some have suggested that the hike in volatility and decrease in the

pound value were to be expected in the financial market during the period of the EU referendum and that the financial markets would get increasingly volatile as the date get closer and thereafter. Others put the run on the British pound as just an overreaction and pointed out that financial markets are by their nature volatile. In this part of the literature review, we will review the theoretical and practical literature on the reaction of the market participants during the early stages of the Brexit process including the EU referendum and the aftermath. We will also review the limited empirical evidence of the reaction. Finally, we will review the academics views of Brexit.

As stated by Carmassi & Micossi (2010), it is not uncommon for financial market to grossly overreact; an example is the Eurozone sovereign debt crisis which started with Greece. The funny thing is Greece's public debt is a tiny proportion of the Eurozone total debt and banks' capital, yet the crisis grew into a full blown Eurozone sovereign debt crisis. As hinted by Collignon *et al.,* (2013), conflicting views on the solution to the sovereign debt crisis between key members and an initial lack of will to take action sent contradicting signals to market participants. This was further enhanced by each member state putting its own interest ahead of the EU's. And as stated by Carmassi & Micossi (2010), at the heart of the Eurozone's sovereign debt crisis was the big issue of political miscommunication and confusions. In fact, as highlighted by Collignon *et al.,* (2013), the issue of political miscommunication and confusion was the leading reason for market participants lack of willingness to hold the Greek sovereign debt and more importantly price the asset accordingly, this led to a hike in the required interest rates or yields. Mainly due to the perceived risk of default. In essence it was this political miscommunication and confusion which was at the heart of the contagion effect and the duration of the crisis.

Given as illustrated previously by the comments of those involved in the Brexit process, be it during the referendum or the negotiations, once again political miscommunications and confusions seem to be at the heart of the uncertainty within the financial markets. As highlighted by Gade *et al.,* (2013), political miscommunication does tend to have a negative asymmetrical effect on financial markets, thus meaning that negative communication has an increased impact on financial markets than positive communication. And as hinted by Gade *et al.,* (2013) the impact of the political communication on the financial markets is highly susceptible to the attributed person/organisation, this means the financial markets would react more heavily with the levels of importance of the originating person/organisation is to the event. In short, there seem to be a positive correlation between the importance of the originating person/organisation and the impact on the markets. Certainly, the evident seem to suggest there is a link between the political communication and the volatility of the financial markets during Brexit.

A further complication of the financial market reaction to the Brexit process is the area of policy uncertainty as suggested by Belke *et al.,* (2016).

As stated by Smales (2017), a key factor found in previous studies of the impact of political uncertainty on financial markets is a change in the political orientation or a sudden policy change can dramatically increase financial market uncertainty. And as illustrated by Smales (2017), past empirical evidence has found that national elections have a positive relationship with uncertainty in the financial market. This relationship has an increasingly positive correlation as the election approaches. The magnitude of the impact on the financial market is determined partly by the margin of victory andchanges in the political orientation. Furthermore, financial markets are increasingly volatile when the result is uncertain. In addition, the financial markets' reaction is dependent on whether the current status quo is continued. Conversely, the evidence seems to suggest the industries dependant on trade are especially sensitive to political events.

Smales (2017) finds that during the EU referendum there was a significantly positive relationship between market and political uncertainty. Put simply, as political uncertainty rises or fall an equivalence rise or fall in uncertainty is registered in the financial markets. the magnitude of this relationship was heightened in the aftermath of the announcement of the referendum. As suggested earlier, they found that the influence of political uncertainty from the EU referendum increase as the polling day approaches. Moreover, the result seems to be consistent with past findings that market uncertainty significantly increases with political uncertainty when opinion polls indicate a very close outcome.

Belke *et al.,* (2016) also argue that a key affect during the Brexit campaign was the impact of the poll updates on the financial markets. Gropp (2016) states evidence from the polls before the Brexit referendum seem to suggest a negative impact on the banks stocks and FX markets of the EU and UK. when the polls suggest a Brexit. This is further highlighted by Danielsson *et al.,* (2016), who states that the markets are reacting to a substantial shock indicating weaknesses for sterling and global asset markets, especially banks. Thus, hinting at a negative impact on banks stocks and FX markets in the event of a Brexit vote. However, as pointed by Gropp (2016), a key factor is the differentiation of the UK leaving the EU and the impact on the Euro in the FX markets. A key factor, as Belke *et al.,* (2016) hints, is that policy uncertainty typically tends to lead to option value effect, a "*wait and see attitude*" by market participants.

