World commodity prices and UK inflation indexes: Food for thought?

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Abstract— **The dynamics of food price inflation have changed significantly. So, understanding them is important for policy not only in developing countries but also in developed countries like the UK. A question that has risen is the role, if any, of central banks in combating global food price inflation.**
The financial crisis and its negative consequences represent the primary problem for policy makers in stabilizing all economies. However the food crisis should not be forgotten since the dynamic of the structural problems of food prices have accelerated recently due to the problems associated with the financial crisis. As the financial crisis causes imbalances in financial markets and a liquidity trap for the banking sector, it also affects investments in agriculture in developing countries. Due to reduced growth, investment and productivity in developing countries, it is estimated that by 2020 rice prices will rise by 13 per cent, wheat by 15 per cent and maize by 27 per cent. Therefore, looking beyond the present crisis, we can expect other challenges to emerge, one of which is a possible resurgence in food and other commodity prices.
This paper proposes a framework which views the recent rise in global food prices as a consequence of the global financial crisis and applies this approach to considering how the increasing prices of food products affect inflation targeting in the UK, cause inflation uncertainty and points out the weakness of Consumer Price Index (CPI) as a measure of inflation in the UK.
Our results show that over the period 1970 – 2011, Granger causality tests reject the hypothesis that global food prices do not cause inflation in the UK, whereas the same hypothesis is not rejected for oil prices. Considering the rising trend of global food prices and that the contribution of food to a change in the UK's CPI index in 2011 was 10 per cent, which makes it the most significant factor after housing and transport, opens a discussion about whether the declining weight of food prices in the UK's CPI may disorient policy makers and lead to wrong decisions about interest rates.
This paper has potential implications for future studies of the emerging challenges of monetary policy in the UK and may contribute to solving the problem of the exceeding of the inflation targeting tolerance bands in the UK by implementing a more accurate measure of inflation.

Keywords— **World food prices, UK inflation, Consumer Price Index, Retail Price Index**

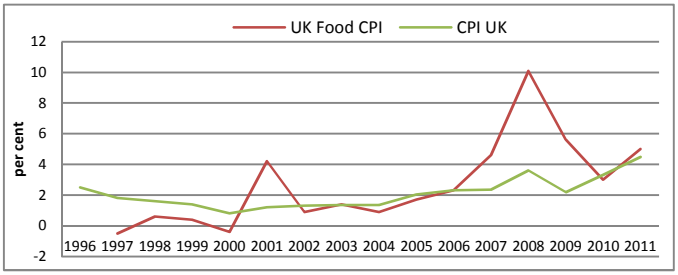
I. Introduction

In recent years, policy makers and researchers have paid considerable attention to oil prices and their effect on monetary policy and domestic price inflation (e.g. LeBlanc and Chinn 2004, Kaliam 2009, Trostle 2010) mostly due to the dynamic of oil prices and the fast pass-through effect. Moreover, it can be assumed that oil prices affect not only domestic inflation but also world food prices. However, insufficient attention has been paid to world food prices and their effect on domestic inflation in developed countries, mainly due to their characteristics. Food prices are typically characterised by long-term relatively stable prices interrupted by short-term price spikes and slower dynamic of the past-through effect (Deaton and Laroque (1992) and Williams and Wright (1991)).

Even if the effects of increasing world food prices transform into domestic retail prices relatively slowly, they cannot be ignored. Recent major fluctuations in food prices have been of particular concern. Given the large weight of food in households' consumption baskets (on average more than 10 per cent in the UK) and its limited substitutability by other goods, food price fluctuations often have a sizeable impact on overall consumer prices as well as on terms of trade. Given the expectations of increasing world commodity prices and the greater volatility of commodity prices, understanding the dynamics of commodity price shocks on domestic retail prices is an important issue for macroeconomic policy, especially in inflation targeting countries such as the UK.

The volatility of food prices is illustrated in Figure 1, which presents the yearly percentage change in CPI inflation in the UK against CPI food price inflation.

