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Measuring the external risk in the United Kingdom

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Abstract

This paper aims to describe the evolution of the external risk in the United Kingdom between 1961 and 2008. We first present a theoretical description of the risk indicator. Then, we calculate this measure for the British economy in the period of study. In general, the results reveal a very small increase of external risk. Finally, the relationship between the two dimensions of external risk: trade openness and external volatility is analysed.

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1. INTRODUCTION

Among the authors who found a positive relation between international economic integration and public sector size, we can mention Rodrik (1996, 1998), who devised a hypothesis that nowadays is known as the hypothesis of compensation. The idea behind it is that more open economies are exposed to a greater risk as a result of the possible turbulences in the international markets which can affect their domestic economy. As the public sector is "the safe" sector of the economy, both in terms of employment and income, it can exert an isolation function over the external risk that affects the other sectors, increasing its participation in the economy as a whole. So, to calculate the degree of the external risk that an economy is exposed to, it is necessary to use measures that reflect the volatility of income derived from the external shocks.

The paper is organised as follows. In the second section, we describe the calculation of the indicator of external risk and show its evolution in the British economy. In the third section, we carry out an analysis of the relation between trade openness and external volatility. This has never been done previously for the case of the United Kingdom. Finally, we sum up the main conclusions of this work.

2. THE INDICATOR OF EXTENAL RISK

The measure used by Rodrik (1996, 1998), and that was subsequently used in all the works of cross-country and panel data about this topic, was the interaction term of trade openness and volatility of terms of trade. This volatility is the standard deviation of the terms of trade growth rate. That is to say, it is necessary to distinguish between exposure to external risk and openness. Two countries can have similar levels of exposure to trade and have quite different levels of exposure to external risk -if the volatility of their terms of trade is different-. Openness refers to the exposure to international economy and external risk refers to the instability of the terms and conditions under which an economy trades with foreign economies[1]. The important thing is the interaction between the two variables.

As we are working in a time series context, we need a measure of external risk that varies over time. So, to calculate the volatility of the terms of trade, in line with Islam (2004), we use the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model[2]. In this technique, frequently employed to calculate volatilities, above all for financial time series, the variance is not constant. The prediction of the volatility of some variables is very important not only for financial planners but also for the agents who participate in international trade, because the variability of some variables such as exchange rates or terms of trade may involve huge profits or losses.

The simplest and most frequently used GARCH model is the GARCH (1, 1)[3]:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

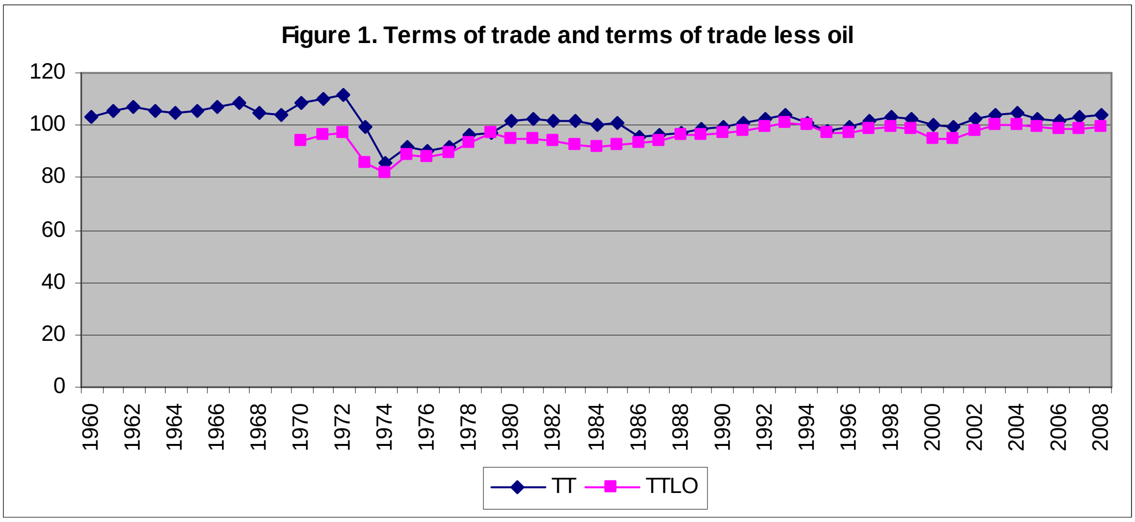
The conditional variance in period *t* depends on the squared error term and the conditional variance in the previous period. This model calculates the conditional variance of the terms of trade growth rate. Therefore, the volatility of the terms of trade

[1] Kim (2007). Examples of open economies with little risk are those of Southeast Asia.
[2] This model was developed by Bollerslev (1986), as an extension of the ARCH model proposed by Engle (1982).
[3] It is equivalent to an ARCH(2) model.

will be the square root of this variance (VOLTT). Finally, multiplying this series by trade openness, we obtain a measure of external risk.

