Appendix A

SAS Output for Ryan Patrick's Analysis

A-1 Distribution of Sales Price

The SAS System

The UNIVARIATE Procedure
Variable: SalePrice

Moments			
N	1460	Sum Weights	1460
Mean	180921.196	Sum Observations	264144946
Std Deviation	79442.5029	Variance	6311111264
Skewness	1.88287576	Kurtosis	6.53628186
Uncorrected SS	5.69973E13	Corrected SS	9.20791E12
Coeff Variation	43.9100032	Std Error Mean	2079.10532

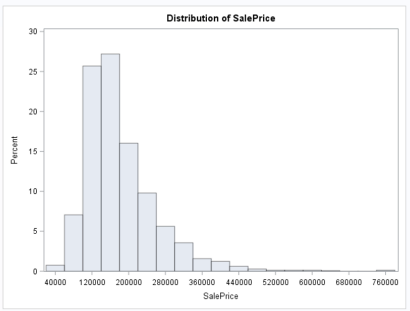
Basic Statistical Measures			
Location		Variability	
Mean	180921.2	Std Deviation	79443
Median	163000.0	Variance	6311111264
Mode	140000.0	Range	720100
		Interquartile Range	84050

Tests for Location: Mu0=0			
Test	Statistic	p Value	
Student's t	t 87.01877	Pr > |t|	<.0001
Sign	M 730	Pr >= |M|	<.0001
Signed Rank	S 533265	Pr >= |S|	<.0001

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.869671	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.123685	Pr > D	<0.0100
Cramer-von Mises	W-Sq	7.288421	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	41.692	Pr > A-Sq	<0.0050

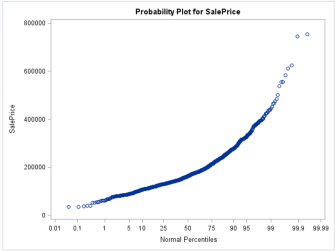
The SAS System

The UNIVARIATE Procedure



The SAS System

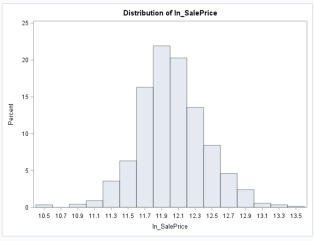
The UNIVARIATE Procedure



A2-Distribution of Log of Sale Price

The SAS System

The UNIVARIATE Procedure



A-3 Split Data Output

Test and train sets for Salesprice

The SURVEYSELECT Procedure

Selection Method	Simple Random Sampling

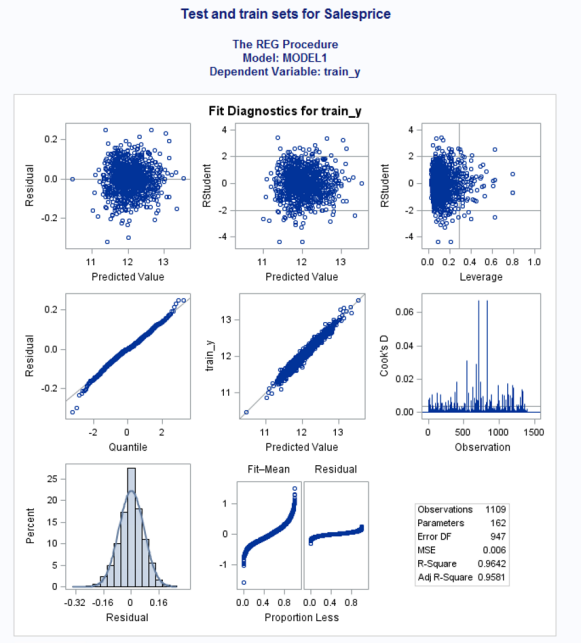
Input Data Set	HOUSE_LOG_CLEAN
Random Number Seed	899512
Sampling Rate	0.8
Sample Size	1116
Selection Probability	0.8
Sampling Weight	0
Output Data Set	XV_ALL

A-4 Backward Selection method output

Backward Elimination: Step 148

Variable numRoofStyle1 Removed: R-Square = 0.9642 and C(p) = 117.2404

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	161	152.79383	0.94903	158.33	<.0001
Error	947	5.67624	0.00599		
Corrected Total	1108	158.47006			



A-5 Stepwise Selection method output

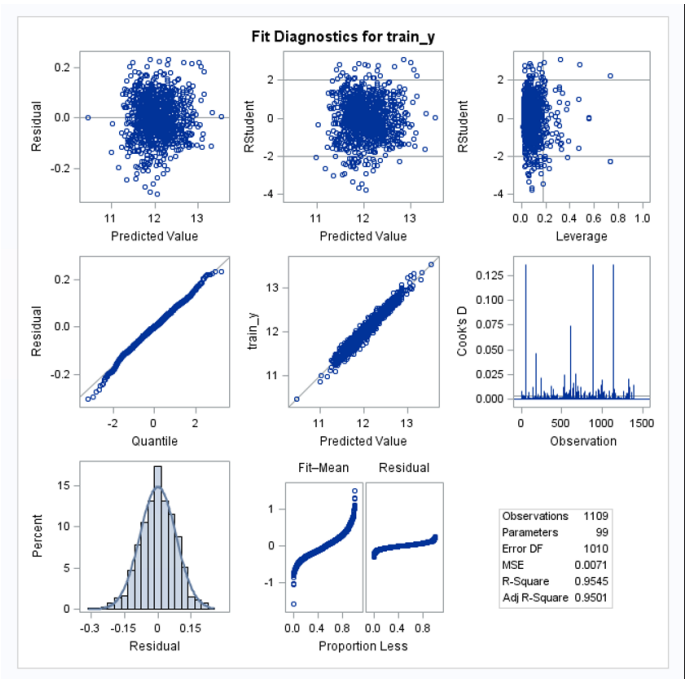
Validation - Test Set

The REG Procedure
Model: MODEL1
Dependent Variable: train_y

Number of Observations Read	1395
Number of Observations Used	1109
Number of Observations with Missing Values	286

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	98	151.26175	1.54349	216.27	<.0001
Error	1010	7.20832	0.00714		
Corrected Total	1108	158.47006			

Root MSE	0.08448	R-Square	0.9545
Dependent Mean	12.04224	Adj R-Sq	0.9501
Coeff Var	0.70153		



A-6 Final Model Validation

Validation statistics for Model

Obs	_TYPE_	_FREQ_	rmse	mae
1	0	279	0.19613	0.086199

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	ln_saleprice	phat
ln_saleprice	1.00000	0.88557
		<.0001
	279	278
phat	0.88557	1.00000
Predicted Value of train_y	<.0001	
	278	278

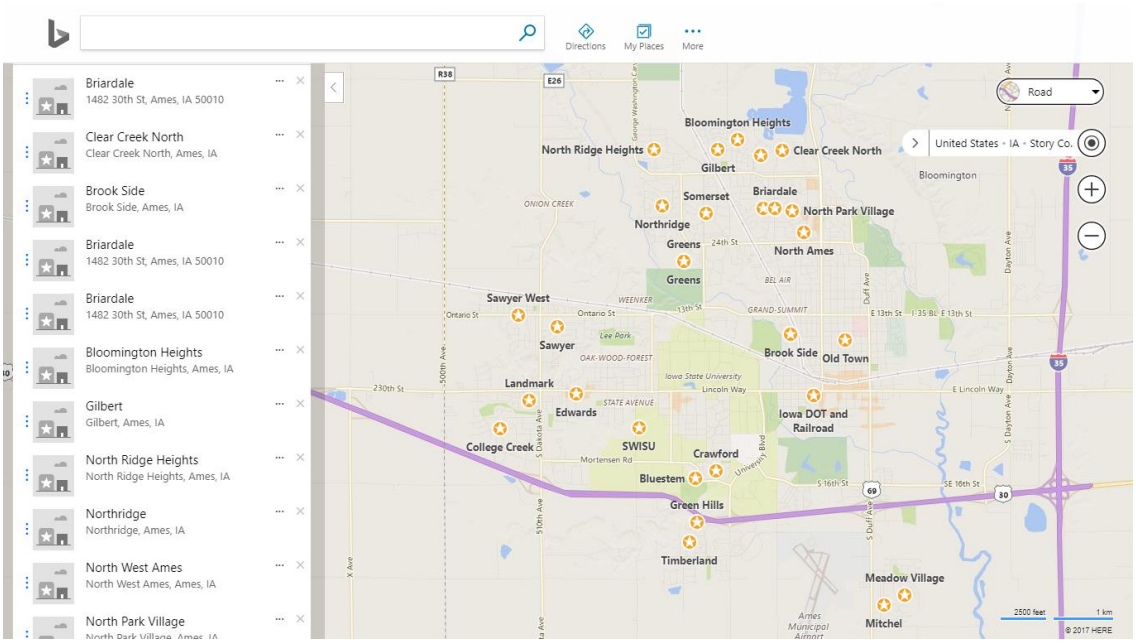
A-7 Final Model Statement

Y = 10.61208 -0.10634*numMSSubClass1 +0.406*numMSSubClass2 -0.04382*numMSSubClass4 +0.10272*numMSZoning1 +0.18241*numMSZoning3 -0.00008513*LotArea +0.25838*numStreet1 -0.06107*numLandContour2 -0.04417*numLotConfig2 - 0.02412*numLotConfig4 -0.19589*numLandSlope2 -0.13676*numNeighborhood3 +0.10973*numNeighborhood6 - 0.08618*numNeighborhood7 -0.04704*numNeighborhood11 -0.05145*numNeighborhood18 +0.06249*numNeighborhood24 +0.05373*numCondition1_2 +0.04076*numCondition1_3 +0.11144*numCondition1_4 -0.07276*numCondition1_5 +0.17751*numCondition1_8 -0.05856*numBldgType1 -0.08815*numBldgType2 -0.12581*numHouseStyle3 +0.03544*numHouseStyle7 +0.16231*numOverallQual1 +0.23307*numOverallQual2 -0.05438*numYearBuilt1 +0.04525*numYearRemodAdd1 +0.03671*numYearRemodAdd2 +0.05898*numYearRemodAdd3 +0.0905*numYearRemodAdd4 +0.1137*numYearRemodAdd5 - 0.01962*numRoofStyle1 +0.5144*numRoofMatl2 +0.24396*numRoofMatl3 +0.09079*numExterior1st3 +0.02751*numExterior1st8 +0.09091*numExterior1st11 -0.05802*numExterior1st13 +0.04454*numExterior2nd13 +0.06491*numExterior2nd14 +0.00003831*MasVnrArea -0.10719*numExterQual1 -0.0691*numExterQual2 -0.09084*numExterQual3 -0.06821*ExterCond1 - 0.16899*Foundation5 -0.05123*BsmtQual2 -0.06391*BsmtQual4 +0.10119*BsmtCond1 +0.0998*BsmtCond4 +0.05405*BsmtExposure1 +0.0223*BsmtFinType12 +0.00007417*BsmtFinSF1 +0.00008255*TotalBsmtSF -0.02104*HeatingQC2 +0.04831*NumCentAir +0.00027432*GrLivArea +0.01423*BsmtFullBath -0.06173*numFunctional1 -0.13832*numFunctional3 -0.08486*numFunctional4 - 0.32596*numFunctional5 -0.40655*numFunctional6 +0.01989*Fireplaces +0.01508*numGarageType1 +0.03816*numGarageYrBlt1 - 0.0151*numGarageFinish2 +0.03732*GarageCars +0.00006812*GarageArea -0.04272*numGarageQual3 -0.04203*numGarageCond3 - 0.04463*numPavedDrive2 +0.00011919*WoodDeckSF +0.00018831*OpenPorchSF +0.00010402*EnclosedPorch +0.00022898*_3SsnPorch +0.00025207*ScreenPorch -0.03053*numFence2 +0.01561*numMoSold1 +0.02475*numMoSold2 -0.01106*numYrSold3 +0.05972*numSaleType3 -0.07524*numSaleCondition1 -0.03704*numSaleCondition4 +0.06661*NumNeighborhood3*BedroomAbvGr - 0.0614*NumNeighborhood10*BedroomAbvGr -0.01873*NumNeighborhood12*BedroomAbvGr +0.01871*NumNeighborhood15*BedroomAbvGr -0.01994*NumNeighborhood17*BedroomAbvGr +0.02045*NumNeighborhood20*BedroomAbvGr +0.03295*NumNeighborhood21*BedroomAbvGr +0.00009969*MSZoning1*LotArea +0.00010448*MSZoning2*LotArea +0.00008882*MSZoning3*LotArea +0.00010661*MSZoning4*LotArea + e

Appendix B

SAS Output for Akbar Aidarov's analysis

B-1 The Map of Neighborhoods of Ames.



