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BANK TRENDS

ANALYSIS OF EMERGING RISKS IN BANKING

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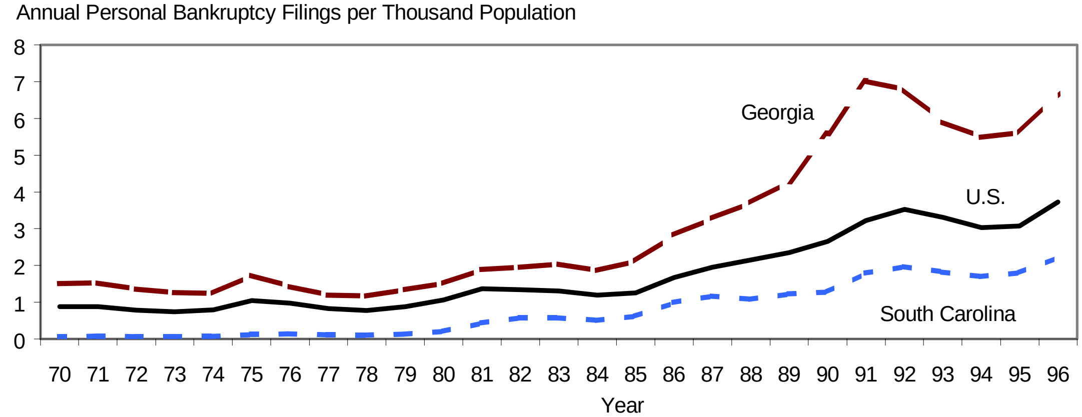
Time Series Analysis of State-Level Personal Bankruptcy Rates, 1970 – 1996

This paper provides basic statistical analysis of personal bankruptcy filing rates across the 50 states since 1970. Results indicate that the forces pushing bankruptcy rates upward over the past 25 years have operated in a relatively uniform manner across the nation. The presence of a relatively stable rank ordering among individual state filing rates over time indicates the influence across states of institutional or demographic differences, or both, that also strongly affect bankruptcy filing rates. The paper recommends three areas for future research.

Differences in State Personal Bankruptcy Rates Have Persisted Over Time

Annual Personal Bankruptcy Filings per Thousand Population



Source: Administrative Office of the U.S. Court

Time Series Analysis of State-Level Personal Bankruptcy Rates, 1970 – 1996

The widely noted secular rise in U.S. rates of personal bankruptcy over the past 20 years has raised concerns over the financial well-being of both consumers and the institutions that lend to them. The FDIC has noted both the rapid rise in bankruptcy filings and the apparent close correlation between U.S. filing rates and aggregate consumer loan charge-offs at FDIC-insured commercial banks.[1] Former Federal Reserve Board Governor Lawrence B. Lindsey has discussed possible causes for the recent rapid increase in filings and expressed concern about the effect of these trends on household finances and future macroeconomic performance.[2]

In evaluating the risk posed by rising personal bankruptcy rates to the deposit insurance funds, two issues stand out. The first is the need to gain a clear understanding of the various causes of this long-term rise in bankruptcy filings as well as their relative importance. Such an understanding will be essential to determine what, if any, policy response is appropriate. The second issue is to evaluate what the future might bring in terms of consumer bankruptcies, particularly when the next recession takes place. Although forecasting future trends is at best an imperfect process, the FDIC is nonetheless exposed to adverse developments in consumer credit and obligated to estimate their probability.

This study presents a limited-scope evaluation of personal bankruptcy data at the state level to ascertain how much insight these data might provide concerning those two key issues. The evaluation has been motivated by two casual observations about the data. The first is the above-noted secular rise in personal bankruptcy rates; a rise attributed by various observers to changes in bankruptcy laws, household credit practices, consumer lending practices, and legal practices. The second observation is the apparent high degree of stability in the ordinal rankings of states by personal bankruptcy rates over time. Tennessee has long been the state with the highest rate, and the New England states have long had among the lowest rates. These persistent differences across states have in turn been attributed to the following institutional factors: state law governing asset exemptions, property foreclosure, and wage garnishment; local legal practices; state law and local custom regarding auto insurance, health insurance, and divorce; and finally, lender behavior that presumably takes into account the institutional factors for each state.[3]

This study does not specifically review these arguments or present evidence as to their relative importance. Instead, it is a straightforward look at the amount and type of empirical information contained in U.S. and state-level data on personal bankruptcy filing rates. This exercise is intended as a precursor to additional research that explores institutional and cyclical factors in more depth and detail.

