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An emerging market credit scoring system for corporate bonds

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Abstract

In this article we introduce a scoring system (EMS Model) for Emerging Corporate Bonds. The scoring system provides an empirically based tool for the investor to use in making relative value determinations. The EMS Model is an enhanced version of the statistically proven Z-Score model. Unlike the original Z-Score model, our approach can be applied to nonmanufacturing companies, and manufacturers, and is relevant for privately held and publicly owned firms.The adjusted EMS Model incorporates the particular credit characteristics of emerging markets companies, and is best suited for assessing relative value among emerging markets credits. The model combines fundamental credit analysis and rigorous benchmarks together with analyst-enhanced assessments to reach a modified rating, which can then be compared to agency ratings (if any) and market levels. We have included a summary of Mexican companies for which we have applied the EMS Model. We have included in this a description of Mexican company credits, first from prior to the Mexican crisis (1994) then followed, in some cases, to a more recent date.

JEL classification: G20; G21; G28; G33

Keywords: Credit risk; Corporate bonds; Emerging markets

1. An emerging market credit scoring system for corporates

Most published credit scoring models, including the author's original Z-Score model (Altman, 1968) involve the development and testing of scoring models based, essentially, on U.S. data. While there is no reason why these models cannot be applied to companies throughout the rest of the world, we recognize that each environment has its own peculiarities; hence, "local" models could be expected to perhaps outperform U.S. models, at least in their testing phase. Indeed, in Altman and

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Hotchkiss (2005), we present an annotated bibliography and short discussion of numerous models built in over 20 countries throughout the world over the past 30 years. Still, we believe that generic credit risk models are applicable in most environments since the fundamentals of corporate insolvency analysis are relevant everywhere. What does differ is local bankruptcy laws and therefore the expected and unexpected default *loss* function will be impacted (see Altman et al., 2005).

In this article, we explore the application of one of our Z-Score approaches for credit rating purposes in emerging markets. We developed this model first in the mid-1990s (Altman et al., 1995) to provide an analytical framework for the then growing, but still nascent, corporate market for emerging market companies issuing bonds in non-local currency (usually U.S. dollars). Since this Eurobond market was launched in the early 1990s, there was little history and no defaults to facilitate the construction of models based on "local" data.

2. The Emerging Market Score Model (EMS model)

The emerging market scoring model (EMS) for rating emerging market credits is based first on a fundamental financial review derived from a quantitative risk model; and second, on our assessments of specific credit risks in the emerging market in order to arrive at a final *modified rating*. The investor can then utilize this rating after considering the appropriate sovereign yield spread, to assess equivalent bond ratings and intrinsic values. We realize that most of the variation in yields on corporate bonds is explained by sovereign yield variation. Our approach is to analyze the yield differences between emerging market corporate bonds based on firm unique variables, and then add the sovereign spread differential to arrive at a required return determination. An alternative method could be a model which strips out the part of the corporate spread explained by its sovereign affiliation and concentrates on the idiosyncratic spread.

The foundation of the EMS model is an enhancement of our Z″-Score model (see Altman, 1993), resulting in an EM Score and its associated bond rating equivalent (BRE). The EM score's rating equivalent is then modified based on three critical factors including (1) the firm's vulnerability to currency devaluation, (2) its industry affiliation, and (3) its competitive position in the industry. Unique features of the specific bond issue should also be considered. These subjective modifications are an important complement to the EM score. The resulting analyst modified rating is compared to the actual bond rating (if any). Where no agency rating exists, our analyst modified rating is a means to assess credit quality and relative value both to credits within a country and to US corporates. The implied yield spread based on the Analyst Modified Rating can be observed from the U.S. Corporate bond market. Steps 1 through 6 (below) will outline the process by which we use the EM score to reach an analyst modified rating. You will note that our analyst modified rating is not constrained in any manner by the so-called "sovereign-ceiling." A sovereign-ceiling is a standard rating protocol that usually limits an individual corporate issuer to receive an international-rating no higher than the sovereign in which it is located. The reasoning is that the sovereign can usually expropriate resources from the corporation should there be a crisis of some sort. We do advocate, however, in most cases, to factor in the appropriate current sovereign yield spread differential between the emerging market country and comparable-duration U.S. Treasuries, when arriving at a required rate of return on the emerging market corporate.

