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Managing price risk in a changing policy environment: the case of the EU dairy industry.

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Abstract
The EU dairy industry faces an unprecedented level of change. The anticipated removal of milk quotas and the move to a less restricted global trade environment will provide the industry with both opportunities and challenges. The primary challenge will be the need for the industry to deal with more volatile prices. Active management of the risks associated with these more volatile prices will help to place the industry in a more competitive position. However this will require the industry and policy makers to embrace a new set of tools. For example the US dairy industry has been much more active in the management of risk and lessons from their experience provide a valuable insight into which tools may be more appropriate in an EU context.

Keywords Dairy, Risk Management, EU, US

Introduction

To date the policy instruments employed by the EU have very successfully isolated internal EU dairy prices from the greater volatility associated with world prices. Intervention purchasing has placed a floor on prices while other measures such as production quotas, export refunds, import tariffs and subsidized consumption measures have helped to ensure higher and much less volatile prices than those pertaining in world markets. As a consequence dairy industry participants in the EU have had little incentive to develop and use price risk management tools. However the policy environment facing the EU dairy industry continues to undergo considerable change under WTO and CAP reform. Movement towards lower levels of CAP support prices, reduced intervention and a more liberal global agricultural trading system will involve greater price volatility for dairy commodities as prices align more closely with World prices. The greater volatility observed in the world dairy commodity prices may in part be explained by the fact that these global markets are considered thin, with only 7% of output traded and four major countries accounting for more than 80% of supply. Hence relatively small changes to supply or demand often lead to relatively large price fluctuations. As this scenario is likely to continue as trade liberates, this poses a serious concern for the EU industry which accounts for approximately 14 % of agricultural output and was worth about EUR 117 billion at processing level in 2004.

This increase in volatility will translate into an increase in risk for dairy industry participants. Furthermore the expected elimination of the milk quotas and the envisaged increase in production at farm level will require that farmers and manufacturers place greater emphasis on risk management if they are to survive and compete in this new

environment. In the past it was possible in part to manage risk by diversification both within and outside of agriculture. In the future such strategies may be curtailed by the need for expansion to achieve the economies of scale required to survive in an increasingly competitive environment. Diversification is just one of the many tools used to mange risk in agricultural markets. Contracting, insurance, risk pooling and the use of private financial markets are some of the many examples of other tools employed to mange risk. In some parts of the world, particularly the USA, the use of risk management tools is already significantly developed (e.g. private financial markets for managing market risk including futures contracts are now available for Grade AA Butter, Cheddar Cheese, Fluid Milk, Nonfat Dry Milk, whey and BFP Milk on the Chicago Mercantile Exchange (CME)). At policy level the current US farm bill as just recently agreed at the House of Representatives stage specifically incorporates a risk management policy instrument (retention of forward price contracting).

While there has been some development of these markets and alternative tools for a number of commodities in the EU (cereals, livestock and energy crops), the dairy sector to date has been largely ignored. However the changing dairy policy environment suggests that this sector may reap large benefits from the future development of such markets and tools. The successful development of these new markets and tools will require that the users will have access to information on the role and function of these instruments. This paper aims to provide this information. The role of current EU policy in reducing price volatility in the dairy sector is initially presented and the implications of future policy changes highlighted. This is followed by a section providing details of how price risk is currently managed in the US dairy industry. The suitability of these tools and strategies in relation to the EU is then discussed. Finally a number of conclusions and recommendations are presented.

The regulatory framework of the EU dairy industry

The EU dairy sector is subject to the Common agricultural Policy (CAP). The Treaty of Rome which was signed in 1958 by the six founding members of the European Economic Community (EEC) established a common market which included agriculture. Amongst the stated objectives for agriculture in Article 39 of this treaty was “to stabilise markets”. The Commission’s proposals for milk and milk products were incorporated into Regulation (EEC) No 804/68 which set out the common organisation of the market in milk and milk products. In this and subsequent regulations the EU has sought to regulate its dairy market by intervening primarily in its butter and SMP markets[1]. In order to establish a common market with common prices, the CAP relied on a system of market interventions. Foremost amongst these market interventions are intervention buying[2], market protection (import levies) and market development (export subsidies). The more

1 The choice of these commodities may be explained by the fact that these joint products provide a means of long term storage for milk fat and milk protein, the two more valuable components of raw milk. It should also be noted that casein, wholemilk powder, liquid milk and certain varieties of cheese have to a lesser degree also been regulated by the CAP.

