The Aftermath of Investment Grade Distress

- **What should one do with investment grade bonds that start to trade at distressed levels? This is the time when a portfolio manager is compelled to make the critical decision: Sell, hold, or buy?**
- **To help managers make an objective decision, we carefully examine the historical evidence regarding the performance of distressed investment grade (DIG) bonds after distress.**
- **The historical record shows that DIG bonds have been very strong performers. On average, the 901 DIG bonds from January 1990 to July 2011 returned 51.6% over the 24 months following their distress month. They outperformed their peers by 30.1%, and earned 39.8% more than comparable Treasury bonds.**
- **We show that the occurrence of DIGs, and their subsequent performance, is correlated with the performance of the overall credit market.**
- **After adjusting for DIGs' *ex ante* higher expected excess return volatility, we find that DIGs generated approximately 81bp per month of additional return, compared with an equal risk investment in the IG Corporate Index.**

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Executive Summary

One of the more vexing decisions for a portfolio manager (PM) is what to do with investment grade bonds that start to trade at distressed levels. It is usually at this time that the PM is compelled to make the critical decision: Sell, hold or, buy?

Selling the bond has the benefit of removing the "ugly" line item from the portfolio and spares the PM from increased monitoring costs. Also, managers, who have to sell bonds that are downgraded to high yield, may choose to sell upon distress to avoid competing with other similar PMs who may wait for a downgrade announcement.

Or maybe the investor should hold the bond? Given that the bond is still investment grade (at least, for now) and the PM can continue to hold it, why lock in a loss given that credit bonds have displayed, as a group, strong mean reversion? Also, PMs may feel that the market is overreacting to the news regarding the bond, thereby causing the bond to trade at a distressed level. Such perceived low bid prices may reflect particularly high transactions cost, the lack of buyers (high yield investors may not yet be interested), or both.

If the view is that distressed bonds are under-valued then, perhaps, investors, especially those who are not under the spotlight of monthly public performance reporting, should take the opportunity to generate alpha by adding to their positions in these bonds. If that is too bold, perhaps investors fortunate enough to have avoided holding such a bond until now, should at least get back to an index allocation? While buying distressed bonds may feel like a good value strategy, investors face reputational risk if it does not work out.

To make an informed "Sell, hold, or buy" decision, an investor needs to understand the risk/return profile of distressed bonds. In 2003, after the "worst of all possible credit crises," we published a paper on the performance of distressed, investment grade (or, "DIG") bonds.[1] We found that the long-term performance of DIG bonds had been very good, outperforming comparable non-distressed bonds during the 24 months following classification as distressed. Now, after the most recent "worst of all possible credit crises," we expand upon this research while incorporating almost 10 years of additional data.

Our goal is to carefully examine the historical evidence to help investors make an objective decision detached from the emotions and uncertainty of the distress event. Specifically,

- What ultimately happened to distressed investment grade (DIG) bonds? Did they remain IG and recover, get downgraded to HY, or default?
- What was the performance of DIG bonds, after their distress month, in absolute terms, versus their IG peer group, and versus Treasuries?
- Was DIG performance following distress a function of the issue's sector, size, level of distress, and other characteristics?
- Was there a "cliff price" in the distress month below which DIG bonds failed to recover, but above which they did recover?
- Finally, what has been the historical performance of a strategy of investing in DIG bonds? While DIGs are expected to have high volatility and, hence, high expected returns, did DIGs offer **risk-adjusted** return potential over their non-distressed IG peers?

To define "distress", we employ absolute (price <= 80 and spread >= 400bp) and relative (spread > 2 x $\text{spread}_{\text{peer group}}$) criteria. Since January 1990, we identify 901 DIG bonds.

To measure a DIG bond's performance after distress, we take a conservative approach by not compounding bond-level monthly returns. Given that DIG bonds can trade at very low prices, compounding monthly returns assumes that any cash flow received is reinvested in more par of the bond. Since DIGs have strong performance after distress, this assumption has a tendency to significantly increase DIG performance. For distressed bonds, we feel that investors would simply hold any cash received, as cash, which for this study we assume earns 0%.[2]

We find DIGs to be very strong performers. On average, the 901 DIG bonds returned 51.6% over the 24 months following their distress month. They outperformed their peers by 30.1% points and earned 39.8% points more than comparable Treasury bonds. In addition, there was no "cliff-price" below which DIGs failed to perform well.

[1] J. Mann and B. Phelps: "Return Performance of Investment-Grade Bonds after Distress", Chapter 15 in *Quantitative Management of Bond Portfolios*, Princeton University Press, 2007.
[2] A. Edelstein and B. Phelps, *A Note on Strategy Back-testing: The Implications of Compounding Monthly Bond-Level Returns*, Barclays Capital, January 2012.

We show that the occurrence of DIGs and their subsequent performance were correlated with the performance of the overall credit market. Still, after adjusting for DIGs' beta exposure to the IG credit market, we find that DIGs generated approximately 81bp per month of additional return, compared with an equal risk investment in the IG Corporate Index.

Defining "Distressed"

We define distress in **absolute** and **relative** terms. To be classified as distressed, a bond must be trading at a low price **and** a wide spread (absolute). We also require that an issue be trading at a wider spread than its sector/duration peer group (relative). This ensures that an entire sector (e.g., financials in 2008) is not labeled distressed. A bond's peer group is defined according to three broad sectors (financials, industrials, utilities) and five duration buckets (0-3, 3-5, 5-7, 7-10, and 10+).[3] We assume the bond's peer group is IG, as that is the investment alternative for an IG manager.

Specifically, a DIG bond must be a member of the Barclays Capital U.S. Corporate Investment Grade Index (Statistics Universe) at the (month-end) time of distress and meet the following criteria:

- Clean price < 80% of par;
- OAS (versus Treasury) >= 400bp; and
- OAS >= 2 x $OAS_{peer\text{-}group\ avg}$

To understand the need for all three criteria, consider a few examples. As of June 30, 2011, the RBS 5% of '13 (LT2) had an OAS of 441bp and a price of 99.854. According to a spread criterion alone, this bond would be designated as distressed. However, a bond with a price of almost par is hardly distressed. On the flip side, consider the KO 0% of '20 as of the same date. The zero-coupon bond had a price of 72.242 but an OAS of 44bp. The spread condition is necessary so that low-coupon bonds when market yields are much higher are not automatically classified as distressed.

Whether a bond is classified as distressed also depends on the bond's spread relative to peers. To illustrate the need for a relative criterion, consider the financial sector of the Corporate Index as of the end of September 2008. At that time, the OAS of the sector was 696bp with a par-weighted average price of 83.135. Without a relative spread criterion, 301 (from 64 tickers) of the 1,076 financial bonds in the index would have been labeled as distressed. With the requirement, 94 bonds (from 23 tickers) are classified as distressed. Since the objective of this study is to identify troubled bonds rather than troubled sectors, the relative spread criterion is very important.

We recognize that any definition of "distress" is inherently arbitrary. However, we have found that our definition does resonate with investors. In addition, we now have the tools in place to consider, if desired, alternate definitions of "distress".

Constructing the DIG Data Set

To find DIG bonds, we search the Barclays Capital U.S. Corporate Investment-Grade Index from January 1990 through July 2011. To be eligible for the DIG data set, the bond must meet the distress criteria and be a member of the IG Index (Statistics Universe) at month-

[3] The bond's IG peer group is updated at each month-end as its duration changes. We do not use ratings to define a distressed bond's peer group as its rating is likely to be under review.

end. This ensures that all DIG bonds that meet the distress criteria were eligible for purchase by IG managers.[4]

We define the month during which a bond becomes distressed as its "distress month", or m[0]. To ensure that we identify new instances of distress, any bond entering the sample must not have met the distressed criteria for the prior 12 months (or, for the period of a bond's membership in the Corporate Index if less than 12 months). This avoids repeatedly including in the sample bonds that bounce in and out of distress.[5]

In addition to looking at results by bond, we also aggregate bonds into distressed **issuers** (using equal weights). Of course, bonds from an issuer may not meet the distress criteria in the same month. In aggregating bonds to the issuer level, we only group bonds together if they became distressed in the same month.

