# Elements of an index-based margin insurance – an application to wheat production in Austria

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## Abstract

Farmers may use financial market instruments to hedge price risks. Moreover, various types of insurance products are on the market to protect against production losses. An insurance that covers losses of both input and output prices was recently introduced in the US. We develop this concept further by proposing a prototype of an index-based margin insurance which accounts for both production risks and price risks (input and output prices). The prototype is based on standardised gross margin time series for specific activities. It accounts for revenues, variable costs by cost item, various insurance coverage levels, and gross margin. Indemnities are paid if the gross margin falls short of a determined level. We identify steps necessary to accomplish a market-ready insurance product (e.g. data validation, defining the details of the sub-indexes and the premium calculation, evaluating acceptance on the market prior to its launch). Using Austrian data, the innovative approach is exemplified with respect to different farm management practices, more specifically for the case of conventional and organic wheat production. Farmers could benefit from such a margin insurance since production and price risks would be covered in one scheme, thus reducing opportunity costs.

**Keywords** natural hazards, price risk, margin insurance

**JEL codes** G22, G32, Q12, Q14, Q18

## 1. Motivation and problem statement

Income volatility is a major concern of famers. Volatile incomes are the result of volatile production flows and volatile prices. In recent years, the portfolio of insurance products for agriculture has expanded significantly in many EU Member States. Insurance against damages due to natural hazards like hail, frost, snow pressure, floods are now available in Austria for a large number of crops. Recently index-based insurances were introduced to cover losses due to draught for crops and grassland (ÖHV, 2017). The acceptance on the market shows that farmers actually need such products and are willing to pay for them.

Representatives of farmers, however, are not yet satisfied with the current product portfolio (aiz, 2017). They argue that a single product that covers both production and market risks is needed. Such a product would reduce transaction cost compared to the current situation where additional contracts are necessary to hedge price risks. A revenue insurance would be an improvement compared to the current situation but farmers are mainly concerned about profits and incomes and less about yields or revenues. Therefore, an ideal insurance product would cover not only production risk and product price risks but also price risks of inputs such as fuel and fertilizer.

Moreover, many farms in the EU and in particular in Austria are relatively small. Most farmers are typically both managing and operating their business. They would benefit from a simple insurance product since many of them are extremely time-constrained, but nevertheless need to make well-informed choices whether to take up the insurance or go along with their current practice.

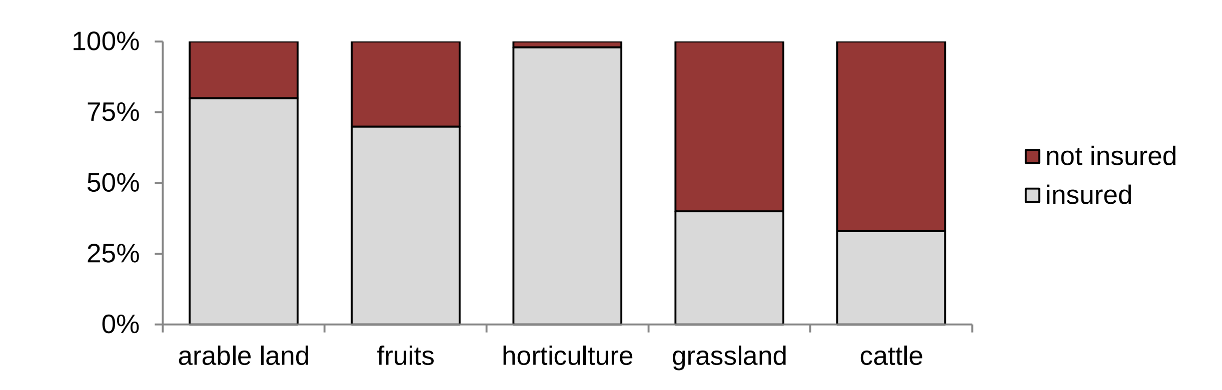
These considerations and the fact that index-based products are already well established on the market make it plausible to develop a product for Austria that is simple to communicate and that can be implemented at low costs. In order to evaluate the feasibility of such a solution, a prototype was developed that may be applied to the most important crops and production regions in Austria. The purpose of this paper is to identify conditions and elements necessary for developing a marketable product that deals with production and market risks and that offers advantages over existing approaches.

## 2. Managing production risk in Austria's agriculture – state of affairs

The Austrian market of disaster risk management is characterized by the fact that private firms and the public are actively involved but not well co-ordinated as far as some hazards like flood risks are concerned (Url and Sinabell, 2008). With respect to agriculture, the situation is different. A single insurer, the Austrian Hail Insurance Company (Österreichische Hagelversicherung) offers a wide range of insurance products for numerous production activities and against a variety of events (e.g. hail, frost, storm, heavy rain, fire; see annex for a comprehensive overview). New index insurances were introduced recently that rely on big data meteorological applications as triggers. Drought index insurance for winter wheat and sugar beet were introduced in 2017. In the same year, additional coverage was offered against losses due to frost and flood, but these products are not index-based (aiz, 2017).

