Wrote the report and built the project based on our discussion on 10-Nov-2010. Hoping for a B+ based on our discussion.

Auto Formatter for loan analysis

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VBA Class

Summary:

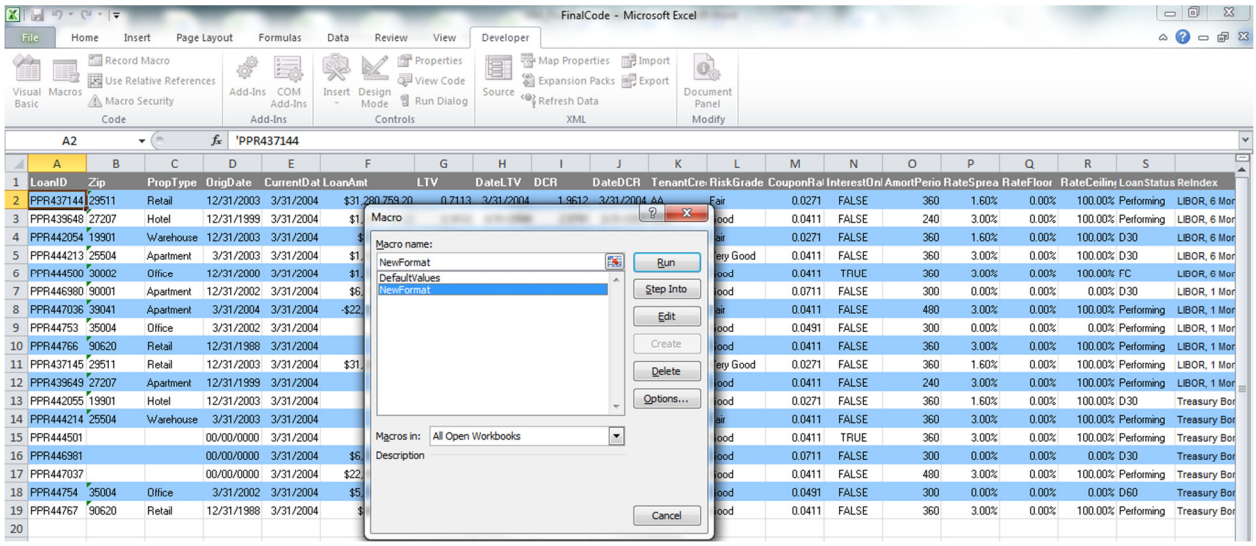
In order for a bank in Salt Lake City to accurately forecast losses for its Commercial Real Estate loans, it needs the help of a third party tool called “CRE Analysis”.

But, the tool needs the user to input a data sheet, providing details such as loan amount, zipcode, LTV(Loan to Value) etc. of the loan. This data is retrieved from a database of the bank. However, the data retrieved from the database doesn’t comply with the format “CRE Analysis” requires. Every day tens of sheets are loaded by each user of the tool to perform analysis on loans. Each user spends about half an hour to one hour just formatting the sheet to comply with the tool’s requirements. Automating the process can save the bank about 25-30 man hours each day and generate lot of savings for the bank as the time spent on formatting the sheet can be spent on some financial analysis.

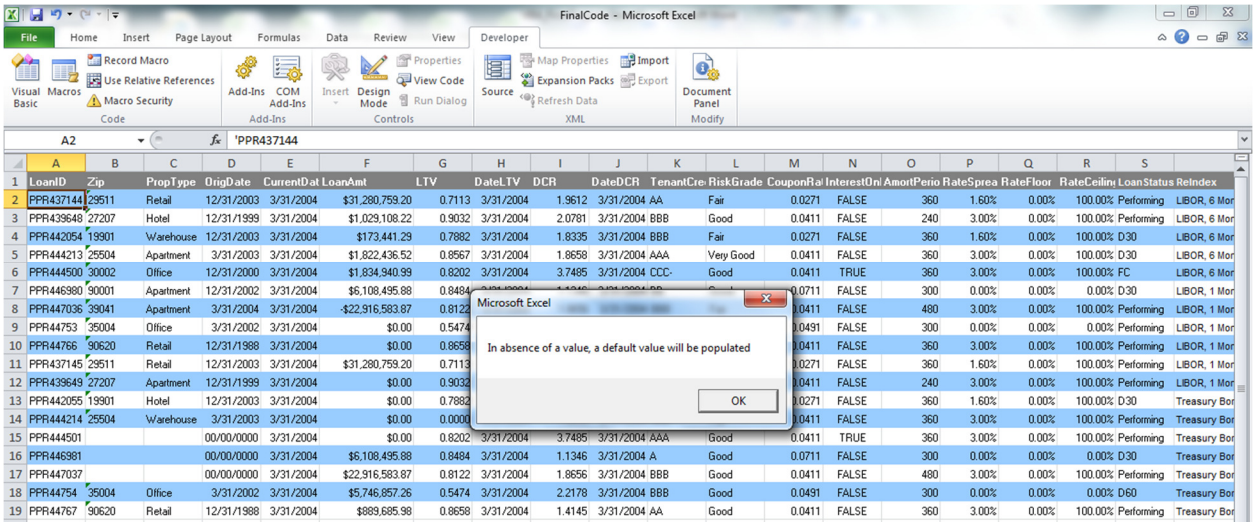
This document details the VBA algorithm and code used to automate the process.

