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FINANCING OF INVESTMENTS IN DAIRY COOPERATIVES TO STABILIZE THE MILK MARKET AFTER THE LIQUIDATION OF THE QUOTA SYSTEM

FINANSOWANIE INWESTYCJI W SPÓŁDZIELNIACH MLECZARSKICH STABILIZUJĄCYCH RYNEK MLEKA PO LIKWIDACJI SYSTEMU KWOTOWEGO

Key words: lending export production, the elimination of milk quotas, to stabilize the market
Słowa klucze: kredytowanie produkcji eksportowej, likwidacja kwot mlecznych, stabilizacja rynku

Abstrct. The aim of the research was to indicate assets related to the export of dairy products. This was addressed to milk producers, co-operatives and bankers influencing the level of milk prices - after the elimination of the quota system and an indication of desirable investment destinations. The study was based on USDA data for the period 2005-2014. Average purchase prices, expressed in USD, were used for the analysis of the US market. The assumed average annual exchange rate of EUR/USD, calculated on the basis of exchange rates on the interbank market, was applied. Eurostat data were also used; the weight average price was the volume of production in the 25 countries of the EU (new EU countries were omitted). The study used the multiple regression method, t and F tests and coefficients of correlation, regression and determination. It was established that after the removal of the quota system, milk prices may rise due to an increase of prices and export value of hard cheeses traded internationally, especially cheddar cheese and skimmed milk powder.

Introduction

The financing of investments in dairy cooperatives after the removal of the quota system will lead to a different credit risk. Not all banks understand which investment in the milk processing industry will stabilize milk production after the removal of milk quotas. We can assume that in the years 2015 and 2016 the volume of milk production will increase and the purchase price will fall – to the dissatisfaction of farmers. Therefore, we should expect a search for other stabilizers of production and milk prices.

The development of these stabilizers may be associated with a lower credit risk. The authors' study shows that purchasing milk prices mainly result from the export prices of butter in blocks, skimmed milk powder and hard cheeses, which are internationally traded. Supporting the processing capacity and export of these items can be very important for the stabilization of the milk market. Therefore, crediting the processing lines connected with those assortments may be associated with a lower risk compared with other investments in the milk sector.

A decision was made to repeal milk quotas from the EU's Common Agricultural Policy from April 1st 2015 [Parzonko 2015]. The removal of milk quotas may cause higher production for some period as a means of producers compensating for lower prices. This, in turn, could cause social and political perturbations, which could be greater than anticipated [Świtłyk, Wilczyński 2012]. Thus, the consideration of stabilizing mechanisms is advisory in order to reduce the negative impact when milk quotas are rescinded.

„Key success factors" (KSF) influence producers' lifestyle and production profitability [Kowalski 1992]. Rational milk production with regard to scale and volume has strategic weight for environmental protection; cattle on pastures or large corrals also affect countryside landscapes [Juszczyk, Balina 2014]. Therefore, taking advantage of EU environmental funds, in the form of subsidies for farms respecting environmental requirements, may be an effective method for

rational rural development [Runowski 2013]. These regulations can be understood and accepted. Furthermore, the underlining reason for this approach should be the protection of landscapes, as well as environmental protection from irrational intensity and scale of agricultural production. Tying profitability of milk production to EU institutions responsible for social and aid policies may be an important stabilizing element [Guba, Dąbrowski 2012]. This could be tied into already existing and utilized programs such as subsidies for milk consumption in schools, consumption of butter in mass catering, or use of butter in ice cream production. Regardless of the above examples, it may be advisable to institutionalize activities which will be probably introduced in EU aid programs directed to EU citizens living in poverty or near-poverty conditions; this pertains to approximately 80 million people who need support. These kinds of endeavors would significantly strengthen the Union's authority and at the same time, could be the rationale for Union contracts within these policies for powdered milk and butter. This in turn would be an important stabilizing factor for milk production profitability. Another significant consideration may be the value of maintaining reserves of powdered skim milk, butter and hard cheeses for external EU aid needs. Appropriate reserves earmarked for foreign aid should be maintained and administrated under the EU's humanitarian aid policies. Here again, as mentioned above, the authority of the EU would be reinforced (but on the international scale) and would be the rationale for additional powdered milk, butter and hard cheese contracts, further stabilizing the profitability of milk production.