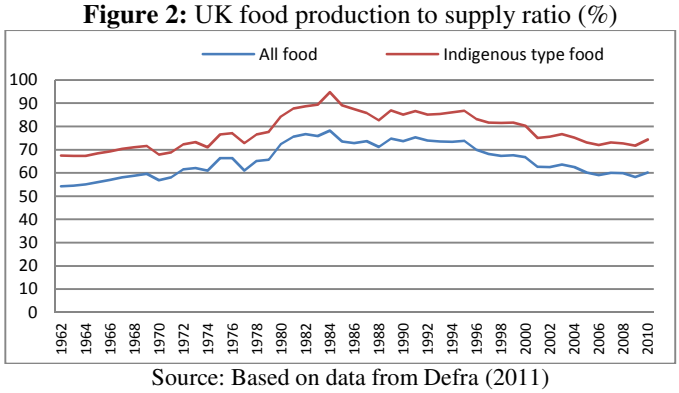
Figure 1: Food price inflation in the UK



Source: Based on data from ONS (2012)

UK retail food price inflation reached around 10 per cent in 2008 compared to overall inflation of 3.6 per cent. This increase in UK retail food prices was driven by an approximately 80 per cent increase in world food prices before falling back sharply in early 2009. One of the main reasons for world food prices affecting the UK's domestic food prices and overall inflation significantly is the UK's falling level of food self sufficiency, calculated as the food production to supply ratio. (Figure 2)

Figure 2: UK food production to supply ratio (%)

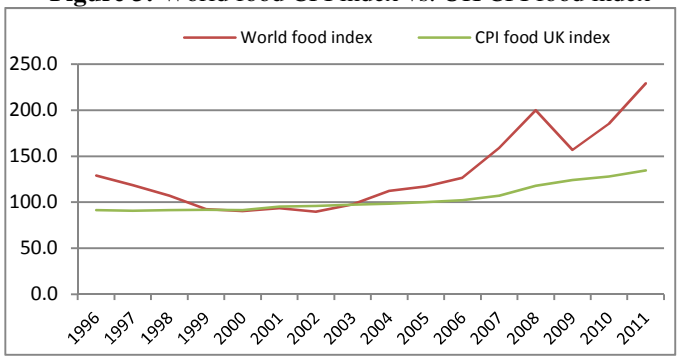


Source: Based on data from Defra (2011)

The declining trend of UK food self sufficiency consequently leads to rises in the volume of imported food products; therefore increasing imported inflation.

The problem of world food prices can be demonstrated by looking at its current rising trend. In late 2009, world food prices started rising sharply again; however this time the trend has persisted till the present. (Figure 3)

Figure 3: World food CPI index vs. UK CPI food index



Source: Based on data from ONS (2012)

The list of factors influencing world food prices is extensive and it is not the aim of this paper to analyse the behaviour of world food prices. As the higher level of world food prices has passed into domestic inflation rates for small open economies, like the UK, often operating under inflation targeting, meeting the inflation target is becoming an increasingly difficult task for policy makers.

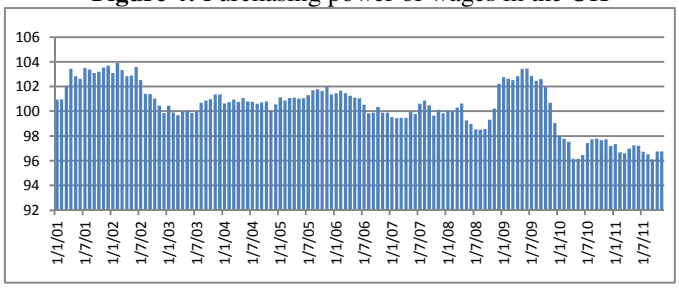
Monetary policy should respond if there is inflation, i.e. if there is a sustained increase in the general price level. However, it can be argued that high food prices often result from adverse supply shocks or large increases in input costs and it is not the intention of policy makers to react to short-term shocks since the conventional wisdom is that if inflation expectations are well anchored, monetary policy does not need to react to supply shocks. This premise is based on the assumption that the supply shocks are purely temporary. However, this assumption does not always hold. In the real world, supply shocks are often structural and lead to a permanent upward shift in prices, which is indeed the case for food prices.

As global food prices are exogenous to a small open economy, there arises an important question for inflation targeting countries. What importance should be given to increasing fluctuations in domestic food price inflation caused by world food prices and how should central banks react in order to meet the inflation target?

Should the Bank of England revise the inflation target upward from its current 2 per cent and risk losing the credibility which is a strategic pillar of inflation targeting; thus it also could be interpreted as a change in the strategy? A higher inflation target would consequently lead to increases in inflation expectations, and therefore to expectations of long-term interest rate increases which would be soon accompanied by increases in short-term rates. Such a movement would have an effect on markets and their behaviour in terms of wage demands. This effect is more likely to be stronger in a period of economic recovery than in the current situation of high unemployment. Nevertheless, expecting the Bank of England to increase the inflation target due to increasing commodity prices seems to be unrealistic as the negative consequences would lead to bigger problems than imported prices.

