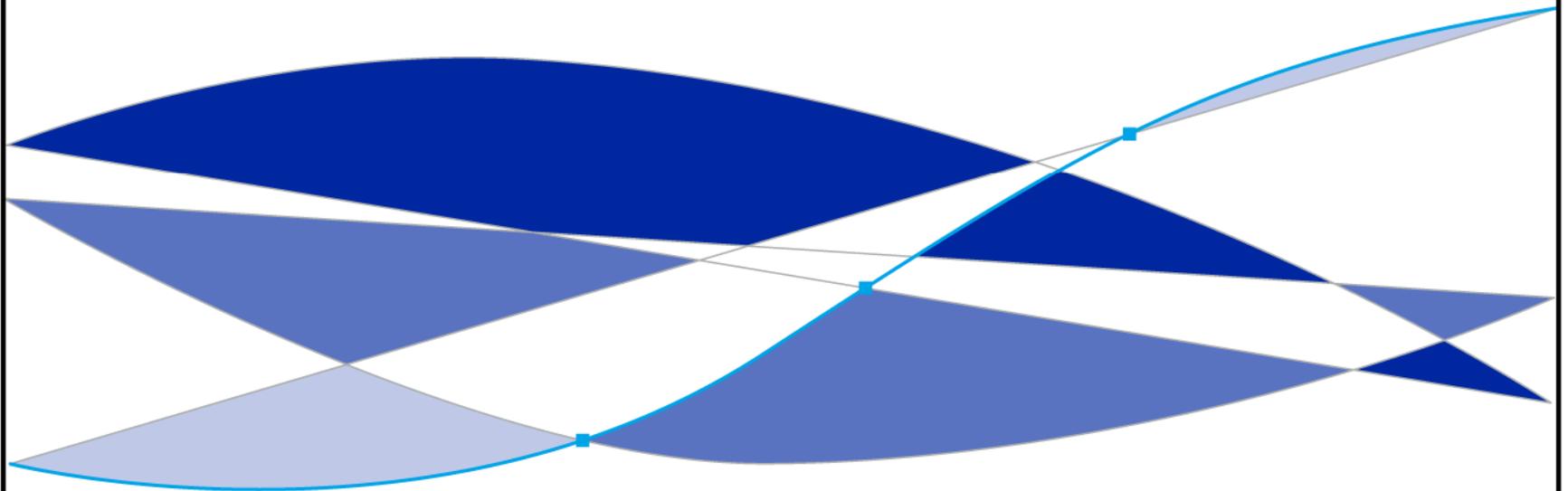


The Use of Financial Statements to Predict Default and Improve Middle-Market Loan Liquidity



Douglas W. Dwyer
April 20, 2007

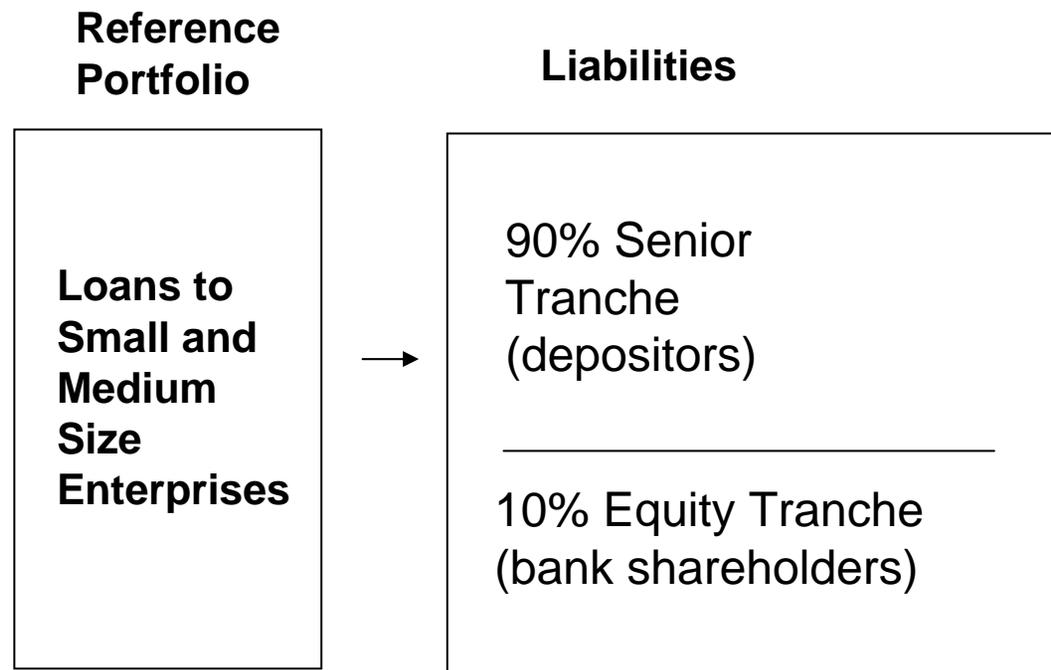


Introduction

Bankers need information to managed credit risk

- Both agency ratings and public firm EDFTM credit measures provide valuable signals for firms that have publicly traded debt or equity or both.
- Behavioral information is useful for consumers and very small firms
- For the '**middle-market**,' bankers traditionally have relied on financial statements and fundamental analysis to assess risk
- Over the past 20 years, the concept of **the probability of default** has become an increasingly important tool in credit risk management
 - Key role in the securitization of middle-market debt
 - Key role in determining capital requirements