2.1. Step 1: U.S. Bond rating equivalent

In developing our emerging market system (EMS), we proceeded based on a series of steps. We scored each bond by its EM score and classified it relative to its stand-alone U.S. bond rating

equivalent. Emerging market corporate credits should initially be analyzed in a manner similar to traditional analysis of U.S. corporates. This involves the examination of measures of performance in such a manner as to establish a rating equivalent of the particular issuer. Instead of using a new ad hoc system, which may not be based on a rigorous analytical examination of creditworthiness, we will use an established and well-tested system. Since it was not yet possible to build such a model from a sample of emerging market credits, we suggest testing the applicability of a modified version of the original Z-Score model. This Z″-Score model is based on a comparative profile of bankrupt and non-bankrupt U.S. manufacturers. Our modifications, we felt, could be applied to non-manufacturing, industrial firms and to private and public entities.

The original Z-Score model is based on at least two data sources that make it inappropriate to use for all emerging markets corporates: (1) it requires the firm to have publicly traded equity and (2) it is primarily for manufacturers. In more than 35 years of experience in building, testing and using credit scoring models for a variety of purposes, the original model has been enhanced to make it applicable for private companies and non-manufacturers. The resulting model, which is the foundation for our EMS model approach, is of the form:

$$\text{EM Score} = 6.56(X_1) + 3.26(X_2) + 6.72(X_3) + 1.05(X_4) + 3.25$$

where X_1 = working capital/total assets; X_2= retained earnings/total assets;
X_3 = operating income/total assets; X_4 = book value of equity/total liabilities.

The constant term in the model (3.25), which is derived from the median Z″-Score for bankrupt US entities, enables us to standardized the analysis so that a default equivalent rating (D) is consistent with a score below zero (actually scores below 1.75 are rated D).

Major accounting differences between the emerging market country and the United States must be factored into the data used in the calculations of our measures. For example, our calculation of retained earnings is based on the sum of past retained earnings plus the value of stock issuance plus the capital reserve, (the surplus or deficiency on restatement of assets) and finally, the net income (loss) for the current period.

The original Z″-Score model was tested on samples of both non-manufacturers and manufacturers in the U.S. and its accuracy and reliability have remained high. We have also carefully calibrated the variables and the resulting score with U.S. bond rating equivalents. These equivalents, given in Fig. 1, are based on a sample of more than 750 U.S. firms with rated bonds outstanding.

2.2. Step 2: adjusted bond rating for foreign currency devaluation vulnerability

Each bond is then analyzed as to the issuing firm's vulnerability to problems in servicing its foreign currency denominated debt. Vulnerability is assessed based on the relationship between non-local currency revenues minus costs compared to non-local currency interest expense, and non-local currency revenues versus non-local currency debt. Finally, the level of cash is compared with the debt coming due in the next year.

If the firm has high (weak) vulnerability, that is, it has low or zero non-local currency revenues and/or low or zero revenues/debt, and/or a substantial amount of foreign currency debt coming due with little cash liquidity, then the bond rating equivalent in Step 1 is lowered by a full rating class, such as, BB+ to B+. There is a one-notch (BB+ to BB) reduction for a neutral

	Z''-Score			Rating		Z''-Score			Rating	
Safe zone			> 8.15	AAA		5.65	–	5.85	BBB-	
	7.60	–	8.15	AA+		5.25	–	5.65	BB+	
	7.30	–	7.60	AA		4.95	–	5.25	BB	Grey zone
	7.00	–	7.30	AA-		4.75	–	4.95	BB-	
	6.85	–	7.00	A+		4.50	–	4.75	B+	
	6.65	–	6.85	A		4.15	–	4.50	B	
	6.40	–	6.65	A-		3.75	–	4.15	B-	
	6.25	–	6.40	BBB+		3.20	–	3.75	CCC+	Distress zone
	5.85	–	6.25	BBB		2.50	–	3.20	CCC	
						1.75	–	2.50	CCC-	
								< 1.75	D	

Source: Average Z”-Score by rating from In-Depth Data Corporation financial statements.

Fig. 1. Z''-score and equivalent bond rating.

vulnerability assessment, but no change in rating for a low risk given a currency devaluation. This is so because we are interested in a U.S. BRE.

2.3. Step 3: adjusted for industry

The original (Step 1) bond rating equivalent is compared to a U.S. generic industry safety rating equivalent, as shown in Fig. 2. For up to each full-letter grade difference between the two ratings, Step 2's bond rating equivalent is adjusted up or down by one notch. For example, if the rating from Step 1 is BBB and the industry's rating is BBB−, BB+, or BB, then the adjustment is one notch down; if the difference is more than one full rating class but less than two full ratings, there is a two-notch adjustment. Finally, the industry environment in the specific emerging market country is factored into the analysis. For example, the Mexican construction industry's weakness in the post-peso crisis period was a consideration and its industry risk rating was adjusted lower than its US counterpart.