From the imported inflation perspective, should the Central Bank put restrictions on the purchasing power of wages? Therefore do the increased prices of imported goods such as food feed into wages and domestic prices?

Figure 4: Purchasing power of wages in the UK



Source: Calculated based on data from ONS (2012)

Lowering an already declining trend in the purchasing power of wages (Figure 4) could be harmful for an economy as fewer products could be purchased by households. This would negatively affect demand in the economy and extend the period of economic recovery.

Therefore, in order to meet the inflation target, the price of domestic products would have to be lower than 1.2 per cent per year as imported inflation in the UK is about 1.3 per cent.

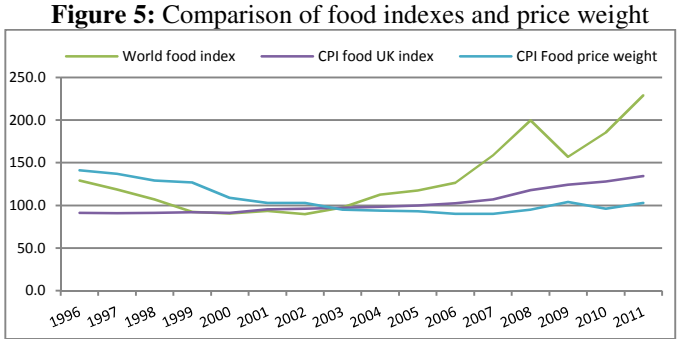
Dealing with increasing food prices is not an easy task and it obviously makes it harder for policy makers to meet the target in the current post – crisis situation. For some critiques

it might be the right time to return to the question of whether inflation targeting really works. However, should we judge inflation targeting as "a framework which does not work" and leave it aside together with other frameworks? Or maybe there is another solution which (to the best of our knowledge) has not been discussed so far.

As is true for constructing the model of the economy, any model can be only as good as the data used. The same applies to the policy decisions of central banks. The study of Moessner, Zhu and Ellis (2011) indicates a substantial disagreement among UK consumers, and between the Monetary Policy Committee (MPC) and consumers, concerning one-year-ahead inflation forecasts. Such disagreement persisted throughout the sample, with no signs of convergence. This is consistent with consumers' inflation expectations not being well-anchored in the sense of matching the Central Bank's expectations. In particular, the expectations estimated by the MPC tended to underestimate inflation in periods of high and rising inflation, and overestimate it in periods of low and falling inflation. In this paper we extend the study and focus on the measurement of food price inflation in the UK, particularly on weights of food in the CPI basket, based on our assumption of the weakness of the CPI basket reflecting consumers' buying habits and we assume that the food weight in the basket should be higher.

A rising trend in world food prices is driven by many factors. Continuously growing world demand and decreases in supply recently caused by a downturn of economic growth and production in developing countries, as a consequence of the financial crisis, has driven food prices up to new levels. World food prices led to rising UK domestic inflation due to the UK's food price inflation hitting 10 per cent in 2008 and being above 5 per cent in 2011. While rising world food prices have increased food prices in the UK, the food price weight in the UK's CPI basket has a downturn trend (Figure 5).

Figure 5: Comparison of food indexes and price weight

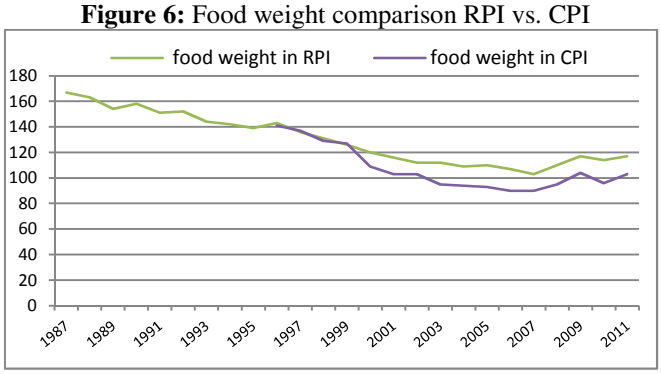


Source: Based on data from ONS (2012)

The weights are meant to reflect the relative importance of goods and services as measured by their shares in the total consumption of households. The weight attached to each good or service determines the impact that its price change will have on the overall index. Therefore, considering a lower elasticity of food demand and low substitutability, does it mean that the consumption of food within the UK is decreasing? Not necessarily.