The Data

Bankruptcy rates in this study are expressed as total annual filings for personal bankruptcy per thousand population for the year ending June 30. Personal bankruptcies include both Chapter 7 filings providing for the discharge of indebtedness and Chapter 13 filings providing for restructuring of indebtedness. The data are compiled by the Administrative Office of the United States Court, which has responsibility for administering personal bankruptcy filings under the two federal Chapters.

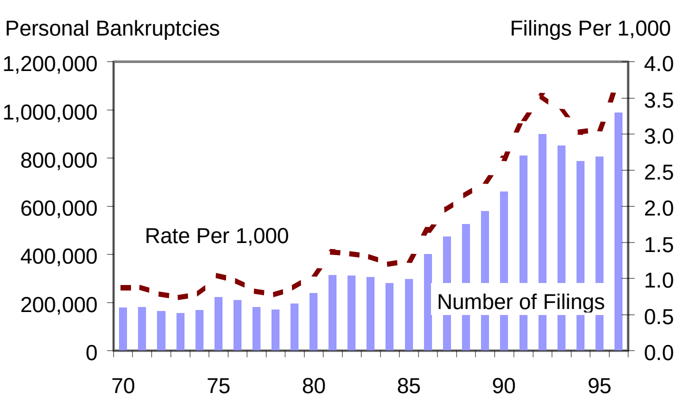
Two possible anomalies in the data should be noted. One is the fact that an application for Chapter 7 or Chapter 13 is recorded as a bankruptcy filing whether or not a plan is ultimately approved and administered by the U.S. Court. This distinction between bankruptcy applications and the actual discharge or restructuring of debt may be material in some jurisdictions where so-called "face filings" have become prevalent as a means of temporarily keeping creditors at bay. In addition, while bankruptcy remains relatively rare in the general population and Chapter 7 filers are prevented from filing again for seven years, the rules governing Chapter 13 filings may in some cases permit so-called "serial filers" to repeatedly file and carry out debt restructuring plans. Both of these practices are thought to inflate the number of filings compared to the prevalence of household financial distress; however, no correction for these anomalies is attempted.

Graphical Analysis

Analysts, the press, and the regulators—including the FDIC—have pointed out a large and rapid rise in the annual number of personal bankruptcy filings per thousand population going back at least 25 years (see Chart 1). The consistent rise in the bankruptcy rate from under 1.0 per thousand annually in the early 1970s to almost 4.0 per thousand for the year ending June 30, 1996, represents a quadrupling of the prevalence of bankruptcy in the general population over 25 years. By way of interpretation, if one were to assume that each person can file at most once every seven years (a somewhat restrictive assumption, as

Chart 1

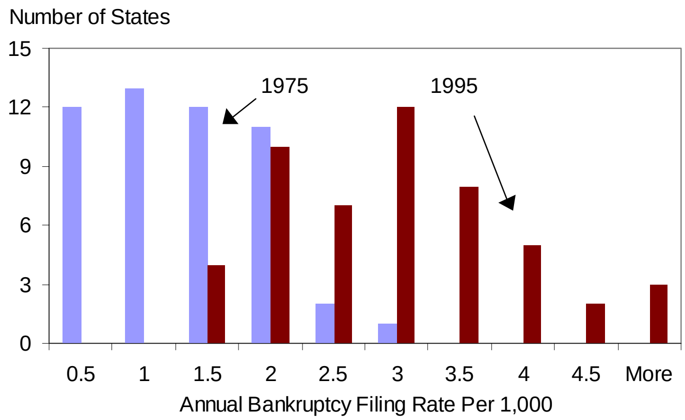
The Increase in U.S. Personal Bankruptcies Has Been Dramatic -- Particularly Since 1985



Source: Administrative Office of the U.S. Court

Chart 2

Bankruptcy Rates Have Increased in All 50 States



Source: Administrative Office of the U.S. Court

has been noted above), then around 1 out of every 45 Americans has gone bankrupt since 1989.