The European Commission could, through a designated agency and/or agencies, participate in futures markets to insure minimum sales price of skimmed milk powder (SMP), bulk butter and selected hard cheese. These commodities could originate from EU market intervention. Such a mechanism would stabilize prices for SMP, bulk butter and hard cheese, and in turn, stabilize wholesale milk price. However, it should be noticed that in the long-term, futures contracts can only stabilize prices, but they cannot continually raise those prices. Therefore, in the case of repealed milk quotas, futures contracts will not cause prices to rise to present levels in the long-term i.e. contract prices may be stable, but at lower levels than present. The influence of futures contracts on prices can be stabilizing or destabilizing. A Stabilizing effect can be attained through careful analysis of milk prices and milk products and appropriate anticipatory intervention which would reflect countercyclical – not procyclical – features [Ziętara 2009]. Variations in price changes vary in time state-by-state, therefore the decisions for contracting should be undertaken in reference to each state's reality by that state and realized by the appropriate state agency. The stabilization of prices at a lower level through futures contacts is not only a great value for producers; it also allows forecasting the market as well. In the event of no futures contracts, lower wholesale prices and their high variability would generally give a negative social and political effect.

The potential of influencing the wholesale price of milk through the price of key dairy products and methodological assumptions

In a market economy, demand is an effective factor affecting general production. Trying to influence the anticipated wholesale milk price without milk quotas can be attained through establishing minimum prices for key dairy products which potentially are commodities for invternational trade. This can pertain to skimmed milk powder, bulk butter and eventually types of hard cheese generally consumed world-wide - such as cheddar and/or mozzarella. Analyzing the participation of continents in world milk production, it is evident that Europe's share is falling basically because of production limitations. Conversely, North and South America, Africa, Asia and Australia shares continue to rise. For estimating the future wholesale price of raw milk, it was accepted that models would be constructed for the United States, European Union, Poland and New Zealand. Other countries with high internal milk consumption – such as India, Russia, Brazil and others – would not be taken into account.

For further analysis, 30.50 €/100 kg was accepted as the average EU wholesale price for 2005-2014, based on price and production volume. For analysis, the yearly average wholesale price was

accepted in USD. For further comparison, the yearly average rates of EUR/USD were accepted calculated on the basis of daily interbank exchange rates. For the period 2005-2014, the average wholesale price for 100 kg of raw milk in the United States was € 26.25. Simplifying, one can suggest that after the repeal of milk quotas, long-term prices of raw milk in the European Union should not fall below this level. This indicates the drop in long standing average milk prices in the EU would not waver more than approximately 10%. In practice it can be expected that the long term wholesale price in the EU would be approximately 27-29 €/100 kg. It should be noted that spot prices may periodically vary significantly from the above level as a result of seasonal events and trend changes. Moreover, it seems there may be short-term fluctuations especially after the repeal of milk quotas.

The link between prices of milk and derivative products in the United States

Taking advantage of available data and statistical methods, multiple regression, correlation, and least squares calculation were applied. Further technical analysis would take into account current knowledge on the issue. Recognizing the correlational dependence between milk prices and it products in international trade, the data from the USDA for the period 2005 - 2014 was chosen for examination – an in all-time series was considered for wholesale milk, butter, skimmed milk powder and cheddar cheese prices.

