



Guide for Accessibility

Accessible Excel 2007 Spreadsheets

Agency Section 508 Team

Office of the Chief Information Officer

June 4, 2010

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The Access Board, an independent Federal agency devoted to accessibility for people with disabilities, develops and maintains design criteria and Technical Standards for electronic and information technology. The Access Board's Technical Standard §1194.22 (Web-based intranet and internet information and applications) applies to Electronic Documents at the point that they are distributed over an "intranet" or the "internet", to the public or Federal Employees, via NASA external or internal Web sites (FTP, HTTP, etc.), email, file sharing (SharePoint or other document management system), or other electronic means.....	3
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Why Accessible Electronic Documents?

In 1998, Congress amended the Rehabilitation Act and strengthened provisions covering access to information in the Federal sector. As amended, Section 508 of the Rehabilitation Act requires access to the Federal government's electronic and information technology (EIT) by Federal Employees and members of the public. The law covers all types of electronic and information technology in the Federal sector and is not limited to assistive technologies used by people with disabilities. It applies to all Federal agencies when they develop, procure, maintain, or use such technology.

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This guide will provide some tips on how to create Excel documents that are accessible. Screenshots and detailed explanations have been provided to guide you through the process. Also, you will find a list of Access Board's technical standards that are applicable to Electronic Documents. Electronic documents created and stored for individual use are not required to comply with Section 508 accessibility standards. If distributing electronic documents that are not accessible, a text-based disclaimer should be attached to all correspondence stating "For an accessible version of this material, please contact <NASA Civil Servant Document Owner>, <Organization of Document Owner>, <Phone>."

For more information or guides and best practices for other Electronic Documents or web technologies, please visit our website at

http://www.nasa.gov/accessibility/section508/sec508_overview.html.

Technical Standards for Electronic Documents

The Access Board developed a set of Accessibility Standards for EIT. NASA Section 508 Policy 2800.3 specifies that Electronic documents comply with Section 1194.22 of the technical standards. Below is a list of the applicable standards specifically for most Electronic Documents.

§ 1194.22 Web-based intranet and internet information and applications.

- (a) A text equivalent for every non-text element shall be provided (*e.g.*, via “alt”, “longdesc”, or in element content).
- (c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
- (d) Documents shall be organized so they are readable without requiring an associated style sheet.
- (g) Row and column headers shall be identified for data tables.
- (h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
- (j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
- (k) A text-only page, with equivalent information or functionality, shall be provided to make a web site [or electronic document] comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.
- (l) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.
- (m) When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).
- (n) When electronic forms are designed to be completed on-line [or offline], the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
- (p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

Data Tables

For data tables, identify row and column headers. Headings should be clearly separated from other text using differential styling (i.e. bold, italics). Also, header cells should be clearly or easily associated with data cells in a logical order, avoiding complex header structures. For best results, minimize headings to the first columns or rows, but, if more complex heading structures are needed, provide a a short description of the layout.

In figure 1 below, you will see where we have used Excel 2007's text styles to help define the table headers:

1. First, highlight the headers cells of your data table.
2. Using the "Cell Styles" menu item, select the style you would like to use. In this case we selected "Heading 4".
3. Text styles can be customized to your needs and just about any style is acceptable as long as it is unique to the headers on your worksheet and helps to define the headers as a higher level than the data cells (i.e. larger/bolder text).