As a mutual insurer, the Austrian Hail Insurance Company is not profit-oriented and thus costs can be kept low. In Austria, the hail insurance premium has been subsidized for all crops since 1995 and the frost insurance premium for vine cultures and other insurable crops since 1997. The subsidy is shared equally between the federal and Länder governments and amounts to 50% of the total premium (see BGBl Nr. 46/2016).

Figure 1: Market penetration of production-related risk insurance in the Austrian agriculture in 2014 (% of area or herd insured)




Source: ÖHV (2016)

Figure 1 illustrates the proportion of the area or of the herd insured against production-related risks in 2014. It is apparent that almost all horticulture area and approximately three quarters of arable land or fruit production areas were insured. Less than half of the grassland area and cattle herd were insured against production-related risks.

Table 1 shows that the market for production-related risks has grown significantly during the last decade and that public support has grown likewise. The annual total production volume of agriculture in Austria was €6.7 billion in recent years (Statistik Austria, 2017). The sum of insured values was €3.7 billion (ÖHV, 2016) and shows the high market penetration.

Table 1: Key data on the market for production-related risks in Austrian agriculture

| | | 2000 | 2005 | 2014 |
|---|---|---|---|---|
| clients | | 71,897 | 67,866 | n.a. |
| area | 1,000 hectare | 913 | 1,079 | 1,209 |
| premium volume | million € | 45.9 | 53.1 | 96.3 |
| farmer's losses | million € | 64.3 | 23.3 | n.a. |
| premium subsidy | million € | 22 | 24 | 40 |
| sum insured | billion € | n.a. | n.a. | 3.7 |

Hint: The decreasing number of clients is due to structural change. n.a. = not available
Source: Own table based on data from ÖHV (various years) and BMF (various years)

## 3. Managing price risk in Austria's agriculture – some weaknesses and potential remedies

Price volatility has increased dramatically since 2005 and farmers are more and more concerned about price risks (European Commission, 2011). Until recently, however, there were no insurance products available that a typical Austrian farmer would use to reduce price-related risks. Few farmers are employing brokers for the hedging of futures contracts or are buying options or similar financial products. Several years ago, grain trade companies started to introduce price hedging products as a service for their suppliers. One of the motivations has been to strengthen the ties to suppliers and another one was to make price negotiations easier. Several big trade companies in Austria are co-operatives and therefore are interested in negotiating high prices for their members (Bartmann, 2015). Such products are available only for a few crops (wheat, rapeseed, corn) as well as for piglet, pig or milk production. The decline of agricultural prices in 2014 has raised awareness among farmers for price hedging instruments further (aiz, 2014).

Farms in Austria are small by European standards and a typical farmer has little time for managing the business since most of the time is consumed by working in the field or stable. Therefore, there is an entry barrier for farmers who wish to get involved in price hedging because the learning curve is felt to be very steep. Farmers wish to have price hedging instrument at their disposal that are standardized, easy to understand and affordable (Lembacher, 2017). Eventually farmers are mostly concerned about income stability (Larcher et al., 2015). Alleviating production-related risks like frost, hail or drought improves the situation for those exposed to these risks. But many more were confronted with very volatile income streams during the last decade like milk or pig producers.

In a study on risk management in the Austrian agriculture, Sinabell et al. (2010) analyzed the concept of a general income insurance / margin insurance for Austrian farms. The idea was to switch EU farm payments from hectare-based premiums to support premiums for such an insurance product. Livestock producers (mainly pig producers) and fruit producers would have benefited considerably from such a policy at the cost of farms with large amounts of land. One assumption explaining this result was that direct payments would be shifted to such an income insurance scheme. This proposal was not implemented. However, the discussion to insure income losses in Austrian agriculture has been going on in a small group of persons in administration, insurance business and research.

The United States 2014 Farm Bill introduced an insurance scheme in the US, the Dairy Margin Protection Program (MPP-Dairy), which resembles such an approach (Orden and Zulauf, 2015). The MPP-Dairy was established on the market in 2015 and is available for milk producers in the US to cover part of losses in income resulting from low milk prices or high feeding costs. A minimum coverage is guaranteed by a government funded premium support. The prototype of an insurance product presented in the next chapter has two commonalities with the MPP-Dairy: (1) indexes are used to identify losses and (2) the insurance covers a certain share of the margin (margin = revenue – costs). Scharner and Pöchtrager (2016) recently presented a version of this scheme adapted to the Austrian situation. Because the general concept is not limited to milk production we demonstrate a similar insurance product for wheat.

## 4. Necessary conditions for an income insurance scheme in agriculture to work

Income insurance schemes are widely used in the Austrian economy but only few of them are offered by the private market. Such products cover the payment of daily allowances in the case of illness or annuity payments for reduction in earning capacity. Income losses are covered by the unemployment insurance which is offered by the state for all employees. Self-employed persons have the option of buying such an insurance as well for which the premium is 6% of gross income (WKO, 2017).

Contrary to employees and the self-employed population, income insurance does not yet exist for farmers in Austria. However, experiences from other schemes can be used to identify necessary conditions that must be met in order to get a working margin insurance scheme:

- *Cost of administration:* In order to keep administrative costs (and thus: premiums) low, administrative processes have to be highly automated, information has to be transparent and available swiftly at low costs to all involved parties.
- *Moral hazard:* The farmers' behavior should not impact on the outcome. Easily observable variables should trigger indemnities automatically.

