

Housing Prices, Ames - Iowa

Thomas Osodo, James Seung Won Lee & Laura Suchomska

Facts & Figures

Ames is a city in Story County, Iowa, United States approximately 30 miles north of Des Moines in central Iowa.

Population: 66,498 (2017)

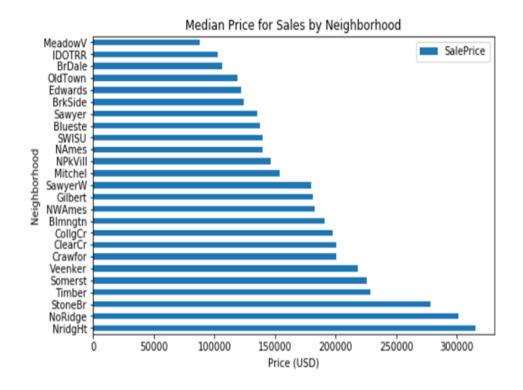
One of the **lowest unemployment** Rates in the US.

Ames has seen the **job market increase** by 2.3% over the last year.

Overall, United States, is 13.1% more expensive than Ames, Iowa

(Source: www.bestplaces.net/economy/city/iowa/ames)





Neighbourhood

It is possible to argue that neighbourhood is an important factor when it comes to housing prices.

Meadow V for example, presents the lowest prices in the sample, with an average of US\$98K

Conversely, homes have the highest Mean prices in the sample (US£335K).

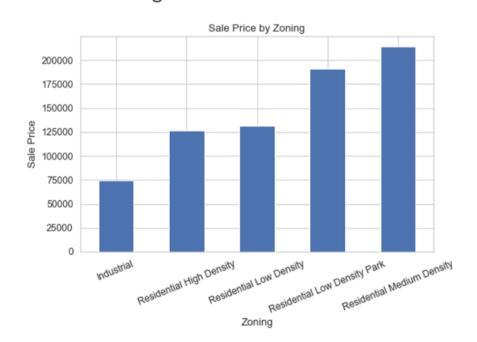
Median price: US\$ 163K

Price per Square Footage: US\$ 2567K

Is it possible to predict housing prices by neighbourhood?

Not Always!

Zone and Neighbourhood



* R-squared: 0.553 (Appendix I)

24 neighbourhoods

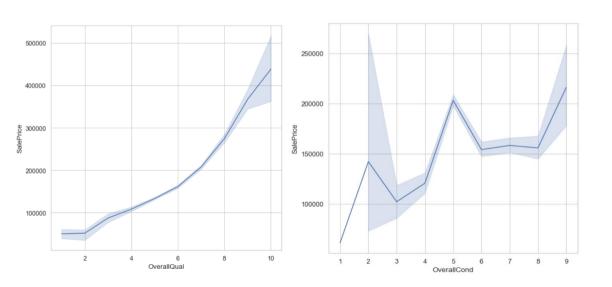
Only 13 were indicated as good predictors for Sale Prices

Zone is not a good predictor!

Are overall quality and condition of the property good predictors for Sale Prices?

* R-squared: 0.626 (Appendix II)

Graph Showing comparisons in Sale Prices according to the Properties' Overall Quality and Overall Condition



Overall Quality:



Overall Condition:

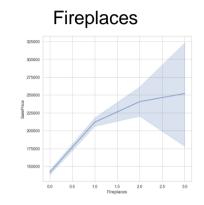


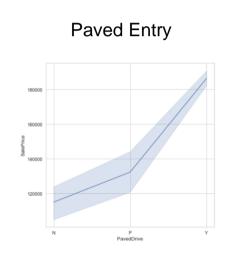
Caveat: Overall quality definition

Potential Renovations

Projects to consider:

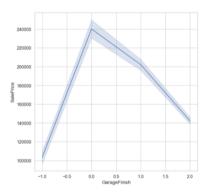
Projects to Avoid:



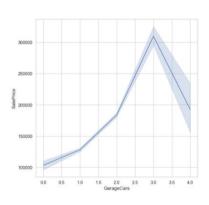


*R-Squared 0.656 (Appendix III)

Garage Finish



Parking Spaces



In Sum:

Our findings showed:

Neighbourhood does not necessarily mean good Sale Prices

Invest in Quality Materials

Consider Renovations Projects including: Fireplaces and Paved Entry

Future Research:

Investigate with more specificity the Overall Quality and Condition items for better it of the model.



