TIAA-CREF | Center for Farmland Research

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Farmland Markets:

Valuation, Investment Performance, and Issues for the Future

*This paper serves to identify and assess contemporary issues facing farmland markets, with embedded linkages to related research items, tools, and databases aimed to better inform those interested in farmland. It is published as a product of the **TIAA-CREF** Center for Farmland Research (**Center**), a new effort involving research and outreach faculty at the University of Illinois, and the longstanding farmdoc project (www.farmdoc.illinois.edu) that provides decision support and educational programming related to farm management. The **Center** extends the capacity of both farmdoc, and the outreach platform used to communicate from the University, and allows the development of a new area of emphasis focused specifically on issues directly related to farmland as these evolve through time.*

TIAA-CREF Center for Farmland Research

Advancing Farmland Markets through Research and Information

Farmland Markets: Valuation, Investment Performance, and Issues for the Future

I. Farmland Markets: Introduction and Background

Farmland is the primary asset used in production agriculture. The total stock of farm real estate in the United States is valued at just over $2.4 trillion, representing roughly 83% of the total value of all assets in the agricultural sector which now top $3 trillion (USDA-ERS, 2013). In recent years, the growth in farm asset values has been relatively high and has consistently outpaced the increase in farm debt, and as a result, aggregate leverage in the agricultural sector has fallen and equity grown. The USDA's Economic Research Service forecasts a 2013 end-of-year aggregate debt-to-asset ratio for the agricultural sector of 10.2%. More telling, the forecast of real estate's share of total sector debt is only roughly 58% of the total debt in the sector, far less than proportional to its value. Additional detail about the long term growth and financial structure of the sector at the aggregate level is provided in table 1 below with selected decade-end statistics and the most recent three years.

Table 1. US Farm Sector Balance Sheet, selected periods.

	1970	1980	1990	2000	2010	*2011*	*2012*	*2013f*
			($millions, except ratios - source ERS-USDA)					
Farm Assets	**278,864**	**983,305**	**840,609**	**1,203,215**	**2,358,461**	***2,529,849***	***2,811,255***	***3,010,265***
Real Estate	202,417	782,819	619,149	946,428	1,887,157	*2,078,284*	*2,310,560*	*2,483,852*
Non Real Estate	76,447	200,486	221,459	256,787	471,305	*451,566*	*500,695*	*526,413*
Farm Debt	**48,753**	**166,824**	**137,962**	**177,637**	**278,931**	***294,472***	***300,315***	***308,324***
Real Estate	27,506	89,692	74,732	91,109	154,065	*167,191*	*173,019*	*178,411*
Non Real Estate	21,247	77,131	63,230	86,529	124,865	*127,281*	*127,296*	*129,912*
Equity	**230,112**	**816,481**	**702,647**	**1,025,578**	**2,079,531**	***2,235,377***	***2,510,940***	***2,701,941***
Selected Indicators								
Debt/Equity	21.2%	20.4%	19.6%	17.3%	13.4%	*13.2%*	*12.0%*	*11.4%*
Debt/Assets	17.5%	17.0%	16.4%	14.8%	11.8%	*11.6%*	*10.7%*	*10.2%*
Real Estate/Assets	72.6%	79.6%	73.7%	78.7%	80.0%	*82.2%*	*82.2%*	*82.5%*
Real Estate/Equity	88.0%	95.9%	88.1%	92.3%	90.7%	*93.0%*	*92.0%*	*91.9%*
Real Estate D/Total D	56.4%	53.8%	54.2%	51.3%	55.2%	*56.8%*	*57.6%*	*57.9%*

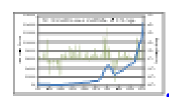
Over the period shown in the table, total assets have grown at an annual (continuously compounded) rate of 5.5% while the real estate and non-real estate components grew at 5.8% and 4.5% respectively. Equity grew at an annually compounded rate of 5.7% while debt grew by only 4.3%, and thus its share of the balance sheet declined as well, diluted by the more rapid growth on the asset side of the balance sheet. Focusing on the recent past, the agricultural sector experienced a period of both relative and absolute prosperity, while many other sectors of the economy struggled to recover from the financial crisis emanating from the housing market decline. In contrast to the broad financial sector, the agricultural sector has been marked by high and stable farm incomes, high commodity prices, favorable exchange rates, and increased demand for commodities for food in the developing world and domestically for the growing biofuels industry. Financial valuation theories posit that the value of a productive asset is determined by its ability to generate future income derived from its production, and as the market values of agricultural goods and services have increased, so have expectations about future farm incomes. Consistent with these financial valuation theories, farm real estate prices have followed suit. In fact, throughout many areas of the United States farmland prices are at an all-time high in both real and nominal terms. Aggregate USDA survey data show the 2013 national average value of all farm real estate was approximately $2,900 per acre, representing an increase of 9.4% over the 2012 reported value (USDA-NASS, 2013). Double digit appreciation rates, however, were observed throughout the Midwest, including an average of 11.5% in the Lake States (Michigan, Minnesota, and Wisconsin), 15.3% in the Corn Belt (Illinois, Indiana, Iowa, Missouri, and Ohio), and 23.1% in the Northern Plains (Kansas, Nebraska, North Dakota, and South Dakota). The appreciation rates reported by the USDA are consistent with those generated by other surveys. For example, the Federal Reserve Bank of Chicago reported similar appreciation rates for their

*A spreadsheet with the complete historic series of the US Agricultural Balance Sheet from 1960-2013f and associated detail about debt shares is available in an Excel-based **Center** utility by clicking here.*

district (17%), which includes parts of Iowa (18%), Wisconsin (7%), Illinois (17%), Indiana (21%), and Michigan (18%) (Oppedahl, 2013), and The Purdue Land Value and Cash Rent Survey suggests that, between 2012 and 2013, farmland prices in Indiana grew by 14.7% to 19.1% depending on agricultural productivity. The value for top quality Indiana farmland in 2013 averaged $9,177 (Dobbins and Cook, 2013). The Illinois ISPFMRA annual survey indicates continued increases into mid-year 2013, with a previous two year period of over 30% increase in value (ISPFMRA 2013). In Iowa, an annually conducted survey of farmland market professionals revealed even greater increases with reports in 2012 of a two year rate of gain of over 56% (Duffy, 2012.) Outside of the Midwest, there are less direct surveys regularly reported, although a few of the Federal Reserve districts in addition to The Chicago Federal Reserve Bank provide agricultural condition surveys, or run regular series focused on farmland, but these tend to be based on surveys of bank collateral conditions or derived from loan relationships secured with agricultural collateral.

*Detailed Illinois sales and turnover data by region and PI are available **here** in a utility developed in the Center for the ISPFMRA.*

*Additionally, a utility to establish basis values and convert index series through time is available **here.***



Among publicly available commercial sources of information on farmland values, the National Council of Real Estate Investment Fiduciaries (NCREIF) is probably the most widely relied upon measure of returns to institutionally owned and managed farm properties (NCREIF Farmland Index). The series published by NCREIF have total returns reported by quarter based on common accounting and reporting requirements across all members, with a universe of properties that may change through time, and a process for allocation into "quarterlies" that is meant to retain consistency with annual returns. Its recent returns likewise corroborate the favorable returns (over 17% 2012, over 7.4% for first half of 2013) to farmland investments, but it remains difficult for individuals or even institutions to directly access the investments represented in that index. There are other proprietary and special purpose farm returns series published by groups such as Ibbotson Associates and MSCI, but the methodologies behind the proprietary series are difficult to validate as representative, though at minimum they too tend to be highly correlated with other farmland returns series, and thus likely rely on USDA-related components. In total, the evidence is very consistent across the broad set of sources about the general rates of increase in farmland values, and general about levels of current income. Where more detailed data exist, the patterns agree very closely with USDA index values, though actual price levels in any region depend on specific parcel characteristics, and tend to be higher than the USDA indexes which represent all agricultural farmland, not just tracts available for investment or control through traditional rental arrangements.[1]

The dynamics of farm real estate values through time are driven by a complex set of factors, including variables that affect expectations about agricultural returns, macroeconomic conditions, market structure, and policy. Farmland prices also exhibit substantial variation across locations as a result of urban influence, agricultural production practices, and state and local policies. In addition, several key characteristics of the farm real estate market and agricultural production, more generally, make farmland distinct from other asset classes. These key characteristics and driving factors are outlined in more detail below. Where appropriate, theoretic discussions and explanations are provided to help link economic indicators and conditions to their farmland market responses. And, as part of a continuing effort to summarize and catalog related information, we draw on insights provided by a vast economic literature, including both theoretical and empirical examinations to better depict the current state of knowledge about farmland valuation, financial performance as an investment, and about factors likely to impact the market for farmland in the future.[2]

While farmland investments have been the subject of academic investigations for decades, recent performance of the sector has substantially elevated the visibility of the asset class and drawn more attention from all corners including those concerned with land use policy, environmental issues, energy policy through linkages to the RFS and other non-commodity market uses; as well as increased attention by absentee owners (how to manage holdings),

[1] More detail about specific patterns of farmland returns is provided in a later section, along with a link to a TIAA ***Center*** utility that allows the generation of specific state reports of farmland values, and both income and capital gains components of return for 48 states in the US.

[2] Separately from this report, an annotated bibliography of literature related to farmland investments and returns is being maintained at the ***Center*** (Link – TK current here to show version 1).

operators (should they expand, how to control) and the investment community in the large (numerous facets, but accessing exposure to the asset class is the primary current question). Historically, there have also been periods with relatively higher academic interest in understanding recreational amenity impacts of farm and wooded areas, use in tax management through 1031 exchange, development planning, estate management applications and the like, though these seem to ebb and flow in prevalence.

Farmland has been studied both as an investment in isolation (including single farm-centric analyses) as well as in the context of a portfolio of investments. Past studies of the determinants of farmland value have typically focused on attributes that contribute to the fundamental value of farmland, including government program payments, productivity measures, commodity price risk, input cost variation, and enterprise mix (e.g., Klinefelter 1973; Duncan 1977; and Huang et al. 2006). The use of present-value related models formalizes the theory behind these intuitive determinants, providing a theoretical link between the stream of income generated through economic rents and the value of the farmland itself. However, such studies often revealed a 'puzzle' in that farmland values could not consistently and entirely be attributed to the stream of future cash rent payments alone, or to the income stream from use in production (Faulk 1991, 1998; Moss 1997), or that the dynamics of farmland pricing appear highly stable compared to the inputs into the models, at least as a factor of production on a commercial farm.

There is also a longstanding vein in the literature that views farmland as any other asset, and applies tenets of rational no-arbitrage pricing to compare returns to investment in farmland to the returns of common stock and other alternative investments (Kost 1968; Gertel and Lewis 1980), Barry (1980) formalized the notion of farmland as an investment class in an equilibrium capital market. Specifically, Barry and others (Irwin, Forster and Sherrick 1988; Moss and Katchova 2005) formalized the treatment of farmland as an investment and applied traditional financial theory to evaluate the returns in a portfolio context, and within CAPM and its extensions to accommodate the impacts of inflation. Others have improved conventions related to the measurement and treatment of land returns and values with examinations of income expectations, discounting techniques, non-pecuniary contributions to value, role of government programs, impacts of market conditions, and so forth; and they have done so against a broad set of alternative investments across differing time periods, and by agricultural typology. In virtually every case across the majority of periods examined, and under the bulk of the characterizations of returns, the summary message has been that farmland compares favorably with most other common asset classes both in actual returns measures, relative risk, and in terms of the diversification benefits offered by its low correlation with other financial assets and its inflation hedging potential.

Key Features of the Sector:

Given that many traditional financial models applied to farmland returns demonstrate relatively high risk-adjusted returns, it is then incumbent to square the key features of the market against these empirics. For example, efficient frontiers calculated against typical asset groupings show "optimal" holdings of farmland to be far greater than observed in virtually any real portfolio; or that Jensen, Treynor, and Sharpe related measures of capital asset performance broadly confirm excess returns relative to broad indexes or own risk; or that measures of correlation to inflation-sensitive positions are high and stable compared to traditional consumer sector investments.

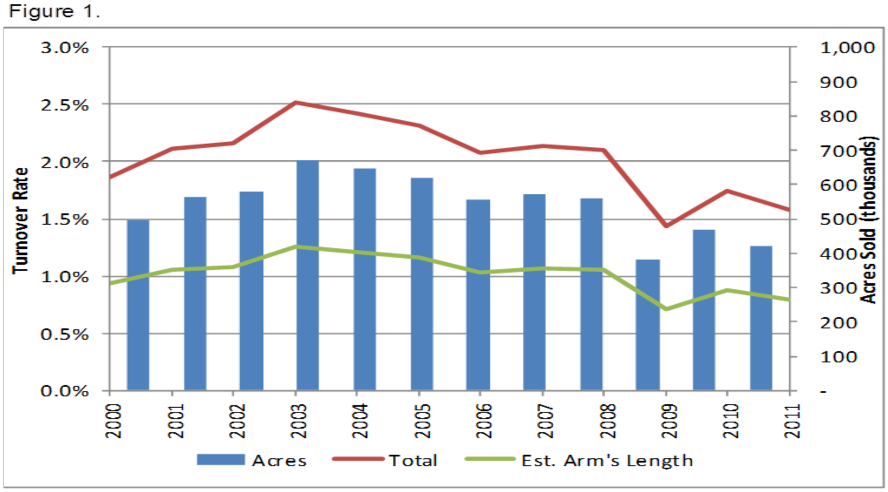
Typically, the explanations of the excess positive returns involve key market features or institutional frictions that prevent low-cost investment, or specialized required management skills, or holding period limitations, and so forth that create difficulties in directly accessing and routinely realizing the returns derived from aggregated farmland returns series. Common caveats include that property specific returns are simply too difficult to capture in a diversified manner, or the lumpiness of the investment makes rebalancing costly or impractical. Additionally, transactions costs are higher with real assets, and holding periods tend to be longer, but tax management of capital gains in particular is simpler with real assets. Additionally cited "new" explanations offered to explain continued "excess" returns to farmland have included the RFS (ethanol and bio fuels) influence, world food demand increases, emergence of new middle classes in previously less developed parts of the world, and other transitory factors that can be found as plausible potential explanations.

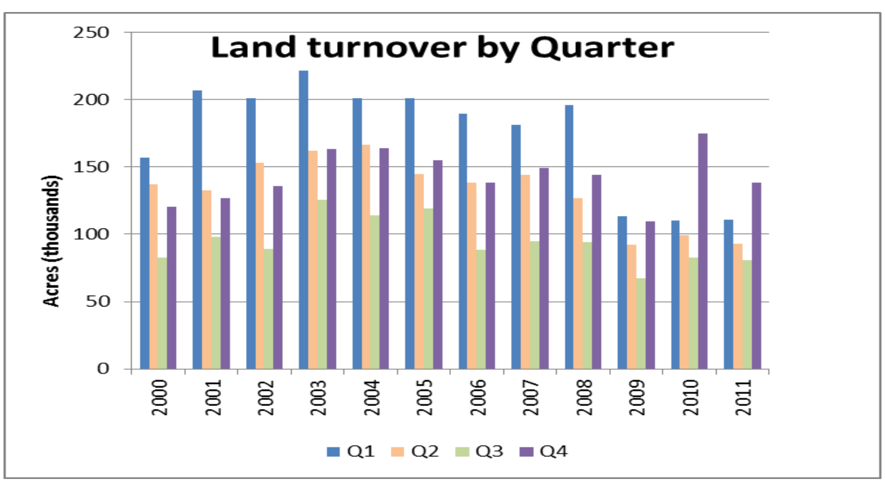
To better understand some of the key features of the farmland market with relevance to investment returns, we identify a set of items that may help to distinguish farmland markets from other more traditional investments, and point to related TIAA-*Center* and farmdoc sources that help communicate more details about these issues. Additionally, we also lay out items for additional future research that support the understanding of the performance of the market and contribute to the long-term efficiency of these markets within the list of key factors below.

More detail on turnover is provided in a farmdoc daily post and in a Center synopsis report available here, and in a farmdoc daily post here.

Turnover: Most farmland markets can be accurately characterized as "thin" due to the low rate of turnover, and somewhat seasonal nature of observed sales. It is surprisingly difficult to precisely measure the rate of farmland turnover, but most evidence points to annual rates of transfer in the 1-2% range for arm's-length production sector acreage, at highest. While property transfer records are public in most states, they are often difficult to access and thereafter the definition of a *farm* and a *sale* are both somewhat difficult to singularly identify from transfer records alone in many cases. In Illinois, the data are particularly good, and due to a longstanding relationship with the Illinois Department of Revenue, TIAA -**Center** personnel have access to all transfer records from 1979 through present (unfortunately with a year plus recording and reporting lag). Despite having one of the best possible data sets, the direct identification of turnover rates remains complex. Farms are classified by both type and use, and for taxation purposes, may qualify as a farm but be essentially a development property, or not farmable for other reasons. Likewise, parcel size may limit the usefulness in a commercial scale farm operation of certain small "farm" parcels. And, sales between related parties account for a surprisingly large fraction of transfers. In the end, the definition of a farm is that which interests the farm buyer. Using sensible screens and applying these through time consistently at least provides a useful benchmarking exercise for turnover. A study further documented in the TIAA -**Center** Research Briefs includes additional detail, but the summary points are worth reporting here as well. The graphic below shows that in Illinois, likely a good proxy for most Midwest row-crop agricultural regions, the annual turnover rates for all transfers (unscreened) range from roughly 1.5% to 2.5% of agriculturally classified acreage per year, with a slight decline toward recent periods. After screening for transfers to related parties, agricultural classification consistency, and parcel size screens, the amount of land transferred under "arm's length" conditions is more likely around 1% per year through time. This fact substantially impacts the ability to acquire or re-balance holdings on a large scale in any given region over a short period of time. The other side of the issue is that there may be substantial buyer and seller premiums realized in certain conditions to take advantage of the same issue. The lower panel of the graphic helps further appreciate the seasonal nature of the farmland market, with recent periods emphasized by end-of-year tax uncertainty in 2010 and 2011 while capital gains laws were being

Figure 1.





actively debated, and general emphasis of transfers in first (or fourth) quarter between crop harvest and planting. The implied length of the average holding period for an investor/owner of farmland is interesting on its own, but it would also be important to better understand the reasons why this occurs, as it seems atypical compared to other investment holdings. Estate tax laws and capital gains treatments likely favor holdings of farmland through death, and owners may simply have other preferences for long term ownership of their land, with the result that the market feature that land is held by single positions for long periods of time. This low turnover, long term holding period has implications for the measurement of riskiness through time and comparison to other assets as well.

Leverage: Another key feature is that the financial leverage applied to the sector is simply completely unlike virtually any other common production sector. The direct debt in the sector is very low as documented earlier, but more importantly, is not the only feature that impacts the effective leverage of farmland holdings. Intertwined with this issue is that roughly half of all farmland is owned by absentee owners who rent their land to operators who in turn typically carry operating debt effectively helping to leverage longer term positions. In addition to the fact that absentee ownership is the norm and growing, the terms are shifting more toward cash leases and flexible cash leasing arrangements that move more of the income risk to the operator and tend to stabilize the current income stream to owners.

Interestingly, measures of capital debt capacity, and unused borrowing potential have reacted to the decline in leverage, but lenders have actually become more conservative in terms of the fraction of the asset value financed. Several Farm Credit System lenders have recently instituted maximum dollars per acre caps in addition to maximum loan-to-value ratios.

Acquisition/disposition costs: Low turnover has obvious implications for the search costs involved in simply identifying suitable properties to purchase, and also impacts the ability to liquidate without concern about idiosyncratic market conditions surrounding the sale. It is typical to incur brokerage or auction commission costs of 5%-6% of the sales price (seller expense); and purchasers under privately negotiated sales can incur substantial additional costs related to the location and contracting of specific property purchases. Compared to traditional financial assets, the costs to acquire and manage are substantially higher on a single transaction basis. However, additional research is called for on the effective transactions costs given the much longer typical holding periods that typify farmland investments. On a yield drag basis, it is not obvious how much different the in/out costs are when viewed on a holding period basis compared to those of financial assets with low transactions costs, but more frequent trade activity.

Asset Specificity/property heterogeneity: Unlike tradable shares of financial assets, individual farmland parcels are virtually all unique and have characteristics that require some degree of specialized knowledge to assess and manage. This fact complicates the balancing of positions as properties can be very "lumpy" and exist within local markets that often have additional impacts on values. Asset specificity refers to the feature that the same asset has different value in specialized applications – such as a custom machine in a manufacturing plant. In farmland markets, it is not unusual for a neighboring operation to "value" a farm at a premium because of convenience of proximity for operation, or because of specialized knowledge about a parcel's features. Likewise, different potential development pressures, for example, can occur across properties separated by very short distances based on access to roads, and other favorable features. Across regions, crop patterns, market price bases (often reflecting terminal market transportation cost differences), weather patterns and access to water, and many other differentiating features result in heterogeneity of properties and the resulting complexities in assessing individual asset values. This feature also has implications for the ability to pool and securitize or crate otherwise easily traded positions in farmland as the scale of the fund needed to accomplish this would necessarily be larger to mute the individual property impacts.[3]

Alternately, this feature also leaves room for the possibility of maintaining persistent "alphas" due to the specific nature of individual properties and inability to be directly substituted for via complete replicating positions in other assets.

Property Taxation: Interestingly, all 50 states employ some form of preferential use-value taxation of farmland used in production (Anderson, 2011). Most states tie a parcel's property tax

[3] Traditional diversification studies often point to 30 or so positions in a pool to effectively diversify idiosyncratic risk. A similar study of the number of farm positions is needed, but the likely result is that a larger set of positions may be useful given the within-class correlations that are found. This fact improves the potential value of a farmland fund that allows "hedging" positions against individual shares of a diversified pool of properties.

load to a form of current income potential rather than to actual incomes or to market values. While many different applications of this concept occur in practice across states, the general idea is that the tax burden is proportional to the ability to pay out of recurring potential income available under typical management, and thus not be as likely to require liquidation of the asset and potential conversion in use to meet a market value tax load. Likewise, failure to generate income does not insulate the owner from property taxes as it would from income taxes. Though not an uncontroversial idea when highly valued development properties are taxed at low relative values, or in the few notable cases where an operator is "paid to farm" (negative rent) to assure continued taxation at production values, it is a feature of the market that is a net positive to the financial performance of farmland compared to some other real assets. Economic theories suggest that the bulk of differences across tax burdens would be passed on, and materialize in the form of differential rental rates, though additional research on the impact of property taxes on rental values is still needed.

Government Programs: The primary means by which the federal government participates in farmland markets is indirectly through programs collectively referred to as the "Farm Bill". The seminal legislation originating government support of agricultural prices and production was begun in the 1930s and focused almost exclusively on supply side issues. Through at least the early 1990s programs that included set aside acreage, indirect support prices, and mechanisms to manage grain and commodity stocks through government holdings were the norm. A salient feature of most farm bills through 1996 was the effort to tie (couple) payments to production in an effort to reduce supply, and increase market prices. Further, it was common through the 1990s to have *ad hoc* disaster bills to make payments to farmers in cases with widespread and severe losses from weather, flooding, or other non-market event.

Academic work through that period typically attributed roughly 25% of farm income to government program payments. Interestingly, tests of the degree of permanence imply that farmers viewed a substantial portion of government payments to be temporary, or simply offsetting market revenue when unexpected declines occur (Gardner, Moss). Beginning in 1996 with what was termed the "Freedom to Farm Act", farm bill legislation increasingly emphasized risk management and decoupled payments and avoidance of most forms of supply influence. An important point in the change in emphasis of farm programs is that rather than direct income augmentation, the general goals now focus on avoiding large losses.

Treated as a separate "key feature" is the remarkable growth in crop insurance usage, but it is important to recognize the participation of the government in crop insurance programs that stabilize and indirectly subsidize farm income. The tone of the debate surrounding the 2013 farm bill legislation (not yet passed) has changed somewhat and is pivoting a bit around the continued inclusion of Supplemental Nutrition Assistance Program (SNAP, or food stamp program) which has always represented the bulk of the farm bill, but for some reason is more debated this cycle. The major programs that currently exist in both the House and Senate proposals further emphasize crop insurance, along with the equivalent of price flooring programs (revenue loss and price loss programs, along with Supplemental Coverage or SCO shallow loss coverage proposals exist in both bills) intended to help mitigate the possibility of longer term lower price environments that are feared under a sequence of high production years.