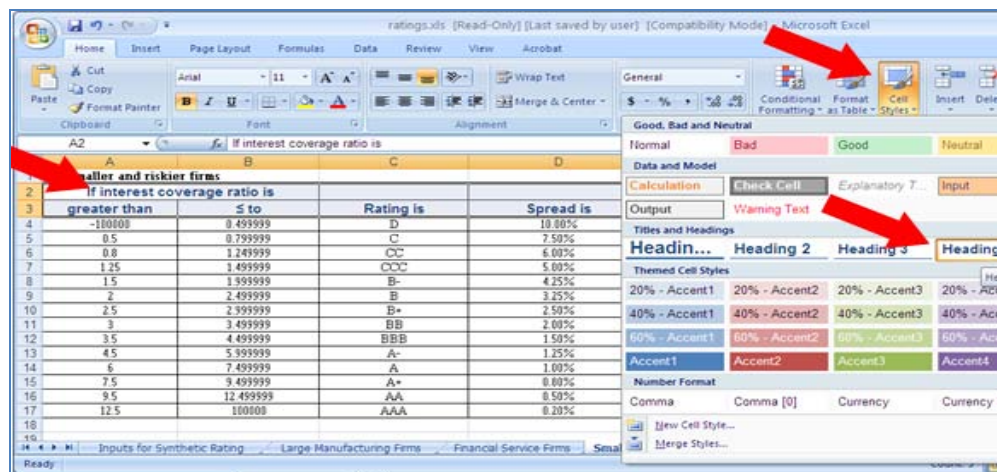


Figure 1: Screen shot using styles to help define table headers.

In figure 2, there is a table with a very complex header structure with multiple column headers and several row headers that virtually break the table into multiple tables. There are also a number of row headers seem unrelated to the main header in that column. This can be very difficult for assistive technology users to navigate through and recognize the relevance of each data cell in relation to the header cells. To solve this, try to use a simplified header flow and break tables into multiple worksheets when possible so that the data flows in a way that makes sense.

SIMPLIFIED CFROI VALUATION MODEL AUDIT										
BPS COST OF CAPITAL			START UP			BIG "B"			STOP INVESTING	
			1	2	3	4	5	6	7	8
(A1)	Growth Rate	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
(B1)	Project FIRR	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Project Cash Flow										
1			42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
2				46.2	46.2	46.2	46.2	46.2	46.2	46.2
3					50.8	50.8	50.8	50.8	50.8	50.8
4						55.9	55.9	55.9	55.9	55.9
5							57.2	57.2	57.2	57.2
6								58.1	58.1	58.1
7									58.8	58.8
(C)	Gross Cash Flow	0.0	42.0	88.2	139.9	192.9	242.9	292.9	342.9	392.9
(D)	Investment NPV	20.0	22.0	24.2	26.6	29.9	32.9	35.9	38.9	41.9
(E)	Presented NPV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(F)	Net Change NPV (D-E)	20.0	22.0	24.2	26.6	29.9	32.9	35.9	38.9	41.9
(G)	CAPEX	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
(H)	NPV (C - F - G)	(90.0)	(48.0)	(1.8)	25.9	30.4	32.9	34.2	34.9	34.9
(I)	Balance Sheet - NPV	20.0	42.0	66.2	72.9	79.9	86.9	92.9	98.9	104.9
(J)	Balance Sheet - Gross Assets	800.0	290.0	331.0	344.1	358.5	372.8	384.2	393.9	401.9
(K)	% Non-Depreciating	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
(L)	CFROI	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
(M)	Gross CF(%) & Gross Assets(%)									
VALUE #1			354.3	363.9	369.9	374.0	377.3	379.3	380.3	381.3
COSTING ASSETS										
(N)	Cost of Assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 2: Screenshot of data table with complex header structure.

Another example of a complex header structure can be seen in Figure 3. Here, multiple rows are used for headers. In some cases, use of multiple rows is necessary and, as long as the table is formatted as described above, that is acceptable. But, in this case, it is not necessary to use multiple rows and an Assistive Technology user may become confused expecting each row to have individual significance.

	A	B	C	D	E	F	G
1	Break-Even Analysis						
2							
3							
4		Cost Per	Cans			Sell This	
5	Cookies	Can	Purchased	Total Paid	Retail	Many Cans	
6	Chocolate Chip	\$5.99	200	\$1,198.00	\$10.99	to Break Even	Profit/Loss
7	Peanut Butter	4.99	300	1497.00	9.99		
8	Lemon	6.99	125	873.75	11.99		
9	Coconut Macaroon	5.99	100	599.00	10.99		
10							
11						Total Profit:	(\$4,167.75)



Figure 3: Screenshot showing a data table with several rows used for column headers.