B-2 Pearson Correlation Table (Fragment). Color coded.

Initial Model on Cleaned Data with 21 Numeric Variables.

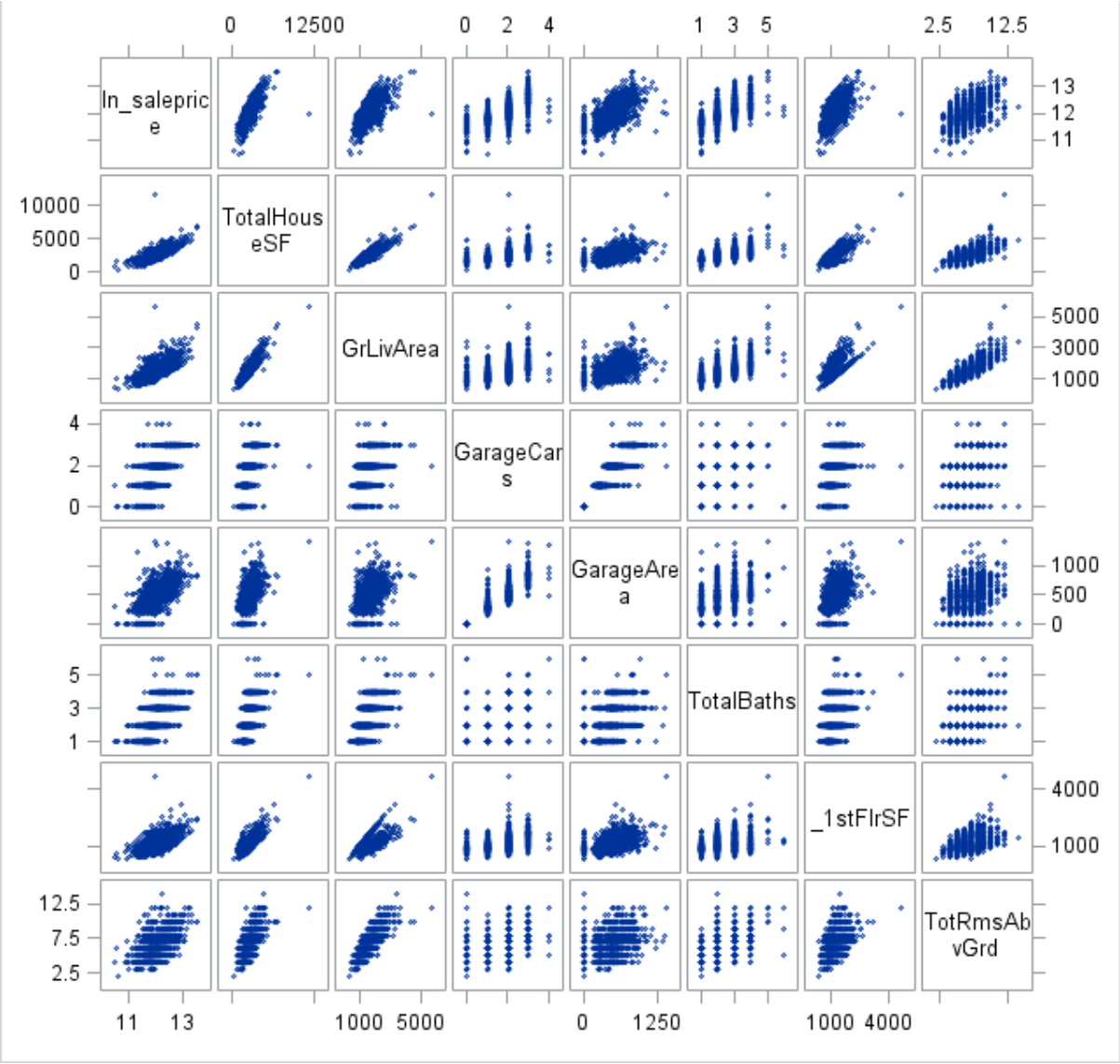
The values in range between 0.70 and 0.89 are highlighted.

	ln_saleprice	LotFrontage	LotArea	MasVnrArea	TotalHouseSF	_1stFlrSF	_2ndFlrSF	GrLivArea	TotalBath	BedroomAbvGr	KitchenAbvGr	TotRmsAbvGrd	Fireplaces	GarageCars	GarageArea	WoodDeckSF	OpenPorchSF	EnclosedPorch	_3SsnPorch	ScreenPorch	PoolArea	MiscVal
ln_saleprice	x	0.19039	0.26177	0.44284	**0.79**	0.60624	0.32008	**0.714**	0.65332	0.21062	-0.1565	0.53823	0.49174	0.68431	0.65627	0.32741	0.35312	-0.1393	0.04718	0.12081	0.06845	-0.0223
LotFrontage	0.19039	x	0.09394	0.10148	0.26532	0.24205	0.0425	0.21827	0.06296	0.14473	0.03466	0.21971	0.04563	0.16389	0.20489	-0.0135	0.06311	0.02563	0.0232	0.02395	0.16463	-0.06
LotArea	0.26177	0.09394	x	0.0987	0.29318	0.29272	0.04443	0.25411	0.17976	0.12079	-0.0176	0.1864	0.2718	0.15249	0.17833	0.16738	0.07578	-0.0161	0.02266	0.04385	0.08452	0.03837
MasVnrArea	0.44284	0.10148	0.0987	x	0.43581	0.33539	0.16973	0.38292	0.32631	0.10543	-0.038	0.27432	0.25044	0.35843	0.36625	0.16134	0.11798	-0.1077	0.01745	0.06229	0.03125	-0.0301
TotalHouseSF	**0.79**	0.26532	0.29318	0.43581	x	**0.793**	0.33872	**0.877**	0.56305	0.36602	0.02637	0.6782	0.47888	0.52839	0.55762	0.27784	0.33935	-0.0411	0.03066	0.1117	0.2252	-0.012
_1stFlrSF	0.60624	0.24205	0.29272	0.33539	**0.793**	x	-0.2168	0.55524	0.28343	0.12376	0.0631	0.40462	0.41026	0.43466	0.48571	0.2289	0.20382	-0.0594	0.05281	0.03036	0.15245	-0.0215
_2ndFlrSF	0.32008	0.0425	0.04443	0.16973	0.33872	-0.2168	x	0.68674	0.47393	0.50379	0.0587	0.61362	0.19448	0.17335	0.13402	0.08851	0.20615	0.06412	-0.0225	0.03396	0.10281	0.01587
GrLivArea	**0.714**	0.21827	0.25411	0.38292	**0.877**	0.55524	0.68674	x	0.61385	0.52932	0.10117	**0.827**	0.465	0.46416	0.46627	0.24148	0.32608	0.01434	0.01982	0.10297	0.20671	-0.0028
TotalBaths	0.65332	0.06296	0.17976	0.32631	0.56305	0.28343	0.47393	0.61385	x	0.26872	0.00693	0.47948	0.33946	0.46191	0.41928	0.27546	0.30389	-0.1457	0.02061	0.05464	0.12142	-0.024
BedroomAbvGr	0.21062	0.14473	0.12079	0.10543	0.36602	0.12376	0.50379	0.52932	0.26872	x	0.19391	0.67389	0.10967	0.08677	0.06712	0.04422	0.09768	0.04262	-0.022	0.04344	0.06548	0.00721
KitchenAbvGr	-0.1565	0.03466	-0.0176	-0.038	0.02637	0.0631	0.0587	0.10117	0.00693	0.19391	x	0.25732	-0.1253	-0.0538	-0.0675	-0.0316	-0.0715	0.03823	-0.0245	-0.0525	-0.0125	0.06206
TotRmsAbvGrd	0.53823	0.21971	0.1864	0.27432	0.6782	0.40462	0.61362	**0.827**	0.47948	0.67389	0.25732	x	0.32631	0.35852	0.33365	0.16187	0.23673	0.00726	-0.0042	0.05839	0.03554	0.02443
Fireplaces	0.49174	0.04563	0.2718	0.25044	0.47888	0.41026	0.19448	0.465	0.33946	0.10967	-0.1253	0.32631	x	0.23895	0.26687	0.19523	0.17638	-0.023	0.00891	0.18453	0.10316	0.00116
GarageCars	0.68431	0.16389	0.15249	0.35843	0.52839	0.43466	0.17335	0.46416	0.46191	0.08677	-0.0538	0.35852	0.23895	x	**0.873**	0.2217	0.22408	-0.1467	0.03432	0.04836	0.03407	-0.0448
GarageArea	0.65627	0.20489	0.17833	0.36625	0.55762	0.48571	0.13402	0.46627	0.41928	0.06712	-0.0675	0.33365	0.26687	**0.873**	x	0.22147	0.25336	-0.1174	0.03476	0.0504	0.08741	-0.0287
WoodDeckSF	0.32741	-0.0135	0.16738	0.16134	0.27784	0.2289	0.08851	0.24148	0.27546	0.04422	-0.0316	0.16187	0.19523	0.2217	0.22147	x	0.05227	-0.123	-0.0357	-0.0753	0.01351	-0.0099
OpenPorchSF	0.35312	0.06311	0.07578	0.11798	0.33935	0.20382	0.20615	0.32608	0.30389	0.09768	-0.0715	0.23673	0.17638	0.22408	0.25336	0.05227	x	-0.1015	-0.0059	0.07794	0.04163	-0.0188
EnclosedPorch	-0.1393	0.02563	-0.0161	-0.1077	-0.0411	-0.0594	0.06412	0.01434	-0.1457	0.04262	0.03823	0.00726	-0.023	-0.1467	-0.1174	-0.123	-0.1015	x	-0.0364	-0.0829	0.07932	0.01877

B-3 Best 5 Correlations with ln_saleprice (Fragment of the Pearson Correlation Table).

				Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations		
ln_saleprice	ln_saleprice 1.00000 1436	TotalHouseSF 0.79035 <.0001 1436	GrLivArea 0.71396 <.0001 1436	GarageCars 0.68431 <.0001 1436	GarageArea 0.65627 <.0001 1436	TotalBaths 0.65392 <.0001 1436
LotFrontage	LotFrontage 1.00000	TotalHouseSF 0.26938	_1stFlrSF 0.24205	GrLivArea 0.22758	TotRmsAbvGrd 0.21971	GarageArea 0.20984

B-4 Scatterplot Matrix of Top 7 Correlated Independent Variables.



B-5 STEPWISE Selection – 1st Model (112 Steps).

