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A Stochastic Analysis of the Impact of Volatile World Agricultural Prices on European and UK Agriculture

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Abstract: Successive Common Agricultural Policy (CAP) reforms and trade liberalisation have led to a more market-orientated European agricultural sector, with EU commodity prices now more closely linked to world prices. As a consequence EU prices have become more volatile. Greater price volatility increases uncertainty and raises fresh challenges for projections of policy impacts in the EU. To take account of world price volatility stochastic modelling has been applied to the FAPRI-EU partial equilibrium model, which includes a UK modelling system. Stochastic modelling provides a means to capture some of the inherent uncertainty associated with agricultural production systems. By varying assumptions about certain exogenous variables, stochastic models can be used to examine the different ways markets may behave. Variable world prices are incorporated within the EU GOLD model. This process identifies the impact of a stochastic distribution of world prices on EU agriculture rather than the single point estimates in the conventional deterministic approach. The results outlined in this study demonstrate the impact of volatile world prices on EU and, in particular, UK prices and market control instruments.

Keywords: Agricultural policy, Stochastic modelling

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1 Introduction

Following the world food price crisis in 2007-08, agricultural commodity prices and price volatility have received a great deal of attention from the media, policy makers and academics. Global agricultural commodity prices exhibited a further surge in the latter part of 2010, leading to new concerns about food security for the poor people of the world (Fan, 2011). It is difficult to isolate the contribution of individual factors, but it is argued that declining stock levels, exchange rate movements, oil prices, trade policies, large purchases by governments and speculation are important underlying factors of price volatility (European Commission, 2009). While the issue of price volatility in agricultural commodity markets is not new, the evidence indicates that global price volatility has increased in recent years (European Commission (2009 and 2010) and FAO (2007 and 2008). Successive Common Agricultural Policy (CAP) reforms and trade liberalisation have led to a more market-orientated European agricultural sector, with EU commodity prices now more closely linked to world prices. As a consequence EU prices have become more susceptible to global shocks.

From a modelling perspective, it is informative to account for global price volatility in examining policies that have asymmetric features. In order to take account of world price volatility, variable world prices are derived from the output of the FAPRI-Missouri US stochastic modelling system and incorporated within the EU GOLD model, which includes the FAPRI-UK modelling system. Stochastic modelling provides a means to capture some of the inherent uncertainty associated with agricultural production systems. By varying assumptions about certain exogenous variables, stochastic models can be used to examine the different ways markets may behave. Linking the EU model to the Missouri stochastic modelling system identifies the impact of a stochastic distribution of world prices on EU agriculture. This partial stochastic analysis based on alternative world prices facilitates the assessment of how alternative policies respond under different global conditions.

The following sections describe the methodology underlying the stochastic analysis of volatile world prices. An overview of the process involved in generating a deterministic baseline is initially presented to place the stochastic analysis in context. This is followed by a description of the FAPRI-Missouri US stochastic modelling system, together with an explanation of how the stochastic world prices are incorporated within the EU GOLD model. World, EU and UK projections based on the December 2009 Stochastic Baseline are presented to illustrate certain features of the stochastic approach. Finally, the relevance of the stochastic approach for policy analysis is illustrated by considering EU export subsidies.

2. Deterministic Modelling

The generation of a deterministic Baseline is the first step in the FAPRI process. FAPRI-Missouri and FAPRI-Iowa State University meets to run the global modelling system simultaneously. In general FAPRI-Missouri maintains a model of the US and FAPRI- Iowa State University has a collection of global models (that includes their own EU model). The models are simulated to generate one set of projections of key variables. This global model is not used in any stochastic projection.

Central to the deterministic Baseline process is the generation of one set of what are generally referred to as “world prices”. As part of the Baseline a large number of individual country or regional prices are generated. In some cases these are generated via simple “price linkage” equations using the projected “world prices”, which are the prices that are used to solve the models by balancing net trade. In other cases country/region models solve by balancing internal prices and the “world prices” appear in trade equations. There is a single “world price” for each commodity. In practice, there is rarely a single “world price” for each commodity in the sense that there would be one price at which all traded product for a commodity will take place.

Within the EU GOLD model deterministic Baseline world prices are based on the projections of world prices from the Global FAPRI model generated for the World Outlook. These work well for cereals but for some livestock commodities it is necessary to make some adjustments to account for the nature of EU trade. For example, the EU wheat price is more reflective of its feed value than the US fob price, and so EU trade equations for wheat also incorporate the feed grain prices. The EU does not trade much beef with the US and so the US price is used to drive a Brazilian beef price which is used to estimate trade under WTO scenarios. The impact of these world prices on internal EU prices is determined by export and import trade equations within GOLD, which incorporate WTO rules regarding import tariffs and export subsidies. As a result, internal EU prices can move independently from world prices due to EU policy, or differences in commodities.