How to execute the program:

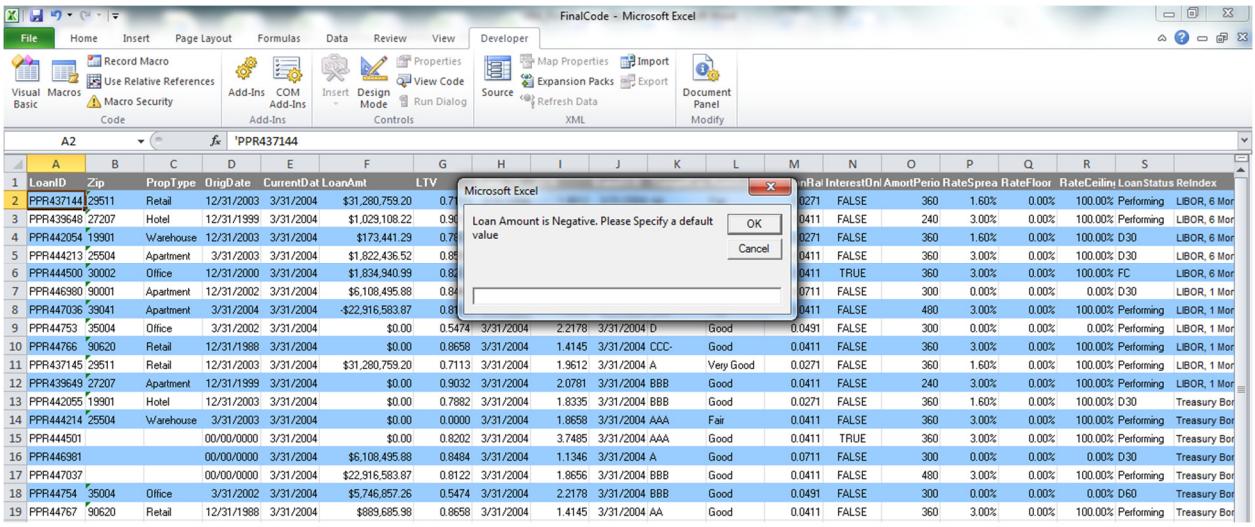
1- Open the file NewFormat_FinalCode.xlsm
2- Go to the Developer tab then Macro and then click on NewFormat Macro as shown below:



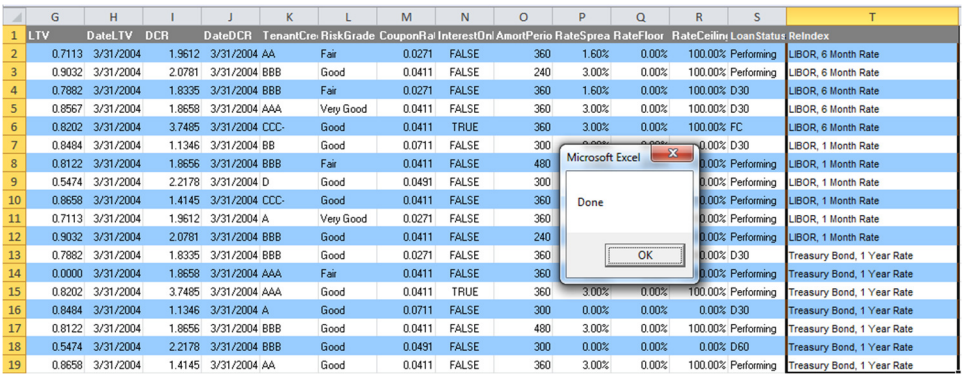
3- A message box pops up saying that “Default values will be assigned to blank cells”. Click OK if the user is OK with predefined default values filling the blank cells. Otherwise the user will have to stop the program and manually enter the values.



4- Enter a desired default value when the input box asks to. This happens when data validation finds bad data. E.g., negative loan amount. A default value such as 0 can be entered in the input box as below:



5- When Formatting is done a message box saying “Done” pops up:



Detailed Explanation:

1- Data Sheet:

In order for the "CRE Analysis" tool to forecast loan losses, it needs the following 20 columns of data retrieved through a SQL query.