Traditional middle market banking



- Was relationship based
- Small spread earned on a levered portfolio
- If losses were low, then return on equity could be substantial

Growth of CLO market may transform middle market banking

Figure 1
Growth in U.S. SME CLO Volume

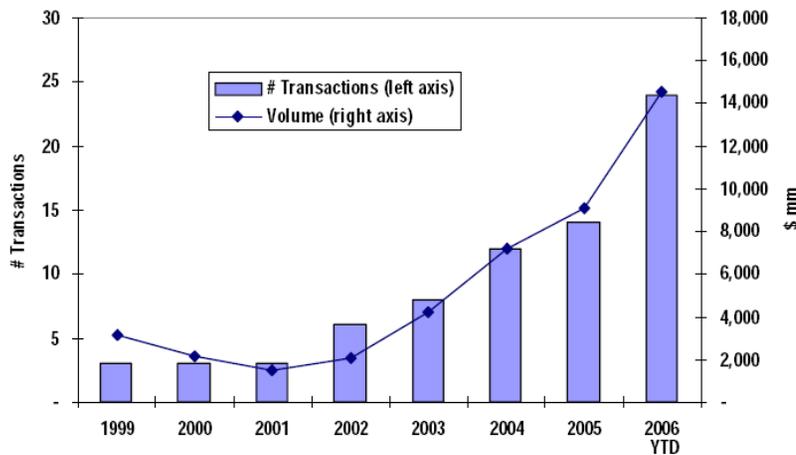
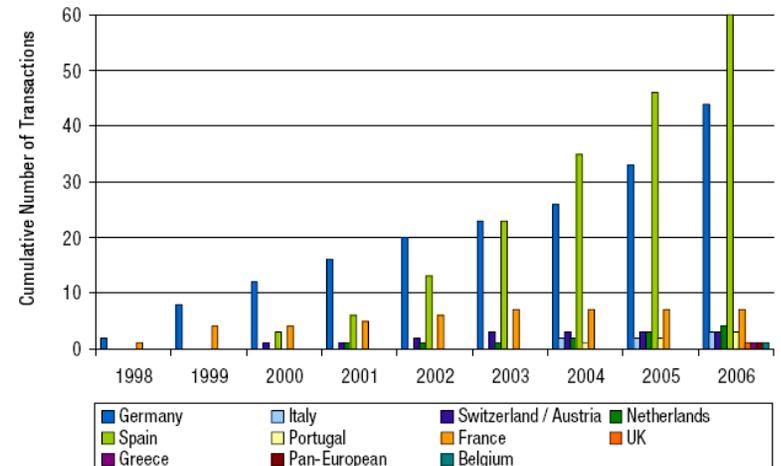


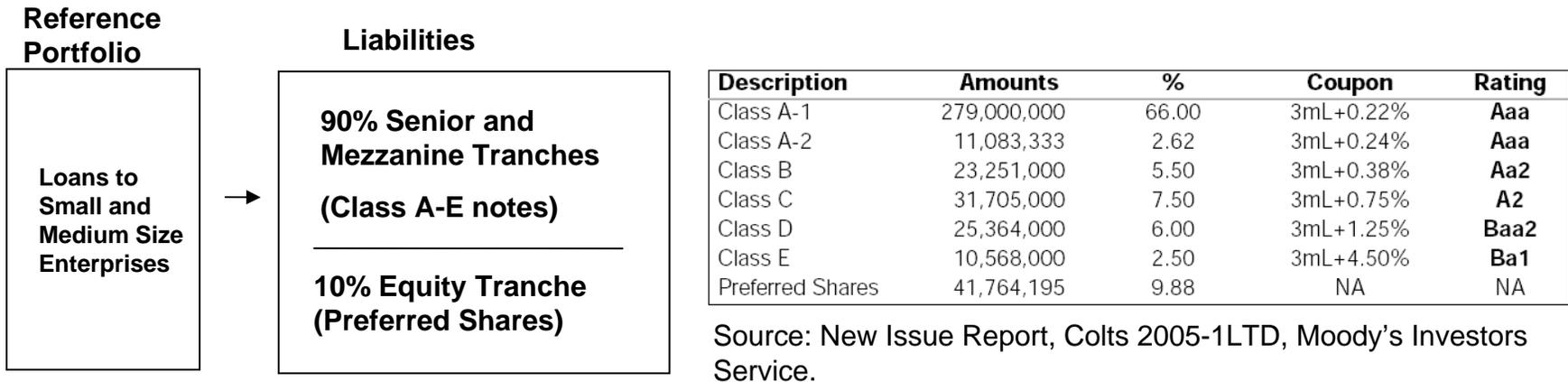
Chart 1:
Cumulative number of SME transactions (excl. leases) brought to the market