3. FAPRI-Missouri US Stochastic Process

The stochastic Baseline is generated by FAPRI-Missouri after the deterministic Baseline is completed The process of generating stochastic projections using the FAPRI-Missouri US stochastic modelling system involves producing distributions around certain exogenous variables and error terms in the equations and simulating the models 500 hundred times with respect to the resulting stochastic draws (FAPRI-UMC, 2006). The global model is not used at all in this step. Rather, one of the key variables that is made stochastic is the error term within the US trade equations. The error term within these equations contains a significant amount of implicit information regarding world markets, macro fluctuations especially exchange rates *etc*. Included in this implicitly are changes in EU trade, in conjunction with numerous other factors.

Given all the factors that make commodity market outcomes uncertain, there is a very large set of variables that could be considered when conducting stochastic analysis. There is uncertainty regarding the parameter estimates in the US model, information from the residuals of these equations and the uncertainty regarding the exogenous variables such as macro variables. As sampling all possible sources of uncertainty is not feasible, a sufficient number of factors that impact both supply and demand-side uncertainty are drawn so that the resulting price and quantity distributions are acceptably consistent with historical observations. The technique employed by FAPRI-Missouri involves a certain amount of analyst judgment, with the distinct objective of plausible distributions and knowing that not all uncertainty has been captured [see Meyer *et al.* (2010) for further details]. In any case, the approach is to focus on certain important elements of the model to ensure these are correct, rather than mechanically generating distributions that might result in implausible outcomes that would inevitably become buried under a mountain of data.

The stochastic variables come from five basic areas - crop yields, exogenous energy and cost variables, domestic demand, domestic stockholding and, as noted above, reduced form equations for the rest of the world represented through trade equations. The segmentation into these groupings is largely a matter of practicality, where utilising problematic spurious correlations may be worse than assuming no direct correlation of the error terms.

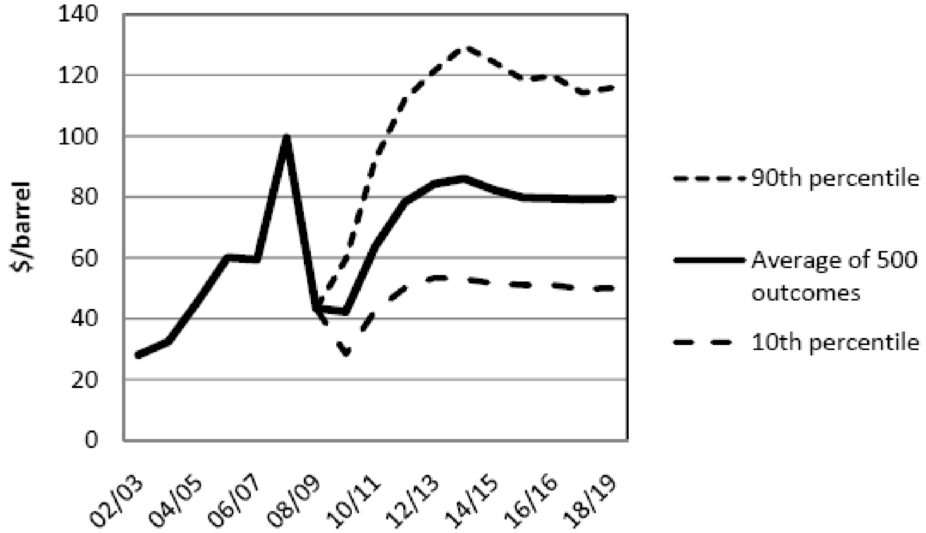
Absolute yield deviations are drawn from empirical distributions across all the crops covered in the model. These yield deviations are drawn based on historical joint distributions, maintaining the historical error correlations in the grouping. The empirical distributions are extended to allow for absolute yield deviations which are unobserved in history. As an example, the yields drawn on a joint distribution mean that an above average corn yield is likely to be accompanied by an above average soybean yield in the same year. Other crops, particularly those grown in geographically more distinct areas, may show less correlation than corn and soybeans.

Exogenous energy prices and costs of production, which often have significant energy components embedded in them, are also drawn as a set to maintain historical correlations. Petroleum, natural gas and the individual components, such as fuel costs, seed costs and labour costs are drawn together. The resulting cost indices are used to calculate each cost of production component and the petroleum and natural gas prices feed directly into other areas of the model, including the biofuels model.

Errors on demand equations, the portion of demand that remains unexplained by prices and income, are drawn on in three separate groups. The errors on key elements of domestic demand are drawn as a joint empirical distribution, maintaining historic relationships unexplained by price and income movements. Stocks or carry-over quantities are drawn as separate group, again drawn from joint distribution to ensure historic relationships among crops. Foreign demand errors, which are in practice reduced-form trade equations, represent the third demand grouping. Foreign demand is separated from domestic demand because, as a result of being represented through a reduced form trade equation, the equation and its errors must incorporate all the unexplained variation from world area, yields, exchange rates, demand shocks and other factors that manifest in demand for U.S. trade. The draws are used to create 500 sets of 10-year correlated draws, which are then used to simulate the model.