<u>Crop Insurance:</u> Crop insurance programs have grown dramatically through time and now exceed the commodity title in the farm bill in terms of budget score. Although the program covers around 190 crops, corn, soybeans and wheat represent the vast majority of the program in terms of acres covered, and premium and liability shares. Figure 2 below shows the growth in acreage through time to the present where approximately 80% of the acreage of row crops is covered under a federally sponsored crop insurance product.

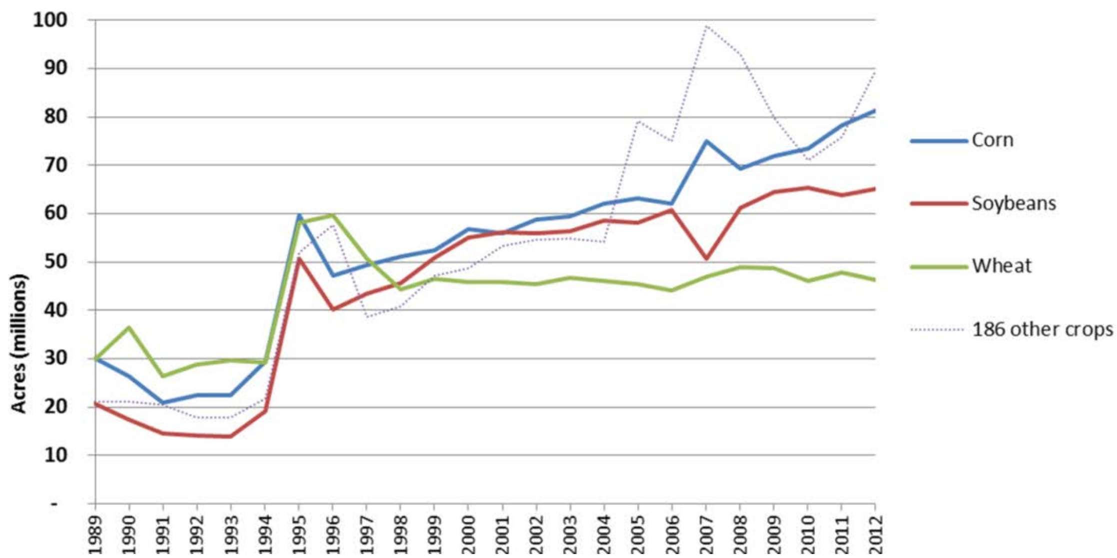


Figure 2. Acres covered by crop insurance through time

Figure 3 below emphasizes another feature in that the premium dollars are proportional to the value of the crop, and thus follow the commodity prices through time. Currently (2013), the annual premium volume in the program is $11-12 billion with aggregate liability in the range of $120 billion across all programs.

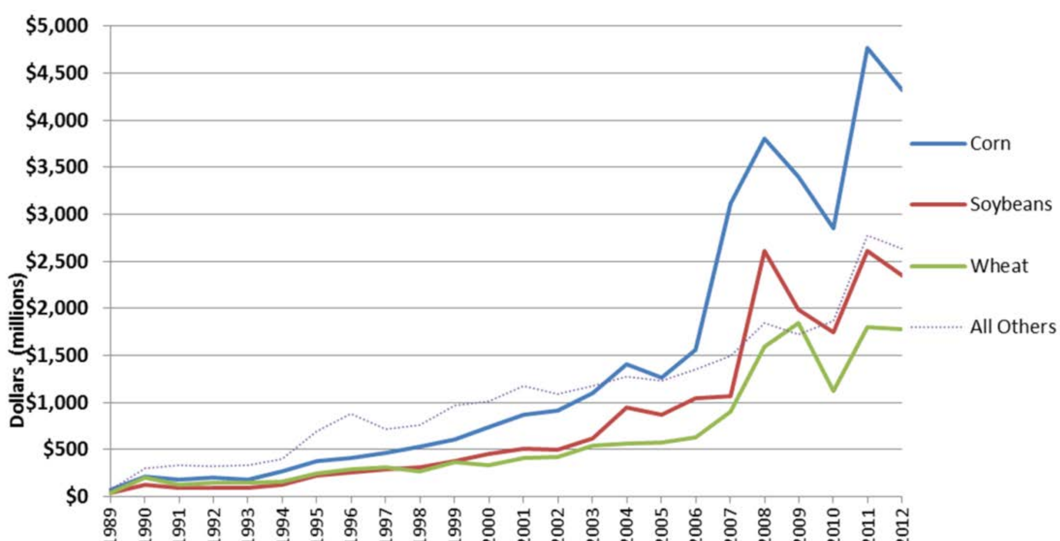


Figure 3. Crop insurance remium dollars by crop/time

The role in stabilizing farm income is made clear by the information in figure 4 below which shows total payments to the major program crops separately and all other crops combined through time. The drought of 2012 resulted in unprecedented large crop insurance payments totaling just over $17 billion, with nearly $12 billion paid to corn policies alone. Importantly, there was never a serious call for *ad hoc* disaster payments despite the severity of the drought, and thus, many market participants noted that insurance worked as intended.

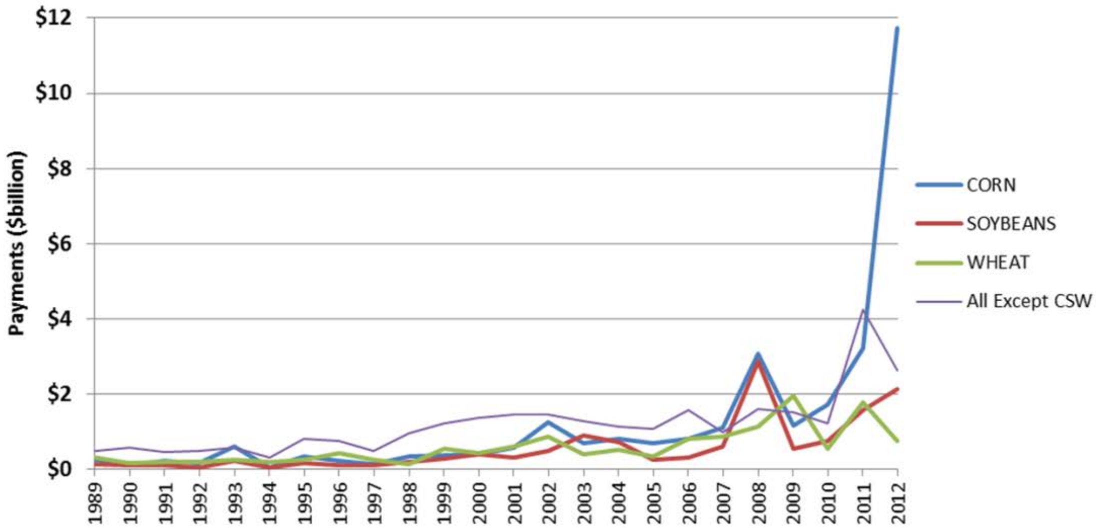


Figure 4. Crop insurance indemnity payments by crop/time

Through time, the program as a whole has run at roughly a 1.0 loss ratio meaning that payments into and out of the program are roughly in balance. However, the federal government pays for the administrative and delivery costs of the entire program as part of an effort to insure widespread and equal access to subsidy in the program, and more importantly, subsidizes the producer's share of the premiums to encourage high participation. The current subsidy schedule is shown in the table below. For example, a farmer buying 80% coverage on an optional unit insurance policy would receive 48% subsidy from the government and only pay 52% of the actual policy premium. As the coverage level increases, the subsidy rate decreases, with the dual intentions that a similar subsidy is conveyed per acre insured, and to create a deductible

Table 2. FCIC Subsidy Rate Schedule

	- -Subsidy rate - -	
Coverage	Optional	Enterprise
50%	0.67	0.80
55%	0.64	0.80
60%	0.64	0.80
65%	0.59	0.80
70%	0.59	0.80
75%	0.55	0.77
80%	0.48	0.68
85%	0.38	0.53

structure that shifts larger losses to the government the more severe the impact on farm revenue.

Crop insurance exists in several forms, and most farm operators have more than 30 policy options per county/crop/share to choose among. The major distinctions are whether the policy is a group policy (settled on county outcomes) or a farm product (settled against individual outcomes). Within each there are options to insure either minimum revenue or yield, and within revenue whether to allow the guarantee to increase with market price changes. Finally, the election option or "coverage level" ranges from 50% to 85% or most policies with some group policies allowing 90% coverage. The customization of coverage to match the farm characteristic is a complex problem that substantially alters the operator's income and thus ability to pay rent. Owners who use share rent relationships can also insure their fraction of the crop separately, but it is increasingly common to simply cash rent the land and let the operator make all crop insurance decisions. The existence of these programs has also substantially altered the relative riskiness of cash rent versus share rent positions -- and would be expected to continue to support the movement away from share rent toward cash rent forms of control. For more details and access to premium estimation information and crop insurance selection and evaluation tools, see the crop insurance section of *farmdoc* at:
http://www.farmdoc.illinois.edu/cropins/index.asp

Visit the Crop Insurance section of farmdoc for premium calculators, insurance evaluation tools, and background data and research on the Federal Crop Insurance programs ***here***

and at farmdoc daily by theme at:
http://farmdocdaily.illinois.edu/areas/crop_insurance/

Annual Returns: Although there are a few exceptions (greenhouses, some livestock, dairy, and aquaculture, etc), the vast majority of agricultural production has an annual income cycle. Even in cases with multiple income cycles per year, there tends to be annual seasonality even in livestock and even wild-caught operations. Taking advantage of the hemispheric rotations, there are ways to have alternating times during a calendar year when the annual cycle ends, but the stark fact is that agricultural land is used in the production of something with a relatively long production cycle compared to most other industries. In the case of permanent plantings, the income cycle is further complicated by the fact that the first crop revenue may not occur until several years after the original investment in the crop; and thereafter is difficult to adjust by variety and type. This fact confounds comparisons to traditional investments and simplifies other issues, but results in complicated econometric treatments for measures of correlation, and association among returns series with other assets. This is not to say that other assets do not experience seasonality, or have income cycles that do not conform directly to the accounting cycle typically reported, only that it is difficult to adjust production frequently and that the relatively long income cycle needs to be understood and appreciated in making comparisons to other assets.

The intent of the material above is to provide the broad introduction and context to better understand the critical features of contemporary farmland markets, and to provide an organic and evolving compendium of information to better document and describe forces affecting these markets through time. This framework will continue to evolve with linkages to supporting data and ongoing research projects, with the intent to continue to timely and relevant information to those involved in sector.

The remainder of the paper emphasizes original ***Center*** research products, and identifies strengths and weaknesses in approaches for evaluating and interpreting farmland values and investment performance, for owners, operators, and entities interested in understanding the impact of portfolio considerations as well. Thereafter, a section identifying critical issues with potential to meaningfully impact future farmland markets is provided, along with interpretations of relevant research needed to better anticipate and plan for the future.

II. Valuation and Performance of Farmland as an Investment

There has been considerable historic academic research on the asset class, with emphases on both a single farm business unit, and as a stand-alone investment. More recently, there has been additional effort by research analysts and financial investment advisory services assessing the sector as an asset class for potential direct investment. The following summarizes what we view as the current state of knowledge, and the most notable findings in two closely related sections. In the first, we identify consistent results across multiple research efforts that confirm features of the asset class as an investment, and in the second subsection, we simply tabulate some related empirical issues that require acknowledgement or accommodation in performing such assessments. The paper then turns to original ***Center*** research evaluating the performance of farmland investments using a longstanding database that will continue to be maintained through time under consistent treatment of return periodicity, and across a wide set of alternative investments. Some novel presentations of the returns measures are provided and key factors influencing the future of the sector are identified and discussed. A summary then concludes this whitepaper compendium of issues affecting farmland investments.

Synopsis of Research approaches and common Findings:

By far, the most commonly pursued strategy to assess farmland investment performance is to use traditional financial theories related to the Capital Asset Pricing Model or CAPM and its extensions to measure *ex post* performance against the benchmarks implied by the market equilibrium conditions of the CAPM theory. Whether an appropriate market index can be defined against which farmland returns can be measured is debated (and debatable) in some cases, but in our judgment presents a similar concern for assessing any specific asset whose role in the constructed broad market index is indirect, or in which total holdings of the market are incomplete, as is always the case in fact. The applicability of broad equity-based indexes for market proxies remains most common in any case, and thus it is instructive to examine relative performance measures under these tenets.

The Center maintains an annotated bibliography of research related to farmland investments. It can be found at (TK link to bibliography goes here)

Under application of traditional theories, it is invariably found that farmland provides higher returns than required to compensate for systematic market risk, measured against traditional proxies, with and without estimation penalties for the potential understatement of specific asset risk in farmland. In common vernacular, Jensen's alpha is most commonly found to be positive and usually significant across a wide set of data representing farmland investments, even against arbitrarily imposed "penalties" on farmland's measured risk (commonly done by scaling up the measured variance and/or reducing absolute values of estimated correlations). Perhaps more notable, use of traditional mean-variance or E-V analyses consistently shows that risk efficiency is improved through the addition of farmland to traditional portfolios, but often with the complication that the "optimal" shares of farmland are unrealistically high if not restricted in sensible ways for maximum shares or minimum numbers of assets to hold. Treynor and Sharpe measures (market- and own-risk denominated) of excess return are also typically found to be positive (and/or positive excess) for farmland investments; and are then typically explained as the result of market frictions that prevent access to these returns.

One interesting area that does deserve additional research is that the conditions defining the market return and its excess over the current proxy for the risk free rate do change through time, and can alter relative performance measures independent of the returns characteristics of the assets themselves. In other words, changes in the slope and intercept of the security market line do in fact happen through time and materially impact measures of relative performance. This seems to be an overlooked area in evaluating competing investments where the beta and (E(rm)-rf) measures have time dependence on macro conditions that also influence returns of individual securities.[4]

A second commonly identified question relates to the role of farmland investments as an inflation hedge. This line of inquiry has waned a bit given the relatively lower and more stable inflation that has been experienced for several years (as nothing is correlated with a series that is unchanged, and epochal versions of rate environments characterize inflation regimes as well).

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[4] An interesting demonstration of this effect across market conditions roughly corresponding to recession, normal, and rapid growth, with low, medium, and high interest rates is available in a spreadsheet teaching tool for relating alternate measures of return. {link here}

On the other side of the coin, there is elevated interest and concern about the current rate environment and how long-duration investments will respond if there are unexpectedly high interest rate increases, perhaps as a result of unexpected unwinding by the Federal Reserve of previously unprecedented balance sheet positions in direct financial holdings of asset backed securities, and revisions to supporting liquidity facilities that have grown rapidly at the Federal Reserve. Interestingly, there has actually been less direct work in the area examining capitalization rate responses in farmland investments than for traditional investments, perhaps reflecting the long holding periods that dominate actual investments in the class, and lower direct concern given the difficulty in liquidation that would cause a realization of the value changes under inflation. Nonetheless, the nearly universal conclusion is that farmland has *been* a very effective inflation hedge -- but causal models remain difficult to validate, and thus to use in predictive situations.

There have also been various attempts to develop structural models of farmland prices, both using present value conventions, and through hedonic models of contributory components. Both approaches remain vexed by temporal components that in effect must be forecasted as accurately as the price itself in order to predict prices accurately. These approaches do work relatively well for cross-sectional analysis or explanations of the features affecting farmland values at a point in time, and also help to conduct comparable style analyses. One important outcome of this branch of the literature is that non-farm income amenities often have substantial contributory value, and that the hedonic contributions or "layers" of value can be used to identify impacts of features such as distance to population and natural amenity sites, influence of location of an ethanol plant, soil productivity, parcel size, and so forth. Hanson conducts a recent large scale evaluation for Illinois sales including spatial and temporal controls for changing influence of factors influencing farmland by location and time. Hanson confirms that soil productivity remains the determinant of relative value, but also shows the changing impact

The first MS thesis completed in the TIAA Center at the University of Illinois is titled "Determinants of Illinois Farmland Prices" by Erik Hanson. A copy of that work can be downloaded here. It uses a hedonic model to assess Illinois farmland sales from 2001 to 2011 to isolate various contributory components.

through time of the distance to population centers, changing demand for recreational components, and changes in the composition and level of farm income through time.

There have also been efforts to identify replicating portfolios – in essence a combination of other assets that in combination mimics farmland returns. These efforts have a solid base in the Arbitrage Pricing Theory (APT) literature and have applications to both identify components of return, and to allow a position to gain exposure to an asset's return without actually having to own that particular asset. Additionally, there are analogs in developing "agribusiness" index portfolios that combine assets with specific exposure to agriculture (i.e., Deere, Monsanto) in an effort to indirectly capture returns from the agricultural sector. On balance, however, there have not been any good replication strategies identified that exhibit meaningfully high correlation to returns from direct ownership of the asset, and thus remain somewhat an activity of investigation/refinement, or perhaps simply academic curiosity.

There have also been substantial efforts to document the underlying micro structure of local farmland markets for example, to understand the role of neighbor influence on auction values, or the relationship in value between parcels sold and those not listed for sale, or the impact of disclosure laws and so on. Our take is that virtually all markets have idiosyncrasies and that farmland is neither uniquely uninfluenced nor overly affected; nor immune from concerns about local market influence either. It simply punctuates the point that specific understanding of the asset class is essential when evaluating individual positions. This type of study is often conducted in case study form, and can be difficult to generalize as well.

Empirical features and farmland returns data characteristics:

Across a wide set of data conditions and over most periods, farmland returns display a weak or negative correlation to equity index returns. The natural extension is that farmland is likely to improve the risk efficiency when held in a portfolio of other investments, independently of its potential role in increasing available returns directly. Use of alternative holding period intervals changes this finding slightly, but at minimum, the factors broadly affecting equity markets are simply not translated similarly through farmland markets. The figure below is taken from a utility that compares farmland correlations to alternative investments across a wide set of conditions on the aggregation of time.[5] As discussed earlier, farmland investments also tend to be positively correlated with inflation, although the strength of the relationship depends on inflation regimes. The correlation also tends to display "tail-" or state-dependence in which the strength of the association also depends on the severity of movement. This result holds at crop region levels, and at higher levels of aggregation, but declines in strength with shorter time intervals, and with movement toward very recent intervals during which time inflation was relatively historically low and returns to farmland were high. This result seems to have recently garnered the most attention by outside investment groups rather than other diversification benefits or the relative stability of income through across different output price environments.

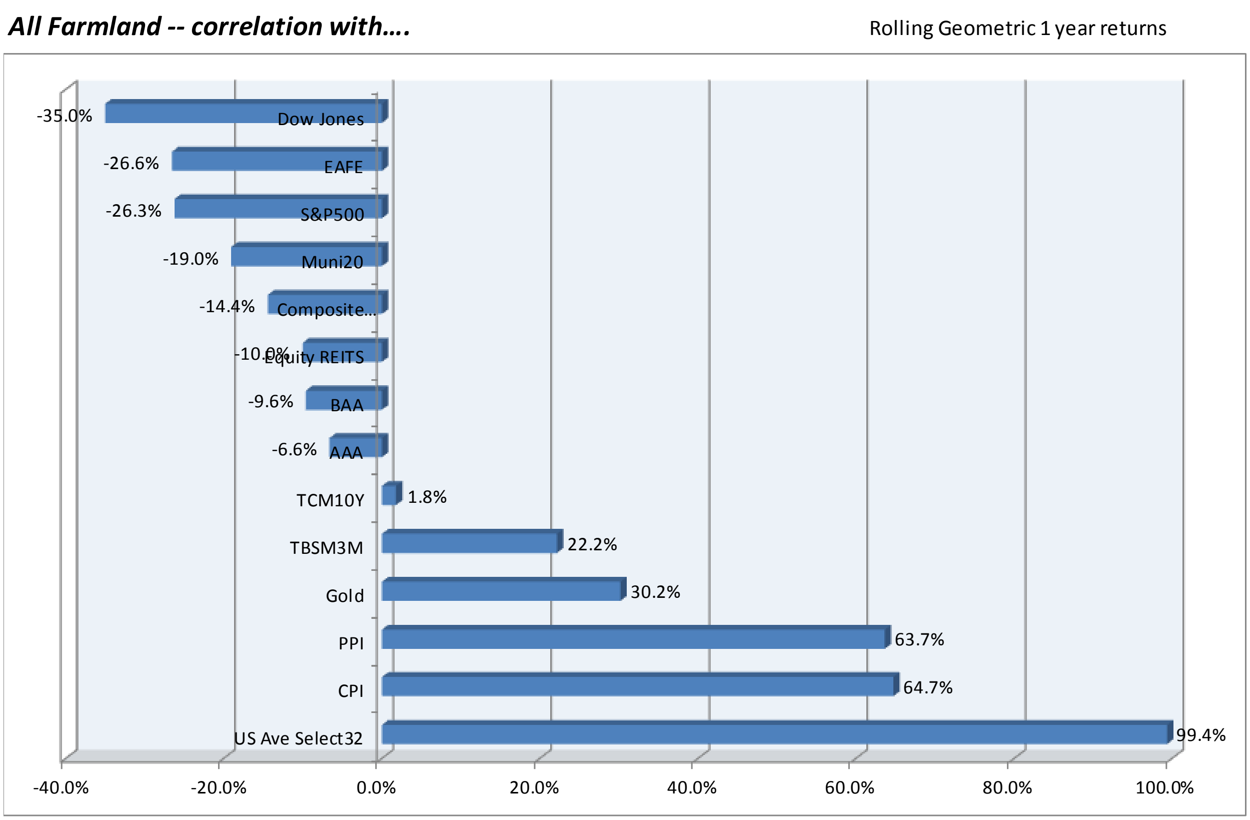

Figure 5. Correlation of farmland returns with other investments

[5] A spreadsheet utility available here allows the user to examine the impact of alternative returns intervals or holding period "rolls" on the estimate of correlation of returns with all farmland, and with an index of the farmland from the top 32 states based on acreage/production.

The results shown for one year holding periods from 1970 to 2012 confirm the positive correlation with inflation on both the CPI and PPI units of measure, and also the negative correlation with returns to equities. The relationship to treasuries and fixed income positions depends more critically on the time interval and can switch signs but remain relatively close to zero across many holding periods. Virtually all forms of "farmland" from individual state levels, regional levels, all states unweighted, and selected by agricultural intensity share the same features adding confidence to the reliability of alternative measures of return. The correlation between the US All farmland index and the item labeled US Ave Select 32 is partly included to maintain a relevant scale on the graph for interpretation of the inflation series, not because it is a meaningfully different asset in comparison to the US average.

Income smoothing or "stickiness" is another feature that notably occurs, both because of the symbiotic relationship between land owners and operators and the need to maintain viable relationships through time when contracting is costly, and because the primary source of crop revenue is derived from prices and yields that display strong negative correlation. Unlike many production activities where prices are strongly correlated with total revenue, in many crop production activities, the revenue is far smoother than indicated by crop price movements alone. Another important insight is that the term "annual" cash rent arrangements refers more to the frequency with which they are paid than to the effective term of the relationship. Additional research on the effective term of rental relationships is warranted, but at least within Illinois, the relationships tend to be at minimum negotiated for three year intervals, often with options to renew that trigger according to Illinois lease law features. (Uchtmann)

Another commonly posed question involves the implied capitalization rate in farmland markets, and an understanding of the forces that determine what share of the expected income is captured by the rental arrangement. Structural "cap rate" models suffer from the fact that the capitalization rate is mainly a measure imputed from observations about the income and price relationships through time rather than an observable feature that can be taken or estimated from one market and applied to a different series of income. In the case of farmland, a simple test is to compare rental values to farmland values through time to construct the implied capitalization rate (net growth version) through time. Figure 6 below shows something rather remarkable that has been documented in numerous places by several independent researchers. Contrary to the position that growth in prices has outstripped earning capacity, the direct evidence points to a much more rational relationship between income and farmland values. The version shown below is for Illinois farmland using USDA sources, but the graph is virtually identical for most all states with intensive agricultural production.