Using a VAR variance decomposition-based model proposed by Diebold & Yilmaz (2009) with the daily UK's economic policy uncertainty index and CBOEVIX index observed from 01/01/2001 to 23/09/2015. Belke *et al.,* (2016) results seem to confirm that policy uncertainty about Brexit did have an adverse effect on the price volatility of the UK's financial markets.

As stated by Danielsson *et al.,* (2016), it is tempting to say that the initial reactions are nothing but the markets normal reaction to news, however the probability of a consequent increase in systemic crisis, however remote, is certainly not zero. There are some who think that systemic risk will

increase due to the large disruptions in the financial markets bought about by Brexit. The main issues seem to be based around two key legal factors: "legal plumbing" and equivalence.

According to Danielsson *et al.,* (2017), the issue of legal plumbing arises when a function such as a settlement or rehypothecation has its legal status questioned. Good examples are the bankruptcy of Lehman Brothers and AIG which intensified the recent financial crisis. Unfortunately, legal timescales operate on a completely different horizon to market participants. Hence should a legal issue arise, the UK and EU government must underwrite the affected activity until a legal solution can be found.

As stated by Danielsson *et al.,* (2017), the issue of legal equivalence arises when any financial organisations operate under the assumption that there is a permanent equivalence agreement that both the UK and EU rules are compliance with each other. Under the UK's membership of the EU, no problems had arisen with regard to interpretation of the rules because the UK's rules were regarded as EU rule and vice-versa. However, when the UK leaves the EU, the assumption is that a permanent equivalence agreement will be agreed. Unfortunately, by their very nature. such agreements are transient; meaning in principle they could be revoked with just a few months' notice.

However, as Danielsson *et al.,* (2017) points, there are others who believe that systemic risk will likely decrease mainly due to the behaviour of market participants under uncertainty and fear and the increase of fragmentation in the financial market. Certainly, as Danielsson *et al.,* (2016) hints, if the UK loses some of its financial sector to the EU be it at a substantial economic cost, the potential benefits are the reduction of the importance of the financial sector on the economy and hence systemic risks. A counter argument, put by Danielsson *et al.,* (2016), is although theoretically both the UK and EU could benefit, however the more likely outcome could be an increase in inefficiency, protectionism and systemic risk and a fall in the quality of financial regulation.

As both Busch & Matthes (2016) and Chang (2017) alludes a key issue is the addition of large levels of uncertainty on the UK's economy which could hinder the confidence of investors and consumers. There is already a danger of financial markets pricing the uncertainties and risks posed by Brexit causing a certain degree of financial turmoil as highlighted by Busch & Matthes (2016). Furthermore, as Busch & Matthes (2016) alludes the rating agencies have hinted of a possible downgrade depending on the negotiations and final agreement. And as Kierzenkowski *et al.,* (2016) hints a hike in economic uncertainty could reduce confident and hence increase risk premiums and cost of finance. According to a survey commissioned by the Centre for Macroeconomics, published on 25 February 2016, amongst its members a significant majority thought there was going to be a hike in volatility as illustrated by Haan *et al.,* (2016). The reasons behind the expectation of a hike in volatility was uncertainty regarding the result of

the referendum and implication of Brexit. However, some members disagreed as illustrated by Haan *et al.,* (2016).

4. Methodology

As stated by Pastor & Stambaugh (2012), conventional wisdom dictates there is a different between the long and short run. Generally, markets are less volatile in the long run due to being less perceptive to shocks; hence they are increasingly stable. As Engle & Lee (1999) states volatility is greater in the short horizon than in the long horizon. This indicates a more rapid short run volatility mean reversion than in the long run as hinted by Engle & Lee (1999). Per Colacito *et al.,* (2011), another important principle often made in economics is the existence of different long and short run sources affecting volatility. Additionally, as de Bondt (2000) hints the price reverts to the fundamental value in the long run. Effectively what de Bondt (2000), Pastor & Stambaugh (2012) and many others like Engle & Lee (1999) are hinting is the reaction of markets participants tend to deviate with time. Another factor, suggested by Engle & Lee (1999), is the different impact from the leverage effect and market risk premium on the market in the short and long run. In a paper written as part of a book in honour of Clive Granger, Engle & Lee (1999) extended the GARCH model to account for the permanent (long run) and transitory (short run) components of volatility deriving the component GARCH model (aka C-GARCH).

It must be remembered that as hinted by Black (1976), a key observation often made in the equity market is the negative correlation between returns and volatility, acknowledged as a leverage effect. Additionally, as indicated by Engle *et al.,* (1987), theory dictate that market participants require increasingly high premium on returns for investing and/or holding increasingly risky assets which is often referred to as the feedback effect.

