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On the Information Content of LDC Secondary Loan Market Prices

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Abstract

This note examines the impact of measurable and unmeasurable (not correlated with observed aggregates) information on secondary market LDC loan prices. The Institutional Investor country risk ratings are used to construct a proxy for the non-quantifiable information that moves debt market values. Regression results indicate that market participants use both macroeconomic aggregates and unmeasurable information to price LDC loans. This implies that price changes unrelated to observables need not raise concerns regarding price reliability, and, in fact, such price movements may well be conveying important information not quantified elsewhere.

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Contents

Summary

Prices in the secondary-loan market are used in many sovereign external debt buy-backs to value outstanding bank loans. Movements in the price of these loans in the absence of changes in macroeconomic aggregates raise concerns, however, about how reliable these prices are as indicators of debt values. This paper assesses these concerns by examining the impact of both measurable and unmeasurable (i.e., not correlated with observed indicators) information on prices in the secondary-loan market.

The analysis is based on a procedure which uses the ratings of country risk in the Institutional Investor to construct a proxy for the unobservable information that moves debt-market values. Regression results indicate that secondary-market prices respond to changes in observable macroeconomic indicators (e.g., debt to GDP ratio, reserve to import ratio, real GDP growth, inflation). In addition, a large portion of loan price movements not explained by macroeconomic aggregates is correlated with the proxy for unobservable information.

The paper concludes that loan price movements that do not correspond to changes in quantifiable indicators need not raise doubts about the information embodied in loan market prices. In fact, such movements may well be conveying important information not measured elsewhere.

I. Introduction

Many heavily indebted LDCs are restructuring their external debt by trading outstanding bank loans for new securities or cash. In most cases secondary loan market prices are being used to determine the transaction value of existing debt. 1/ However, loan price movements in the absence of changes in macroeconomic aggregates has raised concerns regarding the reliability of these prices as indicators of debt values. 2/ This note addresses these concerns by examining the impact of both measurable and unmeasurable (not correlated with observed indicators) information on secondary market loan prices.

Market prices for any security will reflect the information available to investors, regardless of whether all the information used by traders is quantifiable. For equity markets, this information set will correspond closely to the observable economic events that impact company profits. The market value of claims on national governments should also be influenced by movements in macroeconomic measures; for example, since external debt payments are made in foreign currency investor information sets are likely to include measures of international reserves. However, because claims on sovereigns are not legally enforceable, unlike equity contracts, debt prices may be sensitive to factors not directly linked with observable economic measures, such as investor evaluation of political stability, and the probability of third party financing. This paper provides an estimate of the impact of such non-quantifiable information on secondary market loan prices.

The analysis is based on a two-step procedure which uses the Institutional Investor country risk ratings to construct a proxy for the unobservable information that moves debt market values. First, the risk ratings are partitioned into a component explained by observable macroeconomic measures, and a component not explained by these indicators, which is the proxy for non-quantifiable information. The hypothesis that investors employ non-quantifiable information when forming expectations of loan market prices is tested by regressing secondary LDC loan market prices on the surrogate for unmeasurable information and on the same set of macroeconomic measures used in the first step.

1/ For an overview of debt restructurings see Economic Commission for Latin America and the Caribbean (1990) and International Financing Review (various issues). In some cases e.g., the Philippines, Bolivia and Uruguay, borrowers use third party financing to directly buy back debt at market prices.

2/ According to The Economist (1990) "Such oddities [as the lack of a relationship between the value of borrower exports with loan prices, and strong price co-movement] cast doubt on the ability of the debt market to judge the debtor's prospects...". The Financial Times (1990) stated that several studies have "... found little linkage between the solvency of a debtor country and the price of its loans on the secondary market."

The risk ratings and loan price data sets are described in the next section, which is followed by discussion of the empirical model and estimation issues. Presentation of the results follow, and the note concludes with a brief summary.

II. Risk Ratings and Sovereign Loan Prices

The appeal of the Institutional Investor country risk ratings for this study is that they encompass all the components of sovereign creditworthiness as perceived by 75 to 100 international bankers.

