Safe haven or contagion? The disparate effects of Euro-zone crises on non Euro-zone countries

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Abstract

This paper investigates the potential contagion from changes in the Greek sovereign risk premium over 2009-2016, measured by the yield on 10 year government bonds, to six European countries outside of the Euro-zone all of which operated a managed float against the Euro. We find evidence of contagion to other potential Euro-zone ascendants (Czech Republic, Hungary and Poland), but 'flight to safety' (or safe haven) effects for Great Britain, Sweden and Switzerland.

JEL Classifications: C32, F34, G15

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1. Introduction

There is now considerable evidence that the Greek crises after 2009 exerted significant contagion effects on other Euro-zone member states (see, for example, Mink and de Haan, 2013, Ludwig, 2014, and Metiu, 2012). Less attention has been paid by researchers to the extent to which contagion effects were experienced in European economies outside the Euro-zone. To address this question we examine the effects of relative changes in the Greek sovereign risk premium on the risk premium in two groups of non-Euro-zone countries. The first group comprises three Central and Eastern European countries that are geographically close to the Euro-zone and are committed to be future members of the zone: The Czech Republic (CZ), Hungary (HU) and Poland (PO). The second group comprises three countries (Great Britain (GB), Switzerland (CH) and Sweden (SW)), that have chosen not to be part of the Euro-zone. Of these both Great Britain and Switzerland are major international financial centers. It is possible that contagion could be either positive or negative. If higher risks in the Euro-zone are expected to lead to increased risk in other countries then their premia should also rise.

The six countries we investigate have all maintained managed floats with the euro, although the variation in the bilateral nominal exchange rates have been much greater for Great Britain and Switzerland than for the other four countries. The GBP/Euro rate and Swiss Franc/Euro rates have coefficients of variation of 20 per cent and 23 per cent respectively over the sample period from 1st October 2009 to mid-August 2016, whereas the Swedish krona has a coefficient of variation of just under 7 per cent and all three Central and Eastern European countries have coefficients of variation of 5 percent or less. It is therefore possible to test the joint hypothesis that the degree of international financial integration and exchange rate flexibility are significant in accounting for both the sign and extent of contagion. We should emphasize that we are using the term contagion in its broad sense and do not attempt to divide it into rational and non-rational components as some studies do (see, for example, Ludwig, 2014; Giordano *et al*., 2013).

The rest of the paper is organized as follows. Section 2 briefly explains the model we use and the econometric methodology we adopt. Section 3 presents the main results which show the statistical significance of safe haven effects as well as direct contagion from the Greek crises. Section 4 offers a few brief conclusions.

2. The Model and Methodology

The Greek sovereign risk premium, (ρ_{GR}), is defined as the difference between the 10-year Greek (r_{GR}) and German ($\overline{r}$) long-term bond yields measured in euros, that is: $\rho_{GRt} = r_{GRt} - \overline{r}_t$. Similarly, we express the risk premia for all other countries in our sample relative to the German long-term bond yield. The 'home' risk premium for these countries is defined as $\rho_{it} = (r_{it} - x_{it}) - \overline{r}_t$ where r_{it} is the long-term sovereign bond yield of the home country *i* in period t in its domestic currency and x_{it} is the expected bilateral depreciation of the home currency against the euro. In the case of a highly, but imperfectly integrated EU capital market it is postulated that the home country and Greek asset returns and risk premia will be related such that

$$\rho_{it} = \beta_0 + \beta_1 \rho_{GRt} + \varepsilon_{it} \quad (1)$$

where β_1 measures the impact of a rise in the Greek risk premium on the home country risk premium[1]. The sign of β_1 is strictly ambiguous. In the case of direct contagion β_1 is expected to be positive as the risk spreads to other countries whose bonds are perceived as having similar risk characteristics to Greek bonds and whose economies and currencies are closely linked to the value of the euro. But the sign of β_1 can also be negative if the home country is deemed to be a safe haven. In this case investors flee euro-denominated assets and purchase home country bonds. If this capital flow is sufficiently large it will raise the price of the home country bonds and lower their yields. Since we are measuring the home risk premia relative to German bonds a fall in the risk premia means that the market's perception is that the home country's risk has declined not only absolutely but also relative to Germany. In such cases the implication is that in search of greater safely more funds would be diverted to countries outside of the Euro zone than to Germany itself.

Such changes in perceptions would be likely to have an immediate effect on exchange rates, but not necessarily on expected future changes. Unlike the risk free case where uncovered interest parity would imply that any differentials in interest rates would be offset by expected changes in exchange rates, where differentials only reflect expectations of default risk there would be no further expected changes in the spot exchange rate. Of course expectations may not be fully efficient so in imperfect markets the initial changes in exchange rates could generate expectations of further changes or of reversals.

[1] Equation (1) collapses to uncovered interest rate parity in the very special case where β_0 =0 and β_1 =1, although this parity condition is not central to the analysis here.

