The challenges posed by price volatility in the EU dairy sector.

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Annotation:

It is now accepted that the significant increase in the level of price volatility experienced by the EU dairy sector in recent years is expected to persist, and perhaps even increase, as EU dairy policy continues to become more market focused. The specific challenges which volatility present are numerous. This increase in volatility translates to increased risk for all participants in the dairy supply chain. The identification and adoption of suitable risk management tools will help to ensure that the sector remains competitive and profitable in an uncertain future. In this paper the increased levels of volatility are quantified while the challenges associated with these increased levels are presented and possible tools to manage this issue are presented and analysed.

Keywords: Volatility, Risk Management, Dairy Futures, Common Agricultural Policy

JEL classification: Q13, Q14 and Q18

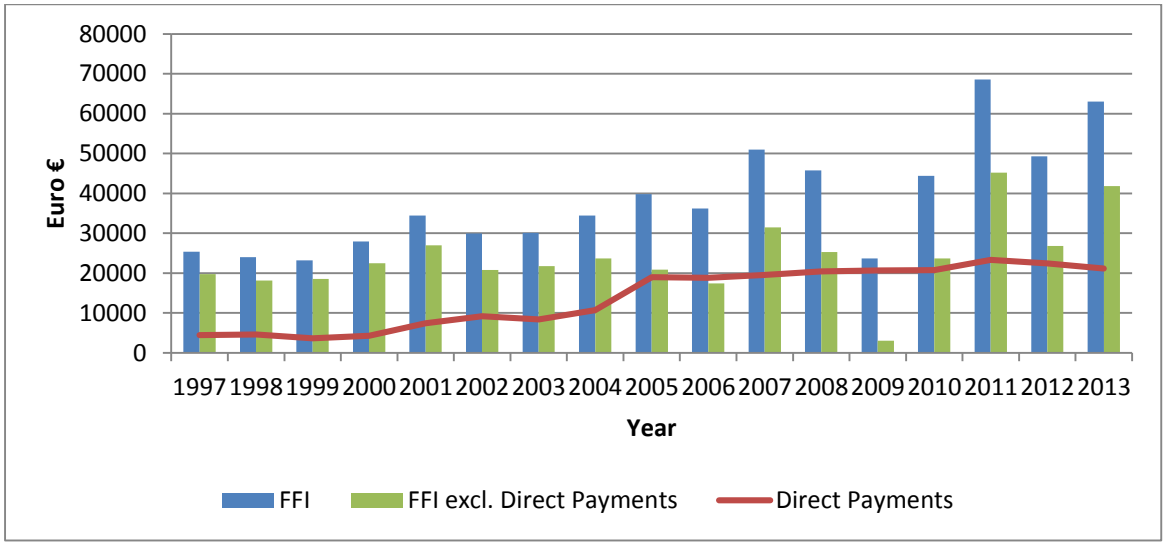
1. Introduction

Providing an acceptable definition of price volatility is not easy. Most people associate increased volatility with increased risk. However risk is subjective, so while one person might consider an investment to be high risk their neighbour may consider it low risk and likewise with volatility. In term of a working definition the following by Gilbert and Morgan (2010) is useful. "Price volatility is a directionless measure of the extent of the variability of a price". The inclusion of directionless is crucial as it counters the myopic view of sellers that volatility only occurs when prices are falling and low and that of buyers that it only occurs when prices are rising and high. Likewise it should be acknowledged that sustained periods of high or low prices do not constitute volatility, it is the speed and degree of change in prices which constitute volatility. Furthermore it should be noted that price volatility is just one of a number of risks which all members of the dairy supply chain face. Other risks include financial, asset (fire, theft etc.), policy, legal, currency risk and market risk to name some.

Price variation to some degree is both desirable and inevitable in all free markets as it reflects the changing needs and preferences of customers and the changing cost and competitive positions of participants at all stages in the supply chain and these price variations act as signals to reallocate resources efficiently. While this element of changing prices may be regarded as normal and desirable in free markets, the emergence of exceptional price volatility in dairy and food markets in recent years is creating many problems for processors, farmers and other supply chain participants. Over the last eight years wholesale skim milk powder (SMP) prices in the EU have varied from a peak month of over €3,800 in 2007 to a low of less than €1,650 in 2009, then rising to €3,310 in early 2014 before falling to €1,815 by mid-2015. This dramatic price variation, when combined with similar variation in prices for other dairy

products, has resulted in farmgate milk prices at EU level varying with equal magnitude. This dramatic change in farmgate milk prices has resulted in dramatic variation in dairy farm income levels. Taking Ireland as an example, dairy farm incomes have varied from a low of about €25,000 in 2009 to a peak of between €60,000 and €70,000 in 2011 and 2013 (Figure 1). This variation in incomes takes account of the income stabilization provided by the EU single payment and is even more dramatic if that payment is excluded.

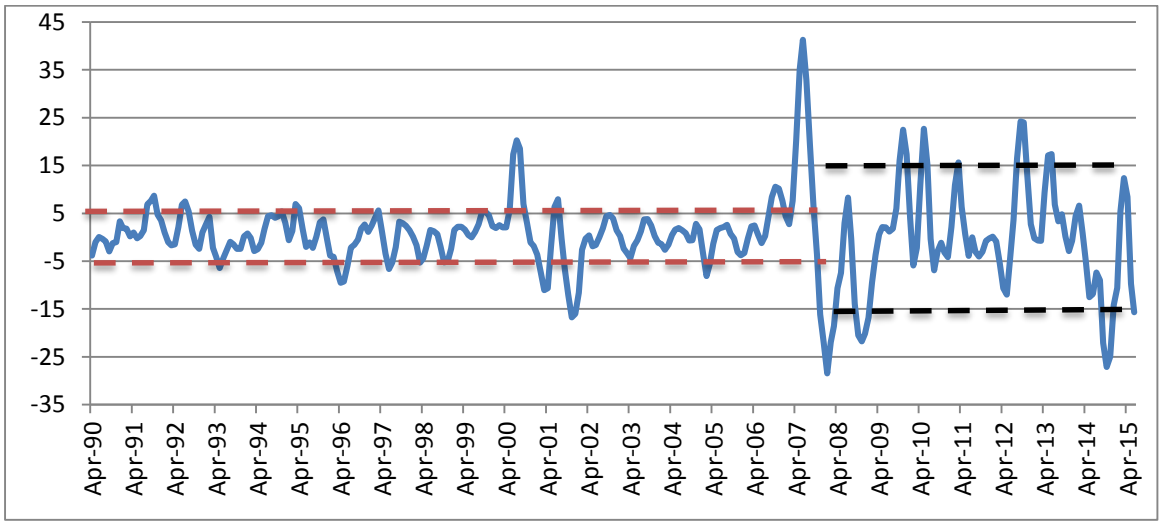
Figure 1: Family farm income (€/farm) on specialist dairy farms in Ireland 1997 to 2013



Source: Teagasc National Farm Survey

Figure 2 clearly displays how volatility has increased dramatically in EU SMP wholesale prices since 2007. This graph shows the percentage change in prices relative to the price three months previously. Prior to 2007 prices rarely changed by more than 5% over any three month period (red dashed line) while post 2007 changes of 15% or more are not uncommon (black dashed line).

