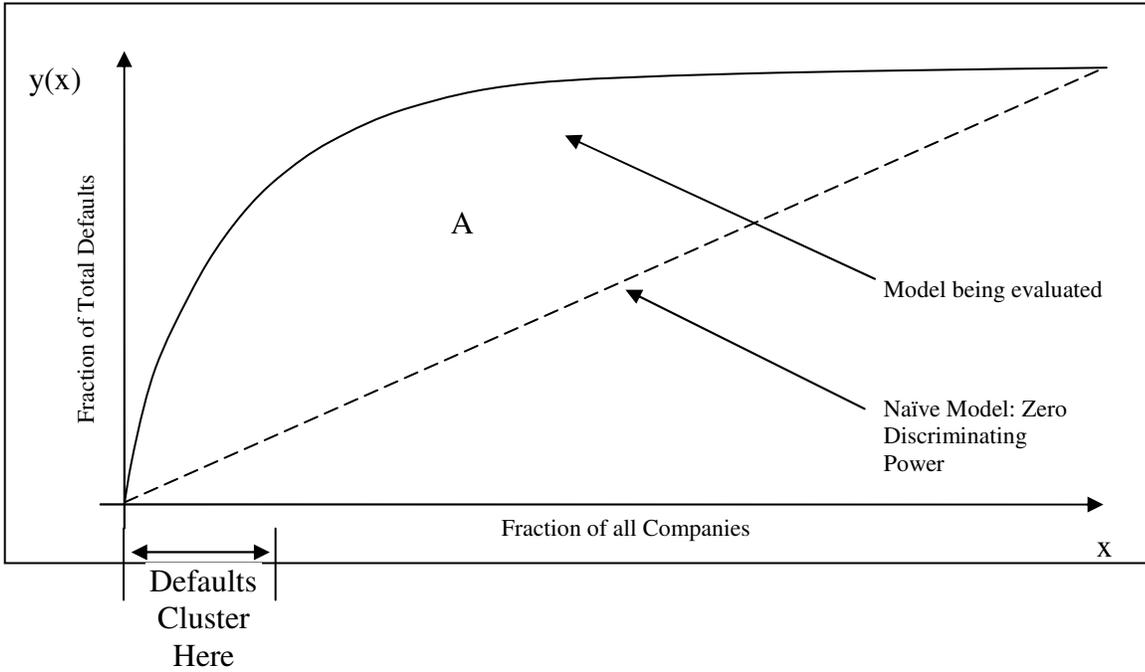# www.FirstKnow.It Cumulative Accuracy Profile (CAP) – Gini Coefficient©

Introduction

Rigorous back testing of credit models is essential and is a key element of the new Basel II capital accords. The Basel II proposals indicate a minimum back testing period of one year, preferably three years. Gini Curves – often called Cumulative Accuracy Profiles (CAP's), and Gini Coefficients, are expected to be a key element of this process.
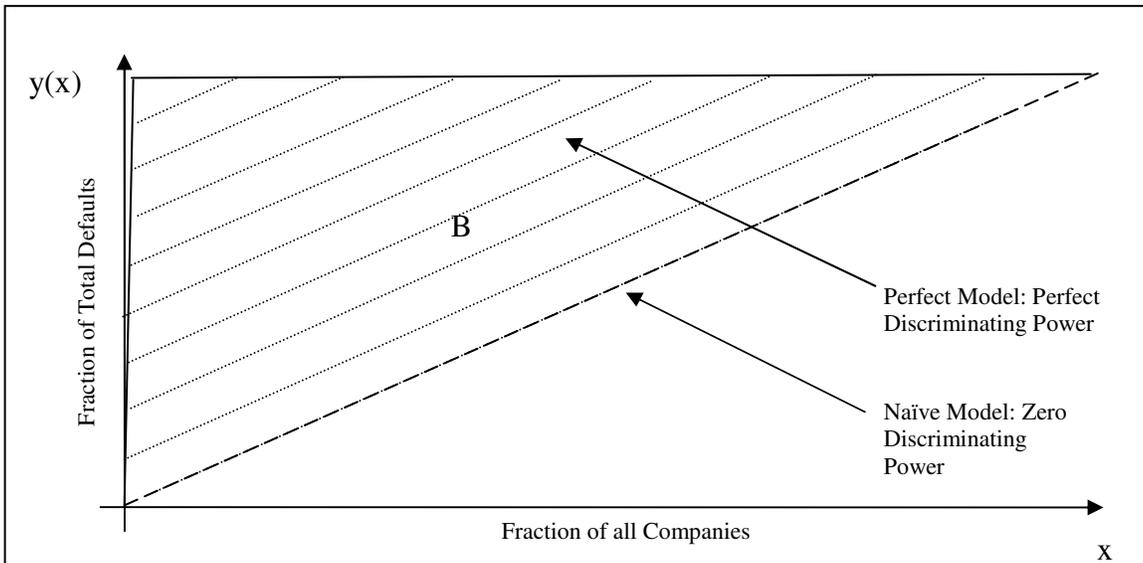
Gini Coefficients are widely used to measure the degree of concentration, or inequality, of a variable in a distribution of its elements. In the case of credit analysis, it is measuring the ability of a predictive measure to discriminate between defaulting and non-defaulting companies. A further advantage of the Gini analysis is to enable different credit evaluation techniques, either quantitative or based on qualitative rating grades, to be compared in their ability to predict default.

Essentially, the Gini analysis takes a specific date and orders the companies in the analysis in order of descending default probability (ratings) predictions. Assuming a 12 month default probability, the analysis then maps the predictions against actual defaults during the subsequent 12 month period. If the predictions are accurate, the companies with the highest predicted default probability should be mapped against a large number of defaults and correspondingly few surviving companies. If the predictions have no informational content, defaults should be mapped randomly throughout the chart, with equal numbers mapped against companies with low default probability as against companies with high default probability. This gives the well known Gini Curve (Chart 1):

---

y(x)

Fraction of Total Defaults

A

Model being evaluated

Naïve Model: Zero
Discriminating
Power

Fraction of all Companies

x

Defaults
Cluster
Here

Weaker Firms ←——————————————————→ Stronger Firms

The more predictive the model, the more the defaults cluster to the left of the chart into the
weakest firm category. Thus a naïve model has companies dispersed equally throughout the chart,
the weakest 5% of companies correspond to 5% of defaults, the weakest 30% corresponds to 30%
of defaults, producing the diagonal line of the Naïve Model. A perfectly predictive model would
have all the defaults in the weakest category as follows (Chart 2):

y(x)

Fraction of Total Defaults

B

Perfect Model: Perfect
Discriminating Power

Naïve Model: Zero
Discriminating
Power

Fraction of all Companies

x

The ratio of area A in Chart 1 to area B in Chart 2 – the Gini Coefficient - is a measure of predictive accuracy. This ranges from zero (zero predictive power) to 1 (or 100%) for a perfectly predictive system.

Typical Values

Acceptable credit evaluation systems are expected to have a Gini Coefficient in excess of 50%. Moody's ratings are cited by Oderna, Dacorogna & Jung as being in the 70%-80% range[1]. In an analysis, the same authors found the Gini Coefficient for quoted companies in the MoodysKMV® service to be 87%. In their benchmarking of a Bundesbank private firm model[2] (ie/ on non-quoted companies), Blochwitz, Liebig & Nyberg identified a Gini Coefficient of 59.7% for the KMV Private Firm Model and 68% for the Bundesbank expert system. They found common financial ratios gave much lower Gini Coefficients in the order of 38%-48% for ratios such as ROE, Equity Ratio and Capital Recovery Ratio.

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[1] Credit Risk Models. Do they Deliver Their Promises? A Quantitative Assessment. Oderna, Dacorogna & Jung. Economic Notes 2002.

® MoodysKMV and KMV are trademarks of MIS Quality Management Corp.