1- Loan Id
2- Zip
3- Property Type
4- Origination Date
5- Current Date
6- Loan Amount
7- LTV (Loan to Value)
8- Date when LTV was calculated
9- DCR (Debt Coverage Rate)
10- Date when DCR was calculated
11- Tenant Credit
12- Risk Grade of the loan
13- Coupon Rate on debt payments
14- Type of Interest payments
15- Amortization Period
16- Rate Spread
17- Rate Floor
18- Rate Ceiling
19- Loan Performing Status
20- Variable Rate Index

This is how the unformatted data sheet looks:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	LoanID	Zip	PropType	OrigDate	CurrentDat	LoanAmt	LTV	DateLTV	DCR	DateDCR	TenantCre	RiskGrade	CouponRa	InterestOn	AmortPerio	RateSprea	RateFloor	RateCeilin	LoanStatus	ReIndex
2	PPR437144	29511	Retail	37986	38077	31280759.2	0.7113097	38077	1.96121	38077	AA	Fair	0.02714	FALSE	360	0.016	0	1	Performing	LIBOR, 6 Month Rate
3	PPR439648	27207	Hotel	36525	38077	1029108.215	0.9032321	38077	2.07808	38077	BBB	Good	0.04114	FALSE	240	0.03	0	1	Performing	LIBOR, 6 Month Rate
4	PPR442054	19901	Warehouse	37986	38077	173441.294	0.7881852	38077	1.8335	38077	BBB	Fair	0.02714	FALSE	360	0.016	0	1	D30	LIBOR, 6 Month Rate
5	PPR444213	25504	Apartment	37711	38077	1822436.515	0.8567321	38077	1.86584	38077	AAA	Very Good	0.04114	FALSE	360	0.03	0	1	D30	LIBOR, 6 Month Rate
6	PPR444500	30002	Office	36891	38077	1834940.985	0.8201619	38077	3.74847	38077	CCC-	Good	0.04114	TRUE	360	0.03	0	1	FC	LIBOR, 6 Month Rate
7	PPR446980	30001		37621	38077	6108495.878	0.8484248	38077	1.1345996	38077	BB	Good	0.07114	FALSE	300		0		D30	LIBOR, 1 Month Rate
8	PPR447036	39041	Apartment	38077		22916583.87	0.8122222	38077	1.86556	38077	BBB	Fair	0.04114	FALSE	480	0.03	0	1	Performing	LIBOR, 1 Month Rate
9	PPR44753	35004	Office	37346		5746857.264	0.54744	38077	2.2178005	38077	D	Good	0.04914	FALSE	300		0		Performing	LIBOR, 1 Month Rate
10	PPR44766	30620	Retail	32508		0	0.865845	38077	1.41446	38077	CCC-	Good	0.04114	FALSE	360	0.03	0	1	Performing	LIBOR, 1 Month Rate
11	PPR437145	29511	Retail	37986		31280759.2	0.7113097		1.96121	38077	A	Very Good	0.02714	FALSE	360	0.016	0	1	Performing	LIBOR, 1 Month Rate
12	PPR439649	27207	Apartment	36525		0	-0.9032321	38077	2.07808	38077		Good	0.04114	FALSE	240	0.03	0	1	Performing	LIBOR, 1 Month Rate
13	PPR442055	19901	Hotel	37986	38077	0	0.7881852	38077	1.8335	38077		Good	0.02714	FALSE	360	0.016	0	1	D30	Treasury Bond, 1 Year Rate
14	PPR444214	25504	Warehouse	37711	38077	0	0	38077	1.86584	38077		Fair	0.04114	FALSE	360	0.03	0	1	Performing	Treasury Bond, 1 Year Rate
15	PPR444501			00/00/0000	38077	0	0.8201619	38077	3.74847	38077	AAA	Good	0.04114	TRUE	360	0.03	0	1	Performing	Treasury Bond, 1 Year Rate
16	PPR446981			00/00/0000	38077	-6108495.878	0.8484248	38077	1.1345996	38077	A	Good	0.07114	FALSE	300		0		D30	Treasury Bond, 1 Year Rate
17	PPR447037			00/00/0000	38077	22916583.87	0.8122222	38077	1.86556	38077	BBB	Good	0.04114	FALSE	480	0.03	0	1	Performing	Treasury Bond, 1 Year Rate
18	PPR44754	35004	Office	37346	38077	5746857.264	0.54744	38077	2.2178005	38077	BBB	Good	0.04914	FALSE	300		0		D60	Treasury Bond, 1 Year Rate
19	PPR44767	30620	Retail	32508	38077	889685.9827	0.865845	38077	1.41446	38077	AA	Good	0.04114	FALSE	360	0.03	0	1	Performing	Treasury Bond, 1 Year Rate

All the fields in the above sheet are in the General Format. Also, all the fields specified are mandatory. In the absence of a value, we need to populate a default value. We see some blank fields in the sheet,

which was a data entry mistake while creating the loan. Loan Id is a mandatory field during data entry. So, it cannot be blank. The requirements are as follows:

1- Loan Id
   Field Type: Text
   Default value: Mandatory Field
   Constraint: None

2- Zip
   Field Type: Text
   Default value: “00000”
   Constraint: None

3- Property Type
   Field Type: Text
   Default value: “NA”
   Constraint: None

4- Origination Date
   Field Type: Date
   Default value: 00/00/0000
   Constraint: None

5- Current Date
   Field Type: Date
   Default value: 00/00/0000
   Constraint: None

6- Loan Amount
   Field Type: Currency
   Default value: 0
   Constraint: Always > 0