The solution, as seen in Figure 4, is to simply combine the headers on multiple rows onto a single row. The table is simplified for accessibility, no data or important information is lost, and the table looks better organized as well.

	A	B	C	D	E	F	G
1	Break-Even Analysis						
2	Cookies	Cost Per	Cans			Sell This	
3	Chocolate Chip	Can	Purchased	Total Paid	Retail	Many Cans to	Profit/Loss
4	Peanut Butter	\$5.99	200	\$1,198.00	\$10.99	Break Even	
5	Lemon	4.99	300	1497.00	9.99		
6	Coconut Macaroon	6.99	125	873.75	11.99		
7		5.99	100	599.00	10.99		
8						Total Profit:	(\$4,167.75)

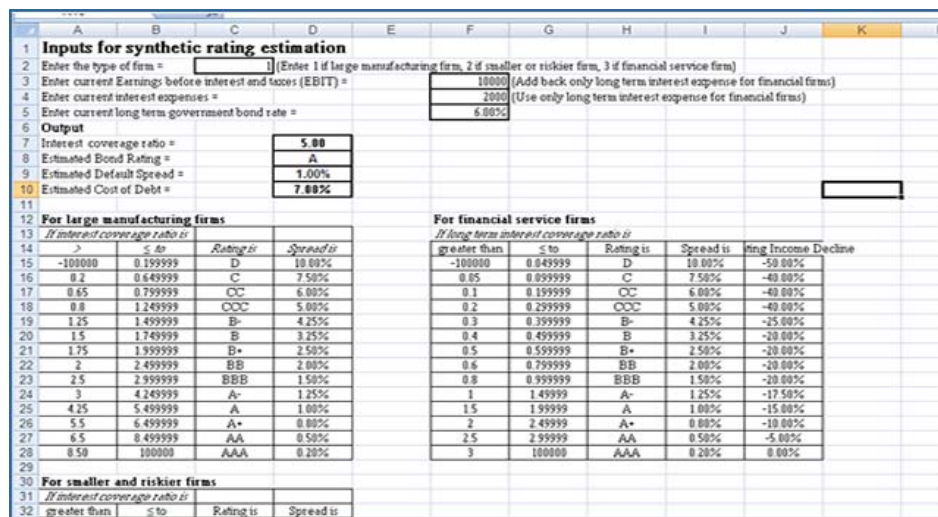


Figure 4: Screenshot showing table from Figure 3 with only one row for column headers.

Reading order

Avoid complex layouts. Make sure that all information easily flows from left-to-right and top-to-bottom. Try to use multiple worksheets to display various data sets instead of placing multiple tables, diagrams, or graphics on a single worksheet.

In figure 5, there is a large amount of data on a single worksheet, including two data tables with completely different data sets placed side-by-side. It can be difficult for assistive technology users to navigate this page. If a complex format is required, provide a brief description at the top of the worksheet about the layout of the page. Otherwise, try to use multiple worksheets, as noted in “Frames/Worksheets” section of this document below.