[2] Benchmarking Deutsche Bundesbank's Default Risk Model, the KMV Private Firm Model and Common Ratios for German Corporations. Blochwitz, Liebig & Nyberg. November 2000

Economic Background

The last three years really have been wretched from a credit perspective. The following chart shows the number and value of international credit defaults identified by S&P since 1980.

Chart 2

Annual Defaults

S&P Quarterly Default Update & Rating Transitions.April 23rd 2004
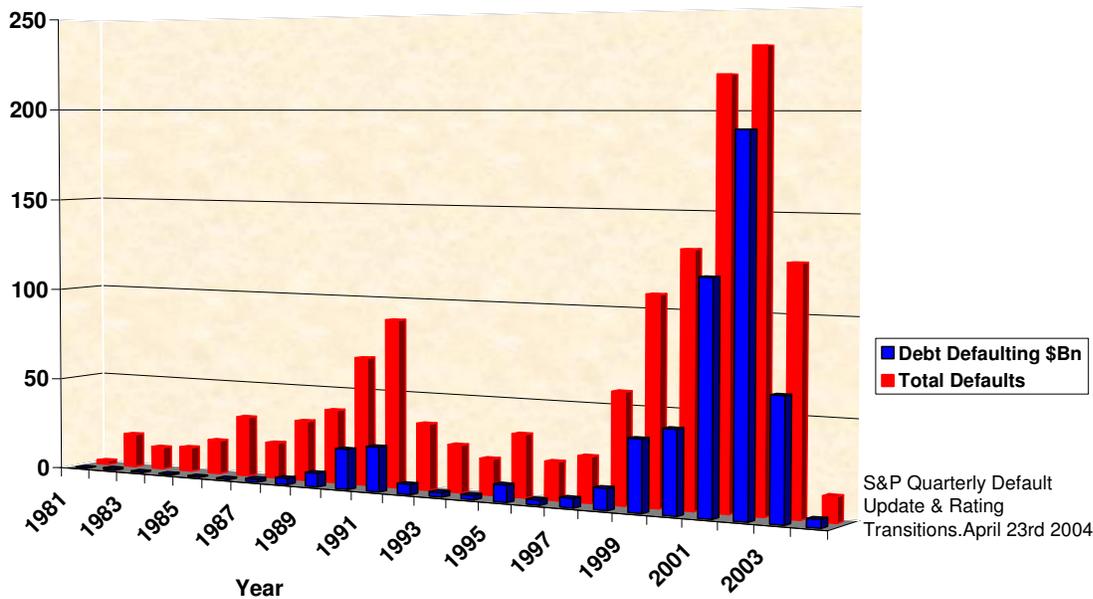
Whereas the early '90s recession saw numbers of defaults peak at 89 involving 3 investment grade companies and $23 bn, the latest downturn peaked in 2002, involving 232 defaulting companies 17 of which were investment grade and $ 191 bn. There were 815 defaults during the 1999/2003 period compared to 231 between 1989 and 1994. The poor credit environment has been further deteriorated by the corrosive effects of several major instances of corporate fraud and financial misrepresentation.

In a broader context, the analysis period has been marked by immense political and social uncertainty. Following the 1999/2001 economic slowdown and dotcom crash, the 9/11 outrage was a huge political and psychological blow, exacerbating the uncertain credit outlook. The subsequent Afghan and Iraq wars followed. The second half of 2002 was marked by immense uncertainty as the US and its allies squared up against former allies in "Old Europe" and against Russia over the campaign against Saddam Hussein. These political uncertainties caused great concern in the financial markets, with the S&P500 declining 31% between March and October 2002 and average implied asset volatility peaking at 26.9% in December 2002 compared to just 18.8% in the post-Iraq-war period in mid 2003.

The last three years can therefore be characterized as one of the weakest economic and credit environments of the post- World War II period.

US Coverage

The Gini analysis is produced on an annual basis for the www.FirstKnow.It data for three successive years commencing 6th June 2001. The analysis takes the one year default probability and performs the Gini analysis on companies defaulting during the subsequent 12 months. Over the three year time horizon, there were 33 defaults among the 850 US companies comprising the US coverage, as follows:

Table (1)   US Defaults: June 2001 - June 2004

June 2001/2002		June 2002/2003		June 2003/2004	
Company	**Default**	**Company**	**Default**	**Company**	**Default**
Safety Kleen	9-Jun-00	Worldcom	21-Jul-02	Mirant	15-Jul-03
Genesis Health Ventures	22-Jun-00	US Airways	11-Aug-02	Loral Space & Communications	15-Jul-03
Owens Corning	5-Oct-00	Consolidated Freightways	2-Sep-02	Northwestern	14-Sep-03
USG	25-Jun-01	Eott Energy Partners	9-Oct-02	Solutia	17-Dec-03
Federal Mogul	8-Oct-01	Oakwood Homes	15-Nov-02	Footstar	3-Mar-04
Bethlehem Steel	15-Oct-01	UAL	16-Dec-02	Healthsouth	8-Jun-04
Chiquita Brands International	29-Nov-01	Magellan Health Services	11-Mar-03		
Hayes Lemmerz International	5-Dec-01	Spiegel	17-Mar-03		
Kmart	22-Jan-02	Fleming Companies	1-Apr-03		
PhyCor	31-Jan-02	Weirton Steel	19-May-03		
Kaiser Aluminum	13-Feb-02	Penn Traffic	30-May-03		
National Steel	7-Mar-02	Westpoint Stevens	1-Jun-03		
Covanta Energy	1-Apr-02				
Exide	16-Apr-02				
Williams Communications	23-Apr-02				
Total Defaults	**15**	**Total Defaults**	**12**	**Total Defaults**	**6**

Despite this challenging backdrop, the www.FirstKnow.It US model has performed excellently, consistently producing Gini Coefficients of about 90% for the Historical Volatility Analysis and well in excess of this for the Implied Volatility Analysis, as shown in Tables (2) and (3):

Table (3)	**Gini Coefficient: US Implied Volatility Analysis %: June**		
2001*	**2002**	**2003**	**Mean**
91.92	92.91	94.25	93.03

* from Sept 2001

Table (2)	**Gini Coefficient: US Historical Volatility Analysis %: June**		
2001	**2002**	**2003**	**Mean**
92.08	90.45	92.31	91.61

Analysis for US companies based on Historical Volatility commenced on 5th June 2001. The Gini analysis is produced on an annual basis mapping one year default probabilities to defaults during the subsequent 12 months from 6th June 2001 to 6th September 2003. This is repeated for the Implied Volatility Analysis. The data series begins in early September 2001 so the first data point was taken from starting 6th September 2001 running for 12 months and subsequent years were taken from June to correspond to the dates of the historical volatility analysis to facilitate comparison.

The results are excellent, substantially outperforming alternative systems. The Historical Volatility Analysis has a mean Gini Coefficient of 91.61%. The minimum full year value of 90.45% occurs in the year commencing June 2002 whilst the highest value of 92.31% occurs in the year commencing June 2003. The Implied Volatility Analysis outperforms the Historical