- Very active rapidly growing markets in Collateralized Loan Obligations in Japan, US, Germany and Spain
- CLOs can be viewed as ‘synthetic banks’
- This market requires a ‘linqua franca’ of risk

Sources: *Update on the US Market for SME CLOs, 2006* and *Information on EMEA SME Securitizations, 2007* Moody's Investors Service

Like banks, the equity tranche of a CLO makes a small spread on a levered portfolio



- In this specific deal, equity holders borrow at a spread of 46bps (weighted average spread on senior and mezzanine tranches)
- Spreads on underlying assets for this type of deal typically exceed 4%
- Equity tranche is levered by a factor of 10
- If losses are low, returns to equity holders can be substantial

A middle-market CLO requires a measure of credit risk for the underlying exposures

STRUCTURED FINANCE

Special Report

CDO RatingFactors

VOL. II ... No.1

Moody's Rating Approach to U.S. SME CLOs: Using Credit Tools to Expand Manager Flexibility

Lowest .EDF	Maximum Senior Implied Mapped Rating (applicable to loans)	Maximum Senior Unsecured Mapped Rating (applicable to bonds)
>=.baa	Ba3	Ba3/B1
.ba1	B1	B1/B2
.ba2, .ba3, .b1	B2	B2/B3
.b2, .b3	B3	B3/Caa1
.caa	Caa1	Caa1/Caa2

(1) For LBOs or other combination type transactions, mapping will be reduced by an additional ½ rating subcategory. In addition, all ratings will be calculated without regard to any projected synergies.

(2) Managers will have the flexibility to reduce the ratings if in their judgment lower ratings are warranted.

Performance on SME CLOs has been strong

- Of 61 US deals, 7 experience upgrades and only one downgrade
 - For the downgrade, interest and principal was paid in full
- In Japan, there have been 50 deals with 4 upgrades and no downgrades
- In Europe, SME CLOs are reported to be performing in line with expectations
- SME CLOs have not yet been tested through an adverse credit environment on a large scale

Source: Moody's Investors Service (*Update on the US SME Market for CLOS, 2006; Performance Review of Japanese CLOs/CDOs, 2006; European SME Securitisation Review 2005*)