2.4. Step 4: adjusted for competitive position

Step 3's rating is adjusted up (or down) one notch depending on whether or not the firm is a dominant company in its industry or a domestic power in terms of size, political influence, and quality of management. It is also possible that the consensus competitive position result is neutral (no change in rating).

2.5. Step 5: special debt issue features

If the particular debt issue has unique features, such as collateral or a bona fide, high-quality guarantor, then the issue should be upgraded accordingly. We advocate that if there is a high-quality guarantor that it be a legal guarantee and not an informal one. The latter was the case in Argentina when an affiliate of a Pepsi Cola bottler (Baesa, S.A.) did, indeed, default.

2.6. Step 6: comparison to the sovereign spread

The analyst modified rating is then compared to what US corporate bonds of the same rating are currently selling for. The U.S. corporate credit quality spread is then added to the

Sector	Average Sector Credit Safety
Telecommunication	High A
Independent Finance	High A
Natural Gas Utilities	High A
Beverages	High A
High Quality Electric Utilities	High A
Railroads	High A
Food Processing	Mid A
Bottling	Mid A
Domestic Bank Holding	Low A
Tobacco	Low A
Medium-Quality Electric Utilities	Low A
Consumer Products Industry	Low A
High Grade Diversified Mfg./Conglomerates	Low A
Leasing	Low A
Auto Manufacturers	Low A
Chemicals	Low A
Energy	Low A
Natural Gas Pipelines	High BBB
Paper/Forest Products	Mid BBB
Retail	Mid BBB
Property & Casualty Insurance	Mid BBB
Aerospace/Defense	Mid BBB
Information/Data Technology	Mid BBB
Supermarkets	High BB
Cable and Media	High BB
Vehicle Parts	High BB
Textile/Apparel	High BB
Low-Quality Electric Utilities	Mid BB
Gaming	Mid BB
Restaurants	Mid BB
Constructions	Mid BB
Hotel/Leisure	Mid BB
Low-Quality Manufacturing	Mid BB
Airlines	Low BB
Metals	High B

Fig. 2. Average credit safety of industry groups (source: Salomon Brothers, 1995).

appropriate option adjusted spread of the sovereign bond. For example, if the modified rating of the bond is BBB and such quality bonds in the U.S. are trading at 100bp over US Treasuries (e.g., 10 year T-bonds in early 2005 of 4.5%) and the Mexican comparable duration Treasuries are trading at 200bp over their U.S. counterparts, then the required return will be 7.50% (4.50%+100+200 bp). The analyst would then evaluate the actual yield on the particular emerging market corporate bond and compare it to the required yield based on the EM scoring model (e.g., in this case 7.50%). If the actual yield is greater than 7.5%, then the bond would be considered to be an attractive potential purchase, and vice versa.

Fig. 3 summarizes the six-step process we have just outlined. While the last step illustrates our model's applicability to the investment process in choosing, or not, an individual bond, the generic process is a method to assess the relative credit quality of any corporation in the emerging market environment, regardless of whether it has an international bond outstanding. We now move to a few modifications and tests that we made based on an analysis of the model in the period just after we built it. Before observing these tests, however, we would like to suggest that the analyst who does not have the information, or the time, to make the adjustments suggested in Steps 2 through 6, still is able to apply the initial Step 1 calculation and infer some useful information.

- Step 1 – Calculate the EM Score and its Bond Rating Equivalent (BRE) compared to the U.S. bond market
- Step 2 - Adjust (modify) the Bond Rating Equivalent for Foreign Currency Revaluation Vulnerability
  - High vulnerability = -1 rating class (3 notches)
  - Neutral vulnerability = -1 notch
  - Low vulnerability= no change
- Step 3 - Adjust BRE for Risk of Industry in the Emerging Market vs. Risk of the Industry in the U.S.
  - ± -1 or 2 notches
- Step 4 - Adjustment of BRE for competitive position
  - Dominant firm in industry = +1 notch
  - Average firm inindustry = no change
  - Poor competitive position = -1 notch
- Step 5 - Assess Impact of Special Collateral or Guarantees on BRE
- Step 6 - Assess the yield in the U.S. market on the modified BRE of the emerging market credit, then add the sovereign yield spread. Finally, compare the resulting required yield with the yield in the market

Fig. 3. An emerging market credit scoring system.