The aggregate rise in bankruptcies per thousand population has been rather evenly distributed across the states. Chart 2 shows that the increase in the aggregate rate since 1975 represents a shift in the entire distribution of state rates. Not only did the mean state rate increase from 1.1 to 2.8 over that 20-year period, but the variance of individual state rates also increased from 0.4 to 1.2.

Another notable phenomenon that is directly observable in the data is the remarkable persistence of measured differentials between the U.S. personal bankruptcy rate and the rates measured for certain high-rate and low-rate states. Chart 3 graphs the four highest-rate states in comparison with the U.S. aggregate rate. These four states—Tennessee, Alabama, Georgia and Nevada—had the nation's four highest bankruptcy rates in 1996 and three of the four highest rates in 1970. Chart 4 shows four states in which bankruptcies have occurred at rates well below the U.S. average for many years. Although some smaller and more remote states currently show even lower bankruptcy rates,[4] Massachusetts, Pennsylvania, Delaware and South Carolina represent larger or more centrally located states in which rates have consistently been lower than the U.S. rate. The apparently stable rank ordering of state bankruptcy rates strongly suggests the influence of relatively static institutional factors or demographic factors, or both, on aggregate filing rates.

Econometric Analysis

More refined measurements of these effects can be obtained through statistical analysis of state-level personal bankruptcy rates over time. These data represent a time series of cross-sections, or panel data. Relatively straightforward statistical methods can be applied to such a data set to describe its basic structure and informational content.

Basic Model. Given the knowledge that both the U.S. aggregate bankruptcy rate and individual state rates have increased over time, we can construct a simple model to measure how much of the individual state variation can be attributed to the observed national trend. This model is represented by the following equation (1).

$$R_{it} = \beta_0 + \beta_1 R_t + u_{it} \qquad (1)$$

where R_{it} is the personal bankruptcy rate in state i for period t, R_t is the U.S. personal bankruptcy rate for period t and u_{it} is the error term for each state. Estimation of equation (1) produced the results in Table 1 in the Appendix. These results indicate that movements in the aggregate U.S. bankruptcy rate explain just under half the total variation in individual state rates.

Fixed Effects Model. We can give the model additional explanatory by estimating the fixed influence of factors specific to each state over the sample period. Termed a *fixed effects model*, this specification merely involves swapping the constant term β_0 for 51 individual constant terms β_{0i}, one for each state i and the District of Columbia. Equation (2) below reflects this substitution.

$$R_{it} = \beta_{0i} + \beta_1 R_t + u_{it} \qquad (2)$$

The results in Table 2 show that adding the fixed state effects explains about another 35 percent of the total variation in state bankruptcy rates in the model, bringing the total R^2 statistic to almost .85. Estimated coefficients for twenty-five states and the District of Columbia were negative and significant at the 90 percent level, while the coefficients for twenty other states were positive and significant at that level.

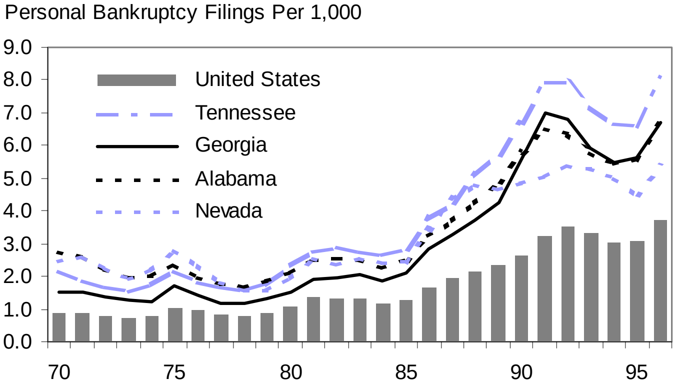
Autoregressive Error Correction. In estimating equation (2), one finds that—despite the identification of significant fixed effects that explain persistent differences across states—the residual error term u_{it} remains *serially correlated*, that is, somewhat consistent over time.[5] This means that the individual state rates have tended to trend slightly higher or lower relative to U.S. rates over the sample period. Not only does serial correlation make the regression results less reliable than they could be,[6] but its presence indicates that the model is ignoring information inherent in those upward and downward trends that could be used to improve the fit of the regression line. We can address the problem of serial correlation by reestimating the model as a *first-order autoregressive process*, or AR(1), as described in equations (3) and (4).