As was noted earlier, any model can be only as good as the data used for it which brings us to the measurement of the consumer price index and its possible mismeasurement. There is an extensive critique of the disadvantages of using CPI as a measurement of inflation and some economists suggest using RPI instead of CPI. However, our intention is not to promote RPI as a more accurate inflation measurement but to point out a key difference in the weights to items in the consumer basket. As can be seen from Figure 6, there is a difference in the weights of food in the RPI and the CPI.

Figure 6: Food weight comparison RPI vs. CPI



Source: Based on data from ONS (2012)

Even if the same items are included in the food category and in both indexes the weight of the food category has a decreasing trend, the weight given to food is higher in the RPI than the CPI. The reason for this difference is in the method of weights estimation.

RPI weights are based primarily on household spending estimates derived from the Living Costs and Food Survey (LCF), while CPI weights are based on National Accounts estimates of household final consumption consistent. The LCF collects information on spending patterns and the costs of living that reflects household budgets across the country. The survey is the most significant consumer survey undertaken in the UK. From 1957 to March 2001, the Family Expenditure Survey (FES) and the National Food Survey (NFS) provided information on household expenditure patterns and food consumption. Both survey series provided an important source of information for government, charting changes and patterns in Britain's spending and food consumption since the 1950s (ESDS Government, 2012).

Contrary to LCF, the household final consumption expenditure (private consumption) is the market value of all goods and services, including durable products purchased by households. It also includes payments and fees to governments to obtain permits and licenses. Therefore, the estimations based on household final consumption expenditure follow general consumption rather than patterns of particular consumption which lead to different weights given to food category in indexes (The World Bank, 2012).

Given recent events on world commodity markets caused by the financial crisis, coupled with the high levels of global and UK food price inflation, the specific contribution of this paper is to explore the conventional wisdom of world oil prices causing the world food prices and the determinants of food price inflation in the UK accounting for a range of factors that may drive it. The main aim is to provide a valuable support for our argument that considering the UK's falling food self sufficiency, rising world food prices together with the method of weighting in the CPI lead to an underestimation of the importance of food prices.

II. Methodology

The non-stationary behaviour that characterises the CPI and its drivers discussed in the previous section gives rise to the possibility of cointegrated long-run relationships. To allow for the potential existence of these long run relationships, coupled with the potentially dynamic nature of the adjustment process, we develop an econometric model in a co-integrated vector autoregressive (C-VAR) framework.

This has an underlying form given by;

$$X_t = \Phi_1 x_{t-1} + \Phi_2 x_{t-2} + \cdots + \Phi_p x_{t-p} + \Psi \mathrm{D_t} + \varepsilon_t \quad (1)$$

Where lag length (p) is determined empirically using conventional model selection criteria and x_t is a vector of jointly determined I(1) variables containing the UK's CPI/RPI (r_t) and a set of potential drivers, as discussed in the previous section. Specifically, these are the natural logs of: world food prices, world oil prices, effective exchange rate, import prices and official interest rate.

However as variables form cointegrated relationships, it is more convenient to express (1) in its vector error correction (VEC) form;

$$\Delta x_t = \alpha\beta' x_{t-1} + \sum_{i=t}^{p-1} \Gamma_i \Delta x_{t-i} + \Psi \mathrm{D_t} + \varepsilon_t \quad (2)$$

where the cointegrated relationships are explicitly parameterised by the matrix β, coefficients provide estimates of the usual (long-run) response elasticity, given that the variables are expressed in natural logs. Trace and Maximal Eigenvalue statistics are used to assess the number of cointegrating relationships among the data. Equation (2) also defines a matrix of error correction coefficients α, elements of which load deviations from equilibrium into Δx_t for correction, thus quantifying the speed at which each variable adjusts to maintain equilibrium. Coefficients in Γ_i estimate the short-run effect of shocks to the variables on Δx_t and thereby allow the short and long-run responses to differ. Given the interest in the dynamics of inflation as well as the long-run impact of changes in the drivers in x_t, it is essential to use impulse response analysis in order to provide dynamic simulations of the effects of shocks of known size and duration for each driver of inflation discussed in the previous section. Based on the parameters estimated in (2), an impulse response function is used to produce the time path of the dependent variables to shocks from all the explanatory variables. Plots of the impulse response function over time provide a graphical illustration of the period-by-period simulation, describing the long-run effect on the inflation in response to the shock. Coefficient variance decomposition is added in order to provide information on the eigenvector decomposition of the coefficient covariance matrix. As noted in the previous section, there is an assumption of causality between variables; therefore Granger causality test is provided as well.