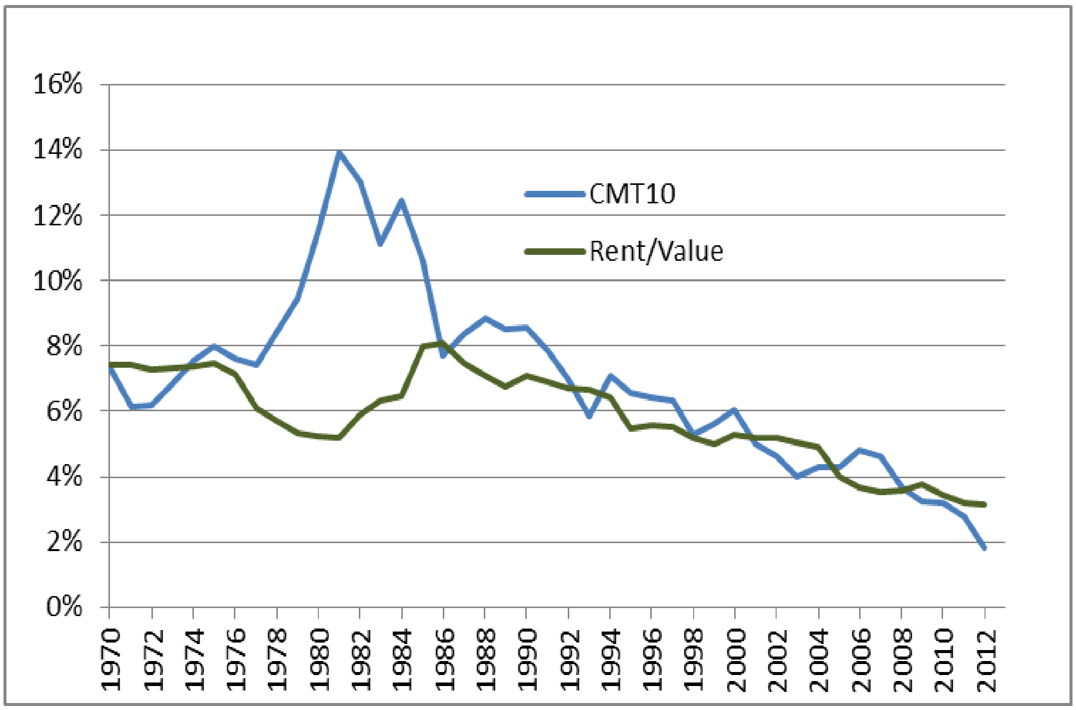

Figure 6. Implied Capitalization rate and 10-year CMT through time, Illinois farmland

The constant maturity 10-year Treasury yield is included in the graph for context to show the rationality of pricing under recent higher income environments. If anything, the graph suggests that rents have perhaps not grown quite as quickly as proportional to the capitalized income in the recent few years. The close agreement between the implied capitalization rate and the CMT-10 holds fairly well, except for period in early 1980s during farmland's only notable historic decline. That single historic period of rapidly declining values is generally viewed to be related to lender-fueled pricing features, and world market shocks that corresponded to the Soviet grain embargo of 1980. One notable feature of that period in the 1980s was that Farm

Credit System lenders used what was termed "average cost funding" to set loan rates, and during the escalating rate environment prior to the 1980-1984 readjustment, this fact led to loan rates substantially below market rates offered by other lenders. This "cheap" or even negative carry-cost market helped fuel land values, as loan to value ratios were allowed to creep into the 80% range in many cases, and a land bidding war broke out in key areas. After the peaking of interest rates, average cost pricing was then more costly than marginal cost pricing used by other lenders, and the better credits tended to leave in waves for newer forms of lower cost funding, while weaker credits suffered from declining asset prices, and inability to access refinancing options. Importantly, funding access for farm credit system lenders was actually restored reasonably quickly and no "spillover" to other financial markets of note was experienced. The point is that the farm crisis of the 1980s was not a macro-level event, and that concerns about the current rate environment and possible upward rate shocks should be remembered to be of concern more broadly. Put more bluntly, if interest rate shocks impact agricultural markets, then most other real asset markets are likely to experience similar impacts and the relative impact on agricultural assets might be expected to be reasonable similar, and thus not represent any unique risk.

{ Sidebar link to Website Mission Statement} There has been a substantial increase in interest in understanding farmland markets, and in supporting data and information for owners, operators, investors, policymakers, environmental groups, and others. A notable investment in capacity to conduct independent and intensely focused efforts is represented in the TIAA-CREF Center for Farmland Research at the University of Illinois, and a purpose of this document is to organize related research questions and promote a comprehensive research agenda targeting these issues. This paper represents one type of output of the Center – a compendium of issues and linkages to supporting information, and original analyses of specific items supporting direct questions and issues.

TIAA-*Center* Related Data, Research Findings, and Tools[6]

To address many of the issues identified above, a fundamental informational item required is to have accurate measures of farmland returns, and a mechanism to convert those to analogs that allow exposure

[6] The materials in this document update and extend various other research projects, and provide a common location for dissemination of the results. Additionally, research briefs summarize individual research project efforts at the Center website. The document will continue to be updated and extended through time as additional data accumulate and as other research projects supported in the Center are completed.

to the return if such investment vehicles existed, or at minimum to assess the performance in a direct investment framework. In other words, to do any meaningful research, we first need consistent and accurate returns data that present the situation that an owner or investor would face, and in context of other financial assets, with similar treatments of time intervals in the returns periods.

The bulk of the ag-asset only studies take an annual income cycle as a given. It is simply a fact that the production cycle for most agricultural investments is annual, and this treatment of time is typical untested in many agricultural academic studies as that is the unit of time available for study. Financial asset studies, however, usually employ shorter returns intervals, and often report on quarterly or monthly bases, partly to allow more numerous observations in a given time interval, and partly because quarterly return evaluations are the norm in publicly traded companies with quarterly disclosure requirements. The difference in time perspectives is important to recognize, though either can be correctly done with reference to its unit of time. The difficulty tends to arise when ag investments are compared to traditional financial investments, and in particular, when the agricultural returns are forced into a more-frequent-than-annual returns measure. This is an especially confounding issue when the comparison covers a portfolio that may include nearly continuous yielding assets (e.g., bonds) and nearly continuously cleared positions (equities) along with real assets that have longer term income cycles. For most investments, the temporal interval choice in which to characterize returns involves an aggregation across the underlying income producing activities across multiple cash conversion cycles, into common accounting cycle conventions. There are implications for measurement of aggregate returns (most equities), and allocation of partially accumulated returns (most ag), but probably more important are the implications for characterizing risk or variability in the returns when comparing across situations where some assets are reported in aggregate across income intervals and at least one asset whose returns are allocated into the same interval represented by only a partial income cycle.[7] Simple tests do exist to identify the

[7] There is an extensive literature that examines appraisal smoothing bias, and methods to control for measurement error in constructing returns indexes from aggregated value series and survey series. Among the first, Firstenberg, Ross and Zisler provided a mechanism to restate the returns variances to accommodate the possibility induced by allocation of annual returns into other intervals (quarterly). Gilbert and others extended the research to include re-

rate at which measured variation reduces to accurate measures of the underlying returns variance, but these are seldom employed, instead using *ad hoc* conventions to convert income cycles from multiple investments to the time frame considered most common by the researcher for the task. Unfortunately, this often untested assumption can have important implications for measures of risk in isolation, correlation, and periodicity of accumulations of gain/loss (measures of own return relatives). Traditional studies using the conventional lens of quarterly reporting when agricultural investments are included, require a reconciliation of the temporal characteristics if the measures of relative performance are compared[8].

For the materials presented herein, an annual convention seems most suitable as it is the shortest interval with full income cycle across all the candidates. Importantly, all data sets reported herein are maintained in shorter units of time where available, with most maintained on monthly bases. All annual returns are calculated on geometrically linked bases when collected in levels or indexes; rates are maintained in time-compounded form for consistency. Additional research is warranted however, on the impact of alternative treatments of time in the calculation of returns.

The holding period issue is important to appreciate from another perspective – a behavioral finance view would be that the "risk measures" and return results are only relevant to holders of the assets who have longer than one-period target holding horizons. Importantly, returns measured more frequently than the actual income cycle may have variance measures that do not reflect the correct measures of risk from the decision maker's perspective if they have a longer target horizon. Given the features described above, farmland returns are likely best measured

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sampling methods to estimate the confidence limits. In empirical applications, a practical method is to "scale up" the measures of variance and test at what point conclusions change. If the estimated relationships hold across a wide scale of possible values, then the evidence remains strong. Lins et al. show that farmland returns measures are robust to such measurement errors.

[8] Some groups have adopted reasonable and consistent reporting standards for such purposes including NCREIF for example, but it is difficult to accurately identify returns shorter than one year for agriculture for use in tests against alternative investments for performance.

annually for consistent risk and return relationships. Fortunately in the agricultural sector, the groups with greatest interest in farmland investments tend to have holding period preferences that favor longer term measures of performance. Among these are:

- Absentee Farm owners – the behavior of this group reflects strong incentives to hold land for long periods, and many acquired through parents' decisions to leave land to their heirs. Due to both favorable tax treatment and high transactions cost, farmland is generally viewed as a very useful asset to leave in estate. Empirically, the low turnover rate in farmland markets confirms long holding period perspectives.
- Operator-owners -- the typical operator/owner has multi-year business objectives and do very little rebalancing intra-year. FBFM data for example, also show that the average operator has staggered contracts with a median of slightly more than five landowners at a time. This fact leads to the need for longer term planning measures.
- Long-term investors (e.g. life insurance and pension fund positions) – in this category, the long term inflation hedging performance is particularly important given the nature of the long term contract for use of the proceeds in death and retirement benefit payments (this issue was of course more important when defined benefit plans were more the norm), and lack of correlation with other investments to improve the efficiency of the E-V available set.

The farmland returns series used below rely on a set of USDA and University of Illinois farmland price and income series that have been maintained in the Department of Agricultural and Consumer Economics in various forms for over 4 decades. In addition to USDA survey data, the ***Center*** faculty maintain a transactions database of all farmland sales in the state from 1979 to present, and also work closely with the Illinois Farm Business Farm Management (FBFM) record keeping association who have consistent accounting details for approximately 6,000 farms in Illinois. Additionally, ***Center*** faculty have managed the data collection and reporting of the annual Farmland Values and Lease Trends publication for the Illinois Society of Professional Farm Managers and Rural Appraiser (ISPFMRA) and associated surveys for more than 10 years. Importantly, the multiple sources of data allow confirmation both directly and indirectly on the accuracy and efficacy of the data by source and application.

Given the extensive detail on Illinois-only sources and the close agreement in rates within the more general USDA sources, there is a high degree of confidence in the ability to use the same methods for calculating state-based income and total return measures from USDA data. Since 1970, state-level data on farmland, cropland, and pastureland values, along with rental rates has been possible to acquire from USDA. For accuracy in extensions through time, and to allow alternative comparisons to be made in other markets with different time observation intervals, both continuously compounded returns and geometrically compounded returns are calculated. Note that in a series with positive growth through time, the continuously compounded rates may be viewed as slightly conservative compared to arithmetic measures sometimes reported as simple average rates. Further, we favor use of cropland series over total real estate to focus more directly on the farmland features and avoid influences of buildings and non-crop parcels included in the totals. These data are available for 48 states (excluded are Hawaii and Alaska), though we tend to focus on states with meaningful crop density and values of crop production when comparing to alternative investments (for example, New Jersey farmland rates of return are artificially high due to development pressures and returns from non-farm activities in our opinion and should be excluded when comparing actual farm owner returns to alternative investments). These are included in certain cases simply examining historic outcomes.

To begin, simple tabulations are available in a utility (available for 48 states here) that help appreciate the farm-level valuation patterns through time, the composition of return, and the patterns of capital gains versus income components through time. Four versions of the returns series are provided by state for completeness of context, with two summary figures shown in this document. Examples are provided from Illinois a representative version of the utility's outputs. In figure 7 below, a simple graphical version of average prices through time is provided. Importantly, the data from USDA are for all farmland and include PI soils from roughly 82 to 130. Current estimates of soils with PIs of roughly 120 (close to the state median of 117) would top $10,000/acre in Illinois – the class of soils typically emphasized in auction sales and popular press reports for commercial scale sales.

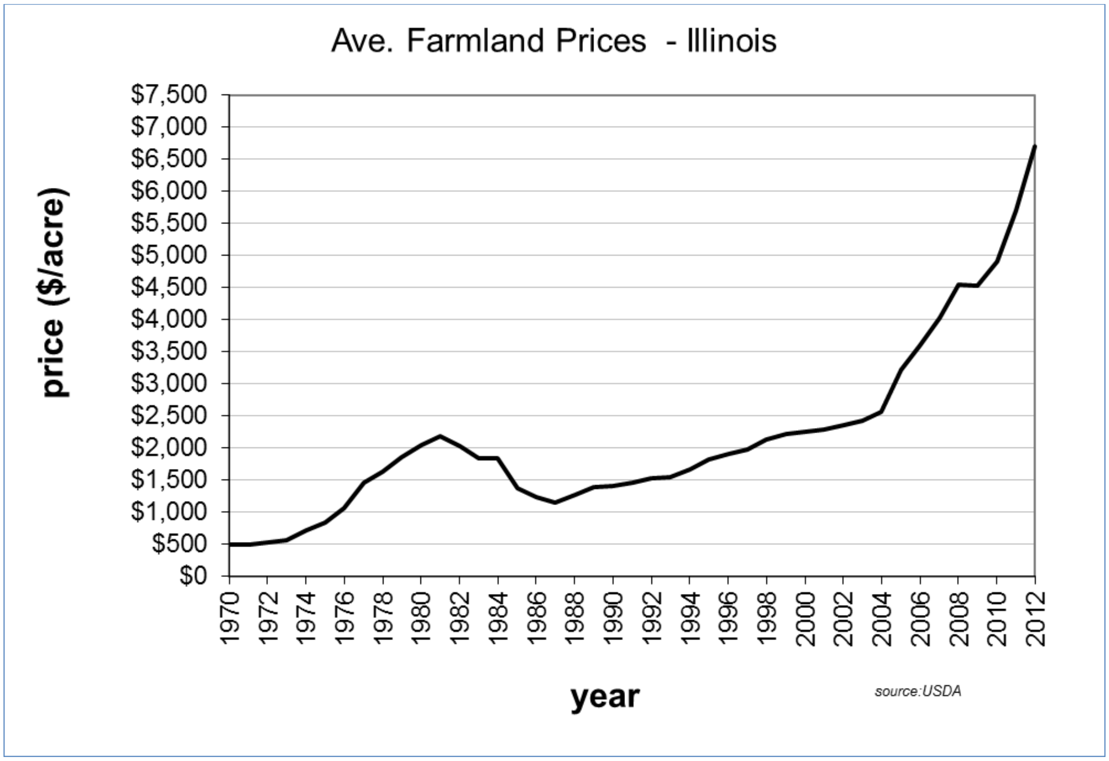


Figure 7. Illinois Farmland Values through time.

The total returns are comprised of both capital gains and income however, and the following graph in figure 8 includes both to emphasize the relationship between the components and to illustrate the relative smoothness of the current income component.

The construction of the income measures first calculate the cash rental income as a rate and subtract the property taxes (as a rate) of the cropland value, with the remainder rate as current income. The current income component has been remarkably stable, though declining slightly through time as a share of value, while the capital gains have been positive except for a period in the 1980s when farmland responded to an export crisis that was accelerated through lending market stresses. The slightly lower current returns near the end of the sample period are primarily due to an increase in asset values prior to a full adjustment in rental rates, though cash levels of income have remained stable to higher through time. The capital gains series (shown) is calculated as the logarithmic relatives of sequential observations, or the continuous rate of change from one period to the next. The capital gains are combined with the current return to construct a total return.

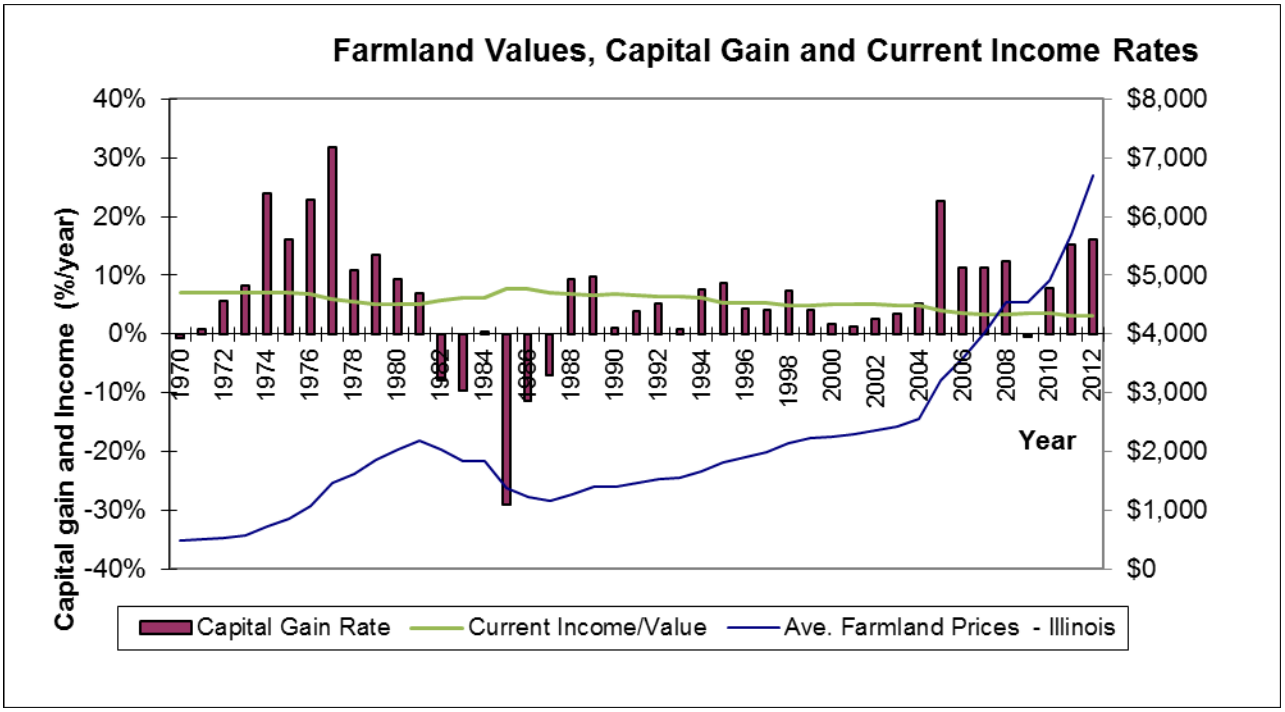


Figure 8. Components of farmland returns

There are concerns about combining income and gain measures in any series, especially if not liquidated and/or verified through sales data, but the methods are at least consistently applied and appear to maintain close congruence to both IDOR and ISPFMRA sources at the actual sales level where available for comparison. The returns are converted to a geometrically compounded annual rate of return that allows a measure of the accumulated returns through time to be consistently compared to alternate investments across different intervals, and in cases where data from assets with returns observed more frequently than annual are compared, and for consistency with measures used for other financial assets.

In addition to agricultural returns, historic returns data are also maintained for a broad set of alternative investments including alternative real estate investments, traditional equity investments, corporate bond and fixed income alternatives, and default-risk free Treasury investments. Data for REITs are provided by the National Association of Real Estate Investment Trusts (NAREIT) on all publicly traded real estate investment trusts (REITs), as well as mortgage REITs to provide alternative real estate benchmarks. Data for equity index comparison include the Dow Jones Industrial Index, the S&P 500 index, and regional indices maintained by MSCI for the US, North America in total, EAFE, and several developing markets. Corporate bond data for Aaa and Baa rated instruments and Treasury related yields were taken from the Federal Reserve H.15 system along commercial paper rates, CDs, and Municipal bonds. Various Treasury series were compiled including yields on 3-month, 1-year, 5-year, 10-year, and longer term constant maturity series to provide a broad set of comparisons across traditional investments. Gold prices and US price denominated returns were collected and added to the set recently due to increased interest and loss of access to the CRB Commodity Price series. Finally, inflation indexes of the Consumer Price Index (CPI) and Producer Price Index (PPI) were taken from the Bureau of Labor Statistics to measure inflation hedging potential and the correlation of returns with items representing constant purchasing power.[9]

Table 3 provides summary statistics for returns by asset class for farmland and the competing asset classes considered for the complete period 1970-2012 and for a period covering the past 23 years (providing both a more recent perspective, and eliminating the only period of decline in farmland values from the mid-1980s). All returns are calculated ignoring any transactions cost, ignoring capital gains and income taxes; and assuming an unlevered, or zero debt position in all investments. The annual average return provides the most commonly reported feature of returns along with standard deviation, the most common measure of relative risk. The correlation column is provided with respect to the US AVE (ALL) farmland series. In this light, US Farmland has performed very well relative to most equity categories and fixed income alternatives, across both sub-periods examined. Equity REITS over both sub periods had slightly larger average returns, but far more risk and risk per unit of return. In the case of farmland, the

[9] Data on the equity indexes were obtained from MSCI and Dow-Jones, REIT returns data from the NAREIT data warehouse, Treasury instrument data from the Federal Reserve h.15 release, and corporate debt rates from Moody's Investor Services. Gold prices were taken from the gold.org data, US series.

low relative risk could partially reflect the "smoothing bias" from use of aggregated and average returns data from ERS. However, it is hard to imagine that the results are due solely to the methods used to construct the data series.[10] Note that the correlation with inflation measures declined in the latter sample period as did both the levels and variability of the inflation measures themselves.

Table 3. Asset Return Characteristics

Asset/Index	Annual Ave. Return	Standard Deviation	US Ave (all) Correlation	Annual Ave. Return	Standard Deviation	US Ave (all) Correlation
	--------- 1970 - 2012---------			--------- 1990 - 2012--------		
US Ave (all)	10.72%	6.54%	1	9.48%	3.78%	1
AAA	8.05%	2.38%	-0.043	6.53%	1.38%	-0.025
Gold	8.96%	22.77%	0.301	6.20%	12.85%	0.041
PPI	3.99%	4.85%	0.629	2.51%	3.85%	0.161
CPI	4.20%	2.85%	0.644	2.61%	1.09%	0.173
TBSM3M	5.28%	3.13%	0.227	3.29%	2.12%	0.313
S&P500	6.33%	17.00%	-0.257	5.99%	18.10%	-0.140
Dow Jones	6.50%	15.74%	-0.348	6.78%	15.34%	-0.136
Equity REITS	11.15%	17.61%	-0.098	10.39%	19.50%	-0.103
CompositeREITS	9.01%	20.92%	-0.143	9.72%	20.00%	-0.127
US Ave Select32	11.09%	6.73%	0.993	9.85%	3.41%	0.976
BAA	9.16%	2.59%	-0.073	7.50%	1.27%	-0.157
TCM10Y	6.98%	2.74%	0.036	5.18%	1.65%	0.115
EAFE	6.49%	21.16%	0.000	1.85%	21.27%	0.000

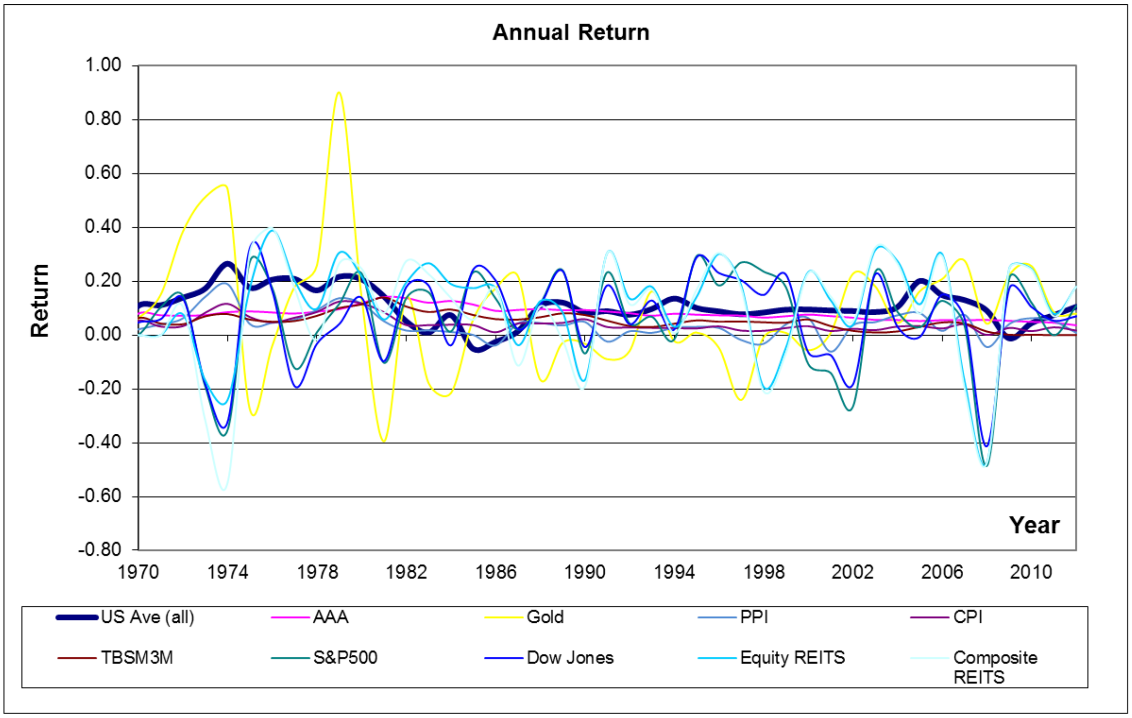
In addition to the previous issues discussed with regard to smoothing, there is also a complicated sample period issue that may generate favorable appearance to particular positions, based simply on the starting or ending point of the data period used. The holding period is particularly important to control when comparing to other assets, and the sample period effects may be difficult to eliminate with relatively short data sets. While it is common to simply provide

[10] The Dow Jones series is strictly an index based calculation and does not reflecting changing composition or treatment of divisor issues. The Muni20 is an aggregated index of 20 year municipal bond rates; the EUROPE index is MSCI's aggregate European equity return index; EAFE is MSCI's East Asian and Far East aggregate. The treasuries (T) and treasury bills (TB) series are identifiable as constant maturity (CM) or secondary market (SM) based followed by term and unit (Month-M and Year-Y). Libor rates from British Bankers Association. Commercial paper rates on 3 month issuances and corporate bond rates are from the Federal Reserve. CPI and PPI data are from the Bureau of Labor Statistics.

statistics for the longest period available, often justifiably so as the approach with most statistical reliability, it is also important to assess how the observation window would change the conclusions. For example, if we were to have asked similar performance questions in the mid 1980s farmland investments would not have fared as well. Also, the starting point of each potential holding period should not be arbitrarily assigned the same common point in history simply due to the limitations of the asset with the shortest available sample period.

