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**FARM OPERATOR'S UTILIZATION OF DEBT REPAYMENT CAPACITY: A LEADING
INDICATOR OF FARM FINANCIAL STRESS**

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FARM OPERATORS' UTILIZATION OF DEBT REPAYMENT CAPACITY: A LEADING INDICATOR OF FARM FINANCIAL STRESS

James T. Ryan*

Total farm business debt rose by over \$7 billion during 1997, surpassing \$165 billion in reaching its highest level since 1986 (USDA). Preliminary estimates indicate that debt rose another \$5 billion in 1998. Despite a favorable interest rate environment, this increase in debt, combined with slightly declining farm incomes and relatively low commodity prices for the near future, suggests that indebted farm operators will have less income available to meet higher principal and interest payments on their loans. There is concern that the rise in farm debt may burden the sector's ability to repay, and precipitate a return of financial stress in the sector. The agricultural finance community was criticized for its failure to anticipate the farm financial crisis of the mid-1980s, a time of rapidly declining land values, farm foreclosures, debt write-offs and restructurings, and bank failures.

Much of the financial crisis of the mid-1980s can be attributed to the build-up of debt in the preceding years. Farm business debt more than quadrupled from about \$46 billion in 1969 to \$194 billion by the end of 1984. As financial problems extended beyond the farm gate to farmers' creditors and suppliers, farm business debt fell over \$56 billion from this peak, to \$138 billion by the end of 1989.

Farmland values rose throughout the 970's, facilitated, to an extent, by the collateral-based loan policy of some agricultural lenders. The total value of farm business assets increased from \$270 billion at the beginning of 1970 to almost \$1 trillion by the end of 1981, while total farm debt increased from \$46 billion to \$182 billion over this same period. As farm debt continued to rise, reaching \$194 billion in 1984, land values began to decline in 1981, and, by the end of 1984, the total value of assets had fallen to \$857 billion.

The rise in asset values and expansion of credit use, at least in retrospect, appears to have anticipated projected income increases that failed to materialize. While most financial experts agree that strategic use of debt capital can enhance long term productivity and profitability, in the ensuing years it was obvious that farmers had accumulated too much debt. The farm financial crisis of the mid-1980's was driven, to a large extent, by the inability of borrowers to meet higher debt repayment obligations out of the cash income that their farms were generating.

While there is ample literature on optimal capital structure for individual farms, little research has addressed the issue of a "maximum" level of debt that the farm sector can carry before widespread financial problems are likely to ensue. In an effort to better monitor potential farm financial problems as they arise, ERS has developed a farm sector model comparing of farmers' actual debt with that which could be serviced by current income (Ryan, 1995). This paper presents that debt repayment capacity utilization (DRCU) model, which measures actual debt

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relative to the maximum debt that farm operator income can support, given the constraint of meeting a minimum debt coverage ratio. While the debt coverage ratio is a traditional financial performance standard applied to individual loan applicants, it is modified here to apply to farm sector accounts. Comparisons of actual outstanding debt with this hypothetical maximum, debt repayment capacity, are presented for U.S. farm operators for 1970-98.

Debt repayment capacity utilization is derived and compared with indexes of land value declines and lender charge-offs, which are both symptoms and effects of farm financial stress.

Credit Capacity

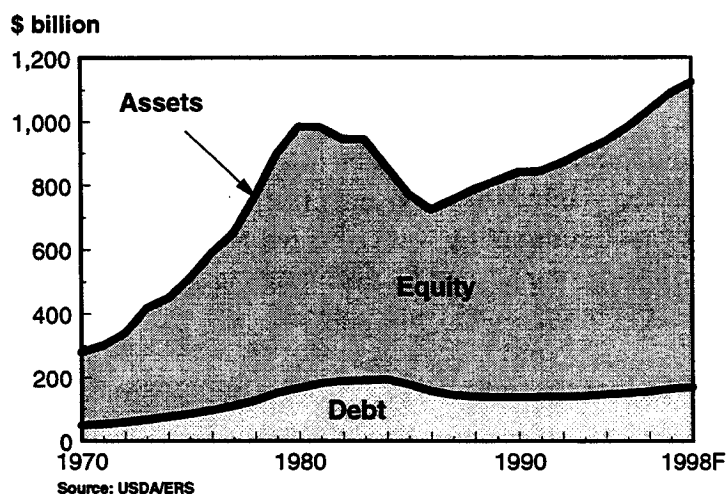
Agricultural lenders evaluate borrower creditworthiness based on a combination of factors, including the loan applicant's character, repayment capacity, financial condition, and value of collateral offered as loan security. The Farm Financial