3. Applying the EMS model to Mexican corporates

In Fig. 4 we calculate the EM score for almost 30 Mexican corporations that had issued corporate bonds in the Eurobond market. Note that only 13 had received a rating from at least one of the three rating agencies as of year-end 1994. Also, you can observe that the scores range across the full spectrum of bond rating equivalents from AAA to D. Indeed, only one firm, Aeromexico, was rated as D at the time of the peso-crisis (December 1994) and that firm had already filed for bankruptcy in an experimental test of the bankruptcy court system. We will later examine the profile of Aeromexico subsequent to its emergence from bankruptcy.

Four Mexican firms received the highest BRE, and many had ratings above the Mexican sovereign ceiling (BB). The modified ratings are also shown, and most firms received lower ratings than the original EMS rating from Step 1.

4. Modifications and tests of the emerging market model

4.1. Equity market value consideration and impact

When we first modified our U.S. Z''-Score model to adopt to the emerging market bond sector, we decided to use a model with the book value of equity, not the market value, as the fourth variable. This was done for several reasons, including the concern that emerging equity markets were not very liquid and possibly seriously inefficient. Also, we were not sure if we could even find continuous equity prices for some of our sample companies. We since discovered that equity prices were consistently available for many companies, especially the ones large enough to issue corporate bonds in the international bond market and that there could, indeed, be some valuable information content in the equity numbers and their changes over time.

Despite the inefficiencies in emerging market equity valuations, a company whose stock is valued highly by the financial community can usually borrow more easily and raise new equity or sell assets at better prices than one that is being discounted by investors.

Company	Industry	EM Score	Bond-Rating Equivalent	Modified Rating	Ratings M/S&P/D&P
Aeromexico	Airlines	-4.42	D	D	NR/NR/NR
Apasco	Cement	8.48	AAA	A	Ba2/NR/NR
CCM	Supermarkets	4.78	BB-	B+	NR/NR/NR
Cemex	Cement	5.67	BBB-	BBB-	Ba3/BB/BB
Cydsa	Chemicals	4.67	BB-	B+	NR/NR/NR
DESC	Conglomerate	4.23	B	BB+	NR/NR/NR
Empresas ICA	Construction	5.96	BBB	BB	B1/BB-/B+
Femsa	Bottling	6.37	A-	BBB+	NR/NR/NR
Gemex	Bottling	5.40	BB+	BB+	Ba3/NR/NR
GIDUSA (Durango)	Paper and Forest Products	4.61	B+	BB	B1/BB-/NR
GMD	Construction	4.85	BB	B-	B3/NR/NR
Gruma	Food Processing	5.56	BBB-	BBB+	NR/NR/NR
Grupo Dina	Auto Manufacturing	5.54	BBB-	BB+	NR/NR/B
Hylsamex	Steel	5.51	BBB-	BB-	NR/NR/NR
IMSA	Steel	5.45	BBB-	BB-	NR/NR/NR
Kimberly-Clark de Mexico	Paper and Forest Products	8.96	AAA	AA	NR/NR/NR
Liverpool	Retail	9.85	AAA	A+	NR/NR/NR
Moderna	Conglomerate	5.28	BB+	BB+	NR/NR/NR
Ponderosa	Paper and Forest Products	6.64	A	BB	NR/NR/NR
San Luis	Autoparts	2.69	CCC	CCC-	NR/NR/NR
Sidek	Conglomerate	4.68	BB-	B	NR/NR/CCC
Simec	Steel	4.42	B+	B-	NR/NR/CCC
Situr	Hotel and Tourism	5.17	BB+	B	NR/NR/CCC
Synkro	Textile/Apparel	1.59	CCC-	CCC	NR/NR/NR
TAMSA	Steel Pipes	3.34	CCC+	B	NR/NR/NR
TELMEX	Telecommunications	9.57	AAA	AA-	NR/NR/NR
Televisa	Cable and Media	7.29	AA	BBB+	Ba2/NR/NR
TMM	Shipping	5.34	BB+	BB+	Ba2/BB-/NR
Vitro	Glass	5.18	BB+	BB	Ba2/NR/NR

M = Moody's Investor Services
S&P = Standard & Poor's
D&P = Duff & Phelps (now FITCH)

Source: Author's compilations.

Fig. 4. Mexican corporate issuers — EM Scores and modified ratings (December 1994).

Since the corporate bonds of emerging market companies are, by rating agency definitions, almost all non-investment grade, their yield and volatility patterns at times are more correlated with equity market activity than are investment grade corporates. The same could be argued for firms issuing bonds in the U.S. high yield bond market.