In practice the generation of these stochastic draws is a combination of art and science. Consider the oil price shown in Figure 1. The deterministic Baseline uses the projected oil price that comes from IHS Global Insight, which is therefore also imposed as the average of the stochastic draws. If a strict statistical approach based on history were to be applied, then the average would be lower. Using the forecast as the average of the stochastic runs reflects the widespread expectations from industry that oil prices are going to be higher than in the last decade. In order to generate the 500 draws, some persistence is imposed through a lagged dependant variable, with an empirical distribution applied to multiplicative adjustment terms. There is a restriction on how much oil prices can move within a particular year, but over time the oil price can climb to high (or fall to low) levels.

Figure 1: Oil price used in the stochastic model



Based on the estimated distributions, 500 correlated random draws are made of the selected variables. The FAPRI-Missouri stochastic modelling system is solved for each of the 500 sets of exogenous variables and generates the values of the endogenous variables. The models are simulated using SAS and Excel, with stochastic draws generated using Simitar (Richardson *et al*., 2000).

4. GOLD Stochastic Process (includes UK modelling system)

Upon determining the stochastic US projections, the US prices are linked to the representative world prices in the EU GOLD model using price linkage equations that take into account transport costs to yield 500 new "world prices". In some cases the external prices that the GOLD model uses are generated in the FAPRI-US model. This is the case for the meat and dairy prices. Cereal prices are US fob prices and generally differ by transport costs (which are themselves stochastic as they are tied to the oil price). The US model produces soybean prices and products and these are converted to North European prices by adding (stochastic) shipping costs. The rest of the oilseed complex is assumed to move proportionately to the soybean price as the US model does not produce estimates of rapeseed or sunflower product prices. The EU GOLD model, which includes the FAPRI-UK modelling system, is then simulated using 500 sets of world prices, rather than just the one that comes from the FAPRI Global Outlook that up until now has been used in the EU Baseline. This process generates 500 sets of market outcomes for each year for EU and UK variables, where each outcome is based on a particular set of world prices.

In almost all of the markets, within the GOLD model the internal EU markets move independently from world markets as a result of EU policy, or differences in commodities. If prices were linked directly to world prices, then these would be transmitted to EU markets and the level of volatility between EU and world prices would be the same. However, since prices can move independently, the volatility is always smaller. As more elements of the EU model are made stochastic, such as yields or exchange rates the internal EU volatility will increase and in some cases will approach or maybe even exceed that at world level.

The EU Commission retains the ability to use market management tools in response to different market situations. In order to run the model these need to be included explicitly. Exactly how this behaviour is incorporated is important. For example, within the model if market prices for butter or SMP are significantly below intervention levels for consecutive years then the intervention price is reduced in order to prevent the build up of excessive intervention stocks. Note, it is unlikely that this rule would be triggered within a significant number of stochastic draws since the dairy price draws are not strongly correlated across time periods.

The range of the distribution generated by the 500 stochastic projections is depicted by percentiles[1]. Upper and lower boundaries of the distribution in each year are illustrated by the 90th and 10th percentiles respectively. Ten per cent of the stochastic projections are above the 90th percentile and ten per cent fall below the 10th percentile. The 10th and 90th percentiles therefore delineate the boundaries that contain 80 per cent of the stochastic outcomes. As the model is simulated 500 times the 90th percentile shows the 450th highest price and the 10th percentile the 50th lowest price for each year. These percentiles, therefore, provide an indication of the magnitude of variability of projections in each year. Care needs to be taken interpreting the results, as they are influenced by assumptions regarding a limited number of variables in the model. In the case of the work that is presented in this paper, the source of uncertainty is solely variability in world prices. The analysis does not include variability in the EU market such as exchange rates, demand shocks or weather variability. Neither do the simulations include any uncertainty regarding the parameters of the model.

It should be noted that the percentiles are generally smooth lines, but underlying these are individual draws that show significant inter-temporal variation. The behaviour of these draws is more like real life, as a smooth path generally implies that for example, price will always be at intervention levels or never at them, whereas experience shows that there are likely to be short periods of intervention activity punctuated by periods where stocks are run down.

5. Stochastic Baseline Projections

World Stochastic Price Projections

The world prices that are used in the Baseline are not the prices or distributions from the 2010 FAPRI World Outlook, but are based on those generated by the FAPRI Global Outlook from spring 2009 (although they have been altered in some cases to address market developments). The stochastic distributions are based on those generated by the US model for US prices at that time.