7- LTV (Loan to Value)
   Field Type: Number with 4 decimals (0.0000)
   Default value: 0
   Constraint: Always > 0

8- Date when LTV was calculated
   Field Type: Date
   Default value: 00/00/0000
   Constraint: None

9- DCR (Debt Coverage Rate)
   Field Type: Number with 4 decimals (0.0000)
   Default value: 0
   Constraint: None

10- Date when DCR was calculated
   Field Type: Date
   Default value: 00/00/0000
   Constraint: None

11- Tenant Credit
   Field Type: Text
   Default value: “BBB”
   Constraint: None

12- Risk Grade of the loan
   Field Type: Text
   Default value: “Good”
   Constraint: None

13- Coupon Rate on debt payments
   Field Type: Percentage
   Default value: 0
   Constraint: None

14- Type of Interest payments
   Field Type: Text
   Default value: “False”
   Constraint: None

15- Amortization Period
   Field Type: Number with zero decimals
   Default value: 0
   Constraint: None

16- Rate Spread
   Field Type: Percentage
   Default value: 0
   Constraint: None

17- Rate Floor

Field Type: Percentage
Default value: 0
Constraint: None

18- Rate Ceiling
Field Type: Percentage
Default value: 0
Constraint: None

19- Loan Performing Status
Field Type: Text
Default value: NA
Constraint: None

20- Variable Rate Index
Field Type: Text
Default value: NA
Constraint: None

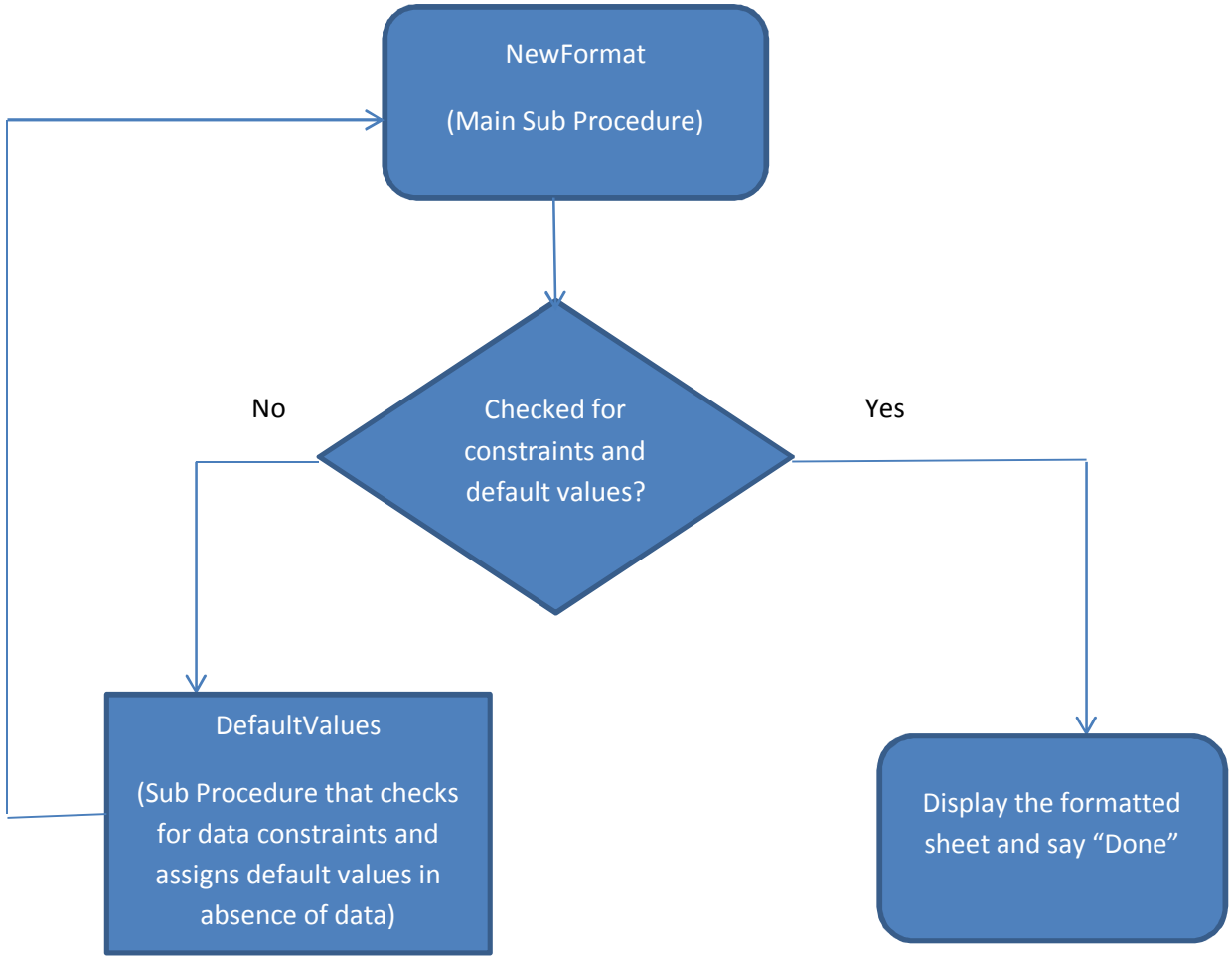
Sub Procedures Used:

1- NewFormat: This is the main macro. When executed, it calls another macro i.e DefaultValues to fill blank data with default values depending on the column. It later formats each of the columns to the desirable format.