Root MSE	0.09767	R-Square	0.9433
Dependent Mean	12.02823	Adj R-Sq	0.9385
Coeff Var	0.81197		

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	10.69692	0.09119	131.25110	13760.1	<.0001
numMSZoning1	0.34033	0.05073	0.42923	45.00	<.0001
LotFrontage	0.00014584	0.00010043	0.02011	2.11	0.1468
LotArea	0.00000339	4.352624E-7	0.57981	60.79	<.0001
numStreet1	0.11003	0.05440	0.03902	4.09	0.0434
numLotShape1	-0.01935	0.00704	0.07207	7.56	0.0061

The REG Procedure
Model: MODEL1
Dependent Variable: tr_y

Number of Observations Read	1436
Number of Observations Used	1141
Number of Observations with Missing Values	295

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	88	166.86521	1.89620	198.79	<.0001
Error	1052	10.03454	0.00954		
Corrected Total	1140	176.89976			

Insignificant Parameters (p>0.05)

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
LotFrontage	1	0.00014584	0.00010043	1.45	0.1468
numBsmtFinType12	1	0.01464	0.00986	1.48	0.1379
numYearRemodAdd3	1	0.02379	0.01532	1.55	0.1208
numLandSlope1	1	-0.02696	0.01682	-1.6	0.1093
numRoofStyle1	1	-0.01306	0.0079	-1.65	0.0986
numMoSold3	1	-0.01543	0.00932	-1.65	0.0979
numExterior1st10	1	0.1289	0.07434	1.73	0.0832
numExterQual3	1	-0.01935	0.01115	-1.74	0.083
numGarageQual1	1	-0.10072	0.05681	-1.77	0.0765
_3SsnPorch	1	0.00017608	0.00009794	1.8	0.0725
numNeighborhood3	1	-0.03425	0.01879	-1.82	0.0686

B-6 STEPWISE Selection Model. SLE=SLS=0.05 (60 Steps)

The REG Procedure
Model: MODEL1
Dependent Variable: tr_y

Number of Observations Read	1436
Number of Observations Used	1141
Number of Observations with Missing Values	295

Root MSE	0.10428	R-Square	0.9334
Dependent Mean	12.02823	Adj R-Sq	0.9299
Coeff Var	0.86692		

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	56	165.11300	2.94845	271.16	<.0001
Error	1084	11.78676	0.01087		
Corrected Total	1140	176.89976			

B-6 (Continued)

Parameter Estimates							
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Variance Inflation
Intercept	1	10.71827	0.07044	152.16	<.0001	0	0
LotFrontage	1	0.00027213	0.00010457	2.60	0.0094	0.02363	1.34099
LotArea	1	0.00000228	3.740523E-7	6.09	<.0001	0.05697	1.42476
numStreet1	1	0.24126	0.05278	4.57	<.0001	0.04047	1.27534
numLotShape1	1	-0.02269	0.00738	-3.08	0.0022	-0.02781	1.33047
numNeighborhood1	1	-0.06321	0.01348	-4.69	<.0001	-0.04075	1.22868
numOverallQual1	1	0.18710	0.02700	6.93	<.0001	0.18312	11.36459
numOverallCond1	1	0.20812	0.02435	8.55	<.0001	0.14946	4.97622
numYearBuilt1	1	-0.05314	0.02182	-2.44	0.0150	-0.02262	1.40320
numYearRemodAdd1	1	0.04035	0.01394	2.90	0.0039	0.03178	1.96061

Parameters ranked by the Standardized Estimate.

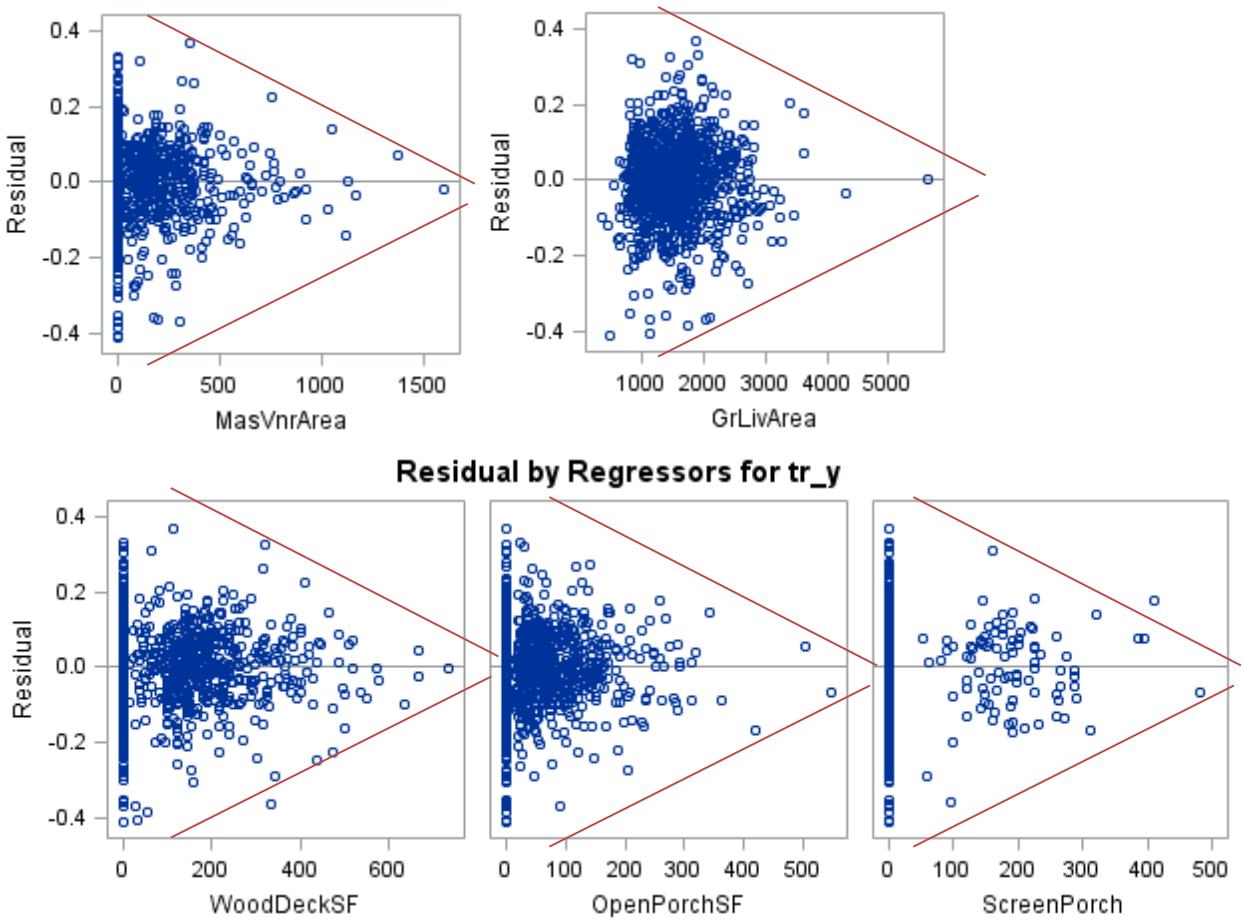
Parameter Estimates							
Variable	D	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	STB Ranking
numOverallQual2	1	0.27079	0.02993	9.05	<.0001	0.25458	1
TotalHouseSF	1	0.00011982	0.00001021	11.73	<.0001	0.25019	2
numPoolQC1	1	-2.76256	0.12369	-22.33	<.0001	-0.20761	3
numOverallQual1	1	0.1871	0.027	6.93	<.0001	0.18312	4
GrLivArea	1	0.00012855	0.00001531	8.4	<.0001	0.16939	5
numOverallCond2	1	0.25519	0.02802	9.11	<.0001	0.16355	6
numOverallCond1	1	0.20812	0.02435	8.55	<.0001	0.14946	7
numExterQual3	1	-0.1118	0.02196	-5.09	<.0001	-0.13772	8
numYearRemodAdd5	1	0.09093	0.01149	7.91	<.0001	0.10953	9
numExterQual2	1	-0.08071	0.0189	-4.27	<.0001	-0.09661	10

B-7 Akbar Aidarov's Final Model Equation.

ln_saleprice = 10.71827 + 0.00027213LotFrontage + 0.00000228LotArea + 0.24126numStreet1 - 0.02269numLotShape1 - 0.06321numNeighborhood1 + 0.1871numOverallQual1 + 0.20812numOverallCond1 - 0.05314numYearBuilt1 + 0.04035numYearRemodAdd1 + 0.00005507MasVnrArea - 0.2243108numExterQual1 + 0.06407numBsmtExposure1 - 0.04842numBsmtFinType21 + 0.00011982TotalHouseSF + 0.10102numCentAir1 + 0.00012855GrLivArea + 0.02698TotalBaths - 0.11625KitchenAbvGr - 0.05226numKitchenQual1 - 0.05502numFunctional1 + 0.03068Fireplaces + 0.084numGarageYrBlt1 + 0.03001GarageCars + 0.00014919GarageArea + 0.00008783WoodDeckSF + 0.00020114OpenPorchSF + 0.0031022ScreenPorch - 2.76256numPoolQC1 - 0.08211numSaleCondition1 + 0.069748numNeighborhood2 + 0.27079numOverallQual2 + 0.25519numOverallCond2 - 0.04131numYearBuilt2 - 0.08071numExterQual2 + 0.03005numFoundation2 + 0.02426numBsmtFinType12 - 0.24658numFunctional2 - 0.0218numGarageFinish2 + 0.07294numExterior1st3 + 0.03598numMasVnrType3 - 0.1118numExterQual3 - 0.33715numHeating3 - 0.04221numGarageYrBlt3 - 0.04968numGarageQual3 + 0.06853numSaleType3 - 0.10021numMSZoning4 + 0.06725numYearRemodAdd4 - 0.03354numHeatingQC4 + 0.27903numGarageQual4 + 0.05513numYearBuilt5 + 0.09093numYearRemodAdd5 - 0.10946numRoofMatl5 - 0.21626numFoundation5 - 0.03221numBsmtFinType16 + 0.178numExterior1st10 + 0.08776numExterior1st11 + e.

B-8 Residual Plots of the Final Model.

Funnel-shaped patterns due to extreme outliers and skewed distribution of values.



B-9 Test Performance Statistics.

Validation statistics for Model

The CORR Procedure

2 Variables:	ln_saleprice phat

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
ln_saleprice	287	12.03455	0.37237	3454	11.11245	13.52114	
phat	287	12.02376	0.35214	3451	11.03763	13.29815	Predicted Value of tr_y

Pearson Correlation Coefficients, N = 287
Prob > |r| under H0: Rho=0

	ln_saleprice	phat
ln_saleprice	1.00000	0.94816 <.0001
phat Predicted Value of tr_y	0.94816 <.0001	1.00000

Validation statistics for Model

Obs	_TYPE_	_FREQ_	RMSE	MAE
1	0	287	0.11834	0.091450

B-9 (Continued)

TRAIN

R^2 93.34%, Adj. R^2 92.99%, RMSE 0.10428, MSE 0.01087

TEST

R^2 89.90%, Adj. R^2 87.44%, RMSE 0.11834, MAE 0.09145

B-10 Two New Prediction Data Lines (tr_y= .)

Fireplaces	GarageArea	GarageCars	GrLivArea	KitchenAbvGr	LotArea	LotFrontage
1	1000	2	2800	1	8000	140
0	700	1	3000	1	9800	200

MasVnrArea	numBsmtExposure1	numBsmtFinType12	numBsmtFinType16	numBsmtFinType21	numCentAir1	numExterior1st10
800	1	1	0	0	1	1
1000	1	0	0	1	1	0

numExterior1st11	numExterior1st3	numExterQual1	numExterQual2	numExterQual3	numFoundation2	numFoundation5
0	0	1	0	0	1	0
1	0	0	1	0	0	1

numFunctional1	numFunctional2	numGarageFinish2	numGarageQual3	numGarageQual4	numGarageYrBlt1	numGarageYrBlt3
0	1	1	1	0	1	0
1	0	1	1	0	0	1

numHeating3	numHeatingQC4	numKitchenQual1	numLotShape1	numMasVnrType3	numMSZoning4	numNeighborhoo
1	1	1	1	1	1	1
1	0	0	0	1	0	0

numNeighborhood2	numOverallCond1	numOverallCond2	numOverallQual1	numOverallQual2	numPoolQC1	numRoofMatl5
0	1	0	1	0	0	1
1	0	1	0	1	0	0

numSaleCondition1	numSaleType3	numStreet1	numYearBuilt1	numYearBuilt2	numYearBuilt5	numYearRemodAd
1	0	1	1	0	0	1
0	1	1	0	1	0	0

numYearRemodAdd4	numYearRemodAdd5	OpenPorchSF	ScreenPorch	TotalBaths	TotalHouseSF	WoodDeckSF
0	0	300	0	2	3500	200
1	0	450	300	3	3900	0

Prediction Results

The REG Procedure
Model: MODEL1
Dependent Variable: tr_y

Output Statistics

Obs	Dependent Variable	Predicted Value	Std Error Mean Predict	95% CL Mean		95% CL Predict		Residual
1	.	11.6515	0.1601	11.3373	11.9657	11.2766	12.0264	.
2	.	12.3547	0.1205	12.1183	12.5912	12.0421	12.6674	.
3	12.2	12.2183	0.0125	12.1939	12.2428	12.0123	12.4244	0.0294
4	12.1	12.1038	0.0222	12.0603	12.1473	11.8946	12.3130	0.005197
5	12.3	12.3087	0.0132	12.2828	12.3346	12.1025	12.5149	0.008471
6	11.8	11.9555	0.0256	11.9052	12.0057	11.7448	12.1661	-0.1061