As previously stated the main aim of this paper is to analyse the impact of Brexit on the stability of the markets in the long and short runs. We extend the variance bound test proposed by Fakhry & Richter (2018) using an asymmetrical C-GARCH-m model, proposed by Engle & Lee (1999). We use the 5% critical value F-statistics to test thestable marketpre-condition hypothesis and hence the efficient market hypothesis. As withFakhry & Richter (2015, 2016a, 2016b, 2018) and Fakhry *et al.,* (2016, 2017), we follow the pre-requisite steps advocated by Shiller (1979, 1981).

1. As illustrated by Shiller (1981), the key factor underlying any variance bound test is the variance calculation. We model the datasets in our test as a time varying lagged variance of the price using equation 1. We used the 5-lagged system, as oppose to the 20-lagged system advocated by Fakhry & Richter (2015).

$$\lim_{t\to T} var(Price_t) = \frac{\sum_{q=1}^{Q}(Price - \mu)^2}{Q} \quad (1)$$

2. As with previous works, Fakhry & Richter (2015, 2016a, 2016b, 2018) and Fakhry *et al.*, (2016, 2017), we estimate the residuals by using a first order autoregressive model as illustrated by equation 2.

$$var(Price_t) = a + b_1 var(Price_{t-1}) + \mu_t \qquad (2)$$
$$\mu_t = \tau\mu_{t-1} + \varepsilon_t$$

In a previous paper, Fakhry & Richter (2018) used a first order autoregression model as the underlining equation to the mean section of the GARCH model as illustrated in equation 3.

$$var(Price_t) = a + b_1 var(Price_{t-1}) + \mu_t \qquad (3)$$

However, in this paper we are analysing the feedback effect, hence as defined by Engle *et al.*, (1987), we use equation 4.

$$var(Price_t) = \lambda h_{t-1} + a + b_1 var(Price_{t-1}) + \mu_t \qquad (4)$$

The key to interpreting the feedback effect is the λ coefficient in equation 4. Thus, a significantly positive λ coefficient hints at a positive feedback effect and suggests that as risk increases the return should increase as well. However, in contrast a significantly negative λ coefficient suggests as risks increases, the returns should decrease. We estimate a first order asymmetrical C-GARCH (1, 1) model to obtain the long run and short run volatility coefficients. It is worth remembering that the GARCH (p, q) model as proposed by Bollerslev (1986) is written as equation 5 where $h_t = \sigma_t^2$ and $k_t = \varepsilon_t^2$

$$h_t = \omega + \alpha_p k_{t-1} + \beta_q h_{t-1} \qquad (5)$$

As suggested by Engle & Lee (1999), equation 5 can be slightly transformed into equation 6 where the dynamics of the structure of conditional variance can be illustrated.

$$h_t = \sigma^2 + \left(\alpha_p k_{t-1} - \sigma^2\right) + \left(\beta_q h_{t-1} - \sigma^2\right) \qquad (6)$$

The issue is that σ^2 represents the unconditional long run variance. However as argued by Engle & Lee (1999), at the heart of this equation is the question of whether the long run volatility is truly constant over time. Surely, a more flexible specification where the long run volatility is allowed to evolve slowly in an autoregressive manner is a more appropriate model of volatility, given the empirical evidence on time varying and mean reverting volatility as stated by Engle & Lee (1999). A more flexible model would be equations 7 and 8 where by σ^2 is represented by m_t ,a time varying long run model of volatility.

$$m_t = \omega + \rho m_{t-1} + \varphi(k_{t-1} - h_{t-1}) \quad (7)$$
$$(h_t - m_t) = \sigma^2 + (\alpha_p k_{t-1} - m_{t-1}) + (\beta_q h_{t-1} - m_{t-1}) \quad (8)$$

Hence, equation 7 is s stochastic representatives of the long run volatility otherwise known as the trend in volatility and equation 8 is the different between the conditional volatility and trend, i.e. the long run volatility. Essentially equation 8 is the short run or transitory volatility.

In essence, this means the dynamics of the volatility components can be interpretedin three steps. Firstly, the short run volatility component is mean reverting to zero at a geometric rate of $(\alpha + \beta)$ under the condition of $0 < (\alpha + \beta) < 1$. Secondly, as highlighted previously the long run volatility component evolves over time in an AR process; conversely if $0 < \rho < 1$ then it will converge to a constant level of $\frac{\omega}{1-\rho}$. The third step is based on the assumption that the long run volatility component has a slow rate of mean reversion than the short run volatility component; simply put, the long run volatility component is the more persistent of the two components meaning $0 < (\alpha + \beta) < \rho < 1$.