- *Adverse selection:* The characteristics of potential buyers of a gross margin insurance have to be known well. Contracts need to be designed in a manner that self-selection supports a smooth operation of the insurance system.
- *Concentration risks:* In economic terms, livestock production is more important than crop production in Austria (BMLFUW, 2016: p. 13). If only milk producers bought income insurance and crop producers did not, risks for the insurer would be highly concentrated, resulting in relatively high reinsurance premiums. A diversification of not-related income risks would help reduce the exposure of the insurance company.
- *Trends in agricultural prices and input costs:* An income insurance should not impact on structural change and adaptation to unexpected market conditions but help farmers to adjust to new situations without worrying about income losses too much. This can be achieved by adjusting premiums periodically. An alternative is to block access to loss coverage for a certain period for those clients who received indemnities.

A product that is placed on the market and successful over long periods has to have finely-tuned features that address all elements listed above. These features have not yet been fully developed for the prototype of a farm income insurance in Austria. The concept introduced below is capable of accounting for the diversity of production conditions and management practices. It relies on the availability of certain data, but not all of the required data are readily available. Calculations for conventional and organic wheat production in Austria are presented as examples. For simplicity, costs of administration and reinsurance are disregarded (= €0) in this paper. The presented method is applicable to all major crops, and also to livestock activities (provided the concept is adjusted accordingly) and can therefore be expanded to reduce concentration risks as well.

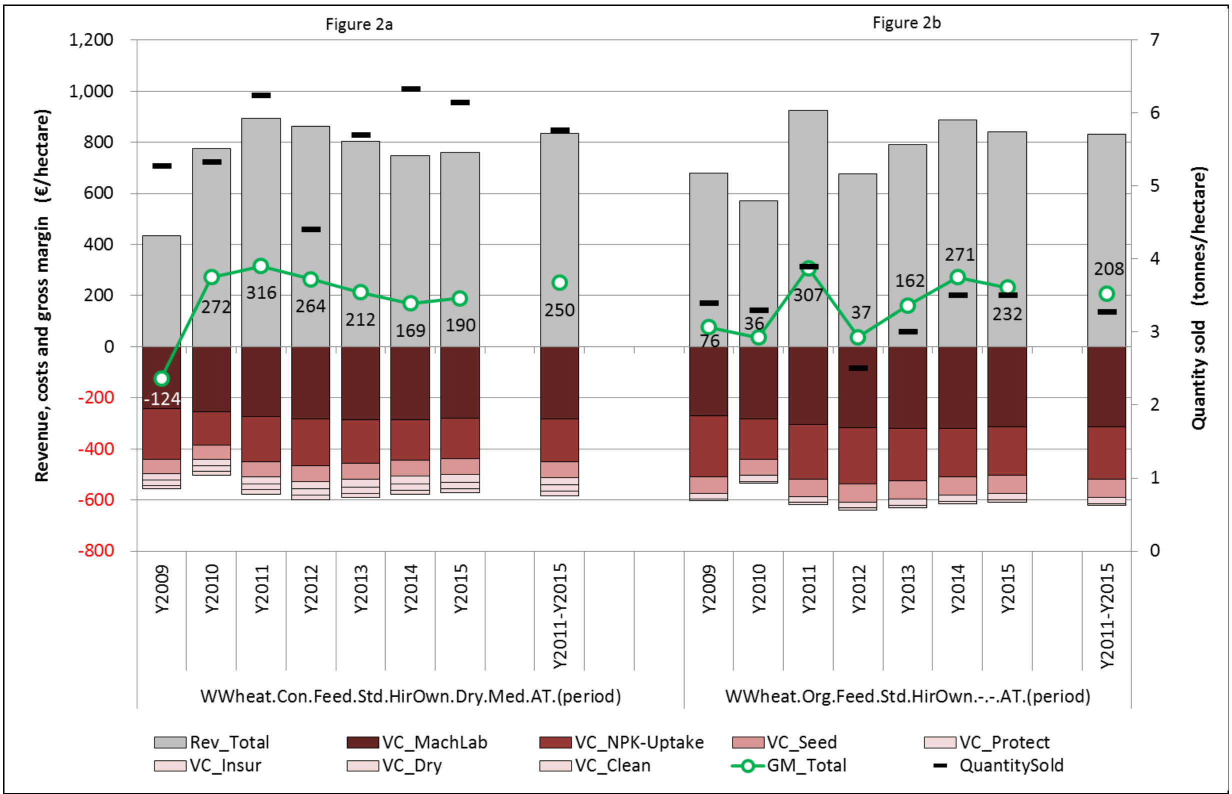
## 5. Index-based standard gross margin calculations

The core of the proposed insurance product are gross margins calculations. Most Austrian farmers are familiar with this concept. Sophisticated online tools are provided that offer gross margin calculations for numerous agricultural activities (see e.g. AWI, s.a.). These tools may be populated by the farmers with their own data to calculate *farm-specific gross margins* for the respective production activities. In addition, many farmers are organized in working groups promoted by the Chambers of Agriculture (LKÖ, s.a.). When meeting in these groups, farmers compare gross margin results and cost breakdowns of their production activities and farms in order to learn from their peers and improve their performance.