There are two ways that we can introduce a market value of equity factor into our system. First, a new variable reflecting the market to book value of equity, or some similar measure, could be added to the existing four variables. Since the original database used to construct the EM systems did not contain that variable, it is impractical to reestimate the equation using a new database. The second approach is to add an additional phase to our modified equivalent bond rating process — one that incorporates a comparison of the bond rating equivalent using the ratio of book value of equity to total liabilities (X_4 in the model) versus the same variable with the market value of equity (number of shares outstanding times the stock price) substituted for the book value.

The second approach is what we actually have done in this iteration of the EMS model. The procedure we followed is to calculate the bond rating equivalent in the traditional manner, which involves (1) the initial bond rating based on the multivariate model, and (2) modifications based on currency devaluation vulnerability, industry affiliation, and competitive position. The final phase now is to compare the bond rating equivalent using book equity to the rating equivalent using the market value of equity.

If the two systems give the identical rating or are different by only one notch, then the modified rating is unchanged. If, however, the two versions result in a two-notch differential, then we increase or decrease the final modified rating by one notch. Finally, if the difference is a full rating class (three notches) or more, the modified rating is changed by two notches.

4.2. Testing the EMS model

As an example of the application of this new adjustment, based on six months ended (June) 1996 data, there were 14 firms with higher bond rating equivalents when using the market value compared to the book value equity. Of the 14 firms, six had the same modified rating since the difference was only one notch; one had a one-notch upgrade and seven had a two-notch upgrade. Six firms in total had lower EM scores using market value compared to book value of equity, with four resulting in a one-notch downgrade and the other two not changed. Nine firms had the identical rating using the book and market value of equity measures. The actual comparisons are not shown for each firm.

The impact of using the market value of equity versus the book value can be considerable in the final modified rating for a company. Such an impact could, however, reflect the often inefficient market for Mexican companies' equity. The volatility of the Mexican peso and its impact on the Mexican equity market can mask the intrinsic values of Mexican equities. In addition, inflation accounting can distort the book value of equity of Mexican firms because of income statement noncash charges and the consequent changes in retained earnings and stockholders' equity. We believe that despite these inefficiencies, the Mexican equity market had rallied sufficiently and was efficient and comprehensive enough to add value to our model in the postcrisis period.

5. Performance of the EMS model for Mexican firms in post-peso crisis period

We continued to monitor the Emerging Market Scoring System (EMS) model, which was used first to assess the creditworthiness of Mexican firms as of year-end 1994, i.e., just at the time that the peso crisis hit that country [Fig. 4 above]. Subsequent bond equivalent modified ratings were calculated and evaluated for most of the same firms as of the third-quarter of 1995 and through the second quarter (midyear) of 1996. We paid close attention to those firms which the model classified as extremely risky (CCC or worse) or as likely near-term defaults (D). As noted earlier, we added the market to book value equity modified rating to the bond rating equivalent modified rating.

The emerging market model clearly illustrated the difficult economic and corporate environment in Mexico in the immediate period after the crisis and was a fairly accurate predictor of deteriorating credit quality in 1995 and then the recovering economy in 1996. More importantly, the model predicted accurately every defaulting firm's debt in the postcrisis period while also indicating the successful restructuring of a few entities. Fig. 5 updates the EM scores of 29 (out of the 31 companies listed) Mexican companies for two post-crisis periods, Q3-1995 and June 1996 (Q2), as well as their ratings at the time of the crisis in December 1994.

The EMS ratings were very accurate in assessing credit risk migration in the 18 months after the crisis. For example, we first rated Vitro Corporation "BB" in December 1994, downgraded it