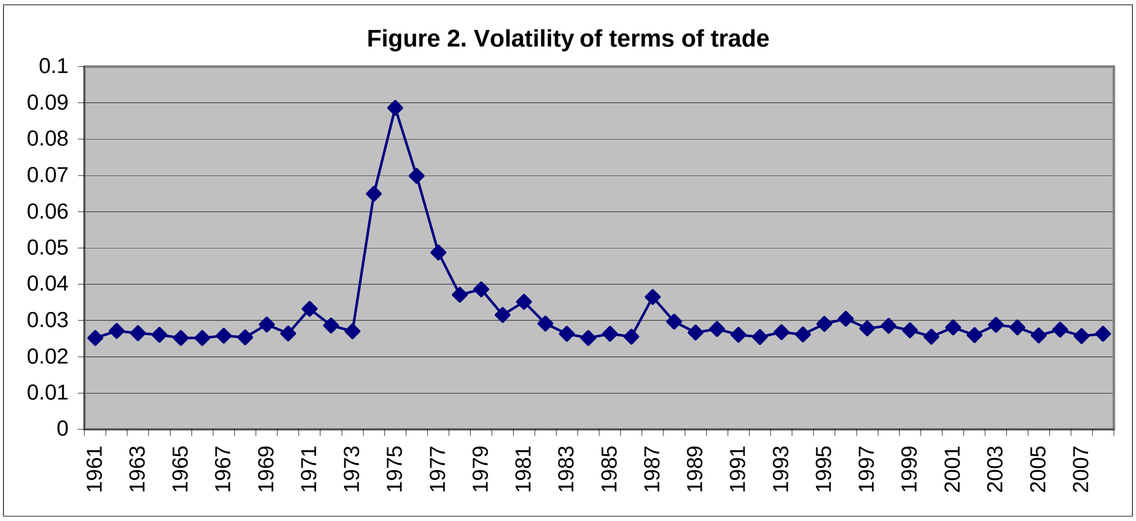
2.1 The volatility of the terms of trade in the British economy

In Figure 1, we show the evolution of the terms of trade in the United Kingdom between 1960 and 2008[4].



Source: Own elaboration. Terms of trade are from the AMECO Database (National Accounts), European Commission, Economic and Financial Affairs. Terms of trade less oil data are from the UK office for National Statistics.

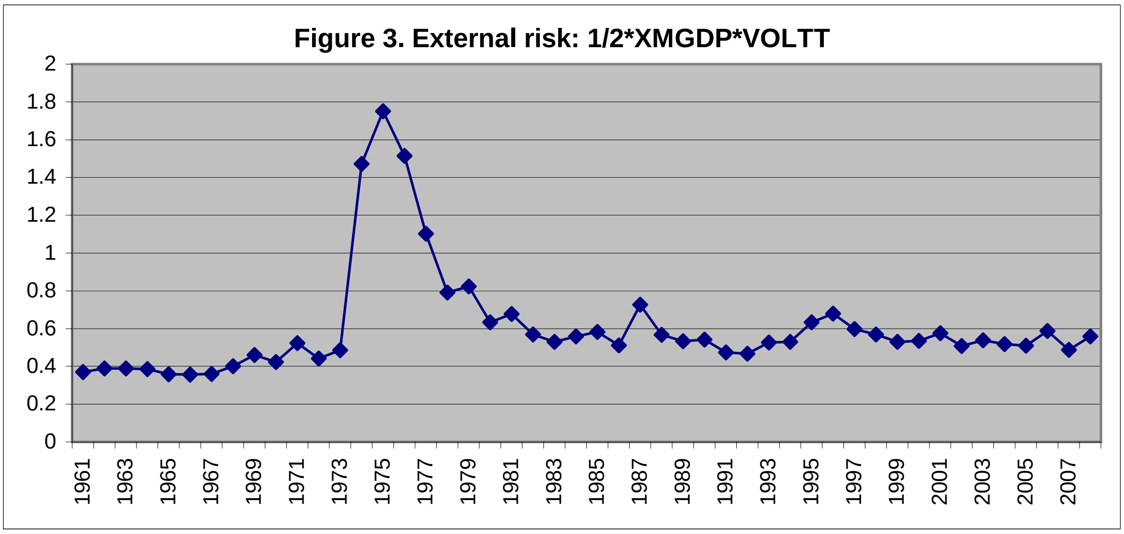
In general, we can say that there has been an improvement in the British terms of trade. On the one hand, the British economy is more or less self sufficient in oil and, because of this, terms of trade have not been significantly affected by shocks in oil prices -as can be seen in Figure 1-. On the other hand, the United Kingdom has tended to import those goods that have undergone the largest price decrease. In Figure 2, we can see the volatility of the terms of trade, derived from the aforementioned GARCH (1, 1) model. This figure also reflects the stability of the terms of trade series, since its volatility is both very low and stable. The only significant increase is clearly linked to the international economic crisis of the seventies.