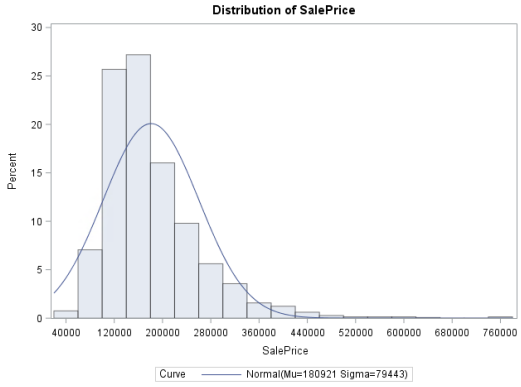
Appendix C

SAS Output for Amy Aumpansub's analysis

C-1 The Distribution of Sale Price

The UNIVARIATE Procedure
Variable: SalePrice

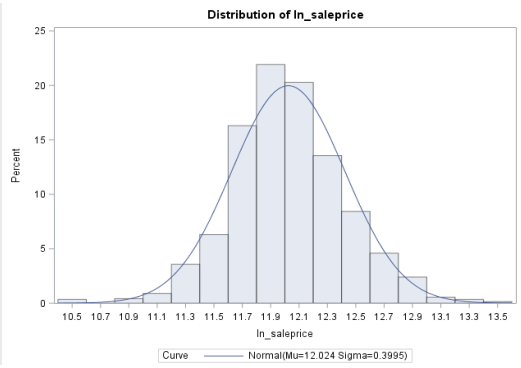
Moments			
N	1460	Sum Weights	1460
Mean	180921.196	Sum Observations	264144946
Std Deviation	79442.5029	Variance	6311111264
Skewness	1.88287576	Kurtosis	6.53628186
Uncorrected SS	5.69973E13	Corrected SS	9.20791E12
Coeff Variation	43.9100032	Std Error Mean	2079.10532



C-2 The Distribution of Log of Sale Price

The UNIVARIATE Procedure
Variable: ln_saleprice

Moments			
N	1460	Sum Weights	1460
Mean	12.0240509	Sum Observations	17555.1143
Std Deviation	0.39945187	Variance	0.1595618
Skewness	0.12133506	Kurtosis	0.809532
Uncorrected SS	211316.389	Corrected SS	232.800659
Coeff Variation	3.32210726	Std Error Mean	0.01045413



C-3 Pearson Correlation Coefficients Table

The CORR Procedure

29 Variables:	ln_saleprice LotFrontage LotArea MasVnrArea BsmtFinSF1 BsmtFinSF2 BsmtUnfSF TotalBsmtSF _1stFlrSF _2ndFlrSF LowQualFinSF GrLivArea BsmtFullBath BsmtHalfBath FullBath HalfBath BedroomAbvGr KitchenAbvGr TotRmsAbvGrd Fireplaces GarageCars GarageArea WoodDeckSF OpenPorchSF EnclosedPorch _3SsnPorch ScreenPorch PoolArea MiscVal

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	ln_saleprice	LotFrontage	LotArea	MasVnrArea	BsmtFinSF1	BsmtFinSF2	BsmtUnfSF	TotalBsmtSF	_1stFlrSF	_2ndFlrSF	LowQualFinSF	GrLivArea	BsmtFullBath	BsmtHalfBath	FullBath	HalfBath
ln_saleprice	1.00000	0.17930	0.25732	0.43081	0.37202	0.00483	0.22199	0.61213	0.59698	0.31930	-0.03796	0.70093	0.23622	-0.00515	0.59477	0.31398
		<.0001	<.0001	<.0001	<.0001	0.8536	<.0001	<.0001	<.0001	<.0001	0.147	<.0001	<.0001	0.8442	<.0001	<.0001
	1460	1460	1460	1452	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460

	ln_saleprice	BedroomAbvGr	KitchenAbvGr	TotRmsAbvGrd	Fireplaces	GarageCars	GarageArea	WoodDeckSF	OpenPorchSF	EnclosedPorch	_3SsnPorch	ScreenPorch	PoolArea	MiscVal
ln_saleprice	1.00000	0.20904	-0.14755	0.53442	0.48945	0.68062	0.65089	0.33414	0.32105	-0.14905	0.05490	0.12121	0.06980	-0.02002
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0359	<.0001	0.0076	0.4446
	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460

C-4 Regression output for Data Exploration and Data Cleaning

The REG Procedure
Model: MODEL1
Dependent Variable: ln_saleprice

Number of Observations Read	1460
Number of Observations Used	1452
Number of Observations with Missing Values	8

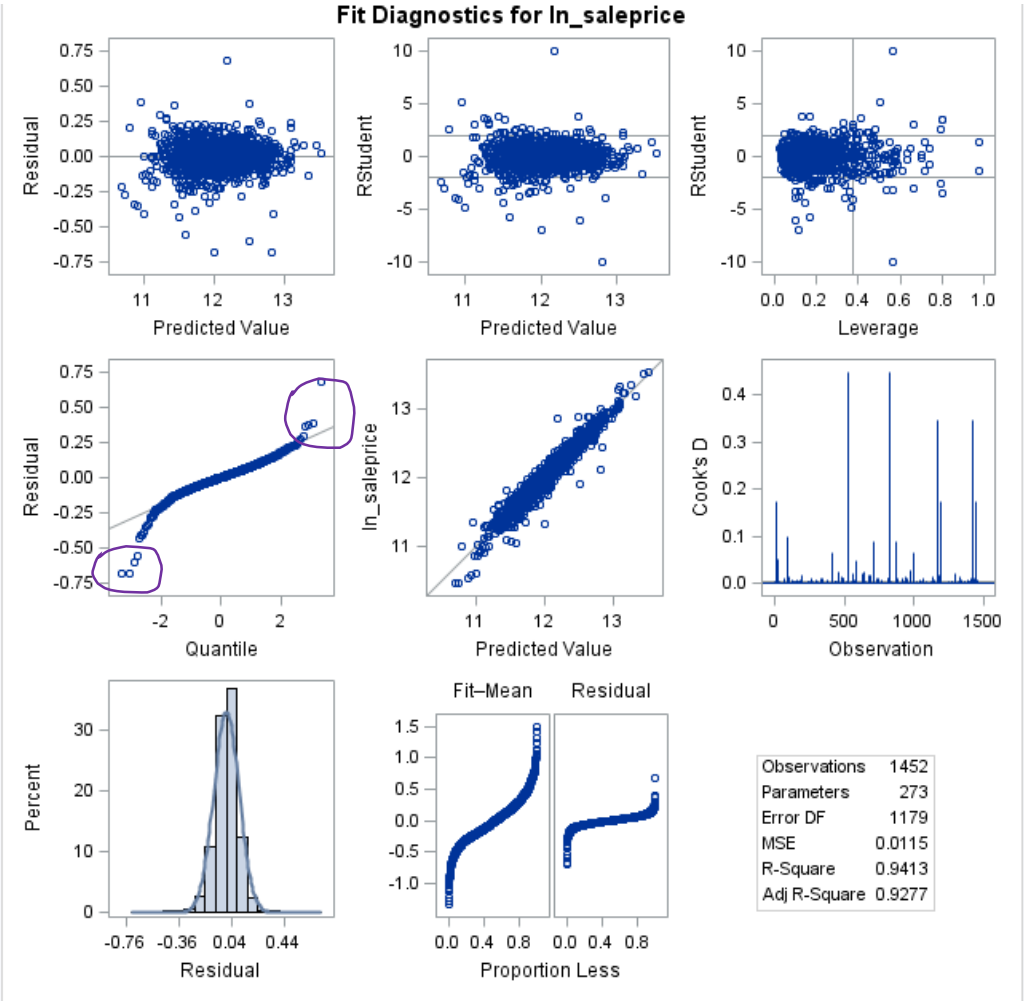
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	272	217.82739	0.8008	69.45	<.0001
Error	1179	13.59482	0.01153		
Corrected Total	1451	231.42221			

Root MSE	0.10738	R-Square	0.9413
Dependent Mean	12.02239	Adj R-Sq	0.9277
Coeff Var	0.89318		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	7.02580	0.53415	13.15	<.0001	0
numMSSubClass1	1	-0.10671	0.02492	-4.28	<.0001	3.54077
numMSSubClass2	1	-0.09909	0.08456	-1.17	0.2415	2.47371
numGarageCond2	1	0.31722	0.16849	1.88	0.0600	299.44808
numPoolQC4	1	0.77424	0.59862	1.29	0.1961	216.49418



C-5 Regression output after removing outliers and influential points

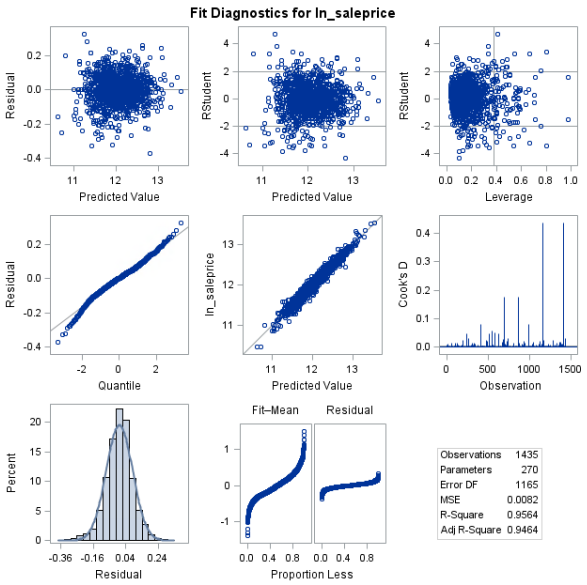
The REG Procedure
Model: MODEL1
Dependent Variable: ln_saleprice

Number of Observations Read	1443
Number of Observations Used	1435
Number of Observations with Missing Values	8

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	269	209.96304	0.78053	95.09	<.0001
Error	1165	9.56289	0.00821		
Corrected Total	1434	219.52593			

Root MSE	0.09060	R-Squar	0.9564
Dependent Mean	12.02836	Adj R-S	0.9464
Coeff Var	0.75323		



C-6 Splitting cleaned dataset into train/test sets

Selection Method	Simple Random Sampling

Input Data Set	HOUSE_LOG_AMY
Random Number Seed	731425
Sampling Rate	0.8
Sample Size	1155
Selection Probability	0.800416
Sampling Weight	0
Output Data Set	TRAIN_AMY

Obs	Selected	Id	MSSubClass	MSZoning	SalePrice	ln_saleprice	train_y
1	1	1	60	RL	208500	12.2477	12.2477
2	1	2	20	RL	181500	12.1090	12.1090
3	1	3	60	RL	223500	12.3172	12.3172
4	1	4	70	RL	140000	11.8494	11.8494
5	1	5	60	RL	250000	12.4292	12.4292

C-7 Regression output from step 174 of stepwise selection

The REG Procedure
Model: MODEL1
Dependent Variable: train_y

Number of Observations Read	1443
Number of Observations Used	1151
Number of Observations with Missing Values	292

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	118	170.52173	1.44510	173.24	<.0001
Error	1032	8.60837	0.00834		
Corrected Total	1150	179.13010			

Root MSE	0.09133	R-Square	0.9519
Dependent Mean	12.02318	Adj R-Sq	0.9464
Coeff Var	0.75963		

Summary of Stepwise Selection

Step	Variable Entered	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	GrLivArea		1	0.4956	0.4956	9459.90	1128.83	<.0001
2	GarageCars		2	0.1578	0.6534	6143.51	522.67	<.0001
3	TotalBsmtSF		3	0.0594	0.7128	4896.38	237.24	<.0001
4	KitchenQual3		4	0.0367	0.7495	4127.28	167.73	<.0001
5	NumCentAir		5	0.0288	0.7782	3524.42	148.51	<.0001
6	numOverallQual2		6	0.0160	0.7942	3190.36	88.84	<.0001
7	numMSZoning4		7	0.0131	0.8073	2916.94	77.69	<.0001
8	numMSSubClass1		8	0.0090	0.8163	2729.89	55.89	<.0001
9	numFireplaceQu5		9	0.0085	0.8248	2553.85	55.13	<.0001
10	BsmtFinType12		10	0.0076	0.8324	2395.00	52.03	<.0001

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	1	6.98877	0.33711	20.73	<.0001	0
numMSSubClass1	1	-0.10607	0.01767	-6.00	<.0001	-0.05685
numMSSubClass4	1	-0.04585	0.01261	-3.64	0.0003	-0.03512
numMSSubClass7	1	-0.06380	0.04230	-1.51	0.1319	-0.01773