[2] Intervention buying of produce by government agencies is generally referred to as intervention. The use of this term can confuse as it refers to only one form of government intervention. Henceforth intervention will refer specifically to intervention buying, while government intervention in the market will be referred to as policy intervention.

salient features of these policy interventions as they relate to market stability are now outlined

Intervention Purchasing: At the intervention price the national intervention agencies are obliged to purchase all produce which meets the required quality standards, unless buying-in has been suspended[3]. As milk is perishable, intervention applies to butter and SMP, as these are the most basic derivatives of milk which may be stored long term. While in practice sales to intervention are restricted, as the produce must conform to quality, age, packaging and quantity requirements, nevertheless the intervention system places an effective floor price to the market and thus eliminates the more extreme negative price fluctuations.

Aid for the private storage (APS) for butter and cheese are market support measures that are available to the EU for introduction when there is a seasonal imbalance between supply and demand in the product market concerned. The aim of the schemes is to facilitate producers to store these products for a minimum of 90 days and a maximum of 210 days in the case of butter. The produce must be placed under control between March 1st and August 15th each year and withdrawn from August 16. At the end of the storage period the storer receives aid at a rate which has been fixed in advance. The schemes are an alternative to public intervention in that the products remain the property of the storers to sell at their unrestricted discretion at the end of the storage period.

Import levies are border taxes which are charged by the EU on imports from third countries. Their purpose is to protect local intervention agencies from cheap imports when the intervention price is above the world price. These levies help to insulate EU prices from the more volatile world prices. Restrictive **tariff-rate quotas (TRQs)** also serve to limit imports and isolate EU prices.

Export refunds are subsidies paid to those who export outside the community. Their main purpose is to enable agricultural products to be marketed in these countries by compensating exporters for the difference between EU internal market prices and the lower prices normally prevailing on the world market. Exporters with an approved license can pre-fix the export refund rate. This allows the trader to set the rate of refund up to five months in advance of the export of the butter or SMP. As the refund is fixed and guaranteed, the risk borne by the trader is reduced. In addition the exporter, with a letter of guarantee from an approved financial institution, may avail of an advance payment facility whereby they can apply for payment of the pre fixed refund prior to export. Again such measures reduce risk for the exporter.

There are also a number of **other subsidies** designed to promote internal consumption and thus reduce surpluses within the EU. These measures have included subsidised butter sales to non-profit making organisations, the bakery sector, ice-cream manufacturers and manufacturers of concentrated butter. SMP used in animal feed has also attracted subsidies, as well as skim milk used in the production of casein (casein aid).

[3] From 2008 intervention purchases of butter are suspended above a limit of 30,000. Above that limit, purchases may be carried out under a tender procedure. For SMP the limit is 109,000 tonnes.

A milk **supply quota** was introduced in the EU in 1984 as a response to growing over production and an increasing demand on EU finances of operating the schemes just outlined. One effect of introducing this quota has been that dairying has been the subject of little policy reform until the Luxembourg agreement which was agreed in June 2003. This reform has seen the introduction of the single farm payment in April 2005. In return for lower intervention stocks and anticipated lower intervention prices, dairy farmers receive direct compensation by means of an annual payment from the Commission. This payment has an obvious income stabilising effect for dairy farmers.

The success of the EU in attaining its goal of higher and less volatile prices may be seen in Figure 1 and Table 1. In Figure 1 the USDA North European FOB skim milk powder prices is taken as a representative world SMP price, while the comparable EU price is a Dutch price series sourced from Agra Europe[4]. While the greater volatility of the world series is evident on close examination of Figure 1, the extent of this increased volatility is best captured by the much larger coefficient of variation[5] reported for the world SMP series in Table 1. This table also shows a similar though less extreme pattern when comparable butter series are considered.