DIG Bond Characteristics

Figure 1 shows the number of distressed bonds and issuers by vintage year. Overall, there were 901 distressed bonds from 429 issuers. The figure highlights years with at least 10 DIG bonds. Also, years with no DIG bonds (e.g., 2004) are not represented.

As one would expect, the incidence of IG distress is not uniform over time. There are many more DIG bonds during periods of credit market stress (e.g., 1990-91, 2001-02, and 2008-09). As a percentage of the Index market value, 2002 remains the DIG leader with 6.1% of the Index market value (and 9.5% of its amount outstanding) classified as distressed.[6]

Figure 1: Number of Distressed Investment-Grade Bonds and Issuers, by Vintage Year

	Count		Amount Outstanding		Market Value	
	Issues	Issuers	($mn)	% of Index	($mn)	% of Index
1990	50	26	9,371	1.9	7,326	1.6
1991	14	7	1,953	0.4	1,506	0.3
1992	1	1	75	0.0	60	0.0
1995	5	2	900	0.2	690	0.1
1996	1	1	100	0.0	83	0.0
1998	5	5	837	0.1	608	0.1
1999	8	3	1,775	0.2	1,373	0.2
2000	108	63	27,311	2.2	19,806	1.6
2001	66	36	22,437	1.5	16,380	1.0
2002	242	81	150,810	9.5	106,768	6.1
2003	5	4	1,291	0.1	995	0.1
2005	20	4	15,931	1.0	11,547	0.7
2007	18	11	13,350	0.7	10,144	0.5
2008	249	110	169,396	7.9	107,927	5.3
2009	106	73	56,934	2.4	38,337	1.5
2010	3	2	2,850	0.1	2,308	0.1

Source: Barclays Capital

Figure 2 shows the characteristics of DIG bonds, both in absolute terms and versus peers. We also break down the historical DIG data set into two periods to isolate the most recent

[4] By the same token, a bond which jumped from not being distressed in the IG index to the HY Index or default in one month will not be included in the data set. For example, 345370BQ (F 7.25% '08) went from being non-distressed (price of 98.47) to HY in August 2005. Similarly, Lehman bonds such as 52517PG9 will also not be in our data set as they went from non-distressed (price of 93.42 at month-end August 2008) to default in September 2008.
[5] If, though, a bond becomes distressed, then non-distressed (for 12 months) and subsequently becomes distressed again, we consider the bond to have two distinct instances of distress and the bond will appear in the data set twice.
[6] We take the sum of MV at m[0] across all DIGs for each year and divide it by the year-end MV. This is a rough approximation, of course, because the bonds may have become distressed at different times of the year.

credit crisis (i.e., "post-2007" which includes 2007). Over the past 259 months (January 1990 – July 2011), there have been, on average, approximately 3.5 new DIG bonds each month. At the time of distress, DIG bonds had a price that was 70% of their peer group price, on average, and spreads that were more than three times as wide. As far as age, OAD, and size, DIG bonds were roughly comparable to peers.

Figure 2: Characteristics of DIG Bonds, January 1990-July 2011

	Total	Pre-2007	Post-2007
Price	68.43	71.53	64.10
Price as a % of Peer group price	71.1%	72.1%	69.8%
Spread	1,098.3	851.5	1,442.9
Spread as a % of peer group spread	337.9%	394.0%	259.7%
# of Months w/ at least 1 bond	88 / 259	61 / 204	27 / 55
# of Issues	901	525	376
Average # issues per distress month	10.2	8.6	13.9
# of Issuers	429	233	196
Average # issuers per distress month	4.9	3.8	7.3
%non-Baa	16.5%	5.0%	32.7%
Age vs age of peer group	93.6%	90.0%	97.7%
Size vs size of peer group	107.2%	122.0%	86.6%
LCS vs LCS of peer group	224.5%	N/A	224.5%
OAD	5.67	6.24	4.88
OAD vs. peer group	100.6%	101.6%	99.3%
Years to Maturity	12.70	15.17	9.24
Years to Maturity vs. peer group	122.2%	119.1%	126.6%

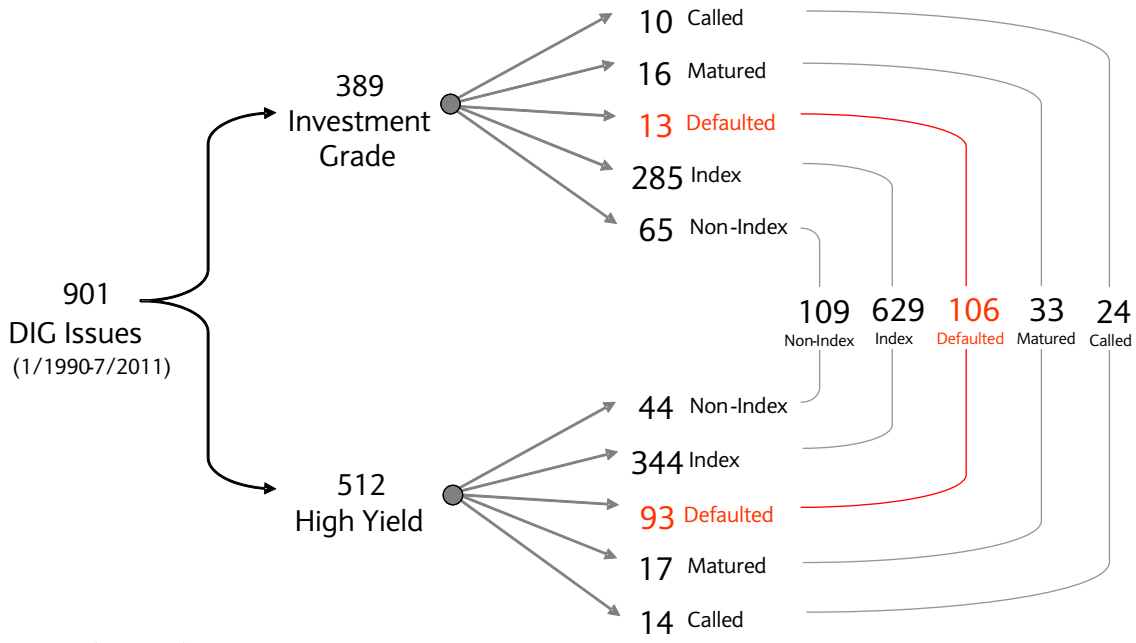
Note: DIG bonds (and peer group) characteristics are as of the end of their distress month. Source: Barclays Capital

When looking at the post-2007 period versus the prior period, we find that while the average relative dollar price was lower than in the prior period (69.8% versus 72.1%), bonds in the post-2007 period were less distressed relative to peers in terms of spread (259.7% versus 394.0%). The post-2007 period also had a larger percentage of distressed bonds rated greater than Baa (33%), compared with the pre-2007 period (5%). For the post-2007 period, we have Liquidity Cost Scores[7] (LCS)™ that allow us to compare the cost of trading distressed bonds versus their IG peers. We find that, at the time of distress, DIGs are more than two times as expensive to trade.

Figure 3 shows what ultimately happened to DIGs over the course of 24 months following their distress month.[8] Of the 901 DIG bonds in our data set, 512 (57%) became high yield, while 389 (43%) remained investment grade.[9] This compares with Moody's 1y and 5y HY transitions rates for Baa-rated issuers of 10.7% and 38.6%, respectively (1970-2010, 1970-2006, respectively).[10] Overall, of the 901 DIG bonds, 106 bonds (12%) ultimately defaulted. This compares with Moody's 0.84% two-year default rate for Baa-rated issuers (1994-2010).[11]

[7] See "Quantifying the Liquidity of Corporate Bonds", Chapter 5 in *Quantitative Credit Portfolio Management*, Wiley, 2012
[8] Not all bonds stayed in our data set for a full 24 months following their distress designation. Bonds that defaulted, matured or were called prior to 24 months were removed from the data set at the time of the event. All 901 DIG bonds are accounted for in Figure 3.
[9] This number also includes 9 bonds that were downgraded to HY and subsequently upgraded to IG before the end of 24 months.
[10] *Corporate Default and Recovery Rates*, 1920-2010, Moody's Investors Service, February 28, 2011.
[11] Ibid.