In the following, several alternative views of relative performance are provided for broadest context in understanding farmland market performance. The presentation anticipates a concern about the use of farmland data from a period that some view as historically abnormally good, and presents a full and fair analysis of the sample period impacts and on the behavior of statistics related to variability under alternative information sets.

To begin, both annual returns and the total holding period returns for each asset class were re-calculated under alternative holding period definitions as though the investment had been made first in each year from 1970 on, and held until present (ending in 2012, the most recent complete set). Figure 9 provides a graphical summary of the results showing (top panel) the average annual return and (bottom panel) the annualized holding period on a held until present basis for a selected set of investments assumed. Most remarkable is that US farmland performs favorably for virtually the entire final 20 years of the sample period with far less variability than the equity indexes in particular. After the fact, it is easy to find the time period during which it would not have been as attractive to have initiated an investment – in each of the asset classes, not just with farmland in the 1980s.



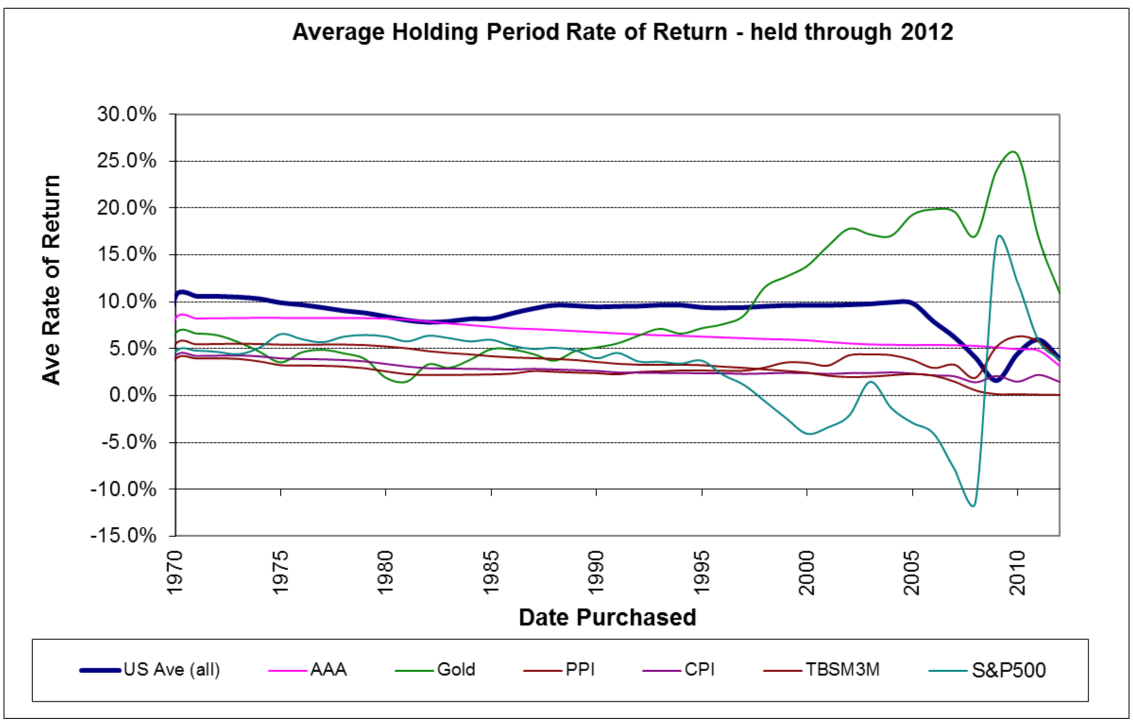


Figure 9. Average returns, and annualized if held until end of 2012.

While instructive on a "held until present" basis, it is also useful to consider different "endpoints" and not simply default to present day conditions in case there are end of period sample effects that matter. As a means to address this issue, rolling investment windows of different lengths – essentially the sampling distribution by length of time – can be identified. The figures presented contain massive amount of information across all possible starting and ending points for alternative investments to hopefully provide a solid context for comparisons in financial performance contexts. The visualization tool is thus for understanding the relative levels of returns through time, variability in returns and how quickly returns "average out", and how the start and end of any particular sample period examined would have influenced measured performance in the data. The figures are created with the intent to show patterns in returns and relative risk in a number of related ways. Figures 10 and 11 shows the results for Illinois farmland and All US farmland respectively to show the impact of diversifying across states, and to provide a base for comparison of individual holdings as well. In the top portion of each of the figures, the triangular area in the upper right corner contains color coded returns based on purchase at the beginning of the year on the vertical axis and held through the end of the year listed across the top. The inset three dimensional graph shows the same information, but in a manner that allows a sense of the number of "excess" good and bad periods to be quickly grasped. The shading is standardized at the **mean** of the overall period (top right cell) with the lowest returns shown as darkest red in the upper triangular region regardless of value, but standardized around **zero** in the 3-D graph. The complementary information shows both levels and when in the sample period returns were at their maximums and minimums. Importantly, the single point at the top right of the large shaded triangle, and the front vertex of the 3-D insert graph contain the information typically provided when only the mean return from the longest sample period is provided, and standard deviations around that single mean is then provided across the set of single period returns (down the lower diagonal). We believe this new presentation provides substantially more complete information and a useful means of comparing levels, variability, and the impact of sample period on measures of performance.

To illustrate and communicate the additional information contained in the figures, a few descriptions of the Illinois case are first provided. The first set of boxes down the lower diagonal of what we will refer to as the shaded triangle contains the single year returns. The 3-D version can be thought of as "walking over the surface" with the distance from the left to right diagonal representing the holding period, i.e., one unit of time away from the diagonal from left to right is the lowest diagonal on the shaded triangle and represents single period holding returns. Two units away from the diagonal represents two-year periods and so forth. The dark green areas show particularly high returns periods and the red spike downward through the floor of the returns set occurs in the early 1980s when land values plummeted by more than the annual income earned resulting in negative total returns. As the length of the holding period increases, two types of effects are notable. Moving from left to right in the upper triangular section gives a sense of how long any period "lasts" or how long it takes to smooth out. In the 1980s for example, the periods influenced by the (red) low returns of the 1980s last for roughly 5-8 years depending on the starting date. Looking ahead to the results across all farmland, the most notable difference is the additional smoothing that occurs from holdings of farmland across multiple locations. The remaining patters for the two farmland investments are remarkably similar (not shown, but these patterns are remarkably consistent across other states as well). In general, the patterns turn rather bland fairly quickly even in the single state version as one moves to longer holding periods, regardless of the starting date. In the 3-D insert, different length holding periods are different distances away from the diagonal flat line with longer holding periods toward the front apex of the graph. One can interpret the degree of up and down as a "smoothing out" rate of the return series. For example, if Illinois farmland have been purchased in 1985 experiencing the greatest initial decline in its history, then after five years, the surface is back above 0. If instead land had been purchased in 1981, there would have been initial positive returns, but then it would have taken seven total years to get back above zero. This information helps complement the "maximum decline" statistic often reported, but which we find to be particularly prone to sample period effects, and thus prefer the current interpretation of maximum duration of losses to the more commonly reported maximum downside risk movements, though both contain useful information.

The front right face of the 3-D graph is analogous to the "held until present" information provided earlier, and "slices" at different previous disposition dates can be viewed in terms of units of time toward the left axis. Again, this perspective helps avoid the possibility of selectively presenting particularly good or bad results due to sample period issues.

The middle panel of each of the following graphs helps further display the rate at which returns measures converge on more stable ranges, and on the width of the ranges as well. In that presentation, the various possible holding periods from 1 year to twenty years are provided as annualized values. Starting from the left, the 1 year returns (blue line) is followed by the two year line (red) and three year (green) and so forth wherein the initiation of each line is for successively longer holding periods. In this case, as the holding period increases, the returns stabilize fairly quickly and form a narrow "cone" of possible returns over possible time periods and holding durations – in essence a convergence of rates based on possible window lengths and investment initiations. This information is critical when comparing only historic data to evaluate different alternatives as it helps provide a sense of the rate at which the historic data stabilize, and hence how to interpret an investment begun and held to a point in the future with unknown future returns patterns. The meaning of this central panel is more apparent when comparing across alternative investments (while the following pages provide several, the on-line version of the utility provides comparable graphical materials for roughly 80 alternatives).

The lower panel contains a plot of the sample average and standard deviation and shows how the holding period variance and standard deviation change across the possible holding intervals and all available starting and stopping points in the data. The natural pattern of a purely stable distribution with normal i.i.d. sampling features would be for the average to remain relatively constant across time, but the standard deviation to shrink at a rate proportional to the square root of the length of the sample period. As there are limitations on the number of holding periods of various length that can be constructed, the single period average has more of the areas represented as dark green above and is thus slightly higher than longer for longer periods. Again, when discussing variability, it is important to recognize that the longest sample period is often all that is provided, yet the target holding period may differ and thus be subject to different degree of riskiness. The extent to which sampling variability impacts this measure as an accurate summary of other length holding periods is evident in the figures and interesting to compare across alternate investments.

Surface graphs for approximately 70 other assets are available in a Center Utility here. Other positions will be added through time.

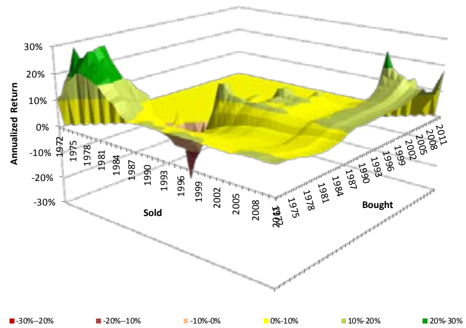
Figure 12 shows identically formatted information for the S&P 500 returns series. Several interesting contrasts are evident. It is obviously strikingly more volatile, and far more frequent, but shorter lived, penetrations through the "floor" of zero. There is also a generally elevated period in the mid-1990s that was effectively removed for all holding periods after the start of the 2000s. Using the surface analogy to physical topography, the hills and valleys are more pronounced further from the diagonal in the 3-D presentation, corresponding to more volatility over longer holding periods than existed with either Illinois or the more diversified farmland set. Next, figure 13 shows the MSCI European Equity Index, a measure of equity market exposure of the major 16 countries in developed Europe, viewed by some as an important source of international diversification. The returns surface, and the slow convergence of the measured standard deviation are consistent with the occasional extremes as well. Gold is presented in figure 14 that follows. Gold has been an asset of particular interest post-crash and in light of suggestions of its stable value under uncertain inflation prospects. It does look particularly favorable in the recent decade or so, but perhaps more intriguing is its somewhat opposite pattern relative to equities. Next, a constant maturity 1-yr treasury is provided in figure 15 which helps show the long general decline in rates at that point on the yield curve, moving through time. There is virtually no volatility in this series, and ends near its overall lowest value in the period examined. Finally, figure 16 displays result for Mortgage REITS to demonstrate the more extreme variability contained in its returns and the tradeoff between level and variability that inevitably exists. These comparisons are provided mainly to give a more complete sense of the periods of data prior to developing measures at a portfolio level across multiple combined assets. Importantly, we hope to avoid criticisms of selective sample period issues, or of treating first stage estimates as though they contain no sampling variability when used in later portfolio applications.

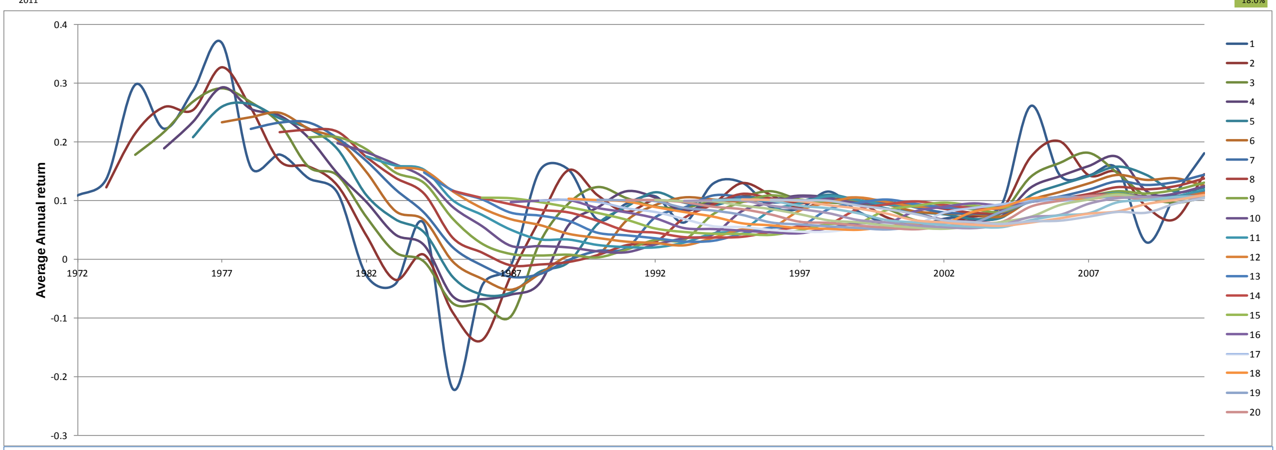
Illinois

Sell (end of year) / Buy (beginning of year)

Buy \ Sell	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1972	10.8%	12.2%	17.8%	18.9%	20.8%	23.3%	22.2%	21.6%	20.7%	19.7%	17.5%	15.5%	14.7%	11.6%	10.5%	9.7%	10.0%	10.3%	10.1%	10.1%
1973		13.6%	21.4%	21.7%	23.4%	26.0%	24.2%	23.2%	22.0%	20.8%	18.2%	15.9%	15.1%	11.7%	10.4%	9.6%	10.0%	10.3%	10.1%	10.0%
1974			29.7%	25.9%	26.8%	29.2%	26.4%	24.9%	23.3%	21.7%	18.7%	16.2%	15.2%	11.5%	10.2%	9.3%	9.7%	10.0%	9.8%	9.8%
1975				22.2%	25.4%	29.1%	25.6%	24.0%	22.2%	20.6%	17.4%	14.8%	13.9%	10.0%	8.7%	7.9%	8.4%	8.8%	8.7%	8.8%
1976					28.7%	32.7%	26.7%	24.4%	22.2%	20.3%	16.7%	13.9%	13.0%	8.8%	7.5%	6.8%	7.4%	8.0%	7.9%	8.0%
1977						36.8%	25.8%	23.1%	20.7%	18.7%	14.8%	11.9%	11.1%	6.8%	5.6%	5.0%	5.8%	6.5%	6.5%	6.7%
1978							15.6%	16.7%	15.7%	14.6%	10.9%	8.2%	7.9%	3.6%	2.6%	2.3%	3.4%	4.3%	4.5%	4.8%
1979								17.8%	15.8%	14.3%	9.7%	6.8%	6.7%	2.0%	1.1%	0.9%	2.2%	3.3%	3.6%	4.0%
1980									13.8%	12.5%	7.2%	4.2%	4.6%	-0.5%	-1.1%	-1.1%	0.6%	2.0%	2.4%	3.0%
1981										11.3%	4.0%	1.2%	2.4%	-3.1%	-3.3%	-3.0%	-0.9%	0.8%	1.3%	2.0%
1982											-2.8%	-3.5%	-0.4%	-6.4%	-6.0%	-5.2%	-2.6%	-0.5%	0.3%	1.2%
1983												-4.3%	0.7%	-7.6%	-6.8%	-5.7%	-2.5%	-0.2%	0.7%	1.6%
1984													6.0%	-9.2%	-7.7%	-6.1%	-2.2%	0.5%	1.4%	2.4%
1985														-22.2%	-13.8%	-9.8%	-4.1%	-0.5%	0.7%	1.9%
1986															-4.6%	-2.8%	2.8%	5.8%	6.0%	6.5%
1987																-1.1%	6.7%	9.5%	8.8%	8.9%
1988																	15.1%	15.2%	12.3%	11.6%
1989																		15.2%	10.9%	10.4%
1990																			6.7%	8.1%
1991																				9.4%

Buy \ Sell	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1972	10.1%	9.9%	10.0%	10.2%	10.1%	10.1%	10.1%	10.0%	9.9%	9.8%	9.7%	9.6%	9.6%	10.0%	10.2%	10.3%	10.4%	10.2%	10.2%	10.4%
1973	10.1%	9.9%	10.0%	10.1%	10.1%	10.0%	10.1%	10.0%	9.9%	9.7%	9.6%	9.6%	9.5%	10.0%	10.1%	10.3%	10.4%	10.2%	10.2%	10.4%
1974	9.9%	9.7%	9.8%	10.0%	9.9%	9.9%	9.9%	9.9%	9.7%	9.6%	9.5%	9.4%	9.4%	9.9%	10.0%	10.2%	10.3%	10.1%	10.1%	10.3%
1975	8.9%	8.7%	8.9%	9.1%	9.1%	9.1%	9.2%	9.1%	9.0%	8.9%	8.8%	8.8%	8.8%	9.3%	9.5%	9.6%	9.8%	9.6%	9.6%	9.8%
1976	8.1%	8.0%	8.3%	8.5%	8.5%	8.5%	8.6%	8.6%	8.5%	8.4%	8.4%	8.3%	8.4%	8.9%	9.1%	9.2%	9.4%	9.2%	9.3%	9.5%
1977	7.0%	6.9%	7.2%	7.5%	7.6%	7.6%	7.8%	7.8%	7.8%	7.7%	7.6%	7.6%	7.7%	8.3%	8.5%	8.7%	8.9%	8.7%	8.7%	9.0%
1978	5.2%	5.3%	5.7%	6.1%	6.2%	6.4%	6.6%	6.7%	6.6%	6.6%	6.6%	6.7%	6.8%	7.4%	7.6%	7.8%	8.1%	7.9%	8.0%	8.3%
1979	4.5%	4.6%	5.1%	5.6%	5.7%	5.9%	6.2%	6.3%	6.3%	6.2%	6.3%	6.3%	6.4%	7.1%	7.3%	7.6%	7.8%	7.7%	7.8%	8.1%
1980	3.5%	3.7%	4.3%	4.8%	5.1%	5.3%	5.6%	5.7%	5.7%	5.7%	5.8%	5.9%	6.0%	6.7%	7.0%	7.2%	7.5%	7.3%	7.5%	7.8%
1981	2.7%	3.0%	3.7%	4.3%	4.6%	4.8%	5.2%	5.3%	5.3%	5.4%	5.4%	5.5%	5.7%	6.4%	6.7%	7.0%	7.3%	7.1%	7.3%	7.6%
1982	2.0%	2.3%	3.1%	3.8%	4.1%	4.4%	4.8%	5.0%	5.0%	5.1%	5.2%	5.3%	5.4%	6.2%	6.5%	6.8%	7.1%	7.0%	7.1%	7.5%
1983	2.5%	2.8%	3.6%	4.3%	4.6%	4.9%	5.3%	5.5%	5.5%	5.5%	5.6%	5.7%	5.8%	6.6%	6.9%	7.2%	7.5%	7.4%	7.5%	7.8%
1984	3.3%	3.6%	4.4%	5.1%	5.4%	5.6%	6.0%	6.1%	6.1%	6.1%	6.1%	6.2%	6.3%	7.2%	7.5%	7.7%	8.0%	7.8%	7.9%	8.3%
1985	2.9%	3.3%	4.2%	5.0%	5.3%	5.5%	6.0%	6.1%	6.1%	6.1%	6.1%	6.2%	6.4%	7.2%	7.5%	7.8%	8.1%	7.9%	8.0%	8.4%
1986	7.1%	7.0%	7.6%	8.2%	8.2%	8.3%	8.5%	8.5%	8.3%	8.2%	8.1%	8.0%	8.1%	8.9%	9.2%	9.4%	9.7%	9.4%	9.4%	9.8%
1987	9.2%	8.8%	9.3%	9.7%	9.6%	9.5%	9.7%	9.6%	9.3%	9.1%	8.9%	8.8%	8.9%	9.7%	9.9%	10.1%	10.4%	10.0%	10.1%	10.4%
1988	11.4%	10.5%	10.8%	11.1%	10.9%	10.6%	10.7%	10.5%	10.2%	9.8%	9.6%	9.5%	9.5%	10.3%	10.6%	10.7%	10.9%	10.6%	10.6%	10.9%
1989	10.5%	9.6%	10.1%	10.6%	10.3%	10.1%	10.3%	10.1%	9.7%	9.4%	9.2%	9.1%	9.1%	10.1%	10.3%	10.5%	10.7%	10.4%	10.4%	10.7%
1990	8.9%	8.3%	9.2%	9.8%	9.7%	9.5%	9.7%	9.6%	9.3%	9.0%	8.8%	8.7%	8.7%	9.8%	10.0%	10.3%	10.5%	10.1%	10.2%	10.5%
1991	10.1%	8.8%	9.8%	10.4%	10.2%	9.9%	10.1%	9.9%	9.5%	9.2%	9.0%	8.9%	8.9%	10.0%	10.2%	10.5%	10.7%	10.3%	10.3%	10.7%
1992	10.7%	8.4%	9.9%	10.7%	10.3%	10.0%	10.2%	10.0%	9.5%	9.1%	8.9%	8.8%	8.9%	10.0%	10.3%	10.5%	10.8%	10.4%	10.4%	10.8%
1993		6.2%	9.5%	10.7%	10.2%	9.9%	10.1%	9.9%	9.4%	9.0%	8.8%	8.6%	8.7%	9.9%	10.3%	10.5%	10.8%	10.3%	10.4%	10.8%
1994			12.8%	12.9%	11.6%	10.8%	10.9%	10.5%	9.8%	9.3%	9.0%	8.9%	8.9%	10.3%	10.6%	10.8%	11.1%	10.6%	10.6%	11.0%
1995				13.0%	10.9%	10.1%	10.5%	10.0%	9.4%	8.8%	8.6%	8.5%	8.5%	10.0%	10.4%	10.7%	11.0%	10.4%	10.5%	10.9%
1996					8.8%	8.7%	9.6%	9.3%	8.6%	8.1%	7.9%	7.9%	8.1%	9.7%	10.1%	10.5%	10.9%	10.3%	10.3%	10.8%
1997						8.6%	10.0%	9.4%	8.6%	8.0%	7.8%	7.8%	8.0%	9.8%	10.3%	10.6%	11.0%	10.4%	10.4%	10.9%
1998							11.5%	9.8%	8.6%	7.8%	7.6%	7.6%	7.9%	10.0%	10.5%	10.8%	11.2%	10.5%	10.6%	11.1%
1999								8.2%	7.1%	6.6%	6.7%	6.9%	7.3%	9.8%	10.3%	10.8%	11.2%	10.4%	10.5%	11.0%
2000									6.1%	5.9%	6.2%	6.5%	7.1%	10.0%	10.6%	11.1%	11.6%	10.7%	10.7%	11.3%
2001										5.6%	6.2%	6.7%	7.3%	10.9%	11.4%	11.8%	12.3%	11.2%	11.2%	11.8%
2002											6.9%	7.2%	7.9%	12.2%	12.6%	12.9%	13.2%	11.9%	11.8%	12.4%
2003												7.5%	8.4%	14.0%	14.1%	14.1%	14.3%	12.6%	12.4%	13.0%
2004													9.4%	17.4%	16.4%	15.9%	15.8%	13.5%	13.1%	13.7%
2005														26.1%	20.1%	18.1%	17.4%	14.3%	13.8%	14.4%
2006															14.3%	14.3%	14.6%	11.6%	11.5%	12.5%
2007																14.3%	14.8%	10.7%	10.8%	12.2%
2008																	15.4%	8.9%	9.6%	11.7%
2009																		2.8%	6.8%	10.4%
2010																			11.0%	14.5%
2011																				18.0%