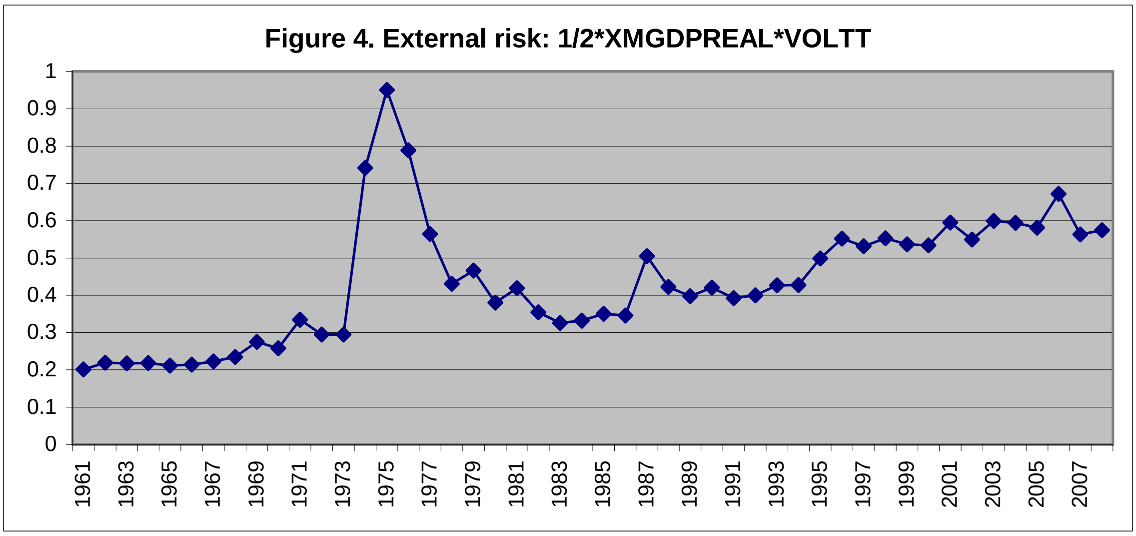
Source: Own elaboration from data in Figure 1.

[4] We have chosen this period because of the availability of data for terms of trade.

Figures 3 and 4 show the evolution of the external risk (the interaction term), with openness measured in current terms and real terms, respectively[5]. As can be appreciated, the external risk has undergone a slight increase in the period of study.



Source: Own elaboration. Data of exports, imports and GDP in current terms are from the AMECO Database (National Accounts), European Commission, Economic and Financial Affairs.



Source: Own elaboration. Data of exports, imports and GDP in real terms are from the AMECO Database (National Accounts), European Commission, Economic and Financial Affairs.

Kim (2007) classifies geographical regions according to their levels of openness (total trade as a percentage of GDP) and external volatility -averaged for the second half of the nineties- into four groups[6].