$$R_{it} = \beta_{0i} + \rho R_{it-1} + \beta_1 (R_t - \rho R_{t-1}) + \varepsilon_{it} \qquad (3)$$

Chart 3

These Four States Have Consistently Led the Nation in Bankruptcy Filing Rates

Personal Bankruptcy Filings Per 1,000

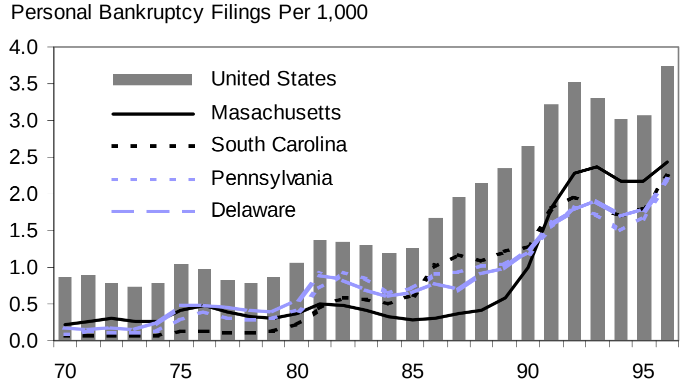


Source: Administrative Office of the U.S. Court

Chart 4

These Four States Have Consistently Trailed the Nation in Bankruptcy Filing Rates

Personal Bankruptcy Filings Per 1,000



Source: Administrative Office of the U.S. Court where

$$u_{it} = \rho u_{i\,t-1} + \varepsilon_{it} \qquad (4)$$

Parameter ρ in equations 3) and (4) is the serial correlation coefficient, measuring the statistical relationship between adjacent error terms in the uncorrected model.

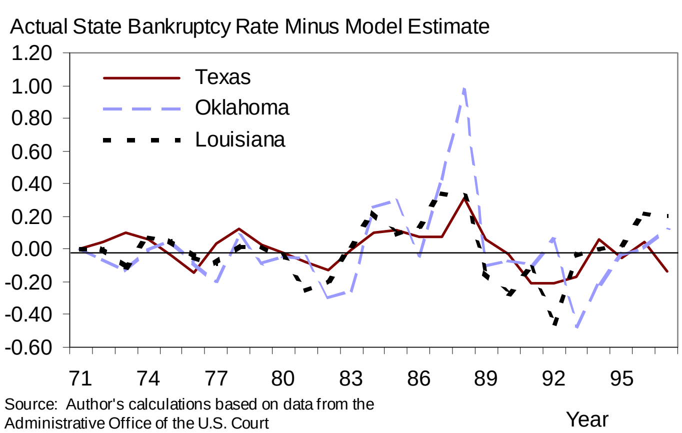
Estimating the corrected form of the model adds yet more explanatory power, as indicated in Table 3. Incorporating the lagged errors explains an additional 13 percent of the total variation in individual state rates, resulting in a cumulative 98 percent ratio of explained-to-unexplained variation for this version of the model. Table 3 also indicates that serial correlation is much less evident in this specification.[7] Note, however, that the fixed effects associated with individual states are far less robust that in the uncorrected model. In this new version, only ten states are found to have negative and significant fixed effects, while six additional states are found to have positive and significant fixed effects.

Analysis of Residuals. After accounting for national trends and persistent differences among states over time, one can go further to examine the variation in state bankruptcy rates that remains unexplained by the model. This unexplained variance is found in the *residuals* or differences between actual state rates and the rates predicted for that state by the model for each period. These residuals offer us a chance to observe cyclical trends operating at the state level that are not captured by information contained in the U.S. aggregate bankruptcy rate, fixed differentials between states, or long-term trends in individual states.