We opt to use a single asymmetrical order one lagged C-GARCH model in our tests. Remember the short run volatility component is given by equation 8. The TARCH model as defined by Zakoian (1994) is given by equation 9. Taking equation 9, we could transform it to a single order asymmetrical C-GARCH model by subtracting the long run volatility from each term in the equation to give equation 10. Notice how if the asymmetrical effect is zero the basic model collapses to a C-GARCH model as illustrated by equation 8. A key factor is that the asymmetrical effect is only added to the short run component of the C-GARCH model, see equation 10. This is mainly due to the short life of the asymmetrical effect.

$$h_t = \alpha k_{t-1} + \beta h_{t-1} + \gamma k_{t-1} I \quad (9)$$
$$(h_t - m_t) = \sigma^2 + (\alpha_p k_{t-1} - m_{t-1}) + (\beta_q h_{t-1} - m_{t-1}) + \gamma(k_{t-1} - m_{t-1})I \quad (10)$$

$$\text{Where } I = \begin{cases} 0, & \varepsilon_t \geq 0 \\ 1, & \varepsilon_t < 0 \end{cases}$$

Unlike Fakhry & Richter (2015, 2016a, 2016b, 2018), we also illustrate the impact of the asymmetrical effect on the stability of the market. The key is the γ coefficient in equation 10 where $\gamma \neq 0$ then there is an asymmetrical effect; if $\gamma > 0$ then there is a leverage effect meaning negative shocks have greater impact than positive shocks. As noted by Engle & Patton (2001), there is a story within any member of the GARCH family of volatility models influenced by the coefficients in thevariance equations. Since as illustrated by Engle & Patton (2001), the market shocks and persistent are indicated by the coefficients α and β, respectively. Therefore, we can deduce that ϕ and ϱ indicate the long run market shocks and persistent, respectively.

The coefficients of the Component-GARCH model of volatility are also key to our variance bound test. As mentioned earlier in this section, we derive our stability test by using the f-statistics; for our observed samples, the f-statistics at the 5% level is 1.96. We calculate our test statistics using equation 11 and 12 as the short run and long run tests of stability respectively.

$$Stability\ Test_{SR} = \frac{(\alpha+\beta+\gamma)-1}{standarddeviation\ \ (var\,(x))} \leq Fstatistics \quad (11)$$

$$Stability\ Test_{LR} = \frac{(\rho+\Phi)-1}{standarddeviation\ \ (var\,(x))} \leq Fstatistics \quad (12)$$

In previous work by Fakhry & Richter (2015, 2016a, 2016b, 2018) and Fakhry *et al.*, (2016, 2017), the definition was the market is efficient when the conditions as set in equations 11 and 12 are true. Theoretically, the market is only truly efficient when the StabilityTest statistics is equal to the f-statistic. Hence, we reject the null hypothesis for the EMH if the condition in equations 11 and 12 are true but accept the null hypothesis of the market being too volatile to be efficient for anything else. However, since in this paper the main emphasis is on the stability of the market, therefore we use this test to analyse whether the market is stable or to what extent the market is volatile. The condition given by equations 11 and 12 also state that the market is stable and the variable Stability Test in both equations gives the volatile levels for the long and short runs.

5. Data description

As stated previously, this paper analyses the stability and thusefficiency of the four major UK financial marketsto establish whether Brexit affected the financial markets. With this in mind, we test the stability and hence efficiency of the equity, FX, gold and sovereign debt markets. As illustrated in table 1, we opt to use the price on the major indices to reflect the British financial market. As with the norm, we choose to use a five-day week filling in the missing data with the last known price.

Table1. *Major British financial markets indices*

Market	Equity	Gold	Foreign Exchange	Sovereign Debt 1	Sovereign Debt 2
Index	FTSE 100		Effective Exchange Rate index, £	UK Gilt Index	
Source	investing.com	World Gold Council	Bank of England	Barclays Capital	S&P4F4F[5]
Modifier	250	25	1	2.5	
Period	08/06/2007–29/12.2017			08/06/2007-23/06/2016	24/06/2016-29/12/2017
Observations	3356			2360	396

It must be noted that like all indices, the four indices are based on weighted ratios of the components prices. The FTSE100 consist of 100 of the largest listed companies on the British equity market each weighted by a given ratio. The Sterling Currency Index 5F5F[6] is calculated daily by the

Bank of England using the five major currencies with a weighted ratio: US Dollar, Euro, Japanese Yen, Swiss Franc and Swedish Krona. As hinted by the name, the UK GiltIndex consists of all the government bonds maturities weighted by a ratio. The gold market index is the price of gold weighted by the 3-year GDP in US $.

