Moody's ANALYTICS

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EDF-X Early Warning System At a Glance

Early warning of material risk is one of the fundamental challenges of credit risk analysis. While credit risk models provide a view into firm level credit risk, deriving actionable insights remains a challenge. A good early warning system requires robust measures of credit risk, straightforward decision rules and a framework for turning signals into action. The EDF-X Early Warning System includes these elements and is well suited for credit market professionals hoping to identify at-risk exposures well in advance of a negative credit event.

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1. EDF-X Early Warning System

Early warning of material risk is one of the fundamental challenges of credit risk analysis. Credit risk models using firm financials, prices of traded financial assets, behavioral data, macroeconomics and alternative metrics provide views into a company's credit risk. However, deriving actionable insights from such credit risk information remains a challenge. A robust early warning of credit risk requires three elements:

» Forward-looking measures of firm and credit cycle risk

» Early warning decision rules

» Analytical framework that summarizes risk signals into actionable insights

The EDF-X[1] Early Warning System (EWS) includes these elements, providing pre-calculated, point-in-time forward-looking credit risk signals for over 450 million public and private firms globally.

The EDF-X EWS combines two early warning decision rules into an actionable framework. The first decision rule, distance to trigger, identifies firms that are currently risky compared to their country/region/industry peer group. The second decision rule is the change in implied rating in the past year, which captures the trend in movement of credit risk.

Moody's EDF-X solution highlights the early warning risk measures and tools required not just to manage risk, but also to screen potential borrowers and exposures. The early warning tools in EDF-X allow you to efficiently and effectively identify the riskiest exposures, allowing you to prioritize these names for deeper assessment.

2. Moody's Analytics PDs

The EDF-X EWS uses projections from across Moody's Analytics suite of probability of default (PD) models. While using different inputs and approaches, these models all yield forward-looking, point-in-time PDs, are updated monthly or daily and serve as a solid foundation for early warning of credit risk. Further, EDF-X pre-calculates PDs for more than 450 million firms, meaning the EWS can identify changes in credit risk in a near automated way.

3. Decision Rules for Early Warning

Early warning decision rules are arguably more important than risk measures themselves. Even accurate risk measures like PDs lack an intuitive interpretation. If a PD rises from 0.2% to 0.4%, should you be concerned? It is not obvious. But if the same exposure's rating were to go from A to Baa, then you would be concerned, because the thresholds between ratings have meaning. As mentioned above, the EDF-X EWS relies on two decision rules to identify firms most at risk: PD distance to trigger and the change in PD-implied rating. The PD distance to trigger captures point-in-time relative credit risk. The PD-implied rating change captures transitions in absolute credit risk.

3.1. Distance to PD Trigger

Our first rule is the PD distance to trigger, defined as the log-difference between the company's PD and its peer-level trigger.

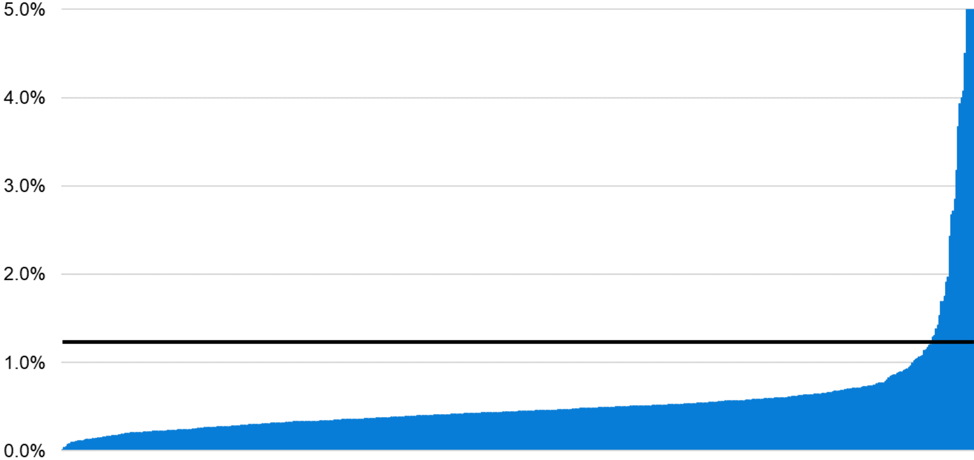
When a firm's PD is above the trigger level, it exhibits high risk relative to its peers, and it is more likely to experience financial distress. We can observe material differences in the distribution of PDs across industry sectors and countries. Therefore, applying a single PD trigger level across sectors would result in a perversely biased watchlist. Instead, triggers must be appropriately calibrated for a given exposure's peer group. In EDF-X, the most granular peer group includes private or public firms in the same country and industry sector.