Standards Council (FFSC) has developed standardized financial statements and recommended universal financial criteria and measures, which are being adapted by lenders as standard loan documentation materials. In practice, lenders apply a range of measurable creditworthiness criteria in calculating any applicant's maximum loan eligibility, or credit capacity. Credit criteria are then weighted in determining the ultimate loan amount. Different credit criteria emerge as most restrictive in determining credit capacity for different borrowers at any point in time, while, over time, different criteria are most restrictive for all borrowers as a group. As the farm sector recovery progressed during the late 1980's, lenders placed greater emphasis on borrowers' ability to cash flow loan payments out of current income. In evaluating loan applicants' repayment ability, lenders relied more heavily on debt coverage margins and debt coverage ratios, and reduced emphasis on loans based on the collateral value of the assets.

The evaluation of a loan applicant's credit capacity varies among lenders, depending on the relative emphasis each places on the various creditworthiness criteria. Farmer Mac, the secondary market for farm real estate mortgages, determined seven underwriting standards for loans qualifying to be included in a mortgage pool (FAMC). These standards define measures of a loan applicant's past and anticipated financial performance, as evidenced by historic and pro forma liquidity, solvency, profitability, and repayment capacity ratios. Farmer Mac requires that these standards all be met simultaneously for eligible loans, with no weighting of criteria.

Applying each Farmer Mac standard to any given borrower can, in effect, provide an independent estimate of that borrower's credit capacity. It appears that these alternative measures can produce distinctly different estimates of credit capacity. A previous analysis of Farmer Mac standards indicated that, in 1994, over 72 percent of all farm operators were eligible for Farmer Mac

Farm sector balance sheet, 1970-98



pooling under the debt/asset ratio standard (50 percent or less), but only 48 percent qualified under the debt coverage ratio standard (at least 1.25:1) (Koenig and Ryan, 1996). The debt coverage ratio was the most restrictive of the individual Farmer Mac guidelines. When considering all underwriting standards simultaneously, however, less than 26 percent of all farm operator debt qualified. This suggests that overall credit capacity would be substantially less than that indicated by an estimate based on any one criterion.

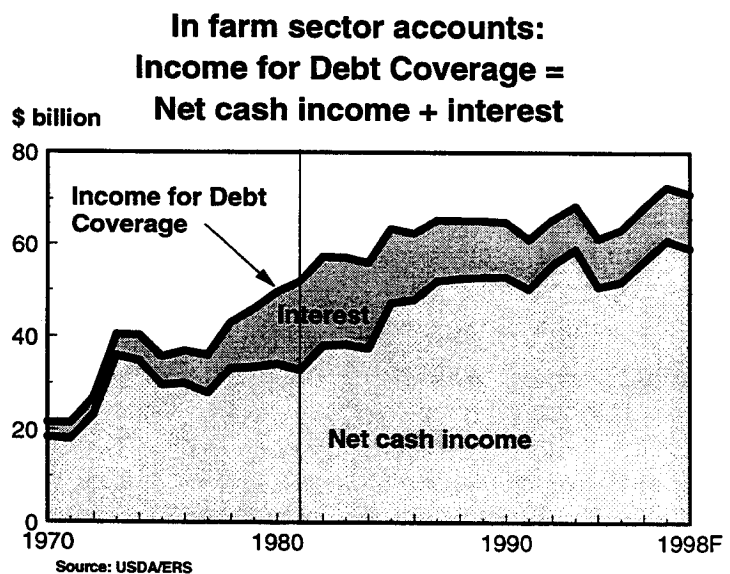
The balance of this article presents results of research designed to estimate farm operator debt repayment capacity, one measure of credit capacity. While debt repayment capacity is often a limiting factor in credit extension decisions, it must be emphasized that it is only one of several commonly used criteria. The following section reports the formulation of the debt repayment capacity utilization model developed for this analysis. Then, based on USDA farm sector income and balance sheet accounts, estimates of farm operator debt capacity and its use during 1970-98 are presented. Estimates of capacity utilization rates are presented by size of farm.