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[5] The measure of the external risk, 1/2*OPENNESS*VOLTT, is derived from the following argument. Let x, m and y stand for volumes of exports, imports, and GDP, respectively. Let π be the natural logarithm of the price of exports relative to imports (the terms of trade). Let the log of the terms of trade follow a random walk, possibly with drift. The unanticipated component of the income effects of a terms of trade change can then be expressed (as a % of GDP) as 1/2 $[(x+m)/y]$ $[d\pi-\alpha]$, where α is the trend growth rate in the terms of trade. The standard deviation of this is 1/2 $[(x+m)/y]$ x st. dev. $(d\pi)$. Hence, the interaction of the measure of openness $[(x+m)/y]$ with the standard deviation of the first (log) differences in the terms of trade gives us (twice) the appropriate measure of external risk. Rodrik (1998), pp. 1014.

[6] Kim (2007) carried out and panel data analysis of the relationship between openness, external risk and economic volatility, thorough a sample of 175 countries in the period 1950-2002.

(1) More-open/lower-volatility economies. Examples of regions that fall into this category are East Asia, which countries are the most trade-open and at the same time have low levels of external volatility and Western Europe, with the lowest level of terms of trade volatility (0.0284).

(2) More-open/higher-volatility economies. Example countries in this group include Central Asia.

(3) Less-open/higher-volatility economies. Latin America and Sub-Saharan Africa are in this category.

(4) Less-open/lower-volatility economies. North America countries have the least trade-open economies (53.78%) and also very low levels of terms of trade volatility (0.035).

According to this classification, the United Kingdom is included in the fourth group. On the one hand it has very low levels of terms of trade volatility (0.0314 and 0.0281 for the period 1961-2008 and 1995-2000, respectively). One the other hand it is not a very open economy, even taking into account the coefficient of openness in real terms[7]. Thus, we can say that the British economy is not very exposed to the risk emanating from turbulence in world markets.

3. THE RELATION BETWEEN TRADE OPENNESS AND THE VOLATILITY OF THE TERMS OF TRADE

In the previous sections, we have carried out a theoretical and graphical description of the indicator of external risk. In this section we use UK data from 1961-2008 to test more formally for an effect of trade openness on external volatility[8]. We should mention the papers of Lutz and Singer (1994) and Easterly and Kraay (2000), where these authors did not find evidence that a higher level of openness increases the risk of shocks in the terms of trade. The explanation of this result was that the diversification derived from the increase of openness involves new, non-traditional exports.

We start with a simple analysis of the coefficients of correlation of openness and the volatility of the terms of trade.

Table 1. Correlations

XMGDP/VOLTT	0.31
XMGDPREAL/VOLTT	-0.21

Source: Author's calculations.

[7] The average of trade of goods (as a % of GDP) for 1995-2000 is 41.93% (current terms) and 38.11% (real terms). Kim's classification is based on Penn World Tables, namely on total trade of good and services (as a % of GDP) in current terms. Our conclusions are the same taking into account the trade of services, because the averaged trade of good and services for the aforementioned period is 56.08%, very near to that of North America.

[8] According to the argument of Rodrik (1998) and Kim (2007), a higher degree of openness does not necessarily involve greater volatility of the terms of trade.

As we can see in Table 1, the process of trade openness in the British economy did not raise the volatility of the terms of trade. Both indicators of openness show a very small coefficient of correlation with external volatility. Moreover, in the case of total trade in real terms this coefficient is negative.

We complete our analysis with the cointegration test of Johansen to assess whether there is a long-term relation between the two variables. We carry out a test of unit roots to find out the integration order of the series. We apply the tests of Dickey Fuller (1979, 1981) (ADF), Phillips-Perron (1988) (PP), Dickey Fuller GLS of Elliott, Rothenberg and Stock (1996) (DF-GLS), the optimum point of Elliot, Rothenberg and Stock (1996) (ERS) and Ng and Perron (2001) (NG-P). Alternatively, we use the test of Kwiatkowski, Phillips, Schmidt and Shin (1992) (KPSS), where the null hypothesis is stationarity. Looking at Tables 2 and 3, we can say that VOLTT is I(0) and the measures of openness are I(1). Taking into account that our interest variables have different order of integration, it can be expected that the cointegration analysis does not reveal a long-term relation between them. Because of this, the estimators derived from an OLS equation will be inefficient. To solve this problem, as we have said, we use the multivariant technique of Johansen, based on the VAR model. The main advantage compared to uniequational methods is that it does not suppose that there is just one direction in the relation studied, as it is a system of equations in which all variables are endogenously fixed.