However, for the model tested here whether the euro is ex ante expected to depreciate, appreciate or remain the same against outside countries is unimportant, as what matters is the total risk premium. So the risk premia of assets which are perceived to exhibit similar risk characteristics as Greek bonds will rise with the Greek risk premium ($\beta_1 > 0$); the risk premia of assets which are deemed to be less risky in terms of likely default, and hence a safe haven, will move inversely with the Greek premium ($\beta_1 < 0$). To allow for possible expected changes in exchange rates besides our base case of no changes we also provide a set of estimates where the actual change in the following day is assumed to have been expected.[2]

To estimate the risk premium model as specified in (1) the error term, ε_{it}, is assumed to have a mean of zero, but a time-varying variance such that □□ ∈ □(0, □□). This is in recognition of the fact that not only are the errors very unlikely to exhibit constant variance, but asset returns exhibit volatility clustering, whereby the current level of volatility is positively related to its level in the immediately preceding periods. The model we use is therefore in the MGARCH class of models. We use the dynamic conditional correlation (DCC) method proposed by Engle (2002), which has the advantage of dealing directly with heteroskedasticity, as well as being able to estimate multiple country risk premia without adding too many parameters.

The multivariate conditional variance is specified as:

$$H_t = D_t R_t D_t \tag{2}$$

where D_t is the $(n \times n)$ diagonal matrix of time varying standard deviations from univariate GARCH models with $\sqrt{h_{ii,t}}$ on the i[th] diagonal, and $i = 1, 2, \cdots, n$; R_t is the $(n \times n)$ time-varying correlation matrix. The DCC model, following Engle (2002), can be estimated using a two-stage approach to maximize the log-likelihood function. If we let θ denote the parameters in D_t and ϕ the parameters in R_t then the log-likelihood function is:

$$l_t(\theta,\phi) = \left[-\frac{1}{2}\sum_{t=1}^{T}\left(n\log(2\pi) + \log\left|D_t\right|^2 + \varepsilon_t' D_t^{-2}\varepsilon_t\right)\right] + \left[-\frac{1}{2}\sum_{t=1}^{T}\left(\log\left|R_t\right| + u_t' R_t^{-1} u_t - u_t' u_t\right)\right] \tag{3}$$

[2] Of course there are many other ways to proxy expectations but since the expectations are not crucial to the analysis we limit ourselves to this one measure. As predicted we find that using this proxy does not substantially affect the results.

where u_t is the $(n \times n)$ matrix of risk premium residuals transformed by their standard deviations, from the univariate stage of the estimation, such that an individual element is $u_{i,t} = \varepsilon_{it} / h_{ii,t}^{-1/2}$.

3. The Results

The model is estimated using daily data from 1st October 2009 until 12th August 2016 which, allowing for weekends and bank holidays, gives 1,746 observations for estimation. Daily 10-year sovereign bond yields were taken from investing.com and daily spot exchange rate data from the ECB website, for all six 'home' countries plus Greece.

Table 1 shows the results when the expected exchange rate change is assumed to be zero as would occur under static or rational expectations, such that $x = 0$. Table 2 shows an equivalent set of results, but with exchange rate expectations reflecting the actual ex post change in the exchange rate the following day, so that $x_t = ((E_t e_{t+1} / e_t) - 1) \times 100 = ((e_{t+1} / e_t) - 1) \times 100$, where e_t is the spot exchange rate and E_t is the expectations operator at time period t. In both expectations models, there is positive contagion from Greece to the other three Central and Eastern (CEEC) EU members' risk premia, as $\beta_1 > 0$ and is statistically significant. However there is 'inverse' or negative contagion in the case of the three western European countries, as $\beta_1 < 0$. This we interpret as reflecting safe haven or 'flight to safety' effects.

In addition in both versions of the model, the absolute values of the β_1 coefficients are smaller for the three advanced economies than for the three CEEC economies, suggesting that the offsetting exchange rate changes are larger in these economies. Moreover the β_1 coefficients are very similar in size under both expectations scenarios, suggesting that the actual next day depreciation of the euro is not an important element in the transmission of changes in the Greek risk premium to other EU member states, including Switzerland.

Furthermore, by comparing the final columns of Tables 1 and 2, it seems that with static exchange rate expectations, the effects of any shock persist longer (i.e. die away more slowly) in every case (except for Switzerland). This may suggest that the flexibility of the nominal exchange rate is related to the persistence of the shocks, such that greater nominal exchange rate flexibility is commensurate with less persistence. The Czech Republic, Poland and Hungary, for example, have the lowest falls in persistence and the least flexible exchange rates over the sample period. By contrast, the countries with the largest falls in persistence are Sweden and GB, which are countries with more flexible exchange rates. The economy with the most variable exchange rate, however, is Switzerland and Table 2 shows a rise in persistence and potential instability[3].

In general, as far as the direction and magnitude of the contagion effects are concerned, the variability of the nominal exchange rate is not important. In terms of persistence the adjustment to shocks is more quickly dissipated, the more flexible the exchange rate against the euro. To a limited extent, exchange rate flexibility moderates the spill-over effects from the increases in the risk premium in Greece to the home economies.