Debt Repayment Capacity Utilization Model

Debt repayment capacity utilization measures actual debt relative to the maximum amount of debt supportable by farm operators' current income. Conceptually, the model originates in the *debt coverage ratio* (Equation 3): the *maximum loan payment* is the debt payment obtained by solving the equation, where *income for debt coverage* is known, and the minimum *debt coverage ratio* is set at some predetermined level. This *maximum loan payment*, for any amortization schedule, determines *debt repayment capacity*, the maximum feasible level of debt that farm operators can service from income for debt coverage while meeting the debt coverage ratio constraint. *Debt repayment capacity utilization*, the ratio of *actual debt* to *debt repayment capacity*, effectively expresses actual debt as a percentage of that debt that could be serviced from current income. The complete model is derived in the following series of equations:

- (1) **Income for Debt Coverage** = Net farm income + Depreciation + Interest on capital debt + Interest on capital lease payments + Net off-farm income - Living expenses - Income taxes

Income for debt coverage measures the cash income that is available, after meeting all cash expenses, to make principal and interest payments on debt, and to provide a reasonable margin for capital replacement and contingencies. For the sector DRCU model, *income for debt coverage* is calculated as net cash income plus farm operator interest expense, which conceptually measures the income that would be available to farm operators if the farm sector was debt-free, and



thus interest-payment free. This proxy is an appropriate farm sector measure of income for debt coverage. In the graph, the vertical line indicates the point of maximum relative interest expenses: interest payments took 38 percent of income for debt coverage in 1981, but less than 17 percent in 1998.

While net off-farm income, living expenses, and income taxes were excluded from the computation in the present analysis, these variables are included in income for debt coverage in the DRCU model developed for farm level analysis using Agricultural Resource Management Study data.

(2) **Debt Payment** = Principal and interest on capital debt + Capital lease payments

Actual debt payment is not used directly in the computations. It will be solved for in Equation 4 as the *maximum loan payment* that could be supported by current income.

(3) **Debt Coverage Ratio** = Income for debt coverage / Debt payment

The *debt coverage ratio* presented here was originally developed as the *total debt service coverage ratio* by Farmer Mac (FAMC). A similar measure has been adopted by the Farm Financial Standards Council (FFSC) as the *term debt and capital lease coverage ratio*. According to Farmer Mac qualifying guidelines, the total debt coverage ratio should be no less than 1.25:1, including income from farm and nonfarm sources. FFSTF considers a ratio above 1.1:1 as favorable. A minimum debt coverage ratio of 1.25 is used in this analysis.

(4) **Maximum Loan Payment** = Income for debt coverage / Minimum debt coverage ratio

The *maximum loan payment* supportable by a level of income for debt coverage can be determined by dividing the income for debt coverage by the predetermined minimum debt coverage ratio. Here, requiring a minimum *debt coverage ratio* of 1.25 is equivalent to stating that no more than 80 percent ($1/1.25$) of *income for debt coverage* can be allocated to *debt payment*.

(5) **Debt Repayment Capacity** = Maximum loan payment $\times (1-(1+r)^{-n})/r$
Where $(1-(1+r)^{-n})/r$ = Present value of an annuity of \$1, at r percent for n periods

Debt repayment capacity, measuring the amount of debt that the maximum loan payment could support, is a function of that loan payment, the interest rate, and the term of the loan. Once a maximum loan payment has been established, the maximum amount of debt that could be supported by income for debt coverage can be determined for any given amortization schedule (interest rate and loan term). Thus, applying a minimum debt coverage ratio requirement to any farm operator, the maximum debt that can be repaid from any level of income for debt coverage can be computed.

Debt repayment capacity varies directly with the maximum loan payment and loan term, and inversely with the loan interest rate. Therefore, debt repayment capacity was calculated for loan

amortization schedules based on three alternative interest rates (current bank rates, average interest rates on outstanding debt, and a constant 10-percent rate) for 1970-98 over three alternative hypothetical repayment terms (5, 7, and 10 years). For simplicity, only the results for loan payments amortized over 7 years at current bank interest rates are presented here. In this analysis, debt repayment capacity measures the maximum debt that farm operators could borrow, given that the loan must be repaid over 7 years at current bank interest rates, with the loan payment such that the debt coverage ratio is at least 1.25.

(6) **Debt Repayment Capacity Utilization** = Actual debt / Debt repayment capacity

DRCU is expressed in percentage terms. Operators with debt are, in effect, using a portion of their credit capacity. The ratio of actual debt to maximum debt repayment capacity measures the extent to which they are using their capacity to borrow.