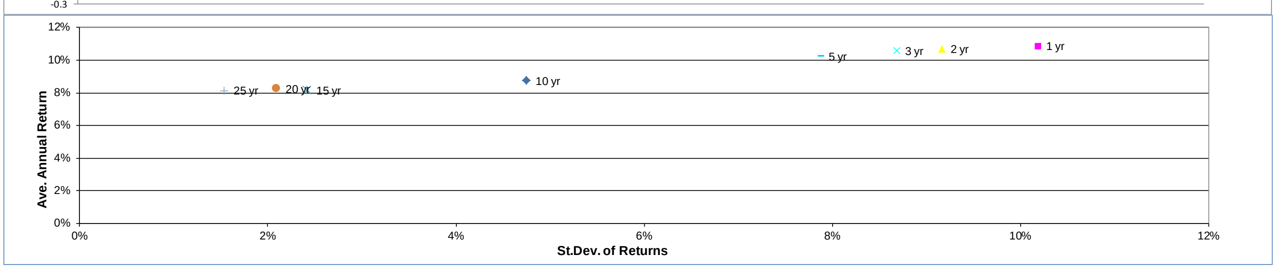


Figure 10. Illinois farmland returns profiles through time and by holding period

US Ave (all)

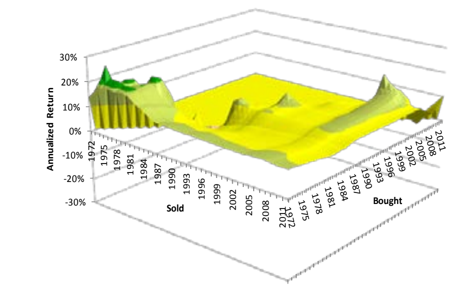
Sell (end of year)

Buy (beginning of year)

Buy	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1972	14.0%	15.6%	19.2%	18.8%	19.1%	19.4%	19.0%	19.4%	19.5%	19.0%	17.7%	16.2%	15.5%	13.9%	12.7%
1973		17.3%	21.9%	20.4%	20.5%	20.6%	19.9%	20.2%	20.2%	19.6%	18.0%	16.4%	15.6%	13.9%	12.6%
1974			26.6%	22.0%	21.6%	21.4%	20.4%	20.6%	20.7%	19.9%	18.1%	16.3%	15.4%	13.6%	12.3%
1975				17.6%	19.1%	19.7%	18.9%	19.5%	19.7%	18.9%	17.1%	15.2%	14.4%	12.5%	11.1%
1976					20.6%	20.8%	19.4%	20.0%	20.1%	19.1%	17.0%	14.9%	14.0%	12.0%	10.6%
1977						20.9%	18.7%	19.7%	20.0%	18.8%	16.4%	14.1%	13.2%	11.0%	9.6%
1978							16.6%	19.1%	19.7%	18.3%	15.6%	13.0%	12.2%	9.9%	8.4%
1979								21.7%	21.2%	18.9%	15.3%	12.3%	11.5%	8.9%	7.4%
1980									20.8%	17.5%	13.3%	10.1%	9.5%	6.9%	5.5%
1981										14.4%	9.7%	6.7%	6.9%	4.4%	3.2%
1982											5.1%	3.0%	4.5%	2.0%	1.1%
1983												1.0%	4.1%	1.0%	0.1%
1984													7.4%	1.0%	-0.2%
1985														-5.1%	-3.8%
1986															-2.5%

Buy	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1972	12.0%	11.9%	11.9%	11.7%	11.6%	11.4%	11.3%	11.4%	11.4%	11.3%	11.1%	11.0%	11.0%
1973	11.8%	11.8%	11.8%	11.6%	11.5%	11.3%	11.2%	11.3%	11.2%	11.1%	11.0%	10.9%	10.8%
1974	11.4%	11.4%	11.4%	11.3%	11.1%	10.9%	10.9%	11.0%	11.0%	10.9%	10.7%	10.7%	10.6%
1975	10.4%	10.4%	10.5%	10.4%	10.3%	10.1%	10.1%	10.3%	10.3%	10.2%	10.1%	10.0%	10.0%
1976	9.8%	9.9%	10.0%	9.9%	9.8%	9.7%	9.7%	9.9%	9.9%	9.9%	9.8%	9.7%	9.7%
1977	8.8%	9.0%	9.2%	9.2%	9.2%	9.1%	9.1%	9.3%	9.4%	9.4%	9.3%	9.2%	9.3%
1978	7.7%	8.0%	8.3%	8.3%	8.4%	8.3%	8.4%	8.7%	8.8%	8.8%	8.7%	8.7%	8.8%
1979	6.8%	7.2%	7.6%	7.7%	7.8%	7.7%	7.9%	8.2%	8.3%	8.4%	8.3%	8.3%	8.4%
1980	5.0%	5.6%	6.3%	6.5%	6.7%	6.7%	7.0%	7.4%	7.6%	7.6%	7.6%	7.7%	7.8%
1981	2.9%	3.9%	4.8%	5.1%	5.5%	5.6%	6.0%	6.5%	6.7%	6.9%	6.9%	7.0%	7.1%
1982	1.1%	2.5%	3.6%	4.2%	4.6%	4.9%	5.3%	5.9%	6.2%	6.4%	6.5%	6.6%	6.7%
1983	0.4%	2.0%	3.4%	4.0%	4.6%	4.9%	5.3%	6.0%	6.3%	6.5%	6.5%	6.7%	6.8%
1984	0.2%	2.3%	3.8%	4.5%	5.0%	5.3%	5.7%	6.4%	6.7%	6.9%	7.0%	7.0%	7.2%
1985	-2.1%	1.0%	3.1%	4.0%	4.7%	5.0%	5.6%	6.3%	6.7%	6.8%	6.9%	7.0%	7.2%
1986	-0.5%	3.1%	5.3%	5.9%	6.4%	6.6%	7.0%	7.7%	7.9%	8.0%	8.0%	8.0%	8.1%
1987	1.4%	6.1%	8.0%	8.1%	8.3%	8.2%	8.4%	9.0%	9.1%	9.1%	9.0%	8.9%	9.0%
1988		10.9%	11.5%	10.4%	10.1%	9.6%	9.6%	10.2%	10.2%	10.0%	9.8%	9.7%	9.6%
1989			12.1%	10.2%	9.8%	9.2%	9.3%	10.0%	10.0%	9.9%	9.7%	9.5%	9.5%
1990				8.4%	8.7%	8.3%	8.7%	9.6%	9.7%	9.6%	9.4%	9.2%	9.3%
1991					8.9%	8.3%	8.8%	9.9%	10.0%	9.8%	9.5%	9.4%	9.4%
1992						7.6%	8.7%	10.3%	10.2%	10.0%	9.6%	9.4%	9.4%
1993							9.8%	11.7%	11.1%	10.6%	10.0%	9.7%	9.7%
1994								13.6%	11.8%	10.8%	10.1%	9.7%	9.7%
1995									10.1%	9.5%	8.9%	8.8%	8.9%
1996										8.8%	8.3%	8.3%	8.6%
1997											7.7%	8.1%	8.5%
1998												8.4%	8.9%
1999													9.5%

Buy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1972	10.9%	10.9%	10.8%	10.7%	10.7%	11.0%	11.1%	11.1%	11.1%	10.7%	10.6%	10.5%	10.5%
1973	10.8%	10.7%	10.7%	10.6%	10.6%	10.9%	11.0%	11.1%	11.0%	10.7%	10.5%	10.4%	10.4%
1974	10.6%	10.5%	10.5%	10.4%	10.4%	10.7%	10.8%	10.9%	10.8%	10.5%	10.3%	10.2%	10.2%
1975	10.0%	10.0%	9.9%	9.9%	9.9%	10.2%	10.4%	10.4%	10.4%	10.1%	9.9%	9.8%	9.8%
1976	9.7%	9.7%	9.7%	9.6%	9.6%	10.0%	10.1%	10.2%	10.2%	9.8%	9.7%	9.6%	9.6%
1977	9.3%	9.3%	9.2%	9.2%	9.3%	9.6%	9.8%	9.9%	9.9%	9.5%	9.4%	9.3%	9.4%
1978	8.8%	8.8%	8.8%	8.8%	8.9%	9.2%	9.4%	9.6%	9.5%	9.2%	9.0%	9.0%	9.0%
1979	8.4%	8.5%	8.5%	8.5%	8.6%	9.0%	9.2%	9.3%	9.3%	9.0%	8.8%	8.8%	8.8%
1980	7.8%	7.9%	8.0%	8.0%	8.1%	8.5%	8.7%	8.9%	8.9%	8.6%	8.4%	8.4%	8.5%
1981	7.2%	7.3%	7.4%	7.5%	7.6%	8.1%	8.3%	8.5%	8.5%	8.2%	8.0%	8.0%	8.1%
1982	6.9%	7.0%	7.1%	7.1%	7.3%	7.8%	8.1%	8.3%	8.3%	7.9%	7.8%	7.8%	7.9%
1983	7.0%	7.1%	7.2%	7.2%	7.4%	7.9%	8.2%	8.4%	8.4%	8.0%	7.9%	7.9%	8.0%
1984	7.3%	7.4%	7.5%	7.6%	7.7%	8.2%	8.5%	8.7%	8.7%	8.3%	8.2%	8.2%	8.2%
1985	7.3%	7.4%	7.5%	7.6%	7.7%	8.3%	8.6%	8.8%	8.8%	8.4%	8.2%	8.2%	8.3%
1986	8.2%	8.3%	8.3%	8.3%	8.4%	9.0%	9.3%	9.4%	9.4%	9.0%	8.8%	8.7%	8.8%
1987	9.0%	9.0%	9.0%	9.0%	9.1%	9.6%	9.9%	10.0%	10.0%	9.5%	9.3%	9.2%	9.3%
1988	9.6%	9.6%	9.6%	9.5%	9.6%	10.1%	10.4%	10.5%	10.4%	9.9%	9.6%	9.5%	9.6%
1989	9.5%	9.5%	9.5%	9.4%	9.5%	10.1%	10.3%	10.5%	10.4%	9.8%	9.6%	9.5%	9.5%
1990	9.3%	9.3%	9.3%	9.2%	9.3%	9.9%	10.2%	10.4%	10.3%	9.7%	9.5%	9.4%	9.4%
1991	9.4%	9.4%	9.3%	9.3%	9.4%	10.0%	10.3%	10.5%	10.4%	9.8%	9.5%	9.4%	9.5%
1992	9.4%	9.4%	9.4%	9.3%	9.4%	10.1%	10.4%	10.6%	10.5%	9.8%	9.5%	9.4%	9.5%
1993	9.7%	9.6%	9.5%	9.5%	9.5%	10.3%	10.6%	10.8%	10.7%	10.0%	9.6%	9.5%	9.6%
1994	9.7%	9.6%	9.5%	9.4%	9.5%	10.4%	10.7%	10.9%	10.8%	10.0%	9.6%	9.5%	9.6%
1995	9.0%	9.0%	9.0%	9.0%	9.1%	10.1%	10.5%	10.7%	10.6%	9.7%	9.4%	9.3%	9.4%
1996	8.8%	8.9%	8.9%	8.8%	9.0%	10.1%	10.5%	10.7%	10.6%	9.7%	9.4%	9.2%	9.3%
1997	8.8%	8.9%	8.9%	8.8%	9.0%	10.2%	10.7%	10.9%	10.7%	9.8%	9.4%	9.3%	9.3%
1998	9.1%	9.1%	9.1%	9.0%	9.2%	10.5%	11.0%	11.2%	11.0%	9.9%	9.5%	9.4%	9.4%
1999	9.5%	9.4%	9.3%	9.1%	9.4%	10.8%	11.3%	11.5%	11.3%	10.1%	9.6%	9.4%	9.5%
2000	9.6%	9.4%	9.2%	9.1%	9.3%	11.1%	11.6%	11.8%	11.5%	10.1%	9.6%	9.4%	9.5%
2001		9.2%	9.1%	8.9%	9.3%	11.4%	12.0%	12.1%	11.7%	10.2%	9.6%	9.4%	9.5%
2002			8.9%	8.8%	9.3%	11.9%	12.5%	12.6%	12.1%	10.3%	9.7%	9.5%	9.6%
2003				8.6%	9.5%	13.0%	13.4%	13.4%	12.6%	10.5%	9.8%	9.5%	9.6%
2004					10.5%	15.2%	15.1%	14.6%	13.5%	10.9%	9.9%	9.6%	9.7%
2005						20.1%	17.5%	16.0%	14.2%	11.0%	9.8%	9.5%	9.6%
2006							14.9%	14.0%	12.3%	8.8%	7.9%	7.8%	8.2%
2007								13.0%	11.1%	6.8%	6.2%	6.5%	7.1%
2008									9.1%	3.8%	4.0%	4.9%	6.0%
2009										-1.2%	1.6%	3.5%	5.2%
2010											4.5%	5.9%	7.5%
2011												7.4%	9.0%
2012													10.6%



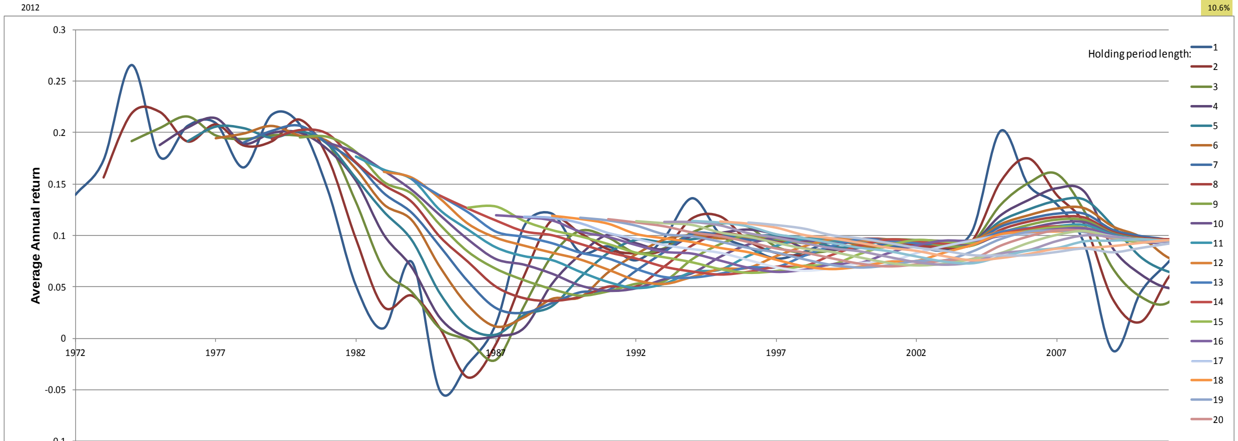
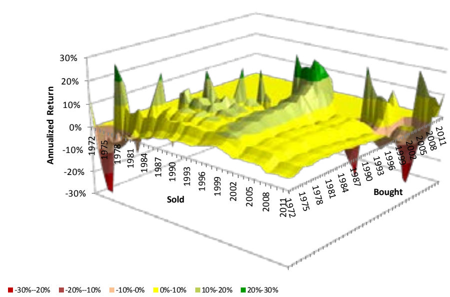


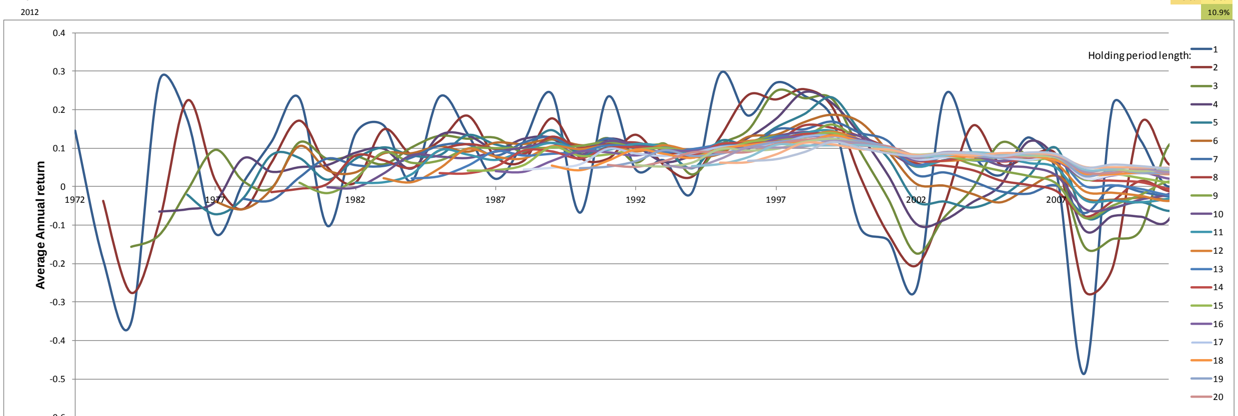
Figure 11. All US farmland returns profiles through time and by holding period

S&P500

Sell (end of year)

Buy (beginning of year)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1972	14.5%	-3.7%	-15.7%	-6.5%	-2.1%	-3.9%	-3.2%	-1.5%	1.0%	-0.2%	1.0%	2.2%	2.1%	3.5%	4.2%	4.0%	4.5%	5.5%	4.8%	5.6%	5.6%	5.6%	5.3%	6.2%	6.7%	7.4%	8.0%	8.3%	7.6%	6.8%	5.5%	6.0%	6.1%	6.0%	6.2%	6.1%	4.1%	4.5%	4.7%	4.5%	4.7%
1973		-19.1%	-27.6%	-12.6%	-5.9%	-7.2%	-5.9%	-3.5%	-0.6%	-1.7%	-0.3%	1.1%	1.1%	2.7%	3.4%	3.3%	3.9%	4.9%	4.3%	5.2%	5.1%	5.2%	4.9%	5.9%	6.4%	7.1%	7.7%	8.1%	7.3%	6.5%	5.2%	5.7%	5.8%	5.7%	5.9%	5.9%	3.8%	4.2%	4.4%	4.3%	4.5%
1974			-35.3%	-9.2%	-1.0%	-4.0%	-3.0%	-0.7%	2.4%	0.7%	2.1%	3.4%	3.2%	4.8%	5.4%	5.2%	5.6%	6.7%	5.8%	6.7%	6.6%	6.6%	6.2%	7.2%	7.6%	8.4%	9.0%	9.3%	8.5%	7.6%	6.2%	6.7%	6.8%	6.6%	6.8%	6.7%	4.5%	4.9%	5.1%	5.0%	5.1%
1975				27.4%	22.4%	9.5%	7.4%	8.2%	10.5%	7.3%	8.1%	8.9%	8.1%	9.4%	9.8%	9.2%	9.3%	10.3%	9.1%	9.9%	9.6%	9.4%	8.9%	9.8%	10.1%	10.8%	11.3%	11.6%	10.6%	9.6%	8.1%	8.6%	8.6%	8.4%	8.5%	8.3%	6.0%	6.4%	6.6%	6.4%	6.5%
1976					17.5%	1.6%	1.4%	3.9%	7.4%	4.3%	5.6%	6.8%	6.2%	7.8%	8.3%	7.8%	8.1%	9.1%	8.0%	8.9%	8.6%	8.5%	8.0%	9.0%	9.4%	10.1%	10.7%	11.0%	10.0%	9.0%	7.4%	7.9%	8.0%	7.8%	7.9%	7.8%	5.4%	5.8%	6.0%	5.8%	6.0%
1977						-12.2%	-5.8%	-0.3%	5.0%	1.8%	3.7%	5.4%	4.9%	6.8%	7.4%	6.9%	7.3%	8.5%	7.4%	8.4%	8.1%	8.0%	7.5%	8.5%	9.0%	9.8%	10.4%	10.7%	9.7%	8.7%	7.0%	7.6%	7.6%	7.5%	7.6%	7.5%	5.0%	5.5%	5.7%	5.5%	5.7%
1978							1.1%	6.2%	11.5%	5.6%	7.2%	8.6%	7.5%	9.4%	9.9%	9.1%	9.3%	10.5%	9.0%	10.0%	9.6%	9.4%	8.8%	9.8%	10.2%	11.0%	11.6%	11.9%	10.8%	9.6%	7.9%	8.4%	8.4%	8.2%	8.4%	8.2%	5.7%	6.1%	6.3%	6.1%	6.2%
1979								11.6%	17.1%	7.2%	8.8%	10.2%	8.7%	10.7%	11.0%	10.0%	10.2%	11.4%	9.7%	10.7%	10.2%	10.0%	9.3%	10.3%	10.8%	11.6%	12.2%	12.4%	11.2%	10.0%	8.2%	8.7%	8.7%	8.5%	8.7%	8.5%	5.8%	6.3%	6.5%	6.3%	6.4%
1980									22.9%	5.0%	7.9%	9.8%	8.1%	10.5%	10.9%	9.8%	10.0%	11.3%	9.5%	10.6%	10.1%	9.9%	9.1%	10.3%	10.7%	11.6%	12.2%	12.5%	11.2%	9.9%	8.0%	8.6%	8.6%	8.4%	8.6%	8.4%	5.6%	6.1%	6.3%	6.1%	6.2%
1981										-10.2%	1.1%	5.8%	4.7%	8.2%	9.1%	8.0%	8.5%	10.1%	8.3%	9.6%	9.1%	9.0%	8.2%	9.5%	10.0%	10.9%	11.6%	11.9%	10.7%	9.4%	7.4%	8.0%	8.1%	7.9%	8.0%	7.9%	5.1%	5.6%	5.8%	5.6%	5.7%
1982											13.8%	14.8%	10.2%	13.3%	13.4%	11.4%	11.5%	13.0%	10.6%	11.8%	11.1%	10.7%	9.7%	11.0%	11.5%	12.4%	13.1%	13.3%	11.9%	10.4%	8.3%	9.0%	8.9%	8.7%	8.8%	8.6%	5.7%	6.2%	6.4%	6.2%	6.3%
1983												15.9%	8.4%	13.2%	13.3%	10.9%	11.1%	12.8%	10.2%	11.6%	10.8%	10.5%	9.4%	10.8%	11.4%	12.3%	13.0%	13.3%	11.8%	10.3%	8.0%	8.7%	8.7%	8.5%	8.6%	8.4%	5.4%	5.9%	6.1%	5.9%	6.1%
1984													1.4%	11.8%	12.4%	9.7%	10.1%	12.3%	9.4%	11.0%	10.3%	9.9%	8.8%	10.4%	11.0%	12.1%	12.8%	13.1%	11.6%	10.0%	7.6%	8.4%	8.4%	8.1%	8.3%	8.1%	5.0%	5.5%	5.8%	5.6%	5.7%
1985														23.4%	18.4%	12.7%	12.4%	14.7%	10.8%	12.5%	11.4%	10.9%	9.6%	11.3%	11.8%	12.9%	13.7%	14.0%	12.2%	10.5%	8.0%	8.8%	8.8%	8.5%	8.7%	8.4%	5.1%	5.7%	5.9%	5.7%	5.9%
1986															13.6%	7.7%	9.0%	12.6%	8.4%	10.8%	9.8%	9.5%	8.2%	10.1%	10.9%	12.1%	13.0%	13.3%	11.5%	9.7%	7.2%	8.0%	8.0%	7.8%	8.0%	7.8%	4.4%	5.0%	5.3%	5.1%	5.3%
1987																2.0%	6.7%	12.2%	7.1%	10.2%	9.2%	8.9%	7.5%	9.7%	10.6%	12.0%	12.9%	13.3%	11.4%	9.5%	6.8%	7.7%	7.7%	7.5%	7.7%	7.5%	4.0%	4.7%	5.0%	4.8%	5.0%
1988																	11.7%	17.7%	8.9%	12.4%	10.7%	10.1%	8.3%	10.7%	11.6%	13.0%	14.0%	14.3%	12.1%	10.0%	7.1%	8.0%	8.1%	7.8%	8.0%	7.8%	4.1%	4.8%	5.1%	4.9%	5.1%
1989																		24.1%	7.6%	12.6%	10.5%	9.7%	7.8%	10.6%	11.6%	13.2%	14.2%	14.5%	12.2%	9.9%	6.8%	7.8%	7.9%	7.6%	7.8%	7.6%	3.7%	4.5%	4.8%	4.6%	4.9%
1990																			-6.8%	7.2%	6.3%	6.4%	4.8%	8.5%	9.9%	11.9%	13.1%	13.6%	11.1%	8.8%	5.5%	6.7%	6.9%	6.6%	7.0%	6.8%	2.7%	3.6%	4.0%	3.8%	4.1%
1991																				23.4%	13.5%	11.2%	7.9%	11.9%	12.9%	14.8%	15.9%	16.1%	13.1%	10.3%	6.6%	7.8%	7.9%	7.6%	7.9%	7.6%	3.3%	4.2%	4.5%	4.3%	4.6%
1992																					4.4%	5.6%	3.2%	9.2%	11.0%	13.5%	14.9%	15.2%	12.0%	9.1%	5.2%	6.6%	6.8%	6.5%	6.9%	6.7%	2.2%	3.2%	3.6%	3.4%	3.8%
1993																						6.8%	2.5%	10.8%	12.7%	15.4%	16.7%	16.9%	13.0%	9.6%	5.3%	6.9%	7.0%	6.7%	7.1%	6.9%	2.1%	3.1%	3.6%	3.4%	3.8%
1994																							-1.6%	12.8%	14.7%	17.6%	18.8%	18.7%	13.9%	10.0%	5.2%	6.9%	7.0%	6.7%	7.1%	6.9%	1.8%	2.9%	3.4%	3.2%	3.6%
1995																								29.3%	23.8%	24.8%	24.5%	23.2%	16.7%	11.8%	6.0%	7.8%	7.9%	7.5%	7.9%	7.5%	2.0%	3.2%	3.7%	3.5%	3.9%
1996																									18.5%	22.7%	23.0%	21.7%	14.4%	9.1%	3.1%	5.4%	5.8%	5.5%	6.1%	5.9%	0.2%	1.5%	2.2%	2.1%	2.6%
1997																										27.0%	25.3%	22.8%	13.4%	7.3%	0.7%	3.7%	4.3%	4.1%	5.0%	4.8%	-1.2%	0.3%	1.1%	1.1%	1.6%
1998																											23.6%	20.7%	9.2%	2.9%	-3.9%	0.2%	1.4%	1.6%	2.8%	2.8%	-3.4%	-1.6%	-0.6%	-0.6%	0.2%
1999																												17.8%	2.6%	-3.3%	-9.7%	-3.9%	-1.9%	-1.2%	0.4%	0.8%	-5.8%	-3.6%	-2.4%	-2.2%	-1.3%
2000																													-10.7%	-12.3%	-17.4%	-8.7%	-5.4%	-4.1%	-1.9%	-1.2%	-8.1%	-5.5%	-4.1%	-3.7%	-2.7%
2001																														-14.0%	-20.5%	-8.0%	-4.1%	-2.7%	-0.3%	0.2%	-7.8%	-5.0%	-3.4%	-3.1%	-2.0%
2002																															-26.6%	-4.8%	-0.5%	0.3%	2.7%	2.8%	-6.9%	-3.8%	-2.1%	-1.9%	-0.8%
2003																																23.4%	15.8%	11.3%	11.7%	10.0%	-3.1%	0.0%	1.5%	1.3%	2.2%
2004																																	8.6%	5.7%	8.0%	6.9%	-7.7%	-3.4%	-1.3%	-1.2%	0.1%
2005																																		3.0%	7.8%	6.3%	-11.4%	-5.6%	-2.9%	-2.5%	-0.9%
2006																																			12.8%	8.0%	-15.7%	-7.7%	-4.0%	-3.4%	-1.5%
2007																																				3.5%	-27.1%	-13.6%	-7.8%	-6.3%	-3.6%
2008																																					-48.6%	-21.1%	-11.3%	-8.6%	-5.0%
2009																																						21.1%	16.5%	10.7%	10.7%
2010																																							12.0%	5.8%	7.5%
2011																																								0.0%	5.3%
2012																																									10.9%