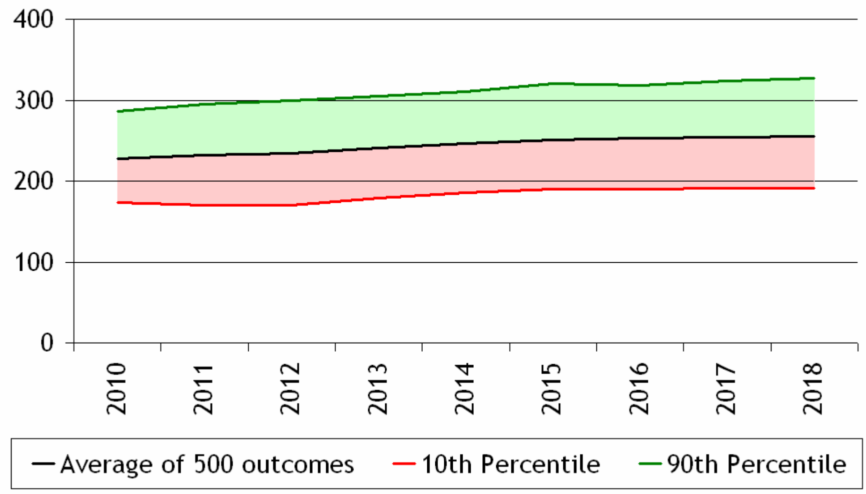
[1] Note, the range of the stochastic projections is not based on any probability distribution of individual projections but rather reflects the impact of the alternative world prices.

The variability of the stochastic world price projections differs across commodities. As indicated by the wide gap between the 10^{th} and 90^{th} percentile in Figure 2, there is a large amount of uncertainty associated with the stochastic projections for world wheat prices. In 2018 the percentage difference between the average projection and the 10^{th} percentile is 25 per cent, while the percentage difference between the average projection and the 90^{th} percentile is 28 per cent[2]. The uncertainty associated with the stochastic projections for the world wheat price is illustrated by the coefficient of variation (see footnote Figure 2). The coefficient of variation (computed as the ratio of the standard deviation to the mean) provides a measure of dispersion that is independent of the variable's measurement unit. Unlike the standard deviation, the computed coefficient of variation for different variables can be used for comparison purposes. The higher the coefficient of variation, the greater the dispersion in the variable.

The coefficients of variation for the other projected stochastic world commodity prices are shown in Figure 3 (blue bars) and in Appendix A. This measure of dispersion indicates that there is a similar level of uncertainty associated with barley and maize. This is partly explained by the impact of weather on the crop sector, which results in yield variability. The livestock sector is less affected by weather conditions and has much longer production cycles than crops. Consequently, livestock output and prices are less variable. The variations for dairy commodity prices are quite large. The world market for dairy products is small relative to total milk production and consequently, short term imbalances between production and consumption can lead to large price swings. In contrast to cereal yields where historical distributions can be a good guide to variability, recent developments in the dairy market mean that the current distribution of dairy prices are determined largely by analyst judgement rather than historical distribution.

[2] The distribution of the world crop prices is not symmetrical since underlying yields are not normally distributed and agricultural policy in both the US and the EU still has some safety net elements. In addition, biofuels policy in the US acts as a safety net for grain prices (i.e. the mandate effectively sets a floor).

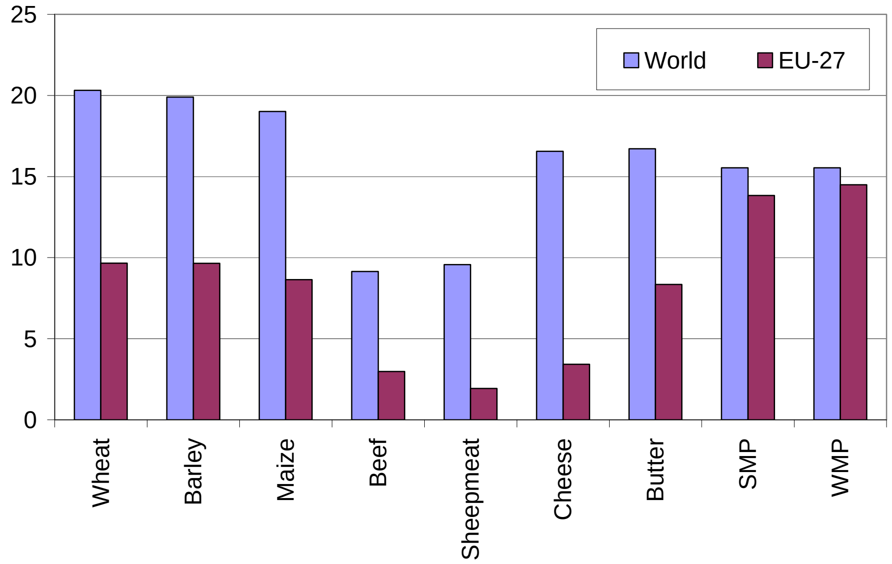
Figure 2: Projected Stochastic World Wheat Price (US $/tonne)*



* Percentile differences and coefficient of variation for stochastic world wheat price

	2010	2014	2018
Percentage difference between 10th percentile and average	-23.9%	-24.5%	-25.2%
Percentage difference between 90th percentile and average	25.9%	26.0%	28.2%
Coefficient of variation	18.9	19.2	20.3

Figure 3: Comparison of Coefficients of Variation for Projected Stochastic World and EU Prices (2018)