Volatility analysis, with a mean Gini Coefficient of 93.03%. The lowest full year value of 91.91% occurs in September 2001 whilst the highest coefficient of 94.25% is achieved in June 2003.
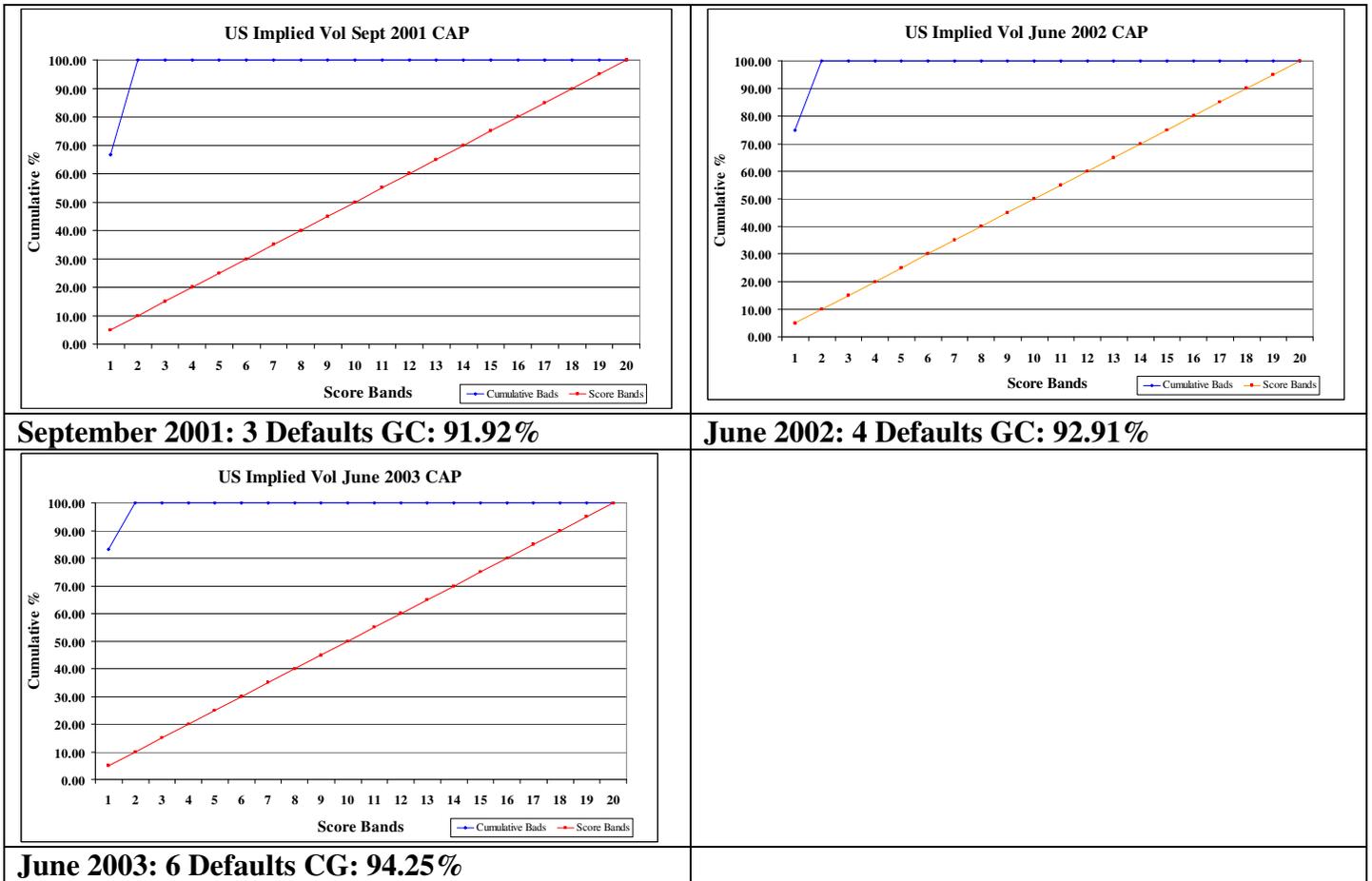
This analysis indicates the model has an exceptionally strong ability to discriminate between good and bad credit risks on the one year time horizon.

As well as producing very high Gini Coefficients, the model also provides very stable results indicating a consistent ability to discriminate default risks.
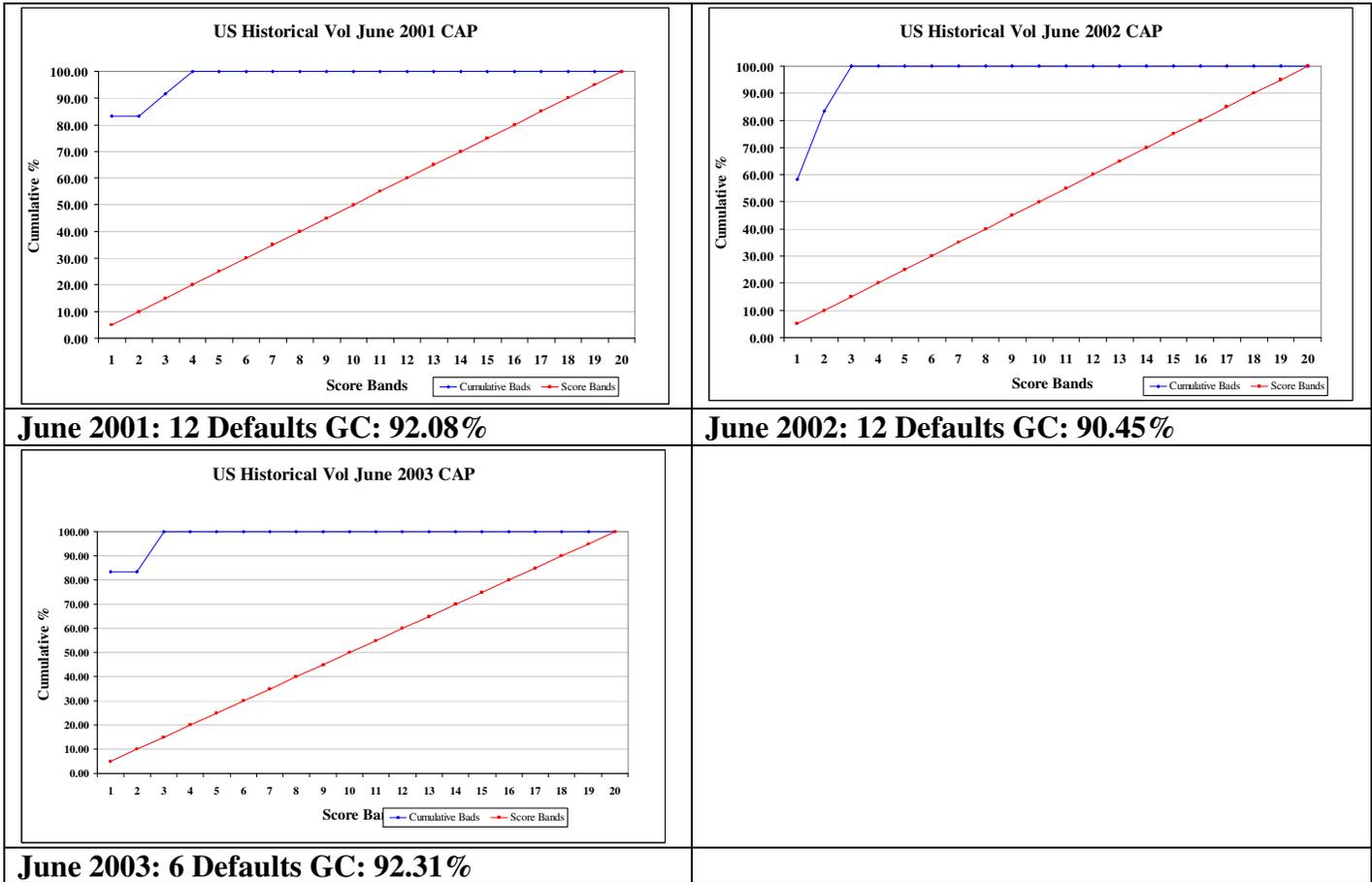
Gini Charts are as follows:

Note, the difference in numbers of defaults between the analysis occurs because not all companies in the Historical Volatility Analysis have options traded on their stock, and hence not all are available within the Implied Volatility Service. There are approximately 850 US companies in the Historical Volatility Analysis, of which approximately 630 are also available within the Implied Volatility Analysis.