(7) **Maximum feasible debt / asset ratio** = Debt repayment capacity / Assets

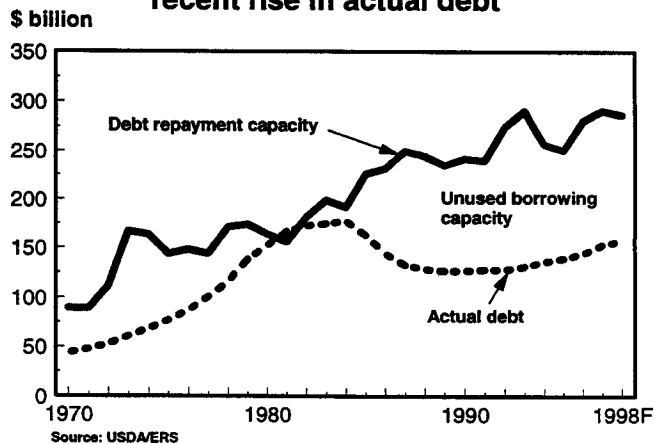
This ratio measures the maximum debt / asset ratio that can be supported by current income.

Historical Debt Repayment Capacity Utilization

Data for this analysis were drawn primarily from the USDA's farm sector accounts. The Economic Research Service (ERS) annually publishes income statement and balance sheet account data for the farm sector (USDA). The sector estimates in these accounts include financial data for all farms (defined as those establishments that sell or normally would sell at least \$1,000 of agricultural products in a calendar year). Farm sector accounts for gross income, expenses, assets, and debt include data for nonoperator landlords. Net cash income measures farm operator income, with net rent to nonoperator landlords deducted as a cash expense. Sector accounts were modified to distribute interest expense, assets, and debt between farm operators and nonoperator landlords.

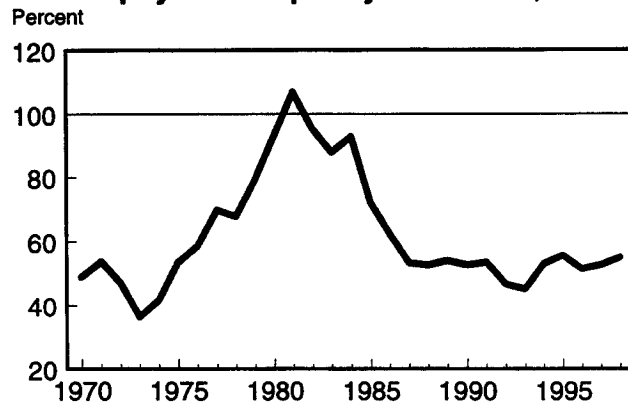
Comparison of actual farm operator total debt with a hypothetical maximum based on debt repayment capacity indicates the extent to which farm operators have used their potential credit. Based solely on debt repayment capacity, the late 1980's would appear to have been a period of relative aggregate prosperity in U.S. farming. Farm operators could have supported almost \$250 billion in debt in 1987, up from less than \$156 billion in 1981. Actual debt, though increasing during the interim, dropped by over \$34 billion during this period.

Farm operators' still have substantial borrowing capacity available, despite recent rise in actual debt



Debt repayment capacity utilization, the ratio of actual debt to debt repayment capacity, rose from 67 percent in 1978 to almost 107 percent in 1981. This ratio generally declined between 1981 and 1987, as income levels and more favorable interest rates supported additional debt, but actual debt outstanding increased only slightly. DRCU declined from almost 93 percent in 1984 to less than 45 percent by 1993, then rose to almost 56 percent in 1995. While this indicator, standing at 55 percent in 1998, indicates a recent increase in use of total commercial farm operator debt repayment capacity, it remains favorable compared to the values reported in 1978-86.

Debt repayment capacity utilization, 1970-98



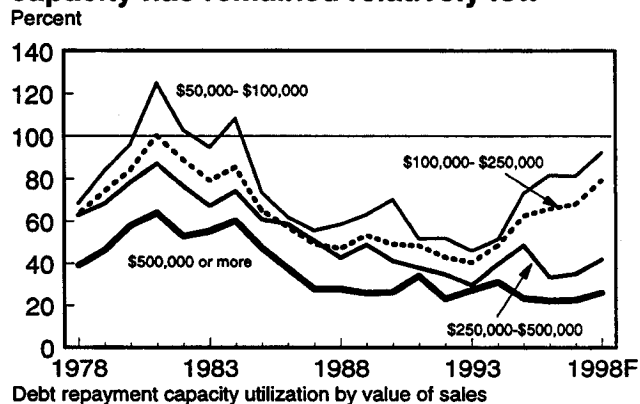
Actual debt compared with a hypothetical maximum debt that could be carried based upon repayment capacity.