Given the monthly frequency of our data from the official database of the ONS and the Bank of England, the VEC representation expresses the variables as $\%\Delta\ in\ x_t\ to\ x_{t-1}$ and the VEC model is expressed in log-levels. This is useful when we wish to evaluate the dynamic impact of shocks on the level of food prices.

III. Results and discussion

The empirical VEC model contains seven equations (Δr, Δp ,Δw ,Δe ,Δo ,Δl, Δi and Δu_t) estimated by the least generalised variance estimator with 126 monthly observations over the period 1991M09 to 2011M09.

In the model, there is no intercept in CE and VAR, with a linear trend in CE and no trend in VAR and the trend is included in the CE as a trend-stationary variable to take into account exogenous growth, assuming there is no trend in the short-run relationship.

The results (Table 1) for the model with 2 lags point to the presence of one cointegrating relationship indicated by a Trace statistic test and Max-Eigenvalue test at 0.5 levels of significance.

Table 1: Cointegration Test Statistics-Johansen Test

Hypothesized No. of CE(s)	Trace statistic	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	178.8953	62.64378	50.59985	0.0019
At most 1	116.2515	42.07348	44.49720	0.0896
At most 2	74.17806	37.34033	38.33101	0.0647
At most 3	36.83773	27.27543	32.11832	0.1742
At most 4	9.562300	4.538257	25.82321	1.0000
At most 5	5.024043	4.356585	19.38704	0.9948
At most 6	0.667458	0.667458	12.51798	1.0000

The results indicate one stable cointegrating relationship at the 0.05 level.

Therefore a VEC with one Cointegration equations under assumption four is estimated. Table 2 shows the estimation outputs.

Table 2: Cointegration relationships of VEC

Cointegrating Eq:	CointEq1
LOGRPI(-1)	1.000000
LOGCPI(-1)	0.375566 (0.17912) [2.09668]
LOGI_NOMINAL(-1)	0.499327 (0.16163) [3.08925]
LOGFOOD_PRICE(-1)	0.598354 (0.90479) [0.66132]
LOGOIL_PRICE(-1)	-3.330681 (0.64604) [-5.15551]
LOGEFFECTIVE_EXCH_RATE(-1)	2.599083 (1.88035) [1.38224]
LOGIMPORT_PRICES(-1)	0.271442 (0.09948) [2.72848]
@TREND(70M01)	0.030108 (0.00493) [6.10771]
C	-16.59303

Table 3: The Cointegration equation in the VEC model

Error Correction:	D(LOGRPI)	D(LOGCPI)	D(LOGI_NOMINAL)	D(LOGFOOD_PRICE)	D(LOGOIL_PRICE)	D(LOGEFFECTIVE_EXCH_RATE)	D(LOGIMPORT_PRICES)
CointEq1	-0.060404	-0.018855	-0.075476	8.17E-05	0.002828	-0.005828	-0.322699
	(0.02531)	(0.04188)	(0.01901)	(0.00898)	(0.02113)	(0.00442)	(0.17161)
	[-2.38655]	[-0.45017]	[-3.97076]	[0.00910]	[0.13382]	[-1.31774]	[-1.88044]

The results in Table 3 show that almost all of the variables do not depend significantly on the Cointegration equation. However, dependency can be identified from individual analysis (Table 4).