Figure 2: Three month percentage price change in EU SMP prices

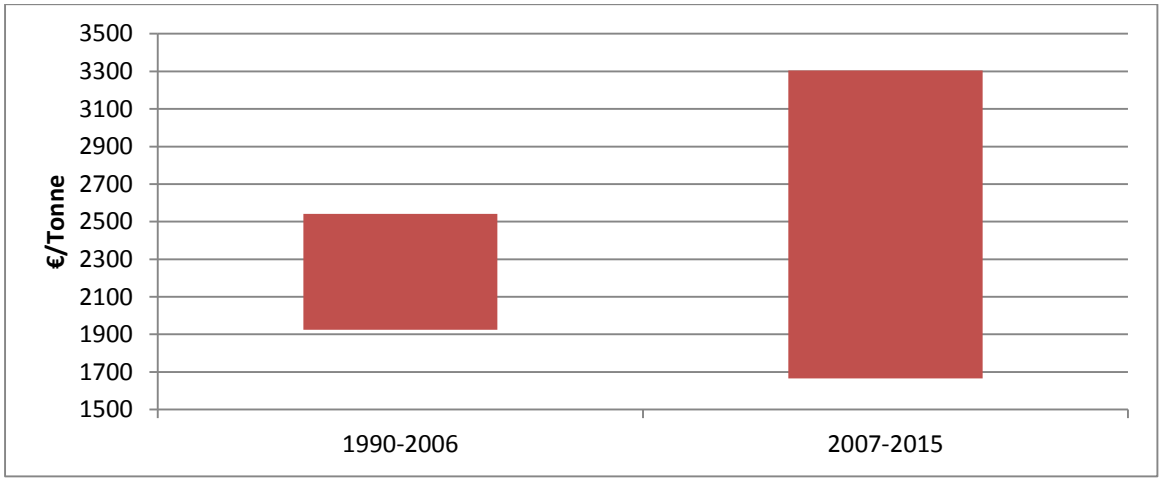


Source: Own Calculations

As discussed later the objective of more recent Common Agricultural Policy (CAP) reform was to align EU dairy prices more closely with world prices. This greater alignment of prices has also seen an alignment of price volatility. From an industry perspective this has created a twin problem in so far as the range within which prices now fluctuate is far wider as seen in Figure 3. This chart shows the range within which the mid 90% of SMP wholesale prices fluctuated prior to and post 2007. In this chart the largest and smallest 5% of prices in each period are truncated, so for example on 5% of occasions prices would have fallen below €1,925 or above €2,542 in the earlier period. Comparable figures for the second period are €1,665 and €3,305.

A further point to consider is that the nature of EU farm gate prices would appear to have changed in recent times. Bergmann et al (2015) decomposed German, Irish and an average EU farm gate milk price time series into trend, seasonal and cyclical components using structural time series models. Their analysis showed that in the recent decade most of the price variation was attributed to the cycle component along with the seasonal to a lesser degree. The authors then concluded that price volatility for this period seemed to be endemic to the dairy industry and to some degree predictable and best addressed using countercyclical measures. Nicholson and Stephenson (2014) arrive at similar results and conclusion when considering US data.

Figure 3: Mid 90% range of EU SMP wholesale prices



Source: EEX

2. Materials and Methods

2.1 Causes and Consequences of Price Volatility

The causes of extreme price volatility in dairy commodity markets are very well established in economics literature and they relate primarily to a combination of the somewhat unique characteristics of the demand for food (inelastic demand) combined with unanticipated variation in supply due to weather, disease, etc., whereby even small changes in supply can cause very large changes in price (O Connor and Keane 2009). This has been further accentuated by low dairy inventory levels in more recent years. In an EU dairying context major policy changes over recent years have also resulted in greatly increased volatility. Finally it should be noted that while it is possible to reduce or increase milk production modestly in the short run, substantial production changes in particular takes a considerable time in dairying.

With regard to consequences, extremely low dairy product prices cause many financial problems for dairies and farmers (e.g. low margins, cashflow management, and financing) and ultimately threaten solvency, while extremely high prices result in product substitution which can subsequently be difficult or impossible to reverse. Dairy product buyers also suffer from volatility as they much prefer stability for planning and customer relationship purposes and hence, if alternatives are available, will prefer to conduct business with more price stable sectors. For example these buyers are sometimes required to budget up to fifteen months in advance. Deviations from these budgeted estimates have at times to be explained and justified, in particular in the case of publicly listed companies. To avoid this situation buyers in particular favour fixed price contracts or materials which display lower levels of price variability. Finally extreme volatility can also inhibit innovation and R and D.

2.2 The role of policy[1]

Prior to the fundamental reform of dairy policy under the Luxembourg agreement in 2003 the policy instruments employed by the EU had very successfully isolated internal EU dairy commodity prices from the greater volatility associated with world prices. Intervention purchasing placed a floor on prices while other measures such as production quotas, export refunds, import tariffs and subsidized consumption measures helped to ensure higher and much less volatile prices than those pertaining in world markets. However the Luxembourg agreement saw the milk sector became fully integrated into the overall "new" CAP. As a result EU dairy product commodity prices became closely aligned with world prices and experienced for the first time in decades the extreme price volatility experienced in world commodities markets generally. In order to mitigate these effects the CAP reform of 2003 saw a switch to decoupled farm payments (Single Payment Scheme), which issues payments based on historic production levels and enables producers to switch to the production of products demanded by the markets. As part of this reform a Dairy Premium was introduced in 2004. This premium is compensation for the reduction in the intervention prices (25% for butter and 15% for skimmed milk powder), it is decoupled from the milk quota and added to the Single Payment from April 2005. These payments are in place to 2020.

A major price collapse in 2009 caused much concern, not least among EU dairy farmers who experienced severe income stress. As a result a High Level group was established under the European Commission which proposed a number of reforms. This led to the milk package 2012 which involved a series of measures aimed at boosting the position of dairy producers in the dairy supply chain and preparing the sector for a more market-oriented and sustainable future[2]. The measures included the promotion of written contracts between farmers and processors, the promotion of producer organisations (PO) which can negotiate contract terms collectively, including the price of raw milk, and the application of rules for inter-branch organisations in the milk sector which allows actors in the dairy supply chain to carry out a number of activities such as for example promotion, research, innovation and quality improvement. Finally this reform led to the establishment of an EU milk market observatory with a view to enhancing transparency in the EU milk market.

[1]A detailed discussion of EU dairy from its inception is presented in Keane and O Connor (2015)

[2]These measures established by the Milk Package will apply until mid-2020.