For reasons noted in footnote 5 and as illustrated in table 1, we used two indices to analyse the sovereign debt market over both observational periods. Apart from the sovereign debt market, a key issue with our variance bound test was the standard deviation of the FTSE 100, gold and UK gilt indices variances which caused a problem with the stabilitytest statistics. We tried several methods to resolve the issue, the best solution was to divide the daily index price by the modifier as illustrated by table1 before calculating the five-day variance.

6. Empirical evidence

As hinted earlier, the keys to the stability and henceEMH test statistics are the coefficients to the variance equation of the volatility model and standard deviation of the observed dataset. Hence in essence the model of volatility estimated determines the statistics. In Fakhry & Richter (2015) and Fakhry *et al.*, (2016, 2017), the estimated model was the GARCH. In Fakhry & Richter (2016a, 2016b), the model used was the GJR-GARCH. The GJR-GARCH had the influential factor of allowing for the analysis of the asymmetrical effect on the EMH. In Fakhry & Richter (2018), the model totest the efficiency in the long and short runs was an asymmetrical variant of the C-GARCH model. We continue to use the asymmetrical effect in this paper; however, in order to extend the analysis of the behavioural factors to include the feedback effect, we use an asymmetrical C-GARCH-m model.

In estimating the models, we used the Marquandt estimation method for all estimations. However, with the error distribution, we used a different distribution model to get the best estimation as illustrated by table 2. For all other options, we used the default settings. Crucially, the system environment may influence the estimation: our system is running EViews 9.5 on a Windows 10 Procomputer with a 10 cores CPU and 32 Gigabytes RAM6F6F[7].

6.1. Crisis Period (8th June 2007 - 23rd June 2016)

This period was influenced by a combination of three factors leading to a period of sustained uncertainty and highly volatile global financial markets. The financial crisis started with the subprime mortgages in the US and quickly enveloped the global financial sector, for further in-depth research and analysis on the crises see (Brunnermeier, 2009; Caballero & Krishnamurthy, 2009; Masood, 2009) amongst others. The sovereign debt crisis started with the Greek revision of the deficit statistics, gradually becoming a wide spread issue of confident in global fiscal policies enveloping the GIPS nations as illustrated by (Schwarcz, 2011; Metiu, 2011; Mohl & Sondermann, 2013). The crisis reached the US with the deficit/debt

ceiling crises which closed the US federal government. The third factor is the causal effect resulting from a deep and costly financial crisis which developed into a deep recession, see (Taylor, 2008; Feldstein, 2009) amongst others for details of the recent economic downturns. An added issue within this period was the confusion and miscommunication by the policy makers which heightened uncertainty during the financial and sovereign debt crisis.

Table 2 seem to be hinting at a significantnegative feedback effect across all markets during the crisis. This seem to be highlighting a change in the risk premium required by the market participants. However, the key to understanding the main impact of the crises in the UK can be obtained from the equity market. The λ coefficient of the equity market is hinting at a significantly large negative feedback effect in relation to the other markets. It must be noted that the equity market was the main source of uncertainty and risk in the UK's financial market throughout the crises period, especially the banking sector.

Table 1. *Statistics for Variance Bound Test using Asymmetrical C-GARCH model7*[8]