Debt Repayment Capacity Utilization Varies by Size of Farm

While farm operators' use of debt repayment capacity has varied over time, it has also varied considerably for different sizes of farms. Analyzing DRCU by size of farm indicates that, although farms as a whole generally appear to have generated sufficient income to service debt, many operators of smaller farms may have carried debt in excess of their repayment ability.

Farms in the largest sales classes (sales over \$250,000) maintained debt levels within their ability to repay throughout the period, but those in smaller farm sales classes (sales of \$50,000-\$99,999) appear to have borrowed in excess of repayment ability nearly continuously from 1980 through 1984. This excess use of credit peaked in 1981, when farms in this sales class carried almost 25 percent more debt than their income for debt coverage would have supported. Farms with sales between \$100,000 and \$250,000 averaged using almost 88 percent of their capacity during 1980-84. While the aggregate farm sector does not appear to have borrowed in excess of its debt repayment capacity during most of 1970-98, these results support the view that smaller farm units were not able to generate sufficient cash to cover debt repayment obligations for much of the early 1980's. Accumulated deficiencies later placed an unsustainable financial drain on these smaller units. This finding is consistent with the contention that smaller family farm operations experienced significant financial stress during the farm crisis of the 1980's.

Larger farms utilization of debt repayment capacity has remained relatively low



Debt repayment capacity utilization by value of sales

The recent rise in debt, combined with slightly lower 1998 net income and prospects for relatively low commodity prices for the near future, translates into gradually rising debt

repayment capacity utilization across all farm size classes, especially in the smallest, where utilization has risen from less than 50 percent in 1993 to over 92 percent in 1998.

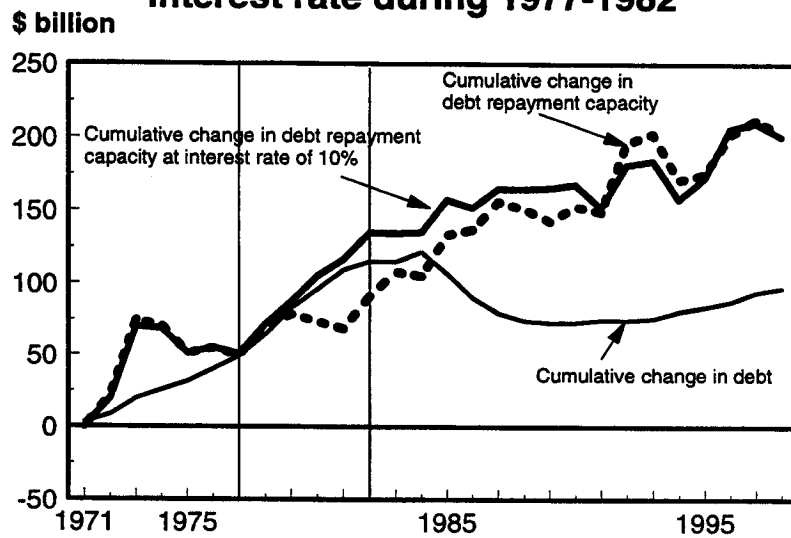
Traditional Debt/Asset Ratio Poor Indicator of Stress

These results also underscore the limitations of interpreting traditional measures individually in analyzing farm financial conditions. The debt/asset ratio has historically been a commonly used indicator of farm solvency and overall financial health. Applied to farm operators, this measure has moved within a relative narrow range throughout the period. (These debt/asset ratio values are lower than those published in sector accounts, since sector ratios include debt/asset ratios of nonoperator landlords, which are lower, on average, than those of farm operators). The operator debt/asset ratio was about 30 percent in 1970, fell below 23 percent in 1978-79, approached 32 percent in 1984-85, and stands at about 20 percent in 1998, its lowest level for the entire 1970-98 study period. Comparison of actual debt-to-asset ratios with those based on debt repayment capacity create a different impression. The maximum feasible debt/asset ratio was 60 percent in 1970, nearly twice the level of the actual ratio. During 1982, when farm operations were in debt substantially beyond their ability to repay, the average debt/asset ratio was about 28 percent. However, based on farm earnings, operators were only generating sufficient income to repay a level of debt that would have been about 29 percent of the value of their assets. In 1998, the maximum feasible debt/asset ratio is about 37 percent, again almost double the actual debt/asset ratio of 20 percent.