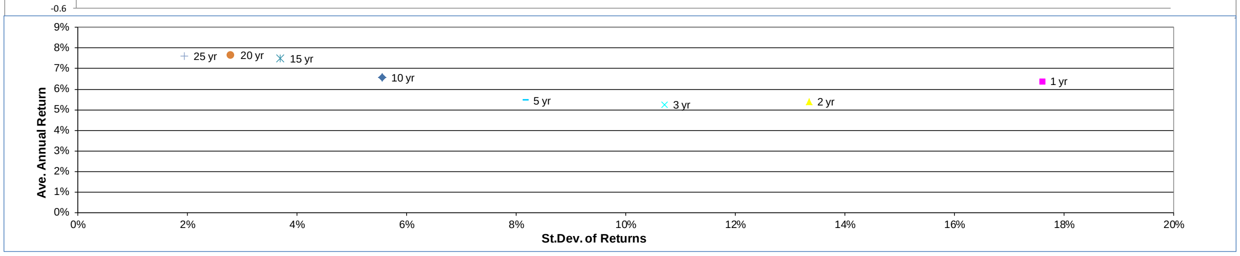


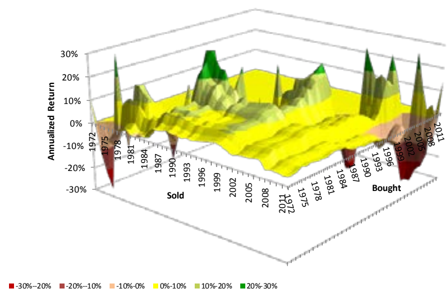
Fig ure 12. S&P 500 index returns profiles through time and by holding period

EUROPE

Sell (end of year) / Buy (beginning of year)

Buy \ Sell	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1972	11.1%	-1.0%	-12.3%	-3.0%	-4.8%	-1.6%	0.8%	1.7%	2.3%	0.2%	0.1%	1.4%	1.0%	4.2%	5.9%	5.6%	6.0%	6.9%	6.1%	6.3%	5.6%
1973		-11.8%	-22.1%	-7.3%	-8.4%	-3.9%	-0.8%	0.4%	1.2%	-1.0%	-0.9%	0.5%	0.3%	3.7%	5.6%	5.3%	5.7%	6.6%	5.8%	6.0%	5.3%
1974			-31.3%	-5.0%	-7.2%	-1.8%	1.5%	2.6%	3.2%	0.4%	0.4%	1.9%	1.4%	5.1%	7.0%	6.6%	7.0%	7.9%	7.0%	7.1%	6.3%
1975				31.3%	7.8%	10.5%	11.9%	11.2%	10.5%	6.0%	5.3%	6.4%	5.4%	9.2%	11.1%	10.3%	10.4%	11.2%	10.0%	10.0%	8.9%
1976					-11.5%	1.4%	6.2%	6.6%	6.8%	2.3%	2.0%	3.6%	2.9%	7.2%	9.4%	8.7%	9.0%	9.9%	8.7%	8.7%	7.7%
1977						16.2%	16.2%	13.5%	11.9%	5.3%	4.4%	6.0%	4.9%	9.5%	11.7%	10.8%	10.9%	11.7%	10.3%	10.2%	9.0%
1978							16.2%	12.1%	10.4%	2.8%	2.2%	4.4%	3.3%	8.7%	11.2%	10.2%	10.4%	11.4%	9.9%	9.8%	8.6%
1979								8.1%	7.7%	-1.4%	-1.0%	2.2%	1.3%	7.7%	10.6%	9.6%	9.8%	10.9%	9.3%	9.3%	8.0%
1980									7.3%	-5.8%	-3.9%	0.8%	0.0%	7.6%	11.0%	9.8%	10.0%	11.2%	9.5%	9.5%	8.0%
1981										-17.2%	-9.0%	-1.3%	-1.7%	7.7%	11.6%	10.1%	10.4%	11.7%	9.7%	9.7%	8.1%
1982											0.0%	7.7%	4.1%	15.0%	18.5%	15.5%	15.0%	15.9%	13.1%	12.8%	10.7%
1983												16.0%	6.2%	20.4%	23.7%	18.8%	17.7%	18.4%	14.9%	14.3%	11.9%
1984													-2.8%	22.7%	26.3%	19.6%	18.0%	18.8%	14.8%	14.1%	11.4%
1985														55.0%	44.0%	28.1%	23.9%	23.6%	18.0%	16.7%	13.4%
1986															33.8%	16.5%	15.0%	16.8%	11.7%	11.3%	8.4%
1987																1.4%	6.6%	11.7%	6.8%	7.3%	4.7%
1988																	12.0%	17.2%	8.6%	8.8%	5.3%
1989																		22.6%	7.0%	7.8%	3.7%
1990																			-6.7%	1.1%	-1.9%
1991																				9.5%	0.6%
1992																					-7.6%

Buy \ Sell	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1972	6.3%	6.0%	6.5%	6.9%	7.4%	7.9%	8.1%	7.4%	6.2%	5.1%	5.8%	6.1%	6.1%	6.7%	6.8%	3.5%	4.1%	4.0%	3.5%	3.7%
1973	6.1%	5.8%	6.3%	6.7%	7.2%	7.8%	8.0%	7.3%	6.0%	4.9%	5.6%	6.0%	6.0%	6.5%	6.6%	3.3%	3.9%	3.8%	3.3%	3.6%
1974	7.1%	6.7%	7.2%	7.6%	8.1%	8.7%	8.8%	8.1%	6.7%	5.5%	6.3%	6.6%	6.6%	7.1%	7.2%	3.8%	4.4%	4.3%	3.7%	4.0%
1975	9.6%	9.1%	9.5%	9.8%	10.2%	10.8%	10.8%	10.0%	8.5%	7.2%	7.9%	8.2%	8.1%	8.6%	8.7%	5.1%	5.6%	5.5%	4.9%	5.1%
1976	8.5%	8.1%	8.5%	8.9%	9.4%	9.9%	10.1%	9.2%	7.7%	6.4%	7.1%	7.4%	7.4%	8.0%	8.0%	4.3%	5.0%	4.8%	4.2%	4.5%
1977	9.8%	9.3%	9.7%	10.0%	10.5%	11.0%	11.1%	10.1%	8.5%	7.1%	7.9%	8.2%	8.1%	8.7%	8.7%	4.9%	5.5%	5.4%	4.7%	5.0%
1978	9.4%	8.9%	9.3%	9.7%	10.2%	10.8%	10.9%	9.9%	8.2%	6.8%	7.6%	7.9%	7.8%	8.4%	8.5%	4.5%	5.2%	5.1%	4.4%	4.7%
1979	9.0%	8.4%	8.9%	9.4%	9.9%	10.5%	10.6%	9.6%	7.9%	6.4%	7.3%	7.6%	7.5%	8.2%	8.2%	4.2%	4.8%	4.7%	4.1%	4.3%
1980	9.1%	8.4%	9.0%	9.4%	10.0%	10.6%	10.8%	9.7%	7.9%	6.3%	7.2%	7.6%	7.5%	8.2%	8.3%	4.0%	4.7%	4.6%	3.9%	4.2%
1981	9.2%	8.5%	9.1%	9.6%	10.1%	10.8%	11.0%	9.8%	7.9%	6.3%	7.2%	7.6%	7.5%	8.2%	8.3%	3.9%	4.7%	4.5%	3.8%	4.1%
1982	11.8%	10.8%	11.3%	11.6%	12.1%	12.8%	12.8%	11.4%	9.3%	7.6%	8.5%	8.8%	8.7%	9.4%	9.4%	4.8%	5.5%	5.4%	4.6%	4.9%
1983	12.9%	11.8%	12.2%	12.5%	13.0%	13.6%	13.6%	12.1%	9.8%	8.0%	8.9%	9.2%	9.1%	9.8%	9.8%	5.0%	5.7%	5.6%	4.8%	5.1%
1984	12.6%	11.4%	11.9%	12.3%	12.8%	13.4%	13.4%	11.9%	9.5%	7.5%	8.6%	8.9%	8.8%	9.5%	9.6%	4.6%	5.4%	5.2%	4.4%	4.7%
1985	14.4%	12.9%	13.3%	13.6%	14.1%	14.7%	14.6%	12.9%	10.3%	8.2%	9.2%	9.5%	9.4%	10.1%	10.1%	4.9%	5.7%	5.5%	4.7%	5.0%
1986	10.2%	9.0%	9.8%	10.4%	11.2%	12.1%	12.2%	10.5%	8.0%	5.9%	7.1%	7.6%	7.5%	8.3%	8.4%	3.1%	4.0%	3.9%	3.1%	3.5%
1987	7.2%	6.2%	7.4%	8.3%	9.3%	10.4%	10.6%	9.0%	6.4%	4.3%	5.7%	6.3%	6.3%	7.2%	7.3%	1.9%	2.9%	2.8%	2.0%	2.5%
1988	8.1%	7.0%	8.2%	9.1%	10.1%	11.3%	11.5%	9.6%	6.8%	4.5%	6.0%	6.6%	6.5%	7.5%	7.7%	1.9%	3.0%	2.9%	2.1%	2.5%
1989	7.4%	6.1%	7.7%	8.8%	9.9%	11.2%	11.4%	9.4%	6.4%	4.0%	5.6%	6.2%	6.2%	7.3%	7.4%	1.5%	2.6%	2.5%	1.7%	2.2%
1990	3.9%	3.1%	5.4%	6.9%	8.4%	10.0%	10.3%	8.3%	5.2%	2.7%	4.5%	5.2%	5.3%	6.4%	6.6%	0.5%	1.6%	1.6%	0.8%	1.3%
1991	7.7%	5.7%	7.9%	9.4%	10.8%	12.3%	12.4%	9.9%	6.3%	3.6%	5.4%	6.1%	6.1%	7.3%	7.5%	0.9%	2.1%	2.0%	1.2%	1.7%
1992	6.8%	4.5%	7.6%	9.4%	11.0%	12.7%	12.8%	10.0%	6.0%	3.0%	5.0%	5.9%	5.9%	7.2%	7.4%	0.4%	1.7%	1.7%	0.8%	1.4%
1993	23.4%	11.1%	13.2%	14.1%	15.2%	16.5%	16.0%	12.4%	7.6%	4.2%	6.3%	7.1%	7.0%	8.3%	8.4%	0.9%	2.3%	2.2%	1.2%	1.8%
1994		0.1%	8.4%	11.2%	13.2%	15.2%	14.9%	10.9%	5.8%	2.2%	4.7%	5.7%	5.8%	7.2%	7.4%	-0.4%	1.1%	1.1%	0.1%	0.8%
1995			17.3%	17.1%	17.9%	19.3%	18.1%	12.8%	6.6%	2.5%	5.2%	6.3%	6.3%	7.8%	8.0%	-0.5%	1.2%	1.1%	0.1%	0.9%
1996				17.0%	18.2%	20.0%	18.3%	11.9%	5.0%	0.5%	3.8%	5.1%	5.2%	7.0%	7.3%	-1.7%	0.1%	0.2%	-0.9%	0.0%
1997					19.5%	21.5%	18.7%	10.7%	2.7%	-2.0%	2.0%	3.7%	4.0%	6.1%	6.5%	-3.2%	-1.1%	-1.0%	-1.9%	-1.0%
1998						23.5%	18.3%	7.9%	-1.1%	-5.8%	-0.6%	1.7%	2.2%	4.7%	5.2%	-5.0%	-2.7%	-2.4%	-3.3%	-2.2%
1999							13.2%	0.9%	-8.2%	-12.0%	-4.9%	-1.6%	-0.5%	2.5%	3.4%	-7.4%	-4.7%	-4.3%	-5.1%	-3.9%
2000								-10.2%	-17.3%	-19.0%	-8.9%	-4.3%	-2.6%	1.1%	2.2%	-9.5%	-6.4%	-5.7%	-6.5%	-5.1%
2001									-23.9%	-23.2%	-8.5%	-2.8%	-1.0%	3.1%	4.1%	-9.4%	-5.9%	-5.3%	-6.2%	-4.6%
2002										-22.4%	0.4%	5.4%	5.7%	9.5%	9.7%	-7.1%	-3.4%	-2.9%	-4.2%	-2.7%
2003											29.9%	23.0%	17.1%	19.4%	17.5%	-4.3%	-0.3%	-0.2%	-1.9%	-0.4%
2004												16.4%	11.3%	16.1%	14.6%	-10.0%	-4.6%	-3.9%	-5.3%	-3.3%
2005													6.3%	15.9%	14.1%	-15.6%	-8.4%	-6.9%	-8.1%	-5.5%
2006														26.4%	18.1%	-21.8%	-11.7%	-9.3%	-10.3%	-7.1%
2007															10.4%	-38.5%	-21.7%	-16.5%	-16.2%	-11.8%
2008																-65.8%	-34.0%	-24.0%	-21.8%	-15.6%
2009																	27.2%	13.3%	3.0%	5.7%
2010																		1.0%	-7.3%	-0.6%
2011																			-14.9%	-1.4%
2012																				14.1%



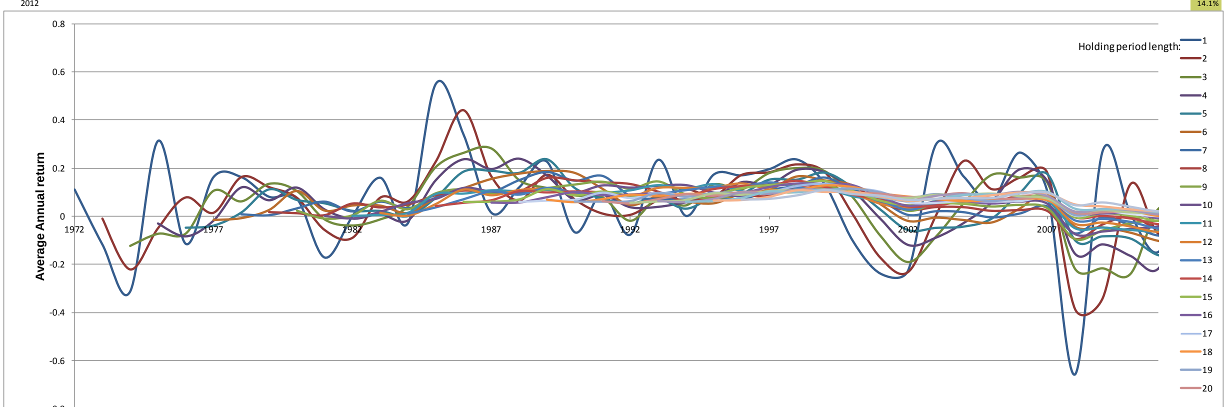


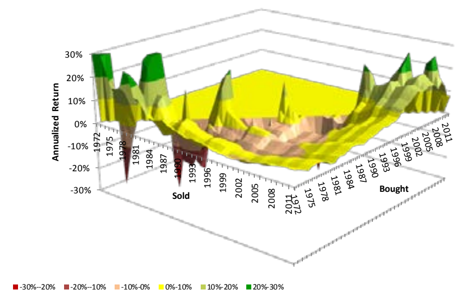
Figure 13. Europe (MSCI) returns profiles through time and by holding period

Gold

Sell (end of year)

Buy (beginning of year)	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1972	38.5%	44.8%	47.9%	23.7%	17.6%	17.6%	18.8%	26.0%	24.6%	15.9%	15.8%	12.5%	9.4%	9.2%	9.7%	10.4%	8.6%	7.9%	7.3%	6.4%	5.8%
1973		51.3%	52.8%	19.1%	12.9%	13.9%	15.8%	24.3%	23.0%	13.7%	13.7%	10.4%	7.3%	7.2%	7.9%	8.8%	7.0%	6.4%	5.8%	5.0%	4.4%
1974			54.3%	5.6%	2.4%	6.1%	9.8%	20.3%	19.4%	9.7%	10.1%	7.0%	4.0%	4.1%	5.1%	6.2%	4.5%	4.1%	3.6%	2.9%	2.4%
1975				-27.7%	-16.6%	-6.4%	0.8%	14.4%	14.4%	4.5%	5.6%	2.7%	0.0%	0.5%	1.8%	3.2%	1.7%	1.4%	1.1%	0.4%	0.1%
1976					-3.9%	6.5%	12.6%	28.4%	25.4%	11.1%	11.5%	7.3%	3.6%	3.8%	5.0%	6.3%	4.4%	3.8%	3.3%	2.5%	2.0%
1977						18.0%	21.9%	41.4%	34.0%	14.3%	14.3%	9.0%	4.6%	4.7%	5.9%	7.3%	5.1%	4.4%	3.9%	3.0%	2.4%
1978							25.9%	54.7%	39.8%	13.4%	13.5%	7.6%	2.8%	3.2%	4.7%	6.3%	4.0%	3.4%	2.9%	2.0%	1.4%
1979								90.2%	47.3%	9.5%	10.6%	4.2%	-0.6%	0.3%	2.3%	4.3%	2.0%	1.6%	1.2%	0.3%	-0.1%
1980									14.1%	-16.9%	-7.7%	-10.3%	-12.7%	-9.8%	-6.4%	-3.2%	-4.8%	-4.6%	-4.5%	-4.9%	-4.9%
1981										-39.5%	-16.9%	-17.2%	-18.3%	-14.0%	-9.4%	-5.5%	-6.9%	-6.5%	-6.2%	-6.4%	-6.4%
1982											13.9%	-3.2%	-9.8%	-6.1%	-1.8%	1.8%	-1.1%	-1.3%	-1.5%	-2.3%	-2.6%
1983												-17.8%	-19.7%	-12.0%	-5.4%	-0.5%	-3.4%	-3.3%	-3.3%	-3.9%	-4.1%
1984													-21.5%	-8.9%	-0.9%	4.4%	-0.2%	-0.6%	-1.0%	-2.0%	-2.5%
1985														5.8%	11.4%	14.8%	6.0%	4.2%	2.9%	1.1%	0.2%
1986															17.4%	19.6%	6.1%	3.8%	2.3%	0.4%	-0.5%
1987																21.9%	0.9%	-0.4%	-1.1%	-2.7%	-3.3%
1988																	-16.6%	-10.0%	-7.8%	-8.1%	-7.6%
1989																		-2.9%	-3.0%	-5.0%	-5.3%
1990																			-3.2%	-6.1%	-6.0%
1991																				-8.9%	-7.4%
1992																					-5.9%