PD trigger levels must also move with the credit cycle. Almost all PDs rise when the credit cycle turns, because refinancing conditions are less favorable, rates and credit spreads often increase, and the business environment is simply more challenging. Hence, the trigger must adjust when the aggregate credit environment becomes riskier/safer, in order to effectively identify the relatively risky names.

[1] https://edfx.com/

EDF-X includes time-varying PD trigger levels for over 300,000 peer groups. **Figure 1** illustrates the EDF-X trigger calculation with an example. For every date, we compute the PiT PD for each firm in the peer group. We sort them by size, compute the credit cycle-adjusted trigger percentile, and identify what PD level will be the cutoff above which there is excessive risk at that time.

Figure 1. Trigger and PD Distribution for a Given Peer Group at a Given Date



Calibration of the trigger level is critical to its success as an early warning signal. The higher the PD trigger level is set, the fewer firms will trigger an alert, which leads to lower false positives, or Type I errors, but at the expense of missing defaults right below the trigger level, leading to a higher false negative rate. Conversely, a relatively lower PD trigger level will lead to a higher number of firms signaling elevated risk and thus reducing the false negative rate, or Type II errors. There is an appropriate level for the PD trigger that balances out the early warning prediction errors; we define this parameter as the positive signal rate (PSR)[2]. PSR is the percentage of firms from a given portfolio that will signify enough risk to be assigned to a user's watchlist. Therefore, it consists of both the true and false positive signals. For example, a PSR of 20% means that, at any given time, 20% of the riskiest exposures in your portfolio will appear on your watchlist.

3.2. PD-Implied Rating Change

In many applications, the management of credit portfolios must take into account changes in absolute credit risk. This concept is distinct from the relative risk captured by our PD trigger. Whereas the PD trigger level is based on peer-comparison, significant increase in absolute credit risk evaluates changes in firm risk on a standalone basis and is often communicated using the language of credit ratings. To address this concept, the second decision rule in the EDF-X EWS is the change in the PD-implied rating over the past 12 months.

PD metrics can be mapped to the Moody's Investors Service (MIS) rating scale using a PD-implied rating mapping, with the mapping determined by historical PD measures associated with each rating class. It should be noted that PD-implied ratings, while expressed using the same rating symbols as MIS credit ratings, are not agency credit ratings.[3]

To assess changes in the level of credit risk, we calculate the 12-month change in the implied rating. We map both the current one-year PD and the PD value 12 months ago to the numerical static implied rating, using Table 1. The implied rating change is computed as the difference between the two. For example, if the PD today is 5% and it was 2% 12 months ago, the corresponding numerical implied rating is 15 (B2) at present and 13 (Ba2) one year ago. Consequently, the 12-month net change in implied rating is 15-13=2, meaning that the implied rating has deteriorated by two notches over the past 12 months.

[2] Customization of PSR will be available to users in future EDF-X releases.
[3] Moody's Investors Service credit ratings are based on the agency's own methodologies and do not rely on Moody's Analytics PD measures.

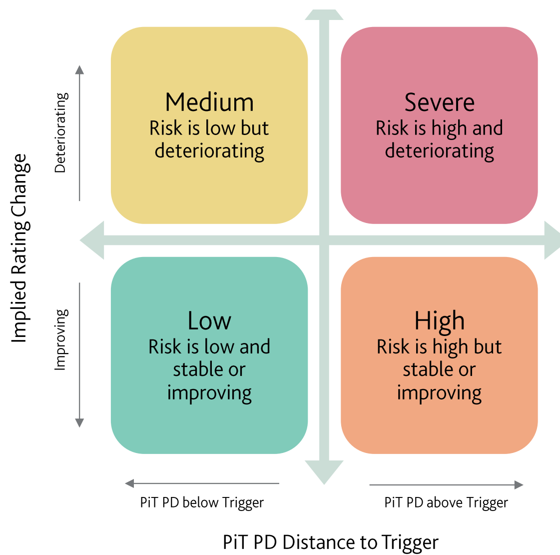
Table 1. EDF-X EWS PD-implied rating mapping