APPENDICES

APPENDIX I

OLO regression resons Dep. Variable:

No. Observations:

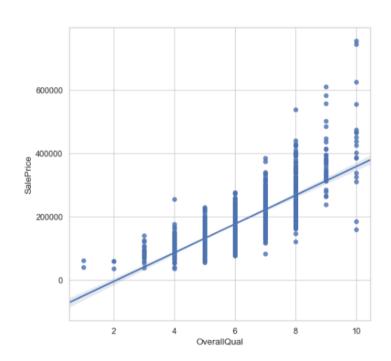
300000

200000

100000

			OLS Regression Res	ults		_			_		
			Dep. Variable:	SalePri		coef	std err	t	P> t	[0.025	0.975]
PPENDIX I		Model:	0	Intercept	1.535e+05	2.41e+04	6.365	0.000	1.08e+05	2.01e+05	
		Method:	Least Squar	M SZoning[T.FV]	-4831.0708	2.45e+04	-0.197	0.844	-5.28e+04	4.32e+04	
			Date:	Wed, 22 Jan 20	MSZoning[T.RH]	6279.2586	2.48e+04	0.253	0.800	-4.24e+04	5.49e+04
			Time:	12:11:	MSZoning[T.RL]	4.171e+04	2.04e+04	2.041	0.041	1620.216	8.18e+04
			No. Observations:	14	MSZoning[T.RM]	3.63e+04	1.92e+04	1.890	0.059	-1378.801	7.4e+04
LU TREGICUATION TREA			Df Residuals:	14	Neighborhood[T.Blueste]				0.199	-1.32e+05	2.75e+04
Dep. Variable:	SalePrice	R-squared:	0.553	nonrobi	Neighborhood[T.BrDale]	-8.529e+04	1.99e+04	-4.296	0.000	-1.24e+05	-4.63e+04
Model:	OLS	Adj. R-squared:	0.544		Neighborhood[T.Brk Side]	-8.758e+04	1.52e+04	-4.458	0.000	-9.73e+04	-3.78e+04
					Neighborhood[T.ClearCr]	1.738e+04	1.65e+04	1.053	0.293	-1.5e+04	4.97e+04
Method:	Least Squares	F-statistic:	63.12		Neighborhood[T.CollgCr]	3137.3231	1.37e+04	0.228	0.819	-2.38e+04	3.01e+04
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	1.32e-226		Neighborhood[T.Crawfor]	1.714e+04	1.5e+04	1.140	0.254	-1.24e+04	4.68e+04
Time:	12:11:23	Log-Likelihood:	-17957.		Neighborhood[T.Edwards]	-6.583e+04	1.41e+04	-4.675	0.000	-9.34e+04	-3.82e+04
No. Observations:	1460	AIC:	3.597e+04	+	Neighborhood[T.Gilbert]	-2334.6170	1.44e+04	-0.163	0.871	-3.05e+04	2.58e+04
					Neighborhood[T.IDOTRR]	-8.082e+04	1.77e+04	-4.565	0.000	-1.18e+05	-4.61e+04
Df Residuals:	1431	BIC:	3.613e+04		Neighborhood[T.MeadowV]	-9.12e+04	1.98e+04	-4.657	0.000	-1.3e+05	-5.28e+04
Df Model:	28				Neighborhood[T.Mitchel]	-3.837e+04	1.51e+04	-2.540	0.011	-6.8e+04	-8733.784
Covariance Type:	nonrobust				Neighborhood[T.NAmes]	-4.903e+04	1.35e+04	-3.631	0.000	-7.55e+04	-2.25e+04
					Neighborhood[T.NPkVill]	-5.249e+04	2.21e+04	-2.373	0.018	-9.59e+04	-9097.922
			- = :		Neighborhood[T.NWAmes]	-6139.0548	1.45e+04	-0.425	0.671	-3.45e+04	2.22e+04
					Neighborhood[T.NoRidge]	1.401e+05	1.55e+04	9.049	0.000	1.1e+05	1.7e+05
					Neighborhood[T.NridgHt]	1.212e+05	1.44e+04	8.424	0.000	9.29e+04	1.49e+05
					Neighborhood[T.OldTown]	-6.205e+04	1.51e+04	-4.122	0.000	-9.16e+04	-3.25e+04
			1111	1 -	Neighborhood[T.SWISU]	-4.551e+04	1.71e+04	-2.660	0.008	-7.91e+04	-1.2e+04
					Neighborhood[T.Sawyer]	-5.825e+04	1.44e+04	-4.036	0.000	-8.66e+04	-2.99e+04
				1 + 1	Neighborhood[T.SawyerW]	-5630.3413	1.48e+04	-0.380	0.704	-3.47e+04	2.34e+04
		†			Neighborhood[T.Somerst]	6.537e+04	1.75e+04	3.733	0.000	3.1e+04	9.97e+04
Colligitaren Deer/Mo/Ridgitic 15		MrSewy@QTRR:564WsTbsb6 Neighborhood	ilb 6t bn@eart2Pk@ifnng	garDasaWishbes	Neighborhood[T. StoneBr]	1.153e+05	1.69e+04	6.834	0.000	8.22e+04	1.48e+05
					Neighborhood[T.Timber]	4.708e+04	1.57e+04	3.005	0.003	1.63e+04	7.78e+04
					Neighborhood[T.Veenker]	4.358e+04	2.08e+04	2.099	0.036	2846.981	8.43e+04