Charts 5, 6, and 7 depict the residuals obtained by applying the results estimated for equation (3) to three groups containing relatively homogeneous states: the Oil Patch, the Rust Belt, and New England. These groups of states are of particular interest because each group has undergone fairly well-defined periods of economic distress at some time during the past 25 years–periods that may help to explain some of the residual variance in the model estimates. Some evidence of regional economic cycles is found in all three charts. Chart 5 clearly shows a dip in residual bankruptcy rates in the Oil Patch (Texas, Louisiana, and Oklahoma) during its early 1980s boom, followed by a pronounced rise in bankruptcy rates during the subsequent five-year period. A less pronounced spike in residual bankruptcy rates can be seen in Chart 6 for three Rust Belt states Indiana, Ohio, and Michigan) around the time of the dual recessions that lasted from 1980 to 1982, which brought both high interest rates and high unemployment to that region. Finally, the boom-bust cycle that occurred in New England during the late 1980s and early 1990s is readily apparent in Chart 7, which covers Massachusetts, Connecticut, New Hampshire, and Rhode Island. Overall, these results provide initial evidence that further modeling of the residuals might yield useful information about the connection between state bankruptcy rates and regional economic cycles.

Chart 5

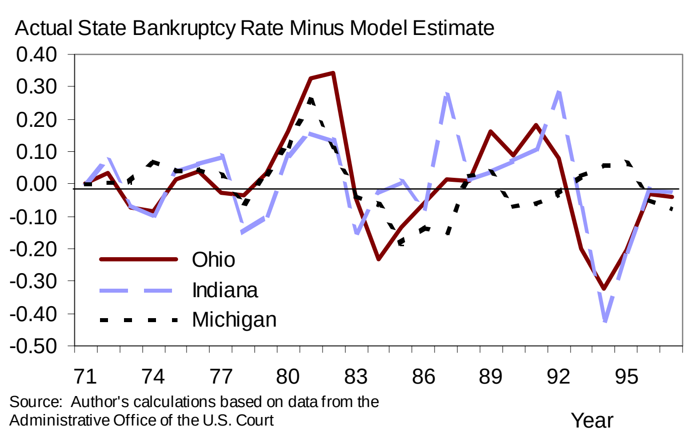
Residuals for Oil Patch States Reflect Economic Boom in Early 1980s, Bust in Mid-1980s



Source: Author's calculations based on data from the Administrative Office of the U.S. Court

Chart 6

Residuals for Rust Belt States Reflect Severe Recession Around 1980, Prosperity in Mid-1990s

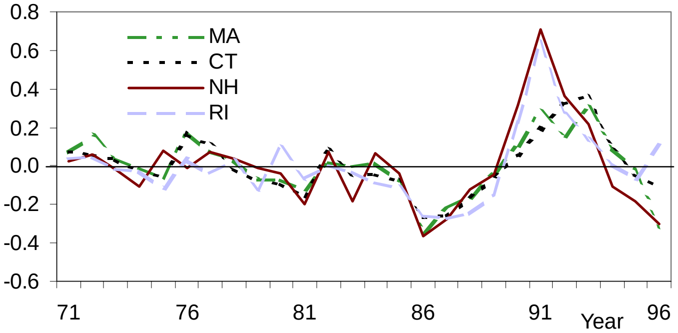


Source: Author's calculations based on data from the Administrative Office of the U.S. Court

Chart 7

Residuals for New England States Reflect Economic Boom in Late 1980s, Bust in Early 1990s

Actual State Bankruptcy Rate Minus Model Estimate

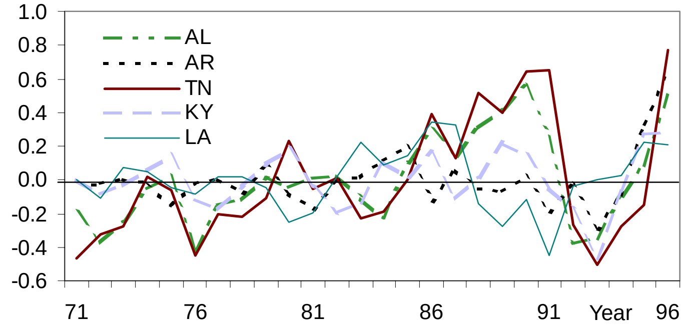


Source: Author's calculations based on data from the Administrative Office of the U.S. Court