Figure 3: What Ultimately Happened to DIG bonds? (24 Months after Distress)



Source: Barclays Capital

Only five (<1%) of the 901 bonds remained IG but still satisfied the distress criteria (not shown).

Measuring the Performance of DIG Bonds

For each DIG bond, we measure its performance for the 24-month period (i.e., m[1] to m[24]) following its distress month (i.e., m[0]). For some DIGs, we have less than 24 months of performance history due to defaults, maturities, and calls. If a bond defaults, we assume it is sold out at the end of the month at the closing index price (a bid-side price). Similarly, called and matured bonds are removed from the dataset at the end of the month. When aggregating the performance of called, matured, and defaulted bonds with the rest of the DIG dataset, we take a very conservative approach and assume that the proceeds from these bonds are held as cash, earning 0%, until the end of 24-month performance period.

In evaluating DIG returns, another important consideration is the coupon reinvestment assumption. Computing a bond's cumulative return by compounding its monthly index returns assumes that any cash flows received are used to purchase more of the bond. For DIG bonds, this assumption can have a significant impact on strategy performance as coupons received would be used to purchase more of the bond at a depressed price, amplifying the returns for bonds that recover.[12] Instead, we assume that cash generated by DIG bonds is held as 0% cash and is not reinvested in more bonds. Although this is another very conservative assumption for evaluating DIG performance (in addition to assuming a 0% return after a DIG bond is called or matures), it is probably more realistic than assuming that a DIG bond investor would use cash to buy more par of the bond

[12] A. Edelstein and B. Phelps, *A Note on Strategy Back-testing: The Implications of Compounding Monthly Bond-Level Returns*, Barclays Capital, January 2012.

DIG Performance at the Bond Level

Figure 4 shows average cumulative returns across all DIG bonds, with a breakdown by vintage year, as well as for the pre-2007 versus post-2007 periods.[13] On average, the 901 DIG bonds returned 51.6%[14] over the 24 months following their distress month. They outperformed their peers by 30.1%[15] and earned 39.8% more than comparable Treasury bonds. Looking across periods, we find that absolute performance since 2007 was stronger than that of before 2007 (71.6% versus 37.3%).

Figure 4 also shows consistent strong performance across vintage years, with few exceptions. For vintage years with 10 or more DIG bonds, only in years 2001 and 2007 did DIGs have a 24-month return less than their peers or against duration-matched Treasuries, although total returns were positive. The main driver of the negative relative returns in 2001 was Enron, and in 2007 it was a handful of financials such as Radian Group.

Figure 4: DIG Bond Performance – Cumulative 24-month Returns

Year of Distress Month m[0]	#	Total Returns	vs. Peers	vs. TSY
1990	50	51.8%	18.9%	23.4%
1991	14	60.6%	35.1%	39.2%
1992	1	60.2%	25.5%	29.6%
1995	5	48.9%	31.5%	32.6%
1996	1	84.9%	69.7%	70.9%
1998	5	-7.8%	-8.8%	-9.1%
1999	8	34.9%	16.6%	12.0%
2000	108	33.0%	15.0%	13.9%
2001	66	6.2%	-7.6%	-5.4%
2002	242	44.5%	26.8%	34.6%
2003	5	47.5%	34.7%	41.7%
2005	20	26.1%	18.2%	18.3%
2007	18	1.1%	-4.0%	-10.1%
2008	249	73.9%	47.0%	65.0%
2009	106	79.4%	51.9%	72.0%
2010	3	35.5%	23.6%	28.7%
Pre - 2007	525	37.3%	18.9%	23.1%
Post - 2007	376	71.6%	45.7%	63.1%
Total	**901**	**51.6%**	**30.1%**	**39.8%**

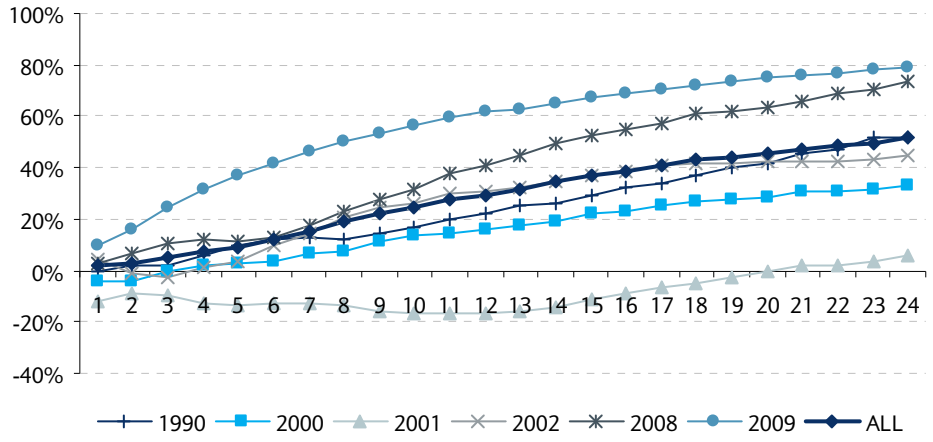
Note: DIG bonds are assigned to a vintage year depending on the calendar year in which m[0] occurs. Annual returns and period returns are calculated by giving equal weight to each bond. As of July 2011 (the end of this study), the 2010 vintage year and six bonds from the 2009 vintage year did not have a full 24 months of returns history subsequent to distress. Source: Barclays Capital

Figure 5 shows the average cumulative return, by month, for the entire dataset, as well as the six most-populated DIG vintage years. While all had positive cumulative performance over 24 months, there was some variation. We see that the 2009 DIG bonds immediately bounced back after satisfying the distress criteria, whereas the 2001 vintage did not have a positive

[13] Average vintage-year and period returns are calculated by giving equal weight to all bonds' returns during the period.
[14] As mentioned above, we assume 0% reinvestment on any coupon proceeds. Computing cumulative returns by compounding monthly index returns would have generated an average cumulative return of 57.3%.
[15] Peer group returns were calculated using compounded monthly returns, effectively assuming cash received is reinvested in the peer group. The effect described in the previous section is less pronounced for large groups of bonds than it is for individual distressed securities. Moreover, given the timing of the occurrence of DIG bonds relative to the credit cycle, compounding monthly returns for the peer group provides a more conservative estimate for DIG bond outperformance.

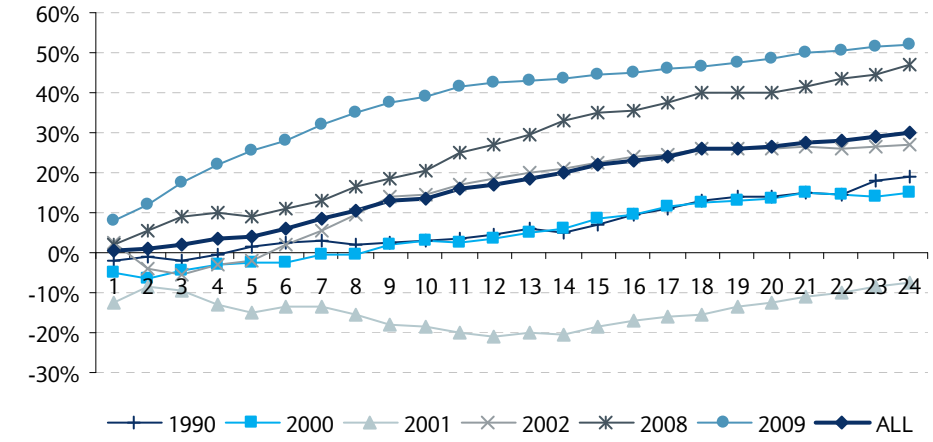
cumulative return until m[20]. Figure 6 shows DIG cumulative returns versus peers. With the exception of 2001, all vintages had positive cumulative outperformance versus peers after 24 months, with the crossover to positive relative returns occurring no later than m[9].

Figure 5: Monthly DIG Cumulative Returns Following Distress, by Vintage Year



Note: DIG bonds are assigned to a vintage year depending on the calendar year in which m[0] occurs. Cumulative returns are calculated by giving equal weight to the returns for all bonds of a given vintage. If a bond is called or matures during the 24-month period, the bond is assumed to earn 0% until the end of the 24-month period. Source: Barclays Capital

Figure 6: Monthly DIG Cumulative Returns Following Distress vs. Peers, by Vintage Year



Note: DIG bonds are assigned to a vintage year depending on the calendar year in which m[0] occurs. Cumulative returns are calculated by giving equal weight to the returns for all bonds of a given vintage. If a bond is called or matures during the 24-month period, the bond is assumed to earn their peer group return until the end of the 24-month period. Source: Barclays Capital.