The most recent reform (CAP to 2020), which saw the expiration of the milk quota regime, recognises that there is need for a "**s**afety net**"** in case of serious imbalance in the market. The measures adopted include "public intervention" and absorption of private storage costs for butter. This reform also acknowledges that export refunds can be used in cases of market imbalances with specific ad-hoc measures also available to be mobilised in case of emergency or significant market disturbances. Finally the European Commission may grant aid for skimmed milk and skimmed-milk powder intended for use as feeding stuffs or to be processed into casein and caseinates.

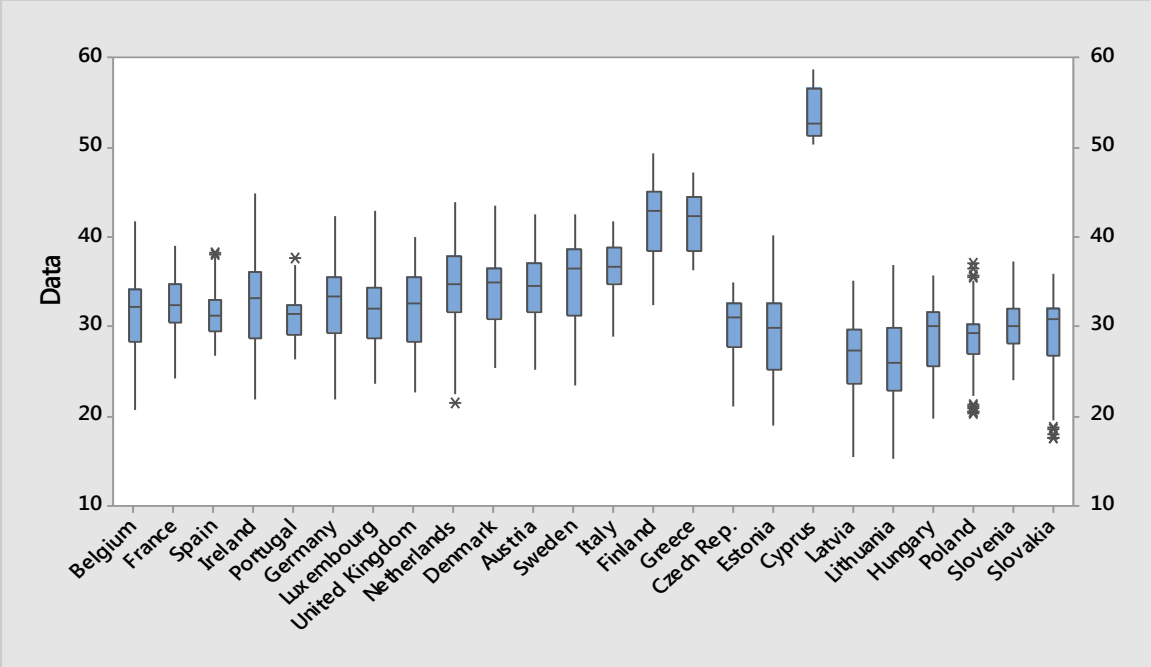
It should be further noted that Article 36 of Regulation (EU) No 1305/2013 allows for support to cover for:
(a) financial contributions to premiums for crop, animal and plant insurance against economic losses to farmers caused by adverse climatic events, animal or plant diseases, pest infestation, or an environmental incident;
(b) financial contributions to mutual funds to pay financial compensation to farmers for economic losses caused by adverse climatic events or by the outbreak of an animal or plant disease or pest infestation or an environmental incident;
(c) an income stabilisation tool, in the form of financial contributions to mutual funds, providing compensation to farmers for a severe drop in their income. This is dealt with in detail in Article 39
Article 37 provides for the provision of crop, animal, and plant insurance and Article 38 for mutual funds for adverse climatic events, animal and plant diseases, pest infestations and environmental incidents.

2.3 Challenges associated with dairy.

Any appropriate risk management tool for the EU dairy sector must be cognisant of the challenging features associated with milk production and its marketing. By its very nature milk is perishable and in some cases seasonal. In order to deal with this constraint, as well as to meet the demands of its end users, a large proportion of milk is usually processed into a myriad of ever expanding products. A non-exhaustive representation of the breath of these products is presented in Appendix 1. This schematic fails to capture dairy's growing role as an ingredient in the nutrition and pharmaceutical industries. This diverse product range means that different dairy processors have very diverse product portfolios which in turn provide very different returns to both processor and farmer. The diversity of these returns at farm level is presented in Figure 4. The data presented show the monthly farm gate prices of selected EU countries over the last six years[3]. Figure 4 clearly demonstrates that not alone are the price levels very different across countries but the level of variability within and across member states is also highly variable from month to month. There is then further variation at local level as these prices represent national averages.

[3]This data is published by the EU Commission at http://ec.europa.eu/agriculture/milk-market-observatory/index_en.htm

Figure 4: Boxplot of EU farm gate milk prices Jan-09 to June-15, €/100 Kg



Source: EU Milk Market Observatory

The heterogeneous nature of the EU dairy farm sector is further highlighted in Table 1. From this table we see that any simple homogenous solution to risk management at farm gate is unlikely to be successful with bespoke solutions necessary and desirable.

Table 1: The heterogeneous nature of the EU dairy farm sector, selected countries

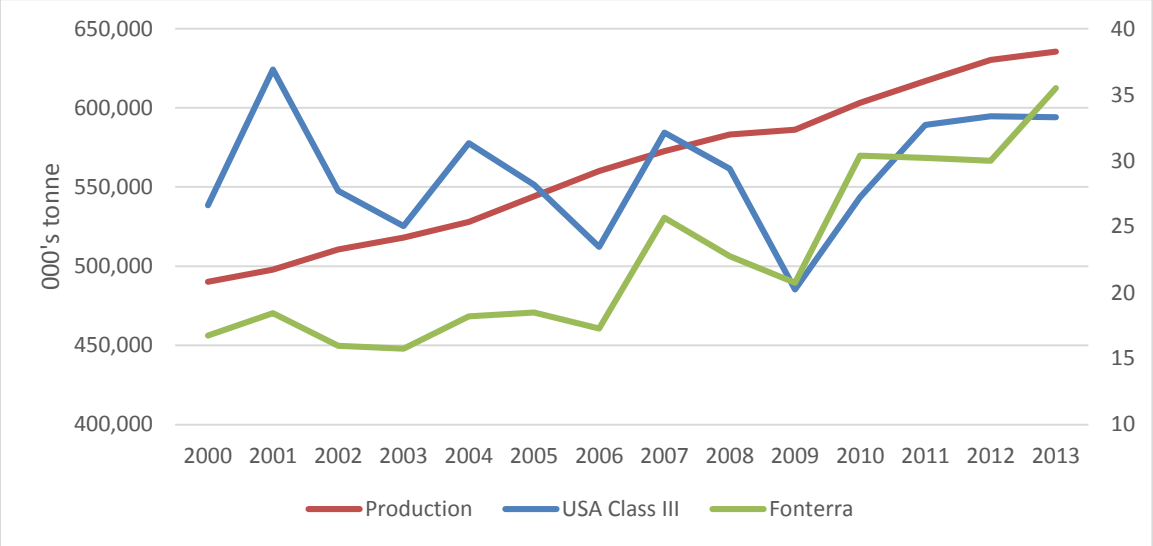
	Fat content	Protein content	Apparent Yield (kg/head)[1]	Apparent milk output per farm (tonnes)[1]
Bulgaria	3.68	3.28	6,924	46.0
Denmark	4.26	3.52	7,592	1292.8
Germany	4.12	3.41	8,963	367.8
Ireland	3.94	3.39	7,882	290.0
Latvia	4.08	3.26	5,438	64.5
Lithuania	4.16	3.25	6,651	32.8
Netherlands	4.4	3.53	7,265	630.1
Poland	3.98	3.21	7,769	64.2
Romania	3.79	3.27	5,532	2.6
Slovenia	4.14	3.37	8,005	65.3
United Kingdom	4.03	3.26	8,254	921.1