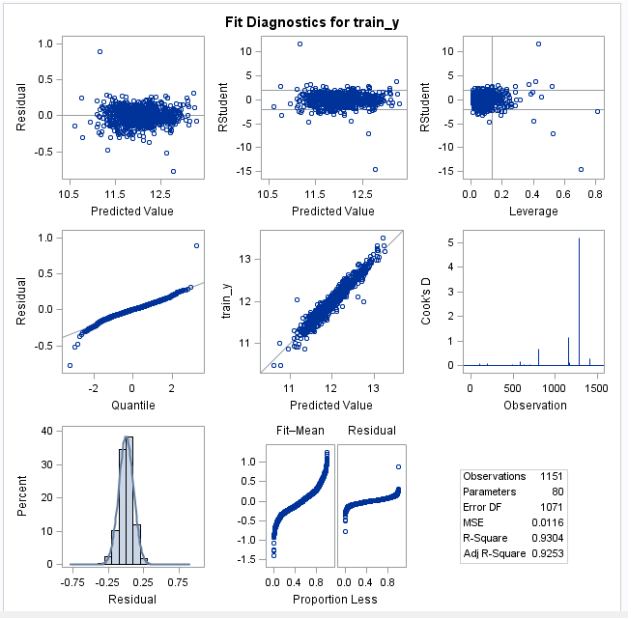
C-8 Amy's Final Model

The REG Procedure
Model: MODEL1
Dependent Variable: train_y

Number of Observations Read	1443
Number of Observations Used	1151
Number of Observations with Missing Values	292

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	79	166.66801	2.10972	181.31	<.0001
Error	1071	12.46209	0.01164		
Corrected Total	1150	179.13010			

Root MSE	0.10787	R-Square	0.9304
Dependent Mean	12.02318	Adj R-Sq	0.9253
Coeff Var	0.89718		



C-9 Amy's final model statement and strong predictors ranked by STB

Amy's Final Model

ln_saleprice = 6.198 -0.127numMSSubClass1 -0.039numMSSubClass4 +0.086numMSSubClass7 0.083numMSSubClass10 -0.052numMSSubClass11 -0.105numMSSubClass12 +0.422numMSZoning1 +0.463numMSZoning2 +0.436numMSZoning3 0.371numMSZoning4 +0.00000123LotArea +0.0449numLotShape1 +0.090numNeighborhood3 +0.054numNeighborhood4 +0.168numNeighborhood6 +0.036numNeighborhood9 -0.203numNeighborhood10 +0.087numNeighborhood13 +0.099numNeighborhood15 +0.095numNeighborhood20 +0.135numNeighborhood21 +0.079numOverallQual1 +0.161numOverallQual2 +0.165numOverallCond1 +0.231numOverallCond2 +0.055numYearBuilt4 +0.094numYearBuilt5 +0.135numYearBuilt6 +0.163numYearBuilt7 +0.021numYearRemodAdd2 +0.058numYearRemodAdd3 +0.045numYearRemodAdd4 +0.045numYearRemodAdd5 +0.093numExterior1st3 +0.056numExterior1st5 +0.019numExterior1st8 +0.017numExterior1st11 +0.031numExterior2nd13 +0.00003957MasVnrArea -0.044BsmtQual2 -0.038BsmtQual4 +0.068BsmtExposure1 -0.046BsmtFinType16 -0.100BsmtFinType24 +0.0008467TotalBsmtSF +0.102Heating1 +0.209Heating2 +0.214Heating5 +0.110NumCentAir +0.0002375GrLivArea +0.032BsmtFullBath +0.042FullBath +0.021HalfBath -0.004BedroomAbvGr -0.052KitchenAbvGr -0.143KitchenQual1 -0.073KitchenQual2 -0.100KitchenQual3 -0.054numFunctional1 -0.054numFunctional2 -0.082numFunctional3 -0.078numFunctional4 +0.032Fireplaces +0.035numGarageType1 +0.063numGarageYrBlt1 +0.036GarageCars +0.00007397GarageArea +0.109numGarageQual1 -0.039numGarageQual3 -0.077numGarageCond1 _0.000837WoodDeckSF +0.00013EnclosedPorch +0.00027ScreenPorch +0.007PoolArea -0.753numPoolQC1 +4.288numPoolQC4 +0.172numSaleType3 -0.071numSaleCondition1 -0.127numSaleCondition5 + e

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	1	6.19863	0.37161	16.68	<.0001	0
PoolArea	1	0.00749	0.00060718	12.34	<.0001	0.80838
numPoolQC4	1	4.28846	0.36025	11.90	<.0001	0.78281
GrLivArea	1	0.00023750	0.00001553	15.29	<.0001	0.30971
numMSZoning3	1	0.43678	0.04813	9.08	<.0001	0.45915
numMSZoning4	1	0.37121	0.04693	7.91	<.0001	0.34332
numOverallQual2	1	0.16108	0.03174	5.07	<.0001	0.14695
numOverallCond1	1	0.16515	0.02591	6.37	<.0001	0.11464
numOverallCond2	1	0.23196	0.03034	7.65	<.0001	0.14331

C-10 Performance stats of test set

Obs	_TYPE_	_FREQ_	rmse	mae
1	0	288	0.10549	0.080409

R^2 Train = 0.9304

R^2 Test = 0.9602^2 = 0.9219

|Model R^2 – R^2_{CV}| = 0.008

Good Case R^2_{CV} 0.008 ≤ 0.3

The CORR Procedure

2 Variables: ln_saleprice phat

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
ln_saleprice	288	12.05398	0.37925	3472	11.00210	13.53447	
phat	284	12.04531	0.36806	3421	11.02788	13.48986	Predicted Value of train_y

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	ln_saleprice	phat
ln_saleprice	1.00000 288	0.96020 <.0001 284
phat Predicted Value of train_y	0.96020 <.0001 284	1.00000 284

C-11 Comparison of train and test sets

Train Set

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	79	166.66801	2.10972	181.31	<.0001
Error	1071	12.46209	0.01164		
Corrected Total	1150	179.13010			

Root MSE	0.10787	R-Square	0.9304
Dependent Mean	12.02318	Adj R-Sq	0.9253
Coeff Var	0.89718		

Test Set

Obs	_TYPE_	_FREQ_	rmse	mae
1	0	288	0.10549	0.080409

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	ln_saleprice	phat
ln_saleprice	1.00000 288	0.96020 <.0001 284
phat Predicted Value of train_y	0.96020 <.0001 284	1.00000 284

Train Set: RMSE = 0.107 R^2 = 0.9304 Adj R^2 = 0.9253 GOF = Ok Residual = Ok

Test Set: RMSE = 0.105 R^2 = 0.9219 Adj R^2 = 0.8922 R^2_{CV} = 0.008

Train Set relatively performs better.

C-12 New predictions with 2 scenarios

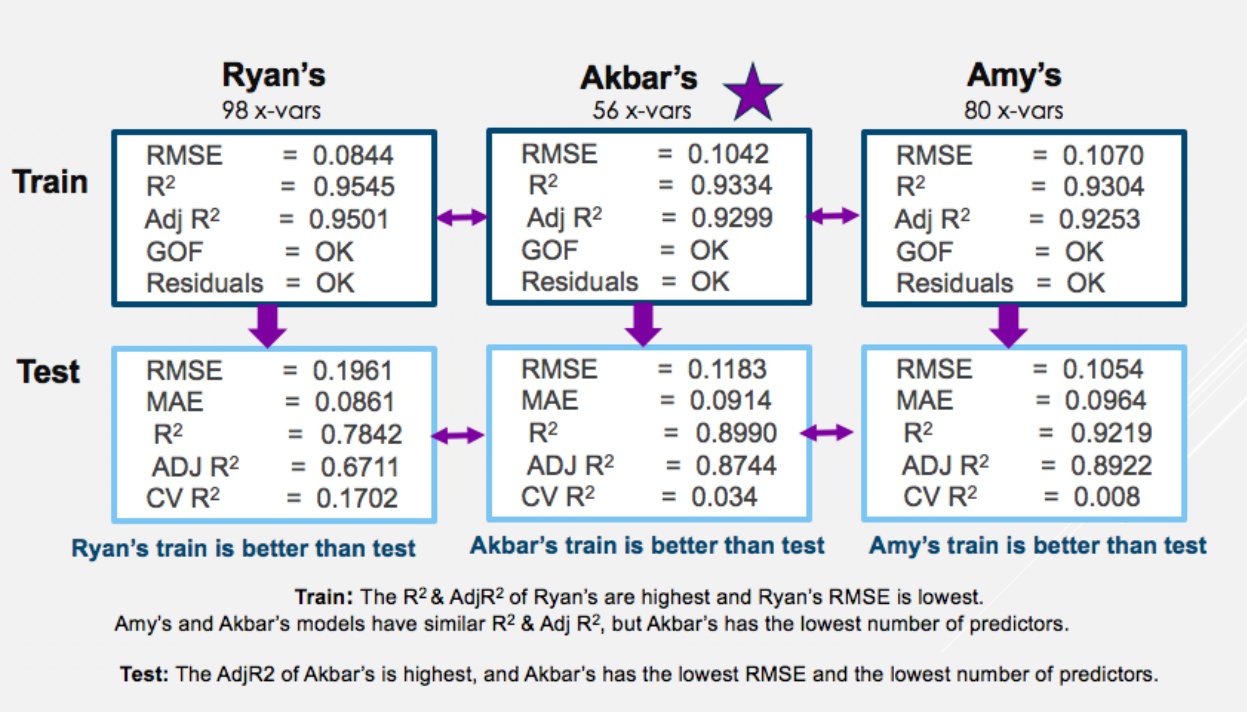
Obs	train_y	numMSZoning1	numMSZoning2	numMSZoning3	GrLivArea	KitchenQual3	PoolArea	numPoolQC4	numSaleType3	numOverallQual2
1	.	0	0	1	1000	1	300	1	0	0
2	.	0	0	1	1200	1	200	1	1	1
3	12.2477	0	0	1	1710	0	0	1	0	0

Output Statistics

Obs	Dependent Variable	Predicted Value	Std Error Mean Predict	95% CL Mean		95% CL Predict		Residual
1	.	13.3078	0.1911	12.9328	13.6828	12.8772	13.7384	.
2	.	13.1720	0.1516	12.8746	13.4694	12.8070	13.5371	.
3	12.2	12.1974	0.0203	12.1574	12.2373	11.9820	12.4128	0.0503

Appendix D

Model Comparison for Team's Final Model



Team's Final Model Statement

ln_saleprice = 10.71827 + 0.00027213LotFrontage + 0.00000228LotArea + 0.24126numStreet1 - 0.02269numLotShape1 - 0.06321numNeighborhood1 + 0.1871numOverallQual1 + 0.20812numOverallCond1 - 0.05314numYearBuilt1 + 0.04035numYearRemodAdd1 + 0.00005507MasVnrArea - 0.2243108numExterQual1 + 0.06407numBsmtExposure1 - 0.04842numBsmtFinType21 + 0.00011982TotalHouseSF + 0.10102numCentAir1 + 0.00012855GrLivArea + 0.02698TotalBaths - 0.11625KitchenAbvGr - 0.05226numKitchenQual1 - 0.05502numFunctional1 + 0.03068Fireplaces + 0.084numGarageYrBlt1 + 0.03001GarageCars + 0.00014919GarageArea + 0.00008783WoodDeckSF + 0.00020114OpenPorchSF + 0.0031022ScreenPorch - 2.76256numPoolQC1 - 0.08211numSaleCondition1 + 0.069748numNeighborhood2 + 0.27079numOverallQual2 + 0.25519numOverallCond2 - 0.04131numYearBuilt2 - 0.08071numExterQual2 + 0.03005numFoundation2 + 0.02426numBsmtFinType12 - 0.24658numFunctional2 - 0.0218numGarageFinish2 + 0.07294numExterior1st3 + 0.03598numMasVnrType3 - 0.1118numExterQual3 - 0.33715numHeating3 - 0.04221numGarageYrBlt3 - 0.04968numGarageQual3 + 0.06853numSaleType3 - 0.10021numMSZoning4 + 0.06725numYearRemodAdd4 - 0.03354numHeatingQC4 + 0.27903numGarageQual4 + 0.05513numYearBuilt5 + 0.09093numYearRemodAdd5 - 0.10946numRoofMatl5 - 0.21626numFoundation5 - 0.03221numBsmtFinType16 + 0.178numExterior1st10 + 0.08776numExterior1st11 + e.

