

Systematic Risk

Crop Insurance in Retrospect and Prospect

By Harun Bulut, Frank Schnapp, and Keith Collins, NCIS

Systematic risk has been an appealing concept for justifying government involvement in crop insurance markets. It is also the basis for the design of alternative plans of insurance and farm programs. This article revisits the concept by reviewing the related agricultural economics literature. The review focuses on the period since the Federal Crop Insurance Act of 1994 when the crop insurance program went through major changes such as increased participation, the adoption of biotechnology, rating and data improvements and the introduction of revenue plans in crop insurance and farm programs.

In crop insurance literature, the term systematic risk (or catastrophic risk) is typically understood as the common portion of underlying risk when losses among insurance units are positively and spatially correlated.¹ Figures 1-3 illustrate no correlation, partial positive correlation and perfect positive correlation between a farmer's and a county's yield. Depending on the level and distribution of positive correlation, a relatively large segment of the insured units may be affected by a common cause of loss, such as widespread adverse weather effects of drought, flood and freeze, as opposed to almost mutually independent events seen in other lines of insurance, such as auto accidents (Miranda

and Glauber, 1997; Skees and Black, 1997; Duncan and Myers, 2000; and Chambers and Quiggin, 2002). Price risk also contributes to the insurer's systematic risk due to the high correlation across producers of the same crop. Despite the natural hedge between yield and price movements, in some years, such as 2008, a sharp reduction in price at harvest without major production loss can result in losses on a large number of crop insurance revenue protection policies at the same time.

In the next two sections, systematic risk is first considered from the perspective of Approved Insurance Providers (AIPs or insurers) and then from the perspective of farmers. The last section provides concluding comments.

Systematic Risk from the Insurers' Perspective

With very few exceptions, the existence of an insurance market is based on the concept of the law of large numbers. If exposures are independent, the law of large numbers implies that the insurer's risk over its entire book of business is relatively small, with gains on many policies offsetting the losses on a few. On the other hand, if exposures are correlated, then the insurer's risk can be considerable. Simulations conducted by Miranda and

Glauber for the 1993 year estimated that the crop insurance portfolios of the ten largest AIPs were 20 to 50 times riskier relative to a hypothetical portfolio consisting of independent crop insurance losses.² Facing such a high systematic risk, crop insurance companies would seek reinsurance. The consensus in the literature is that private insurance and reinsurance markets do not provide adequate coverage at a reasonable premium rate for the systematic risk in crop insurance markets.

Various proposals have emerged in the literature to address systematic risk in crop insurance markets including: 1) government provided subsidized reinsurance (Duncan and Myers), 2) government provided reinsurance through area insurance (Miranda and Glauber), and 3) options markets, futures markets and forward marketing (Grant, 1985; Chambers and Quiggin). These proposals will be reviewed in the following section.

Government Provided Reinsurance through the Standard Reinsurance Agreement (SRA)

Based on a theoretical model, Duncan and Myers study the question of whether, in the presence of systematic risk, a private

¹ The terms "systematic risk" or "systemic risk" have been interchangeably used in the literature. In recent years, "systemic risk" has commonly been used to refer to events that are so severe that they can potentially devastate the entire economy - such as a financial meltdown in 2008. In referring to non-diversifiable risk, Fabozzi and Modigliani use the term systematic risk, whereas Miranda and Glauber; Mason, Hayes and Lence; Skees and Black use the term "systemic risk." Duncan and Myers adopt the term "catastrophic risk" instead of the term "systemic risk." In this article, we choose to use the term "systematic risk."