Buy (beginning of year)	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1972	6.3%	5.9%	5.7%	5.2%	3.9%	3.8%	3.6%	3.3%	3.2%	3.8%	4.2%	4.2%	4.6%	5.0%	5.6%	5.5%	6.0%	6.4%	6.5%	6.5%
1973	4.9%	4.6%	4.4%	4.1%	2.7%	2.6%	2.5%	2.2%	2.2%	2.8%	3.3%	3.3%	3.7%	4.2%	4.8%	4.7%	5.2%	5.7%	5.8%	5.8%
1974	3.0%	2.8%	2.7%	2.4%	1.1%	1.0%	1.0%	0.8%	0.8%	1.5%	2.0%	2.1%	2.5%	3.0%	3.6%	3.7%	4.1%	4.7%	4.8%	4.8%
1975	0.9%	0.7%	0.7%	0.5%	-0.7%	-0.7%	-0.7%	-0.9%	-0.8%	-0.1%	0.5%	0.7%	1.1%	1.7%	2.4%	2.4%	3.0%	3.5%	3.7%	3.8%
1976	2.8%	2.5%	2.4%	2.1%	0.7%	0.6%	0.6%	0.4%	0.4%	1.1%	1.7%	1.8%	2.3%	2.8%	3.5%	3.5%	4.0%	4.6%	4.7%	4.8%
1977	3.2%	2.9%	2.8%	2.4%	0.9%	0.8%	0.8%	0.6%	0.6%	1.4%	1.9%	2.0%	2.5%	3.0%	3.8%	3.8%	4.3%	4.9%	5.0%	5.1%
1978	2.3%	2.0%	2.0%	1.6%	0.1%	0.1%	0.1%	-0.1%	-0.1%	0.7%	1.4%	1.5%	2.0%	2.6%	3.3%	3.3%	3.9%	4.5%	4.6%	4.7%
1979	0.9%	0.7%	0.7%	0.4%	-1.1%	-1.0%	-1.0%	-1.2%	-1.1%	-0.2%	0.5%	0.6%	1.2%	1.8%	2.6%	2.7%	3.3%	3.9%	4.0%	4.1%
1980	-3.6%	-3.5%	-3.2%	-3.3%	-4.6%	-4.4%	-4.1%	-4.2%	-4.0%	-3.0%	-2.2%	-1.9%	-1.3%	-0.5%	0.4%	0.5%	1.2%	1.9%	2.1%	2.3%
1981	-4.8%	-4.6%	-4.3%	-4.3%	-5.6%	-5.3%	-5.0%	-5.0%	-4.8%	-3.7%	-2.8%	-2.5%	-1.8%	-1.0%	-0.1%	0.1%	0.8%	1.5%	1.7%	1.9%
1982	-1.2%	-1.2%	-1.1%	-1.3%	-2.9%	-2.8%	-2.6%	-2.8%	-2.6%	-1.5%	-0.7%	-0.5%	0.2%	0.9%	1.8%	1.9%	2.6%	3.3%	3.5%	3.6%
1983	-2.4%	-2.4%	-2.1%	-2.3%	-4.0%	-3.8%	-3.5%	-3.6%	-3.4%	-2.2%	-1.3%	-1.1%	-0.4%	0.4%	1.4%	1.5%	2.2%	3.0%	3.1%	3.3%
1984	-0.7%	-0.9%	-0.7%	-1.0%	-2.9%	-2.7%	-2.5%	-2.7%	-2.5%	-1.3%	-0.4%	-0.2%	0.5%	1.3%	2.3%	2.4%	3.1%	3.8%	4.0%	4.1%
1985	1.9%	1.5%	1.4%	0.9%	-1.3%	-1.2%	-1.1%	-1.4%	-1.3%	-0.1%	0.8%	1.0%	1.7%	2.5%	3.5%	3.5%	4.2%	4.9%	5.1%	5.2%
1986	1.4%	1.0%	1.0%	0.5%	-1.8%	-1.8%	-1.6%	-1.9%	-1.7%	-0.4%	0.5%	0.8%	1.5%	2.3%	3.4%	3.4%	4.1%	4.9%	5.1%	5.2%
1987	-0.7%	-0.9%	-0.7%	-1.1%	-3.4%	-3.2%	-2.9%	-3.1%	-2.9%	-1.4%	-0.4%	-0.1%	0.7%	1.6%	2.7%	2.8%	3.6%	4.4%	4.6%	4.7%
1988	-4.0%	-3.8%	-3.2%	-3.3%	-5.7%	-5.2%	-4.7%	-4.8%	-4.4%	-2.8%	-1.6%	-1.3%	-0.4%	0.7%	1.9%	2.0%	2.8%	3.7%	3.9%	4.1%
1989	-1.3%	-1.4%	-1.1%	-1.6%	-4.4%	-4.0%	-3.6%	-3.8%	-3.4%	-1.7%	-0.5%	-0.2%	0.7%	1.7%	2.9%	3.0%	3.9%	4.8%	4.9%	5.0%
1990	-0.9%	-1.2%	-0.8%	-1.4%	-4.5%	-4.1%	-3.7%	-3.8%	-3.5%	-1.7%	-0.4%	0.0%	0.9%	2.0%	3.3%	3.3%	4.2%	5.1%	5.3%	5.4%
1991	-0.1%	-0.6%	-0.3%	-1.1%	-4.7%	-4.3%	-3.7%	-3.9%	-3.5%	-1.5%	-0.1%	0.2%	1.2%	2.3%	3.7%	3.7%	4.6%	5.6%	5.7%	5.8%
1992	4.6%	2.3%	2.0%	0.6%	-4.0%	-3.6%	-3.0%	-3.3%	-2.9%	-0.8%	0.6%	0.9%	2.0%	3.1%	4.5%	4.5%	5.4%	6.4%	6.5%	6.6%
1993	16.3%	6.6%	4.7%	2.3%	-3.6%	-3.2%	-2.6%	-3.0%	-2.6%	-0.3%	1.2%	1.5%	2.6%	3.8%	5.2%	5.2%	6.1%	7.1%	7.2%	7.2%
1994		-2.2%	-0.6%	-2.0%	-8.1%	-6.7%	-5.4%	-5.5%	-4.7%	-2.0%	-0.1%	0.3%	1.5%	2.9%	4.5%	4.5%	5.5%	6.6%	6.7%	6.8%
1995			1.0%	-1.9%	-9.9%	-7.7%	-6.1%	-6.0%	-5.1%	-2.0%	0.1%	0.5%	1.9%	3.3%	5.0%	5.0%	6.0%	7.2%	7.3%	7.3%
1996				-4.7%	-14.9%	-10.5%	-7.8%	-7.3%	-6.0%	-2.4%	0.0%	0.5%	2.0%	3.5%	5.4%	5.3%	6.4%	7.6%	7.7%	7.7%
1997					-24.1%	-13.2%	-8.8%	-8.0%	-6.3%	-2.0%	0.7%	1.1%	2.7%	4.4%	6.3%	6.2%	7.3%	8.5%	8.5%	8.5%
1998						-0.8%	0.0%	-1.9%	-1.2%	3.1%	5.5%	5.4%	6.7%	8.2%	10.0%	9.4%	10.5%	11.6%	11.4%	11.1%
1999							0.8%	-2.4%	-1.4%	4.2%	6.8%	6.4%	7.8%	9.4%	11.3%	10.5%	11.6%	12.7%	12.3%	12.0%
2000								-5.6%	-2.5%	5.3%	8.4%	7.6%	9.0%	10.6%	12.6%	11.7%	12.7%	13.8%	13.4%	12.9%
2001									0.7%	11.2%	13.5%	11.2%	12.2%	13.6%	15.5%	14.0%	14.9%	16.0%	15.3%	14.6%
2002										22.8%	20.4%	14.9%	15.3%	16.4%	18.2%	16.1%	16.8%	17.8%	16.8%	16.0%
2003											18.1%	11.1%	12.8%	14.8%	17.3%	15.0%	16.0%	17.2%	16.2%	15.3%
2004												4.5%	10.3%	13.7%	17.1%	14.4%	15.7%	17.0%	15.9%	15.0%
2005													16.4%	18.6%	21.6%	17.0%	18.0%	19.3%	17.7%	16.4%
2006														20.9%	24.2%	17.2%	18.4%	19.9%	17.9%	16.4%
2007															27.7%	15.4%	17.6%	19.6%	17.3%	15.7%
2008																4.2%	12.9%	17.0%	14.8%	13.4%
2009																	22.3%	24.0%	18.6%	15.8%
2010																		25.7%	16.8%	13.8%
2011																			8.6%	8.2%
2012																				7.9%



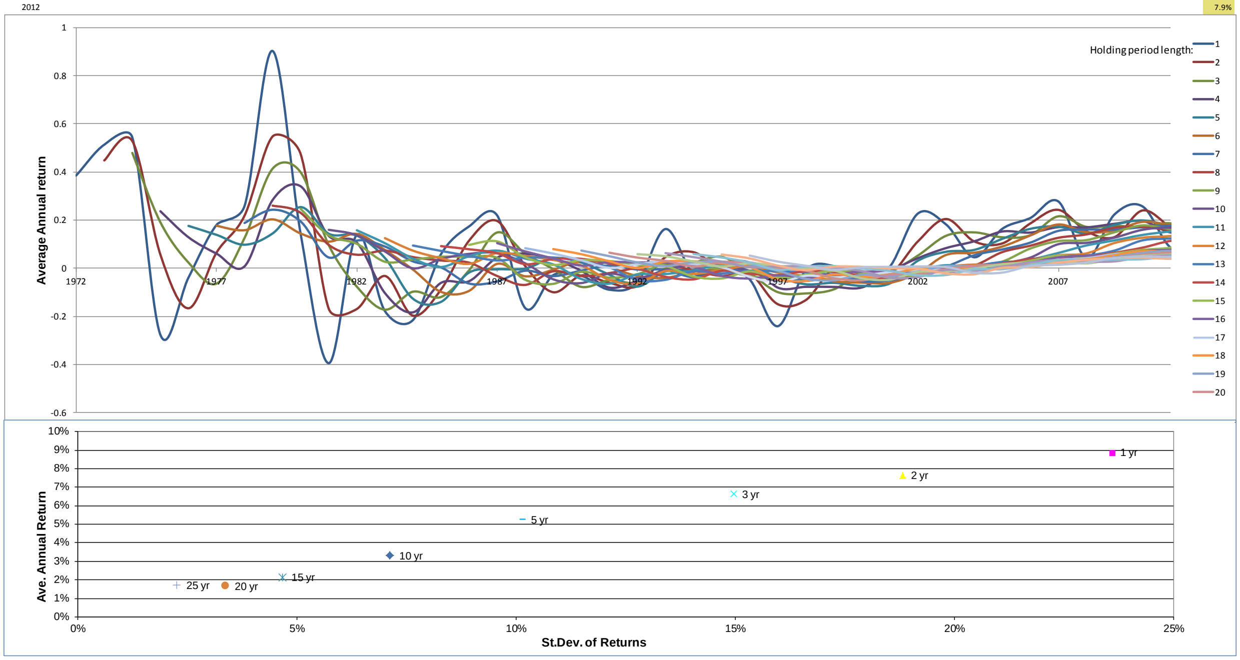


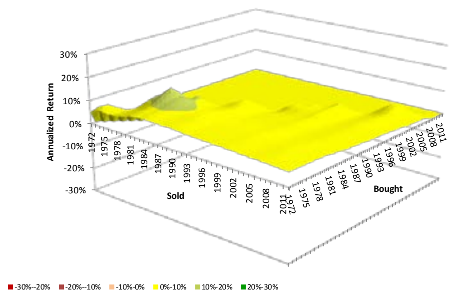
Figure 14. Gold returns profiles through time and by holding period

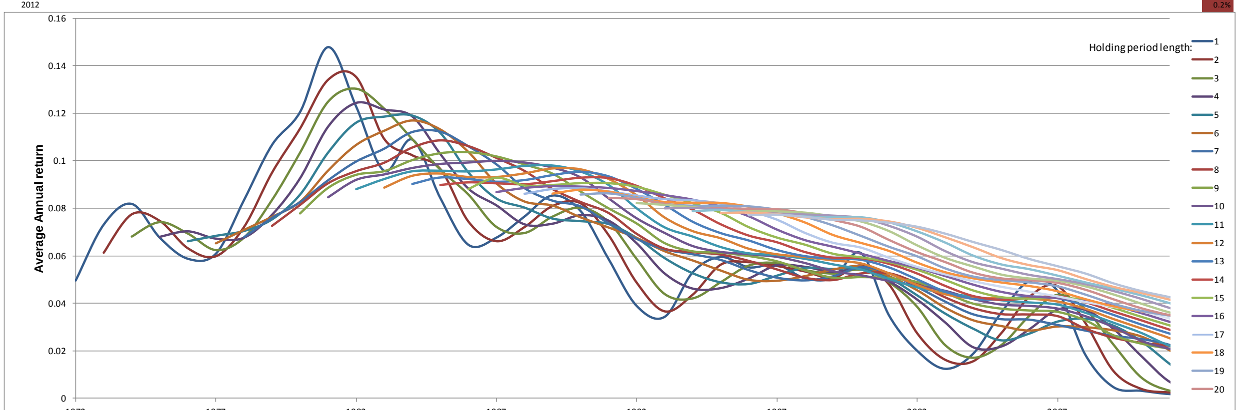
TCM1Y

Sell (end of year)

Buy (beginning of year)

Buy \ Sell	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1972	5.0%	6.1%	6.8%	6.8%	6.6%	6.5%	6.8%	7.3%	7.8%	8.5%	8.8%	8.9%	9.0%	9.0%	8.8%	8.7%	8.6%	8.6%	8.6%	8.4%	8.2%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.4%	7.4%	7.3%	7.1%	6.9%	6.7%	6.6%	6.6%	6.5%	6.4%	6.3%	6.1%	5.9%	5.8%
1973		7.3%	7.7%	7.4%	7.0%	6.8%	7.1%	7.6%	8.1%	8.9%	9.2%	9.2%	9.4%	9.3%	9.1%	8.9%	8.9%	8.8%	8.8%	8.6%	8.4%	8.1%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.5%	7.3%	7.2%	7.0%	6.8%	6.7%	6.6%	6.6%	6.5%	6.3%	6.1%	6.0%	5.8%
1974			8.2%	7.5%	6.9%	6.7%	7.0%	7.6%	8.3%	9.1%	9.4%	9.4%	9.6%	9.5%	9.2%	9.0%	9.0%	8.9%	8.9%	8.7%	8.4%	8.2%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.5%	7.3%	7.2%	6.9%	6.8%	6.7%	6.6%	6.6%	6.4%	6.3%	6.1%	5.9%	5.8%
1975				6.8%	6.3%	6.2%	6.8%	7.5%	8.3%	9.2%	9.6%	9.6%	9.7%	9.6%	9.3%	9.1%	9.0%	9.0%	8.9%	8.7%	8.5%	8.2%	8.0%	7.9%	7.8%	7.7%	7.6%	7.5%	7.5%	7.3%	7.1%	6.9%	6.7%	6.6%	6.6%	6.5%	6.4%	6.2%	6.0%	5.9%	5.7%
1976					5.9%	6.0%	6.8%	7.7%	8.6%	9.6%	10.0%	9.9%	10.0%	9.9%	9.5%	9.3%	9.2%	9.1%	9.1%	8.9%	8.6%	8.3%	8.1%	8.0%	7.9%	7.8%	7.7%	7.5%	7.5%	7.3%	7.1%	6.9%	6.7%	6.6%	6.6%	6.5%	6.4%	6.2%	6.0%	5.8%	5.7%
1977						6.1%	7.2%	8.3%	9.3%	10.3%	10.7%	10.5%	10.6%	10.3%	9.9%	9.6%	9.5%	9.4%	9.3%	9.1%	8.7%	8.4%	8.2%	8.1%	8.0%	7.9%	7.7%	7.6%	7.6%	7.4%	7.2%	7.0%	6.8%	6.7%	6.6%	6.5%	6.4%	6.2%	6.0%	5.8%	5.7%
1978							8.3%	9.5%	10.3%	11.4%	11.6%	11.3%	11.2%	10.9%	10.4%	10.0%	9.8%	9.7%	9.5%	9.3%	8.9%	8.6%	8.4%	8.2%	8.1%	8.0%	7.8%	7.7%	7.6%	7.4%	7.2%	7.0%	6.8%	6.7%	6.6%	6.5%	6.4%	6.2%	6.0%	5.8%	5.7%
1979								10.7%	11.4%	12.5%	12.4%	11.9%	11.7%	11.2%	10.6%	10.2%	9.9%	9.8%	9.6%	9.3%	8.9%	8.6%	8.4%	8.2%	8.1%	7.9%	7.8%	7.7%	7.6%	7.4%	7.2%	6.9%	6.7%	6.6%	6.6%	6.5%	6.3%	6.1%	5.9%	5.8%	5.6%
1980									12.0%	13.4%	13.0%	12.2%	11.9%	11.3%	10.6%	10.1%	9.8%	9.7%	9.5%	9.2%	8.8%	8.4%	8.2%	8.1%	7.9%	7.8%	7.6%	7.5%	7.4%	7.3%	7.0%	6.8%	6.6%	6.5%	6.4%	6.3%	6.2%	6.0%	5.8%	5.6%	5.4%
1981										14.8%	13.5%	12.2%	11.9%	11.2%	10.4%	9.8%	9.6%	9.5%	9.3%	9.0%	8.5%	8.1%	7.9%	7.8%	7.7%	7.5%	7.4%	7.3%	7.2%	7.0%	6.8%	6.6%	6.4%	6.2%	6.2%	6.1%	6.0%	5.8%	5.6%	5.4%	5.2%
1982											12.3%	10.9%	10.9%	10.3%	9.5%	9.0%	8.8%	8.8%	8.7%	8.4%	8.0%	7.6%	7.4%	7.3%	7.2%	7.1%	7.0%	6.9%	6.8%	6.7%	6.4%	6.2%	6.0%	5.9%	5.9%	5.8%	5.7%	5.5%	5.3%	5.1%	5.0%
1983												9.6%	10.2%	9.6%	8.8%	8.4%	8.3%	8.3%	8.3%	8.0%	7.6%	7.2%	7.0%	7.0%	6.8%	6.8%	6.7%	6.6%	6.5%	6.4%	6.2%	5.9%	5.7%	5.6%	5.6%	5.6%	5.4%	5.2%	5.0%	4.9%	4.7%
1984													10.9%	9.6%	8.6%	8.1%	8.0%	8.1%	8.1%	7.8%	7.4%	7.0%	6.8%	6.7%	6.6%	6.6%	6.5%	6.4%	6.4%	6.2%	6.0%	5.7%	5.5%	5.5%	5.4%	5.4%	5.3%	5.1%	4.9%	4.7%	4.6%
1985														8.4%	7.4%	7.2%	7.3%	7.6%	7.6%	7.4%	6.9%	6.5%	6.4%	6.4%	6.3%	6.2%	6.2%	6.1%	6.1%	5.9%	5.7%	5.5%	5.3%	5.2%	5.2%	5.2%	5.0%	4.8%	4.7%	4.5%	4.3%
1986															6.5%	6.6%	7.0%	7.4%	7.5%	7.2%	6.7%	6.3%	6.2%	6.2%	6.1%	6.1%	6.0%	5.9%	5.9%	5.8%	5.6%	5.3%	5.1%	5.0%	5.0%	5.0%	4.9%	4.7%	4.5%	4.3%	4.2%
1987																6.8%	7.2%	7.6%	7.7%	7.3%	6.8%	6.3%	6.2%	6.1%	6.1%	6.0%	5.9%	5.9%	5.9%	5.7%	5.5%	5.2%	5.1%	5.0%	5.0%	5.0%	4.8%	4.6%	4.4%	4.3%	4.1%
1988																	7.7%	8.1%	8.0%	7.5%	6.8%	6.2%	6.1%	6.0%	6.0%	6.0%	5.9%	5.8%	5.8%	5.7%	5.4%	5.1%	5.0%	4.9%	4.9%	4.9%	4.7%	4.5%	4.3%	4.2%	4.0%
1989																		8.5%	8.2%	7.4%	6.5%	5.9%	5.8%	5.8%	5.8%	5.8%	5.7%	5.6%	5.7%	5.5%	5.3%	5.0%	4.8%	4.7%	4.7%	4.7%	4.6%	4.4%	4.2%	4.0%	3.8%
1990																			7.9%	6.9%	5.9%	5.3%	5.3%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%	5.3%	5.0%	4.7%	4.5%	4.5%	4.5%	4.5%	4.4%	4.2%	4.0%	3.8%	3.6%
1991																				5.9%	4.9%	4.4%	4.6%	4.9%	5.0%	5.1%	5.1%	5.1%	5.2%	5.0%	4.8%	4.5%	4.3%	4.3%	4.3%	4.3%	4.2%	4.0%	3.8%	3.6%	3.5%
1992																					3.9%	3.7%	4.2%	4.6%	4.8%	4.9%	5.0%	5.0%	5.1%	4.9%	4.7%	4.4%	4.2%	4.1%	4.2%	4.2%	4.1%	3.9%	3.7%	3.5%	3.3%
1993																						3.4%	4.4%	4.9%	5.0%	5.2%	5.1%	5.1%	5.3%	5.1%	4.7%	4.4%	4.2%	4.2%	4.2%	4.2%	4.1%	3.9%	3.7%	3.5%	3.3%
1994																							5.3%	5.6%	5.6%	5.6%	5.5%	5.4%	5.5%	5.3%	4.9%	4.5%	4.3%	4.2%	4.3%	4.3%	4.1%	3.9%	3.7%	3.5%	3.3%
1995																								5.9%	5.7%	5.7%	5.5%	5.4%	5.6%	5.3%	4.8%	4.4%	4.2%	4.1%	4.2%	4.2%	4.0%	3.8%	3.6%	3.4%	3.2%
1996																									5.5%	5.6%	5.4%	5.3%	5.5%	5.1%	4.7%	4.2%	4.0%	3.9%	4.0%	4.1%	3.9%	3.7%	3.4%	3.2%	3.0%
1997																										5.6%	5.3%	5.3%	5.5%	5.1%	4.5%	4.1%	3.8%	3.8%	3.9%	3.9%	3.8%	3.5%	3.3%	3.1%	2.9%
1998																											5.1%	5.1%	5.4%	4.9%	4.3%	3.8%	3.5%	3.5%	3.7%	3.8%	3.6%	3.3%	3.1%	2.9%	2.7%
1999																												5.1%	5.6%	4.9%	4.2%	3.6%	3.3%	3.3%	3.5%	3.6%	3.5%	3.2%	2.9%	2.7%	2.5%
2000																													6.1%	4.8%	3.8%	3.2%	2.9%	3.0%	3.3%	3.5%	3.3%	3.0%	2.7%	2.5%	2.3%
2001																														3.5%	2.7%	2.2%	2.2%	2.4%	2.9%	3.1%	2.9%	2.7%	2.4%	2.2%	2.0%
2002																															2.0%	1.6%	1.7%	2.2%	2.7%	3.0%	2.9%	2.6%	2.3%	2.1%	1.9%
2003																																1.2%	1.6%	2.2%	2.9%	3.2%	3.0%	2.6%	2.3%	2.1%	1.9%
2004																																	1.9%	2.7%	3.5%	3.7%	3.3%	2.9%	2.5%	2.2%	2.0%
2005																																		3.6%	4.3%	4.4%	3.7%	3.1%	2.6%	2.2%	2.0%
2006																																			4.9%	4.7%	3.7%	2.9%	2.4%	2.0%	1.8%
2007																																				4.5%	3.2%	2.3%	1.8%	1.4%	1.2%
2008																																					1.8%	1.1%	0.9%	0.7%	0.6%
2009																																						0.5%	0.4%	0.3%	0.3%
2010																																							0.3%	0.2%	0.2%
2011																																								0.2%	0.2%
2012																																									0.2%





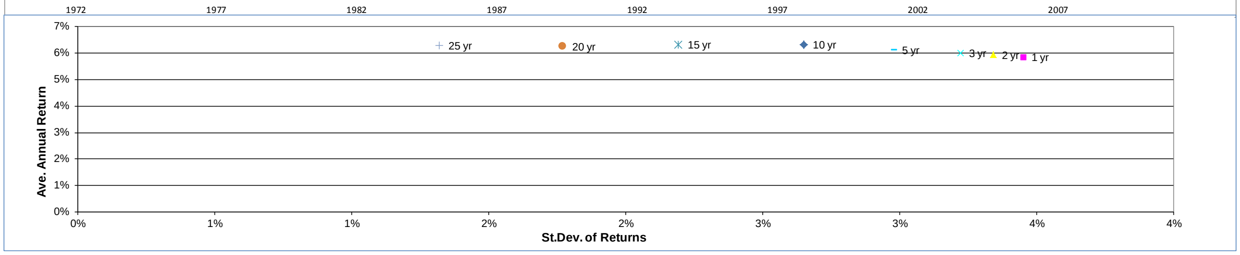


Figure 15. 1-yr. Constant maturity treasury returns profiles through time and by holding period