Appendix E

Description of Dummy Variables

numMSSubClass1 = numMSSubClass2 = numMSSubClass3 = numMSSubClass4 =
numMSSubClass5 = numMSSubClass6 = numMSSubClass7 = numMSSubClass8 =
numMSSubClass9 = numMSSubClass10 = numMSSubClass11 = numMSSubClass12 =
numMSSubClass13 = numMSSubClass14 = 0 if numMSSubClass = 20

numMSSubClass1 = 1 if MSSubClass = 30; numMSSubClass1 = 0 otherwise;
numMSSubClass2 = 1 if MSSubClass = 40; numMSSubClass2 = 0 otherwise;
numMSSubClass3 = 1 if MSSubClass = 45; numMSSubClass3 = 0 otherwise;
numMSSubClass4 = 1 if MSSubClass = 50; numMSSubClass4 = 0 otherwise;
numMSSubClass5 = 1 if MSSubClass = 60; numMSSubClass5 = 0 otherwise;
numMSSubClass6 = 1 if MSSubClass = 70; numMSSubClass6 = 0 otherwise;
numMSSubClass7 = 1 if MSSubClass = 75; numMSSubClass7 = 0 otherwise;
numMSSubClass8 = 1 if MSSubClass= 80; numMSSubClass8 = 0 otherwise;
numMSSubClass9 = 1 if MSSubClass = 85; numMSSubClass9 = 0 otherwise;
numMSSubClass10 = 1 if MSSubClass = 90; numMSSubClass10 = 0 otherwise;
numMSSubClass11 = 1 if MSSubClass = 120; numMSSubClass11 = 0 otherwise;
numMSSubClass12 = 1 if MSSubClass= 160; numMSSubClass12 = 0 otherwise;
numMSSubClass13 = 1 if MSSubClass = 180; numMSSubClass13 = 0 otherwise;
numMSSubClass14 = 1 if MSSubClass= 190; numMSSubClass14 = 0 otherwise;

numMSZoning1 = numMSZoning2 = numMSZoning3 = numMSZoning4 = 0 if MSZoning = C (all)
numMSZoning1 = 1 if MSZoning = FV; numMSZoning1 = 0 otherwise;
numMSZoning2 = 1 if MSZoning = RH; numMSZoning2 = 0 otherwise;
numMSZoning3 = 1 if MSZoning = RL; numMSZoning3 = 0 otherwise;
numMSZoning4 = 1 if MSZoning = RM; numMSZoning4 = 0 otherwise;

numStreet1 = 0 if Street = Grvl, numStreet1 = 1 if Street = Pave

numAlley1 = numAlley2 = 0 if Alley = Grvl
numAlley1 = 1 if Alley = Pave; numAlley1 = 0 otherwise;
numAlley2 = 1 if Alley = NA; numAlley2 = 0 otherwise;

numLotShape1 = numLotShape2 = numLotShape3 = 0 if LotShape = IR1
numLotShape1 = 1 if LotShape = IR2; numLotShape1 = 0 otherwise;
numLotShape2 = 1 if LotShape = IR3; numLotShape2 = 0 otherwise;
numLotShape3 = 1 if LotShape = Reg; numLotShape3 = 0 otherwise;

numLandContour1 = numLandContour2 = numLandContour3 = 0 if LandContour = Bnk
numLandContour1 = 1 if LandContour = HLS; numLandContour1 = 0 otherwise;
numLandContour2 = 1 if LandContour = Low; numLandContour2 = 0 otherwise;
numLandContour3 = 1 if LandContour = Lvl; numLandContour3 = 0 otherwise;
numUtilities1 = 0 if Utilities = AllPub
numUtilities1 = 1 if Utilities= NoSeWa

numLotConfig1 = numLotConfig2 = numLotConfig3 = numLotConfig4 = 0 if LotConfig = Corner
numLotConfig1 = 1 if LotConfig = CulDSac; numLotConfig1 = 0 otherwise;
numLotConfig2 = 1 if LotConfig = FR2; numLotConfig2 = 0 otherwise;
numLotConfig3 = 1 if LotConfig = FR3; numLotConfig3 = 0 otherwise;
numLotConfig4 = 1 if LotConfig = Inside; numLotConfig4 = 0 otherwise;

numLandSlope1 = numLandSlope2 = 0 if LandSlope = Gtl
numLandSlope1 = 1 if LandSlope = Mod; numLandSlope1 = 0 otherwise;
numLandSlope2 = 1 if LandSlope = Sev; numLandSlope2 = 0 otherwise;

numNeighborhood1 = numNeighborhood2 = numNeighborhood3 = numNeighborhood4 =
numNeighborhood5 = numNeighborhood6 = numNeighborhood7 = numNeighborhood8 =
numNeighborhood9 = numNeighborhood10 = numNeighborhood11 = numNeighborhood12 =
numNeighborhood13 = numNeighborhood14 = numNeighborhood15 = numNeighborhood16 =
numNeighborhood17 = numNeighborhood18 = numNeighborhood19 = numNeighborhood20 =
numNeighborhood21 = numNeighborhood22 = numNeighborhood23 = numNeighborhood24 = 0
if Neighborhood = Blmngtn

numNeighborhood1 = 1 if Neighborhood = Blueste; numNeighborhood1 = 0 otherwise;
numNeighborhood2 = 1 if Neighborhood = BrDale; numNeighborhood2 = 0 otherwise;
numNeighborhood3 = 1 if Neighborhood = BrkSide; numNeighborhood3 = 0 otherwise;
numNeighborhood4 = 1 if Neighborhood = ClearCr; numNeighborhood4 = 0 otherwise;
numNeighborhood5 = 1 if Neighborhood = CollgCr; numNeighborhood5 = 0 otherwise;
numNeighborhood6 = 1 if Neighborhood = Crawfor; numNeighborhood6 = 0 otherwise;
numNeighborhood7 = 1 if Neighborhood = Edwards; numNeighborhood7 = 0 otherwise;
numNeighborhood8 = 1 if Neighborhood = Gilbert; numNeighborhood8 = 0 otherwise;
numNeighborhood9 = 1 if Neighborhood = IDOTRR; numNeighborhood9 = 0 otherwise;
numNeighborhood10 = 1 if Neighborhood = MeadowV; numNeighborhood10 = 0 otherwise;
numNeighborhood11 = 1 if Neighborhood = Mitchel; numNeighborhood11 = 0 otherwise;
numNeighborhood12 = 1 if Neighborhood = NAmes; numNeighborhood12 = 0 otherwise;
numNeighborhood13 = 1 if Neighborhood = NoRidge; numNeighborhood13 = 0 otherwise;
numNeighborhood14 = 1 if Neighborhood = NPkVill; numNeighborhood14 = 0 otherwise;
numNeighborhood15 = 1 if Neighborhood = NridgHt; numNeighborhood15 = 0 otherwise;
numNeighborhood16 = 1 if Neighborhood = NWAmes; numNeighborhood16 = 0 otherwise;
numNeighborhood17 = 1 if Neighborhood = OldTown; numNeighborhood17 = 0 otherwise;
numNeighborhood18 = 1 if Neighborhood = Sawyer; numNeighborhood18 = 0 otherwise;
numNeighborhood19 = 1 if Neighborhood = SawyerW; numNeighborhood19 = 0 otherwise;
numNeighborhood20 = 1 if Neighborhood = Somerst; numNeighborhood20 = 0 otherwise;
numNeighborhood21 = 1 if Neighborhood = StoneBr; numNeighborhood21 = 0 otherwise;
numNeighborhood22 = 1 if Neighborhood = SWISU; numNeighborhood22 = 0 otherwise;
numNeighborhood23 = 1 if Neighborhood = Timber; numNeighborhood23 = 0 otherwise;
numNeighborhood24 = 1 if Neighborhood = Veenker; numNeighborhood24 = 0 otherwise;

numCondition1_1 = numCondition1_2 = numCondition1_3 = numCondition1_4 = numCondition1_5 =
numCondition1_6 = numCondition1_7 = numCondition1_8 = 0 if Condition1= Artery
numCondition1_1 = 1 if Condition1 = Feedr; numCondition1_1 = 0 otherwise;
numCondition1_2 = 1 if Condition1 = Norm; numCondition1_2 = 0 otherwise;
numCondition1_3 = 1 if Condition1 = PosN; numCondition1_3 = 0 otherwise;

numCondition1_4 = 1 if Condition1 = PosA; numCondition1_4 = 0 otherwise;
numCondition1_5 = 1 if Condition1 = RRAe; numCondition1_5 = 0 otherwise;
numCondition1_6 = 1 if Condition1 = RRAn; numCondition1_6 = 0 otherwise;
numCondition1_7 = 1 if Condition1 = RRNe; numCondition1_7 = 0 otherwise;
numCondition1_8 = 1 if Condition1 = RRNn; numCondition1_8 = 0 otherwise;

numCondition2_1 = numCondition2_2 = numCondition2_3 = numCondition2_4 = numCondition2_5 = numCondition2_6 = numCondition2_7 = 0 if Condition2= Artery

numCondition2_1 = 1 if Condition2 = Feedr; numCondition2_1 = 0 otherwise;
numCondition2_2 = 1 if Condition2 = Norm; numCondition2_2 = 0 otherwise;
numCondition2_3 = 1 if Condition2 = PosN; numCondition2_3 = 0 otherwise;
numCondition2_4 = 1 if Condition2 = PosA; numCondition2_4 = 0 otherwise;
numCondition2_5 = 1 if Condition2 = RRAe; numCondition2_5 = 0 otherwise;
numCondition2_6 = 1 if Condition2 = RRAn; numCondition2_6 = 0 otherwise;
numCondition2_7 = 1 if Condition2 = RRNn; numCondition2_7 = 0 otherwise;

numBldgType1 = numBldgType2 = numBldgType3 = numBldgType4 = 0 if BldgType =1Fam
numBldgType1 = 1 if BldgType = 2fmCon; numBldgType1 = 0 otherwise;
numBldgType2 = 1 if BldgType = Duplex; numBldgType2 = 0 otherwise;
numBldgType3 = 1 if BldgType = Twnhs; numBldgType3 = 0 otherwise;
numBldgType4 = 1 if BldgType = TwnhsE; numBldgType4 = 0 otherwise;

numHouseStyle1 = numHouseStyle2 = numHouseStyle3 = numHouseStyle4 = numHouseStyle5 = numHouseStyle6 = numHouseStyle7 = 0 if HouseStyle =1.5Fin
numHouseStyle1 = 1 if HouseStyle = 1.5Unf; numHouseStyle1 = 0 otherwise;
numHouseStyle2 = 1 if HouseStyle = 1Story; numHouseStyle2 = 0 otherwise;
numHouseStyle3 = 1 if HouseStyle = 2.5Fin; numHouseStyle3 = 0 otherwise;
numHouseStyle4 = 1 if HouseStyle = 2.5Unf; numHouseStyle4 = 0 otherwise;
numHouseStyle5 = 1 if HouseStyle = 2Story; numHouseStyle5 = 0 otherwise;
numHouseStyle6 = 1 if HouseStyle = SFoyer; numHouseStyle6 = 0 otherwise;
numHouseStyle7 = 1 if HouseStyle = SLvl; numHouseStyle7 = 0 otherwise;

numOverallQual1 = numOverallQual2 = 0 if OverallQual = low
numOverallQual1 = 1 if OverallQual = medium; numOverallQual1 = 0 otherwise;
numOverallQual2 = 1 if OverallQual = high; numOverallQual2 = 0 otherwise;
(Note: low is 1-3, medium is 4-7, high is 8-10)

numOverallCond1 = numOverallCond2 = 0 if OverallCond = low
numOverallCond1 = 1 if OverallCond = medium; numOverallCond1 = 0 otherwise;
numOverallCond2 = 1 if OverallCond = high; numOverallCond2 = 0 otherwise;
(Note: low is 1-3, medium is 4-7, high is 8-10)

numYearBuilt1 = numYearBuilt2 = numYearBuilt3 = numYearBuilt4 = numYearBuilt5 = numYearBuilt6 = numYearBuilt7 = 0 if YearBuilt =1870-1890
numYearBuilt1 = 1 if YearBuilt = 1891-1910; numYearBuilt1 = 0 otherwise;