However, the use of farm-specific calculations would not be practical (e.g. due to high cost of sourcing the data, lack of comparability of data and results etc.). Instead it is suggested to work with *index-based standard gross margins.* In this approach, gross margins are identified by means of a standard calculation scheme for a reference period. Indices are then applied to each component of the gross margin calculation to generate a time series. Insurance premiums and indemnities are the result of fluctuations of prices and quantities during a pre-defined period of observation. In other words, insurance premiums and indemnities are not calculated for the farm-specific situation, but – using a uniform calculation scheme and a certain data set – they are the same for all farms participating in the respective insurance program.

The idea is to develop standard gross margin calculations for a variety of agricultural production activities (plant and livestock). If economically meaningful, the calculations could be differentiated to account for different production environments (e.g. climate type) and management variants (e.g. farming system). For instance, 21% of Austria's total agricultural area was cultivated with organic crops and methods in 2015 (BMLFUW, 2016: p. 48). Given the economic importance of organic farming as well as the differing features of conventional and organic farming, it seems plausible to develop separate standard gross margin calculations for conventional and for organic farming. The farmer who is interested in buying insurance could then choose the preferred scheme from the *catalogue of available schemes.*

Figure 2: Gross margins of specific conventional and organic wheat production activities in Austria in the period 2009 to 2015 (€/hectare)




Notes: *WWheat.Con.Feed.Std.HirOwn.Dry.Med.AT* = activity: winter wheat; farming system: conventional; crop quality: feed; tillage system: standard; labor/machinery: hired and own; climate: dry; plant protection intensity: medium; area: Austria

*WWheat.Org.Feed.Std.HirOwn.-.-.AT* = activity: winter wheat; farming system: organic; crop quality: feed; tillage system: standard; labor/machinery: hired and own; climate: average; measures promoting plant health; area: Austria

*Period* = period of observation: years 2009 to 2015, reference period (average 2011-2015)

*Components of calculation scheme* (€/hectare): Rev = revenue (crop only, no straw recovery); VC = variable costs; VC_MachLab = VC of machinery and labour (hired = certain worksteps carried out by contractor, own = certain worksteps carried out using own machinery and labour); VC_NPK-Uptake = VC of nutrient uptake (NPK); VC_Seed = VC of seeds; VC_Protect = VC of plant protection/health (conventional: chemical plant protection, organic: substances for promoting plant health – none specified in this example), VC_Insur = VC of insurance; VC_Clean = VC of cleaning the crop before drying (none specified in this example); VC_Dry = VC of drying; GM = gross margin (revenue minus variable costs)

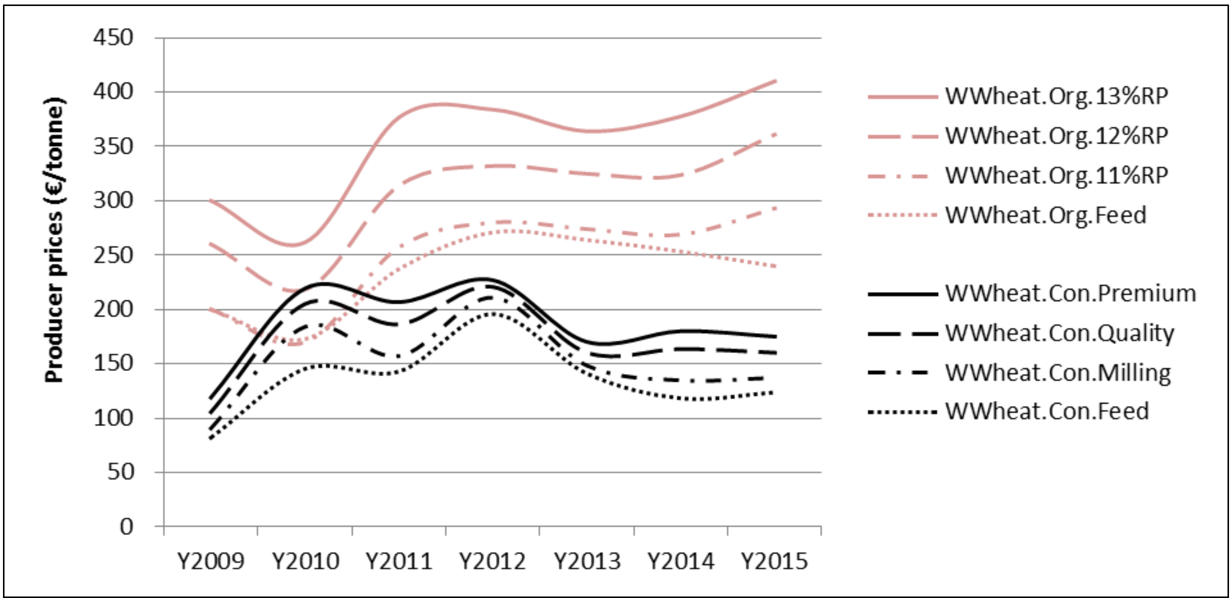
*QuantitySold* = crop sold (tonnes/hectare)