Figure 1 World and EU SMP Prices

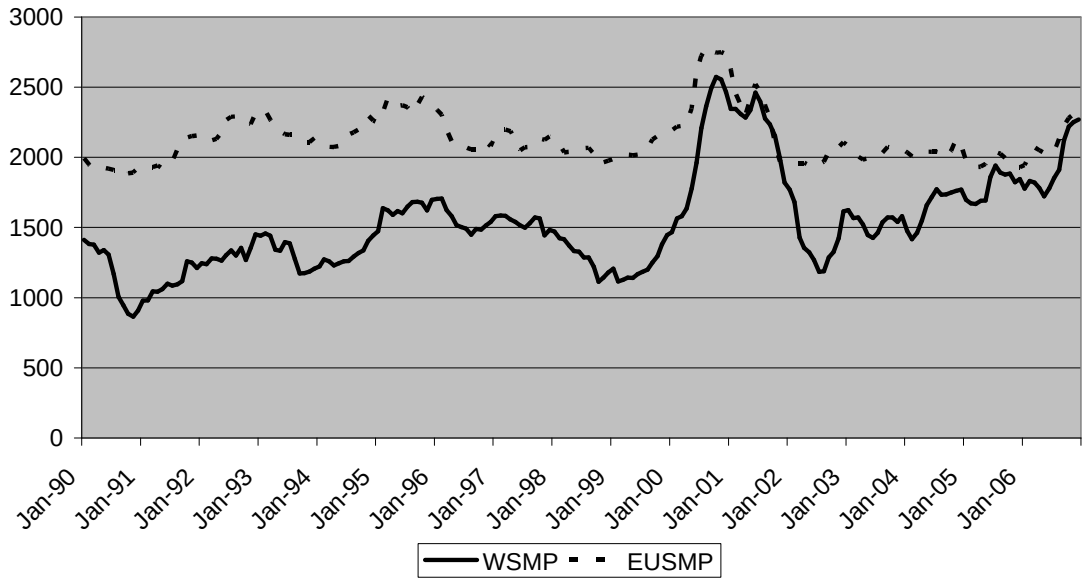

Table 1:A comparison of World and EU dairy prices.

	EU	World

[4] The USDA publishes a monthly high and low quotation and the series considered in this analysis is the mid interval of these quotations.

[5] A common statistic for measuring the variability of a data series is the coefficient of variation (CV), which expresses the dispersion of observed data values as a percent of the mean.

	Butter	SMP	Butter	SMP
Mean	3107.80	2131.93	1369.75	1532.21
Standard Deviation	225.26	182.94	222.46	352.46
Coefficient of Variation	**7.25**	**8.58**	**16.24**	**23.00**

While credit may be attributed to the CAP for successfully isolating the EU dairy sector from the greater volatility associated with world markets to date, it is the future direction of this policy which now concerns EU dairy farmers. While the exact nature of future policy is currently unknown, there are a number of pointers available which outline current European Commission thinking on this matter. Foremost amongst these pointers is the white paper relating to the CAP "health check" (EU 2007) issued on November 20th 2007. In this paper the Commission's desire to withdraw from supply management is outlined. The role of intervention purchasing is to be reviewed with a stated desire that future intervention should be one "which works as a safety net, and which can be used without reliance upon subsidised sales (whether externally or internally)". Such a position implies that intervention would be used as a measure of last resort in times of crisis rather than creating a floor price as is the case at present. With regard to the current production quota the present position advocates "a gradual quota increase …. as this could best prepare the ground for a "soft landing" of the sector by the time quotas expire in 2014/15". In a speech delivered to the Agricultural Committee of the European Parliament in November 2007 the Commissioner clearly stated EU policy re export refunds "I have already signaled clearly that export refunds are now entering their twilight years. Within the Doha Round of world trade talks, the European Union has offered to phase them out by 2013. But whatever happens to the Doha Round, export refunds don't have a place in the CAP toolbox of the future" (Fischer-Boel, 2007). Likewise it is anticipated that any WTO agreement will signal substantial cuts on any import levies which currently apply to dairy products.

Should these reforms proceed as outlined, or even in a less extreme manner, their effects on the EU dairy industry will be immense. The reduction in supply control will mean a much closer alignment between EU and world prices and the greater volatility inherent in the latter prices. However, before one considers how the increased risk associated with these lower and more volatile prices may be managed, it is important to outline the current nature of the EU dairy sector and the impact of global markets on this sector.