APPENDIX II



OLS Regression Results

Dep. Varia	ble:		SalePrice	F	R-square	d:	0.626	
Мо	del:		OLS	Adj. F	R-square	d:	0.625	
Meth	od:	Lea	ast Squares	ı	F-statist	ic:	1218.	
D	ate:	Wed, 2	22 Jan 2020	Prob (F	-statisti	c): 1.2	28e-311	
Ti	me:		12:11:25	Log-L	ikelihoo	d:	-17827.	
No. Observation	ons:		1460		Al	C: 3.5	66e+04	
Df Residu	als:		1457		ВІ	C: 3.5	68e+04	
Df Mo	del:		2					
Covariance Ty	/pe:		nonrobust					
		coef	std err	t	P> t	[0.0	025	0.975]
Intercept	-9.398	3e+04	9006.458	-10.434	0.000	-1.12e	+05 -7.	63e+04
OverallQual	4.54	1e+04	924.629	49.110	0.000	4.36e	+04 4.	72e+04
OverallCond	-370	.0065	1149.137	-0.322	0.748	-2624.	146 18	884.132
Omnibus	s: 59	1.452	Durbin-V	Watson:	1.98	39		
Prob(Omnibus):	0.000	Jarque-Be	ra (JB):	5871.15	54		
Skev	v:	1.606	Pr	ob(JB):	0.0	00		
Kurtosi	s: 1	2.284	Co	nd. No.	59	.9		

APPENDIX III

OLS Regression Results

Dep. Variab	le:	SalePrice	F	R-square	ed: 0	.640
Mod	lel:	OLS	Adj. F	R-square	ed: 0	.639
Metho	od: Le	ast Squares	l	F-statist	tic: 8	61.2
Da	te: Wed, 2	22 Jan 2020	Prob (F	-statisti	c): 5.58e	-322
Tin	ne:	12:11:26	Log-L	ikelihoo	od: -17	799.
No. Observation	ns:	1460		Α	IC: 3.561e	e+04
Df Residua	ls:	1456		В	IC: 3.563e	e+04
Df Mod	lel:	3				
Covariance Typ	pe:	nonrobust				
	coef	std err	t	P> t	[0.025	0.975
Intercept	1.365e+05	6533.040	20.889	0.000	1.24e+05	1.49e+05
KitchenQual -	3.481e+04	1632.175	-21.328	0.000	-3.8e+04	-3.16e+04
Fireplaces	1.894e+04	2190.111	8.646	0.000	1.46e+04	2.32e+04
GrLivArea	75.4168	2.830	26.646	0.000	69.865	80.969
Omnibus	286.742	Durbin-V	Watson:	2.0	22	
Prob(Omnibus)	0.000	Jarque-Be	ra (JB):	7006.1	07	
Skew	-0.205	Pr	ob(JB):	0.	00	
Kurtosis	13.724	Co	nd. No.	8.56e+	03	