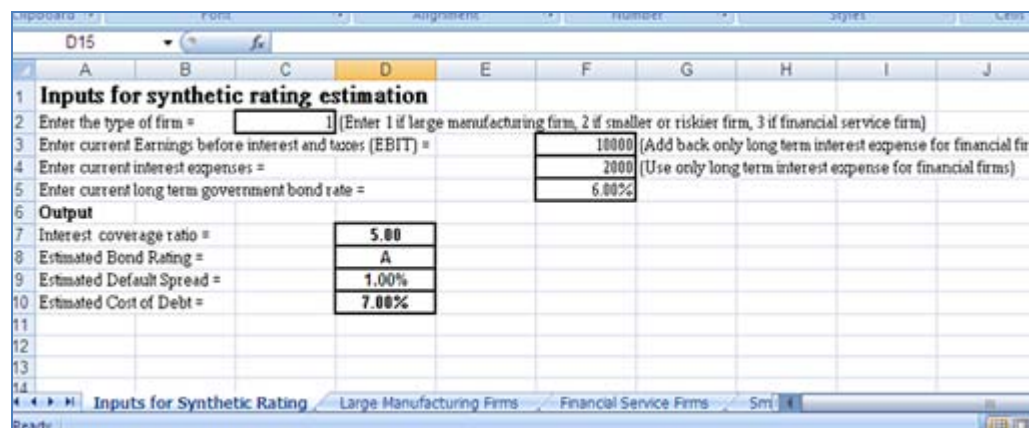
Inputs for synthetic rating estimation			
1	Enter the type of firm = [dropdown] (Enter 1 if large manufacturing firm, 2 if smaller or riskier firm, 3 if financial service firm)		
2	Enter current Earnings before interest and taxes (EBIT) = [input: 10000] (Add back only long term interest expense for financial firms)		
3	Enter current interest expenses = [input: 2000] (Use only long term interest expense for financial firms)		
4	Enter current long term government bond rate = [input: 6.00%]		
5	Output		
6	Interest coverage ratio =	[output: 5.00]	
7	Estimated Bond Rating =	[output: A]	
8	Estimated Default Spread =	[output: 1.00%]	
9	Estimated Cost of Debt =	[output: 7.00%]	

For large manufacturing firms			
If long term interest coverage ratio is greater than	If long term interest coverage ratio is less than	Rating is	Spread is
-100000	0.199999	D	10.00%
0.2	0.649999	C	7.50%
0.65	0.799999	CC	6.00%
0.8	1.249999	CCC	5.00%
1.25	1.499999	B-	4.25%
1.5	1.749999	B	3.25%
1.75	1.999999	B+	2.50%
2	2.499999	BB	2.00%
2.5	2.999999	BBB	1.50%
3	4.249999	A-	1.25%
4.25	5.499999	A	1.00%
5.5	6.499999	A+	0.80%
6.5	8.499999	AA	0.50%
8.50	100000	AAA	0.20%

For financial service firms			
If long term interest coverage ratio is greater than	If long term interest coverage ratio is less than	Rating is	Spread is
-100000	0.049999	D	10.00%
0.05	0.099999	C	7.50%
0.1	0.199999	CC	6.00%
0.2	0.299999	CCC	5.00%
0.3	0.399999	B-	4.25%
0.4	0.499999	B	3.25%
0.5	0.599999	B+	2.50%
0.6	0.799999	BB	2.00%
0.8	0.999999	BBB	1.50%
1	1.499999	A-	1.25%
1.5	1.999999	A	1.00%
2	2.499999	A+	0.80%
2.5	2.999999	AA	0.50%
3	100000	AAA	0.20%

Figure 5: Screenshot displaying a complex page structure on a single worksheet.

In figure 6, Excel is used for formatting purposes instead of displaying data in a tabular format. It is acceptable to use Excel for this purpose as long as the reading order flows from top-to-bottom and left-to-right. But, try to use other document editing software and formats when creating entire documents that do not need to be placed in a tabular or spread sheet format.



Inputs for synthetic rating estimation			
1	Enter the type of firm = [dropdown] (Enter 1 if large manufacturing firm, 2 if smaller or riskier firm, 3 if financial service firm)		
2	Enter current Earnings before interest and taxes (EBIT) = [input: 10000] (Add back only long term interest expense for financial firms)		
3	Enter current interest expenses = [input: 2000] (Use only long term interest expense for financial firms)		
4	Enter current long term government bond rate = [input: 6.00%]		
5	Output		
6	Interest coverage ratio =	[output: 5.00]	
7	Estimated Bond Rating =	[output: A]	
8	Estimated Default Spread =	[output: 1.00%]	
9	Estimated Cost of Debt =	[output: 7.00%]	

Figure 6: Screenshot of page where data is not in tabular format.