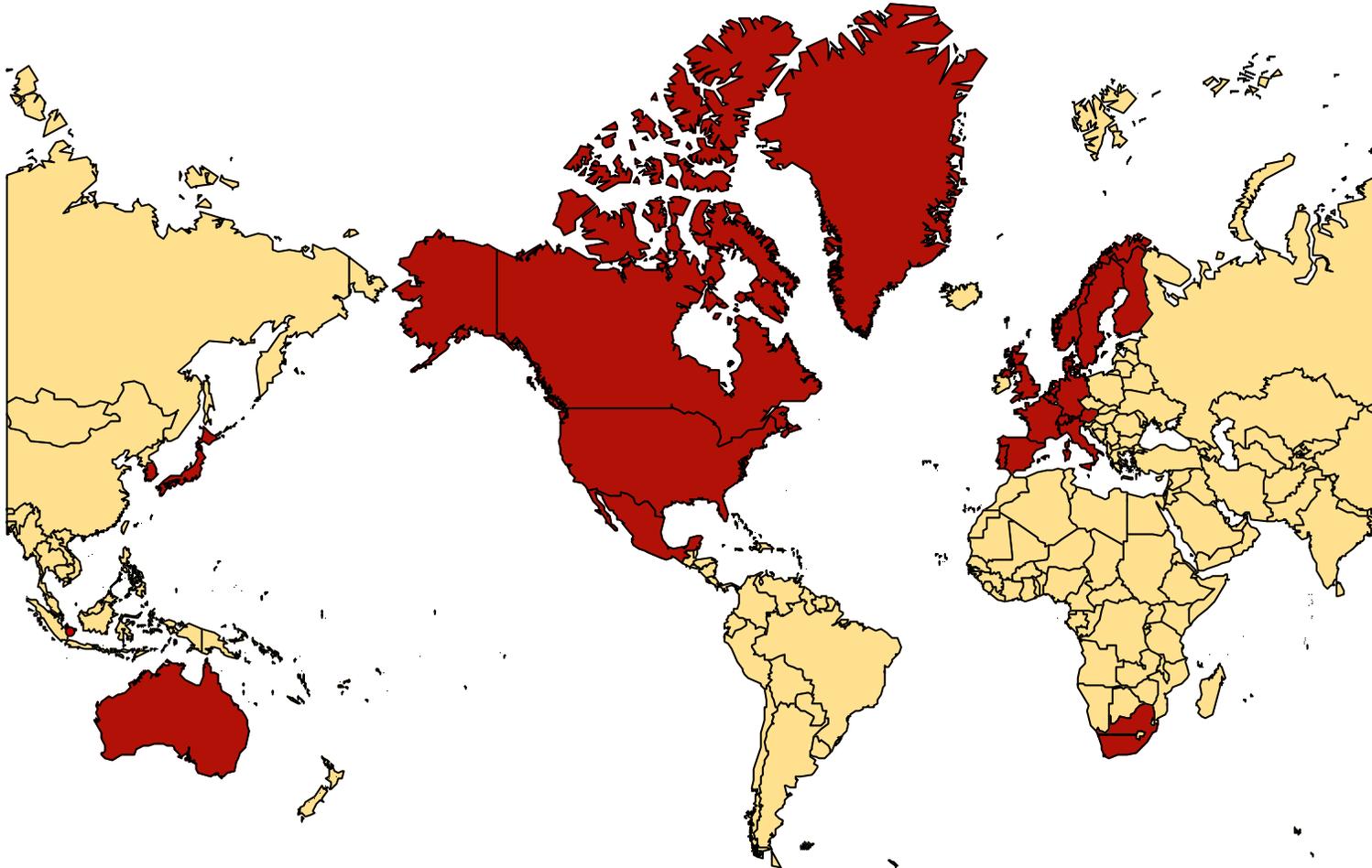
2

Introduction to the RiskCalc Network

RiskCalc network since 2000

- Has expanded to cover 22 different countries representing 80% of the world's GDP
- Includes a model for Private US Banks
- Is actively used by over 200 clients
 - Monitoring of both loans and leases
 - Implementation of risk based pricing
 - Regulatory compliance
 - Transfer pricing
 - Portfolio management
 - Securitization of Small and Medium Size Enterprise (SME) debt into Collateralized Debt Obligations (CDOs)
- Based on data of actual unlisted firms from each country

RiskCalc's international coverage continues to grow



Greenland is part of the Kingdom of Denmark

Credit Research Database (CRD)

- Began effort in 1997
- Database of borrower financial statements matched to select credit performance data
- Data includes
 - Balance sheets and income statements
 - Default status
 - Internal loan grades
 - LGD information
 - Other obtainable loan information
 - loan rate pricing, origination/maturity dates, etc.

A few of our 49 CRD participants...



Credit Research Database today

	Number of Customers	Defaulted Customers	Number of Fin Stmts
North America	106,052	10,496	536,515
Europe	1,711,990	141,178	9,043,417
Asia	263,083	15,609	1,219,300
Australia	31,576	2,715	102,778
Africa	19,633	415	52,613
GRAND TOTAL	2,132,334	170,413	10,954,623

RiskCalc models

- Seek to maximize the predictive power provided the model is
 - Transparent
 - Intuitive
 - Reasonable
- Extract a risk assessment from the financial statements
 - Localized to the specific accounting practices of the country
- Makes an adjustment for industry differences
- Adjusts for the current state of the credit cycle

RiskCalc uses similar financial statement ratios to those used by credit analysts

TABLE 1 Groupings of Financial Statement Ratios

Examples of ratios in the **profitability** group include: net income, net income less extraordinary items, EBITDA, EBIT and operating profit in the numerator; and total assets, tangible assets, fixed assets and sales in the denominator. → *High profitability reduces the probability of default.*

Examples of ratios in the **leverage** group include liabilities to assets and long-term debt to assets. → *High leverage increases the probability of default.*

Debt coverage is the ratio of cash flow to interest payments or some other measure of liabilities. → *High debt coverage reduces the probability of default.*