> "Each banker grades the creditworthiness of each of the countries on a scale from zero to 100, with zero representing the least creditworthy countries (those with the greatest chance of default) and 100 representing the most creditworthy (those with the least chance of default)....The individual responses are weighted, using an Institutional Investor formula that properly gives more weight to responses from banks with the largest worldwide lending exposure and the most sophisticated country analysis systems." Institutional Investor (1983).

The ratings have been reported every six months since September of 1979. The summary statistics for the risk ratings reported in Table 1 show a wide range (1.4 to 73.0) and considerable variability over the period through September 1989. According to Feder and Ross (1982) the ratings are reliable measures of credit perceptions.

The most complete set of secondary market prices is reported by Salomon Brothers, who report biweekly indicative prices. The 23 price series used in this study include all but two of the countries that traded continuously over the January 1988 through December 1989 interval. 1/2/ Price is defined as the midpoint of the bid-ask spread. The price data used in subsequent analysis were obtained by first converting the irregularly dated price series to a daily frequency (based on the midpoints of actual reporting intervals), then averaging the daily series to six month averages. The prices range from 4.4 cents per dollar of debt to 100, and exhibit substantial cross-sectional and temporal variability.

1/ Prices for Nicaragua and Senegal were not included in the data set because of the limited number of transactions and the lack of available macroeconomic data.

2/ Although Salomon Brothers began reporting prices in early 1986 market liquidity picked up greatly at end 1987. Inclusion of the earlier data does not change the regression results.

Table 1 [1/]

Summary Statistics for Institutional Investor Country Risk Ratings, and Secondary Market Prices

	Risk Ratings				Average Secondary Market Prices			
	March 1979 - Sept 1989				1988		1989	
	Avg	Std	Max	Min	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Algeria	51.0	6.4	58.6	6.4	92.6	88.3	74.2	78.1
Argentina	34.4	15.4	64.3	15.4	28.6	22.5	16.8	15.7
Bolivia	13.2	6.0	25.2	6.0	12.2	10.5	10.7	11.5
Brazil	39.2	9.9	52.7	9.9	49.8	45.8	33.2	27.5
Chile	36.6	11.8	54.9	11.8	60.4	58.6	59.1	62.3
Colombia	46.8	9.0	59.1	9.0	66.0	63.5	55.1	63.8
Costa Rica	21.4	9.0	40.4	9.0	14.8	12.9	13.4	16.8
Cote d'Ivoire	32.9	7.8	46.2	7.8	34.3	27.7	16.9	7.2
Dominican Rep	19.1	6.0	30.5	6.0	21.5	21.4	24.4	17.3
Ecuador	32.7	11.9	52.3	11.9	32.2	18.9	12.3	15.7
Jamaica	16.5	1.4	18.1	1.4	35.7	41.7	41.0	42.5
Mexico	44.0	16.2	73.0	16.2	50.8	46.5	39.6	40.1
Morocco	29.3	6.4	40.7	6.4	50.7	50.0	44.0	43.6
Nigeria	34.2	14.0	55.8	14.0	29.6	25.4	21.7	27.8
Panama	33.8	7.6	43.8	7.6	27.9	23.4	13.2	11.8
Peru	24.7	11.6	43.4	10.3	6.9	6.0	4.4	5.2
Philippines	30.7	9.7	46.8	9.7	52.0	52.1	44.9	49.9
Poland	19.3	8.7	37.1	8.3	43.2	37.9	36.0	31.7
Turkey	29.0	10.8	41.1	10.8	98.1	99.4	100.0	100.0
Uruguay	32.9	5.7	41.2	5.7	60.3	60.4	57.7	54.0
Venezuela	47.5	13.8	69.4	13.8	55.2	47.7	36.0	38.4
Yugoslavia	35.7	8.5	52.1	8.5	46.8	47.1	45.7	53.8
Zaire	8.0	1.7	10.6	1.7	21.0	21.9	20.4	19.1

1/ See text for sources.