Chart 8

Residuals for Memphis Region States Show Sharp Upturn in the Mid-1990s

Actual State Bankruptcy Rate Minus Model Estimate



Source: Author's calculations based on data from the Administrative Office of the U.S. Court

A final result gleaned from analysis of the residuals is a sharp, unexplained upturn in bankruptcy rates that has occurred in the five states of the FDIC Memphis Region since 1993 (see Chart 8). This trend is particularly noteworthy in light of the fact that it is measured in terms of residuals that already take into account both the recent increases in U.S. bankruptcy rates and the fact that Memphis Region states consistently turn in well-above-average rates of personal bankruptcy.

Summary and Implications

A great deal of useful information can be obtained through simple analysis of U.S. personal bankruptcy rates at the state and national level over the past 25 years. The most obvious trend is the large increase in bankruptcy rates in the nation as a whole and in virtually every state. The robustness of this trend across all areas of the nation suggests that influences operating at the national level account for a large proportion of the changes observed in individual states. Indeed, our model indicates that just under one-half the total variation across states and over time is explained by the national trend alone.

Differences across states are observed to be large relative to the U.S. rate and relatively persistent over time. These differences are thought to be the result of demographic, legal, and institutional factors that can be unique to particular areas, move slowly or not at all over time, and exert influence over the incidence of personal bankruptcy filings. The results of the model indicate that fixed effects specific to individual states explain about 35 percent of all variation in individual state bankruptcy rates, with another 13 percent of that variation being explained by state-level trends that are statistically unrelated to the U.S. trend or by fixed differences between states. The fact that a simple model can explain almost 98 percent of observed variation in individual state bankruptcy rates should not be construed as a particular success of modeling. Instead, this result is evidence that the data contain a high degree of useful information relative to noise and should provide a productive basis for further investigation of the factors responsible for rising rates of personal bankruptcy.

Additional research using these data should be pursued in at least three directions. One direction is additional time series analysis at the U.S. level to identify economic factors associated with the national trend toward higher personal bankruptcy rates. Although a number of factors appear to have been important, it will be difficult to separate out their effects because they have operated in concert over the past 25 years; therefore, analysis of both cyclical factors and secular factors is called for. A second direction for research is to examine the state-level residuals estimated in this model and determine their relationship to cyclical economic conditions at the state level. Based on inspection of the residuals, it appears likely that they are related to measurable changes in economic performance at the state level over time, at least for states that have experienced wide swings in economic performance. Finally, a third analytical approach is to obtain a more finely detailed breakdown of bankruptcy rates at the county or census-tract level over the past few years.[8] Such an analysis would permit one to break down a given state with a relatively homogeneous legal structure and explain differences in filing rates across the state in terms of population demographics.

Endnotes

1 See FDIC Division of Research and Statistics, *Quarterly Banking Profile*, 1996:Q2 through 1996:Q4.

2 See Lindsey, Lawrence B., "Where Are Consumers Getting Their Money?" Remarks to the National Economists Club, Washington, D.C., January 10, 1995; also *Statement Before the Forum on Credit Card Debt*, U.S. House of Representatives, Washington, D.C., December 14, 1995.

3 See SMR Research Corporation (1997); Gropp, Scholz and White (1997); and Shiers and Williamson (1987).

4 During 1996 and over most of the sample period, the lowest per capita bankruptcy rates in the nation were found in Alaska, Hawaii, South Dakota, North Dakota and the District of Columbia.

5 This result is confirmed by the Durbin-Watson statistic of 0.016. This implies a correlation between error terms of consecutive years equal to about +0.92.