² The analysis was done for the 1993 crop year. The authors made simplifying assumptions such as every farmer chose 65 percent coverage with the yield protection policy. They modeled only the joint distribution of farm-level yields and left out modeling of the joint distribution of price and yield. They combined eight years of farm level data with the county level data which went back 30 years from 1992. The farm level data covered corn, soybeans and wheat farmers who were enrolled in the program in 1993. The sample consisted of 15 percent of the all farmers enrolled in the program in 1993.

crop insurance market can be established so that crop insurance companies obtain an adequate return and farmers obtain adequate coverage levels at affordable premium rates. The authors recognize that the accumulation of risk across a crop insurance portfolio due to systematic risk creates a challenge for the private insurance market since investors generally require a return commensurate with the risk they take. While it might be possible to set the rates at a level that compensates insurers for their high degree of systematic risk, those rates might discourage farmers from participating in the program. If the risk premium is sufficiently high, it may even lead to the complete break-down of the market. They find that reinsurance (private or government provided) will help only if there is a somewhat functioning private crop insurance market to begin with. In case of complete market failure, only subsidized reinsurance can help facilitate the market. In that case, a higher subsidy amount further improves the market outcome in the form of lower premiums, higher coverage and participation levels. Duncan and Myers note that whether the cost of subsidized reinsurance outweighs the resulting benefits is an open question.

Consistent with the Duncan and Myers analysis, and to ensure participation of private insurers in crop insurance by limiting their exposure to systematic risk, the U.S. government acted as reinsurer under terms specified in various SRAs since 1981. The SRA is a risk-sharing agreement in which insurers give up a portion of underwriting gains in low loss years in order to be able to transfer a portion of underwriting losses to the government in high loss years. The SRA allows private companies to cede the bulk of the risk to the government on a certain share of policies they sell, while the policies they retain are allocated into different risk-sharing funds with varying exposure to risk. This facilitates the government's objective of making crop insurance available to all eligible producers, including producers who would otherwise find it difficult to obtain coverage in the private market due to their underwriting characteristics, while simultaneously transferring most of the risk of these producers to the government.

Figure 1. Example County and Farm Yields with No Systematic Production Risk

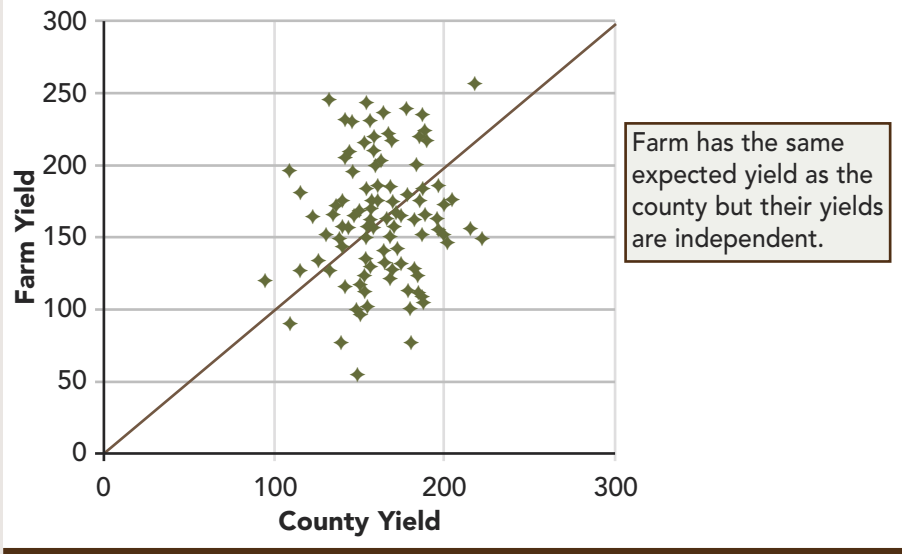
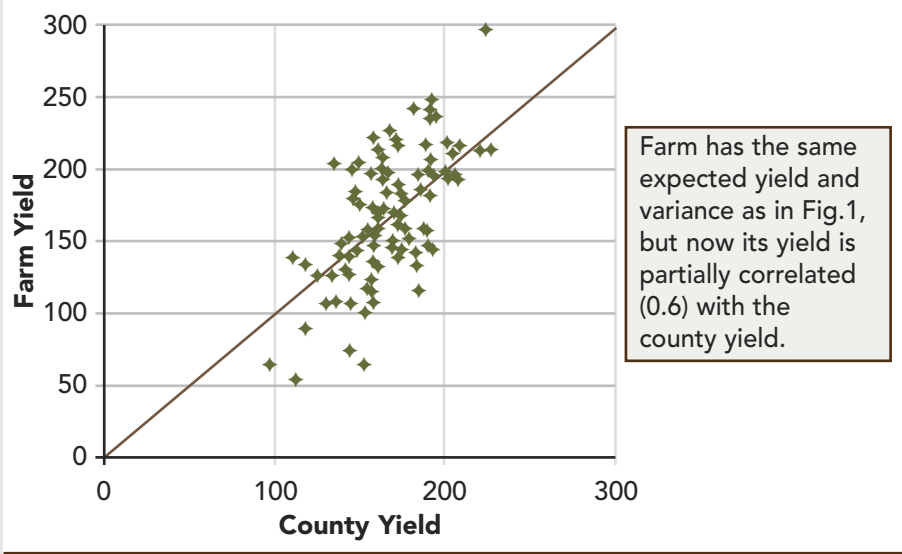