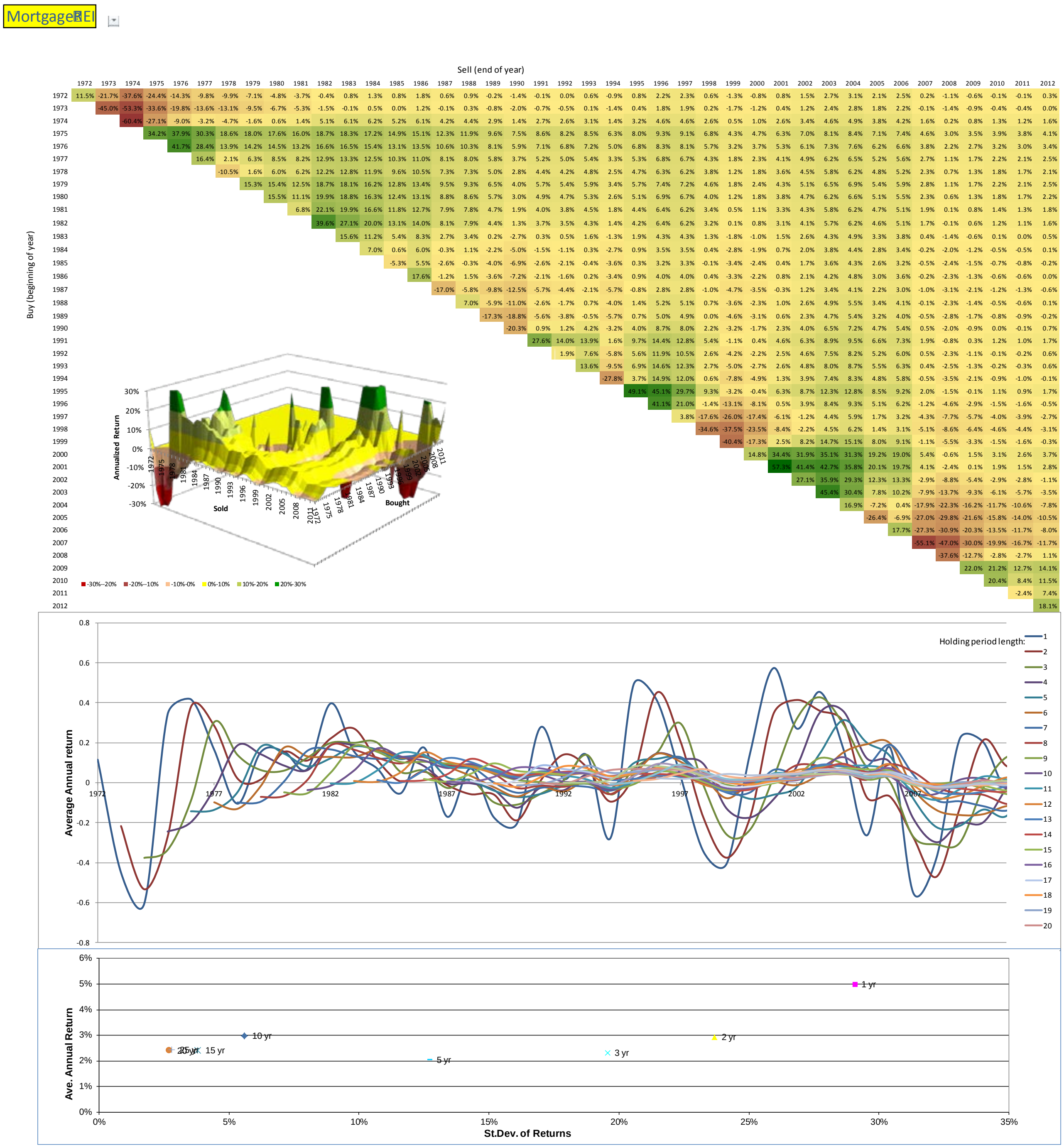


Figure 16. Mortgage REITS returns profiles through time and by holding period

Portfolio Considerations:

When evaluating the investment performance of an asset, it is important to not only assess its own performance in isolation, and relative to the sample period available, but to also understand its role in the diversification of a portfolio, and its relationship to inflation and other factors that affect future purchasing power. Measures of correlation provided earlier for farmland relative to other assets is only one small piece of the puzzle. If the existing set of assets is highly diverse and has relative independence across market conditions – in essence complete market conditions exists outside real assets – then the addition of farmland is unlikely to change the available E-V frontier due to diversification effects alone. If on the other hand the asset is relatively unrelated to the other classes of assets held, then there can be substantial improvements in the efficiency of the available frontier. This discussion assumes a zero alpha, but to the extent that that condition does not hold on either side of zero, the EV frontier can be further altered with the inclusion of farmland.

Next, a simple risk-return plot is provided in figure 17 prior to forming efficient investment portfolios that helps convey the role expected for farmland in a portfolio. The set of low risk returns are largely fixed income or debt positions, and the higher risk items are equities, REITs and gold. The attractive characteristics shown for farmland may be difficult for individuals to capture, and thus may not be relevant for some forms of portfolio optimization. Nonetheless, we begin by simply optimizing combinations (maximize return for each level of risk by solving for weights) of this set of candidate investments with non-negative restrictions. The resulting risk efficient or "E-V" frontier is provided in the top panel of figure 18. The shares of each investment across levels of risk are provided in the lower panel of the graph. In the unrestricted case, the typical results hold that at low risk levels, the portfolio is comprised primarily of fixed income assets and as risk and return increase, the portfolio increasingly becomes weighted toward equities and other riskier assets. If unrestricted farmland is included in the allowable assets, the remarkable feature is that the risk-efficient portfolio contains over 50% farmland at roughly the middle range of the feasible risk range. As the portfolio proceeds to the higher and higher return-risk combinations, farmland becomes the majority asset. This general result has been noted in prior work, and is typically explained away as “not easily adjusted” holdings, or due to omitted higher transactions costs, or unfeasibly long holding periods. It remains remarkable, however, that farmland returns measured in aggregate generate this result at all, regardless of the source of the deviation from empirical shares actually held, except perhaps by farmers.

Figure 17. Risk-return profiles of alternative investments, 1970-2012

To begin to assess the impact of restricted portfolio holdings, the exercise is repeated but with maximums of 33.33% by class, insuring that at least 3 assets enter at each point in the restricted set. Interestingly, figure 19 displays the feature that the restriction actually *increases* the optimal holdings of farmland relative to fixed income assets, and gold and other real estate also enter in larger proportions. What might at first seem counterintuitive given the unrestricted portfolio results simply reflects the fact that farmland’s returns are measured to have low volatility and hence substitute for the treasury securities at low risk levels on the E-V curve. The primary impact of the restriction is to lower the overall attainable returns profile.

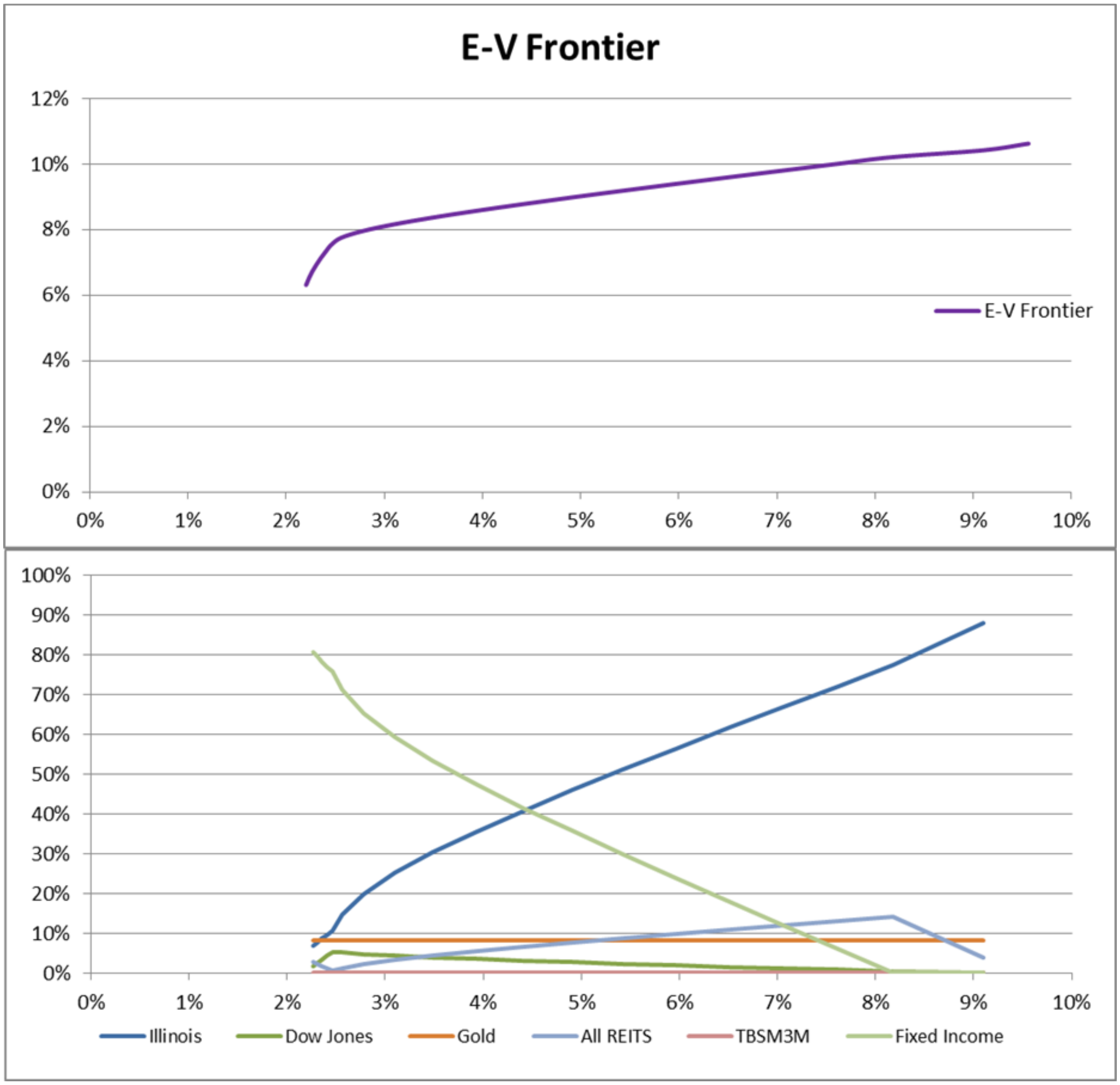


Figure 18. E-V frontier and Asset Shares by risk level - unrestricted

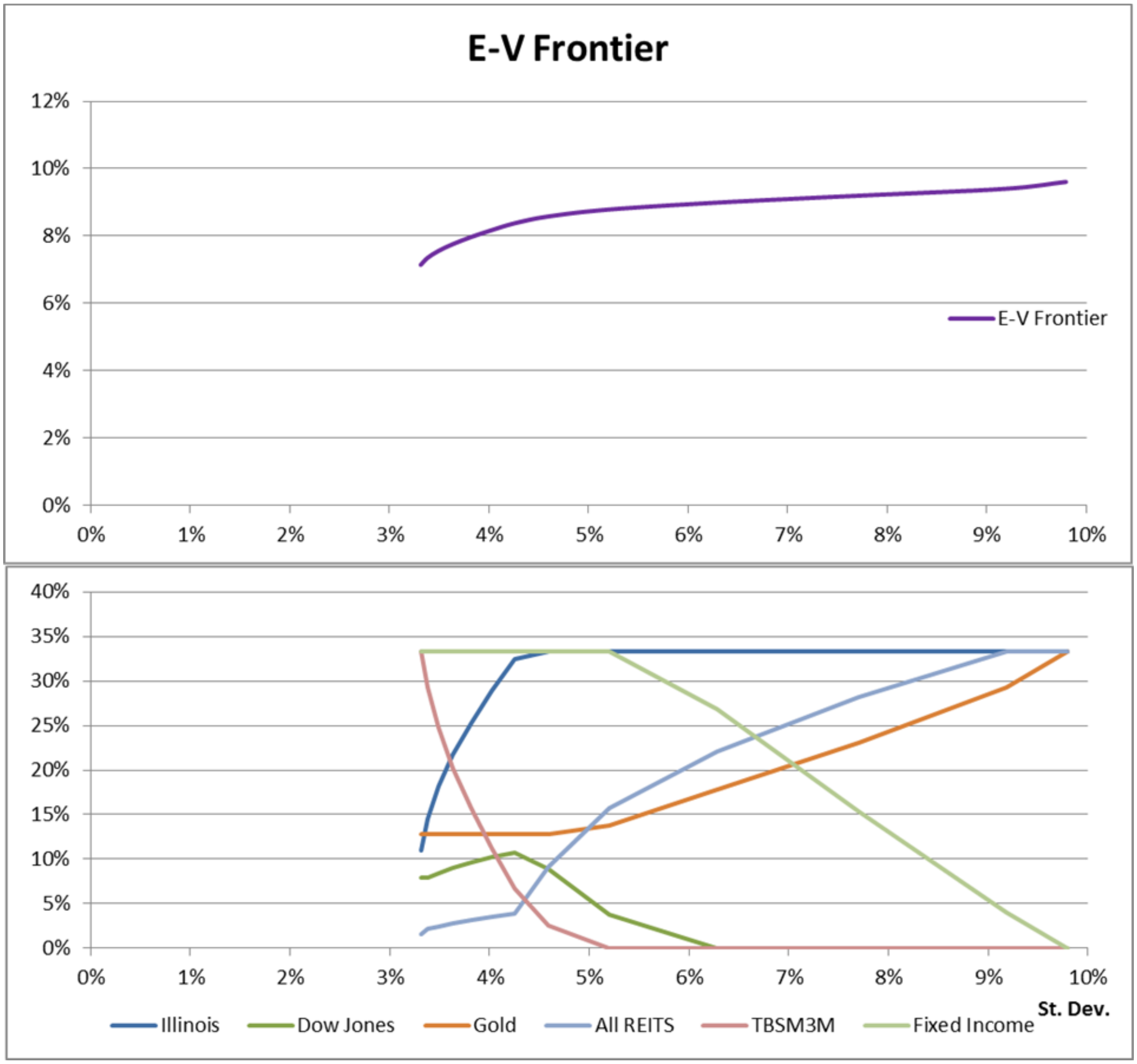


Figure 19. E-V frontier and Asset Shares by risk level – maximum 33.3% shares

Next, to consider the impact of market frictions, we next stress the measured farmland returns by reducing their levels by 1% each period (to reflect transactions costs, management, etc.) and by multiplying the variance by 120% of its sample value. For this analysis, covariances remain as estimated, and the EV frontier re-solved. Importantly, there is little effect as farmland still enters the efficient frontier are relatively high levels throughout, though reduced from the unrestricted set, shown in figure 20. The main impacts again are on the achievable EV set – with the changes to the farmland series of a 1% reduction in annual return and a 120% multiple on its own variance, the achievable EV frontier is moved to the right (higher risk) but the holding patterns are remarkably stable.

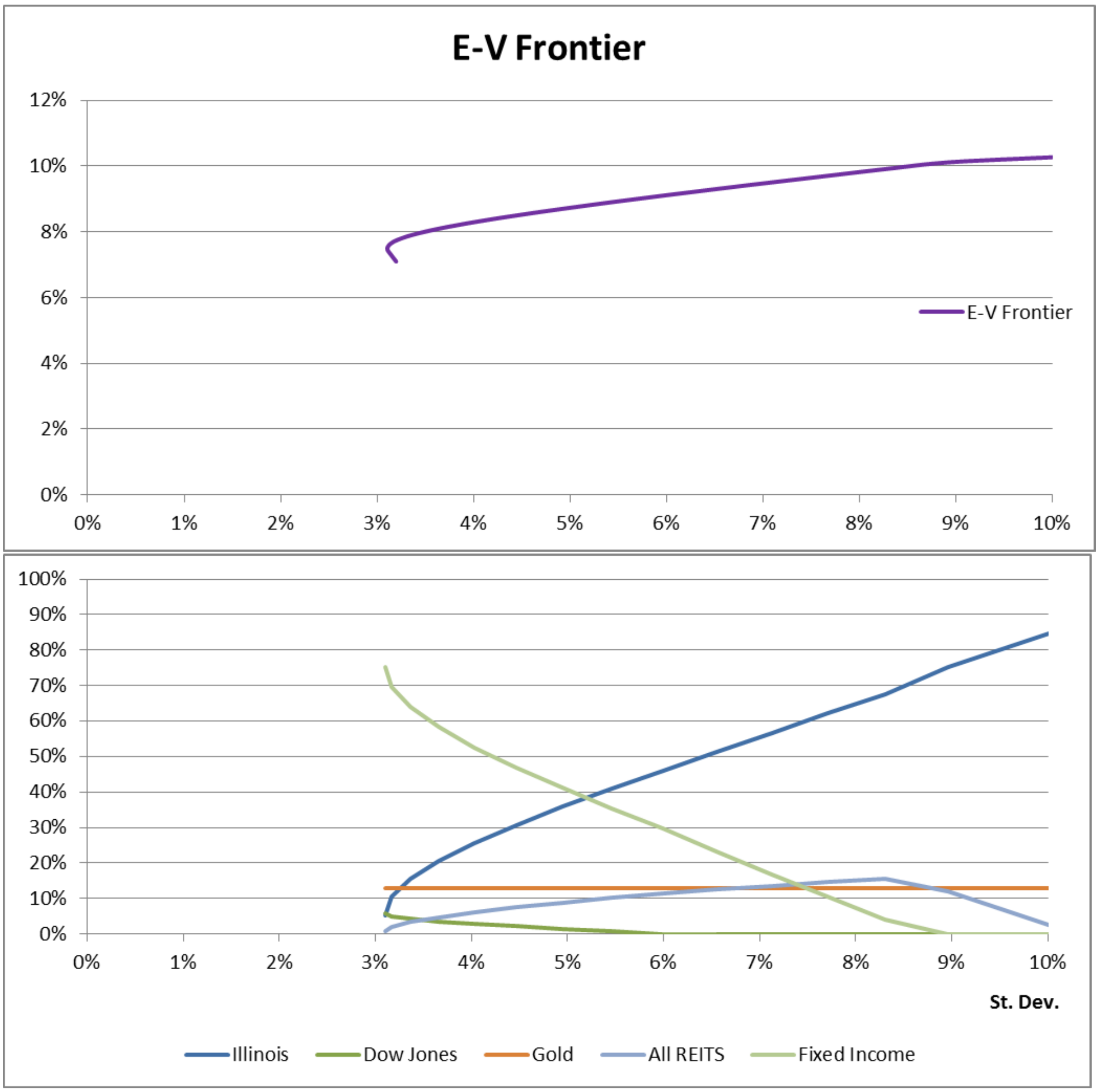


Figure 20. E-V frontier Augmented (1% annual return reduction, 120% variance for farmland)

The information about farmland investments presented above amplifies the message from the previous analysis and much past academic research -- farmland returns have been relatively strong and display low systematic risk, and good diversification benefits. The recent few years have (again) witnessed rates of capital gain that are (again) relatively high by historical standards, and as a result, have generated (renewed) high interest in farmland investments by non-operator investors, institutional investors, and by owner-operators seeking to expand. In virtually all cases, the evidence suggests that the investment class has performed well whether viewed in isolation, or as a complement to other investment holdings and should be considered when evaluating any mixed-asset investment set. In addition to evidence that farmland returns have at least compensated their systematic risk, variability measures of returns to farmland investments demonstrates stability and fairly consistent time aggregation. Finally, farmland returns have also shown positive correlation with inflation measures over the available periods and under most constructions of sample periods, though there appears to be some "state dependence" and additional work is called for to assess the relative performance under alternative regimes of inflation uncertainty.

Future Issues Potentially impacting Farmland Markets:

In this final section, we identify and outline a set of contemporary issues thought to have potential impacts on farmland markets in the future. The list is neither exhaustive, nor ordered by importance, and in some cases in fact is only meant to preview issues that we have been asked to investigate further. Still, it is important to establish a record of the issues and events that are most commonly debated in policy settings, questioned among potential land market participants, and investigated in academic settings. The intent is that this list will be self-regenerating through time with the most important items remaining or resolving, and newly identified issues of the day appearing as they rise to a level of importance for meaningful discourse and debate. Considering the list that might have been in place a couple of decades ago warns that this exercise is bound to miss several issues of importance not yet anticipated, but also to include recurring themes and questions of continued relevance. It is presented in simple bullet form with related statement to present multiple facets of the issue and suggest potential impacts on farmland markets.

Food/Fuel and Future Uses: Much of the increase in commodity price levels during the past decade has been attributable to the RFS and requirements for ethanol and low greenhouse gas biofuels. Energy policy and farm policy are sometimes in conflict, and yet the existing standards, if unchanged, have substantial implications for the demand for soybeans in particular, and the maintenance of corn demand. Substantial changes to the RFS, or to technologies for meeting the standards that create viable biofuels could have dramatic impact on cropping patterns, demand patterns, and feed costs for livestock. The implications for land markets are direct to the extent that changes occur to expectations about future income from the production of crops. (see farm doc daily series for links to relevant research.)

Crop insurance and its role in future farm programs including the potential loss of Title 1 from the farm bill stand as "event" windows on the future income paths to agricultural production. The current debate as of September 2013 is largely leaving traditional crop insurance alone, but is considering means testing for subsidy, and alternative subsidy design. For row crops, crop insurance has become almost as standard an input as fuel and seed. Substantial increases in funding for, and flexibility of insurance programs is also quite possible as it is a very favorable conduit under WTO type evaluations as a non-distorting, and de minimis subsidy despite its magnitude (recall the WTO views a subsidy rate with respect to the value of the crop produced, not with respect to the insurance product.) Competing programs under the Senate and House versions happen to both include a target price analog, and by many evaluations, one that favors certain crops like cotton and peanuts relative to the existing programs. Crop insurance does however reset each year at the price of the underlying commodity expected for that crop year, and the level of income that is possible to guarantee can still vary greatly from year to year.

Multi-country farmland issues include the rapidly increasing demand for calories on a world basis, and the increasing ability to provide those from multiple sources and through multiple channels. As standards of living increase, the quality of calories consumed in food increases and the amount of caloric share converted to higher quality proteins through livestock increases. The traditional production regions with stable export flows are being challenged, and remaining arable areas of the world are being brought into production as economic incentive warrant. The strength of the US in world commodity markets could be threatened or improved due to forces exogenous to US. Direct foreign ownership laws can also become lightning rods for trade and political conflict issues to some degree, though most economists favor few restrictions on who can own what and where based on market efficiency and market completion arguments alone.

Property taxation is increasingly scrutinized, especially as state-based aid for schools across the US is increasingly limited. In Illinois for example, there are calls to limit the preferential impact of farmland property taxation. Means testing for certain federal medical assistance programs (especially Medicaid) have provisions that increasingly consider market valuation of holdings of real assets beyond the residence.

The intersection between rural and urban populations increasingly is joined by environmental and land use issues that could affect farming. Green space laws and other interface issues can lead to governmental responses that can affect property values directly. In total, the irreversibility of development and increasing scarcity arguments tend to outweigh effective confiscation of property rights concerns.

Farmland securitization channels: farmland remains possibly the largest single values asset without an effective mechanism for securitization and direct exposure to the asset class. The eventual solution of the farmland equity “puzzle box”could lead to increasing efficiency in ownership and operation. The usefulness of such an eventuality in hedging of ownership shares and in diversifying local exposures is dramatic and direct.

Macro connections derivative of Federal Reserve and government actions, including through interest rate targeting programs, has substantial potential to alter relative values of many sectors in the economy. Many scenarios favor real assets under certain inflationary and growth environments, but the potential change in general fed policy could happen with unknown consequences. The Fed to Farm linkages are difficult to forecast but may have substantial relevance through interest rate markets in particular.

China’s role in World food markets: “What future for, or because of China, to movements of grains in world” remains an interesting question. China has begun a rapid improvement in its agricultural production sector, but has also continued to increase demand faster than supply capacity. The possibility of infrastructure developments in China to allow the movement of commodities from further inland originations could dramatically alter world trade patterns.

Water availability is crucial for agricultural production. In arid regions, the availability of groundwater for irrigation greatly impacts the productivity and therefore economic value of farmland. In other regions, issues related to water quality and agricultural production, such as erosion or potential contamination, play an important role. Like many of the other issues outlined above, water is likely to become even more important in the future as the demand for agricultural products grows and changes. In the US, the "battleground" for issues related to impact of agricultural production on environmental quality also has increasingly included water usage and water rights conflicts.

Concluding comments:

This whitepaper compendium represents a framework to organize and integrate issues of contemporary importance to farmland markets. It is intended that this document and its linked resources will continue to evolve and reflect the most important issues affecting farmland markets and provide a sense of research projects and tools that are needed to better understand farmland markets and inform those with interests in the single largest asset in agriculture.

The **Center** represents a truly unique capacity to engage in investigations and outreach activities that support a wide range of activities and interests, but with a common intent to use accurate and timely research efforts to inform sustainable and responsible investment and management practices in agriculture.

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