Source: Own figure

In order to identify gross margins, insurance premiums and indemnities, a data set is required that captures the volatility of input prices (fuel, fertilizer), of output prices, of yields and the cost structure. Price volatility can be observed on the market and many detailed statistics are readily available. To deal with the production risk is the core business of any crop insurance and therefore is well known to incumbent insurance companies. Conversely, the cost structure and the relative weight of each cost item is not yet understood well. For this purpose, *INCAP (Index-based Costs of Agricultural Production)* was developed. INCAP is originally an engineering data set: the data used are not based on cost accounting data of farms but are derived from many sources. The quality of the results and their validity is scrutinized using data from farmers in accounting working groups from a major production region (Heinschink et al., 2016a). INCAP covers most relevant production activities of the Austrian agricultural sector (Heinschink et al., 2016b,c). It can be used as a tool for examining risks in Austrian agriculture, such as fluctuations of activity-specific gross margins. It can also be used to evaluate farm-specific incomes or incomes at sector level (Sinabell et al., 2016). Figure 2 shows examples of INCAP results for feed wheat for seven years. The yields as well as the prices of outputs and inputs were mostly taken from annual statistics or other published sources; they represent average values for Austria (AWI, s.a.; LBG Österreich, various years; Statistik Austria, s.a.;). Elements of the INCAP calculation scheme, i.e. quantity sold, output prices and (selected) cost items, are used to develop indices for the margin insurance.

For the examples shown in Figure 2 the assumption was made that management is not altered during the period of observation (years 2009 to 2015). Revenues of conventional feed wheat range from €433 to €893/hectare, total variable costs from €503 to €599/hectare and gross margins from –€124 to €316/hectare (Figure 2a). As for the organic feed wheat activity, revenues range from €570 to €925/hectare, variable cost from €534 to 641€/hectare and gross margins from €36 to €307/hectare (Figure 2b). The fluctuations in gross margins are easily traced back to the changing yields, output prices and respective cost items.

Figure 3: Producer prices for conventional and organic wheat, average values for Austria in the period 2009 to 2015 (€/tonne, excl. VAT)




Notes: *WWheat.Con* = conventional winter wheat, qualities: premium, quality, milling, feed; *WWheat.Org* = organic winter wheat, qualities: 13%, 12%, 11% raw protein content, feed

Source: Own figure based on data taken from Statistik Austria (s.a.) and AWI (s.a.)

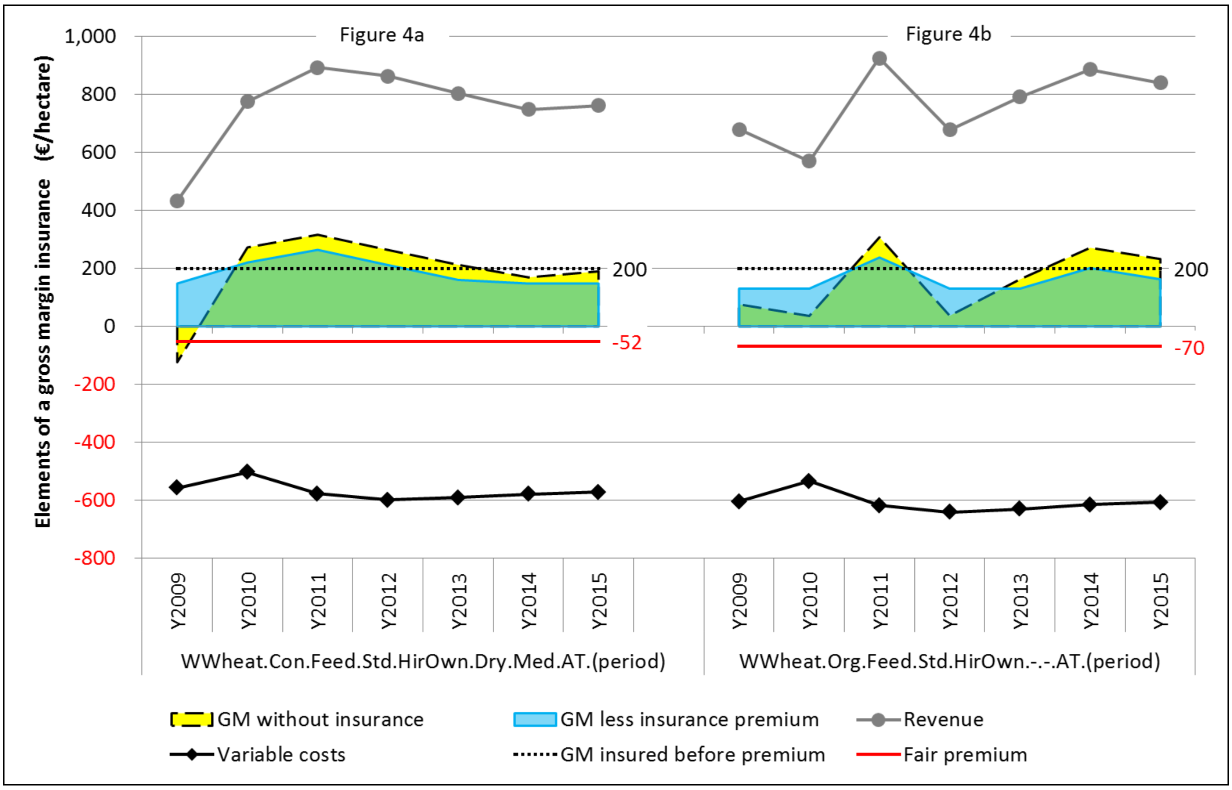
The producer prices for conventional and organic wheat have developed differently during the observed years (Figure 3). Moreover, the comparison between the two different feed wheat activties reveals that the proportions of cost items are similar in both farming systems as well as throughout the observation period. The level of costs, however, varies depending on the farming system and the year; this is mainly due to energy inputs which dominate production costs for both types of wheat. As a consequence, the gross margins are not only different in levels but also have peaks and troughs in different years (Figure 2). For instance, gross margins of organic wheat are on average almost 20% lower than for conventional wheat. The coefficients of variation of gross margins are 85 in the case of conventional wheat and 62 in the case of organic wheat. Such results make it evident that differences in management and product types are important to consider because they expose different risk characteristics.