Observation period	*Crises: 08/06/2007 – 23/06/2016*				*Brexit: 24/06/2016 – 29/12/2017*			
Market	Equity	Forex	Gold	SD	Equity	Forex	Gold	SD
Distribution	Student's	GED	Normal	Normal	Student's	Student's	Student's	GED
Method	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt
Total Observations	2360				396			
Mean Equation								
λ	-14.61138*	-2.506798*	-7.540547*	-5.204332*	-18.22398*	-0.393644***	-1.734168*	-6.966527*
	(0.833948)	(0.157923)	(0.372064)	(0.088347)	(3.694410)	(0.216195)	(0.335234)	(0.118301)
a	0.012499*	0.029464*	0.007504*	0.045705*	0.006789*	0.038081*	0.008478*	0.044532*
	(0.000113)	(0.000182)	(7.57E-05)	(0.000419)	(0.053051)	(0.001939)	(0.000245)	(0.000968)
b	0.882882*	0.887579*	0.911270*	0.842696*	0.858644*	0.982891*	0.952141*	0.874123*
	(0.001855)	(0.001980)	(0.000793)	(0.000983)	(0.002771)	(0.007903)	(0.007075)	(0.002382)
μ	1.006296*	0.999861*	1.046510*	1.035662*	1.028093*	1.075765*	0.974598*	1.030880*
	(0.002710)	(0.002130)	(0.000468)	(0.001382)	(0.005240)	(0.011609)	(0.010333)	(0.004209)
Volatility Equation								
ω	0.000153***	0.029676	0.000149*	0.001287*	1.88E-05*	0.000948*	-0.000911	0.001205*
	(8.39E-05)	(0.031871)	(1.89E-05)	(0.000134)	(2.98E-06)	(0.000148)	(0.014018)	(0.000191)
Long-run Volatility								
ρ	0.987871*	0.999807*	0.993478*	0.991699*	0.696449*	0.713193*	0.999489*	0.733613*
	(0.005963)	(0.000218)	(0.000698)	(0.000878)	(0.053051)	(0.043864)	(0.004620)	(0.023861)
ϕ	0.22698*	0.127902*	0.140644*	0.086387	0.422920*	0.146804**	0.386175	0.129337*
	(0.032056)	(0.016950)	(0.012887)	(0.002735)	(0.130071)	(0.062024)	(0.413189)	(0.010586)
Short-run Volatility								
α	0.274436*	0.382169*	0.486538*	0.42283*	0.235360***	0.137976	0.340276	0.457846*
	(0.023626)	(0.033525)	(0.007261)	(0.013742)	(0.133692)	(0.092175)	(0.413304)	(0.019318)
γ	-0.257393*	-0.117114*	-0.177517*	-0.318547*	-0.417178*	-0.105734**	0.006011	-0.516112*
	(0.022442)	(0.029772)	(0.005991)	(0.014115)	(0.067039)	(0.048677)	(0.008475)	(0.010576)
β	0.70506*	0.500877*	0.483129*	0.533635*	0.515414*	0.766262*	0.647343	0.093503*
	(0.025432)	(0.045433)	(0.008781)	(0.016916)	(0.131232)	(0.133142)	(0.408035)	(0.030059)

Notes: The numbers in brackets are standard errors, *** indicated 10% p-value significance level, ** is 5% and * is 1%.

Table 2. *Statistics for Variance Bound Test using Asymmetrical C-GARCH model7 (Cont.)*

Observation period	*Crises: 08/06/2007 – 23/06/2016*				*Brexit: 24/06/2016 – 29/12/2017*			
Market	Equity	Forex	Gold	SD	Equity	Forex	Gold	SD
Distribution	Student's	GED	Normal	Normal	Student's	Student's	Student's	GED
Method	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt	Marquandt
Total Observations	2360				396			
Model Statistics								
Log Likelihood	8125.126	5727.662	8495.525	5029.003	1543.342	772.0003	1442.913	847.2657
R^2	0.981631	0.970930	0.975552	0.977924	0.976612	0.955086	0.955215	0.972766
DW-Statistics	1.669845	1.463619	1.549033	1.630397	1.808503	1.264399	1.048389	1.964433
ARCH Effects	0.702242	0.778608	4.718990	1.276436	0.299449	0.721682	0.261395	0.003581
Jarque-Bera	14918.69	41686.10	10565.50	4148.194	1603.041	599.8994	287.6948	7333.443
σ^2	0.105889	0.316246	0.094745	0.289699	0.075373	1.195377	0.22601	0.351247
Stability Tests								
Long Run Stability								
Stability Statistics	2.02902	0.40383	1.41561	0.26954	1.58371	0.11712	1.70640	0.39018
Stability Status	Volatile	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Short Run Stability								
Stability Statistics	2.62442	0.74015	2.19378	1.24986	8.84142	0.16856	0.02818	2.74668
Stability Status	Volatile	Stable	Volatile	Stable	Volatile	Stable	Stable	Volatile

Notes: The numbers in brackets are standard errors, *** indicated 10% p-value significance level, ** is 5% and * is 1%.

The volatility has a uniformed long run persistent across all observed markets as highlighted by the ϱ coefficient. This means that the crisis did impactthe long run persistent of volatility in the UK's financial market. The spotlight falls on the significant of the ϕ coefficient in the equity market, this confirms the earlier observation that the main effect of the crisis was on the equity market. The other observed markets all recorded a lesser significantreaction. Part of the reason why is that the remaining three markets were seen as safe haven from the high risks and uncertainties during the crises.