Financial Stress Foreshadowed by Rising Cumulative Debt

Comparison of the growth in debt with the change in debt repayment capacity during the late 1970's and early 1980's supports the perception that farm operator debt grew at a rate that was not sustainable by a concurrent growth in debt repayment capacity (Table 3). Considering a starting point of 1970, repayment capacity exhibited cumulative growth greater than the rise in debt through 1978. From 1979 through 1984, however, the cumulative change in debt exceeded that supportable by earnings growth.

Debt rose at rate consistent with changes in debt repayment capacity and 10 percent interest rate during 1977-1982



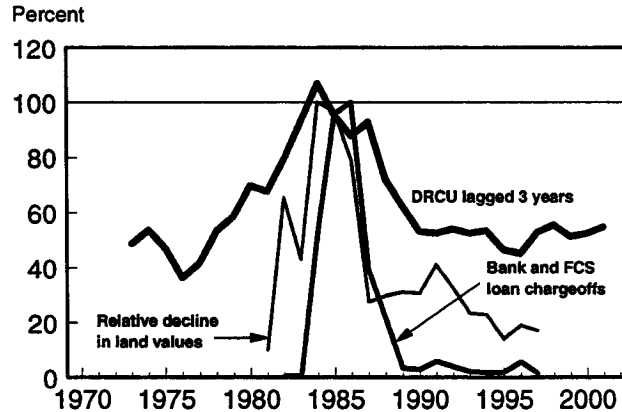
Estimated total farm operator debt increased \$64 billion during 1974-79, while debt repayment capacity in 1979 was only slightly higher than in 1973. These relative changes in debt and repayment capacity produced a rise in use of debt repayment capacity from 36 percent to almost 79 percent during 1973-79. As debt continued to mount, debt repayment capacity use increased to almost 107 percent in 1981. Despite a 10-percent rise in operator debt during 1981-84, concurrent increases in earnings, coupled with lower interest rates, resulted in lower use of repayment capacity after 1981.

Comparison of cumulative debt and repayment capacity growth since 1970, however, suggests that favorable income during 1972-76 created an 'excess credit capacity' condition in the sector. As borrowing increased, the rise in debt of the late 1970's created an 'excess debt' condition beginning in 1980 that prevailed until 1985, when cumulative debt repayment capacity growth again surpassed cumulative debt expansion. While cumulative capacity has remained above cumulative debt since 1985, annual changes in debt levels have exceeded annual changes in debt repayment capacity in 5 of the 7 years over 1988-94. Over his period, debt has risen almost 7 percent, while debt repayment capacity has declined by over 2 percent.

DRCU a Leading Indicator of Farm Financial Stress

Debt repayment capacity utilization would appear to be a leading economic indicator of farm financial stress. The years 1984-87 are generally considered to be the period of greatest farm financial stress, as measured by falling land values, rising farm foreclosures, and lender loan losses. Comparing DRCU, lagged 3 years, with one index of relative declines in land values, and another index of bank and Farm Credit System loan losses, suggests that DRCU may serve as a leading indicator of farm financial stress. Analysis of debt repayment capacity supports the view that it was the increased reliance on debt financing during the 1970's -- rather than reduced farm operator incomes during 1985-87 -- that principally contributed to the farm financial crisis of the mid-1980's.

Rising DRCU may suggest future rise in other financial stress indicators



Separate analysis of the impact of lender loan write-offs on actual debt levels, as measured here, is not included in this analysis. Previous estimates suggest that as much as \$20 billion in farm debt was charged off between 1984 and 1990 (Ryan, May 1991). Debt repayment capacity utilization would have declined much less precipitously if farm operators had retained liability for that debt. For example, an additional \$20 billion in actual debt raise 1994 debt repayment capacity utilization from under 44 percent to almost 53 percent.

Conclusions

The debt repayment capacity utilization model developed here provides additional insight into the possible origins of financial stress in the farm sector. Comparison of actual farm operator debt with maximum debt repayment capacity yields a measure of debt repayment capacity utilization. DRCU, in a single indicator, incorporates elements of farm income, interest rates, and the financial structure of farm businesses into a comprehensive statistic that provides a meaningful interpretation of current farm sector conditions. These results support previous assertions that the farm financial crisis of the mid-1980's was largely driven by increases in debt financing in the late 1970's and early 1980's that were not supportable by farmers' ability to repay. Debt repayment capacity utilization has been rising in recent years, and in 1998 reached its highest level since 1986. While these results do not indicate that widespread financial stress is likely in the farm sector, they do suggest that smaller farm operations may be experiencing increasing financial stress. Debt repayment capacity utilization bears monitoring as an indicator of future farm financial conditions.

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