Variation in DIG Bond Performance

While DIG performance is quite strong overall, there was wide variation across bonds. A significant number of DIGs did not recover and suffered large losses after m[0]. Figure 7 provides a breakdown of the number of bonds that made/lost money, as well as the minimum and maximum returns for each vintage year. Of the 901 DIG bonds, 95 (10.5%) had a negative return (average = -53.0%) over the subsequent 24 months, with some losing virtually all of their remaining value at the time of distress. Consistent with the numbers

above, the 2001 vintage had the largest proportion of bonds that lost money, with 24 bonds out of 66 (36%) exhibiting negative returns.

Figure 7: Variation in DIG Bond Performance

Year of Distress Month m[0]	#	Made $	Lost $	Avg TR	Max TR	Min TR
1990	50	48	2	51.8%	94.8%	-70.8%
1991	14	14	0	60.6%	98.0%	44.9%
1992	1	1	0	60.2%	60.2%	60.2%
1995	5	5	0	48.9%	59.2%	44.9%
1996	1	1	0	84.9%	84.9%	84.9%
1998	5	2	3	-7.8%	36.9%	-41.6%
1999	8	8	0	34.9%	41.8%	14.8%
2000	108	95	13	33.0%	115.7%	-64.3%
2001	66	42	24	6.2%	151.5%	-98.6%
2002	242	217	25	44.5%	182.2%	-85.8%
2003	5	5	0	47.5%	52.9%	37.4%
2005	20	20	0	26.1%	40.9%	12.3%
2007	18	11	7	1.1%	80.9%	-97.4%
2008	249	228	21	73.9%	433.9%	-99.8%
2009	106	106	0	79.4%	221.9%	33.9%
2010	3	3	0	35.5%	44.8%	19.6%
Pre - 2007	525	458	67	37.3%	182.2%	-98.6%
Post - 2007	376	348	28	71.6%	433.9%	-99.8%
Total	**901**	**806**	**95**	**51.6%**	**433.9%**	-99.8%

Source: Barclays Capital

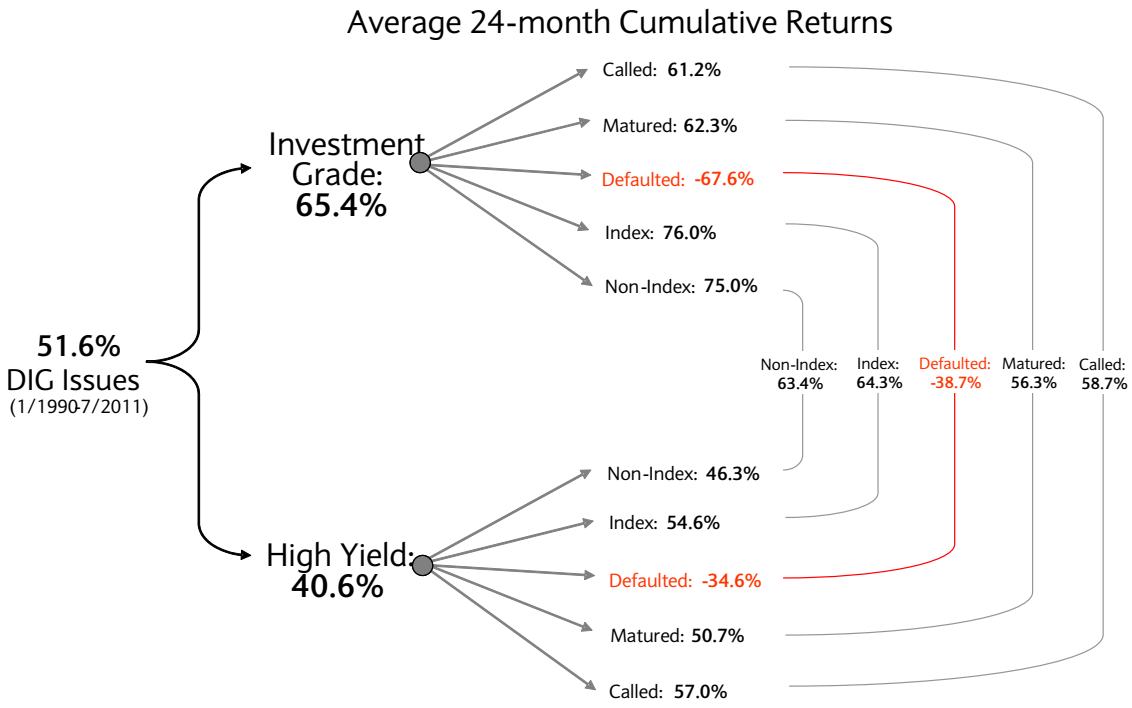
Figure 8 sorts DIG returns according to what happened to each DIG over its ensuing 24-month history. As a group, only defaulted bonds had negative cumulative absolute returns. This would seem to say that when evaluating a DIG's 24-month prospects after m[0], the only thing to consider is whether the bond will default. To be sure, these are only aggregate numbers. But even on the bond level, of the 106 defaulted bonds, 82 had negative cumulative absolute returns. Recall that only 95 bonds in the entire data set lost money in the subsequent 24 months. Of the bonds which did not default, only 13 bonds out of 795 had negative returns (1.6%). Overall, then, one can say that as far as making or losing money in the subsequent two years, the key consideration is whether or not the bond defaults.[16]

Of course, evaluating the performance of DIG bonds is not just about winners and losers. There was also a wide range of results among those bonds that performed well. We can analyze the performance of DIG bonds on several levels.

Figure 9 shows DIG performance with a breakdown between those bonds that at the end of 24 months (or their exit from the dataset) were investment grade or high yield. Overall, bonds which were still investment grade outperformed those bonds which were high yield (70.1% versus 37.6%). In a few years, the performance of IG and HY bonds was of the opposite sign. In 2001, the 13 bonds that remained investment grade had an average return of 61.1% whereas the 53 HY bonds earned -7.0%. And, for 2007, the 10 IG bonds returned 41.3% while the 8 HY bonds returned -49.1%.

[16] The results versus peers were similar. Of the 901 bonds, 118 lost money versus peers. Of those 118 bonds, 90 defaulted. So of the 795 non-defaulted bonds, only 28 lost money versus peers (3.5%).

Figure 8: DIG Cumulative Returns Following Distress, by "Destination"



Source: Barclays Capital

Figure 9: DIG Cumulative Returns Following Distress, IG versus HY

	Total		IG		HY	
Year of Distress Month m[0]	#	TR	#	TR	#	TR
1990	50	51.8%	28	59.3%	22	42.3%
1991	14	60.6%	7	53.2%	7	68.0%
1992	1	60.2%	1	60.2%	0	0.0%
1995	5	48.9%	0	0.0%	5	48.9%
1996	1	84.9%	0	0.0%	1	84.9%
1998	5	-7.8%	0	0.0%	5	-7.8%
1999	8	34.9%	1	40.0%	7	34.1%
2000	108	33.0%	21	37.8%	87	31.9%
2001	66	6.2%	13	60.1%	53	-7.0%
2002	242	44.5%	87	60.1%	155	35.7%
2003	5	47.5%	3	52.0%	2	40.7%
2005	20	26.1%	0	0.0%	20	26.1%
2007	18	1.1%	10	41.3%	8	-49.1%
2008	249	73.9%	139	82.6%	110	62.8%
2009	106	79.4%	76	81.2%	30	74.7%
2010	3	35.5%	3	35.5%	0	0.0%
Pre - 2007	525	37.3%	161	56.5%	364	28.8%
Post - 2007	376	71.6%	228	79.7%	148	59.2%
Total	**901**	**51.6%**	**389**	**70.1%**	**512**	**37.6%**

Source: Barclays Capital

Figure 10 shows a breakdown by Index Class 2 sector buckets. Of the 901 DIG bonds, 495 (54.9%) were industrials, 306 (34.0%) were financials, and 100 (11.1%) were industrials. Whereas financials comprised most of the DIGs in the most recent crisis, 2000-02 had a significant proportion of industrial (telecom) and utility (Enron) DIGs. Overall, the percentages are broadly consistent with the long-term average of each sector's proportion of bonds in the U.S. Corporate Investment Grade Index.