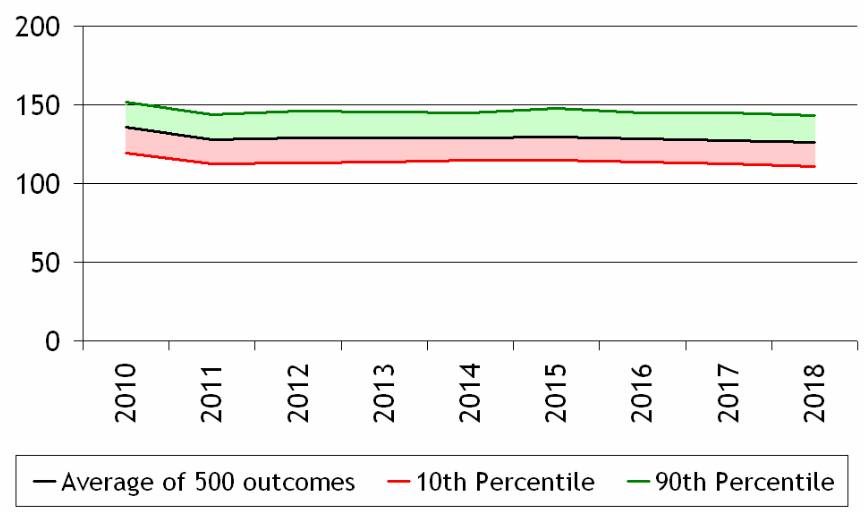


EU Stochastic Price Projections

The projected stochastic EU wheat price is shown in Figure 4. As indicated by the percentile boundaries and the coefficient of variation, the level of dispersion associated with the EU wheat price is considerable. The variability of the EU price is necessarily below that of the world price in the modelling exercise undertaken. The presence of intervention for wheat and import tariffs that are triggered under certain market situations shields the EU to a certain extent. The model does not include variations in EU yields or explicit changes in the euro/dollar exchange rate. If the sources of uncertainty that were incorporated in the US model were repeated for the EU then the variability would be much higher.

The coefficient of variation for the other projected stochastic EU prices are shown in Figure 3 (red bars) and in Appendix A. The degree of dispersion is comparable across the grain commodities. The coefficients of variation for the beef and sheep sectors are low since the protected nature of these markets limits the responsiveness of these commodities to global price changes. Within the dairy sector, the EU powder prices move closely with their world prices, while the transmission from the world market to the EU market is more muted for butter and cheese. The following discussion focuses on the dairy sector.

Figure 4: Projected Stochastic EU Wheat price (Euro/tonne)*



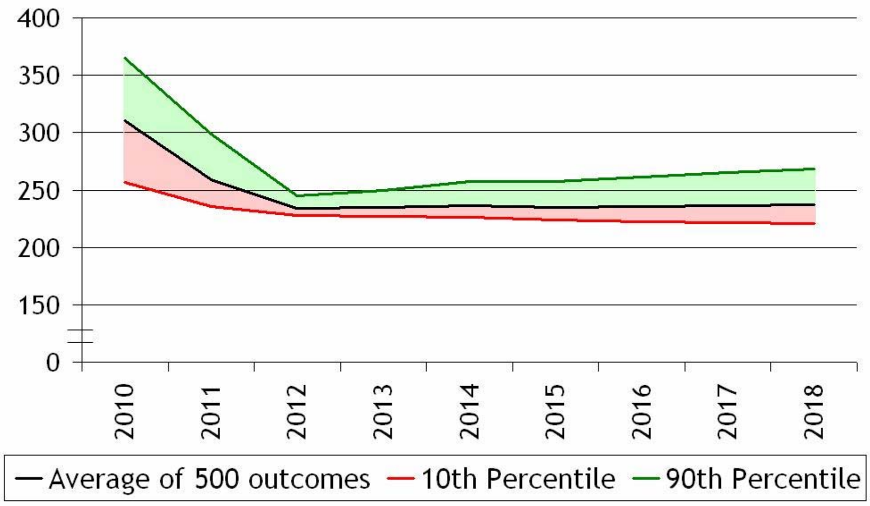
* Percentile differences and coefficient of variation for stochastic EU wheat price

	2010	2014	2018
Percentage difference between 10th percentile and average	-11.9%	-11.2%	-12.0%
Percentage difference between 90th percentile and average	11.8%	12.2%	13.5%
Coefficient of variation	9.2	9.2	9.7

Dairy Sector

Within the dairy sector, it is projected that the percentile boundaries for the stochastic EU butter price change during the projection period reflecting internal EU support policy (Figure 5). At the beginning of the projection period, the level of dispersion around the average projection is high (the difference between the 10th [90th] percentile and the average is -17% [+17%]). However, it is projected that the level of dispersion narrows significantly in 2011 and 2012 as the projected average butter price falls close to the intervention price, which in the model provides a floor and supports the market price. The percentage difference between the 10th percentile and the average is –2.7% in 2012, while the percentage difference between the 90th percentile and the average is 4.7%. Hence, the price distribution is asymmetric when intervention is triggered as it diminishes downward price volatility.