US Implied Volatility Analysis

September 2001: 3 Defaults GC: 91.92%

June 2002: 4 Defaults GC: 92.91%

June 2003: 6 Defaults CG: 94.25%

US Historical Volatility Analysis

US Historical Vol June 2001 CAP Cumulative % (y-axis, 0.00 to 100.00) Score Bands (x-axis, 1 to 20) Legend: Cumulative Bads, Score Bands	**US Historical Vol June 2002 CAP** Cumulative % (y-axis, 0.00 to 100.00) Score Bands (x-axis, 1 to 20) Legend: Cumulative Bads, Score Bands
June 2001: 12 Defaults GC: 92.08%	**June 2002: 12 Defaults GC: 90.45%**
US Historical Vol June 2003 CAP Cumulative % (y-axis, 0.00 to 100.00) Score Bands (x-axis, 1 to 20) Legend: Cumulative Bads, Score Bands	
June 2003: 6 Defaults GC: 92.31%	

Implied Minimum Acceptable Credit Level

In reviewing the default history, it is interesting to consider whether there is a minimum acceptable credit level (MAC level) which will in effect eliminate the overwhelming number of defaults.

16 of the defaulters were on the implied volatility with all but 3 rated D

The other 3 were rated:

Company/Implied Volatility Based Rating previous June		
2001 Defaults	**2002 Defaults**	**2003 Defaults**
Kmart: B	Fleming Co's: CCC+	Footstar: C
Covanta Energy: N/A	Penn Traffic: N/A	

A MAC level of B- would have approved just Kmart   (1/16: 6.3% of defaults)
C+ just Fleming Co's and Kmart,   (2/16: 12.5% of defaults)
C- just Footstar, Fleming Co's and Kmart   (3/16: 18.8% of defaults

All but 5 of the 33 companies defaulting in the historical volatility analysis were rated D on the www.FirstKnow.it 1 year rating in the preceding June

The other 5 were rated:

Company/Historical Vol Based Rating previous June		
2001 Defaults	**2002 Defaults**	**2003 Defaults**
Kmart: B	Fleming Co's: CC	Footstar: CC-
Covanta Energy: CCC	Penn Traffic: C+	

A MAC level of CCC+ would have approved just Kmart,   (1/33: 3.3% of defaults)
CC+ just Covanta and Kmart,   (2/33: 6.6% of defaults)
C+ just Footstar, Covanta and Kmart   (3/33: 9.9% of defaults)

A MAC level of C+ on the historical and implied volatility analysis would statistically eliminate about 90% of defaults. Currently there are 39 (4.5%) of the 850 companies on the system which fall into this category in the historical volatility analysis and 21 (3.3%) of 630 companies in the implied volatility analysis. This leaves in excess of 95% of companies exceeding the MAC level.

Conclusion US Analysis

In both its Implied Volatility and its Historical Volatility forms, the www.FirstKnow.It model has provided an excellent indicator of one-year probability of default over the three year time period of this analysis. The average Gini Coefficients of 91.61% for the Historical Volatility form of the model and 93.03% for the Implied Volatility form substantially exceed the typical maximum aspiration of 50%-80% for credit models. The results of the analysis indicate that models also comfortably outperform Moody's and even exceed the Gini Coefficient of 87% for MoodysKMV cited by Oderna, Dacorogna & Jung, particularly for the Implied Volatility Analysis. The consistency of performance of the models during this highly unstable period has also been outstanding.

UK Coverage

The Gini analysis is produced on an annual basis for the www.FirstKnow.It data for three successive years commencing 6th June 2001. The analysis takes the one year default probability and performs the Gini analysis on companies defaulting during the subsequent 12 months. Over the three year time horizon, there were 33 defaults among the 850 UK companies comprising the UK coverage, as follows:

Table (4)   UK Defaults: June 2001 - June 2004

June 2001/2002		June 2002/2003		June 2003/2004	
Company	**Default**	**Company**	**Default**	**Company**	**Default**
Atlantic Telecom	08-Oct-01	Fish	02-Jul-02	Convergent Communications	07-Jul-03
Snackhouse	08-Oct-01	Miller Fisher Group	04-Jul-02	SBS Group	19-Sep-03
Actionleisure	11-Oct-01	Stenoak Associated Services	08-Jul-02	Bradstock Group	29-Sep-03
QSP Group	18-Oct-01	A.S.W.	10-Jul-02	Arcolectric Holdings	26-Nov-03
Photobition	31-Oct-01	Energis	16-Jul-02	Springwood	09-Feb-04
Railtrack	01-Nov-01	Wescol Group	03-Sep-02	Leeds United FC	27-Feb-04
B W A Group	14-Dec-01	British Energy	06-Sep-02	Clubhaus	26-May-04
VFG	20-Dec-01	Richards	08-Oct-02	Telewest Communications	08-Jun-04
Kalamazoo Computer Group	17-Jan-02	Old Monk Company	09-Oct-02		
Brooke Industrial Holdings	30-Jan-02	Health Clinic	11-Oct-02		
IMS Group	07-Feb-02	Baldwins Industrial Services	28-Oct-02		
Bioglan Pharma	21-Feb-02	Alldays	28-Oct-02		
Garton Engineering	28-Feb-02	RDL Group	06-Feb-03		
Sportsworld Media Group	10-Apr-02	Lamont	06-Feb-03		
John Lusty Group	13-May-02	L. Gardner Group	19-Mar-03		
European Telecom	14-May-02	Hay & Robertson	25-Mar-03		
Albert Fisher	23-May-02	Po Na Na Group	01-May-03		
Total Defaults	**17**	**Total Defaults**	**17**	**Total Defaults**	**8**

The www.FirstKnow.It model gave excellent prediction during the years June 2001 and June 2003 with Gini Coefficients of 81.8% and 91.47% respectively. In the year June 2002, it attained a rather lower score of 44.84%.
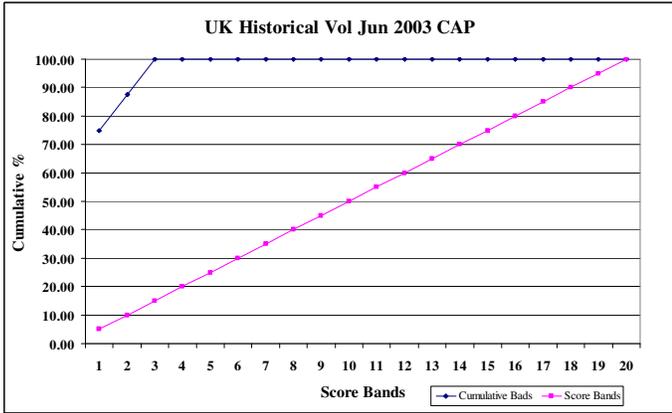
Table (5)	Gini Coefficient: UK Historical Volatility Analysis %: June		
2001	**2002**	**2003**	**Mean**
81.80	44.84	91.47	72.7

Gini Charts are as follows:

UK Historical Vol Jun 2001 CAP
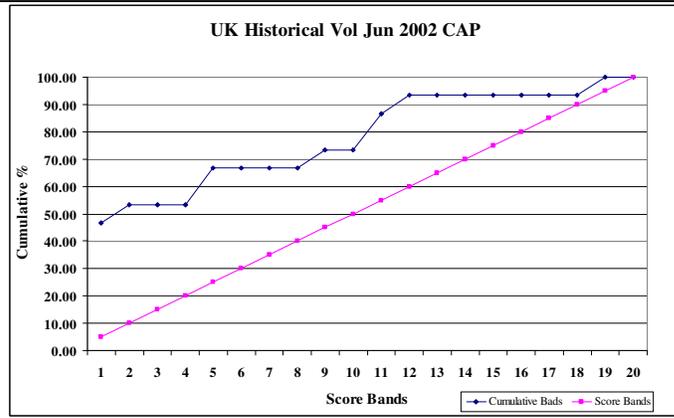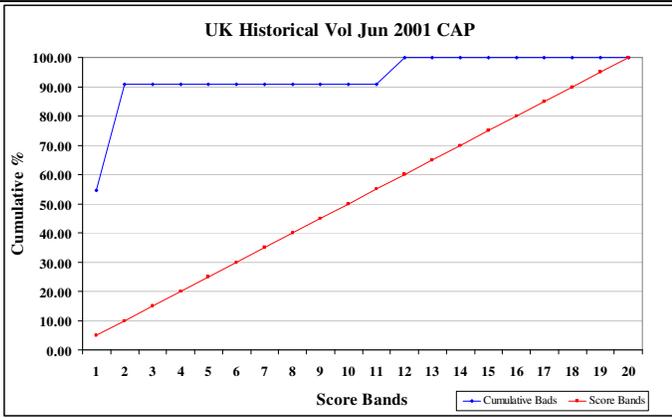
June 2001: 11 Defaults GC: 81.80%