Source: Eurostat & [1] Own Calculations

Dairy, unlike many agricultural products, has a production cycle which is measured in years rather than months. It takes almost three years from the time a cow is inseminated to the production of milk from the consequential calf. This mean that milk production can be increased modestly in the short run by increasing feed intake but more significant responses require time and substantial investment. The short-term changes in EU milk supply since quota

abandonment in April 2015 are discussed in detail in Donnellan and Keane (2015) While the decision to reduce production either by reducing feed input, prematurely terminating the lactation cycle, or accelerated retirement yields more immediate results, the latter in particular is normally seen as a drastic and unwelcome response. Temporary reduction of the herd size is not desirable as it creates idle capacity, the loss of carefully planned genetic merit and the possibility of introducing disease when the herd is expanded at a later date. This reluctance to cut production capacity is clearly illustrated in Figure 5 which shows global cow's milk production (on primary axis in red) alongside representative global milk prices (blue and green on secondary axis). Global milk production has increased in an almost linear fashion while prices have risen and dropped considerably. The large dip in prices in 2009 was accompanied by a 0.5% increase in global production.

Figure 5: World cows's milk production (Tonnes) and world milk prices (2000-2013)



Source: FAO

The versatile nature of dairy as a both a commodity and ingredient means that it has become an integral component of a large number of supply chains. In many cases these chains are long as the base commodity is processed into ingredients before in some cases been further processed. As the chains lengthen the number of actors affected by the volatility cited above increase and the desire for suitable risk management tools increases. In particular some of those further along the supply chain often use a large number of ingredients, many of which allow the management of price risk through established futures and derivate markets for example.

3. Market based solutions.

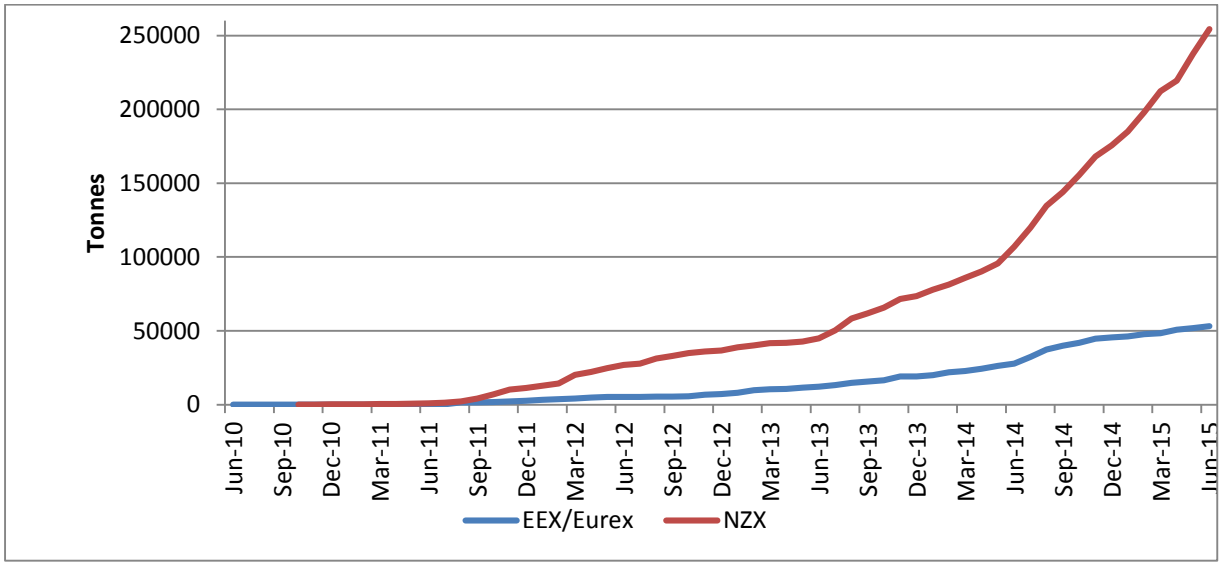
There are a broad range of instruments, both public and private market, which may be utilized to manage price/income volatility. This suite of instruments includes over the counter (OTC) contracts, forward contracting, futures contracts, Options, mutual funds and insurance contracts.[4] The next section will discuss the possible use of insurance and emerging futures markets as possible risk management tools for dairy farmers in the EU.

[4] It should be noted that some instruments can straddle public and private such as subsidised insurance or insurance underwritten by public finances.

3.1 Dairy Futures Markets

At present dairy futures contracts are actively traded on four exchanges: CME (USA), Euronext, European Energy Exchange (EEX), and NZX (New Zealand). The CME dairy futures market has been in existence under different guises for decades and is highly developed while the latter two were launched in 2010[5]. Figure 6 charts the growth in the number of EEX and NZX listed contracts since their 2010 launch. From inception just over 55,000 tonnes of dairy commodities have been traded on the EEX to the end of July 2015 (Figure 6). By comparison, the volume traded on the NZX surpassed 250,000 tonnes by the same date and is now displaying almost exponential growth. There are a few possible explanations as to why the NZX offering has been more successful than the EEX offering. Firstly, it offers one tonne contracts while the EEX offers five tonne contracts. The smaller contract volumes are more attractive to smaller scale market participants and allow greater flexibility to larger participants albeit at additional cost. The commodities traded on the exchanges also differ. Wholemilk powder is not traded on the EEX but represents the majority of all trades on the NZX. In contrast, butter, which plays a similar leading role on the EEX, was only recently launched on the NZX. There is an also an active over the counter (OTC) market in the EU with volumes traded comparable to the EEX exchange volumes and this offers a possible alternative to EEX. There is practically no OTC trade associated with New Zealand dairy. Furthermore, since July 2014 NZX has listed whole milk powder options. Options are somewhat similar to insurance as they offer both a floor (or ceiling) price while also allowing traders the opportunity to benefit from favourable price movements. As options are usually linked to underlying futures contracts, they tend to increase trade in futures markets, as traders rebalance their position as part of their trading activity. In the short period to date since the launch of dairy options, more than 60,000 tonnes of options have traded on NZX. Finally and perhaps most importantly, Fonterra, the giant New Zealand co-op, has been very supportive of the NZX exchange, offering its customers a variety of risk management tools linked to trading on the NZX exchange.