Calculations were carried out for the correlation coefficients for various relative shifts of the time series. Correlation '0' indicates lack of time shift, and for example, the first cell (correlation -12) showing the value 0.250 indicates the correlation coefficient value between powdered milk prices of 12 months earlier and wholesale milk prices without a time shift. The last cell of that column, with a value of -0.018, indicates the correlation coefficient value between powdered milk prices and wholesale milk prices after 12 months, without a time shift. On the basis of correlation coefficient value analysis in Table 1, it can be stated that wholesale milk prices are tied most strongly to, in consecutive order - the prices of cheddar cheese, SMP and finally bulk butter. Furthermore, the prices of skimmed milk powder and bulk butter have a weak correlation which is very important regarding the quality of forecasting raw milk prices with these explanatory variables. The strongest correlation value occurs between wholesale milk prices and cheddar cheese prices with no time shift in the United States market. In the case of butter, there is a lead time shift amounting to 1 month, whereas SMP most strongly correlates with wholesale milk prices with a time lag shift of two months. Furthermore, these data indicate that under conditions of free markets, milk product prices change raw milk prices, not vice versa.

A multiple regression model was generated for raw milk (wholesale) prices where American market data was utilized for two reasons. First, the American agricultural market has little administrative control; higher than European prices result from market dynamics and it may occur that after the repeal of milk quotas, the European market will be less regulated and will behave similarly to the American market. Secondly, good price data is available for the American market, with monthly updates going back to the 1990's. In the case of EU authors, similar data is unavailable from Eurostat.

The data characteristics in Table 2 (variability, symmetry, and kurtosis) enable the application of the linear regression method. The least square method was applied using two explanatory variables producing the following model for raw milk prices in USD.

price of one ton raw milk [USD] = - 30.0522142 + 0.02752776*price of one ton butter one
$\qquad$ (t = -3.93390805)   (t =10.1255729)
month earlier + 0.04346385* price of one ton SMP two month earlier
$\qquad$ (t =13.8205158)
+ 0.04403773*concurrent price of one ton cheddar cheese
$\qquad$ (t = 16.9504503)

Table 1. Correlation coefficients for prices of raw milk, skimmed milk powder, butter and cheddar cheese for average monthly prices for the years 2005-2014 in the United States
Tabela 1. Współczynniki korelacji dla cen mleka surowego, mleka w proszku, masła i sera chedar w stosunku do średnich miesięcznych cen za lata 2005-2014 w USA

Specification/ *Wyszczególnienie*	Correlation coefficients for prices/*Współczynnik korelacji dla cen*					
	powdered milk/milk/ *mleko w proszku/mleko*	butter/ milk/ *masło/ mleko*	cheddar/ milk/*ser cheddar/ mleko*	powdered milk/butter/ *mleko w proszku/masło*	powdered milk/ cheddar/*mleko w proszku/ser chedar*	butter/ cheddar *masło/ser cheddar*
Correlation -12	0.250	-0.215	-0.076	-0.051	0.387	-0.198
Correlation -11	0.308	-0.179	-0.020	-0.042	0.429	-0.161
Correlation -10	0.364	-0.126	0.053	-0.041	0.461	-0.095
Correlation -9	0.423	-0.075	0.137	-0.046	0.488	-0.039
Correlation -8	0.486	-0.016	0.222	-0.053	0.520	-0.005
Correlation -7	0.547	0.054	0.305	-0.054	0.545	0.046
Correlation -6	0.605	0.133	0.383	-0.046	0.562	0.101
Correlation -5	0.662	0.216	0.462	-0.030	0.576	0.171
Correlation -4	0.713	0.309	0.555	-0.009	0.591	0.259
Correlation -3	0.755	0.424	0.671	0.018	0.607	0.366
Correlation -2	0.781	0.521	0.797	0.045	0.618	0.479
Correlation -1	0.778	0.574	0.897	0.063	0.607	0.577
Correlation 0	0.741	0.547	0.918	0.067	0.573	0.575
Correlation 1	0.673	0.464	0.856	0.054	0.509	0.488
Correlation 2	0.584	0.378	0.770	0.022	0.427	0.392
Correlation 3	0.485	0.303	0.692	-0.016	0.338	0.305
Correlation 4	0.391	0.250	0.632	-0.057	0.251	0.232
Correlation 5	0.309	0.212	0.588	-0.094	0.170	0.201
Correlation 6	0.242	0.172	0.545	-0.124	0.109	0.178
Correlation 7	0.183	0.120	0.490	-0.144	0.056	0.140
Correlation 8	0.131	0.061	0.426	-0.157	0.011	0.088
Correlation 9	0.085	-0.005	0.350	-0.155	-0.023	0.021
Correlation 10	0.045	-0.072	0.273	-0.144	-0.043	-0.050
Correlation 11	0.012	-0.120	0.201	-0.122	-0.059	-0.084
Correlation 12	-0.018	-0.169	0.123	-0.093	-0.064	-0.139