UK Historical Vol Jun 2002 CAP

June 2002: 15 Defaults GC: 44.84%

**UK Historical Vol Jun 2003 CAP**

June 2003: 8 Defaults GC: 91.47%

The rather low score in June 2002 occurred due to the very rapid deterioration and default of six companies whose stock prices had been strong in June 2002. A chart of the companies' stock prices and a brief summary of the circumstances leading to their default is as follows:

Event Background	Commentary
Health Clinic Liabilities, Enterprise Value and 1 Year Default Probability	

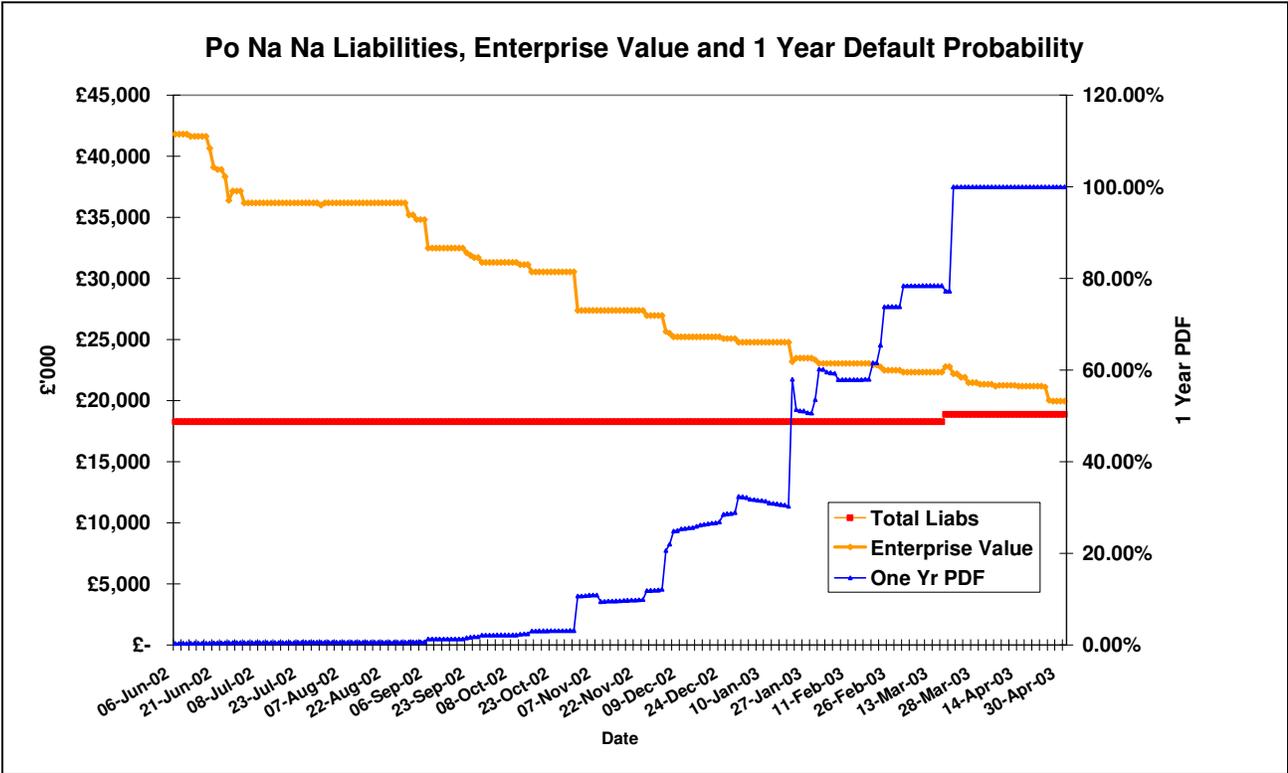| Event Background	Commentary
Cause: Fraud/Financial Deception Stock suspended 13th Sept 02. CFO dismissed for gross misconduct 26th Sept 02 due to £3 MM overstatement of sales/receivables & earnings. 11th Oct 2002, into administration.	Health Clinic Plc was the most serious disparity between the www.FirstKnow.It evaluation and the company's true position. At the time of default, the company was considered strong with liabilities of £10.4 MM and enterprise value of £47.1 MM. It seems the financial markets were deliberately or inadvertently misled as to the true financial position of the company.

Old Monk Liabilities, Enterprise Value and 1 Year Default Probability
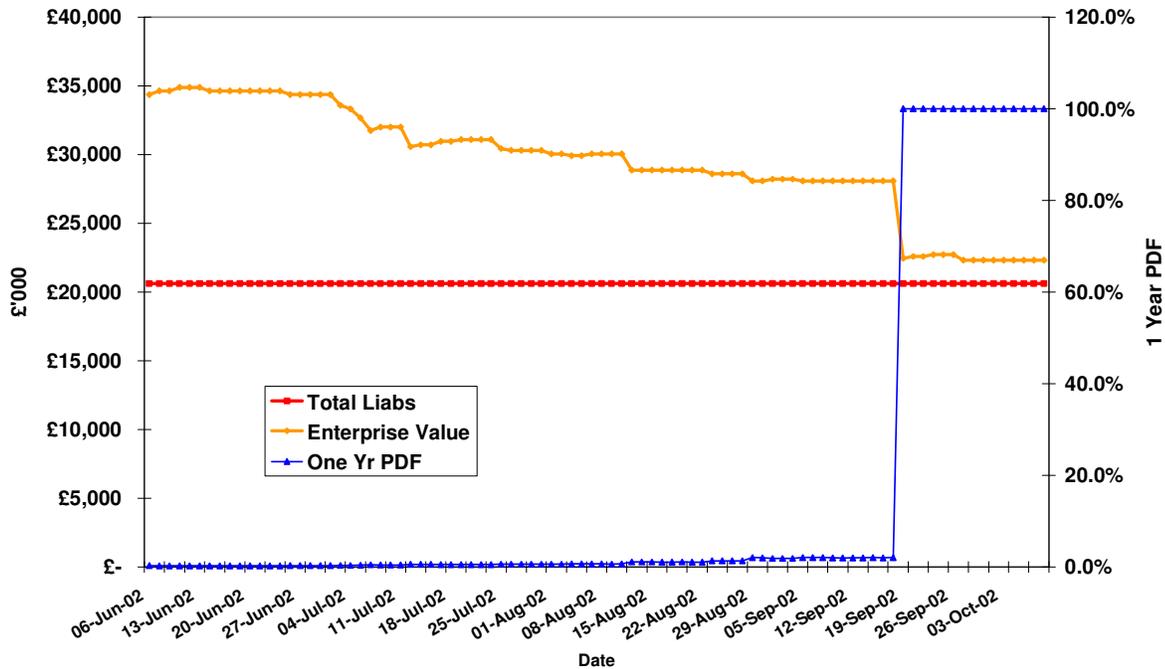
| Cause: Withdrawn Bank Facilities/Trading Environment	Old Monk saw the second greatest disparity between the www.FirstKnow.It evaluation and the company's true financial position. At 6th June 02 the ratio of enterprise value to total liabilities and asset volatility were very similar to Enterprise Inns. On 18th Sept, the day before announcement of discussions with banks, the same variables were very similar to Regent Inns and Honeycombe Leisure in the same sector. Seems the bank was concerned by deteriorating economic and industry background which saw the stock price fall 46% between 6th June 02 and 19th Oct 02 and pulled facilities.
Pubs & bars group. Low sector entry cost, combined with consumer downturn causing oversupply & increased competition. Trading profitably in year to April 2002 with 32% increase in trading profits but loss on pub disposals in strategic redirection.	