Table 2. Test of unit root[a]						**Test of stationarity[a]**
Variable (in levels)	**ADF**	**PP**	**DF-GLS**	**ERS**	**NG-P**	**KPSS**
XMGDP	-2.44	-2.44	-2.42	9.91	-2.15	0.17**
XMGDPREAL	-2.47	-2.41	-2.16	14.29	-1.90	0.21**
VOLTT	-3.51**	-2.49	-3.39***	1.10**	-3.34***	0.18

a) The series in levels include trend and intercept. ** Significant at 5%.
The critical value of the ADF and PP tests are in Mackinnon (1996), DF-GLS and ERS in Elliott, Rothenberg and Stock (1996), KPSS in Kwiatkowski, Phillips, Schmidt and Shin (1992) and NG-P in Ng and Perron (2001). The information criterion used to assess the optimum lag is the SIC. The choice of the residual spectrum of zero frequency is based on the estimation proposed by the author of each test. The method of bandwidth is from Newey-West (1994). These tests check the null hypothesis of the existence of unit roots, with the exception of the KPSS test, where the null hypothesis is the existence of stationarity.

Table 3. Test of unit root[a]						**Test of stationarity[a]**
Variable (in first differences)	**ADF**	**PP**	**DF-GLS**	**ERS**	**NG-P**	**KPSS**
XMGDP	-7.28 ***	-7.42 ***	-7.33 ***	1.46 ***	-3.35 ***	0.10
XMGDPREAL	-6.19 ***	-7.67 ***	-7.03 ***	0,29 ***	-3.39 ***	0.19
VOLTT		-6.84 ***				

a) Without trend and intercept in ADF and PP tests, except XMGDPREAL, which has an intercept.
***, ** and * Significant at 1%, 5% and 10%, respectively.

We have specified a model of two endogenous variables (openness and volatility of the terms of trade). The optimum length of the VAR in accordance with the LR and SC criteria, which allows the residuals fulfil the requirements of normality, homoscedasticity and absence of correlation is two lags for XMGDP and one lag for XMDPREAL. The next step involves choosing one of the five cases proposed by Johansen (1995) in order to make some suppositions about the underlying trend in the data. According to the unit root test, we consider two possibilities. The first is that they have no trend (model 2) and the second is that they have a stochastic trend (model 3). The LR, SC and AIC criteria select model 2 for XMGDP and model 3 for XMGDPREAL.

The results of the test of Johansen about the relation between trade openness and the volatility of the terms of trade are shown in Table 4. In the case of total trade in real terms (XMGDPREAL), both trace and eigenvalue tests accept the null hypothesis of no cointegration because the result is lower than the critical value. However, for the total trade in current terms (XMGDP), there is cointegration.

Table 4. Cointegration test of Johansen:
Trade openness and volatility of the terms of trade, 1961-2008

Cointegration based on max eigenvalues:					
Endogenous Variable	**Null Hypothesis**	**Alternative Hypothesis**	**Statistic**	**Critical Value 5%**	**Probability**
XMGDP	r=0 r≤1	r≥1 r=2	17.40 5.92	15.89 9.16	0.03 0.20
XMGDPREAL	r=0	r≥1	6.95	14.26	0.50
Cointegration based on trace of stochastic matrix:					
Endogenous Variable	**Null Hypothesis**	**Alternative Hypothesis**	**Statistic**	**Critical Value 5%**	**Probability**
XMGDP	r=0 r≤1	r≥1 r=2	23.32 5.92	20.26 9.16	0.02 0.20
XMGDPREAL	r=0	r≥1	6.95	15.49	0.58

The relation between the cointegrated variables adjusts, according to the first vector of the cointegration test, to the following terms:

$$VOLTT = -0.002 + \underset{(1.64)}{0.0008}XMGDP$$

with t-ratio in brackets.

As can be seen, there is a positive, although very small, effect of trade openness on the volatility of the terms of trade.

5. CONCLUSIONS

In this paper, we have presented a theoretical description of a measure that reflects external risk, that is to say, the risk derived from the turbulences in the international markets. Then, we have calculated this indicator for the British economy in 1961-2008. In general, we can say that external risk hardly increased in the United

Kingdom during this period. Finally, the econometric analysis of the relation between trade openness and the external volatility shows that these variables are different concepts. That is to say, there is no causal effect of openness on volatility in the UK.

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