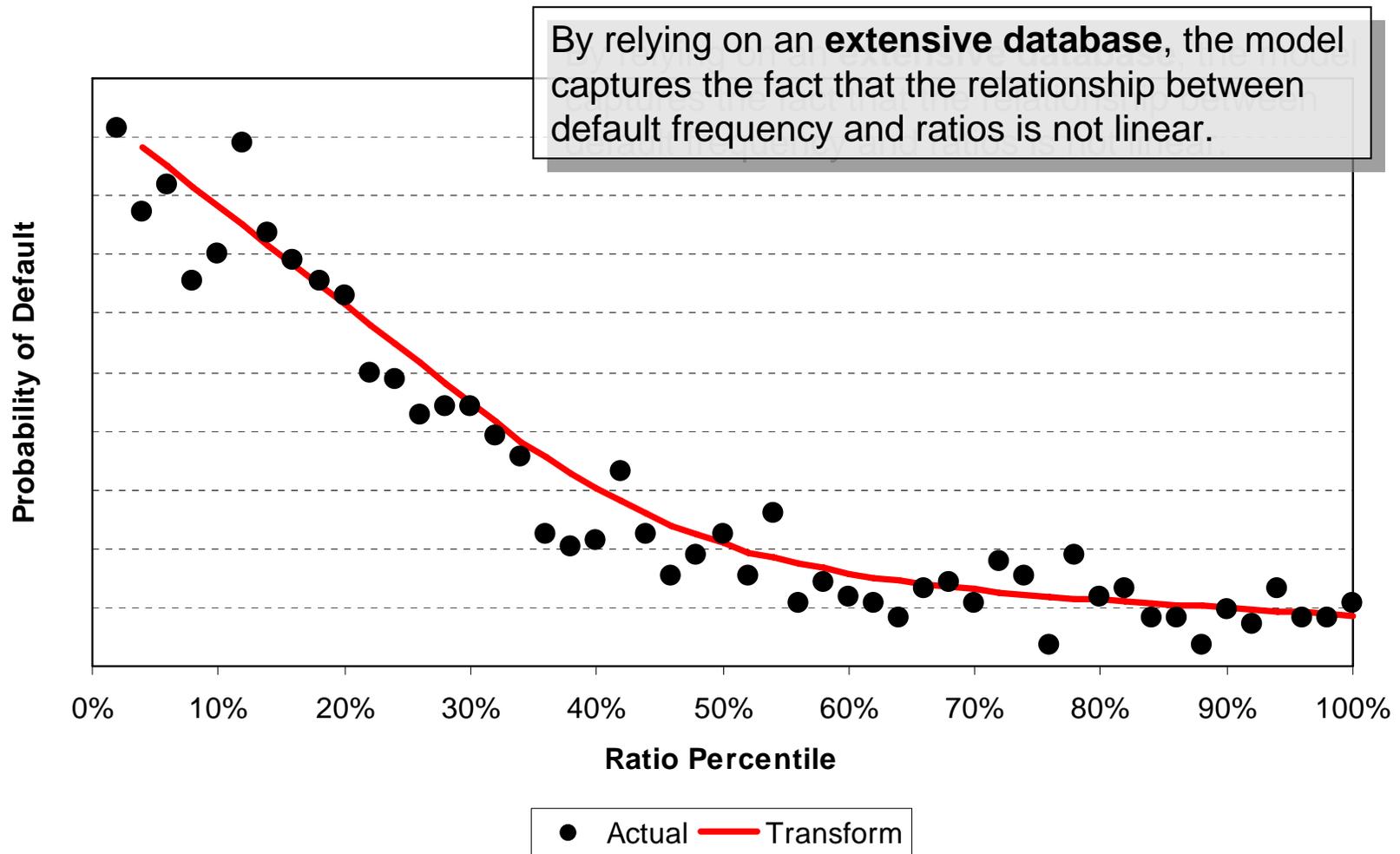
Growth variables are typically the change in ROA and sales growth. These variables measure the stability of a firm's performance. → *Growth variables behave like a double-edged sword: both rapid growth and rapid decline (negative growth) will tend to increase a firm's default probability.*

Liquidity variables include cash and marketable securities to assets, the current ratio, and the quick ratio. These variables measure the extent to which the firm has liquid assets relative to the size of its liabilities. → *High liquidity reduces the probability of default.*

Activity ratios include inventories to sales and accounts receivable to sales. These ratios may measure the extent to which a firm has a substantial portion of assets in accounts that may be of subjective value. For example, a firm with a lot of inventories may not be selling its products and may have to write off these inventories. → *A large stock of inventories relative to sales increases the probability of default; other activity ratios have different relationships to default.*

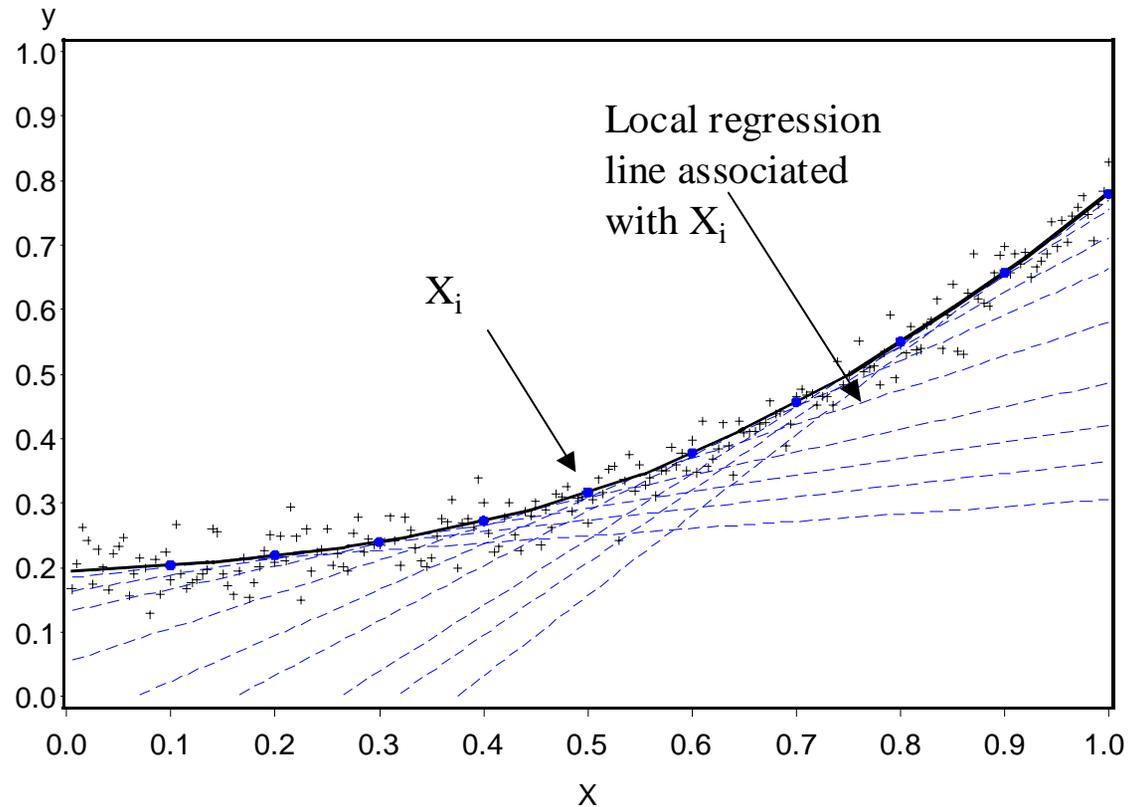
Size variables include sales and total assets. These variables are converted into a common currency as necessary and then are deflated to a specific base year to ensure comparability (e.g., total assets are measured in 2001 U.S. dollars). → *Large firms default less often.*