Po Na Na Liabilities, Enterprise Value and 1 Year Default Probability

Cause: Trading Environment /Withdrawn Bank Facilities	Rather similar background to Old Monk with serious deterioration in conditions in 2nd half of 2002 and first quarter of 2003. Coinciding with adverse market confidence in the context of economic uncertainty, political uncertainty with pre-Iraq war UN disagreements and subsequent Iraq war.
Like Old Monk, a pubs & bars group. Low sector entry cost, combined with consumer downturn causing oversupply & increased competition.	Deteriorating outlook much more evident in stock price after 6th June 02, and hence 1 year default probability, than with Old Monk.

**Hay & Robertson Liabilities, Enterprise Value and 1 Year Default Probability**
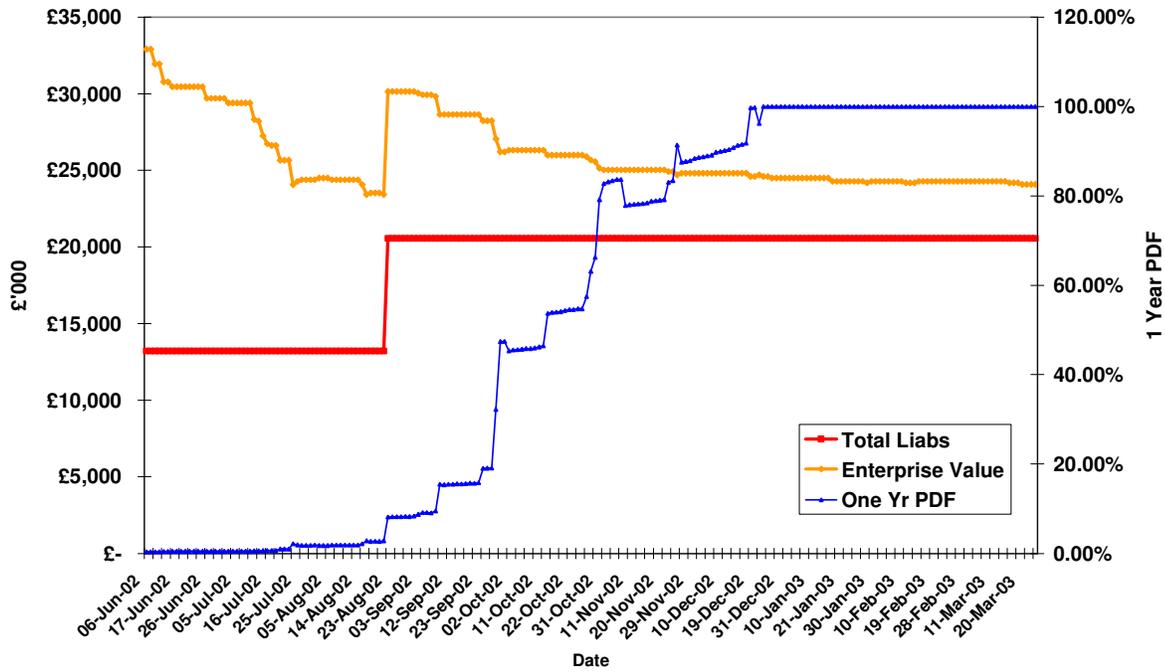
Cause: Deteriorating trading in context of increased indebtedness	Rapid deterioration in the situation. Equity value declined 80% between in six months from 6th June 02 to 6th December 02. Liabilities increased 56% in new accounts, 23rd August 02 with consequent increase in default risk.
Branded merchandise group.	

Stenoak Liabilities, Enterprise Value and 1 Year Default Probability
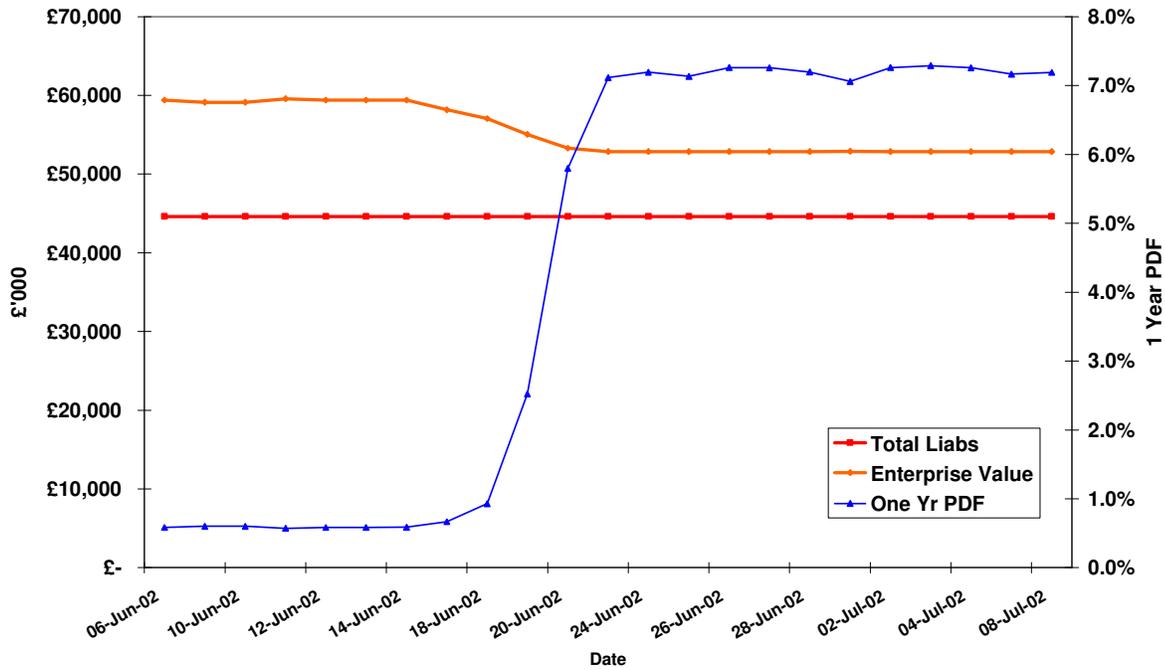
Cause: Withdrawal of Credit Insurance to major suppliers	At 6th June 02 the ratio of enterprise value to total liabilities and asset volatility were very similar to Amec, Carillion, Kier, and Morgan Sindall, Galliford Try in the same sector.
Company saw record PBT in year to December 2001, up 51% on prior year.	
Road maintenance and repair.	