RATING	NUMERICAL RATING	PD GREATER THAN OR EQUAL TO	PD LESS THAN OR EQUAL TO
Aaa	1	0.0100%	0.0185%
Aa1	2	0.0186%	0.0308%
Aa2	3	0.0309%	0.0514%
Aa3	4	0.0515%	0.0857%
A1	5	0.0858%	0.1428%
A2	6	0.1429%	0.1785%
A3	7	0.1786%	0.2231%
Baa1	8	0.2232%	0.2789%
Baa2	9	0.2790%	0.4290%
Baa3	10	0.4291%	0.6600%
Ba1	11	0.6601%	1.1000%
Ba2	12	1.1001%	1.6500%
Ba3	13	1.6501%	2.4750%
B1	14	2.4751%	3.7125%
B2	15	3.7126%	5.5688%
B3	16	5.5689%	8.3531%
Caa/C	17	8.3532%	50.0000%

4. EWS and the Quadrant View

Multiple early warning signals provide different perspectives on credit risk; however, it is sometimes challenging to make a total assessment of risk. Fortunately, the EDF-X EWS framework combines the two early warning decision rules into an intuitive and actionable early warning signal. The EDF-X EWS employs a quadrant framework where the x-axis represents the distance to the PD trigger and the y-axis measures the 12-month change in PD-implied rating. Conceptually, the x-axis represents the assessment of an exposure's relative risk level, while the y-axis captures changes in the firm's absolute risk ranking. There are four early warning categories: Severe, High, Medium and Low (**Figure 2**).

Figure 2: EDF-X EWS quadrant view



The severe, or red, signal consists of exposures with PDs above their PD trigger levels and whose PD-implied ratings have deteriorated over the past 12 months. The high, or orange, bucket includes exposures with PDs above their PD trigger levels, but with a stable or improving PD-implied rating. Exposures that currently have PDs below their PD trigger levels but have experienced deteriorating PD-implied ratings over the last 12 months belong to the medium, or yellow, bucket. The low, or green, category includes exposures whose PDs are below their early warning trigger levels as well as stable or improving PD-implied ratings over the past year. Table 2 summarizes the EDF-X EWS categorization.

Table 2. EDF-X EWS classification

Early Warning Signal	PiT PD vs. EDF-X Trigger	Implied Rating 12-Month Change
Severe	PD above Trigger	Deteriorating
High	PD above Trigger	Improving or Unchanged
Medium	PD at or below Trigger	Deteriorating
Low	PD at or below Trigger	Improving or Unchanged

Note: PD-implied ratings Caa and lower are classified as deteriorating

The EDF-X EWS quadrant design is intuitive, accounting for a company's current level of credit risk and the momentum of recent credit developments. It is transparent, with classifications determined entirely by quantifiable credit metrics. It offers useful visualization; a firm's movement within and across warning signal buckets can be easily traced through the two-dimensional axis over time. Alternatively, an entire portfolio can be plotted on the quadrant at a particular point in time, cross sectionally, and each firm's relative credit ranking in the portfolio can be visualized.

5. Conclusion

Early warning of credit risk is one of the main challenges facing lenders, insurance companies, asset managers and corporates. Higher interest rates, asset volatility, supply-chain disruptions, and economic uncertainty require the close monitoring of portfolios and the need to identify potential problem credits with as much lead time as possible. The EDF-X Early Warning System was designed specifically with this purpose in mind. The EDF-X EWS provides pre-calculated, point-in-time-oriented, forward-looking credit risk signals for more than 450 million firms globally. Further, the EDF-X EWS synthesizes relative and absolute credit risk information into an actionable signal for identifying firms with expected upcoming credit deterioration.

The EDF-X EWS combines two early warning decision rules into an early warning framework. The first decision rule is 'distance to trigger' which flags firms that stand out as relatively risky compared to their country/region/industry peer group. The second decision rule is the 'PD-implied rating change', which measures the significance of recent change in their credit risk. The quadrant design of the EDF-X EWS yields actionable early warning risk assessments: Severe, High, Medium and Low.

Performance tests of the EDF-X EWS highlight the ability of this framework to answer the two key questions any good early warning system needs to address: Which exposures to worry about, and when to worry about them. We find that grouping firms by EWS signal – Severe, High, Medium and Low – yields strong results for both listed and private firms, flagging a meaningful share of ultimate defaults while minimizing the error rate. Further, the EWS signal is a sound leading indicator of firm credit risk; 51% of defaults are flagged as Severe or High three years prior to default, with the percentage rising to 59% two years out and up to 87% one month prior to default. Please consult the methodology paper for additional performance details.

For More Information

To learn more about EDF-X and other Moody's solutions, contact our experts at clientservices@moodys.com.

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