III. The Model and Estimation Issues

The two step analysis employed here tests the impact of non-quantifiable information on loan market prices by first partitioning the risk ratings into measurable and unmeasurable components, then using the unmeasurable component--along with macroeconomic indicators--to explain price movements. 1/ The first step involves estimating the equation

$$R_{it} = \alpha X_{it} + \epsilon_{it} \qquad (1)$$

$$i = 1,\ldots,N \quad t = 1,\ldots,T$$

where R denotes the risk rating, X is a k-vector of macroeconomic measures *observable to investors, and ϵ represents all the unobservable information* that impacts risk ratings. Specifying the form of ϵ--the non-quantifiable information embedded in the ratings--is the key estimation issue.

Given differences between countries, and the likely evolution of important factors determining loan price over time, estimation of the unmeasurable component of the risk ratings should exploit the panel nature of the data. 2/ A variance-components approach is used here. Assume that ϵ can be represented as

$$\epsilon_{it} = \rho_i \epsilon_{it-1} + v_i \qquad (2)$$

$$E(\epsilon_{it} v_i) = E(v_i) = Ev_i v_j) = 0, \; V(v_i) = \sigma_i.$$

The unmeasurable component of risk ratings is assumed to follow a first order autoregressive process, with a different autocorrelation coefficient

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1/ Lui and Thakor (1984) and Woglom (1990) use variants of this approach.

2/ Panel data analyses typically control for differences between subjects by including N intercepts (fixed effects) or estimating a different ϵ variance for each subject (random effects). The fixed effect approach assumes that the unobservable is fixed over time, while ϵ is assumed to be serially uncorrelated in the random effects procedure.

for each country. In addition, the variance of the white noise process v is specific to each country. 1/

Since the data are in level form, the time series for each country may be nonstationary, implying that asymptotic theory is not applicable to parameter estimates relating these series. However, assuming that α is the same for each country and that asymptotic results rely on large N rather the large T, the use of panel data allows relaxation of the usual restriction that rule out unit and explosive roots. 2/

Actual estimation of (1) consists of three stages. 3/ First, OLS is applied to the panel and consistent estimates of ρ_i are obtained from N regressions of the residuals from each country on own first lag. These ρ_i estimates are used to transform R and X 4/ and estimates of the σ_i's are obtained from a regression of the transformed data. The third stage is a *panel weighted least squares regression of the transformed data*, where the weights for each of the N component time series are the inverse of the corresponding σ_i estimate. Because the economic variables in t may be correlated with the unobservables for that period, lagged explanatory variable values are used as instruments. The residuals from this last

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1/ The covariance matrix for each country is

$$\Sigma_i = \sigma_i \begin{bmatrix} 1 & \rho_i & \rho_i^2 & \cdot & \cdot & \cdot & \rho_i \\ \rho_i & 1 & \rho_i & & & & \\ \rho_i^2 & \rho_i & 1 & & & & \\ \cdot & \cdot & \cdot & \cdot & & & \\ \cdot & \cdot & \cdot & & \cdot & & \\ \cdot & \cdot & \cdot & & & \cdot & \\ \rho_i^{T-1} & \cdot & \cdot & & & & 1 \end{bmatrix}$$

and the NT by NT covariance matrix for ϵ is

$$\Sigma = \Sigma_i \ \delta \ I$$

where δ is the kronecker product operator and I is an N by N identity matrix.

2/ See MaCurdy (1982) and Holtz-Eakin, Newey and Rosen (1988).

3/ Parks (1967) applies this procedure to an SUR system with autocorrelated errors.

4/ The transformations are to r and x where

$$r_{it} = R_{it} - \rho_i R_{it-1}$$

$$x_{it} = X_{it} - \rho_i X_{it-1}.$$

regression, denotes as e_{it}, are the estimate of the component of risk ratings uncorrelated with observable economic indicators.

The second step of the analysis is simply ordinary least squares estimation of

$$P_{it} = BX_{it} + \tau e_{it} + \mu_{it} \qquad (3)$$

where P is secondary market price and, since e varies over countries and time, μ is assumed to be an homogenous white noise process. Inferences on the significance of the τ estimate and the explanatory power of e are tests of the central hypothesis of this study.