2- Default Values: This gets called from NewFormat and assigns default values before the columns get formatted.

Algorithm:

Flowchart:



Methodology:

We need to address three aspects in each field:

1- Field Type
2- Default Value
3- Constraints

So, the code follows the following sequence of steps:

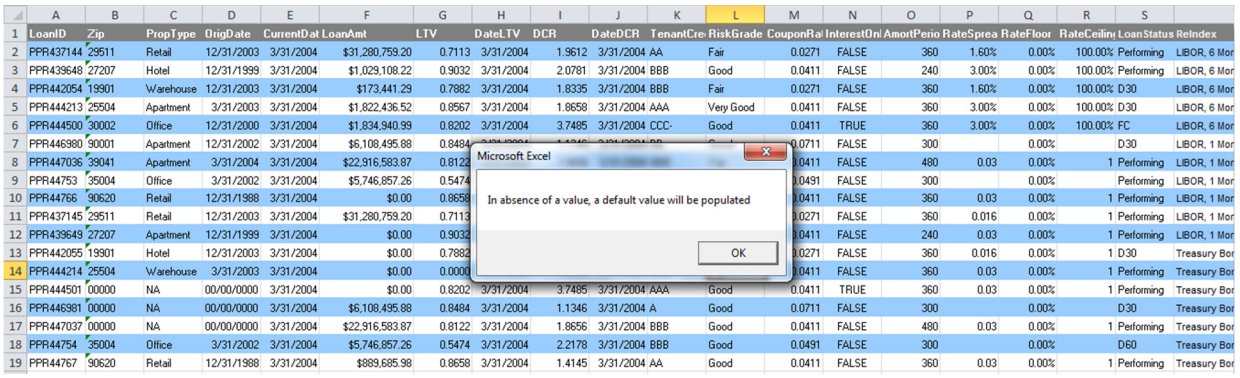
1- Execute the Macro "NewFormat"

2- The macro/sub procedure DefaultValues gets called

After DefaultValues is called, a message box asks for permission if the code can replace blank cells with default values.

The code used is:

```
MsgBox ("In absence of a value, a default value will be populated")
```



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	LoanID	Zip	PropType	OrigDate	CurrentDat	LoanAmt	LTV	DateLTV	DCR	DateDCR	TenantCre	RiskGrade	CouponRa	InterestOn	AmortPerio	RateSprea	RateFloor	RateCeilin	LoanStatus	ReIndex
2	PPR437144	29511	Retail	12/31/2003	3/31/2004	$31,280,759.20	0.7113	3/31/2004	1.9612	3/31/2004	AA	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	Performing	LIBOR, 6 Mor
3	PPR439648	27207	Hotel	12/31/1999	3/31/2004	$1,029,108.22	0.9032	3/31/2004	2.0781	3/31/2004	BBB	Good	0.0411	FALSE	240	3.00%	0.00%	100.00%	Performing	LIBOR, 6 Mor
4	PPR442054	19901	Warehouse	12/31/2003	3/31/2004	$173,441.29	0.7882	3/31/2004	1.8335	3/31/2004	BBB	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	D30	LIBOR, 6 Mor
5	PPR444213	25504	Apartment	3/31/2003	3/31/2004	$1,822,436.52	0.8567	3/31/2004	1.8658	3/31/2004	AAA	Very Good	0.0411	FALSE	360	3.00%	0.00%	100.00%	D30	LIBOR, 6 Mor
6	PPR444500	30002	Office	12/31/2000	3/31/2004	$1,834,940.99	0.8202	3/31/2004	3.7485	3/31/2004	CCC-	Good	0.0411	TRUE	360	3.00%	0.00%	100.00%	FC	LIBOR, 6 Mor
7	PPR446980	90001	Apartment	12/31/2002	3/31/2004	$6,108,495.88	0.8484						0.0711	FALSE	300		0.00%		D30	LIBOR, 1 Mor
8	PPR447036	39041	Apartment	3/31/2004	3/31/2004	$22,916,583.87	0.8122						0.0411	FALSE	480	0.03	0.00%	1	Performing	LIBOR, 1 Mor
9	PPR44753	35004	Office	3/31/2002	3/31/2004	$5,746,857.26	0.5474						0.0491	FALSE	300		0.00%		Performing	LIBOR, 1 Mor
10	PPR44766	90620	Retail	12/31/1988	3/31/2004	$0.00	0.8658						0.0411	FALSE	360	0.03	0.00%	1	Performing	LIBOR, 1 Mor
11	PPR437145	29511	Retail	12/31/2003	3/31/2004	$31,280,759.20	0.7113						0.0271	FALSE	360	0.016	0.00%	1	Performing	LIBOR, 1 Mor
12	PPR439649	27207	Apartment	12/31/1999	3/31/2004	$0.00	0.9032						0.0411	FALSE	240	0.03	0.00%	1	Performing	LIBOR, 1 Mor
13	PPR442055	19901	Hotel	12/31/2003	3/31/2004	$0.00	0.7882						0.0271	FALSE	360	0.016	0.00%	1	D30	Treasury Bor
14	PPR444214	25504	Warehouse	3/31/2003	3/31/2004	$0.00	0.0000						0.0411	FALSE	360	0.03	0.00%	1	Performing	Treasury Bor
15	PPR444501	00000	NA	00/00/0000	3/31/2004	$0.00	0.8202	3/31/2004	3.7485	3/31/2004	AAA	Good	0.0411	TRUE	360	0.03	0.00%	1	Performing	Treasury Bor
16	PPR446981	00000	NA	00/00/0000	3/31/2004	$6,108,495.88	0.8484	3/31/2004	1.1346	3/31/2004	A	Good	0.0711	FALSE	300		0.00%		D30	Treasury Bor
17	PPR447037	00000	NA	00/00/0000	3/31/2004	$22,916,583.87	0.8122	3/31/2004	1.8656	3/31/2004	BBB	Good	0.0411	FALSE	480	0.03	0.00%	1	Performing	Treasury Bor
18	PPR44754	35004	Office	3/31/2002	3/31/2004	$5,746,857.26	0.5474	3/31/2004	2.2178	3/31/2004	BBB	Good	0.0491	FALSE	300		0.00%		D60	Treasury Bor
19	PPR44767	90620	Retail	12/31/1988	3/31/2004	$889,685.98	0.8658	3/31/2004	1.4145	3/31/2004	AA	Good	0.0411	FALSE	360	0.03	0.00%	1	Performing	Treasury Bor