Table 4: The results from the VEC model

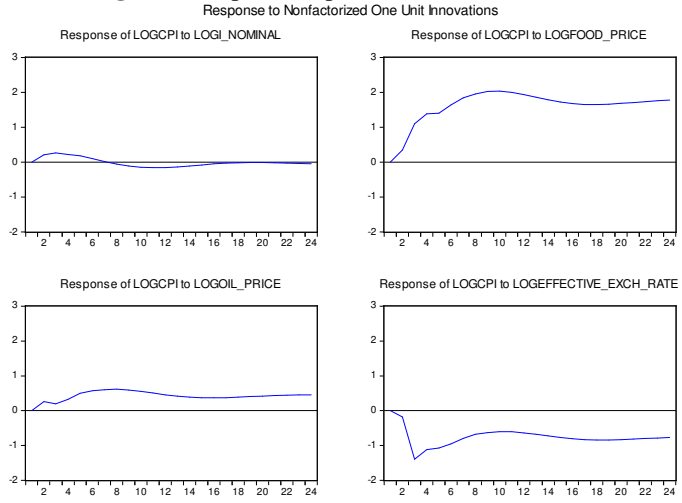
Error correction	D(LOGRPI)	D(LOGCPI)	D(LOGOIL_PRICE)	(LOGIMPORT_PRICES)
D(LOGRPI(-1))	-	-	-	1.158403 (0.82311)
D(LOGI_NOMINAL(-1))	0.220402 (0.11922)	0.221668 (0.19729)	-	-
D(LOGFOOD_PRICE(-1))	0.576810 (0.28653)	0.361891 (0.47416)	0.730657 (0.23921)	-
D(LOGOIL_PRICE(-1))	-	0.195565 (0.21925)	-	-
D(LOGEFFECTIVE_EXCH_RATE(-1))	0.085836 (0.55645)	-	-	-
D(LOGEFFECTIVE_EXCH_RATE(-2))	-	-	-	-

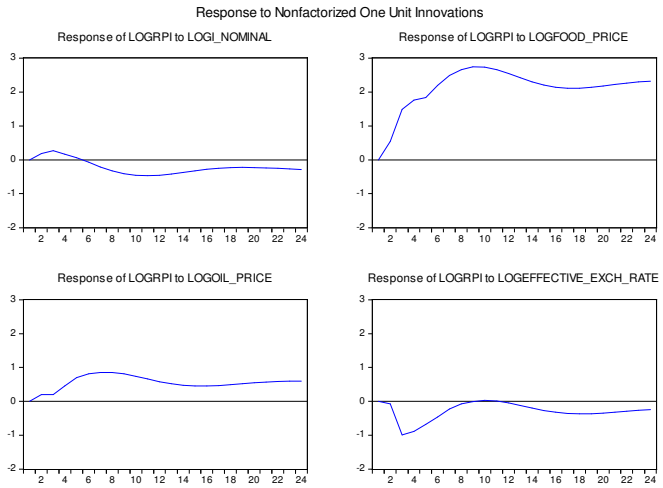
The results provide an opportunity for economic interpretation which confirms the assumption that the UK's inflation depends positively on rising world food prices while weak dependency can be seen in relation to oil prices. The observation of higher dependency of RPI compared to CPI to food prices can be possibly explained by a higher weight of food prices in the RPI which is caused by using a different weights estimation technique for RPI and CPI. While inflation in both cases (RPI and CPI) shows dependency on official interest rates, a positive dependency on the exchange rate was identified only in the case of RPI while the CPI is dependent on oil prices. However the relationship is weaker compared to food prices which confirms our assumption that greater importance should be paid to food prices than oil prices when making policy decisions. The assumption of food prices causing increases in oil prices is also confirmed by the positive dependency of oil prices on world food prices. Surprisingly, imported prices strongly depend on RPI while a strong negative dependency was identified in relation to CPI.

To obtain a more complex picture of the dynamic effects of changes to the drivers, an impulse response analysis is applied to trace the effect of shocks of a specific size and duration on the UK's inflation.

Figure 7 illustrates the dynamic effect of a 1 per cent one-period shock in each driver on the inflation index (CPI or RPI) in the 24 months after the shock. Each impulse response function measures a separate shock so they are plotted together merely for convenience. As can be seen, shocks to world food prices have the largest quantitative impact on the UK's CPI with the maximum impact occurring in the ten months following the shock. Specifically, a 1 per cent increase in world food prices is estimated to increase inflation by almost 2 per cent ten months after the shock, followed by a decrease of approximately 0.5 per cent in the year after the shock. The effect of oil price shocks is similar; however the volume is significantly smaller. A 1 per cent appreciation in Sterling depresses inflation by an estimated 1.20 per cent in the third month following the shock and by 1 per cent one year later. A one-unit shock to nominal interest rates produces smaller impacts confirming the known fact that inflation responds to changes in interest rates by a 0.5 per cent movement.