Figure 6: Cumulative volumes rraded (Tonnes) on EEX/EUREX and NZX to end of June 2015



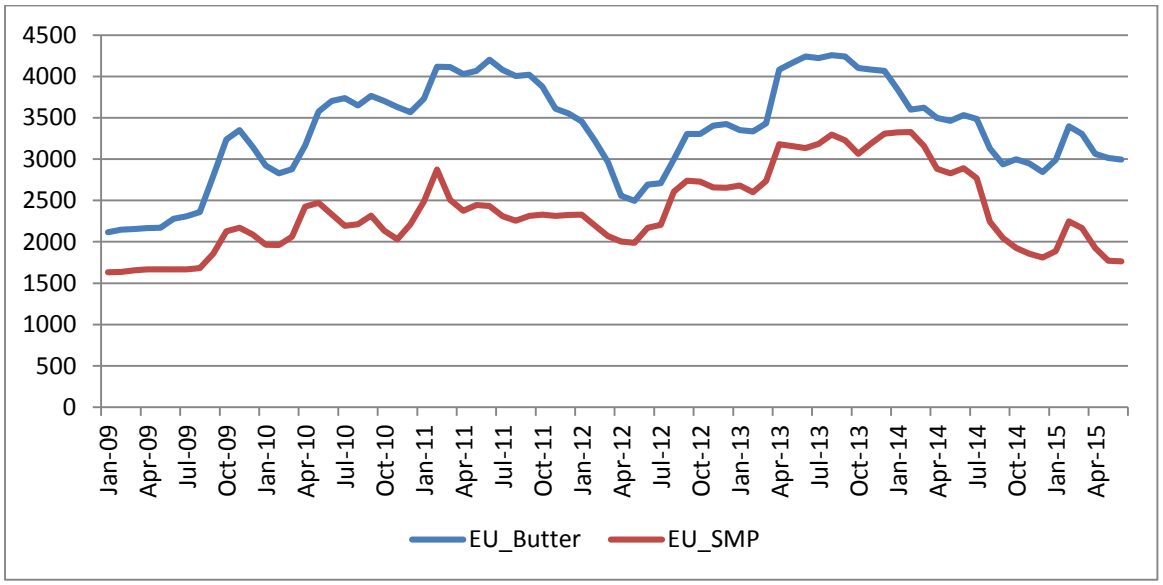
Source: EEX and NZX

[5]The EEX were initially listed on the EUREX exchange until their transfer in May 2015. Euronext has historically listed dairy contracts and relaunched contracts in early summer 2015 with first trades in August 2015.

The growth in these markets since their launch in 2010 suggests that that there is a growing demand for futures based risk management solutions in dairying. The growth in Europe has been primarily driven by demand from the buyer or customer side as the larger buyers of dairy commodities have long been very familiar with hedging on futures markets in relation to their non-dairy commodity purchases. Hedging these commodities is considered to be almost a routine activity at this stage. In contrast the seller side (milk processors and dairy farmers) have been reluctant to trade to date, being unfamiliar with futures markets trading. They did not need to consider these tools during the many years of policy led dairy commodity price stability in the EU.

Their reluctance to trade may also reflect the fact that the contracts traded are not the most suitable for their purpose. In particular there are no raw milk contracts listed on the EU exchanges. As a result those wishing to cover their milk position have to cross hedge their exposure using the available butter and SMP contracts. Such a strategy may potentially create basis and basis risk and this may be considerable. The basis reflects the relationship between cash price and futures price and is obtained by subtracting the futures price from the cash price. In this case the cash price may be considered the farm gate price[6]. In order to quantify the possible basis faced by milk hedgers, the monthly farm gate prices of a number of selected EU countries are regressed on the EEX butter and SMP monthly final settlement prices. These are presented in Figure 7. The farm gate prices are published by the Commission and are available from the milk market observatory[7] (these prices are based on raw cows' milk, actual fat content - prices per 100 kg). All data are modelled from July 2009 to June 2015.

Figure 7: EEX/EUREX butter and SMP Indices (€ per Tonne)



Source: EEX

Correlation analysis revealed that a lagged relationship exists between the commodity and farm gate prices with a three month lag in most cases showing the strongest relationship. Given that farm gate prices are in most cases determined post-delivery and many commodity sales are

[6] Basis risk is the chance that the basis will have unexpectedly strengthened or weakened from the time the hedge is implemented to the time when the hedge is removed.

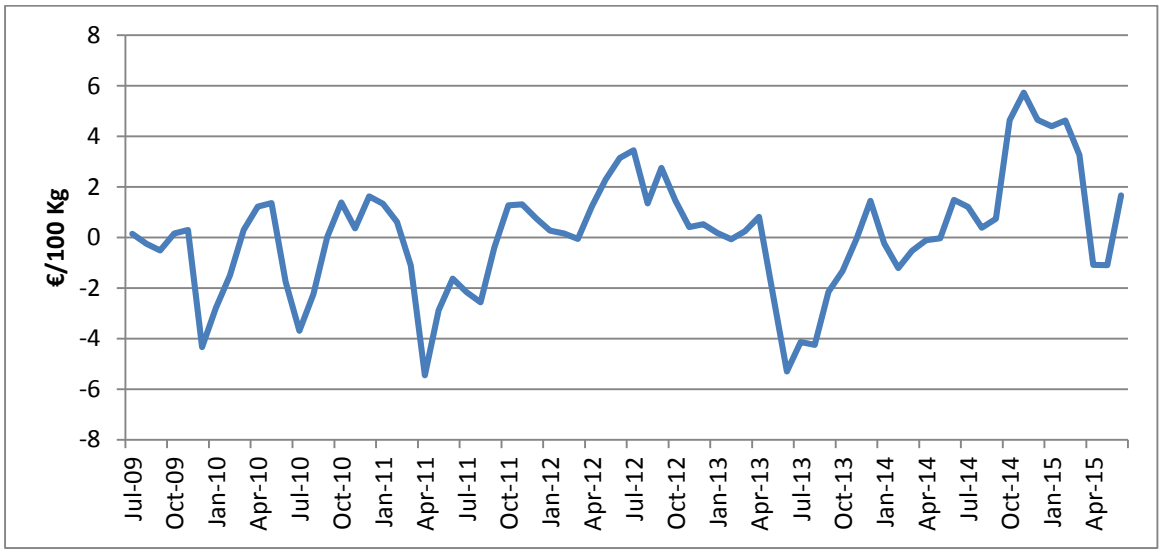
[7] http://ec.europa.eu/agriculture/milk-market-observatory/index_en.htm

contracted months in advance, a lagged relationship is expected. For this reason commodity prices lagged three months are used in all models[8]. In short the relationship modelled can be summarised as follows (Equation 1)

$$Farm\ gate_t = \alpha * Butter\ Index_{t-3} + \beta * SMP\ Index_{t-3} + \varepsilon_t \qquad \text{Equation 1}$$