In the short run, the level of the reaction is significant throughout all four observed UK financial markets as illustrated by the α coefficient. However, rather surprisingly the level of reaction to a shock to the market in the gold market issignificant, thus hinting at a highly reactive market environment. Since, the gold market is seen as a solid safe haven commodity market, hence the highly reactive market could be the result offlights from other markets. The β coefficient is hinting at a mixed market with the equitymarket hinting at high level of persistent in the aftermath of a shock to the market in comparison with the other markets. It must be said thatthe equity market was at the centre of the crisis in the UK. The second factor is the Brexit referendum which came towards the end of this observed period, thus hinting at an increasingly significant persistent in the FX market. With respect to the asymmetrical effect, all markets exhibit a negative γ coefficient meaning a leverage effect. However, there is a different in the level of leverage effect with the sovereign debt market showing a significantly high γ coefficient. As noted earlier the leverage effect hint at market participants reacting to negative shocks to the market with greater magnitude than positive shocks. Although globally the

observe period was highly reactive with negative market shocks, yet it must be remembered that apart from the financial sector the financial market was not significantly affected by negative shocks during the crises. However, the sovereign debt market was affected by the hike in government debt and deficit plus the drop in key economic indicators, more importantly the downgrading of several sovereign debts during the sovereign debt crisis. In addition, the claims and counter claims regarding the impact of Brexit on the economy during the EU referendum.

Analysing the stability statistics and status fromTable 1, it is worth noting that the impact from the crises only affected theequity market in the long run as previously hinted. Conversely, closer inspection of the stability statistic for the equity market hints at a small different between stability and volatile status with a level of approximately 2.03, it is worth remembering that the optimal stability statistic is set to a f-statistics of 1.96. The other observed markets all accept the conventional wisdom of markets being stable in the long run as argued by Engle & Lee (1990) and De Bondt (2000). The stability test points to a mixed result in the short run with both the FX and sovereign debt markets defying the conventional wisdom that markets tend to be more volatile in the short run as hinted by Engle & Lee (1990) and De Bondt (2000). Thus, the statistics are pointing to the FX and sovereign debt markets being stableand hence accepting the EMH. The remaining two markets hint at the accepted convention of markets being volatile in the short run with levels of approximately 2.6 and 2.2.

6.2. Brexit Period (24th June 2016 – 29th December 2017)

As with any big change in any country's direction, the aftermath of the Brexit vote was highlighted by uncertainty and a highly volatile period. Politically, the UK became increasingly unstable especially after a snap general election which was meant to strengthen the hand of the government in the Brexit negotiations resulted in a hang parliament. Economically, as illustrated in the second section, there are huge questions and uncertainties surrounding the economic prospects of the UK during the next few years. Added to these issues, the referendum and Brexit result left a deeply divided country. In the midst of this volatile and uncertain environment, the UK's financial markets must function. The big issue inall thisis the miscommunication, indecision and arguments at the heart of the EU and UK policy making concerning Brexit. Theoretically, this have all the makings of a highly volatile financial market.

Table 1 seem to be hinting at a mixed negative feedback effect from the observed markets during the Brexit period as illustrated by the λ coefficient, with the equity and sovereign debt markets showing signs of an increasing impact. However, the gold and FX markets seem to be hinting at a decreasing impact. Surprisingly, the FX markets is more likely hinting at an indifferent feedback effect than a negative effect. However, upon close inspections of the environment, there a number of pointers to the indifferent. The first is that there is a weakness induced by uncertainty in

all the major currencies. Secondly, the mixed communication from the EU and British policy makers contradicting each other. The third point is that the British economy seem to be performing much better than expected in the aftermath of the referendum result. However, the most vital point is the uncertainty surrounding a weak British government within a hang parliament.

Other than the gold market, the observed markets are hinting at a reduction in the long-run persistency factor with the ϱ coefficient pointing at relatively large decrease. Although significant on its own when combined with the increase in the ϕcoefficient across all markets hinting at an increase in the reaction to market shocks, this becomes increasingly significant. It must be noted that a weak persistent and strong reaction points to a highly reactive market, hinting at a random walk model behaviour, generally, consistent with a stable market.

Although reduced in significant from the crisis period in all markets except the sovereign debt, the α coefficients still hint at a significant level of market shock reaction in the short run. The persistent in the aftermath of a shock in the short run, as given by β, seem to be hinting at mixed results with the equity and sovereign debt markets hinting at a decrease. The issue is that the sovereign debt is approaching an indifferent persistent during the Brexit period, thus meaning a highly reactive market. In a reversal of the short run persistent analysis, the leverage effect seems to be intensifying in the equity and sovereign debt markets. While the FX and especially gold markets are pointing towards a reversal of the asymmetrical effect. The gold market seems to be hinting at an indifferent asymmetrical effect with the γ coefficient pointing to an insufficient positive asymmetrical effect.