RiskCalc first models the relationship between default and individual financial ratios

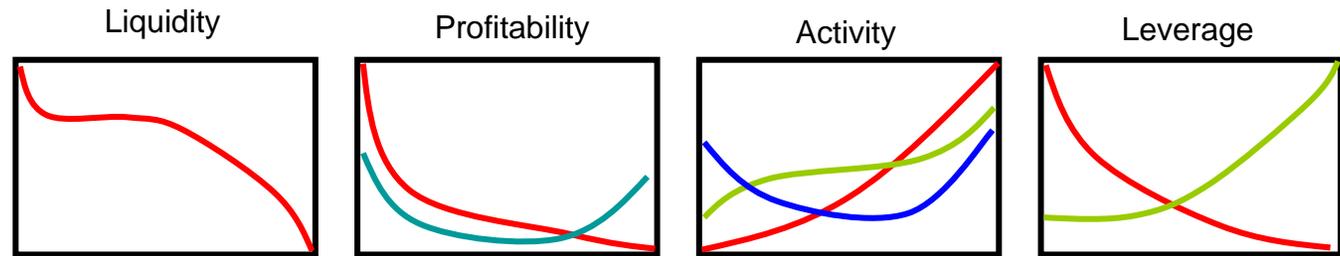


Transforms are computed with a non-parametric methodology

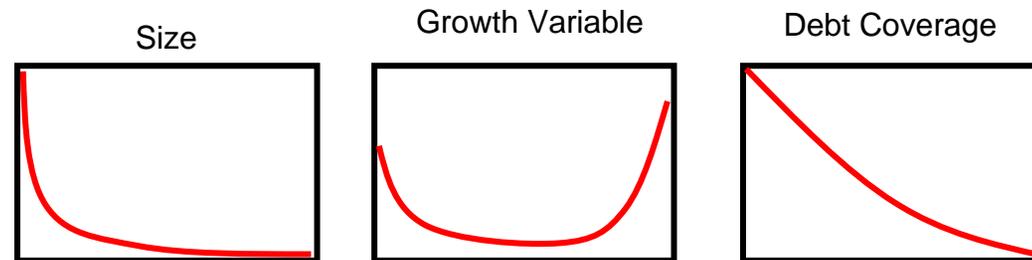
- Non-parametric refers to fitting a continuous function (curve) of the ratio that does not conform to a specific functional form.
- We generally use local regressions (loess) to derive the non-parametric function.
- We estimate a linear regression through a radius of points (locality) and connect the local regressions into one curve



RiskCalc then statistically combines the risk assessment of different ratios into a single EDF



RiskCalc combines several relationships between ratios and default frequencies in a consistent and objective credit risk measure.



Probability of Default: **EDF**

The core of RiskCalc is a Generalized Additive Model

- The functional form that RiskCalc employs

$$\text{probability of default} = g\{f_1(x_1)+f_2(x_2)+\dots+f_n(x_n)\}$$

Where x_i is a financial statement ratio, f is a continuous function and g is the so-called link function.

- This form **balances**
 - the need for incorporating nonlinearities to achieve **discriminatory power**
 - the need to create a **transparent** and **intuitive** model
- The role of each variable in the model can be ascertained by examining its transform.