In this model the residuals (ε_t) can be considered the basis associated using the EEX prices to cross hedge the farm gate prices. The residuals based on the German farm gate price are presented in Figure 8. From this figure it is clear that some basis is present in all months and, while in some months milk processors will benefit from substantial negative basis there are many months when the opposite effect is present. At the extreme this basis is plus or minus in excess of €5.40 per 100 kg which represents a possible basis of in excess of 16% from the long run mean. The associated risk lies in the fact that the basis does not appear to be in any way predictable. The basis risk associated with other selected farm gate series is also presented in Appendix 2.

Figure 8: Basis for German farm gate milk price model.



Source: Own Calculations

The results of the models considered are summarised in Table 2. Of interest is the fact that in a number of countries (Ireland, Germany, Netherlands Denmark and Poland) SMP (β coefficient) takes a greater weighting than butter while the opposite is true in the remaining cases[9]. This again indicates the heterogeneous nature of EU farm gate prices. This is further emphasised when we consider the means of the series which range from less than €27 per 100 kg in Lithuania to over €35 in the Netherlands. The means of the fitted series are interestingly very close to the corresponding means of the original series. While these series should be weighted by monthly volumes to provide a direct comparison, it is still reasonable to consider the returns of the actual and fitted series as very similar over the long term. However the range

[8] Other lag lengths were considered however the three month lag was found to be a good fit in all cases hence all models employ this lagged relationship.

[9]The presence of collinearity in some models means that caution should be applied when assessing the relative importance of these weightings. The correlation of 0.766 between the explanatory variables may explain this collinearity.

and magnitude of the basis as represented by the minimum and maximum basis suggests that using the indices for cross hedging the farm prices may be unacceptably risky.

Table 2: Results of regression model based on equation 1

	Ireland	Germany	Netherlands	Denmark	France	Czech Rep.	Lithuania	Poland
α	0.05265	0.05209	0.05136	0.04883	0.06058	0.06283	0.05205	0.04821
β	0.06293	0.06334	0.07175	0.07396	0.04829	0.03555	0.03747	0.05135
Mean	33.49	33.33	35.27	34.90	32.91	30.42	26.94	29.27
Mean Fitted	33.22	33.23	35.06	34.68	32.5	30.17	26.94	28.99
Min Basis	-7.61	-5.45	-5.83	-6.86	-8.42	-5.16	-5.74	-6.52
Max Basis	7.70	5.74	5.90	6.53	8.98	5.47	3.75	6.10

Source: Own Calculations

The fact that almost more than 39,000 tonnes of butter and only 11,000 tonnes of SMP have traded on the EEX suggest that these markets are primarily used to hedge the commodities rather than milk prices. Milk hedging as suggested by Table 2 would suggest a much closer alignment of volume, while a review of weekly volume also shows that matching weekly trade volumes is unusual suggesting that milk is rarely if at all hedged.

As Burdine et al (2014) point out, while traditional price risk management tools, such as forward contracting and the use of futures and options markets, present opportunities to manage the risks associated with price volatility, they also present challenges. The authors explain that dairy producers generally have struggled to adopt futures and options trading as a means of price protection. For example they claim that the futures contracts available are only a cross-hedge opportunity for the US all-milk price, with a very uncertain basis risk. Furthermore scale issues often prevent smaller dairy operations from using milk futures and options. In the EU the novelty of these tools means that education is required to underpin their adoption and indeed this is crucial at the early stage of futures markets development. In many countries education has not been rolled out to a sufficient degree. In order to attract the necessary speculative interest the rate and quality of data dissemination need to be addressed. While the milk market observatory can be viewed as a welcome development it needs to further improve with regard to timeliness, content and accessibility.

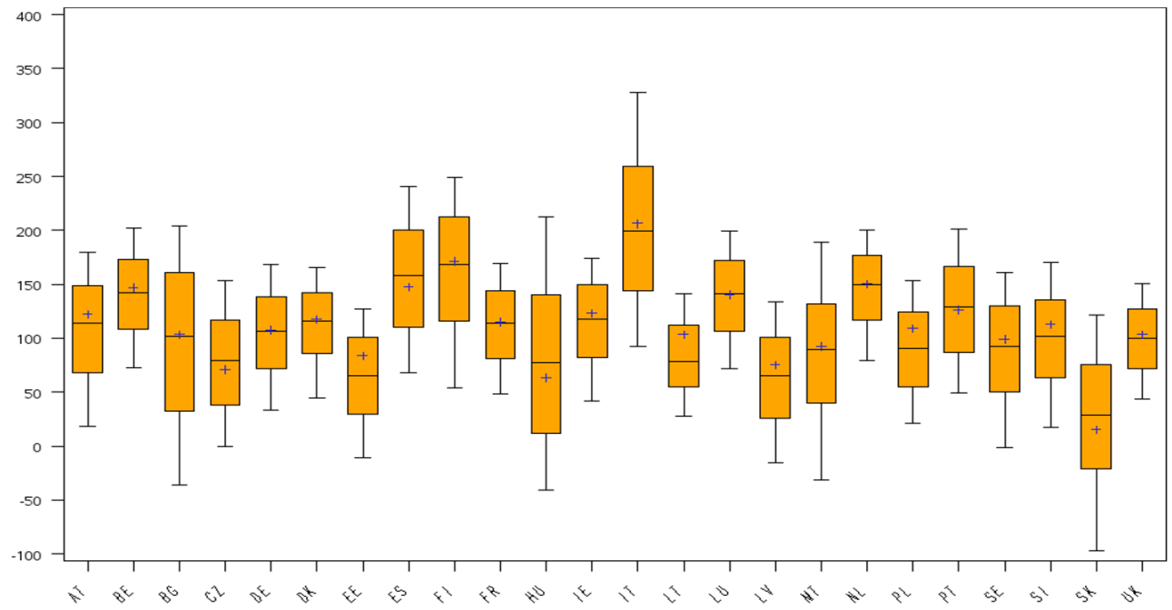
3.2 Insurance

US dairy policy has evolved considerably in recent decades. In many senses it can be seen to lead EU policy but with a similar trajectory. Product price support has yielded to income support which in turn has been replaced by comprehensive insurance tools. The Livestock Gross Margin for Dairy (LGM-Dairy) insurance program was launched in the summer of 2008 and provides protection against the loss of gross margin (market value of milk minus feed costs) on the milk produced from dairy cows. The indemnity at the end of the eleven-month insurance period is the difference, if positive, between the gross margin guarantee and the actual gross margin. The LGM-Dairy uses futures prices and state specific prices for corn, soybean meal and milk to determine the expected gross margin and the actual gross margin. The price the producer receives at the local market is not used in these calculations.