Figure 7: Impulse response of RPI and CPI

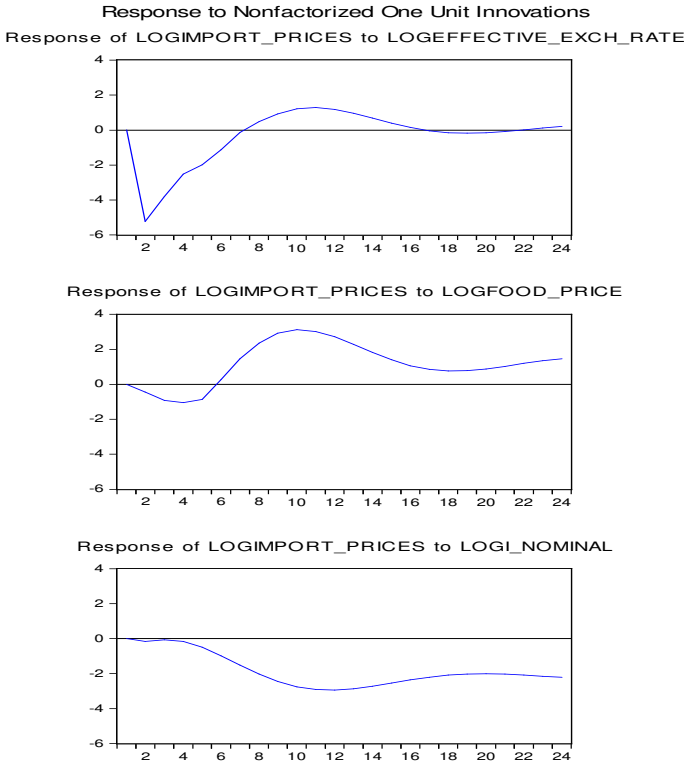


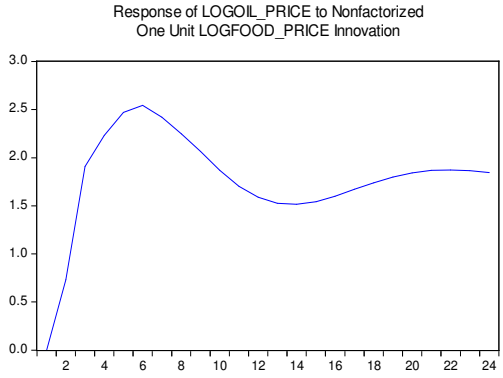


In the case of RPI, the results are slightly different. Shocks to world food prices have not only the largest quantitative impact on the UK's RPI with the maximum impact occurring in the ten months following the shock but compared to the CPI, the response of RPI is larger. This can be explained again by a higher weight of food in RPI than in CPI. On the other hand the effect of oil price shocks to the RPI is slightly greater than in the case of the CPI. A 1 per cent appreciation in Sterling depresses inflation by an estimated 1 per cent in the third month by about 0.5 per cent less than in case of the CPI. Interestingly, a one-unit shock to nominal interest rates depresses the RPI more than the CPI.

Based on the VEC results, Figure 8 shows impulse responses of other variables, confirming the results of VEC as well as our assumption in relation to oil prices.

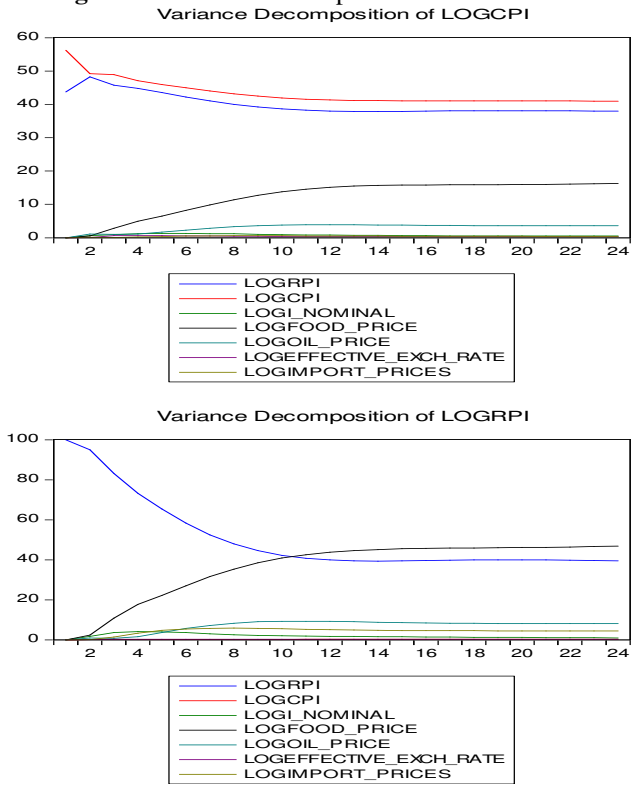
Figure 8: Impulse response of import prices and oil prices