## 6. A prototype of a margin insurance scheme for conventional and organic wheat production

The concept developed in the previous chapters is now applied to an example for a gross margin insurance for wheat producers in Austria. The data used are averages for Austria. The main elements of the proposed gross margin insurance are show in Figure 4. The activities displayed in Figures 2 and 4 are identical. The conventional wheat production activity (Figure 2a) is used to show the consequences if a margin insurance was available (Figure 4a).

The *"variable costs"* (black solid line with diamond markers in the lower panel) indicates the standard production costs, i.e. variable costs of seeds, fertilizer, own machinery, hired labor and machinery, energy, plant protection. The *"revenue"* (grey solid line with circular markers in the upper panel) indicates the revenues from wheat sales. The *"GM without insurance"* (yellow area framed with black broken line) that is partially hidden behind the blue one is the gross margin, i.e. revenue minus costs, before deducting any margin insurance premiums or receiving indemnities. The *"GM insured before premium"* (black dotted line in the upper panel) indicates the minimum margin before the premium is deducted. If the "GM without insurance" falls below the "GM insured before premium" threshold, the farmer receives indemnities. The €200 threshold as indicated in the example is chosen arbitrarily to illustrate how the scheme works. It is apparent from Figure 2a that the gross margin was lower than €200/hectare in three years (2009: –€324, 2014: –€31, 2015: –€10; in total: –€365/hectare). To identify the *"fair premium"* (red solid line below the abscissa), the total amount falling short of the "GM insured before premium" is spread over the entire observation period. It is worth noting that in this paper the term "fair premium" denotes the premium exclusive of administrative and reinsurance costs. In the example, an annual fair premium of €52/hectare (= –€365 / 7 years) is necessary in order to attain a "GM insured before premium" of €200/hectare. A farmer producing conventional wheat and paying annual insurance premiums of €52/hectare would have had gross margins as displayed by the *"GM less insurance premium"* (blue area framed with blue solid line). As a result, the effective minimum GM per year is €148/hectare (= €200/hectare GM insured before premium less €52 fair premium) in 2009, 2014 and 2015. In this concept, the annual average gross margin is the same – regardless if the farmer is insured or not (in this example: €186/hectare and year). The insurance is effectively smoothing volatile income streams.

Figure 4: Examples of an ex-post calculation of an index-based margin insurance scheme for specific conventional and organic wheat production activities (€/hectare, excl. VAT)




Note: *Revenue:* revenue from crop sales (other sources of revenue, e.g. straw recovery, agricultural payments, *not* considered); *Variable costs:* variable costs of seeds, nutrient uptake (NPK), plant protection/health, machinery and labor, cleaning the crop, drying the crop, insurance; GM: gross margin; *GM without insurance:* revenue less variable costs (may assume positive or negative values); *GM insured before premium:* minimum GM before the premium is deducted, the insured farmer receives indemnities if the GM without insurance falls below this threshold (€200/hectare), assuming the tax payer covers the costs of administration and reinsurance; *Fair premium:* annual premium that is necessary in order to attain the specified GM insured before premium (conventional wheat: €52, organic wheat: €70/hectare and year); *GM less insurance premium:* assuming the farmer pays the fair premium themselves – the GM insured before premium less fair premium equals the GM achieved by the insured farmer

Source: Own figure

One assumption in the example is that the farmer pays the fair premium themselves. Alternatively, the fair premium could be paid through an agricultural policy measure which would be equivalent with a product-specific per-hectare payment. A producer of conventional wheat would earn €52/hectare per year or €365/hectare over the period under consideration.

The rationale of Figures 4a and 4b is the same. In the example of organic wheat, the annual fair premium is €70/hectare to achieve a minimum gross margin before covering the insurance costs of €200/hectare. As a consequence, the gross margin is €130/hectare in four out of seven years observed in this example.