OLS Regression Results

Dep. Variable:	SalePric	e F	R-squared	i:	0.089	
Model:	OL	S Adj. F	R-squared	i:	0.081	
Method:	Least Square	s I	F-statistic	:	11.73	
Date: \	Ned, 22 Jan 202	0 Prob (F	-statistic): 6.	83e-23	
Time:	12:11:2	7 Log-L	ikelihood.	i: -	18476.	
No. Observations:	146	0	AIC	3.69	98e+04	
Df Residuals:	144	7	BIC	3.70	05e+04	
Df Model:	1	2				
Covariance Type:	nonrobu	st				
	coef	std err	t	P> t	[0.025	0.975]
Intercep	t 1.57e+05	9.41e+04	1.668	0.095	-2.76e+04	3.42e+05
RoofStyle[T.Gable	-4.442e+04	5.51e+04	-0.806	0.421	-1.53e+05	6.37e+04
RoofStyle[T.Gambre	-6.612e+04	5.97e+04	-1.107	0.268	-1.83e+05	5.1e+04
RoofStyle[T.Hip	2984.2166	5.53e+04	0.054	0.957	-1.06e+05	1.11e+05
RoofStyle[T.Mansard	-4.79e+04	6.32e+04	-0.758	0.448	-1.72e+05	7.6e+04
RoofStyle[T. Shed] -1.355e+04	7.94e+04	-0.171	0.865	-1.69e+05	1.42e+05
RoofMatl[T.CompShg	5.801e+04	7.63e+04	0.760	0.447	-9.16e+04	2.08e+05
RoofMatl[T.Membran	8.448e+04	1.21e+05	0.698	0.485	-1.53e+05	3.22e+05
RoofMatl[T.Metal] 2.298e+04	1.21e+05	0.190	0.849	-2.15e+05	2.6e+05
RoofMatl[T.Roll	2.44e+04	1.08e+05	0.226	0.821	-1.87e+05	2.36e+05
RoofMatl[T.Tar&Grv	3.243e+04	9.41e+04	0.345	0.730	-1.52e+05	2.17e+05
RoofMatl[T.WdShake	1.051e+05	8.53e+04	1.231	0.218	-6.23e+04	2.72e+05
RoofMatl[T.WdShngl] 2.698e+05	8.24e+04	3.275	0.001	1.08e+05	4.31e+05



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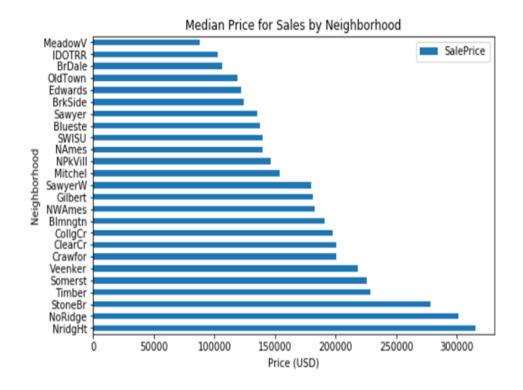
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Conversely, homes have the highest Mean prices in the sample (US£335K).

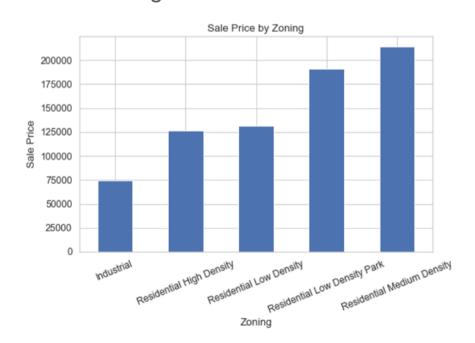
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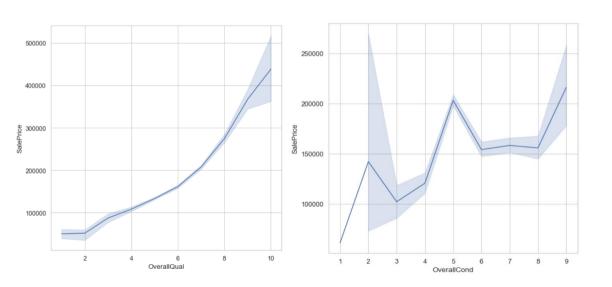
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Graph Showing comparisons in Sale Prices according to the Properties' Overall Quality and Overall Condition



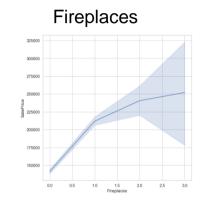
Overall Quality: \(\forall\)

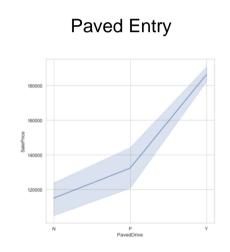


Potential Renovations

Projects to consider:

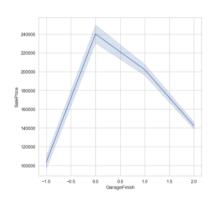
Projects to Avoid:



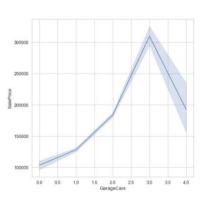


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Parking Spaces



In Sum:

Our findings showed:

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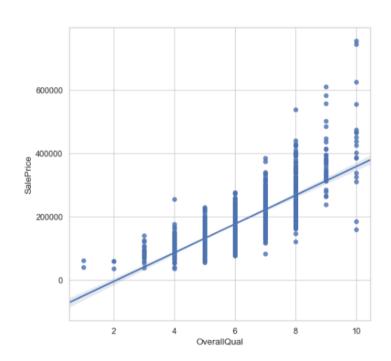
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				1 + 1	Neighborhood[T.SawyerW]	-5630.3413	1.48e+04	-0.380	0.704	-3.47e+04	2.34e+04
					Neighborhood[T.Somerst]	6.537e+04	1.75e+04	3.733	0.000	3.1e+04	9.97e+04
Coll@@en@eevMoRidglac6		MrSewy@QTRRd5dWallbab@ Neighborhood	ilb 6t bn@ear t2 Pk@ithng	BrDoSWISBlues	Neighborhood[T. StoneBr]	1.153e+05	1.69e+04	6.834	0.000	8.22e+04	1.48e+05
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APPENDIX II



OLS Regression Results

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Meth	nod:	Lea	ast Squares	ı	F-statist	ic:	12	18.	
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Df Residu	ıals:		1457		В	IC:	3.568e+	-04	
Df Mo	del:		2						
Covariance Ty	ype:		nonrobust						
		coef	std err	t	P> t		[0.025		0.975]
Intercept	-9.39	8e+04	9006.458	-10.434	0.000	-1.1	2e+05	-7.6	3e+04
OverallQual	4.54	1e+04	924.629	49.110	0.000	4.3	6e+04	4.7	72e+04
OverallCond	-37	0.0065	1149.137	-0.322	0.748	-262	24.146	18	84.132
Omnibu	s: 5	91.452	Durbin-V	Watson:	1.98	89			
Prob(Omnibus	s):	0.000	Jarque-Be	ra (JB):	5871.15	54			
Skev	w:	1.606	Pr	ob(JB):	0.0	00			
Kurtosi	s:	12.284	Co	nd. No.	59	.9			

APPENDIX III

OLS Regression Results

Dep. Vari	able:		SalePrice	F	R-square	ed: 0	.640
M	odel:		OLS	Adj. F	R-square	ed: 0	.639
Met	hod:	Lea	ast Squares		F-statist	ic: 8	61.2
I	Date:	Wed, 2	2 Jan 2020	Prob (F	-statisti	c): 5.58e	-322
1	ime:		12:11:26	Log-L	ikelihoo	od: -17	799.
No. Observat	ions:		1460		Α	IC: 3.561e	e+04
Df Resid	uals:		1456		В	IC: 3.563e	e+04
Df M	odel:		3				
Covariance 1	уре:		nonrobust				
		coef	std err	t	P> t	[0.025	0.975]
Intercept	1.36	5e+05	6533.040	20.889	0.000	1.24e+05	1.49e+05
KitchenQual	-3.48	1e+04	1632.175	-21.328	0.000	-3.8e+04	-3.16e+04
Fireplaces	1.89	4e+04	2190.111	8.646	0.000	1.46e+04	2.32e+04
GrLivArea	75	5.4168	2.830	26.646	0.000	69.865	80.969
Omnibu	ıs: 2	86.742	Durbin-	Watson:	2.0	22	
Prob(Omnibu	s):	0.000	Jarque-Be	era (JB):	7006.1	07	
Ske	w:	-0.205	Pi	rob(JB):	0.	00	
Kurtos	is:	13.724	Co	ond. No.	8.56e+	03	