As illustrated by Table 1, during the Brexit period all the observed markets were stable and hence efficient in the long run. This seem to be highlighting that the market participants were pricing the long run impact of Brexit on the financial market and economy. However, the picture is rather splitwith respect to the short run, with the gold and FX markets seemingly stable and efficient. As noted earlier, there is a weakness in the global FX market induced by uncertainty in the economy and political stability. Hence, this may have played a major role in stabilizing the British FX market in the short run. In contrast the equity and sovereign debt markets were volatile and hence inefficient over the short run with levels of 8.84 and 2.75 approximately. As previously hinted, Brexit is likely to have an impact on the economy and trades, hence these two factors have a strong bearing on the equity and sovereign debt markets. The uncertainty and confusions surrounding the economy and any trade deals is being highlighted by the volatile conditions in the two markets with the most significant propensity with these two factors. In reality these two volatile markets are reacting to the market participants evaluation of thenegotiation status and the likely impact on the economy and trade. At the heart of this is the miscommunication by the policy makers on both sides of the

Channel. In effect this explains why the gold market isn't volatile because of its global status as a safe haven commodity which means that to a certain extent it isn't affected by Brexit.

7. Conclusion

In this paper, we introduced the stable market pre-condition hypothesis and used an asymmetrical C-GARCH-m variant of the variance bound test proposed by Fakhry & Richter (2018) to distinguish between the long and short run effect of Brexit on the stability and hence efficiency of the British financial markets. We also analysed the asymmetrical and feedback effect on the financial markets. The results suggest a limited impact on the general financial market going from the global crisis of the late 2000s-mid 2010s to the Brexit process. During the Brexit process, we found that the markets in general were stable in the long run. However, in the short run, we found the results were mixed with two markets hinting at stability.

There is some evidence from the literature and our empirical evidence pointing at a highly volatile impact from the Brexit process, although it does seem to be short lived. Therefore, backing one of the key arguments in the behavioural finance theory, as hinted by De Bondt (2000); market participants sometimes overreact heavily at the initial stages of an event, thus leading to correction in the long run. Like any game changing event, in the immediate time horizon market participants tend to act on little and often conflicting information leading to asymmetrical information and/or a failure in the information system which is reflected in unstable markets in the short run.

Certainly, the evidence from the literature and news is that there is a hint of miscommunication and confusions brought about by the policy makers. This is at the heart ofthe reaction from the market participants. One of the key lessons of the recent global financial and sovereign debt crises is that a percentage of the underlying uncertainty and volatility is linked to political miscommunication, confusion and disjointed action. These three vital factors of volatile markets have seemingly continued during the referendum debate and to a high extent the Brexit process. Based on our findings, we advise all policy makers to make clear and decisive statements and not to engage in tit-for-tat arguments. We also recommend an agreement by all policy makers on both sides to put forward a unified voice and plan. It is essential not to repeat the same mistakes made during the recent crisesand early stages of the Brexit process. Also, we advise the UK policy makers to put forward a decisive and unified plan for the economyin the aftermath of Brexit and effectively communicate it. As illustrated previously by the literature, the economy is and will be the main source of uncertainty in the financial markets at present and for the foreseeable future.

In concluding, it would seem that market participants have already priced the impact of the EU Referendum into the markets in the long run.

However, with market participants being humans and hence reactive, any unexpected event in the Brexit process or sign of weakness in the economy during the Brexit process could result in a highly volatile and uncertain financial market. The key in any event and not just Brexit is the information that filters in the aftermath of the event, be it statements or statistics; needs to be collated and more importantly not conflicting, if market are to remain stable.

Notes

[1] See [Retrieved from] for details of Article 50 of the 2007 Lisbon Treaty
[2] See [Retrieved from] for details of the 2007 Lisbon Treaty.
[3] See [Retrieved from] for details on the EPU
[4] Economists for Free Trade formerly known as Economists for Brexit
[5] Due to our inability to get the full observation of the Gilt market, we used the Barclays Index to cover the pre-crises and crises periods and S&P Index to cover the Brexit observational periods.
[6] For a description of the index and how it is calculated see the following Bank of England website: [Retrieved from].
[7] We tested on a different environment and got slightly different estimation results. However, the variance bound tests were not affected.
[8] The optimal stability statistic is set at the 5% level f-statistic of 1.96.

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