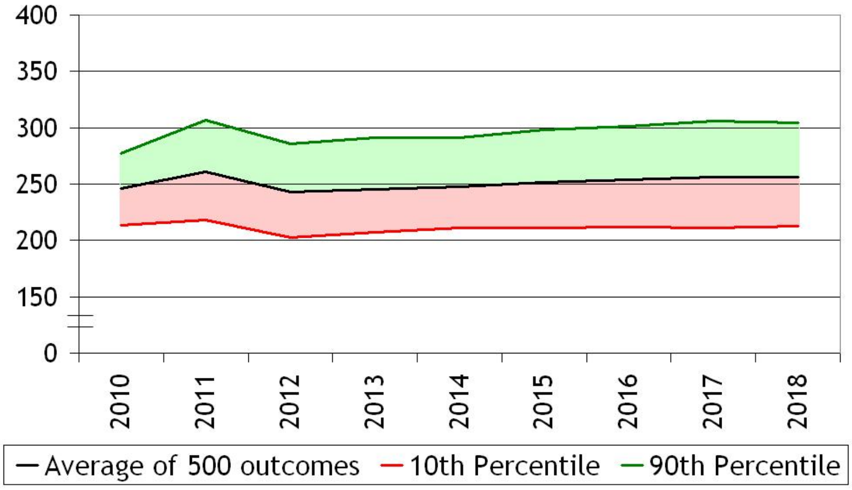
Figure 5: Projected Stochastic EU Butter Price (Euro/100kg)*



* Percentile differences and coefficient of variation for stochastic EU butter price

	2010	2014	2018
Percentage difference between 10th percentile and average	-17.3%	-4.1%	-7.0%
Percentage difference between 90th percentile and average	17.4%	9.0%	13.2%
Coefficient of variation	12.7	5.6	8.3

Figure 6: Projected Stochastic EU SMP Price (€/100kg)*



* Percentile differences and coefficient of variation for stochastic EU SMP price

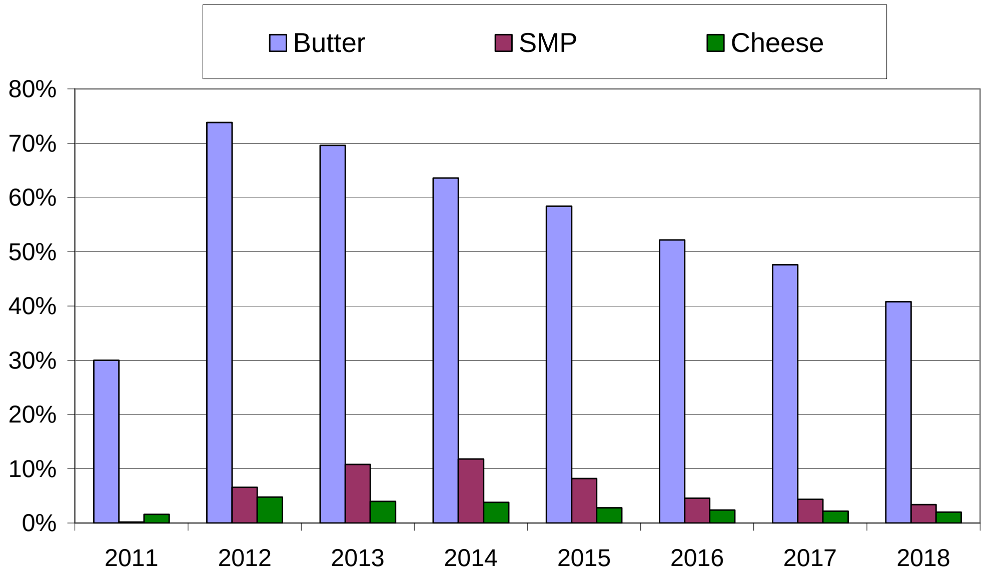
	2010	2014	2018
Percentage difference between 10th percentile and average	-13.1	-14.7	-17.0
Percentage difference between 90th percentile and average	12.8	17.5	18.8
Coefficient of variation	9.7	12.4	13.8

In contrast to butter, the projected SMP world price is mostly above the intervention price and so the EU is much more competitive. The projected stochastic powder prices, therefore, show more variability (a wider distribution) as more of the world price volatility is transmitted to the EU markets (Figure 6). Note that if other sources of variability facing EU producers were incorporated the volatility would be greater.

Under the conventional deterministic Baseline it is projected that butter export subsidies will continue to be retained throughout the projection period so as to support the EU butter market price. In contrast, it is projected that the deterministic export subsidy expenditure is zero for EU cheese, SMP and WMP over the entire projection period. These deterministic projections reflect the level of world prices incorporated within the Baseline. Export subsidies are paid in the model when the EU internal price is above a certain proportion of the world price. In general when world prices are above intervention prices export demand is elastic with respect to world price so export subsidies are not triggered. Recent events have shown, however, that export subsidies may be necessary for a range of dairy products under adverse market conditions. Running the model stochastically yields a set of projections of export subsidy expenditure under alternative world prices, which helps to determine the likelihood that export subsidies will be required in any given year.