Figure 10: DIG Cumulative Returns following Distress by Class 2 Sector

	Total		FIN		IND		UTL	
	#	TR	#	TR	#	TR	#	TR
Pre - 2007	525	37.3%	70	48.7%	368	35.2%	87	37.1%
Post - 2007	376	71.6%	236	71.5%	127	70.0%	13	88.9%
Total	**901**	**51.6%**	**306**	**66.3%**	**495**	**44.1%**	**100**	**43.8%**

Source: Barclays Capital

In regards to performance, we see that financial DIGs performed better (66.3%), in absolute terms, than industrial (44.1%) and utility (43.8%) DIGs. One can perhaps attribute that, in large part, to the period in which these bonds became distressed. Of the 306 financial DIGs, 77% of them (236) became distressed post-2007, compared with 26% for industrial DIGs and 13% for utilities. As will be discussed later, during the recent credit crisis many bonds reached very low prices and still recovered, resulting in greater cumulative 24-month performance after distress.

Did the size of a distressed bond affect its performance? If managers sell DIGs upon distress, perhaps larger issues need a lower distress month price to attract sufficient new buyers? Figure 11 shows a performance breakdown by issue size. When looking across the size buckets, there does not appear to be a relationship between DIG issue size and subsequent 24-month performance.[17]

Figure 11: DIG Cumulative Returns Following Distress by Issue Size ($mn)

	Pre - 2007		Post - 2007		Total	
	#	TR	#	TR	#	TR
<250	218	38.9%	0		218	38.9%
250 - 500	176	37.3%	175	78.2%	351	57.7%
500 - 750	65	39.4%	96	69.0%	161	57.0%
750 - 1,000	18	41.9%	41	52.6%	59	49.3%
1,000 - 1,500	15	8.8%	39	61.0%	54	46.5%
1,500 - 2,000	16	32.0%	11	54.3%	27	41.1%
>2,000	17	33.7%	14	106.1%	31	66.4%
Total	**525**	**37.3%**	**376**	**71.6%**	**901**	**51.6%**

Source: Barclays Capital

[17] While the smallest bucket (<$250mn) had lower performance than all of the other buckets (by a lot in some cases), that is the result of the time period. Effective July 2004, the index changed its liquidity constraint to require that all bonds have at least $250mn outstanding to be in the index. As such, all of the <$250mn bonds happened in the first period of the dataset, when returns for DIG bonds more generally were lower.

Performance at the Issuer Level

So far, we have presented DIG performance at the bond level. What if DIG returns are being driven by a few issuers with many bonds? For example, suppose there are six distressed issuers, one with 10 bonds outstanding that each earned 30% following distress, and five issuers with one bond each that returns -30% over the subsequent 24 months. On the bond level, the average return would be 10%. But an investor considering a strategic investment in distressed credit might look across distressed *issuers*, not bonds. The average issuer return in this example is -20%.

We examine DIG performance at the issuer level. Of course, bonds from an issuer may not meet the distress criteria in the same month. In aggregating bonds to the issuer level, we only group them together if they became distressed in the same month. We then take the simple average of the bonds' returns to arrive at the issuer-level return.[18]

Figure 12 shows the issuer-level results. The 901 DIG bonds represent 429 DIG issuers. The overall average performance on the issuer level was slightly higher (52.3% versus 51.6%) with a lower standard deviation (46.7% versus 54.8%).

Figure 12 also shows the bond-level and issuer-level numbers, by vintage year, side-by-side. The difference in average returns exceeded five percentage points in only two vintages. The 2001 vintage, which had a 6.2% average return at the bond-level, shows a 31.4% return on the issuer level! When looking at sectors, we saw that the relatively poor performance shown by the 2001 vintage was due to a -63.1% return by 15 utility bonds, 13 of which were issued by Enron. So, the 2001 vintage is an example of one issuer significantly influencing the return in a negative way. On the flip side, the 2007 vintage, which had a 1.1% return when averaging its 18 bonds, show a -14.8% average return across its 11 issuers. In that case, Countrywide had seven bonds with an average cumulative absolute return of 49%. As such, looking at returns by issuer rather than by ticker brings down the average return for that vintage year. Overall, though, the issuer-level returns are quite comparable with the bond-level returns, over the entire period and in most vintage years.

[18] We did look at other aggregation possibilities such as combining bonds from the same ticker if they became distressed one, three, and even six months apart. We found that the aggregate performance results were similar.

Figure 12: DIG Issuer-Level Cumulative Returns Following Distress

Year of Distress Month m[0]	# of Issuers	Issuer-Level Total Return	# of Issues	Issue-Level Total Return	|Difference|
1990	26	48.4%	50	51.8%	3.4%
1991	7	58.8%	14	60.6%	1.8%
1992	1	60.2%	1	60.2%	0.0%
1995	2	52.7%	5	48.9%	3.9%
1996	1	84.9%	1	84.9%	0.0%
1998	5	-7.8%	5	-7.8%	0.0%
1999	3	30.7%	8	34.9%	4.2%
2000	63	31.2%	108	33.0%	1.8%
2001	36	31.4%	66	6.2%	25.1%
2002	81	45.9%	242	44.5%	1.4%
2003	4	46.2%	5	47.5%	1.3%
2005	4	24.5%	20	26.1%	1.6%
2007	11	-14.8%	18	1.1%	16.0%
2008	110	69.3%	249	73.9%	4.6%
2009	73	80.1%	106	79.4%	0.7%
2010	2	31.6%	3	35.5%	4.0%
Pre - 2007	233	38.9%	525	37.3%	1.6%
Post - 2007	196	68.2%	376	71.6%	3.4%
Total	**429**	**52.3%**	**901**	**51.6%**	**0.6%**

Source: Barclays Capital

The Degree of Initial Distress and Recovery

Does the price at the end of the distress month provide any insight into a DIG bond's prospects of recovery? We already know that DIG bonds tend to recover, on average. If so, does a bigger decline in the distress month provide a better investment opportunity? Or are the strong average absolute return numbers driven mostly by bonds whose price did not drop to extremely low levels? Figure 13 shows a breakdown of DIG performance by price at m[0]. We find that, on average, the lower the price at the end of the distress month, the greater the recovery.

Figure 13: DIG Cumulative Returns Following Distress by Price at the End of m[0])

	Pre - 2007		Post - 2007		Total	
	#	TR	#	TR	#	TR
<50	22	-9.8%	53	165.7%	75	114.2%
50 - 60	24	35.7%	71	90.4%	95	76.6%
60 - 70	74	43.8%	92	67.1%	166	56.7%
70 -80	405	38.8%	160	34.7%	565	37.6%
Total	**525**	**37.3%**	**376**	**71.6%**	**901**	**51.6%**

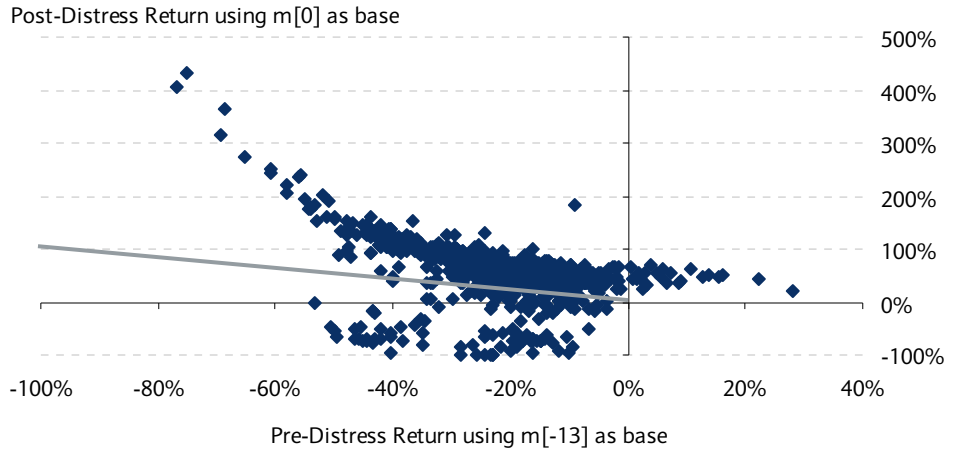
Source: Barclays Capital

In other words, there is no evidence of a "cliff price" – or a price below which DIGs failed to recover.[19] With the exception of pre-2007 DIGs priced below 50%, we find that DIG bonds with the lowest price at m[0] had, on average, the largest absolute returns.[20]

[19] While Figure 14 stops at a price of 50, the results were similar when looking at lower breakpoints. For example, the 20 bonds whose price dropped below 40 in their distress month returned an average of 219%. The six bonds whose priced dropped below 30 returned 295%.
[20] The same is true for returns versus peers. The four price buckets, <50, 50-60, 60-70, and 70-80, outperformed their peers by 84%, 47%, 34%, and 19%, respectively.