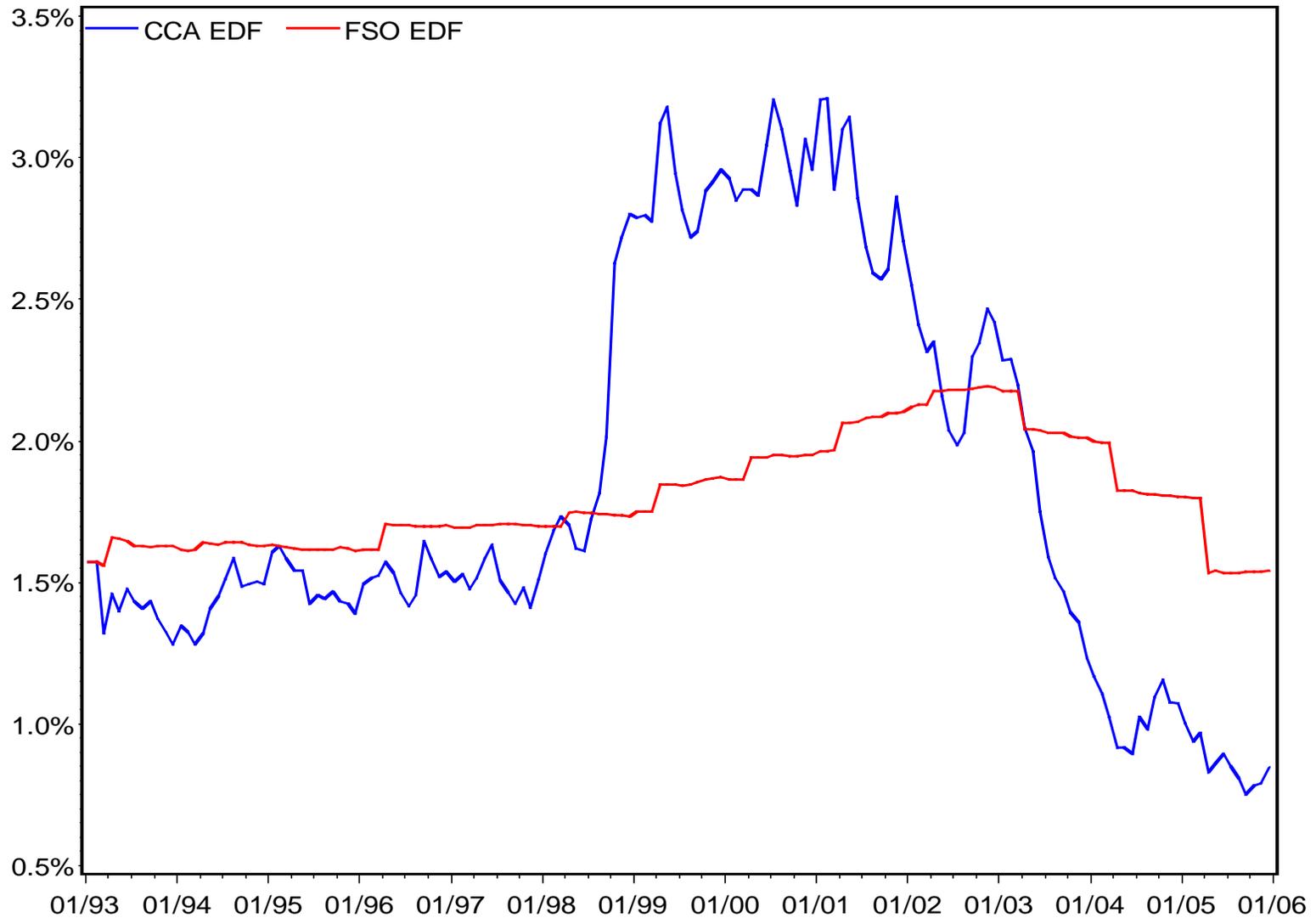
RiskCalc 3.1: Examples of Model Ratios

Ratio	U.K.	Japan	U.S.
Profitability	<ul style="list-style-type: none"> ▪Net P&L/Turnover ▪Chg in ROA 	<ul style="list-style-type: none"> ▪Gross Profit to Total Assets ▪Previous year's net income to sales 	<ul style="list-style-type: none"> ▪Net Income/Assets (ROA) ▪Change in ROA
Leverage	Liabilities/Assets	<ul style="list-style-type: none"> ▪Liabilities less Cash to Assets ▪Retained Earnings to Total Liabilities 	<ul style="list-style-type: none"> ▪Retained Earnings to Current Liabilities ▪Long Term Debt (LTD) to LTD plus Net Worth
Activity	<ul style="list-style-type: none"> ▪Trade Creditors/Turnover ▪Chg in AR/Sales 	<ul style="list-style-type: none"> ▪Inventory to Net Sales ▪Trade Receivables to Net Sales 	<ul style="list-style-type: none"> ▪Inventories/Sales ▪Current Liabilities to Sales ▪Change in AR Turnover
Liquidity	Current Assets/Current Liabilities	Cash to Total Assets	Cash and Marketable Securities to Assets
Growth	Sales Growth	Sales Growth	Sales Growth
Size	Total Assets	Net Sales	Total Assets
Debt Coverage	Operating Cash Flow/Interest Expense	EBITDA to Interest Expense	Operating Cash Flow to Interest Expense

Default Risk Varies with the Credit Cycle

- Episodes of elevated default risk are typically associated with the respective contemporaneous locations in the business cycle
- EDF RiskCalc v3.1 incorporates a forward looking assessment of the credit cycle by drawing from Moody's KMV Public Firm Model (e.g., CreditMonitor).