The EU dairy sector

Milk is the most important single product sector in terms of value at approximately 14 % of EU agricultural output. In 2004 milk production was worth about EUR 43 billion at farm level. The turnover of the dairy processing sector is EUR 117 billion (European Commission (2006)). While the number of dairy farmers in the EU-25 may have declined by almost half a million since 1995, there are at present in excess of 1.3 million dairy farmers still active milking more than 23.3 million cows. These farmers in turn produce just over 140 million tonnes of the global cows' milk production of 543 million tonnes (i.e. over 25%) (IDF 2007).

However dairy farm systems throughout the EU are not homogenous (Table 2). The difference for example in scale between Danish and Polish farmers is vast in terms of units and yield and in particular output per farm. The Polish average output per farm is less than 20,000 kg compared to an average of more than 860,000 kg in the Danish sector. The low EU average, of just over 105,000 kg, shows that the output in Poland is typical of a large number of EU countries and not an exception. What is perhaps more striking is the comparison of EU farms with the USA and New Zealand (1,097,466 kg and 1,211,749 kg respectively). As discussed below these three combined account for the greater part of global dairy exports. Table 1 shows that output per farm in Denmark, which is large by EU standards, is considerably smaller than in either of its competitors. This suggests that in a less regulated global trading environment EU dairy farms will be required to increase scale in a dramatic manner if they wish to compete on global markets. In the past many farmers would have used farm enterprise diversification along with investment beyond the farm gate to reduce risk and generate a more even income flow. However these options may no longer be available in many cases if scale is to be achieved and production increased as quotas are expanded. Furthermore the diverse nature of milk production in the member states will pose many challenges to those wishing to provide risk management tools to the sector.

Table 2: A comparison of dairy structures.

	Denmark	Ireland	Poland	EU-25	New Zealand	USA
Number of dairy cows per farm	103.7	48.3	4.4	16.7	322	121.3
Average milk yield per cow (kg)	8,330	4,760	4,425	7,349	3,763	9,050
Average cows milk production per farm (kg)	864,140	229,925	19,399	105,660	1,211,749	1,097,466

Source: Productschap Zuivel

Global dairy trade

Global trade in dairy produce was estimated at 40.2 million tonnes of milk equivalent in 2006 if intra EU trade is ignored. This represents just over 7% of global cows milk production. This trade is dominated by 4 exporters (New Zealand, EU, Australia and USA) who account for over 82% of exports. While its market share continues to decline, the EU still accounts for almost one third of this trade (12.9 million tonnes) (IDF 2007). While the buyer side of the market is far less concentrated, the quantities purchased are often subject to very large fluctuations from year to year. This may in part be explained by the fact that many of these countries are developing and imports are linked to export earnings and national currency levels. For example Russian purchases of butter doubled to 109,000 tonnes from 2000 to 2001 while Brazilian purchases of whole milk powder more than halved to 43,000 tonnes in the same period (IDF 2007).

With only 7% of milk traded globally, as little as a 1% change in global supply or demand can have very large effects on world prices. The thin nature of these markets helps explain the high levels of volatility recorded on world dairy markets. It needs to be further noted that within the EU a small number of member states account for the greater

part of this trade and a number of these states are highly dependent on exports (e.g. Ireland exports more than three quarters of its dairy output).

The EU and risk management

The inclusion of a section on risk management in the health check paper is significant and signals the realisation by the European Commission that as the EU withdraws from supply side management, market risks will increase and should be managed. This document identifies price risk and production risk (e.g. weather-related or sanitary) as the two main sources of variation affecting income. The Commission acknowledges that the nature and extent of the risks faced vary throughout the EU and "an EU-wide solution (based on a "one-size fits-all" approach) would not be appropriate" (EU 2007). As a result, the Commission considers that in the "health check" it would be appropriate to:

- extend the use of part of modulation savings to allow risk management measures in the framework of RD (rural development) policy, provided that they meet "green box" criteria;
- examine on a case-by-case basis the need for additional measures in the context of future adjustments in market mechanisms and carry out, at a later stage, a more general examination of risk management for the period after 2013.