6 Reliability of the model is diminished in the presence of serial correlation because the standard errors of estimated coefficients are overstated. This overstatement weakens statistical tests applied to model coefficients and might lead one to falsely conclude that a coefficient was significantly different from zero.

7 This result is confirmed by the recalculated Durbin-Watson statistic of 1.23 in Table 3, indicating a corrected residual correlation coefficient of +0.38.

8 These data have been available nationwide since 1992 from CDB Infotek of Los Angeles, CA.

References

Gropp, R., Scholz, J.K. and White, M. 1997. Personal bankruptcy and credit supply and demand. *Quarterly= Journal of Economics* 112, No. 1.

Shiers, A.F. and Williamson, P. 1987. Nonbusiness bankruptcies and the law: some empirical results.= *The Journal of Consumer Affairs* 21, No. 2.

SMR Research Corporation. 1997. =*The =Personal= Bankruptcy = Crisis, = 1997: = Demographics, = Causes,= Implications, = Solutions.* Hackettstown, NJ: SMR Research Corporation.

About the Author

Richard A. Brown is Chief of the Economic Analysis Section of the Division of Insurance.

Appendix: Econometric Results

Table 1

Estimation of Equation (1), Basic Model

Pooled least squares estimation on 1,377 panel observations, 1970–1996
Dependent variable is state personal bankruptcy filings per thousand population.

Variable	Coefficient	Standard Error	t-Statistic
Constant	0.096	0.049	1.97
U.S. Bankruptcy Rate	0.898	0.025	36.66
Adjusted R-squared	0.490		
Mean Dependent Variable	1.650		
S.D. Dependent Variable	1.250		
Durbin-Watson Statistic	0.045		

Source: Author's calculations based on data from the Administrative Office of the U.S. Court

Table 2

Estimation of Equation (2), Fixed Effects Model

Pooled least squares estimation on 1,377 panel observations, 1970–1996
Dependent variable is state personal bankruptcy filings per thousand population.

Variable	Coefficient	Standard Error	t-Statistic	Variable	Coefficient	Standard Error	t-Statistic
U.S. Bankruptcy Rate	0.898	0.013	66.96	ND--Constant	-0.641	0.097	-6.62
AK--Constant	-0.637	0.097	-6.58	NE--Constant	-0.019	0.097	-0.20
AL--Constant	1.916	0.097	19.80	NH--Constant	-0.495	0.097	-5.11
AR--Constant	0.016	0.097	0.17	NJ--Constant	-0.442	0.097	-4.57
AZ--Constant	0.675	0.097	6.97	NM--Constant	-0.104	0.097	-1.08
CA--Constant	0.902	0.097	9.32	NV--Constant	1.713	0.097	17.69
CO--Constant	0.778	0.097	8.03	NY--Constant	-0.454	0.097	-4.69
CT--Constant	-0.531	0.097	-5.49	OH--Constant	0.567	0.097	5.86
DC--Constant	-0.483	0.097	-4.99	OK--Constant	0.784	0.097	8.10
DE--Constant	-0.705	0.097	-7.29	OR--Constant	0.854	0.097	8.82
FL--Constant	-0.305	0.097	-3.16	PA--Constant	-0.739	0.097	-7.63
GA--Constant	1.494	0.097	15.44	RI--Constant	-0.341	0.097	-3.52
HI--Constant	-0.888	0.097	-9.17	SC--Constant	-0.779	0.097	-8.05
IA--Constant	-0.325	0.097	-3.36	SD--Constant	-0.695	0.097	-7.18
ID--Constant	0.631	0.097	6.53	TN--Constant	2.293	0.097	23.69
IL--Constant	0.543	0.097	5.62	TX--Constant	-0.508	0.097	-5.25
IN--Constant	0.968	0.097	10.00	UT--Constant	0.599	0.097	6.19
KS--Constant	0.616	0.097	6.36	VA--Constant	0.440	0.097	4.54
KY--Constant	0.641	0.097	6.62	VT--Constant	-0.912	0.097	-9.42
LA--Constant	0.275	0.097	2.84	WA--Constant	0.555	0.097	5.74
MA--Constant	-0.758	0.097	-7.83	WI--Constant	-0.247	0.097	-2.55
MD--Constant	-0.361	0.097	-3.73	WV--Constant	-0.323	0.097	-3.34
ME--Constant	-0.568	0.097	-5.87	WY--Constant	0.065	0.097	0.67
MI--Constant	-0.235	0.097	-2.43				
MN--Constant	-0.012	0.097	-0.12	Adjusted R-squared		0.848	
MO--Constant	0.122	0.097	1.26	Mean dependent variable		1.650	
MS--Constant	0.647	0.097	6.68	S.D. dependent variable		1.254	
MT--Constant	-0.164	0.097	-1.70	Durbin-Watson statistic		0.158	
NC--Constant	-0.518	0.097	-5.35				