Frames/Worksheets

Use one table per worksheet and label each worksheet with a meaningful name. Each worksheet should be titled aptly to facilitate navigation as opposed to Sheet1, Sheet2, etc which are the default sheet names.

In figure 5, above in the “Reading Order section of this document, there is a complex layout with multiple data tables on one worksheet. As noted, this layout can be difficult for assistive technology users to navigate and can be easily corrected for accessibility without losing data or functionality by simply placing each individual table in a separate worksheet that is titled to facilitate navigation. Figures 7 and 8 show how we have corrected the complexity of the layout in figure 5 by placing each data table in a separate worksheet and titled each worksheet appropriately.

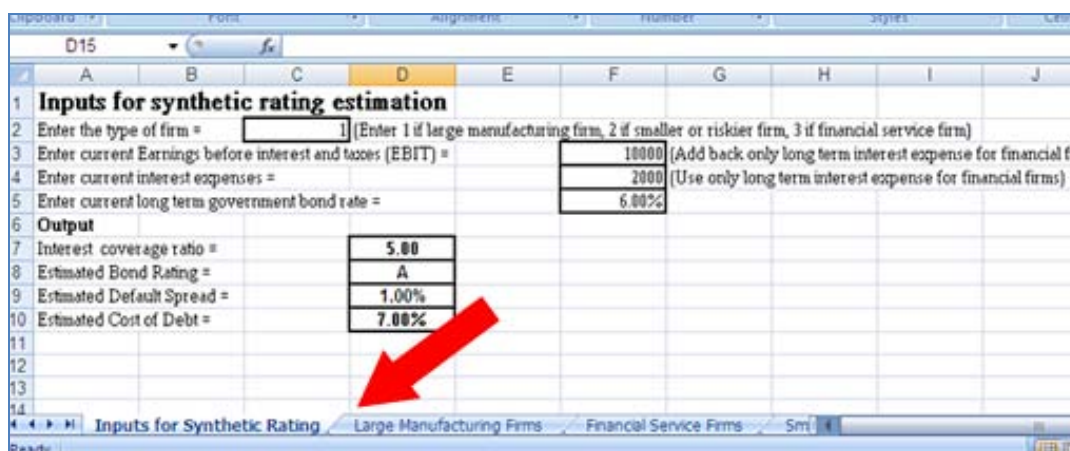


Figure 7: Screenshot of workbook with multiple titled worksheets.

You will also notice that styling has been added to the table headers on each individual table to better define the headers, as described in the “Data Table” section of this document.

A screenshot of a Microsoft Excel worksheet titled 'ratings.xls' showing a table for 'For smaller and riskier firms'. The table has four columns: 'greater than', '≤ to', 'Rating is', and 'Spread is'. It lists 14 rows of data with interest coverage ratios and corresponding bond ratings and spreads. A red arrow points to the table header, and another red arrow points to the worksheet tab 'Smaller & Riskier Firms' at the bottom.

greater than	≤ to	Rating is	Spread is
-100000	0.499999	D	10.00%
0.5	0.799999	C	7.50%
0.8	1.249999	CC	6.00%
1.25	1.499999	CCC	5.00%
1.5	1.999999	B-	4.25%
2	2.499999	B	3.25%
2.5	2.999999	B+	2.50%
3	3.499999	BB	2.00%
3.5	4.499999	BBB	1.50%
4.5	5.999999	A-	1.25%
6	7.499999	A	1.00%

Figure 8: Screenshot of one of the tables in figure 5 transferred to an individual worksheet.

Non-Text Elements/Images

Provide a text equivalent for all non text elements including images, audio, video, charts, graphs, and other complex diagrams. This can be done by providing descriptive text for elements adding on-screen text, captioning, or alternate (alt) text wherever possible for non-text elements that are not solely used as decoration.