The Agricultural Act of 2014 (2014 Farm Bill) saw the introduction of the Margin Protection Program for Dairy (MPP-Dairy). This is a voluntary risk management program for dairy producers authorized through Dec. 31, 2018. The MPP-Dairy offers protection to dairy producers when the difference between the all milk price and the average feed cost (the margin) falls below a certain dollar amount selected by the producer. In this program Catastrophic Coverage (CAT) of $4.00 margin coverage requires no premium payment, but the dairy operation must pay the $100 administrative fee. Participants can cover at most 90 percent of their established production history under these terms. For increased protection, dairy operations may annually select a percentage of coverage from 25 to 90 percent of the established production history in five percent increments and a coverage level threshold from $4.50 to $8.00 in $.50 increments10. This program, along with the Dairy Product Donation Program replaced the Milk Income Loss Contract, Dairy Product Price Support Program and the Dairy Export Incentive Program, so it heralds a new departure in US dairy policy as a price floor is replaced with a more active risk management program[11].

While the MPP-Dairy would appear to provide an easy to understand and user friendly insurance product for dairy farmers, a number of issues would have to be addressed before consideration could be given to introducing a comparable product in an EU context. As evidenced in the above, dairying in the EU is best described as very heterogeneous. Milk prices vary enormously from country to country (Figure 4) and so too do margins (Figure 9). While the data presented in this latter figure is dated the general pattern described is still accurate.

Figure 9: Weighted boxplot of gross margin with coupled payments per Member State 2011



Source: EU FADN — DG AGRI. Extreme values are not displayed. The whiskers represent the percentiles 10 and 90. The mean is a global ratio.

[10]For more details of this program see http://www.fsa.usda.gov/Internet/FSA_File/mpp_dairy.pdf

[11] For a comprehensive discussion of these policies and US dairy policy the reader is referred to http://dairymarkets.org/MPP/ or http://www.ers.usda.gov/topics/animal-products/dairy/policy.aspx

Indeed the dated nature of this data again points to a fundamental issue in the development of many risk management tools. Likewise the novelty of insurance cover in the dairy sector would require an extensive education program in order to encourage adoption.

4. Conclusions

EU dairy commodity prices have become significantly more volatile in the last 7 years as EU and world prices align. In addition the range with which the prices fall has widened considerably and the dynamics at farm gate has changed with a strong cyclical component now evident in some EU countries farm gate prices. These developments make it more difficult to plan and budget, reduces investment and R&D spend and make less volatile substitutes more attractive. The increased volatility at EU level can in part be attributed to reform of the CAP which has seen a movement from product to producer support with reduced market intervention.

In order to manage the increased risk which has resulted from this policy reform, the EU has extended its risk management toolbox and implemented the milk package of 2012. The latter involved a series of measures aimed at boosting the position of dairy producers in the dairy supply chain. However there is a sense that these measures may not be adequate in times of market stress and are of limited use to others in the supply chain. In such an environment it is understandable that the provision of private risk management tools such as insurance and futures markets should gain prominence. However the provision of these latter tools is not straightforward. The dairy supply chain can be regarded as long, making risk sharing problematic. Dairy farmers and even the raw milk they supply is not homogeneous. Raw milk prices and farm incomes and profitability vary considerably across the EU. This fact, coupled with delayed and in some cases incomplete data, mitigates against the introduction of insurance type products, in particular in the short to medium term. The development of EU dairy futures markets has been steady but slow. There appears to be a demand for these markets on the buy side in particular. The slow adoption may in part be explained by the fact that these tools are new and there is an education gap. However it may also indicate that cross hedging milk with dairy commodities is not ideal at present. The basis is highly variable, not deterministic and substantial at times.

Given that hedging on futures markets can offer the prospect of greater price stability at a time of more extreme volatility, the limited involvement of EU dairies in futures markets trading to date may also point to undue caution on their part. Trading on futures markets requires a vital initial period of learning about a somewhat complex subject which many in EU dairying have yet to undergo. The result of being slow to engage with futures markets is likely however to have the effect of further consolidating Fonterra and southern hemisphere processors, as well as the leading USA dairies, as the long-term leaders in the global dairy industry. Hence, if EU dairying wishes to play a leadership role in the global industry of the future and provide greater market stability for the industry at a time of extreme volatility, it is important that the industry now proceeds to learn about the full details of the processes involved in futures markets trading, including both the potential benefits and the risks, and begins to trade more actively than is apparent to date.