Then the following steps are followed in DefaultValues Macro:

a- Identify the last column

In order to format each and every column, it is important to know the last row of the spreadsheet.

In the DefaultValues sub procedure/macro, the last row is identified using the first column, i.e. Loan Id, which will never be blank. The following lines of code take care of that.

```
r = 2

Do Until Sheets("DataSheet").Cells(r, 1).Value = ""

Assign Default values and Check for constraints

r = r + 1

Loop
```

Then the sub procedure DefaultValues assigns default values to the blank cells and checks for constraints.

b- Assign default values

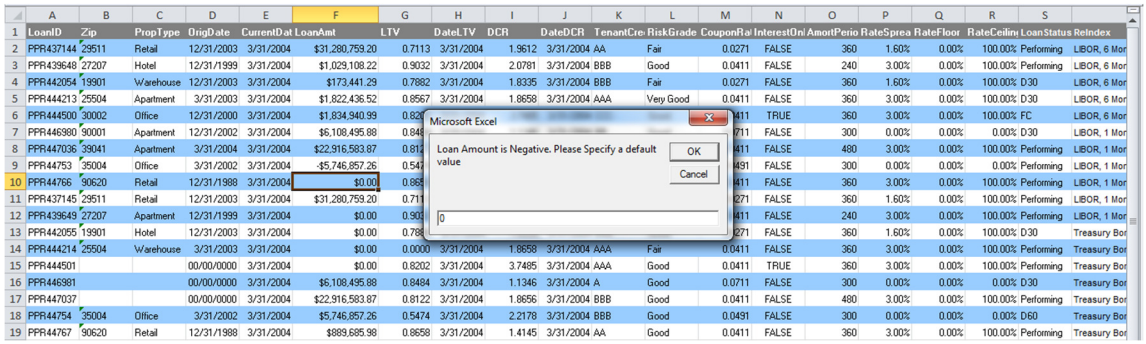
The Do Until loop works till a value in the first column is blank.

The body of the Do While loop assigns default values and checks for the constraints in the column. For example: the code for the first column Loan Id is a mandatory field that cannot be blank. If the first column in a row is non-blank and the sixth i.e. Loan Amount is blank, the sixth column is replaced by the default value i.e. 0. The code is as follows :

```
If Sheets("datasheet").Cells(r, 6).Value = "" Then

Sheets("datasheet").Cells(r, 6).Value = 0
```