## 7. Discussion

### Merits of the proposed insurance scheme

This paper presents core elements of a proposed insurance product that allows farmers to insure against price risk of both input and output prices. A margin insurance can also be seen as a partial substitute for production risk insurances. Hence, one of the major advantages of margin insurance is that multiple risks are covered by one scheme, thus making it possible to reduce transaction costs compared to a situation where separate insurances are bought to cover different risks individually.

In addition, moral hazard can be avoided effectively: the indemnities are always the same regardless of the individual farmer's management practice. This is owed to the fact that, as described above, standard gross margin calculations are used rather than farm-specific calculations. Gross margin calculations are provided for various farm types, production environments and products. The farmer picks one of these schemes and is compensated accordingly. A premium has to be paid annually but indemnities are paid out only if the standard calculation falls short of the pre-defined minimum gross margin.

### Limitations and aspects to be considered

Ideally, like in other index-based products, easily accessible observations are used to trigger the incidence of coverage. Activities can be differentiated in the insurance portfolio only if reliable and representative data are available for the aspect in question (e.g. climate type, farming system, geographical area). Much of the required data is available for conventional activities, but there are important data gaps regarding organic activities. Possible explanations for data gaps are, for instance: that the data is not collected at all; that it is collected but not made available for data protection reasons; that the collection is not standardized, or that the data does not accurately reflect the activity in question (e.g. different crop qualities or livestock performance). It may hence be necessary to initiate the collection of certain data (e.g. producer prices and yields for organic products, potentially differentiated by product quality, climate type or other relevant aspects) before certain variants of the insurance products can be placed on the market.

It is also important to bear in mind that a margin calculation includes more than one variable. The level of covariance between the time series of different prices is sometimes very high. Therefore, the stability of the margins under consideration need to be explored in detail in order to better understand the underlying data generating processes.

The period under consideration in this example is relatively short. An analysis of longer time periods reveals trends in prices (see Sinabell et al., forthcoming) and other aspects of the gross margin calculation. It is important to pay special attention to changing environments and practices in the context of calculating fair premiums. In this context, it will be necessary to review and revise: the standard calculation scheme (revenue and cost components), the assumptions (e.g. quantities, worksteps, technology), the data and indices as well as the observation period applied. The examples shown in this paper are based on the assumption that – apart from yield increases due to genetic improvements – technology does not change. Such an assumption may be justified for short periods but is certainly inadequate for longer ones. Hence it will be necessary to observe the development and uptake of technology over time and to adjust the assumptions made in the gross margin calculation accordingly.

## 8. Next steps and outlook

### Steps prior to placing a gross margin insurance on the market

Several additional steps need to be made before a product can be developed and placed on the market. Following the data validation phase it is necessary to specify the premium calculations, the sub-indexes that enter the formula, the details of premium calculations and other details of the product that shall be placed on the market.

To evaluate the acceptance on the market for such a product (e.g. by asking farmers about their willingness to pay for specific variants of the insurance product) is probably the most important step before its launch. The European Innovation Partnership would offer the opportunity of supporting its development because it supports cooperation between science, industry and farmers in order to develop new products and services.

### Legal considerations and possible sources of funding

An important aspect not touched in this paper is the legal one. It is not yet examined if national or EU legislation limits the scope of detail or any variant of implementation of such a product. It also has to be checked whether public support for such an insurance may be granted or not and if yes, under which conditions. As shown above, a premium support is equivalent to a product specific direct payment. Such considerations show that there may be a trade-off between distortions in product markets and the aim to induce risk averse farmers to reap economies of scale and avoiding self-insurance by following a diversification strategy.

It may be advisable to support premiums in order to save re-insurance premiums at least during the phase of gaining experience and building up the necessary reserves. Support could mean that the government absorbs the administrative costs, the costs of reinsurance, the premium or a combination of these costs, either fully or part of them. In such a case it will be necessary to check conformity with WTO commitments. Conformity is likely since a very similar scheme is operated in the USA.

If public support is legally possible, it is necessary to determine the source of funds used for subsidizing the insurance premium. Since the public budget is limited via the envelope requirement of the CAP, funds need to be taken from another support scheme (e.g. CAP first or second pillar envelopes). In such a case, adverse effects for previously funded specific goals may be a result. Hence it is advisable to thoroughly review the implications for all stakeholders or areas involved. For instance, it is not yet know if farmers would be interested in buying subsidized margin insurance when they are aware that area payments are reduced equivalently. Some farmers may not be willing to trade off a secure source of income (e.g. payments paid through pillar one agricultural policy measures) against an uncertain payment (e.g. indemnities in case the index of gross margins is below a certain threshold). Another question is whether the margin insurance will be available for only a few agricultural products or for many. If only few crops can be insured a premium subsidy taken would imply the reallocation of funds between different groups of farmers. Political support for a scheme that offers benefits for a small group may be low if it entails losses for many or all other agricultural producers. However, some public choice literature supports the view that such an outcome is very likely if it is permitted to reallocate per hectare direct payments in order to fund innovative risk management tools.