Instead of using the price at the end of the distress month as the measure of initial distress, we can use the cumulative returns of DIG bonds leading up to distress. We look at the cumulative returns of DIG bonds for up to 12 months before the distress month and compare with their absolute performance following distress.[21] Figure 14 shows a plot of the post-distress return versus the pre-distress return. We find that bonds that perform particularly poorly in the 13 months through the distress month tended to have particularly strong returns in the subsequent 24 months.

Figure 14: DIG Cumulative Return Post-Distress versus Cumulative Return through m[0]



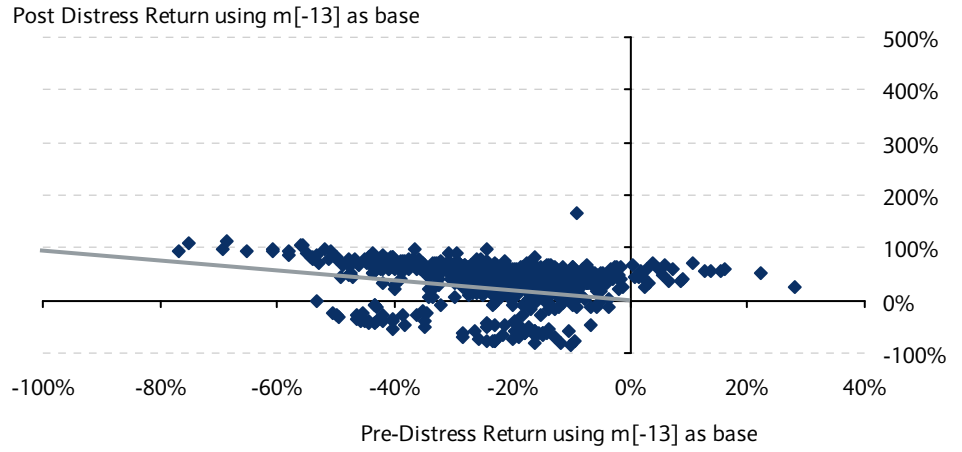
$$\text{24-month Return}_t = 0.12 - 1.88 \times \text{IG Pre-Distress Return}_t$$
t-stat (3.96) (-14.78)
$R^2 = 19\%$

Source: Barclays Capital

At first glance, Figure 14 suggests that DIG bonds recover significantly more than they lost. However, a simple example illustrates why that is not so. Consider a bond whose price goes from 100 to 50 in the 13 months leading through the distress month and recovers completely in the subsequent 24 months, ending at a price of 100. The cumulative return for the 13 months through m[0] is -50% ([50-100]/100). When the bond recovers, its cumulative return is actually +100% ([100-50]/50), as the denominator in the computation was lower in the second period. To understand the extent of the recovery in the context of pre-m[0] losses, one needs to normalize the post-distress period by using the m[-13] price in the denominator. In the above example, the return through m[0] would still be -50%, but the post-distress return would now be just +50% ([100-50]/**100**). Figure 15 plots the post-distress returns normalized using m[-13] price as the base. Still, we find that for most bonds, the loss in the pre-distress period is recouped in the post-distress period.

[21] Bonds issued less than 12 months before the distress month will have a truncated history. Additionally, we require that all history be from an IG index. Bonds that were ineligible for an IG index for part of the prior 12 months will have truncated history as well.

Figure 15: DIG Cumulative Return Post-Distress Using m[-13] Price as Base versus Cumulative Return Through m[0]



$$24\text{-month Return}^*_t = 0.28 - 0.48 \times \text{IG Pre-Distress Return}_t$$

t-stat (13.42) (-5.79)

$R^2 = 3\%$

Source: Barclays Capital

Thus far, we have spoken about recovery in terms of returns. What about price recovery? To see why these are not necessarily synonymous, consider the following example. Suppose a bond with a 5% coupon became distressed with its price dropping from $100 to $75 in the distress month. In the subsequent 24 months, the bond's price increases to $95 and the investor collects $10 in coupon payments. While the loss in the distress month ($75 - $100 = -$25) was recouped in the subsequent two years ($10 + $95 - $75 = $30), the price of the bond did not quite recover.

Given this distinction, another metric by which investors may wish to measure recovery is the extent of bounce-back in the price. Figure 16 shows the number of bonds whose price returned to that of the beginning (i.e., m[-1]) and end (i.e., m[0]) of the distress month. We find that, after 24 months, 76% of bonds saw their price return back to their m[-1] level, while 86% of bonds were trading at a price level at or above their level at the end of the distress month (m[0]). For bonds which did not default within 24 months, these numbers were 85% and 95%, respectively (not shown).

Figure 16: DIG Price Recovery

		After 24 Months, # of DIG Bonds Returning to Price Level Prevailing at time m[·]		After 24 Months, % of DIG Bonds Returning to Price Level Prevailing at time m[·]	
Year of Distress Month m[0]	#	m[-1]	m[0]	m[-1]	m[0]
1990	50	45	47	90.0%	94.0%
1991	14	14	14	100.0%	100.0%
1992	1		1		100.0%
1995	5	3	5	60.0%	100.0%
1996	1	1	1	100.0%	100.0%
1998	5	1	1	20.0%	20.0%
1999	8	5	7	62.5%	87.5%
2000	108	64	92	59.3%	85.2%
2001	66	34	38	51.5%	57.6%
2002	242	183	215	75.6%	88.8%
2003	5	4	5	80.0%	100.0%
2005	20	10	14	50.0%	70.0%
2007	18	8	10	44.4%	55.6%
2008	249	200	220	80.3%	88.4%
2009	106	106	106	100.0%	100.0%
2010	3	3	3	100.0%	100.0%
Pre - 2007	525	364	440	69.3%	83.8%
Post - 2007	376	317	339	84.3%	90.2%
Total	**901**	**681**	**779**	**75.6%**	**86.5%**

Source: Barclays Capital

Incorporating Transactions Cost

Barclays Capital uses bid-side pricing to mark index bonds. However, an investor realistically considering DIGs as an investment opportunity needs to evaluate performance assuming bonds are purchased at the ask price. Since DIG bonds trade at a bid-ask spread that is relatively large compared with their price (Figure 2), perhaps much of their performance will evaporate after accounting for transactions cost? With the availability of LCS since January 2007, we can re-measure DIG performance to account for transactions cost (using LCS and the index bid price to compute the offer price).

Figure 17 shows cumulative 24-month returns for the 2007-10 vintages with and without incorporating LCS.[22] We find that not only are the absolute returns more than 10% points lower, but the returns versus peers are 8% lower. While we are incorporating LCS for the peers as well, distressed bonds have very high LCS, so the result is not surprising. Still, even after accounting for transactions cost, DIG bonds continue to exhibit very strong performance following distress.