Company	Industry	Q4-1994	Q3-1995	Q2-1996	Rating M/SP/D&P
Aeromexico	Airlines	D	CCC+	B	NR/NR/NR
Apasco	Cement	A	BBB-	BBB	Ba2/NR/NR
CCM	Retail	B+	B	BB+	NR/NR/NR
Cemex	Cement	BBB-	BB+	BB	B1/BB/BB
Cydsa	Chemicals	B+	BBB-	BB+	NR/NR/NR
Condumex	Steel	NR	BBB+	BBB+	NR/Nr/BB
Desc	Conglomerate	BB+	BB	BBB	NR/NR/NR
Grupo Dina	Transport Manufacturer	BB+	B+	B+	NR/NR/B-
Elektra	Retail	NR	NR	A+	NR/B/BB+
Empresas ICA	Construction	BB	B+	B	B1/BB-/B+
Femsa	Bottling	BBB+	BB+	BBB+	NR/NR/NR
Gemex	Bottling	BB+	B+	BBB+	Ba3/NR/NR
Durango	Paper & Forest Products	BB	BBB	BB+	B1/BB-/NR
GMD	Construction	B-	CCC	D	B3/NR/NR
Gruma	Food Processing	BBB+	BBB-	A-	NR/NR/NR
Hylsamex	Steel	BB-	BBB+	BBB	NR/NR/NR
Kimberly-Clarke de Mexico	Paper & Forest Products	AA	A+	AA-	NR/NR/NR
Liverpool	Retail	A+	A+	A+	NR/NR/NR
Moderna	Conglomerate	BB+	BBB-	BB	NR/NR/NR
Empaques Ponderosa	Paper & Forest Products	BB	A+	A	NR/NR/NR
San Luis	Autoparts	CCC-	B-	BB-	NR/NR/NR
Sidek	Conglomerate	B	CCC-	D	NR/NR/DD
Simec	Steel	B-	B+	D	NR/NR/DD
Situr	Hotel & Tourism	B	CCC-	D	NR/NR/DD
Synkro	Textile/Apparel	CCC-	D	D	NR/NR/NR
TAMSA	Steel Pipes	B	B+	BB	NR/NR/NR
TELMEX	Telecommunication	AA-	AA-	AA-	NR/NR/NR
Televisa	Cable & Media	BBB+	BBB-	A+	Ba3/BB/NR
TMM	Shipping	BB+	BBB	A+	Ba2/BB-/NR
Tribasa	Construction	NR	CCC	CCC+	Caa/B+/B
Vitro	Glass	BB	B	B-	NR/NR/NR

Source: Author's computations, Moody's, S&P, FITCH.

M = Moody's Investor Services
S&P = Standard & Poor's
D = Duff & Phelps (now FITCH)

Fig. 5. Mexican corporate issuers — modified ratings (1994–1996).

to B as of Q3-1995 and to B− in June 1996. Our adjustments were based on data reflecting Vitro's struggling US subsidiary, *Anchor Glass*, and its progressive cash flow problems, as well as the resultant impact on Vitro's credit standing. Anchor Glass had represented over 40% of Vitro's consolidated revenues in previous years. In July 1996, both Moody's and S&P downgraded Anchor Glass to Caa from B2, and CC+ from B, respectively. In September 1996, Anchor Glass (US) filed for bankruptcy through a prepackaged Chapter 11 reorganization. In other examples, *Grupo Sidek* and its subsidiaries, *Grupo Situr* and *Grupo Simec*, continued to struggle through a restructuring, which began in early 1995. As a result of the ongoing restructuring and uncertainty about the financial independence of these companies, we assigned a rating of D in June 1996 for all three companies. Grupo Sidek, Grupo Situr and Grupo Simec had been rated CCC−, B+ and CCC−, respectively, in our December 1995 rating analysis. All three firms missed interest payments on their debt subsequent to our D rating.

5.1. Rating transitions and default prediction

Fig. 5 lists 31 companies and their rating transitions. Between December 1994 and June 1996, our analysis generated 13 upgrades and 12 downgrades, with six ratings remaining

unchanged. This was a reversal in the initial postcrisis (1995) upgrade/downgrade ratio, consistent with the turnaround in the Mexican economy. The Mexican economy had rebounded significantly since the beginning of 1996 with second quarter year-to-year GDP comparisons showing a 7.2% increase. We similarly began to see the signs of renewed domestic growth in the private sector with margin and volume increases for many of the domestic focused industries in the third quarter ending September 1996. It also reflects the impact of our addition of a market/book value of equity factor to our modified rating system.

Nine firms experienced significant improvements in their modified ratings of at least three notches, including: *CCM, DESC, Femsa, Gemex, Gruma, San Luis, Televisa*, and *TMM*. These nine firms represent a cross-section of domestic focused industries, which enjoyed recovering demand for their products. Only two firms, *Grupo Carso* and *GMD*, experienced significant downgrades of two or three notches. Carso still had a very respectable A-modified rating. GMD, however, had significant liquidity problems and dropped to D (default outlook). All the other downgrades were one-notch although Sidek, Situr and Synkro were firmly entrenched in the D rating category.

5.2. Defaulted. D-rated and low-rated bonds

As just noted, we ascribed a D rating to *GMD*. It was the only entity to receive this rating that had not yet defaulted. The three other firms with D-ratings, Sidek, Situr and Synkro, were all in restructuring on some of their outstanding indebtedness. All three had received either a CCC− or D rating prior to their defaults. And, GMD did subsequently default.