To add alternate text to images (see Figure 9):

1. Select or highlight the image.
2. Select “Format” under the “Picture Tools” Section of the menu.
3. Under the section for “size”, select the button in the bottom right corner to expand the “Size and Properties” menu.
4. Select the “alt text” tab from the “Size and Properties” window.
5. Input text and click the “Close” button.

Note: You can also “right-click” on the image and select “Size” from the menu to open the “Size” window to input “Alt Text”.

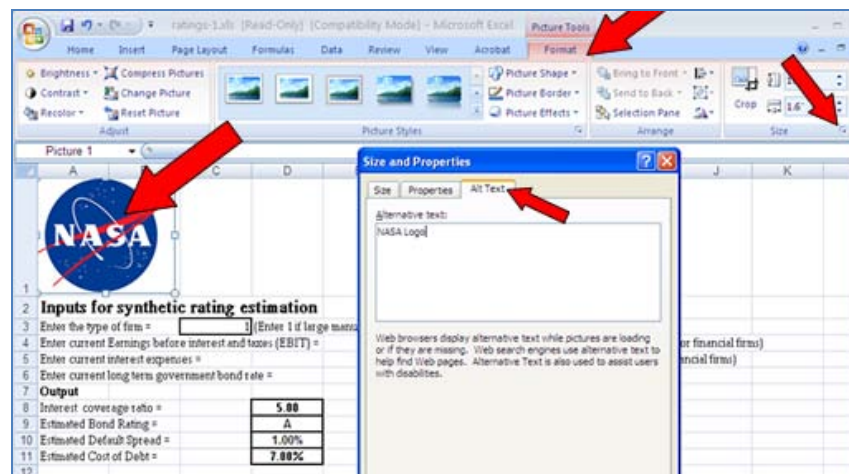


Figure 9: Screenshot of process for adding alternate text to images.

As noted in Figure 10, adding captioning just before or after an image or other graphic is another option for providing alternate text. Try to ensure that the textual styling (i.e. bold, italic) is unique and consistent for all captioning throughout the document, where possible.

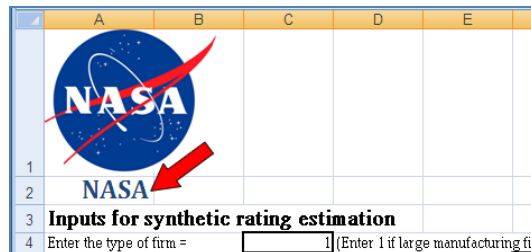


Figure 10: Screenshot of on-screen text captioning of NASA logo.

As far as the level of descriptiveness, any image of a chart, table, or graph and important textual information must be fully described. Charts and tables must be described in greater detail, which means including numbers and what those numbers represent. For basic images, do not overcomplicate the description and only provide the information necessary to explain the main purpose of the image in the context of the document.

If graphs or other complex images or data displays are used, the best alternative is to provide supplemental data provided in a tabular format (see figure 11). Alternate text is acceptable, but tabular data is generally the preferred alternative.

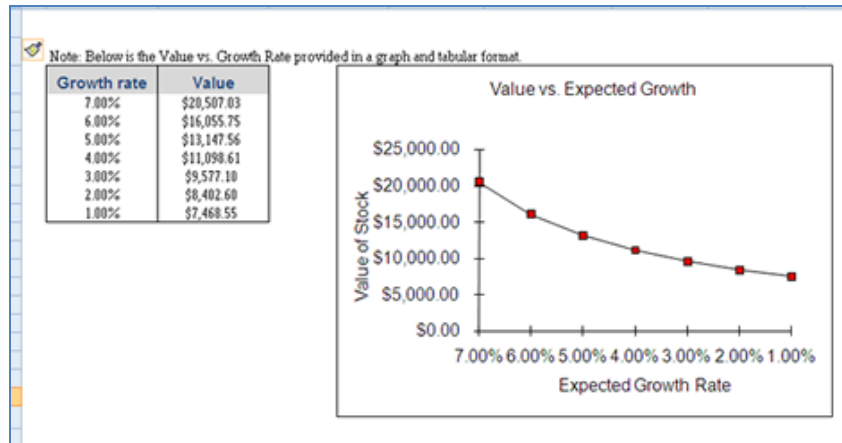


Figure 11: Screenshot of Graph with equivalent tabular data provided.