c- Check Data Constraints

Whenever a data constraint is imposed on a column, for e.g. loan amount i.e. column 6 cannot have negative values. When a negative value is encountered, we get an input box asking for a default value as below:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	LoanID	Zip	PropType	OrigDate	CurrentDat	LoanAmt	LTV	DateLTV	DCR	DateDCR	TenantCre	RiskGrade	CouponRa	InterestOn	AmortPerio	RateSprea	RateFloor	RateCeilin	LoanStatus	ReIndex
2	PPR437144	29511	Retail	12/31/2003	3/31/2004	$31,280,759.20	0.7113	3/31/2004	1.9612	3/31/2004	AA	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	Performing	LIBOR, 6 Mor
3	PPR439648	27207	Hotel	12/31/1999	3/31/2004	$1,029,108.22	0.9032	3/31/2004	2.0781	3/31/2004	BBB	Good	0.0411	FALSE	240	3.00%	0.00%	100.00%	Performing	LIBOR, 6 Mor
4	PPR442054	19901	Warehouse	12/31/2003	3/31/2004	$173,441.29	0.7882	3/31/2004	1.8335	3/31/2004	BBB	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	D30	LIBOR, 6 Mor
5	PPR444213	25504	Apartment	3/31/2003	3/31/2004	$1,822,436.52	0.8567	3/31/2004	1.8658	3/31/2004	AAA	Very Good	0.0411	FALSE	360	3.00%	0.00%	100.00%	D30	LIBOR, 6 Mor
6	PPR444500	30002	Office	12/31/2000	3/31/2004	$1,834,940.99	0.82						411	TRUE	360	3.00%	0.00%	100.00%	FC	LIBOR, 6 Mor
7	PPR446980	90001	Apartment	12/31/2002	3/31/2004	$6,108,495.88	0.845						711	FALSE	300	0.00%	0.00%	0.00%	D30	LIBOR, 1 Mor
8	PPR447036	39041	Apartment	3/31/2004	3/31/2004	$22,916,583.87	0.812						411	FALSE	480	3.00%	0.00%	100.00%	Performing	LIBOR, 1 Mor
9	PPR44753	35004	Office	3/31/2002	3/31/2004	-$5,746,857.26	0.547						491	FALSE	300	0.00%	0.00%	0.00%	Performing	LIBOR, 1 Mor
10	PPR44766	90620	Retail	12/31/1988	3/31/2004	$0.00	0.865						411	FALSE	360	3.00%	0.00%	100.00%	Performing	LIBOR, 1 Mor
11	PPR437145	29511	Retail	12/31/2003	3/31/2004	$31,280,759.20	0.711						271	FALSE	360	1.60%	0.00%	100.00%	Performing	LIBOR, 1 Mor
12	PPR439649	27207	Apartment	12/31/1999	3/31/2004	$0.00	0.903						411	FALSE	240	3.00%	0.00%	100.00%	Performing	LIBOR, 1 Mor
13	PPR442055	19901	Hotel	12/31/2003	3/31/2004	$0.00	0.783						271	FALSE	360	1.60%	0.00%	100.00%	D30	Treasury Bor
14	PPR444214	25504	Warehouse	3/31/2003	3/31/2004	$0.00	0.0000	3/31/2004	1.8658	3/31/2004	AAA	Fair	0.0411	FALSE	360	3.00%	0.00%	100.00%	Performing	Treasury Bor
15	PPR444501			00/00/0000	3/31/2004	$0.00	0.8202	3/31/2004	3.7485	3/31/2004	AAA	Good	0.0411	TRUE	360	3.00%	0.00%	100.00%	Performing	Treasury Bor
16	PPR446981			00/00/0000	3/31/2004	$6,108,495.88	0.8484	3/31/2004	1.1346	3/31/2004	A	Good	0.0711	FALSE	300	0.00%	0.00%	0.00%	D30	Treasury Bor
17	PPR447037			00/00/0000	3/31/2004	$22,916,583.87	0.8122	3/31/2004	1.8656	3/31/2004	BBB	Good	0.0411	FALSE	480	3.00%	0.00%	100.00%	Performing	Treasury Bor
18	PPR44754	35004	Office	3/31/2002	3/31/2004	$5,746,857.26	0.5474	3/31/2004	2.2178	3/31/2004	BBB	Good	0.0491	FALSE	300	0.00%	0.00%	0.00%	D60	Treasury Bor
19	PPR44767	90620	Retail	12/31/1988	3/31/2004	$889,685.98	0.8658	3/31/2004	1.4145	3/31/2004	AA	Good	0.0411	FALSE	360	3.00%	0.00%	100.00%	Performing	Treasury Bor

The code used to check for constraints is always a part of the if statement used to check default values as below:

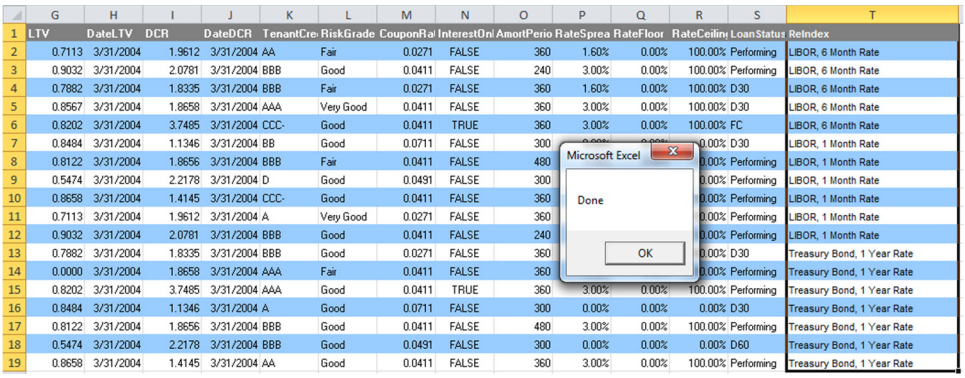
```
ElseIf Sheets("datasheet").Cells(r, 6).Value < 0 Then

Sheets("datasheet").Cells(r, 6).Value = InputBox("Loan Amount is Negative.
Please      Specify a default value")

End If
```