Source: own research
Źródło: badania własne

The quality of matching in this model is even better than in the model of three explanatory variables with no time-shift. The correlation coefficient (r) in this model rates at 0.97767446, and the coefficient of determination (R^2) rates 0.95584734, therefore 95.58% variability of raw milk prices result from the time-shifted fluctuation of independent variables i.e. butter and SMP and cheddar cheese without time-shift. The remaining part of raw milk price fluctuation, only 4.42%, resulted from other variables not addressed in this model. Calculations indicate that the Fisher-Snedecor statistics rate 822.650364, and is clearly higher than the critical values for $\alpha = 0.05$, F = 2.69, and for $\alpha = 0.01$, F =3.95. Taking into account the new results, it reasons that the price of SMP two month earlier, and the price of butter one month earlier, and the current price of cheddar cheese on the American market were statistically significant in regards to raw milk prices and did not incidentally affect its price level. Furthermore, t-statistics indicate better balanced values for the individual explanatory variables of this model.

Table 2. More important statistical characteristics of monthly average prices for raw milk, skimmed milk powder, butter and cheddar cheese in the US market for 2005-2014 years
Tabela 2. Ważniejsze cechy statystyczne miesięcznych średnich cen mleka surowego (skupu), odtłuszczonego mleka w proszku, masła i sera cheddar na rynku amerykańskim w latach 2005-2014

Specification/*Wyszczególnienie*	Dairy products/*Produkty mleczne*			
	skimmed milk powder/ *odtłuszczone mleko w proszku [t]*	butter/ *masło [t]*	cheddar cheese/*ser cheddar [t]*	milk/ *mleko [t]*
Minimum price/*Ceny minimalne [USD]*	1807.8	2004.0	2805.6	242.5
Maximum price/*Cena maksymalna [USD]*	4819.3	4895.1	5290.8	482.8
Median/*Mediana*	2143.1	2888.6	3628.0	316.4
Average/*Średnia*	2364.6	3034.9	3783.3	322.3
Kurtosis/*Kurtoza*	3.8	0.4	-0.6	0.0
Standard deviation/*Odchylenie standardowe*	683.5	620.7	672.2	62.7

Source: own research
Źródło: badania własne

The link between milk and derived products prices in the European Union

The authors could not find Eurostat's detailed statistics which would allow pertinent calculations for Europe as a whole, or for individual member states. This lack has been raised by the High Level Expert Group on Milk (HLG) urging strengthening the EU's statistical system in this area. For this reason OECD data has been utilized for limited calculations. The short time-range, especially for cheese, does not allow for satisfactory statistical results and can only function as a backdrop for basic discovery regression models. For two explanatory variables, SMP and butter, the following model formula was generated for wholesale milk price:

Wholesale milk price [€/100 kg] = 8.64827934 - 0.008745976 x (butter price [1 ton])
$\qquad$ (t = 1.273219986) $\qquad$ (t = - 2.790989315)
+ 0.005128276 x (SMP price [1 ton]) + 0.010835887 x (cheese price [1 ton])
$\qquad$ (t = 2.753476912) $\qquad$ (t = 3.3223834)