Figure 2. Example County and Farm Yields with Some Systematic Production Risk

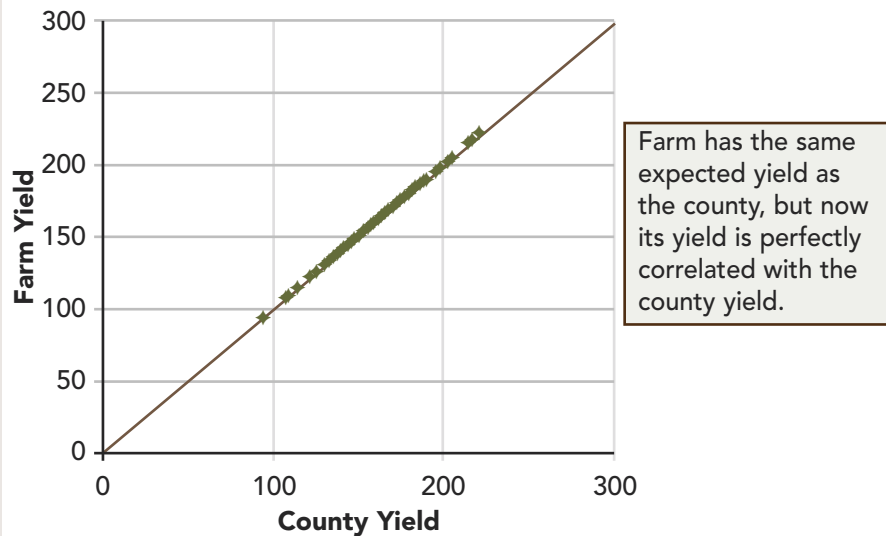


In the early 1990s, Miranda and Glauber criticized the government-provided reinsurance through the SRA by arguing: 1) it does not provide good incentives to companies to monitor adverse selection and moral hazard problems at the farm level, and 2) it provides a rather excessive rate of return on retained premium (above 18 percent). These criticisms were made following a time period, the 1980s and early 1990s, during which the actuarial performance of the crop insurance program had been dismal (Glauber, 2004). The Federal Crop Insurance Act of 1994 and the Agricultural

Risk Protection Act of 2002 (ARPA) increased the participation of low risk producers in the program through increased premium subsidies under the expectation that increased participation would lead to less adverse selection and lower, more accurate, premium rates. Consistent with that expectation, the crop insurance program's actuarial performance has improved over time.

In regard to the first point raised in Miranda and Glauber, one has to recall that the crop insurance industry is highly regulated compared to other lines of insurance.