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Annex: Agricultural risk insurance portfolio in Austria in 2016

| | | risk | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Activity / Risc | Ø 2010/15 Mio. € basic prices | Hail | Consumer's risk due to hail | Hail induces fusarium infestation | Frost | Drought | Re-cultivation | Storm | Drift | Siltation (mud) | Flooding | Predation | Sprouting | Snow damage | Additional hassle and rot | Spoilage | Heavy rain | Death | Dead birth | Animal epidemics | Death failure of ventilation | Technical defects | Fire |
| Wheat | 261 | x | | | x | x | | | x | x | x | x | x | | | | | | | | | | |
| Barley | 114 | x | | | x | x | | | x | x | x | x | x | | | | | | | | | | |
| Oats | 15 | x | | | x | x | | | x | x | x | x | x | | | | | | | | | | |
| Rye | 29 | x | | | x | x | | | x | x | x | x | x | | | | | | | | | | |
| Spelt | | x | | | | | | | x | x | x | x | x | | | | | | | | | | |
| Triticale | | x | | | x | x | | | x | x | x | x | x | | | | | | | | | | |
| cereal mixtures | | x | | | x | x | | | x | x | x | x | | | | | | | | | | | |
| Vetches | 43 | x | | | | x | | | x | x | x | x | | | | | | | | | | | |
| Emmer | | | | | x | x | | | | | | | | | | | | | | | | | |
| Single corn | | | | | x | x | | | | | | | | | | | | | | | | | |
| Sorghum | | | | | | x | | | | | | | | | | | | | | | | | |
| Grain maize | | x | | x | | x | | x | x | x | x | x | | x | | | | | | | | | |
| Silage maize | 321 | x | | x | | x | | x | x | x | x | x | | x | | | | | | | | | |
| Green maize | | x | | | | | | x | x | x | x | x | | x | | | | | | | | | |
| Seed maize | | x | | | | x | x | x | x | x | x | x | | x | | | | | | | | | |
| Potatoes | 78 | x | | | x | x | x | | x | x | x | x | | | | | | | | | | | |
| Horseradish | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Sugar beet | 107 | x | | | | | x | | x | x | x | x | | | | | | | | | | | |
| Forage beet | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Oil pumpkin | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Oil pumpkin propagation | | | | | | x | | | | | | | | | | | | | | | | | |
| Rape | 57 | x | | | x | | | | x | x | x | x | | | | | | | | | | | |
| Sunflower | 19 | x | | | | x | | x | x | x | x | x | | | | | | | | | | | |
| Soy Bean | 37 | x | | | | x | | | x | x | x | x | | | | | | | | | | | |
| Horse Bean | | x | | | | x | | x | x | x | x | x | | | | | | | | | | | |
| Linseed (oilflax) | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Field peas | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Chickling peas | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Turnip rape seeds | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Sweet lupines | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Mustard seeds | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Fodder radish | | x | | | | | | | x | x | x | x | | | | | | | | | | | |
| Poppyseed | | x | x | | | | | | x | x | x | x | | | | | | | | | | | |
| Two and more cut meadows | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Two and more cut pastures | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Clover | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Clover-Grass | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Lucerne | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Forage grasses | | x | | | | x | x | | x | x | x | x | | | | | | | | | | | |
| Other forage plants | | x | | | | | x | | x | x | x | x | | | | | | | | | | | |
| Fruits | | x | | | | | | x | | | | | | x | | | | | | | | | |
| Fruit trees | | x | | | | | | x | | | | | | x | | | | | | | | | |
| Apples | | x | | | x | x | | | | | | | | | | | | | | | | | |
| Pears | | x | | | x | | | | | | | | | | | | | | | | | | |
| Pome fruits | 233 | x | | | | | | | | | | | | | | | | | | | | | |
| Stone fruits | | x | | | | | | | | | | | | | | | | | | | | | |
| Shell fruits | | x | | | | | | | | | | | | | | | | | | | | | |
| Soft Fruits | | x | | | | | | | | | | | | | | | | | | | | | |
| Strawberries | | x | x | | x | | | | | | | | | | | | | | | | | | |
| Elderberries | | x | | | | | | | | | | | | | | | | | | | | | |
| Grapes | 508 | x | | | x | | | | | | | | | | x | | | | | | | | |
| Horticulture | | | | | | | | | | | | | | | | | | | | | | | |
| Glasshouse | | x | | | | | | x | | | x | | | x | | x | | | | | | x | x |
| Plastic greenhouse | 567 | x | | | | | | x | | | x | | | x | | x | | | | | | x | x |
| Tunnels | | x | | | | | | x | | | | | | x | | x | | | | | | | |
| Vegetables outdoor | | x | x | | x | | | | x | | x | | | | | | | | | | | | |
| Ornamental Plants | | x | | | x | | | x | | | x | | | | | x | x | | | | | | |
| Tree nursery | | x | | | x | | | x | | | x | | | x | | x | | | | | | | |
| Cattles | 892 | | | | | | | | | | | | | | | | | x | x | x | | | |
| Hail/Storm Plastics | | x | | | | | | x | | | | | | | | | | | | | | | |
| Milk production | 1110 | | | | | | | | | | | | | | | | | | | x | | | |
| Pigs | 789 | | | | | | | | | | | | | | | | | | | x | x | | |
| Horses | 1 | | | | | | | | | | | | | | | | | x | | | | | |

Source: Own table based on product descriptions of ÖHV (www.hagel.at, retrieved 21.06.2016)