While this development is significant it should be noted that risk management has been on the EU agenda for some time (Directorate-General Agriculture (2001) and Commission of the European Communities (2005))[6]. However these pay little attention to dairy risk management and are focused to a greater extent on cereal production. This focus can be interpreted as proof of the success of the CAP in managing risk in the dairy sector, however as stated a change in emphasis is now required. These Commission documents along with for example Hardaker et al (2004) and Tomek and Peterson (2001) provide a number of examples and solutions to managing risk in agricultural markets, however as a fellow dairy exporter the policies and instruments adopted in the US may be of particular interest from an EU perspective. A number of these policies and instruments are now presented.

Managing risk in the USA dairy sector.

The dairy industry in the US is highly regulated with federal and state programs providing price support and product storage, import protection, marketing regulations that set minimum prices by use and pool revenues for producers, export subsidies and direct producer payments. The broad suite of tools mentioned fulfill many policy objectives however for the current analysis only those programs intended to provide price and income stability and will be considered.

Central to any analysis of US dairy policy is the role played by the federal milk marketing orders (**FMMOs**)[7]. These orders set the minimum milk price paid to dairy

[6] The topic of crisis risk management has received a much greater degree of attention as discussed in Commission of the European Communities (2005).

[7] FMMO's are detailed and somewhat complex to explain so the interested reader who requires further detail is referred to USDA 2004 "Economic Effects of U.S. Dairy Policy and Alternative Approaches To Milk pricing" http://www.milkprocon.org/2004congressreport.pdf or Jesse and Cropp "How the Milk Pricing System Works" http://future.aae.wisc.edu/collection/tutorial/risk_team/risk_team_1.htm

farmers in many parts of the country, and the few areas of the country not under FMMO regulation often have similar state milk price regulations. These orders use price formulas to assign values to the different components of farm milk. These values vary depending on which dairy products are made from farm milk. According to the USDA (2004) the major objective of FMMOs is to equalize competition between proprietary handlers and producers and promote a greater degree of stability in marketing relationships. Two concepts are at the core of Federal milk marketing orders: classified pricing and market-wide revenue pooling. Classified pricing means that milk is priced based on its end use or "class."[8] Under revenue pooling, all producers that sell milk in a particular milk marketing order area receive the same minimum "uniform" or "blend" price. This ensures that even though the producers sell their milk to different types of plants (fluid, cheese, powder etc) they will each receive the same (minimum) price for their milk. This "blend" price ensures that the high level of volatility associated with individual commodities is transmitted directly to the farmers but is mitigated by less volatile and often contrary volatility in other commodity prices. Farmers may also manage price risk through forward contracting. However, roughly one third US dairy farmers are prohibited by federal government regulations from benefiting from these arrangements. Only dairy farm cooperatives are permitted to offer forward contracts for milk pricing. There are proposal in the current US Farm Bill to address this inequity.

The milk support purchase program the **Commodity Credit Corporation (CCC)** will buy, at support purchase prices, any butter, cheddar cheese, or nonfat dry milk that is offered to it and meets the required specifications. The support purchase prices are set to ensure that the price of manufacturing milk averages at least the milk support price of $9.90 per cwt.

The **Dairy Export Incentive Program (DEIP)** pays cash bonuses that allow dairy product exporters to buy U.S. products and sell them abroad when international prices are below domestic prices. As well as removing dairy products from the domestic market, DEIP helps develop export markets, and plays an important role in milk price support

The 2002 Farm Act established a national **milk income loss contract (MILC)** program to provide income stabilization for dairy producers. Under this scheme a monthly direct payment is made to dairy farm operators if the monthly Class I price in Boston (Federal Order 1) is less than a target price per cwt. These countercyclical payments serve as a further safety net for dairy farmers.

Import measures such as protective tariffs and restrictive tariff-rate quotas (TRQs) isolate the U.S. dairy sector from international markets, raise prices to producers, and prevent lower priced dairy products from compromising the price support program. In addition there are a number of dairy promotion programs that raise producer revenue by increasing demand for milk and dairy products.

[8] There are at present 4 classes in the US system. Class I: Beverage milk, Class II: Fluid cream products, yogurt, perishable manufactured products (ice cream, cottage cheese, and others), Class III: Cream cheese and hard manufactured cheese, and Class IV: Butter and dry milks.