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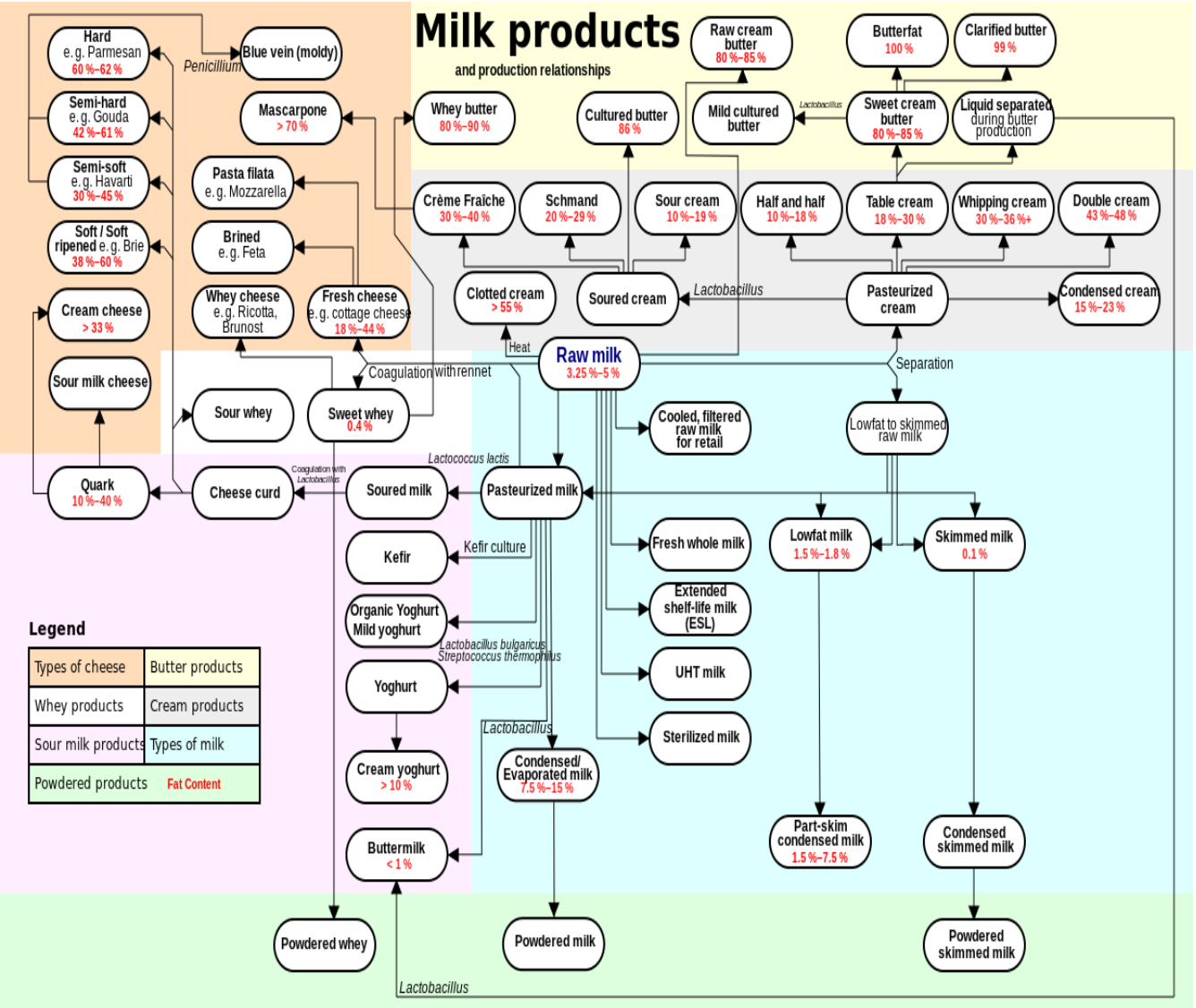
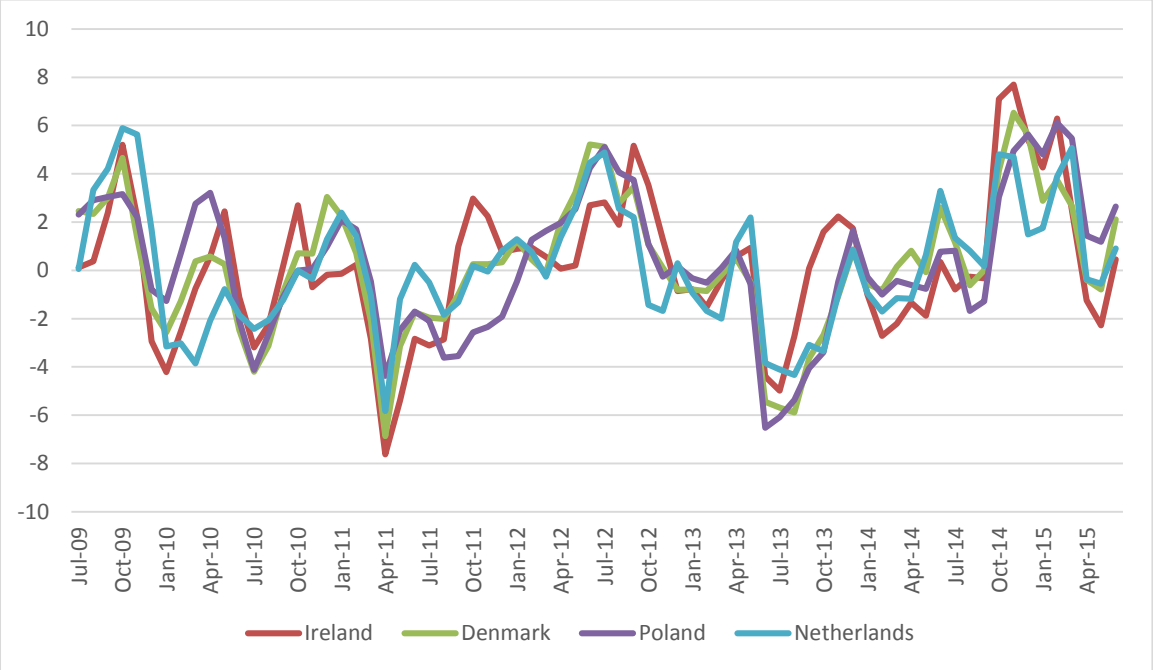
Appendix 1



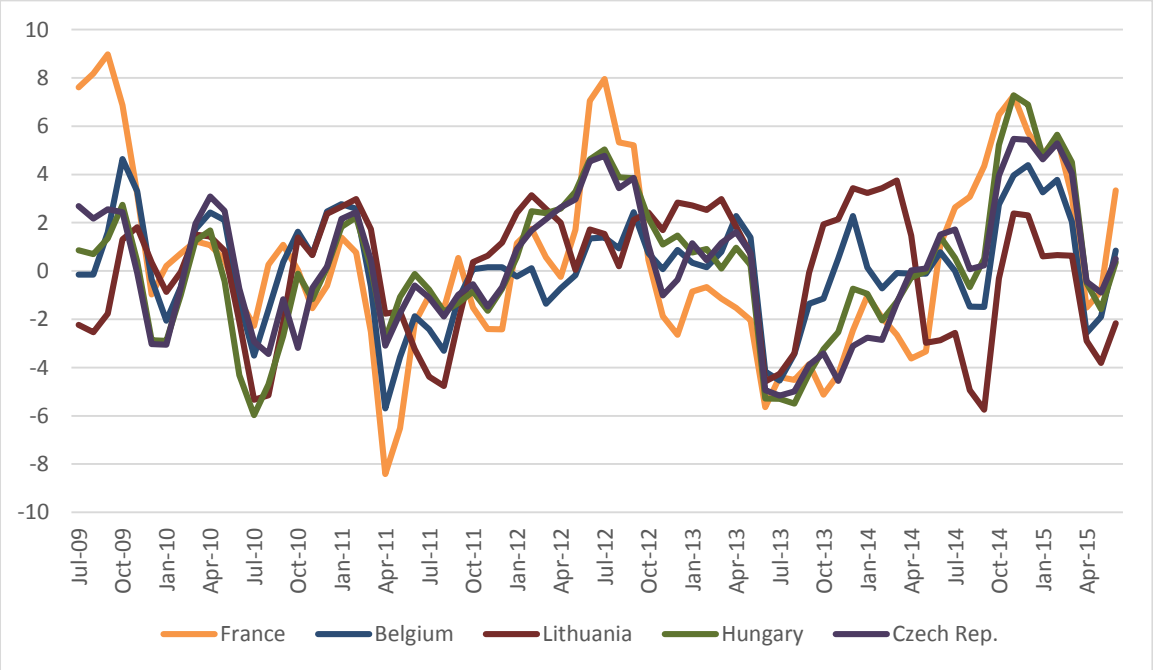
Source WikiNight at https://commons.wikimedia.org/wiki/File%3AMilch.svg

Appendix 2

Figure A2.1 Basis associated with selected farm gate prices



Source: Own Calculations



Source: Own Calculations