The above confirms the observation regarding the American market – namely that the 'cheese variable' defines the wholesale milk price fluctuation. The correlation coefficient for the three independent variables model for the EU rated r = 0.8639, determination (R^2) = 0.7464, which indicates that the wholesale milk price fluctuation in 74.64% is explained by the fluctuations of SMP, butter and cheese price fluctuations. The empirical value of F statistics is 6.8614, and the critical values were for α = 0.05, F = 4.35 meaning that confidence levels of the critical value was higher than the empirical value i.e. the fluctuations of SMP, butter and cheese prices could have influenced wholesale milk prices.

Conclusions

These considerations are fragmentary and do not comprehensively explore the issue. They may have missed actual conditions, yet may be motivation for consideration regarding the EU milk market after the repeal of milk quotas and releasing this market. The following conclusions are offered as a result of this analysis.

Banks should first credit investments of dairy export products, which have a strong impact on the level of milk purchase prices. This mainly concerns the production lines of hard cheese and SMP. The increase of dairy product export may promote the growth of milk purchase prices.

Repealing milk quotas without effective mechanisms for stabilizing the EU milk market will be generally unfavorable for European producers. This impact may be partially ameliorated through

suggested direct and indirect activities tying milk production with other EU policy areas e.g.: environmental protection, social assistance, innovation, research, and energy.

Calculations indicate that the average wholesale price of milk for the EU-25 was 30.50 €/100kg during the years 2005-2014. For the same period in the United States, making adjustment for exchange rates, the wholesale price was 26.56 €/100 kg. Making a simple comparison, one could suggest that after removing milk quotas, long-term wholesale prices in the EU should not fall below this level; meaning that the average long-term wholesale prices of milk in the EU should not dip more than 10%. Practically speaking, this suggests that the average long-term wholesale price of milk in the EU will fluctuate between 27 and 29 €/100 kg. But spot market prices may significantly go beyond these limits sporadically due to seasonal events or changes in buying trends, not to mention the possibility of larger short-term dips resulting from social and political disturbances especially directly after repealing milk quotas.

The strongest correlation value occurs between wholesale milk prices and cheddar cheese prices with no time shift in the United States market. In the case of butter, there is a lead time shift of about one month, whereas SMP most strongly correlates with wholesale milk prices with a time lag shift of two months. Furthermore, these data indicate that under conditions of free markets, milk product prices change raw milk prices, not vice versa.

The itemized activities listed in the report dealing with stabilizing the milk market in the EU after 2015 do not exhaust all possibilities. Furthermore, these possibilities can be exploited selectively, as packages or comprehensively.

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Streszczenie

Celem badań było wskazanie producentom mleka, spółdzielcom i bankowcom kluczowych czynników kształtujących poziom cen mleka po likwidacji systemu kwotowego oraz wskazanie pożądanych kierunków inwestycyjnych związanych z eksportem trwałych artykułów mleczarskich. Materiał stanowiły dane USDA za lata 2005-2014. Do analizy rynku amerykańskiego przyjęto średnioroczne ceny skupu wyrażone w USD. Do porównań przyjęto średnioroczne wartości EUR/USD, wyliczone na podstawie kursów na rynku międzybankowym. Wykorzystano także dane Eurostatu, a wagą średniej ceny był wolumen produkcji w 25 krajach UE (pominięto nowe kraju EU). W badaniach wykorzystano metodę regresji wielorakiej, testy t i F oraz przeanalizowano współczynniki korelacji, regresji i determinacji. Ustalono, że po usunięciu systemu kwotowego cena skupu mleka może wzrosnąć m.in. na skutek wzrostu ceny i wartości eksportu serów twardych będących w obrocie międzynarodowym, zwłaszcza sera cheddar oraz odtłuszczonego mleka w proszku.

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