numYearBuilt2 = 1 if YearBuilt = 1911-1930; numYearBuilt2 = 0 otherwise;
numYearBuilt3 = 1 if YearBuilt = 1931-1950; numYearBuilt3 = 0 otherwise;
numYearBuilt4 = 1 if YearBuilt = 1951-1970; numYearBuilt4 = 0 otherwise;
numYearBuilt5 = 1 if YearBuilt = 1971-1990; numYearBuilt5 = 0 otherwise;
numYearBuilt6 = 1 if YearBuilt = 1991-2000; numYearBuilt6 = 0 otherwise;
numYearBuilt7 = 1 if YearBuilt = 2001-2010; numYearBuilt7 = 0 otherwise;

numYearRemodAdd 1 = numYearRemodAdd 2 = numYearRemodAdd 3 = numYearRemodAdd 4 =
numYearRemodAdd5 = 0 if YearRemodAdd =1950-1960
numYearRemodAdd1 = 1 if YearRemodAdd = 1961-1970; numYearRemodAdd1 = 0 otherwise;
numYearRemodAdd2 = 1 if YearRemodAdd = 1971-1980; numYearRemodAdd2 = 0 otherwise;
numYearRemodAdd3 = 1 if YearRemodAdd = 1981-1990; numYearRemodAdd3 = 0 otherwise;
numYearRemodAdd4 = 1 if YearRemodAdd = 1991-2000; numYearRemodAdd4 = 0 otherwise;
numYearRemodAdd5 = 1 if YearRemodAdd = 2001-2010; numYearRemodAdd5 = 0 otherwise;

numRoofStyle1 = numRoofStyle2 = numRoofStyle3 = numRoofStyle4 = numRoofStyle5 = 0 if RoofStyle =
Flat
numRoofStyle1 = 1 if RoofStyle = Gable; numRoofStyle1 = 0 otherwise;
numRoofStyle2 = 1 if RoofStyle = Gambrel; numRoofStyle2 = 0 otherwise;
numRoofStyle3 = 1 if RoofStyle = Hip; numRoofStyle3 = 0 otherwise;
numRoofStyle4 = 1 if RoofStyle = Mansard; numRoofStyle4 = 0 otherwise;
numRoofStyle5 = 1 if RoofStyle = Shed; numRoofStyle5 = 0 otherwise;
numRoofMatl1 = numRoofMatl2 = numRoofMatl3 = numRoofMatl4 = numRoofMatl5 = numRoofMatl6 =
numRoofMatl7 = 0 if RoofMatl =ClyTile
numRoofMatl1 = 1 if RoofMatl = CompShg; numRoofMatl1 = 0 otherwise;
numRoofMatl2 = 1 if RoofMatl = Membran; numRoofMatl2 = 0 otherwise;
numRoofMatl3 = 1 if RoofMatl = Metal; numRoofMatl3 = 0 otherwise;
numRoofMatl4 = 1 if RoofMatl = Roll; numRoofMatl4 = 0 otherwise;
numRoofMatl5 = 1 if RoofMatl = Tar&Grv; numRoofMatl5 = 0 otherwise;
numRoofMatl6 = 1 if RoofMatl = WdShake; numRoofMatl6 = 0 otherwise;
numRoofMatl7 = 1 if RoofMatl = WdShngl; numRoofMatl7 = 0 otherwise;

numExterior1st1 = numExterior1st2 = numExterior1st3 = numExterior1st4 =
numExterior1st5 = numExterior1st6 = numExterior1st7 = numExterior1st8 =
numExterior1st9 = numExterior1st10 = numExterior1st11 = numExterior1st12 =
numExterior1st13 = numExterior1st14 = 0 if Exterior1st = AsbShng

numExterior1st1 = 1 if Exterior1st = AsphShn; numExterior1st1 = 0 otherwise;
numExterior1st2 = 1 if Exterior1st = BrkComm; numExterior1st2 = 0 otherwise;
numExterior1st3 = 1 if Exterior1st = BrkFace; numExterior1st3 = 0 otherwise;
numExterior1st4 = 1 if Exterior1st = CBlock; numExterior1st4 = 0 otherwise;
numExterior1st5 = 1 if Exterior1st = CemntBd; numExterior1st5 = 0 otherwise;
numExterior1st6 = 1 if Exterior1st = HdBoard; numExterior1st6 = 0 otherwise;
numExterior1st7 = 1 if Exterior1st = ImStucc; numExterior1st7 = 0 otherwise;
numExterior1st8 = 1 if Exterior1st = MetalSd; numExterior1st8 = 0 otherwise;
numExterior1st9 = 1 if Exterior1st = Plywood; numExterior1st9 = 0 otherwise;
numExterior1st10 = 1 if Exterior1st = Stone; numExterior1st10 = 0 otherwise;
numExterior1st11 = 1 if Exterior1st = Stucco; numExterior1st11 = 0 otherwise;

numExterior1st12 = 1 if Exterior1st = VinylSd; numExterior1st12 = 0 otherwise;
numExterior1st13 = 1 if Exterior1st = Wd Sdng; numExterior1st13 = 0 otherwise;
numExterior1st14 = 1 if Exterior1st = WdShingl; numExterior1st14 = 0 otherwise;

numExterior2nd1 = numExterior2nd2 = numExterior2nd3 = numExterior2nd4 =
numExterior2nd5 = numExterior2nd6 = numExterior2nd7 = numExterior2nd8 =
numExterior2nd9 = numExterior2nd10 = numExterior2nd11 = numExterior2nd12 =
numExterior2nd13 = numExterior2nd14 = numExterior2nd15 = 0 if Exterior2nd = AsbShng

numExterior2nd1 = 1 if Exterior2nd = AsphShn; numExterior2nd1 = 0 otherwise;
numExterior2nd2 = 1 if Exterior2nd = Brk Cmn; numExterior2nd2 = 0 otherwise;
numExterior2nd3 = 1 if Exterior2nd = BrkFace; numExterior2nd3 = 0 otherwise;
numExterior2nd4 = 1 if Exterior2nd = CBlock; numExterior2nd4 = 0 otherwise;
numExterior2nd5 = 1 if Exterior2nd= CemntBd; numExterior2nd5 = 0 otherwise;
numExterior2nd6 = 1 if Exterior2nd = HdBoard; numExterior2nd6 = 0 otherwise;
numExterior2nd7 = 1 if Exterior2nd = ImStucc; numExterior2nd7 = 0 otherwise;
numExterior2nd8 = 1 if Exterior2nd = MetalSd; numExterior2nd8 = 0 otherwise;
numExterior2nd9 = 1 if Exterior2nd = Plywood; numExterior2nd9 = 0 otherwise;
numExterior2nd10 = 1 if Exterior2nd = Stone; numExterior2nd10 = 0 otherwise;
numExterior2nd11 = 1 if Exterior2nd = Other; numExterior2nd11 = 0 otherwise;
numExterior2nd12 = 1 if Exterior2nd = Stucco; numExterior2nd12 = 0 otherwise;
numExterior2nd13 = 1 if Exterior2nd = VinylSd; numExterior2nd13 = 0 otherwise;
numExterior2nd14 = 1 if Exterior2nd = Wd Sdng; numExterior2nd14 = 0 otherwise;
numExterior2nd15 = 1 if Exterior2nd = Wd Shng; numExterior2nd15 = 0 otherwise;

numMasVnrType1 = numMasVnrType2 = numMasVnrType3 = 0 if MasVnrType =BrkCmn
numMasVnrType1 = 1 if MasVnrType = BrkFace; numMasVnrType1 = 0 otherwise;
numMasVnrType2 = 1 if MasVnrType = None; numMasVnrType2 = 0 otherwise;
numMasVnrType3 = 1 if MasVnrType = Stone; numMasVnrType3 = 0 otherwise;

numExterQual1 = numExterQual2 = numExterQual3 = 0 if ExterQual = Ex
numExterQual1 = 1 if ExterQual = Fa; numExterQual1 = 0 otherwise;
numExterQual2 = 1 if ExterQual = Gd; numExterQual2 = 0 otherwise;
numExterQual3 = 1 if ExterQual = TA; numExterQual3 = 0 otherwise;

ExterCond1, ExterCond2, ExterCond3, ExterCond4 = 0 if ExterCond = Ex
ExterCond1 = 1 if ExterCond = Fa; ExterCond1 = 0 otherwise;
ExterCond2 = 1 if ExterCond = Gd; ExterCond2 = 0 otherwise;
ExterCond3 = 1 if ExterCond = Po; ExterCond3 = 0 otherwise;
ExterCond4 = 1 if ExterCond = TA; ExterCond4 = 0 otherwise;

Foundation1, Foundation2, Foundation3, Foundation4, Foundation5 = 0 if Foundation = BrkTil
Foundation1 = 1 if Foundation = CBlock; Foundation1 = 0 otherwise;
Foundation2 = 1 if Foundation = PConc; Foundation2 = 0 otherwise;
Foundation3 = 1 if Foundation = Slab; Foundation3 = 0 otherwise;
Foundation4 = 1 if Foundation = Stone; Foundation4 = 0 otherwise;
Foundation5 = 1 if Foundation = Wood; Foundation5 = 0 otherwise;

BsmtQual1, BsmtQual2, BsmtQual3, BsmtQual4 = 0 if BsmtQual = Ex
BsmtQual1 = 1 if BsmtQual = Fa; BsmtQual1 = 0 otherwise;
BsmtQual2 = 1 if BsmtQual = Gd; BsmtQual2 = 0 otherwise;
BsmtQual3 = 1 if BsmtQual = NA; BsmtQual3 = 0 otherwise;
BsmtQual4 = 1 if BsmtQual = TA; BsmtQual4 = 0 otherwise;

BsmtCond1, BsmtCond2, BsmtCond3, BsmtCond4 = 0 if BsmtCond = Fa
BsmtCond1 = 1 if BsmtCond = Gd; BsmtCond1 = 0 otherwise;
BsmtCond2 = 1 if BsmtCond = NA; BsmtCond2 = 0 otherwise;
BsmtCond3 = 1 if BsmtCond = Po; BsmtCond3 = 0 otherwise;
BsmtCond4 = 1 if BsmtCond = TA; BsmtCond4 = 0 otherwise;

BsmtExposure1, BsmtExposure2, BsmtExposure3, BsmtExposure4 = 0 if BsmtExposure = Av
BsmtExposure1 = 1 if BsmtExposure = Gd; BsmtExposure1 = 0 otherwise;
BsmtExposure2 = 1 if BsmtExposure = Mn; BsmtExposure2 = 0 otherwise;
BsmtExposure3 = 1 if BsmtExposure = NA; BsmtExposure3 = 0 otherwise;
BsmtExposure4 = 1 if BsmtExposure = No; BsmtExposure4 = 0 otherwise;

BsmtFinType11, BsmtFinType12, BsmtFinType13, BsmtFinType14, BsmtFinType15, BsmtFinType16 = 0 if BsmtFinType1 = ALQ
BsmtFinType11 = 1 if BsmtFinType1 = BLQ; BsmtFinType11 = 0 otherwise;
BsmtFinType12 = 1 if BsmtFinType1 = GLQ; BsmtFinType12 = 0 otherwise;
BsmtFinType13 = 1 if BsmtFinType1 = LwQ; BsmtFinType13 = 0 otherwise;
BsmtFinType14 = 1 if BsmtFinType1 = NA; BsmtFinType14 = 0 otherwise;
BsmtFinType15 = 1 if BsmtFinType1 = Rec; BsmtFinType15 = 0 otherwise;
BsmtFinType16 = 1 if BsmtFinType1 = Unf; BsmtFinType16 = 0 otherwise;

BsmtFinType21, BsmtFinType22, BsmtFinType23, BsmtFinType24, BsmtFinType25, BsmtFinType26 = 0 if BsmtFinType2 = ALQ
BsmtFinType21 = 1 if BsmtFinType2 = BLQ; BsmtFinType21 = 0 otherwise;
BsmtFinType22 = 1 if BsmtFinType2 = GLQ; BsmtFinType22 = 0 otherwise;
BsmtFinType23 = 1 if BsmtFinType2 = LwQ; BsmtFinType23 = 0 otherwise;
BsmtFinType24 = 1 if BsmtFinType2 = NA; BsmtFinType24 = 0 otherwise;
BsmtFinType25 = 1 if BsmtFinType2 = Rec; BsmtFinType25 = 0 otherwise;
BsmtFinType26 = 1 if BsmtFinType2 = Unf; BsmtFinType26 = 0 otherwise;