[22] Given a return number that does not account for LCS, one can compute an LCS-adjusted return as follows: $1+ ret_{LCS} = (1+ ret_{NOLCS})/(1+ LCS)$

Figure 17: DIG Performance Incorporating Transactions Cost

Year of Distress Month m[0]	#	Total Returns	Returns w/ m[0] LCS	Returns (vs. Peers)	Returns w/ m[0] LCS
2007	18	1.1%	-1.6%	-4.0%	-5.0%
2008	249	73.9%	62.6%	47.0%	38.4%
2009	106	79.4%	68.5%	51.9%	43.8%
2010	3	35.5%	33.3%	23.6%	23.0%
Total	376	71.6%	60.9%	45.7%	37.7%

Source: Barclays Capital

Investing in DIG bonds as a Strategy

We have shown that DIG bonds are strong performers after their distress month, in absolute terms, versus their IG peer group and versus Treasuries. However, we know that DIGs come and go depending on the credit cycle. In some years there are no DIG bonds, in some there are a handful, and in other years there are many. Consequently, the DIG average 24-month return of 51.6% was not a rate of return that was earned on a constant level of investment over the entire 22-year period. In addition, we have highlighted that DIG performance is highly variable across bonds.

A better way to evaluate DIG bonds is to construct an actual investment strategy and measure its monthly performance over time. This will help to highlight the risk and reward of investing in DIGs from 1990 through July 2011.

We construct a strategy that invests $1mn in each DIG bond at the end of m[0] and holds the bond for (up to) 24 months. The amount of capital invested in the strategy in any month varies with the availability of DIG bonds.[23]

$$\text{Capital Invested} = \$1\text{mn} \times \text{Number of "active" DIG Bonds}$$

We look at several characteristics of the strategy and its performance. We compute a strategy $P&L for each month since 1990. We also calculate monthly return by dividing the monthly $P&L by the beginning market value of the strategy each month, incorporating any changes in the prices of the strategy's bonds since the initial capital was invested.

$$\text{Monthly \$P \& L} = \sum_{\text{active DIGs}} \text{BOM Market Value}_i \times \text{Monthly TR}_i$$

$$\text{Monthly Return} = \frac{\text{Monthly \$P \& L}}{\text{BOM MV}}$$

To fund the strategy, we borrow capital at a cost of 1-month Libor. The monthly return of the strategy, including the funding cost, can be expressed as follows:

$$\text{Monthly Return net of 1mL} = \frac{\text{Monthly \$P \& L} - \frac{1\text{mL}}{12} \times \text{Capital Invested}}{\text{BOM MV}}$$

Finally, we also compute cumulative $P&L and cumulative returns for the strategy:

[23] An investment of $1mn represented, on average, 0.49% of a DIG bond's outstanding market value. This percentage ranged from a low of 0.03% to a high of 4.39% across the 901 DIG bonds.

$$\text{Cumulative \$P \& L} = \sum_{\#\text{active DIG months to date}} \text{Monthly \$P \& L}$$

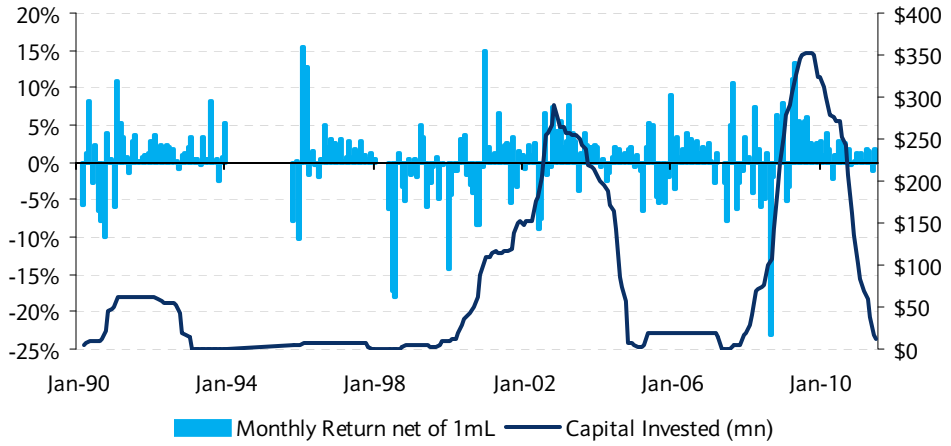
$$\text{Cumulative Return} = \frac{\text{Cumulative \$P \& L}}{\text{Cumulative Capital Invested}}$$

DIG Strategy Performance

The strategy was active for 232 of the 259 calendar months from January 1990 through July 2011. (For the other 27 months, there were no outstanding DIG bonds, and, thus, no capital invested in the strategy.) The amount of capital invested in the DIG strategy ebbed and flowed, mirroring the three main credit cycles since 1990. Figure 18 shows that DIG returns were poor in some months. Still, the effect of these months on the profitability of the DIG strategy depends on how much capital was invested at the time. As reflected in the figure, large negative returns have occurred when little capital is invested in the strategy whereas large positive returns occurred when relatively large amounts of capital was invested. This pattern is to be expected. Many DIGs appeared (and the strategy needs capital) during periods of credit market distress. Since the credit market has tended to be mean-reverting, large positive returns tended to occur after substantial capital had been invested.

Over the 232 months, the MV-weighted average monthly return of the strategy (net of 1m Libor) was 1.8% with a standard deviation of 4.1%. On an annualized basis, that translates into a Sharpe Ratio of 1.68 (compared with 0.64 for the Corporate Index). The strategy was profitable in just over two thirds of the months.

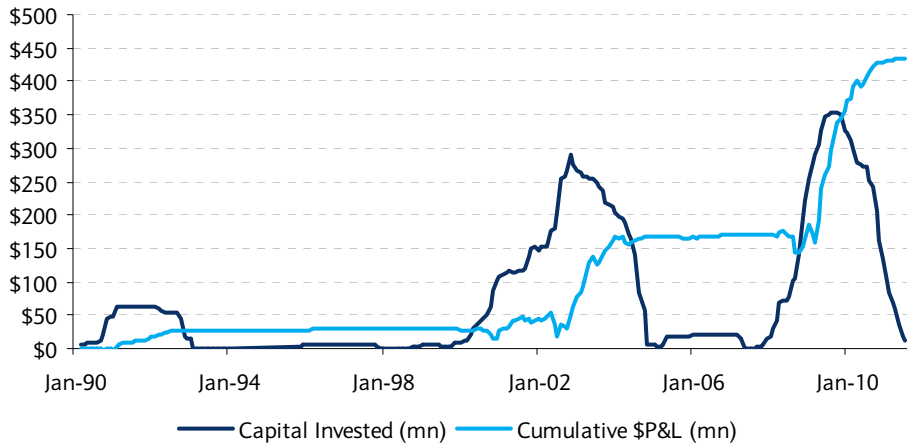
Figure 18: DIG Strategy Monthly Returns net of 1mL and Capital Invested (mn)



Source: Barclays Capital

Figure 19 shows the cumulative $P&L of the strategy, also plotted alongside the current amount of capital invested. Over time, there have been very few small declines in the cumulative $P&L. As more bonds became distressed and investments were made, cumulative $P&L started to increase slowly. As the current investment peaked, reflecting the surge of DIGs during the prior months of credit market stress, the cumulative $P&L tended to increase rapidly.

Figure 19: DIG Strategy Cumulative $P&L (mn) and Capital Invested (mn)

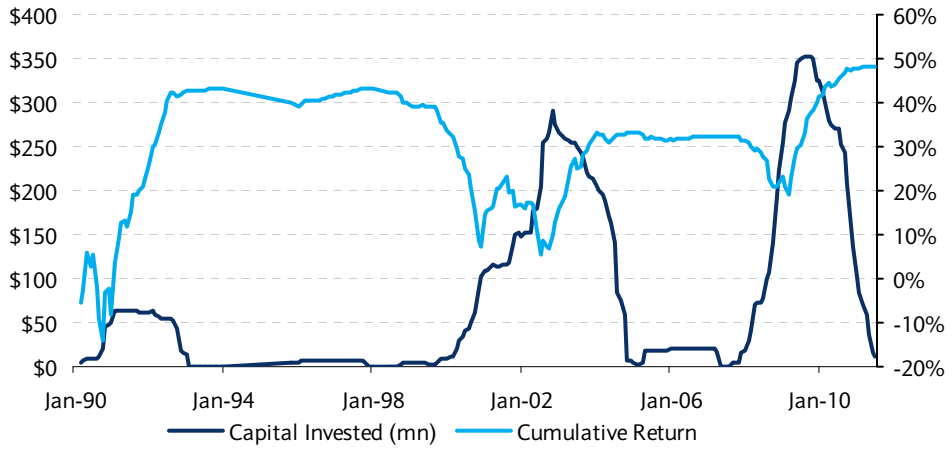


Source: Barclays Capital

Figure 20 shows the cumulative return of the DIG strategy. As expected from the average return numbers presented above, the DIG strategy returned a bit over 48%, after taking into account a funding cost of 1mL.