Using the stochastic projections the proportion of simulations that trigger EU export subsidies for butter, cheese and SMP is shown in Figure 7. Butter export subsidies are triggered in the majority of the simulations from 2012 to 2016 when projected world prices for butter are below EU intervention levels. The number of simulations requiring export subsidies declines as the overall level of world dairy prices is projected to rise over the period. Under the particular rules imposed for the triggering of export subsidies, SMP and cheese export subsidies are much less likely. Nonetheless, the results demonstrate that it may be necessary to pay export subsidies for these commodities under certain market conditions.

Figure 7: Proportion of Simulations that Trigger Dairy Export Subsidies



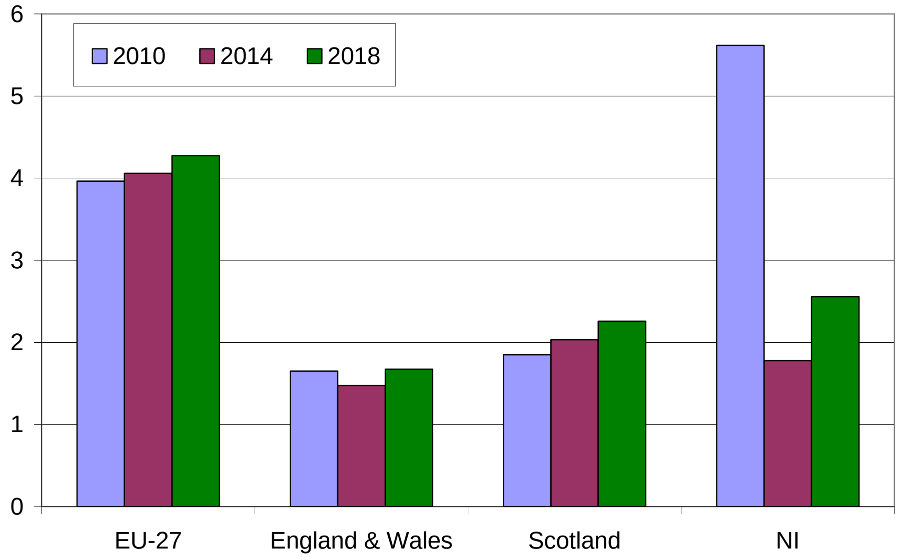
Differences in the dairy industry across the EU impact on the projected variability in producer milk prices. Within the EU-27 as a whole a greater proportion of raw milk is allocated to the manufacture of dairy commodities compared to GB. Within GB liquid milk sales represent an important component of the dairy market. As a consequence, the projected EU-27 producer milk price is more responsive to commodity price swings compared to England & Wales and Scotland. Thus, the projected coefficient of variation for the EU-27 producer milk price is larger than those in GB (England & Wales and Scotland) (Figure 8). These differences in responsiveness are consistent with recent price movements. During the first half of 2009 the average UK producer milk price fell in response to the falling commodity prices to a lesser extent than in many other EU countries (DairyCo Datum, 2009). As a result, the UK moved from near the bottom of the range of producer milk prices in the EU-27 to above the EU-27 average. However, improvements in the dairy commodity markets in the second half of 2009 resulted in producer milk prices in some EU countries increasing more rapidly than in the UK. It should be noted that the stochastic results outlined in this paper are solely based on variable world prices. This partial stochastic analysis limits the degree of variability in the UK. If, in particular, exchange rate fluctuations were included within the stochastic analysis, the degree of variability in the UK would be significantly greater.

In contrast to the rest of the UK, a large proportion of raw milk is allocated to the manufacture of dairy commodities in NI. As a result, it is projected that the NI producer milk price displays a large degree of volatility in the early part of the projection period. In the latter part of the projection period the NI producer milk price displays less volatility due to the projected decline in the variability of the butter price, less dependence on powder production (which displays greater variability) and shipping transportation costs[3] (which influences the incentive to ship milk from NI to GB).

Projected dairy cow numbers in the UK are influenced not only by the producer milk price but also costs of production. As noted above, the variability of the projected stochastic producer milk prices in GB is modest. As indicated by the coefficient of variation in Figure 9, UK dairy cow numbers display a somewhat greater degree of variability. The percentage difference between the average projection and both the 10th and 90th percentiles is approximately 4 per cent in 2018. This variability reflects the significant volatility of projected grain prices, which impacts on the cost of production. Feed costs account for a high proportion of dairy cow costs and hence projected grain prices exert a large impact on dairy cow numbers.