Heating1, Heating2, Heating3, Heating4, Heating5 = 0 if Heating = Floor
Heating1 = 1 if Heating = GasA; Heating1 = 0 otherwise;
Heating2 = 1 if Heating = GasW; Heating2 = 0 otherwise;
Heating3 = 1 if Heating = Grav; Heating3 = 0 otherwise;
Heating4 = 1 if Heating = OthW; Heating4 = 0 otherwise;
Heating5 = 1 if Heating = Wall; Heating5 = 0 otherwise;

HeatingQC1, HeatingQC2, HeatingQC3, HeatingQC4 = 0 if HeatingQC = Ex
HeatingQC1 = 1 if HeatingQC = Fa; HeatingQC1 = 0 otherwise;
HeatingQC2 = 1 if HeatingQC = Gd; HeatingQC2 = 0 otherwise;
HeatingQC3 = 1 if HeatingQC = Po; HeatingQC3 = 0 otherwise;

HeatingQC4 = 1 if HeatingQC = TA; HeatingQC4 = 0 otherwise;

Electrical1, Electrical2, Electrical3, Electrical4, Electrical5 = 0 if Electrical = FuseA
Electrical1 = 1 if Electrical = FuseF; Electrical1 = 0 otherwise;
Electrical2 = 1 if Electrical = FuseP; Electrical2 = 0 otherwise;
Electrical3 = 1 if Electrical = Mix; Electrical3 = 0 otherwise;
Electrical4 = 1 if Electrical = NA; Electrical4 = 0 otherwise;
Electrical5 = 1 if Electrical = SBrkr; Electrical5 = 0 otherwise;

KitchenQual1, KitchenQual2, KitchenQual3 = 0 if KitchenQual = Ex
KitchenQual1 = 1 if KitchenQual = Fa; KitchenQual1 = 0 otherwise;
KitchenQual2 = 1 if KitchenQual = Gd; KitchenQual2 = 0 otherwise;
KitchenQual3 = 1 if KitchenQual = TA; KitchenQual3 = 0 otherwise;

numFunctional1, numFunctional2, numFunctional3, numFunctional4, numFunctional5, numFunctional6, numFunctional7 = 0, if Functional = 'Typ';
numFunctional1 = 1, if Functional = 'Min1'; numFunctional1 = 0 otherwise;
numFunctional2 = 1, if Functional = 'Min2'; numFunctional2 = 0 otherwise;
numFunctional3 = 1, if Functional = 'Mod'; numFunctional3 = 0 otherwise;
numFunctional4 = 1, if Functional = 'Maj1'; numFunctional4 = 0 otherwise;
numFunctional5 = 1, if Functional = 'Maj2'; numFunctional5 = 0 otherwise;
numFunctional6 = 1, if Functional = 'Sev'; numFunctional6 = 0 otherwise;
numFunctional7 = 1, if Functional = 'Sal'; numFunctional7 = 0 otherwise.

numFireplaceQu1, numFireplaceQu2, numFireplaceQu3, numFireplaceQu4, numFireplaceQu5 = 0, if FireplaceQu = 'Ex';
numFireplaceQu1 = 1, if FireplaceQu = 'Gd'; numFireplaceQu1 = 0 otherwise;
numFireplaceQu2 = 1, if FireplaceQu = 'TA'; numFireplaceQu2 = 0 otherwise;
numFireplaceQu3 = 1, if FireplaceQu = 'Fa'; numFireplaceQu3 = 0 otherwise;
numFireplaceQu4 = 1, if FireplaceQu = 'Po'; numFireplaceQu4 = 0 otherwise;
numFireplaceQu5 = 1, if FireplaceQu = 'NA'; numFireplaceQu5 = 0 otherwise.

numGarageType1, numGarageType2, numGarageType3, numGarageType4, numGarageType5, numGarageType6 = 0, if GaragaType = '2Types';
numGarageType1 = 1, if GarageType = 'Attchd'; numGarageType1 = 0 otherwise;
numGarageType2 = 1, if GarageType = 'Basment'; numGarageType2 = 0 otherwise;
numGarageType3 = 1, if GarageType = 'BuiltIn'; numGarageType3 = 0 otherwise;
numGarageType4 = 1, if GarageType = 'CarPort'; numGarageType4 = 0 otherwise;
numGarageType5 = 1, if GarageType = 'Detchd'; numGarageType5 = 0 otherwise;
numGarageType6 = 1, if GarageType = 'NA'; numGarageType6 = 0 otherwise.

numGarageYrBlt1, numGarageYrBlt2, numGarageYrBlt3, numGarageYrBlt4, numGarageYrBlt5, numGarageYrBlt6 = 0, if GarageYrBlt = '1910-1920';
numGarageYrBlt1 = 1, if GarageYrBlt = '1921-1940'; numGarageYrBlt1 = 0 otherwise;
numGarageYrBlt2 = 1, if GarageYrBlt = '1941-1960'; numGarageYrBlt2 = 0 otherwise;
numGarageYrBlt3 = 1, if GarageYrBlt = '1961-1980'; numGarageYrBlt3 = 0 otherwise;
numGarageYrBlt4 = 1, if GarageYrBlte = '1981-2000'; numGarageYrBlt4 = 0 otherwise;
numGarageYrBlt5 = 1, if GarageYrBlt = '2000-2010'; numGarageYrBlt5 = 0 otherwise;

numGarageYrBlt6 = 1, if GarageYrBlt = ‘NA’; numGarageYrBlt6 = 0 otherwise.

numGarageFinish1, numGarageFinish2, numGarageFinish3 = 0, if GarageFinish = ‘Fin’;
numGarageFinish1 = 1, if GarageFinish = ‘RFn’; numGarageFinish1 = 0 otherwise;
numGarageFinish2 = 1, if GarageFinish = ‘Unf’; numGarageFinish2 = 0 otherwise;
numGarageFinish3 = 1, if GarageFinish = ‘NA’; numGarageFinish3 = 0 otherwise.

numGarageQual1, numGarageQual2, numGarageQual3, numGarageQual4, numGarageQual5 = 0, if GarageQual = ‘Ex’;
numGarageQual1 = 1, if GarageQual = ‘Gd’; numGarageQual1 = 0 otherwise;
numGarageQual2 = 1, if GarageQual = ‘TA’; numGarageQual2 = 0 otherwise;
numGarageQual3 = 1, if GarageQual = ‘Fa’; numGarageQual3 = 0 otherwise;
numGarageQual4 = 1, if GarageQual = ‘Po’; numGarageQual4 = 0 otherwise;
numGarageQual5 = 1, if GarageQual = ‘NA’; numGarageQual5 = 0 otherwise.

numGarageCond1, numGarageCond2, numGarageCond3, numGarageCond4, numGarageCond5 = 0, if GarageCond = ‘Ex’;
numGarageCond1 = 1, if GarageCond = ‘Gd’; numGarageCond1 = 0 otherwise;
numGarageCond2 = 1, if GarageCond = ‘TA’; numGarageCond2 = 0 otherwise;
numGarageCond3 = 1, if GarageCond = ‘Fa’; numGarageCond3 = 0 otherwise;
numGarageCond4 = 1, if GarageCond = ‘Po’; numGarageCond4 = 0 otherwise;
numGarageCond5 = 1, if GarageCond = ‘NA’; numGarageCond5 = 0 otherwise.

numPavedDrive1, numPavedDrive2 = 0, if PavedDrive = ‘Y’;
numPavedDrive1 = 1, if PavedDrive = ‘P’; numPavedDrive1 = 0 otherwise;
numPavedDrive2 = 1, if PavedDrive = ‘N’; numPavedDrive2 = 0 otherwise.

numPoolQC1, numPoolQC2, numPoolQC3, numPoolQC4 = 0, if PoolQC = ‘Ex’;
numPoolQC1 = 1, if PoolQC = ‘Gd’; numPoolQC1 = 0 otherwise;
numPoolQC2 = 1, if PoolQC = ‘TA’; numPoolQC2 = 0 otherwise;
numPoolQC3 = 1, if PoolQC = ‘Fa’; numPoolQC3 = 0 otherwise;
numPoolQC4 = 1, if PoolQC = ‘NA’; numPoolQC4 = 0 otherwise.

numFence1, numFence2, numFence3, numFence4 = 0, if Fence = ‘GdPrv’;
numFence1 = 1, if Fence = ‘MnPrv’; numFence1 = 0 otherwise;
numFence2 = 1, if Fence = ‘GdWo’; numFence2 = 0 otherwise;
numFence3 = 1, if Fence = ‘MnWw’; numFence3 = 0 otherwise;
numFence4 = 1, if Fence = ‘NA’; numFence4 = 0 otherwise.

numMiscFeature1, numMiscFeature2, numMiscFeature3, numMiscFeature4, numMiscFeature5 = 0, if MiscFeature = ‘Elev’;
numMiscFeature1 = 1, if MiscFeature = ‘Gar2’; numMiscFeature1 = 0 otherwise;
numMiscFeature2 = 1, if MiscFeature = ‘Othr’; numMiscFeature2 = 0 otherwise;
numMiscFeature3 = 1, if MiscFeature = ‘Shed’; numMiscFeature3 = 0 otherwise;
numMiscFeature4 = 1, if MiscFeature = ‘TenC’; numMiscFeature4 = 0 otherwise;
numMiscFeature5 = 1, if MiscFeature = ‘NA’; numMiscFeature5 = 0 otherwise.

numMoSold1, numMoSold2, numMoSold3 = 0, if MoSold = ‘autumn’;

numMoSold1 = 1, if MoSold = ‘spring’; numMoSold1 = 0 otherwise;
numMoSold2 = 1, if MoSold = ‘summer’; numMoSold2 = 0 otherwise;
numMoSold3 = 1, if MoSold = ‘winter’; numMoSold3 = 0 otherwise;

numYrSold1, numYrSold2, numYrSold3, numYrSold4 = 0, if YrSold = ‘2006’;
numYrSold1 = 1, if YrSold1 = ‘2007’; numYrSold11 = 0 otherwise;
numYrSold1 = 1, if YrSold1 = ‘2008’; numYrSold12 = 0 otherwise;
numYrSold3 = 1, if YrSold1 = ‘2009’; numYrSold13 = 0 otherwise;
numYrSold4 = 1, if YrSold1 = ‘2010’; numYrSold4 = 0 otherwise;

numSaleType1, numSaleType2, numSaleType3, numSaleType4, numSaleType5, numSaleType6, numSaleType7, numSaleType8, numSaleType9 = 0, if SaleType = ‘WD’;
numSaleType1 = 1, if SaleType = ‘CWD’; numSaleType1 = 0 otherwise;
numSaleType2 = 1, if SaleType = ‘VWD’; numSaleType2 = 0 otherwise;
numSaleType3 = 1, if SaleType = ‘New’; numSaleType3 = 0 otherwise;
numSaleType4 = 1, if SaleType = ‘COD’; numSaleType4 = 0 otherwise;
numSaleType5 = 1, if SaleType = ‘Con’; numSaleType5 = 0 otherwise;
numSaleType6 = 1, if SaleType = ‘ConLw’; numSaleType6 = 0 otherwise;
numSaleType7 = 1, if SaleType = ‘ConLI’; numSaleType7 = 0 otherwise;
numSaleType8 = 1, if SaleType = ‘ConLD’; numSaleType8 = 0 otherwise;
numSaleType9 = 1, if SaleType = ‘Oth’; numSaleType9 = 0 otherwise.

numSaleCondition1, numSaleCondition2, numSaleCondition3, numSaleCondition4, numSaleCondition5 = 0, if SaleCondition = ‘Normal’;
numSaleCondition1 = 1, if SaleCondition = ‘Abnorml’; numSaleCondition1 = 0 otherwise;
numSaleCondition2 = 1, if SaleCondition = ‘AdjLand’; numSaleCondition2 = 0 otherwise;
numSaleCondition3 = 1, if SaleCondition = ‘Alloca’; numSaleCondition3 = 0 otherwise;
numSaleCondition4 = 1, if SaleCondition = ‘Family’; numSaleCondition4 = 0 otherwise;
numSaleCondition5 = 1, if SaleCondition = ‘Partial’; numSaleCondition5 = 0 otherwise.