Figure 3. Example County and Farm Yields with No Idiosyncratic Production Risk



Private insurers must accept the premium rates and underwriting provisions as set by government. Instead, they compete only in the quality of their service. In addition, once a company decides to operate in a given state, it has to offer all plans of insurance that are approved for sale (except pilot programs) to every farmer in that state. To mitigate the loss potential because of this, companies can cede a portion of their policies they deem highly risky to the Assigned Risk Fund (ARF), where they retain a relatively lower proportion of the premium and its associated risks compared to other reinsurance funds. Nevertheless, ceding to ARF is done as a proportion of the entire reinsurance fund rather than on an individual contract basis. That is, each company retains at least some liability on every policy it underwrites. This is in contrast to flood insurance where the government takes all the risk and the companies bear none. Since the 1980s, successive SRAs have steadily increased the risk retained by the companies. For example in the 1986-90 SRA, the government assumed 100 percent of the losses for which the loss ratio exceeded 1.565. In the 2011 SRA, the government assumes 100 percent of the losses for which the loss ratio exceeds 5.0. Because crop insurance companies maintain substantial “skin in the game,” they have ample incentives to rigorously adjust losses.

In regard to the second point raised in Miranda and Glauber, an historical perspective can be useful. In terms of potential returns, the basic structure of SRA did not change in the late 1990s. The main change between the 1998 SRA and the 2005 SRA was the introduction of net book quota share (NBQS). NBQS requires that companies cede five percent of their cumulative underwriting gains or losses to the Federal Crop Insurance Corporation (FCIC). Because companies obtain underwriting gains more often than losses, the reinsurance provided by NBQS tends to benefit FCIC more so than the companies. Vedenov et al. (2006) find that the expected returns to companies would be decreased due to NBQS by 1.1 percent after adjusting for the companies’ behavioral response. Another change in the 2005 SRA was an increase in cession limits, but Vedenov et al. calculate that companies would increase gross premiums ceded to the ARF only in a limited number of states. In the 2011 SRA, NBQS is increased to 6.5 percent, and if there is an underwriting gain, the additional 1.5 percent is to be distributed back to companies operating in under-served states. Finally, the 2011 SRA introduced alternative risk sharing provisions based on groupings of states to reflect differing underwriting gain potential among states, further decreasing the companies’ expected returns.

Systematic Risk from the Farmers’ Perspective

The conventional thinking has been that systematic risk lies at the core of farmers’ risk exposure and it is quite uniform and common across farmers in a given area and even across counties in a given state or region. Such a view has been instrumental for the introduction and development area yield or revenue insurance plans and area revenue farm programs.

Area Yield or Revenue Insurance Plans

Group Risk Protection (GRP) Insurance and Group Risk Income Protection (GRIP) are area based plans protecting against yield and revenue shortfalls at the county level, respectively. GRP started out as a pilot program for soybeans in 1993 and expanded to other major crops the following year. GRIP was proposed as a pilot by the private sector in 1997. Starting in 2004, GRIP also began to offer the harvest price option (GRIP-HPO), which sets the insurance guarantee at the higher of planting or harvest prices. Farmers have had little demand for GRP and GRIP in most areas, as these plans accounted for less than four percent of the total MPCI program premium in 2010.

In crop year 2011, the Risk Management Agency (RMA), introduced the Common Crop Insurance Policy (Combo Policy) replacing the previous individual insurance plans with the goal of unifying and simplifying the Federal crop insurance program. To bring the area plans in line with the Combo Policy changes, FCIC proposed a rule to replace GRP Insurance, GRIP Insurance, and GRP-HPO Insurance with new plans called Area Yield Protection Insurance (AYP), Area Revenue Protection Insurance with Harvest Price Exclusion (ARP-HPE), and Area Revenue Protection Insurance (ARP), respectively. These new area plans collectively are referred to as ARPI.