1-Year CCA vs FSO EDF: US CRD 1993-2006



3

Level Validation

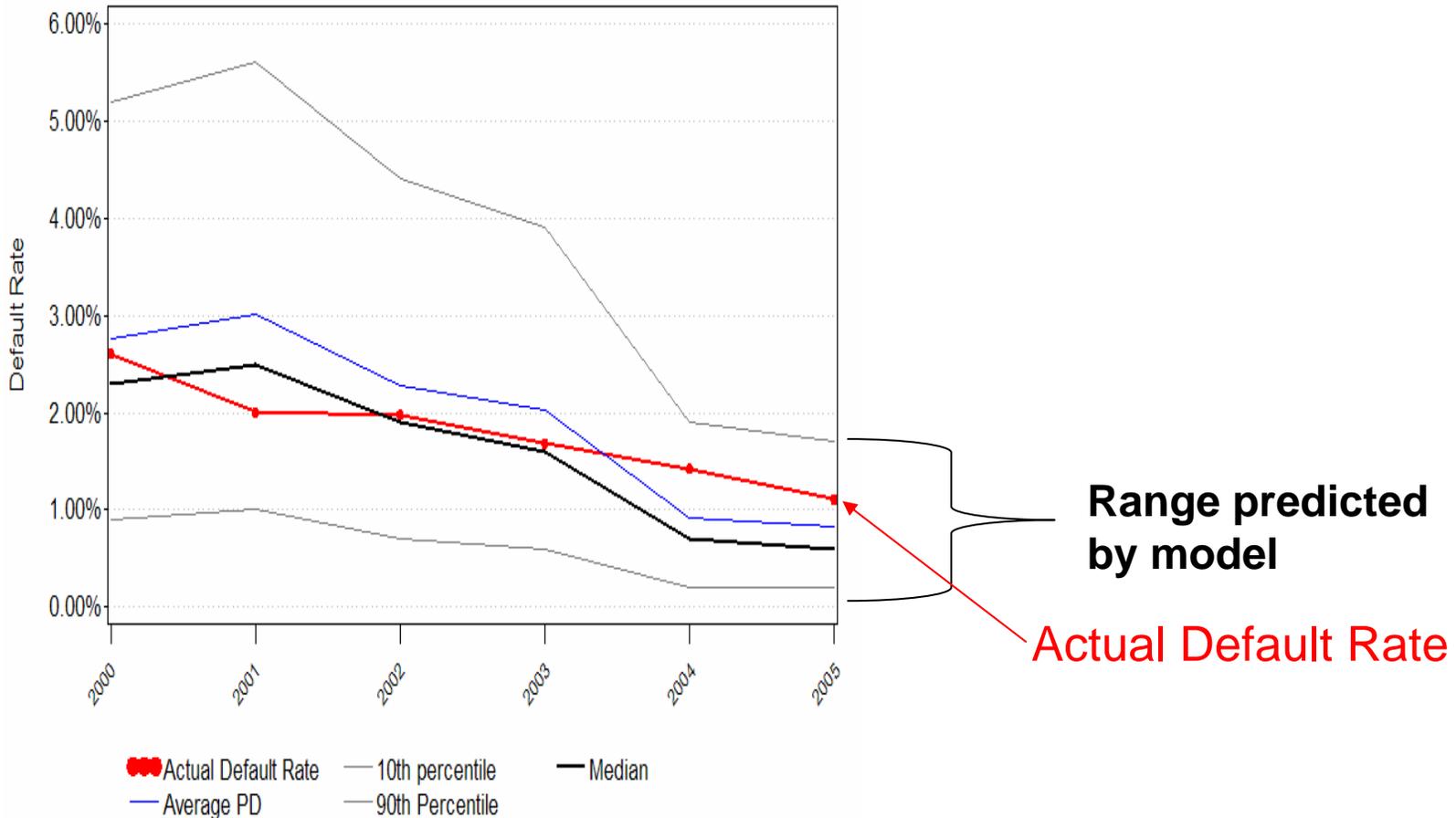
Level validation of private firm default prediction models has been challenging

- PD models have been evaluated on both their ability to 'rank order credits' as well as the correctness of the actual 'PD'
- Level validation of a PD model is more challenging than demonstrating an effective rank ordering
- The distribution of defaults is skewed so most of the time a correct model will over predict defaults
- Due to data issues, level validation in private firm models has been particularly difficult
- Nevertheless, the actual level of the PD is a key determinant of the *expected return* of a portfolio.

In the US, we have been collecting loan accounting system data since 2000

- Five CRD participants have reliably provided such information
- Loan accounting system provides comprehensive default information on 90DPD, Substandard Loans, Charge-Offs and Non-Accrual
- Loan accounting system also allows for the construction of an *Active Borrower Date* for each loan
- Consequently, an 'actual default rate' can be constructed and used for level validation

By restricting to a sample with complete default information, we see that the actual default rate ranges from 2.7% to 1.1%



4

Conclusion

Conclusion

- In the middle-market, financial statements play a key role in determining default risk
- The models are playing an important role in improving 'middle market' liquidity through securitization
- Using loan accounting systems data, the actual default rate on middle market loans ranges from 2.7% to 1.1% over the past six years.
- The performance on SME CDOs has been strong suggesting lower risks than anticipated
- Increased liquidity in the middle market could lead to lower future spreads on SME loans