IV. The Results

Estimation of equation (1) requires specifying the observable indicators used by banks in their evaluation of country creditworthiness. While other studies have evaluated the performance of the ratings in predicting debt payment interruption, none have examined explicitly which measurable information is incorporated in these ratings. 1/ However, the voluminous literature on country risk analysis focusses on a fairly small number of indicators, most of which are tested as explanatory variables for equation (1). 2/ Lagging the right-hand side variables by one period increased their explanatory power, perhaps because of delays in compiling and reporting the risk ratings. 3/

The first column of Table 2 displays an estimate of equation (1) using the four country-specific explanatory variables found to have a significant impact on the risk rating. 4/ All have the expected sign, and together they explain almost half of the rating variance. The hypothesis that the ratings are tied to the world business cycle is tested by adding an index of developed country GDP to the model. The negative coefficient estimate

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1/ See Feder and Ross (1982), Heffernan, Guerten and Magee (1986), Taffler and Abassi (1984), and Short and Angeloni (1980).

2/ For example, Heffernan (1986, pp. 34-41) lists nineteen measures. See also Saini and Bates (1984) and McDonald (1982).

3/ A similar result was obtained by Melvin and Schlagenhauf (1986), who regress the risk ratings on a latent measure of country risk obtained from currency prices.

4/ The widely used debt service to export ratio entered with a positive coefficient, perhaps because the numerator is actual, rather than contracted, debt service, and many of the sample countries interrupted debt repayment. The level of real exports is highly correlated with real GDP and thus had no independent impact. Other measures with no significant effect on ratings include the current account to GDP ratio, money growth, export variance, and debt to population ratio.

Table 2

Institutional Investor Risk Rating Regression Results [1/]
Dependent variable: country risk rating

	Model 1	Model 2	Model 3
Constant	-0.446 (2.76)	-0.652 (3.74)	-0.294 (1.92)
Debt/GDP	-4.884 (7.17)	-5.204 (4.42)	-4.784 (7.06)
Reserve/Imports	2.764 (4.62)	3.149 (5.79)	2.598 (4.34)
Real GDP	0.283 (13.47)	0.372 (10.69)	0.289 (13.20)
Log CPI	-0.664 (1.87)	-0.226 (0.54)	-0.845 (2.26)
Industrial Country GDP		-0.095 (2.34)	
Arrears/Total Debt			-42.467 (3.47)
R^2	49%	65%	60%
Number of observations	460	460	460

1/ Estimation interval is first half of 1980 to second half of 1989. Estimates are adjusted for country-specific autocorrelation and and heteroscedasticity. The explanatory variables are lagged once, and the second lag of the explanatory variables are used as instruments. T-statistics are reported below coefficient estimates.

implies a weak link between creditworthiness and the world economy. 1/ Finally, model 3 tests the effect on ratings of an important non-macroeconomic but observable indicator; total arrears on external debt payment. Not surprisingly, arrears have a significant and adverse impact on the risk rating.

The results of regressing secondary market loan prices on the same sets of explanatory variables as in the risk rating models are reported in the risk three columns of Table 3. 2/ Again, the four country-specific measures each have the expected sign and explain nearly half of price variance. Industrial country GDP has no beneficial impact on loan prices. The arrears measure has an adverse impact on loan price, and adds some ten percent to the R^2.

The principal empirical finding of this paper is reported in the last three columns of Table 3, which display estimates of equation (3). The coefficient estimates for the component of risk ratings not explained by observable information (the rating residual e_{it}) are significant at the 0.1 percent level, and inclusion adds between 19 and 27 percent to the R^2s, depending on the model specification. This result holds even when arrears are included, indicating that prices convey information not captured solely by repayment status. Furthermore, the unobservable increases the t-statistics of each explanatory variable except for, in two of the three models, the CPI. 3/

V. Conclusion

The results show that the portion of sovereign credit risk ratings unexplained by observable aggregates accounts for a large proportion of the movement in secondary sovereign loan market prices, even after controlling for macroeconomic indicators and payment arrears. This is likely a consequence of the lack of legal contract enforceability and appropriable collateral that distinguish these securities. The non-quantifiable information used by investors may include evaluations of political risk,

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1/ Inclusion of an index of real industrial country imports gave a similar result.