Other low-rated entities were *Grupo Tribasa* (CCC+) and Vitro (B−). As noted, Vitro's U.S. subsidiary defaulted on its own U.S. bonds in September 1996. It should also be noted that the one firm with a "D" rating as of December 1994 (Aeromexico) recovered to a "B" rating after emerging from bankruptcy in a rare Mexican corporate court-orchestrated reorganization.

5.3. Rating agency comparisons

Of the 29 Mexican companies that we originally analyzed (Fig. 4), only 13 were rated at that time by at least one of the major rating agencies (Duff and Phelps, Moody's, and S&P). In this section, we compare our modified EMS rating for these firms to the three agencies' evaluations. Our ratings were not constrained by the sovereign ceiling (Ba2/BB). Our ratings were unconstrained in order to assign a stand-alone fundamental credit view of a company and its securities.

Our EM-score's modified ratings were higher than the rating agencies for seven of the 13 firms (Apasco, Cemex, Dina, Durango, Gemex, TMM and Televisa). The EMS model assigned lower ratings for three firms, *GMD*, *Tribasa* and *ICA*, than the ratings assigned by the rating agencies. In the case of GMD, we gave the firm our lowest rating (D) indicating a highly risky situation and distinct default possibility. GMD was rated B3 by Moody's and unrated by the other two agencies. ICA's B rating was slightly lower than all three of the agency ratings. Our modified rating for Tribasa was CCC+ versus a Caa from Moody's, a B+ from S&P and a B from Duff and Phelps. Finally, our ratings were the same as S&P and Duff and Phelps and different by only one notch from Moody's for Cemex (modified rating: BB) and others.

5.4. Some time series examples and risk comparisons

Fig. 6a and b demonstrate the EMS scores (Step 1) for two important Mexican companies over the period 1998–2002. *Cemex*, the perennial benchmark Mexican credit and the world's second largest cement company, shows a fairly stable EMS and BRE. The more recent (2002) score of 4.70 reflects CEMEX's heightened leveraged condition as it pursued an aggressive acquisition strategy. *Telefonos de Mexico* demonstrates the typical global telecom