RDL Group Liabilities, Enterprise Value and 1 Year Default Probability
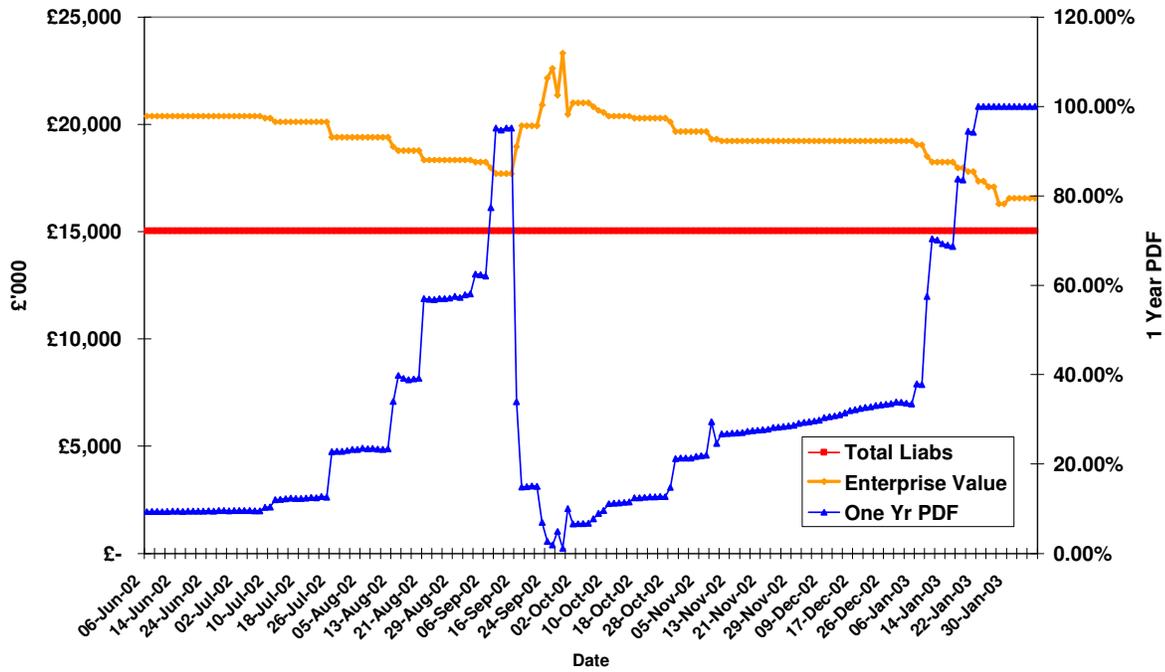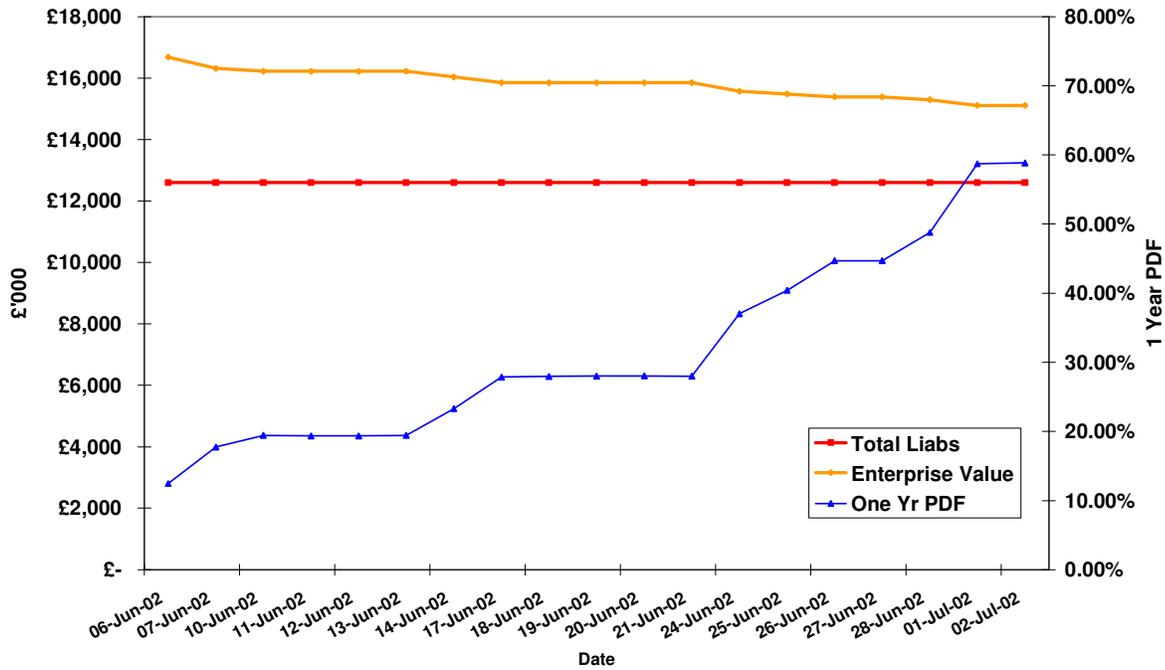
Cause: Bad Timing/IT Recruitment Downturn RDL merged/acquired Systems International Group in Sept 01 with a 50% share premium. Serious downturn in IT Recruitment in late 01 & 2002.	Default probability rose from 9.4% on 6th June 02 to 95% in mid Sept 02.

16

Fish Liabilities, Enterprise Value and 1 Year Default Probability

Cause: Trading Environment /Withdrawn Bank Facilities	
Consumer downturn post 9/11 against. Could not summon resources to restructure the group.	Trading downturn & lack of banker confidence in restructuring the group. Default probability rose from 12.5% on 6th Jun 02 to 60% four weeks later at the time of stock suspension.

RDL Group and Fish were rather weak groups which had a default probability of about 10% on 6th June 02. The companies rapidly deteriorated with the on-set of the difficult trading environment which characterized the second half of 2002.

Stenoak's failure appears to be due to an "unflagged" decision by a credit insurer of third parties to suspend credit insurance on the company. Hence the stock price did not reflect the probable failure of the company.

Old Monk and Po Na Na group were both niche pub and bar groups which could not secure bank support against the background of deteriorating trading and economic and political uncertainty which characterized the second half of 2002. Bankers felt the business environment was not conducive to supporting new initiatives in drinks retailing.

Health Clinic's failure came against a backdrop of misrepresentation of the company's true financial position and hence a false market in the company's stock.

The defaults which particularly reduced the Gini coefficient of the www.FirstKnow.It system were Stenoak, Old Monk, Po Na Na and Health Clinic. The first three of these were events where default hinged on particular decisions by credit providers/insurers which were not foreshadowed in the companies' stock prices. The Health Clinic default occurred against a background of deception, where the company deliberately created a false market in its stock, which consequently did not reflect the likelihood of default.

Conclusion UK Analysis

The performance of the www.FirstKnow.It system in 2001 and 2003 was very good, producing Gini Coefficients of 81.8% and 91.47% respectively.

2002's performance was disappointing, with economic and political uncertainties producing casualties among companies which were relatively highly rated by the www.FirstKnow.It system. Given that the options-based approach to credit evaluation uses the stock price as the primary indicator of financial strength for a company, this disappointing performance really reflects disappointing performance in the stockmarket's pricing of these companies' stock. In part, this is to be expected. Fish, RDL, Stenoak, Po Na Na and Old Monk all come from the smallest quartile of UK companies by equity capitalization. Compared to companies evaluated in the US service, of www.FirstKnow.It , the smaller companies in the UK, French and German services really are very small – the average company size in the smallest two quartiles of companies in the US coverage is about 18 times the size of the average UK company in the corresponding quartiles as shown in the following chart:

Chart 4

Average Equity Capitalization, First and Second Quartiles
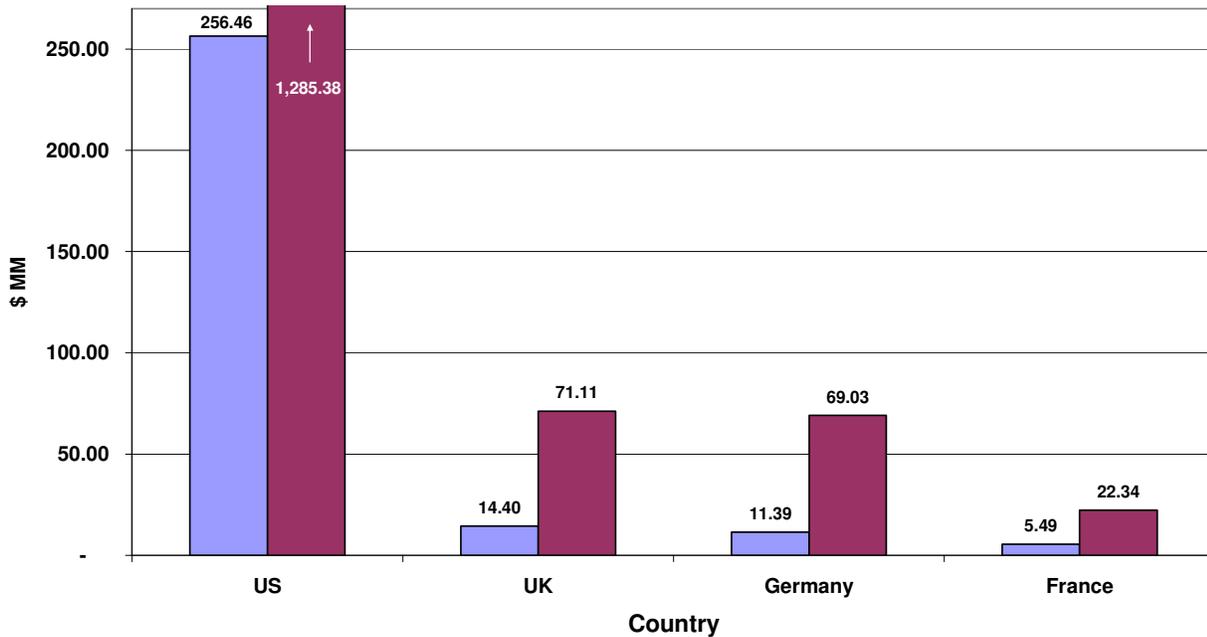
Given their much smaller size, their equity is much less traded and less studied, and correspondingly will be less efficiently priced than companies in the same quartile in the US coverage. Also, as smaller companies, they are much more susceptible to specific factors in the business environment – such as withdrawal of credit and credit insurance - than corresponding companies in the US.

It is therefore to be expected that the average UK Gini Coefficient will be significantly lower than for US companies and downturns will cause smaller companies to be affected by specific factors not reflected in the companies' stock price.

Excluding Health Clinic, which defaulted in circumstances of fraud/deception the Gini Coefficient increases to 55.2%.

French Coverage

The Gini analysis is produced on an annual basis for the www.FirstKnow.It data for three successive years commencing 6th June 2001. The analysis takes the one year default probability and performs the Gini analysis on companies defaulting during the subsequent 12 months. Over the three year time horizon, there were 25 defaults among the 750 companies comprising the French coverage, as follows:

Table (5)   **French Defaults: June 2001 - June 2004**

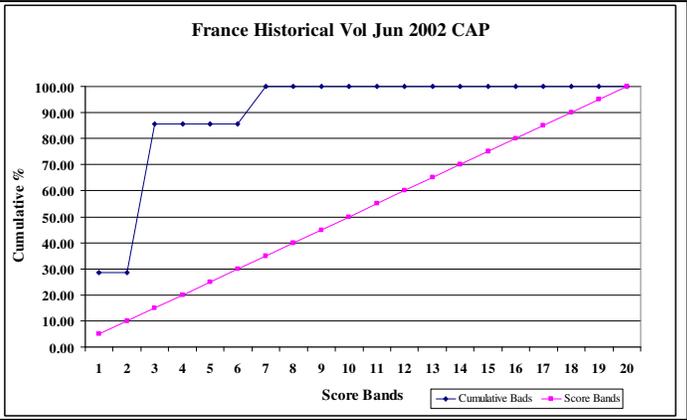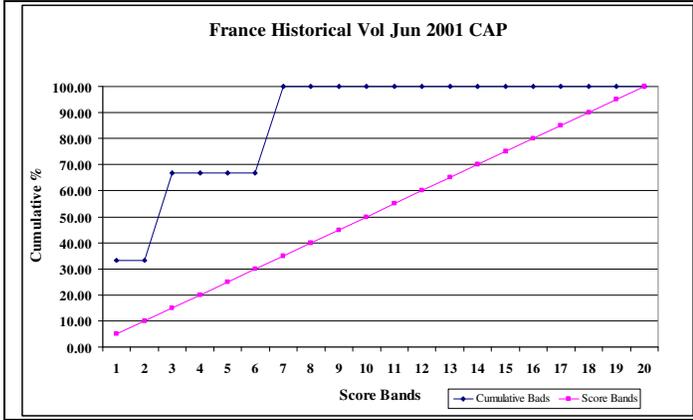| June 2001/2002		June 2002/2003		June 2003/2004	
Company	**Default**	**Company**	**Default**	**Company**	**Default**
Regina Rubens	30-Apr-01	Cryo	15-Jul-02	CAC Systems	30-Jun-03
Leon De Bruxelles	27-Jun-01	Difintel	07-Aug-02	Pere-Noel.Fr	02-Jul-03
Cocoon	09-Nov-01	Integral Media	03-Sep-02	Netvalue	15-Jul-03
Perfect Technologies	28-Nov-01	Artis Finance	27-Sep-02	Thermatech Ingenierie	23-Jul-03
Mossley Badin	15-Mar-02	Integra	01-Oct-02	FI System	26-Sep-03
		INTI	26-Oct-02	Stephane Kelian	23-Dec-03
		D Interactive	29-Oct-02	Parsys	01-Mar-04
		Picogiga	03-Dec-02	Titus Interactive	06-Jun-04
		Mandrakesoft	15-Jan-03		
		R2I Sante	08-Apr-03		
		C2D - Cie Du Develop. Durable	22-Apr-03		
		CGBI - Cie Gen. De Bur. Inform:	07-May-03		
Total Defaults	**5**	**Total Defaults**	**12**	**Total Defaults**	**8**

The www.FirstKnow.It model gave good prediction during the year from June 2001 with Gini Coefficient of 68.50% and very good prediction from June 2002 and June 2003 with Gini Coefficients of 75.68% and 77.04% respectively, giving a mean Gini Coefficient of 73.74% over the three years.

Table (6)	**Gini Coefficient: French Historical Volatility Analysis %: June**		
2001	**2002**	**2003**	**Mean**
68.50	75.68	77.04	73.74

This analysis indicates the model has very good ability to discriminate between good and bad credit risks on the one year time horizon.
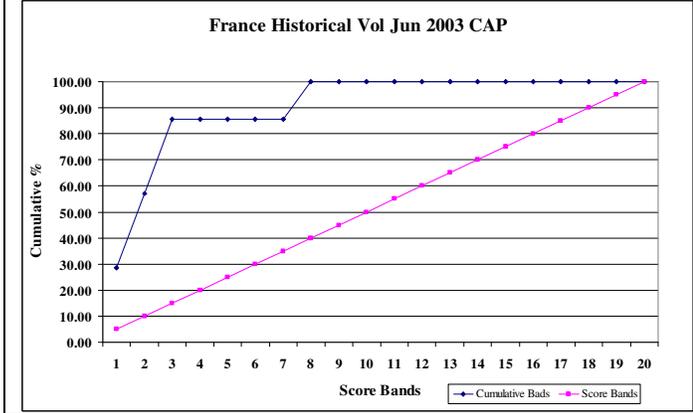
As well as producing high Gini Coefficients, the model also provides very stable results indicating a consistent ability to discriminate default risks.

Gini Charts are as follows:

France Historical Vol Jun 2001 CAP 	**France Historical Vol Jun 2002 CAP**
June 2001: 6 Defaults GC: 68.50%	**June 2002: 12 Defaults GC: 75.68%**
France Historical Vol Jun 2003 CAP 	
June 2003: 8 Defaults GC: 77.04%	

Conclusion French Analysis

The www.FirstKnow.It model has provided a very good indicator of one-year probability of default over the three year time period of this analysis. The average Gini Coefficient of 73.74% is well in the upper range of the typical maximum aspiration of 50%-80% for credit models. The results of the analysis indicate that the model had very good predictive capability. The consistency of performance of the model during this highly unstable period has also been very good particularly given the low equity capitalization of the smaller French companies.