4. Conclusions

The results show that the Greek crises since October 2009 have not only been transmitted to other Euro-zone member states (see also Bird *et al* 2016), but have also been transmitted to other EU member states that are in the process of acceding to membership of the Euro-zone, despite the fact that these countries currently have some exchange rate flexibility vis-a-vis the euro. In sharp contrast, in the cases of Great Britain and Switzerland, and to a lesser extent Sweden, the home risk premium was inversely related to the Greek one. This suggests that during the Greek and Euro-zone crises investors regarded these economies as a safe haven.

[3] Switzerland underwent major changes in its exchange rate policy over the sample period. Although its exchange rate showed the greatest variability against the euro over the whole sample period there have been periods of stability and great variability. Between 1st October 2009 and mid August 2011 the Swiss franc appreciated against the euro by some 40 per cent. Between February 2012 and December 2014 the Swiss franc was basically pegged against the Euro although this was followed by a very sharp appreciation of some 18 per cent between early December 2014 and the end January 2015. These sudden shifts perhaps explain the increased persistence and potential instability of the Swiss results under forward-looking expectations. Given the importance of Switzerland as a financial centre however, it is important to retain it in the sample, especially since, as noted above, exchange rate volatility is not essential for our contagion hypothesis.

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Table 1: Estimation Results from the DCC-MGARCH model

	Risk Premium equations		Variance equations			
	β_0	β_1	*a*	*b*	*c*	Persistence
CH	-0.706***	- 0.009***	0.878***	0.013	0.003***	0.891
	(-94.64)	(-18.98)	(34.58)	(1.41)	(10.61)	
GB	1.205***	- 0.034***	0.876***	0.006	0.004***	0.882
	(102.86)	(-43.89)	(34.10)	(0.55)	(8.81)	
SW	0.477***	- 0.016***	0.916***	-0.018*	0.002***	0.898
	(92.93)	(-42.78)	(34.63)	(-1.84)	(9.56)	
CZ	0.257***	0.042***	0.819***	0.047***	0.006***	0.866
	(20.18)	(60.26)	(32.36)	(3.49)	(9.33)	
HU	2.843**	0.124***	0.868***	-0.012	0.033***	0.856
	(149.74)	(82.71)	(35.44)	(-1.23)	(10.55)	
PO	2.128***	0.054***	0.849***	0.023**	0.007***	0.872
	(175.90)	(78.33)	(33.08)	(2.02)	(8.70)	

Notes: The estimates of the mean-reverting process are λ_1=0.3025 (38.22) and λ_2=0.6854 (82.47). The persistence level of the variance is calculated as the summation of the coefficients in the variance equations (*a* + *b*). The z-statistics are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and the 10% levels with critical values of 2.58, 1.96 and 1.65 respectively. Risk premium equations: $\rho_{it} = \beta_0 + \beta_1 \rho_{GRt} + \varepsilon_{it,}$ where i = CH, GB, SW, CZ, HU, PO and □□□ ∈ □(0, □□). Variance equations: $h_{ii,t} = c_i + a_i h_{ii,t-1} + b_i \varepsilon_{i,t-1}^2$.

Table 2: Estimation Results from the DCC-MGARCH model (with Exchange Rate Expectations)

	Risk Premium equations		Variance equations			
	β_0	β_1	*a*	*b*	*c*	Persistence
CH	- 0.711*** (-10.70)	- 0.010*** (-4.18)	0.878*** (4.24)	0.227*** (5.75)	0.013*** (2.76)	1.105
GB	1.263*** (22.47)	- 0.038*** (-11.03)	0.428*** (8.35)	0.216 (1.34)	0.084*** (2.70)	0.644
SW	0.459*** (13.22)	- 0.018*** (-7.48)	0.424*** (9.31)	-0.042 (-0.47)	0.084*** (6.85)	0.382
CZ	0.201** (2.22)	0.043*** (4.12)	0.607*** (7.94)	0.114 (1.03)	0.043*** (3.24)	0.721
HU	2.830*** (21.81)	0.134*** (10.05)	0.496*** (14.87)	0.141** (1.96)	0.221*** (5.54)	0.637
PO	2.080*** (34.59)	0.060*** (10.10)	0.464*** (12.35)	0. 273** (3.59)	0.064*** (4.27)	0.737

Notes: The estimates of the mean-reverting process are λ_1=0.3187 (23.32) and λ_2=0.4006 (13.25). The persistence level of the variance is calculated as the summation of the coefficients in the variance equations (*a* + *b*). The robust z-statistics are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and the 10% levels with critical values of 2.58, 1.96 and 1.65 respectively. Risk premium equations: $\rho_{it} = \beta_0 + \beta_1 \rho_{GRt} + \varepsilon_{it,}$ where i = CH, GB, SW, CZ, HU, PO and □□□ ∈ □(0, □□). Variance equations: $h_{ii,t} = c_i + a_i h_{ii,t-1} + b_i \varepsilon^2_{i,t-1}$.