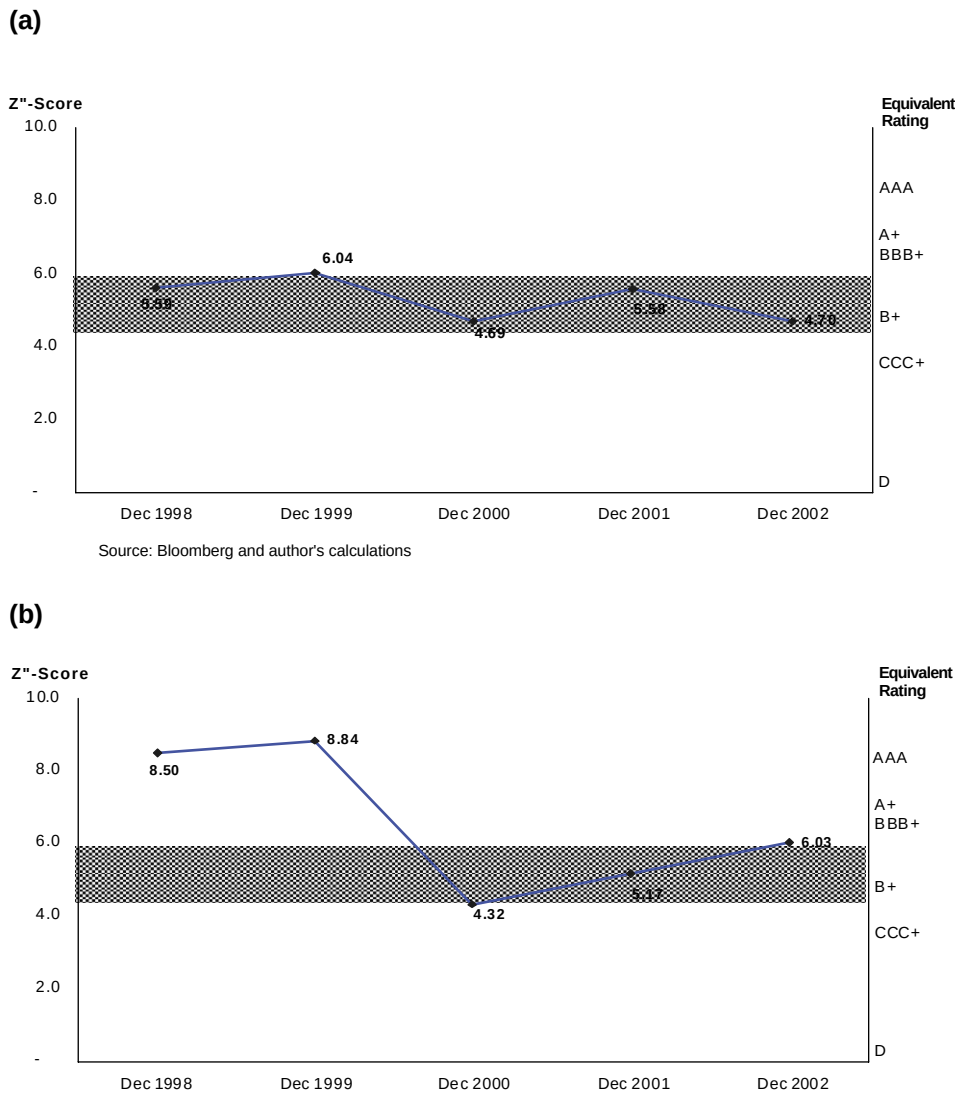

Fig. 6. (a)EMS for Cemex SA de CV (production, distribution, marketing and sale of cement), (b)EMS for Telefonos de Mexico SA de CV (provide telecommunications services (TELMEX)).

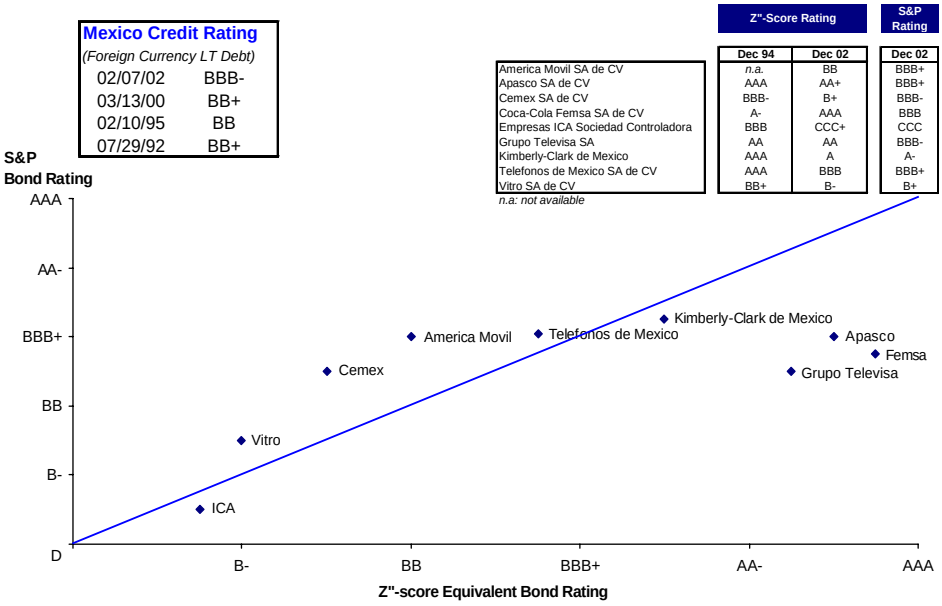

Fig. 7. EM-Scores, bond rating equivalents and S and P ratings (as of December 31, 2002).

experience for major firms with established markets and subscriber bases. Scores were extremely high in the later 1990s, fell considerably in 2000 and 2001, and rebounded in 2002.

Fig. 7 demonstrates the comparisons between our EMS model BREs and those comparable company ratings from a major rating agency (S&P). The firms found above the diagonal are ones where the S&P rating was higher than the EMS rating equivalent and viceversa for those below the line. Again, our model and its BREs are not impacted by the sovereign ceiling. The two firms' bonds shown in Fig. 6a and b are both rated as somewhat more risky by the EMS model than by S&P. Note that we have not applied the quantitative modifications discussed earlier in Steps 2–6.

6. Concluding remarks

Since 1996, we have, from time to time, applied the EMS model to emerging market companies other than Mexico. The results, too numerous to discuss here, were particularly robust in such countries as Brazil and Argentina in the late 1990s and also in many of the Southeast Asian countries in the pre and post-1997 Asian crisis. While we are impressed, and frankly a bit surprised by our modified U.S. model's successful application in non-U.S. environments, we still advocate building and testing models derived from the country's own data and experience, if possible.

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