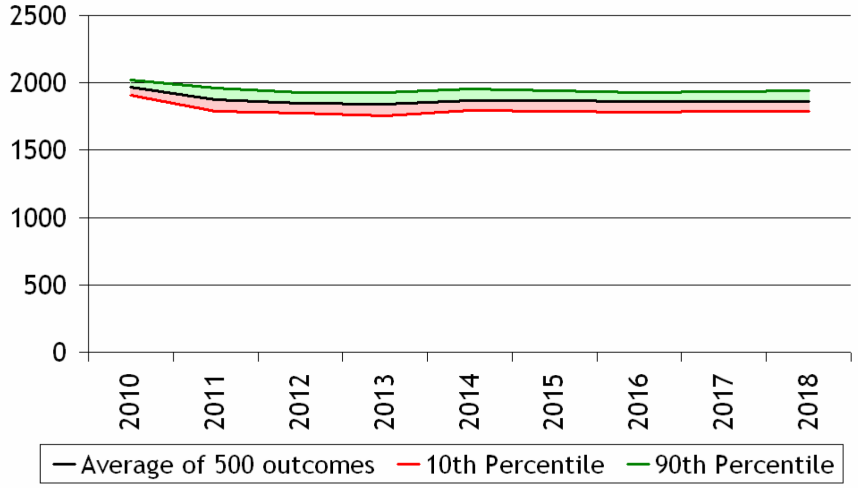
While feed costs also impact beef cow numbers, the proportional impact is less marked compared to dairy cows. As a result, the coefficient of variation for UK beef cow numbers is lower compared to dairy cow numbers and corresponds more closely to the variability in the producer price (see coefficients of variation in Appendix B). Again, it is important to note that the variability here is only that associated with movements in the world price. The beef market of the EU is protected by 100 per cent tariffs and thus, movements in world beef prices do not have much impact on EU markets. Thus, within this exercise the only impacts that are really influencing livestock numbers are changes in feed costs coming from world markets. If all sources of variability facing UK producers were incorporated the variation would be greater.

Figure 8: Comparison of Coefficients of Variation for Projected Milk Producer Prices



[3] It is assumed that the cost of shipping milk from NI to GB equals 3ppl.

Figure 9: Projected Stochastic UK Dairy Cow Numbers (thousands)*



* Percentile differences and coefficient of variation for stochastic UK dairy cow numbers

	2010	2014	2018
Percentage difference between 10th percentile and average	-3.0%	-4.2%	-4.2%
Percentage difference between 90th percentile and average	2.6%	4.4%	4.2%
Coefficient of variation	2.2	3.3	3.4

6. Conclusions

Recent years have shown that variability in prices can be marked and the impact on markets and the policy process significant, as illustrated in particular by the situation in dairy markets. The results outlined in this paper demonstrate the impact of volatile world prices on EU and, in particular, UK markets. The degree of price volatility is more muted within EU agricultural commodity markets compared to global commodity markets because of the presence of import tariffs, export subsidies and the various internal EU support policies still in existence. Diminishing the role of these support policies would increase the level of volatility in the EU.

The results of policy analysis in a deterministic model may be influenced by the assumptions made regarding exogenous variables. A good example is expenditure on export subsidies. In the deterministic Baseline world prices are such that export subsidies for butter are retained throughout the projection period. For some of the 500 simulations, no export subsidies in dairy are needed at all, while in others expenditure is projected for products other than butter. A stochastic model is therefore better able to capture the range of potential consequences of abolishing export subsidies due to WTO negotiations.

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Appendix A: Coefficient of Variation for Projected Stochastic World and EU Prices (2018)*

World Prices

	2010	2014	2018
Wheat	18.9	19.2	20.3
Barley	16.1	20.3	19.9
Maize	17.0	17.0	19.0
Rapeseed	17.4	18.9	20.4
Soybean	17.4	18.9	20.4
Beef	8.1	8.7	9.1
Sheepmeat	8.3	9.3	9.6
Cheese	15.1	16.6	16.6
Butter	14.8	16.9	16.7
SMP	13.3	14.8	15.5
WMP	13.3	14.8	15.5

EU-27 Prices

	2010	2014	2018
Wheat	9.2	9.2	9.7
Barley	7.4	9.0	9.6
Maize	7.3	8.1	8.6
Beef	1.3	2.9	3.0
Sheepmeat	0.4	1.9	1.9
Cheese	3.1	3.3	3.4
Butter	12.7	5.6	8.3
SMP	9.7	12.4	13.8
WMP	12.4	13.7	14.5

* Coefficient of Variation = Standard Deviation / Mean

Appendix B: Coefficient of Variation for Projected Stochastic UK Variables (2018)*

	2010	2014	2018
Prices			
Wheat	9.2	9.2	9.7
Barley	9.2	11.4	12.2
Rapeseed	17.4	18.9	20.4
Beef	1.2	2.9	3.0
Sheepmeat	0.4	1.9	1.9
Cheese	2.7	2.7	2.9
Butter	12.0	4.8	7.3
SMP	9.9	12.7	14.1
WMP	11.9	13.0	13.9
Milk price (Eng & Wales)	1.6	1.5	1.7
Milk price (Scotland)	1.8	2.0	2.3
Milk price (NI)	5.6	1.8	2.6
Livestock Numbers			
Beef cows	1.2	2.6	2.6
Dairy cows	2.2	3.3	3.4
Ewes	1.3	2.3	2.2
Production			
Beef	1.9	3.6	4.1
Sheepmeat	0.9	2.6	2.6
Crop Areas			
Wheat	1.7	1.6	1.7
Barley	1.3	1.6	1.7
Rapeseed	3.6	3.8	3.8

* Coefficient of Variation = Standard Deviation / Mean