Shocks to the effective exchange rate depress the UK import prices only in the first month following the shock while effects from shocks to world food prices appear ten months following the shock. As is obvious from the impulse response in the case of RPI and CPI and imported prices, the effect of shocks in food prices do not transform into the economy immediately. This confirms the theoretical assumption of the characteristics of food prices discussed in the first section. The argument of oil prices affecting the food prices can be refuted as the VEC results as well as impulse response confirms that the relationship is the other way round. As Figure 8 indicates, the one per cent shock in world food prices has an immediate upward effect on world oil prices with an estimated 2.5 per cent increase in the first six months.

Figure 9: Variance decomposition of CPI and RPI



As Figure 9 indicates, the variance decomposition indicates that the forecast error for 24 months is made up of 18 per cent shocks to the world food prices in the case of the CPI while in the case of the RPI it is 40 per cent. On the other hand the forecast error in the case of world oil prices is only around 8 per cent for the RPI and 3 per cent for the CPI. The world oil prices, effective exchange rate, official interest rates and import prices are insignificant in explaining fluctuations in UK's inflation (CPI or RPI). Additionally, results also suggest that the influence on past inflation shocks dominates in the medium term in the case of RPI; however in case of the CPI the influence persists longer.

In addition to these results, the Granger causality test (Table 5) confirms the argument of an opposite relationship between world oil prices and world food prices. It also confirms that the UK's CPI is rather affected by world food prices than oil prices, which confirms our assumption.

Table 5: Granger causality test (Sample: 1989M01 2012M01)

Null Hypothesis	Obs.	F-statistics	Probability
Food price does not Granger Cause CPI	246	3.12636	0.0094
CPI does not Granger Cause Food price		0.68362	0.6363
Import prices does not Granger Cause CPI	127	4.04083	0.0020
CPI does not Granger Cause Import prices		1.81146	0.1159
Oil price does not Granger Cause World food price	246	0.98380	0.4283
World food price does not Granger Cause oil price		3.28327	0.0069
RPI does not Granger Cause Food price	244	0.37511	0.8655
Food price does not Granger cause RPI		2.93885	0.0136
Oil price does not Granger cause CPI	270	1.93826	0.0884
CPI does not Granger Cause Oil price		1.35312	0.2425

IV. Conclusion

Recently UK inflation has had an upward trend, which reflects the post-financial crisis period of world economic imbalances. Attention is now being paid to events in the Far East, as concerns grow about possible increases in oil prices. However, we should not forget that world food prices are on an upward trend as well and even the effect of increasing world food prices does not impact on economies immediately; not paying sufficient attention can later cause emerging problems in inflation targeting countries such as the UK.

Retail food price inflation in the UK over recent years has reached a level of round 14 per cent in 2008 which drove UK inflation upwards. The inference derived from our results confirms our argument that world food prices contribute to increasing oil prices while the opposite direction was not confirmed. More importantly, in view of the decreasing trend of the UK's food self sufficiency, our argument that world food prices play an important role for the UK economy and that insufficient attention is paid to the weight of the food category in the main inflation index – CPI consequently can lead to misleading decisions of policy makers is supported. The gap in weights in the RPI and the CPI, due to different weight estimation techniques, provides a possible solution for weight correction.

Using a 7 variable vector autoregressive model, we have shown that there are a range of factors that determine the UK's inflation rate. Even though world food prices play a dominant role, the exchange rate and oil prices also matter. The results from an impulse response function also support our argument that the effect of world food prices on the UK's food prices is not sufficiency reflected in the CPI, due to lower weights given to the food category. In addition, given the underlying characteristics of food price behaviour on world markets the impact of world commodity prices on retail food price inflation will depend on the duration of the shock. However, based on the expectations that world commodity prices are likely to be higher and more volatile in the future, understanding the dynamics of food price shocks on domestic inflation is an important issue for macroeconomic policy.

V. References

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