Area Revenue Farm Programs

The 2008 Farm Bill emphasized the revenue protection goal for farm programs and introduced new programs such as

Supplemental Revenue Assistance Payments (SURE) and Average Crop Revenue Election (ACRE). This was despite the fact that the premium of revenue insurance products, which provide protection against revenue shortfalls as a share of total U.S. crop insurance premium, is about 80 percent. Farmers have been receiving such protection since the 1990s. SURE is a whole farm program and makes payments based on individual producer losses over an entire farm. ACRE protects against revenue shortfalls for a crop at the state level.

Using a farm level data obtained from Illinois and Kansas Farm Management Associations (for corn, soybeans, and wheat in Illinois and for corn, sorghum, soybeans, and wheat in Kansas) over the time period from 1978 to 2008, Zulauf (2011) finds that the systematic component of the losses appears to be mostly shallow losses, while deeper losses pertain to the idiosyncratic component and that the pattern for shallow versus deep losses differs across states. Zulauf argues that a reason for the introduction of different programs such as ACRE and SURE, in addition to crop insurance could be to accommodate different loss patterns in different states.

The duplication of coverage and overlap between ACRE and crop insurance appears to be modest (Zulauf, Schnitkey, and Langemeier, 2010). They are separate programs whereas in order to receive a SURE payment, the farmer has to purchase crop insurance. Net crop insurance indemnities are counted against the SURE guarantee which eliminates duplication of payments between the two. Both ACRE and SURE are subject to payment limits while crop insurance is not. The program complexity and slow payment of claims have been major issues for both ACRE and SURE.

Overall the participation has been low and selective by region and crop with ACRE.

Using a theoretical model, Bulut, Collins, and Zacharias (2011) study a risk-averse farmer's relative coverage demand for area versus individual insurance. Assuming that the farmer's losses are imperfectly and positively correlated with area losses, they show that under actuarially fair premium rates, farmers would pur-



chase individual insurance only. In addition, if area insurance is underpriced while individual insurance is fairly priced, separate area and individual plans are substitutes and demand for area insurance increases whereas demand for individual insurance decreases as the correlation between farmer and area losses increases. Furthermore, whenever individual insurance becomes overpriced while area insurance is fairly priced, some additional demand for area insurance will be created. The model can be useful to explain the pattern of actual coverage in counties where ACRE participation is low or high.

From the farmers' perspective, the risk management needs of the producer are best met with individual crop insurance under actuarially fair rates along with the use of forward marketing.

Concluding Comments

This article discusses the systematic risk issue in crop insurance markets by reviewing the related agricultural economics literature. After examining the issue from both insurers' and farmers' perspectives, the review raises the following points.

From the insurer's perspective, systematic risk is best addressed through a fairly negotiated SRA agreement. The alternative idea of providing reinsurance through area plans has not been appealing to companies. A fair negotiation must recognize and emphasize the contribution of the private-public partnership in creating the success of the crop insurance program as seen today. The focus of such negotiations should be on whether the program operates effectively and achieves the objectives set for it by Congress by ensuring effective and efficient delivery, creating new insurance opportunities for farmers, keeping premiums affordable, and expanding crop insurance coverage.

From the farmers' perspective, the risk management needs of the producer are best met with individual crop insurance under actuarially fair rates along with the use of forward marketing. Coverage restric-

tions imposed in individual insurance against moral hazard concerns can result in a limited indemnity or shallow loss issues. In that context, a partial role for area farm programs or insurance plans to cover deductibles and therefore to improve risk protection is possible. Even then, the individual plan must be the base product while the area plan is stacked on top of individual insurance. Multi-year price risk is a component of systematic risk and can be addressed through actuarially based multi-year insurance policies or farm programs.

Even though justification can be found for government's role in crop insurance markets as a reinsurer, the funding cuts in the 2008 Farm Bill, the 2011 SRA and the proposals for further cuts to address the Federal budget deficit and premium rate changes have amplified insurers' regulatory risk concerns. Regulatory risk adds to the systematic risk companies are facing and further increases the necessary risk-premium for their involvement in crop insurance markets.

Editor's Note: To read an extended version of this article, please go to www.ag-risk.org and click on "Publications."

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