Color

Ensure that documents that use color are understandable for people who cannot perceive color. Color and highlighting can be used for markup, but should not be the only way to provide information.

In figure 12 below there is a notation stating, “Firms with the lowest and highest ratings have been highlighted in yellow.” Color is being used to highlight specific information and many users with visual impairments or color blindness may not be able to follow the notation. But, in this case, the highlighting is only markup noting information that already exists within the table under the “Rating Is” column. The user can access the information through other means.

For smaller and riskier firms			
If interest coverage ratio is		Rating is	Spread is
greater than	≤ to		
-100000	0.499999	D	10.00%
0.5	0.799999	C	7.50%
0.8	1.249999	CC	6.00%
1.25	1.499999	CCC	5.00%
1.5	1.999999	B-	4.25%
2	2.499999	B	3.25%
2.5	2.999999	B+	2.50%
3	3.499999	BB	2.00%
3.5	4.499999	BBB	1.50%
4.5	5.999999	A-	1.25%
6	7.499999	A	1.00%
7.5	9.499999	A+	0.80%
9.5	12.499999	AA	0.50%
12.5	100000	AAA	0.20%

Note: Firms with the lowest and highest ratings have been highlighted in yellow.



Figure 12: Screenshot showing highlighting used to note data existing in the table.

In figure 13, we have the same table, but the notation now states, “Firms with the highest sales have been highlighted in yellow.” Again, color is used to highlight specific information. The problem here is that the “highest sales” information is not provided anywhere else in the table or on the worksheet. If a visually impaired or color blind individual encountered this, they would likely have no means of determining the information noted using color. The solution is to simply provide the information through other means such as adding a column to the table or providing supplemental textual data.

For smaller and riskier firms			
If interest coverage ratio is		Rating is	Spread is
greater than	≤ to		
-100000	0.499999	D	10.00%
0.5	0.799999	C	7.50%
0.8	1.249999	CC	6.00%
1.25	1.499999	CCC	5.00%
1.5	1.999999	B-	4.25%
2	2.499999	B	3.25%
2.5	2.999999	B+	2.50%
3	3.499999	BB	2.00%
3.5	4.499999	BBB	1.50%
4.5	5.999999	A-	1.25%
6	7.499999	A	1.00%
7.5	9.499999	A+	0.80%
9.5	12.499999	AA	0.50%
12.5	100000	AAA	0.20%

Note: Firms with the highest sales have been highlighted in yellow.



Figure 13: Screenshot showing highlighting used to note data not existing in the table

Contrast

If color is used, use a high contrast between background colors and text colors. People with low vision or color blindness may not be able to read text that does not have a high degree of contrast between the text and the background. Use light text on dark backgrounds and dark text on light backgrounds.

Figure 14 shows table headers with light grey text on a lighter grey background. This can cause problems for some visually impaired individuals.

For smaller and riskier firms			
If interest coverage ratio is			
greater than	≤ to	Rating is	Sp
-100000	0.499999	D	1
0.5	0.799999	C	



Figure 14: Screenshot of table headers with light text on a light background.

The problem with contrast is easily solved in figure 14 by changing the header text to a navy blue color on a light grey background.

For smaller and riskier firms			
If interest coverage ratio is			
greater than	≤ to	Rating is	Sp
-100000	0.499999	D	1
0.5	0.799999	C	




Figure 15: Screenshot of table headers with dark text on a light background.