Source: Author's calculations based on data from the Administrative Office of the U.S. Court

Appendix: Econometric Results
(Continued)

Table 3

Estimation of Equation (3), Autoregressive Error Correction

Pooled least squares estimation on 1,326 panel observations, 1970-1996

Dependent variable is state personal bankruptcy filings per thousand population.

Variable	Coefficient	Standard Error	t-Statistic	Variable	Coefficient	Standard Error	t-Statistic
U.S. Bankruptcy Rate	0.940	0.021	43.94	ND--Constant	-1.345	0.711	-1.89
AK--Constant	-1.958	0.748	-2.62	NE--Constant	-0.750	0.712	-1.05
AL--Constant	2.706	0.723	3.74	NH--Constant	-0.868	0.701	-1.24
AR--Constant	0.695	0.716	0.97	NJ--Constant	0.101	0.710	0.14
AZ--Constant	0.308	0.701	0.44	NM--Constant	-1.058	0.722	-1.46
CA--Constant	1.190	0.702	1.70	NV--Constant	1.790	0.699	2.56
CO--Constant	0.331	0.703	0.47	NY--Constant	-0.565	0.698	-0.81
CT--Constant	-0.618	0.698	-0.89	OH--Constant	-0.090	0.709	-0.13
DC--Constant	-0.528	0.698	-0.76	OK--Constant	1.126	0.703	1.60
DE--Constant	-1.252	0.705	-1.78	OR--Constant	0.606	0.699	0.87
FL--Constant	0.030	0.703	0.04	PA--Constant	-1.224	0.704	-1.74
GA--Constant	3.159	0.791	4.00	RI--Constant	-0.081	0.702	-0.12
HI--Constant	-1.834	0.722	-2.54	SC--Constant	-1.212	0.702	-1.73
IA--Constant	-1.131	0.715	-1.58	SD--Constant	-1.374	0.710	-1.94
ID--Constant	0.291	0.700	0.42	TN--Constant	4.418	0.842	5.25
IL--Constant	0.581	0.698	0.83	TX--Constant	-0.665	0.698	-0.95
IN--Constant	1.071	0.699	1.53	UT--Constant	0.535	0.698	0.77
KS--Constant	-0.189	0.714	-0.26	VA--Constant	0.864	0.706	1.22
KY--Constant	0.498	0.698	0.71	VT--Constant	-1.986	0.729	-2.72
LA--Constant	0.095	0.698	0.14	WA--Constant	0.723	0.700	1.03
MA--Constant	-1.154	0.701	-1.65	WI--Constant	-0.904	0.709	-1.28
MD--Constant	0.220	0.712	0.31	WV--Constant	-1.159	0.716	-1.62
ME--Constant	-2.413	0.791	-3.05	WY--Constant	-0.957	0.726	-1.32
MI--Constant	-0.710	0.703	-1.01	AR(1)	0.947	0.011	86.32
MN--Constant	-0.264	0.699	-0.38				
MO--Constant	-0.126	0.699	-0.18	Adjusted R-squared		0.978	
MS--Constant	1.707	0.738	2.31	Mean dependent variable		1.677	
MT--Constant	-1.117	0.722	-1.55	S.D. dependent variable		1.263	
NC--Constant	-0.809	0.700	-1.16	Durbin-Watson statistic		1.233	

Source: Author's calculations based on data from the Administrative Office of the U.S. Court

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