New DIG bonds tended to produce relatively small profits initially, with the $P&L growing as the DIG bonds had more time to recover. This helps explain the decline in cumulative return shown in Figure 20 from 2000-02 and again from 2008-09. As new DIG bonds enter the strategy the denominator of the cumulative return expression (cumulative capital invested) spiked up with little pick-up in the numerator (cumulative $P&L). This causes the cumulative return to drop initially. As the DIG bonds seasoned and they started to earn significant $P&L, the return increased strongly. Performance was very similar at the issuer level (i.e., investing $1mn in each DIG issuer as opposed to investing $1mn in each DIG issue).[24]

Figure 20: DIG Strategy Cumulative Return and Capital Invested (mn)



Source: Barclays Capital

[24] A strategy of investing $1mn in each issuer (equally divided between its bonds which became distressed that month) would have resulted in a monthly return of 1.8% and a standard deviation of 3.7%. The annualized Sharpe Ratio of the issuer strategy (1.85) is somewhat better than that of the DIG issue strategy (1.68).

Understanding DIG Strategy Outperformance

Distressed IG bonds have extremely strong performance. One might ask, is it *abnormally* strong? In other words, do DIG bonds generate a return beyond what can be explained by broad credit market returns? We saw that DIG bonds tended to appear during periods of credit distress (e.g., 1990-91, 2001-02, and 2008-09), performing relatively poorly as the period of credit stress unfolds, and then performing very well as the market recovers. This pattern suggests that a DIG strategy is highly correlated with overall credit market performance. In particular, the DIG strategy appears to be a "high-beta" corporate bond portfolio.

If we adjust DIG performance for their exposure to IG corporates, have DIG bonds offered additional return (i.e., alpha)? To examine this, we compare the DIG strategy with a "mirror" strategy of investing in the IG Corporate Index. To account for duration differences, we look at excess returns rather than total returns.

Figure 21 shows summary statistics for the two strategies. The DIG strategy outperformed the IG strategy on a risk-adjusted basis, with an excess return information ratio (1.23) almost 50% higher than that of the IG strategy (0.82). In addition, the regression output[25] (Figure 22) suggests that DIG bonds are high-beta corporates (beta = 2.19) with alpha of 61bp per month during months when the DIG strategy is active. The patterns of cumulative $P&Ls for these two strategies (Figure 23) also suggest that DIGs are, in fact, high-beta IG corporate bonds, with some alpha.

Figure 21: DIG Strategy Excess Returns versus IG Strategy Excess Returns

	DIG Strategy	IG Strategy
Monthly Average	1.43%	0.39%
Standard Deviation	4.38%	1.68%
IR	1.23	0.82

Source: Barclays Capital

Figure 22: Regression of DIG Strategy Excess Returns on IG Strategy Excess Returns

$$\text{DIG Strategy Excess Return}_t = 0.0061 + 2.19 \times \text{IG Strategy Excess Return}_t$$

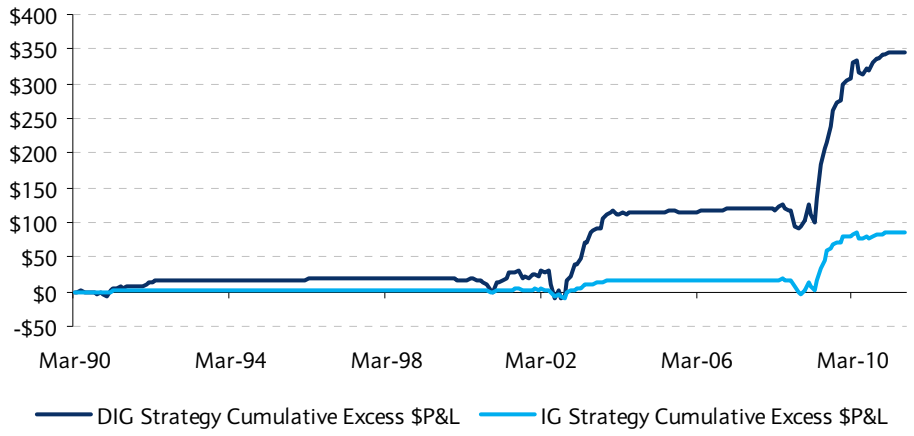
t-stat (3.48) (20.76)

$R^2 = 65\%$

Source: Barclays Capital

[25] We ran a weighted regression, with each monthly observation weighted by its beginning of month market value invested.

Figure 23: Cumulative $P&L of DIG and IG Strategies (mn)



Source: Barclays Capital

Implementing a DIG Strategy

The historical regression results suggest that DIGs generate alpha after exposure to the credit market is removed. However, these results are "backward looking" since the results are based on the entire 232 months of active DIG strategy history. A more realistic test is to compare the DIG strategy with an *ex ante* leveraged investment in the Credit Index. The amount of leverage would depend on the risk of each DIG bond relative to the Index at the time that the DIG investment is made.

We compare the DIG strategy with a "mirror" strategy of investing in a relative DTS-weighted exposure to the IG Corporate Index. In other words, each time the investor made a $1mn investment in a DIG bond, the "mirror" strategy invested $1mn capital in the IG Index, but with a total market value of $1mn * ($DTS_{DIG}/DTS_{Index}$). The difference between the total market value and the $1mn capital invested, the unfunded component of the Index strategy, is financed at 1m Libor. By DTS weighting the IG Index investment, we equalize the *ex ante* expected excess return volatility of the DIG bond and the "mirror" IG Index investment. Given that DIGs have much wider spreads than the Index but comparable durations, we would expect the DTS_{DIG}/DTS_{Index} ratio to have been much greater than one. In fact, across the 901 DIG bonds, the ratio averaged 4.1.

We then compare the relative performance of the DIG strategy and the DTS-weighted IG Index strategy. As before, to account for duration differences, we look at excess returns rather than total returns. Both investments have the same contribution to DTS and should have the same expected excess return volatility. Does the DIG strategy perform better?

As shown in Figure 24, the DIG strategy handily outperforms the DTS-matched IG Index strategy. DIGs outperform by 81bp per month and with a lower volatility. Overall, the DIG strategy had an information ratio of 1.23, compared with 0.40 for the comparable risk IG Index strategy.

Figure 24: DIG Strategy versus DTS-matched IG Strategy

	DIG Strategy	DTS-matched IG Strategy
Monthly Average	1.43%	0.62%
Standard Deviation	4.38%	5.58%
IR	1.23	0.40

Source: Barclays Capital

Summary

Our goal was to carefully examine the historical incidence and performance of distressed investment grade (DIG) bonds.

To measure a DIG bond's performance after distress, we took a conservative approach by not compounding bond-level monthly returns. Instead, we assumed that any cash received from a DIG bond is held as cash earning 0%.

Overall, we found that the 901 DIG bonds performed quite well in absolute terms (51.6%), versus peers (30.1%), and versus Treasuries (39.8%). This was true across sectors, issue sizes, and vintage years. Even those distressed bonds that were ultimately downgraded to high yield exhibited, on average, strong performance.

As we expected, we found that the occurrence of DIG bonds was correlated with the credit cycle, as was their performance. In fact, given their higher risk, DIG performance reflected a high beta ($\beta > 2$) exposure to the Corporate Index. We then examined whether DIGs offered any additional return compared with an equal, *ex ante*, risk exposure to the Corporate Index.

After matching, *ex ante*, each DIG bond's expected excess return volatility to that of Corporate Index (using DTS ratios), we find that DIGs generated approximately 80bp per month of additional return, and with lower volatility.

These results should give some support to investors willing to hold, or possibly buy, distressed investment grade bonds.

Analyst Certification(s)

We, Ariel Edelstein and Bruce Phelps, hereby certify (1) that the views expressed in this research report accurately reflect our personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of our compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

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