2/ Stone (1990) found that monthly sovereign loan price changes do not respond strongly to unexpected changes in borrower exports, imports, exchange rates and reserves. A possible reason why the (mostly annual) indicators used in this study impact semiannual price level averages is that investors don't regularly respond to annual series when forming monthly expectations, but that they do incorporate news concerning political stability, expected lending, and other unmeasurable factors.

3/ The equation (1) residuals used in the equation (2) estimates will not be orthogonal to the explanatory variables, since the price equation is estimated over a subsample.

Table 3

Secondary Loan Market Price Regression Results [1/]
Dependent variable: market price

	Model 1	Model 2	Model 3	Model 1 with Risk Rating residuals	Model 2 with Risk Rating residuals	Model 3 with Risk Rating residuals
Constant	-18.793	101.296	-6.128	-39.165	100.78	-30.587
	(1.06)	(1.24)	(0.38)	(3.09)	(1.74)	(2.42)
Debt/GDP	-4.510	-4.522	-4.985	-8.00	-8.388	-7.822
	(1.87)	(1.89)	(2.28)	(4.60)	(4.81)	(4.64)
Reserve/Imports	3.011	2.925	2.053	5.481	6.041	4.537
	(3.89)	(3.79)	(2.81)	(9.06)	(9.48)	(7.18)
Real GDP	0.550	0.573	0.504	.777	.942	0.743
	(4.41)	(4.59)	(4.45)	(8.52)	(9.73)	(8.21)
Log CPI	-1.680	-1.515	-1.707	-1.127	-.217	-1.522
	(2.39)	(2.15)	(2.69)	(2.26)	(0.42)	(3.17)
Industrial Country GDP		-0.981			-1.30	
		(1.50)			(2.80)	
Arrears/Total Debt			-89.010			-107.607
			(4.51)			(7.13)
Rating Residual				2.00	1.914	1.811
				(9.45)	(9.33)	8.00
R^2	47%	49%	57%	74%	75%	76%
Number of observations	92	92	92	92	92	92

1/ Ordinary least square estimates. Estimation interval is first half 1988 to second half of 1989. T-statistics are reported below coefficient estimates.

third party financing, substitutability between loans and other securities, the proportion of national wealth claimed by others, as well as many other factors, some specific to each debtor. 1/2/

Loan price movements that occur in the absence of changes in observables need not raise doubts concerning the information content of market values. 3/ In fact, this note derives the opposite conclusion: price changes unrelated to observables may well be conveying important information not measured elsewhere.

1/ Many debtor countries have introduced debt-equity transformation schemes. See International Financial Review (various issues).

2/ The other claimants could include domestic government bond holders and official creditors (Dooley, 1990).

3/ Stone (1990) presents evidence that the weak relationship between monthly price changes and unexpected changes in macroeconomic indicators is not the result of illiquidity or inaccurately reported prices.

Data Appendix

Data are from International Financial Statistics (IFS), with series mnemonics parenthesized; and the confidential World Economic Outlook (WEO) database.

Reserves/Imports - Imports are valued in dollars (70d). Reserves are the sum of non-gold reserves (11d) and ounces of gold held in reserves (1ad) valued at commodity market price (112krz). All data are from the IFS.

Total Debt/GDP - Total debt outstanding and GDP are from WEO.

Real GDP - Real GDP indices (1979 = 100) are from WEO, and, because of hyperinflation in several of the debtor countries, were transformed to logs.

Arrears/Total debt - Ratio of accumulated arrears to all creditors (confidential data from WEO) to total bank debt (WEO).

Debt Service/Exports - Debt service includes interest and principal payments on total debt calculated on a balance of payment basis (WEO). Exports are from the IFS.

Exports - Real export indices (1979 = 100) are from WEO.

Imports - Real import indices (1979 = 100) are from WEO.

Semiannual reserve and import data were obtained by averaging monthly values. The annual debt and arrears stocks were distributed to semiannual frequency by linear interpolation, and the other (annual flow) series were distributed using a linear interpolation technique that ensures the target semiannual values sum to the source annual figures.

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