3- After DefaultValues get assigned, the columns get formatted:

After data validation is done and default values are assigned to the blank cells, each of the columns is formatted to the target format. E.g: the eleventh column or column K needs to be formatted to a text. The code below is used for column K.

```
Sheets("DataSheet").Range("K2").Select
Range(Selection, Selection.End(xlDown)).Select
Selection.NumberFormat = "@"
```

After all columns have been formatted, a message box pops us saying “Done” as below:



	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	LTV	DateLTV	DCR	DateDCR	TenantCre	RiskGrade	CouponRa	InterestOn	AmortPerio	RateSprea	RateFloor	RateCeilin	LoanStatus	RelIndex
2	0.7113	3/31/2004	1.9612	3/31/2004	AA	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	Performing	LIBOR, 6 Month Rate
3	0.9032	3/31/2004	2.0781	3/31/2004	BBB	Good	0.0411	FALSE	240	3.00%	0.00%	100.00%	Performing	LIBOR, 6 Month Rate
4	0.7882	3/31/2004	1.8335	3/31/2004	BBB	Fair	0.0271	FALSE	360	1.60%	0.00%	100.00%	D30	LIBOR, 6 Month Rate
5	0.8567	3/31/2004	1.8658	3/31/2004	AAA	Very Good	0.0411	FALSE	360	3.00%	0.00%	100.00%	D30	LIBOR, 6 Month Rate
6	0.8202	3/31/2004	3.7485	3/31/2004	CCC-	Good	0.0411	TRUE	360	3.00%	0.00%	100.00%	FC	LIBOR, 6 Month Rate
7	0.8484	3/31/2004	1.1346	3/31/2004	BB	Good	0.0711	FALSE	300				D30	LIBOR, 1 Month Rate
8	0.8122	3/31/2004	1.8656	3/31/2004	BBB	Fair	0.0411	FALSE	480				Performing	LIBOR, 1 Month Rate
9	0.5474	3/31/2004	2.2178	3/31/2004	D	Good	0.0491	FALSE	300				Performing	LIBOR, 1 Month Rate
10	0.8658	3/31/2004	1.4145	3/31/2004	CCC-	Good	0.0411	FALSE	360				Performing	LIBOR, 1 Month Rate
11	0.7113	3/31/2004	1.9612	3/31/2004	A	Very Good	0.0271	FALSE	360				Performing	LIBOR, 1 Month Rate
12	0.9032	3/31/2004	2.0781	3/31/2004	BBB	Good	0.0411	FALSE	240				Performing	LIBOR, 1 Month Rate
13	0.7882	3/31/2004	1.8335	3/31/2004	BBB	Good	0.0271	FALSE	360				D30	Treasury Bond, 1 Year Rate
14	0.0000	3/31/2004	1.8658	3/31/2004	AAA	Fair	0.0411	FALSE	360				Performing	Treasury Bond, 1 Year Rate
15	0.8202	3/31/2004	3.7485	3/31/2004	AAA	Good	0.0411	TRUE	360	3.00%	0.00%	100.00%	Performing	Treasury Bond, 1 Year Rate
16	0.8484	3/31/2004	1.1346	3/31/2004	A	Good	0.0711	FALSE	300	0.00%	0.00%	0.00%	D30	Treasury Bond, 1 Year Rate
17	0.8122	3/31/2004	1.8656	3/31/2004	BBB	Good	0.0411	FALSE	480	3.00%	0.00%	100.00%	Performing	Treasury Bond, 1 Year Rate
18	0.5474	3/31/2004	2.2178	3/31/2004	BBB	Good	0.0491	FALSE	300	0.00%	0.00%	0.00%	D60	Treasury Bond, 1 Year Rate
19	0.8658	3/31/2004	1.4145	3/31/2004	AA	Good	0.0411	FALSE	360	3.00%	0.00%	100.00%	Performing	Treasury Bond, 1 Year Rate

Learnings and Outcome:

This project has the potential to save about 20 man hours per day for Financial Analysts in one department alone. If used by all the users it can save up to 50 man hours per day in the entire company.

It was a challenge to find the exact syntax for a specific format. E.g: The syntax to format a column to text. This was addressed by recording the macro for formatting a column from general to text.

It was also a challenge to find out the last row given the presence of many blank cells in each row. This was addressed by taking into consideration that the first column always has values given that it is a mandatory field and a Do Until loop was used to make sure that the formatting continues till a cell goes blank in the first column.

I have come a long way since the first class and this class lays a good foundation for me to build on my VBA skills.