As well as benefiting from the government programs outlined, US dairy farmers are also fortunate to be in a position whereby they can also avail of a number of private market instruments to manage price risk. For example since 1996 the Chicago Mercantile Exchange (CME) has traded dairy futures and options and now offers six different futures and options: two on different types of milk (class III and class IV), two different butter contracts, a dry whey contract and a nonfat dry milk contract (SMP)[9]. As with any financial market instruments, these dairy futures and options may be used in combination with each other, or other instruments, to create new instruments which may be used to manage risk. An example is the fence, floor, and stabiliser products offered by Dairylea Cooperatives Risk Management Service to its members (see http://www.dairyriskmanagement.com/priceStabilizer.asp). While these instruments are provided by the private sector US government funding has been used to support their introduction. For example through the Dairy Options Pilot Program (DOPP) transaction costs for dairy farmers using dairy options were subsidised in order to promote their use. Likewise a number of academic institutions have placed a very significant role in disseminating information on the potential uses and benefits of these particular risk management tools[10].

While it is beyond the scope of this paper to gauge the success of these measures in helping US dairy farmers manage price risk, it is interesting to note the growth in milk production from 1998 to 2006 (Table 2). During this period production rose by 15.6% and continues to expand, while in the EU a number of countries now fail to fill their quota.

Table 2: USA Milk Production (Million pounds) and Annual Growth Rate

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Production	157,262	162,589	167,393	165,332	170,063	170,394	170,934	176,929	181,789
Growth %		3.39	2.95	-1.23	2.86	0.19	0.32	3.51	2.75

Source USDA

Conclusions.

While the policy environment facing EU dairy farmers is uncertain at present, it appears reasonable to assume that the level of supply management in particular will be significantly reduced. It is anticipated that in turn EU dairy prices will more closely align with world prices. World prices are both lower and more volatile than EU prices and it is further assumed that this increased volatility will also be transmitted to EU prices. Price volatility is a concern for a number of reasons as it adds challenges for farm business planning, debt repayment, and, in some cases, solvency. Lower prices will require dairy farmers to increase scale in order to maintain income. In many instances this increase in scale will need to be swift and dramatic thus creating the potential for increased risk as farm enterprises specialize. While it is currently possible for EU farmers to manage some of their input price risks through energy and feed price futures and options they may be more inclined to hedge their output price risk[11]. The continued listing and

[9] Details of the specifications of these futures and options may be found at, http://www.cme.com/files/Options_on_CME_Dairy_Futures.pdf

[10] For example the University of Wisconsin Dairy Marketing and Risk Management Program.

[11] While many farmers may not avail directly of these tools they can share in the benefits of others along the supply chain hedging their risk. An example is the fence, floor, and stabiliser products offered by Dairylea Cooperatives Risk Management service mentioned earlier.

expansion of these instruments in the US (the whey instruments were introduced in 2007) suggests that they perform an important role in that industry[12].

The potential for increased risk is acknowledged by the Commission who now have an opportunity to put in place, and facilitate, instruments which will help ensure the long run competitiveness of this most important agricultural sector. The diverse nature of the EU dairy industry suggests that a range of instruments may be necessary if the industry is to successfully manage its price risk. While some of these instruments are currently used in other sectors of EU agriculture the challenge of managing price risk will be a new one for the majority in the dairy sector. Both policy makers and private institutions will need to play important roles if this challenge is to be successfully met.

The US provides an example of an industry where a large number of instruments are provided by both public and private institutions. This system, and a number of its instruments, are complex and may not suit the EU, however they do point to the role both institutions can play in managing risk. While private institutions may be better placed to provide hedging instruments and some insurance products the policy makers can raise awareness for the need for these instruments and provide certain safety nets. This role of educating potential users of these instruments and encouraging their usage is essential as thinly traded instruments tend to be of limited use and are often discontinued. This educational and enabling role would appear to fit within the EU current position of providing risk management through rural development funding. However the EU must act now as a matter of urgency as both its' own and global policy initiatives suggest that an era of freer trade in dairy products is eminent. In conclusion now is the time for the EU to investigate risk management options, and to review, examine and possibly even pilot some schemes

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[12] The evidence at farm level shows that the use of these instruments in the US has been limited and their success in hedging risk has varied with marketing order and the end use of milk in that order. An explanation for the low usage is that the policy instruments employed in the US provide an effective means of managing volatility without the time and cost required to implement a hedging strategy (Maynard et al 2005).

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