OLS Regression Results

ozo regression results						
Dep. Variable:	SalePric	e F	R-squared	i:	0.089	
Model:	OL	S Adj. F	R-squared	d:	0.081	
Method:	Least Square	s I	F-statistic	c:	11.73	
Date: W	ed, 22 Jan 202	0 Prob (F	-statistic): 6.	83e-23	
Time:	12:11:2	7 Log-L	ikelihoo.	d: -	18476.	
No. Observations:	146	0	AIC	3.69	98e+04	
Df Residuals:	144	7	BIC	3.70	05e+04	
Df Model:	1	2				
Covariance Type:	nonrobu	st				
	coef	std err	t	P> t	[0.025	0.975]
Intercept	1.57e+05	9.41e+04	1.668	0.095	-2.76e+04	3.42e+05
RoofStyle[T.Gable]	-4.442e+04	5.51e+04	-0.806	0.421	-1.53e+05	6.37e+04
RoofStyle[T.Gambrel]	-6.612e+04	5.97e+04	-1.107	0.268	-1.83e+05	5.1e+04
RoofStyle[T.Hip]	2984.2166	5.53e+04	0.054	0.957	-1.06e+05	1.11e+05
RoofStyle[T.Mansard]	-4.79e+04	6.32e+04	-0.758	0.448	-1.72e+05	7.6e+04
RoofStyle[T.Shed]	-1.355e+04	7.94e+04	-0.171	0.865	-1.69e+05	1.42e+05
RoofMatl[T.CompShg]	5.801e+04	7.63e+04	0.760	0.447	-9.16e+04	2.08e+05
RoofMatl[T.Membran]	8.448e+04	1.21e+05	0.698	0.485	-1.53e+05	3.22e+05
RoofMatl[T.Metal]	2.298e+04	1.21e+05	0.190	0.849	-2.15e+05	2.6e+05
RoofMatl[T.Roll]	2.44e+04	1.08e+05	0.226	0.821	-1.87e+05	
RoofMatl[T.Tar&Grv]	3.243e+04	9.41e+04	0.345	0.730	-1.52e+05	
RoofMatl[T.WdShake]	1.051e+05	8.53e+04	1.231	0.218	-6.23e+04	2.72e+05
RoofMatl[T.WdShngl]	2.698e+05	8.24e+04	3.275	0.001	1.08e+05	4.31e+05

Dep. Variable: Model:

Method:

Date:

Time:

OLS Regression Results

No. Observations:

Df Residuals:

Df Model: Covariance Type:

Intercept

RoofStyle[T.Hip]

RoofStyle[T.Mansard]

RoofMatl[T.CompShq]

RoofMatl[T.Roll]

Omnibus: 443.786

Skew:

Kurtosis:

Prob(Omnibus):

RoofMatl[T.WdShake] 1.051e+05 8.53e+04

0.000

1.451

7.280

OL	S
Least Square	es

SalePrice

F-statistic: Wed. 22 Jan 2020 Prob (F-statistic): Log-Likelihood:

Adj. R-squared:

R-squared:

6.83e-23

0.089

0.081

11.73

0.975]

2.6e+05

-18476. AIC: 3.698e+04 BIC: 3.705e+04 [0.025]

2984.2166 5.53e+04 0.054 0.957 -1.06e+05 1.11e+05

5.801e+04 7.63e+04 0.760 0.447 -9.16e+04 2.08e+05

2.44e+04 1.08e+05 0.226 0.821 -1.87e+05 2.36e+05

2.005

0.00

198.

1.231 0.218 -6.23e+04 2.72e+05

-4.79e+04 6.32e+04 -0.758 0.448 -1.72e+05

t P>|t| std err 1.57e+05 9.41e+04 1.668 0.095 -2.76e+04 3.42e+05

12:11:27 1460 1447 12 nonrobust coef

RoofStyle[T.Gable] -4.442e+04 5.51e+04 -0.806 0.421 -1.53e+05 6.37e+04

RoofStyle[T.Shed] -1.355e+04 7.94e+04 -0.171 0.865 -1.69e+05 1.42e+05

RoofMatl[T.Membran] 8.448e+04 1.21e+05 0.698 0.485 -1.53e+05 3.22e+05 RoofMatl[T.Metal] 2.298e+04 1.21e+05 0.190 0.849 -2.15e+05

RoofMatl[T.Tar&Grv] 3.243e+04 9.41e+04 0.345 0.730 -1.52e+05 2.17e+05

RoofMatl[T.WdShngl] 2.698e+05 8.24e+04 3.275 0.001 1.08e+05 4.31e+05

Jarque-Bera (JB): 1626.866

Prob(JB):

Cond. No.

Durbin-Watson:

RoofStyle[T.Gambrel] -6.612e+04 5.97e+04 -1.107 0.268 -1.83e+05