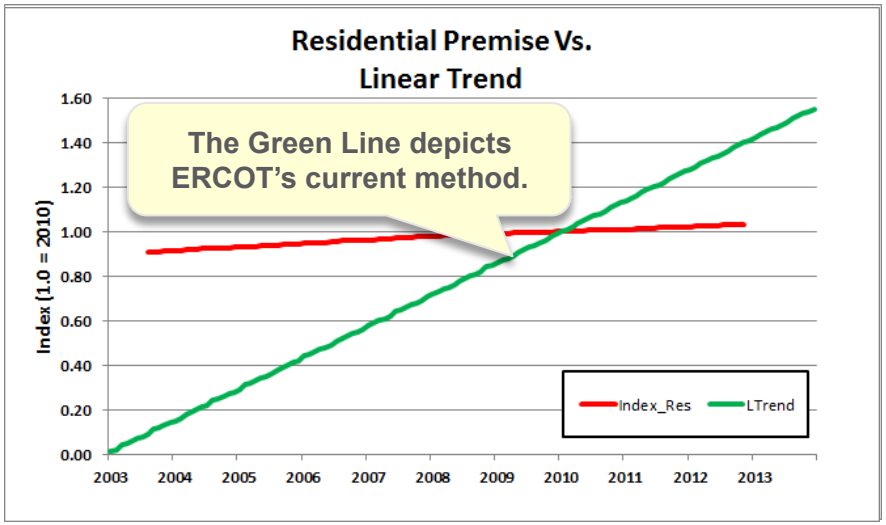
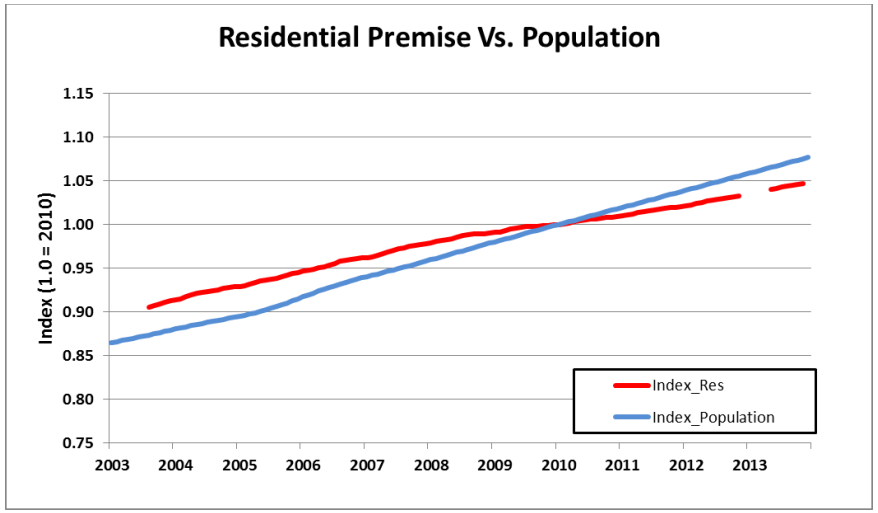
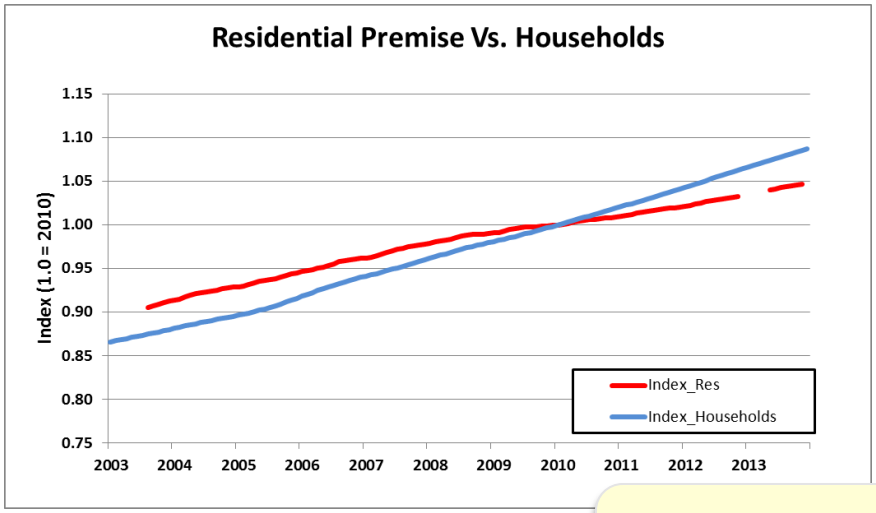
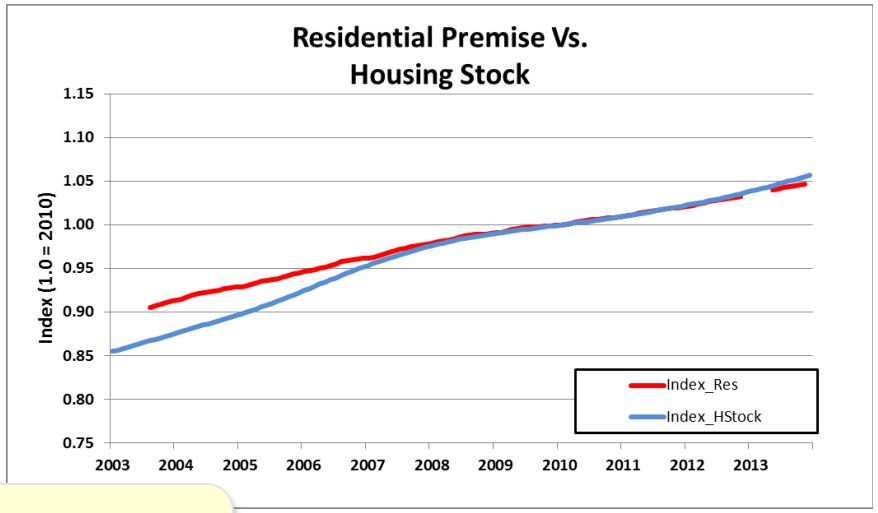
SYSTEM TOTAL
RESIDENTIAL PREMISES

RESIDENTIAL - INDICES



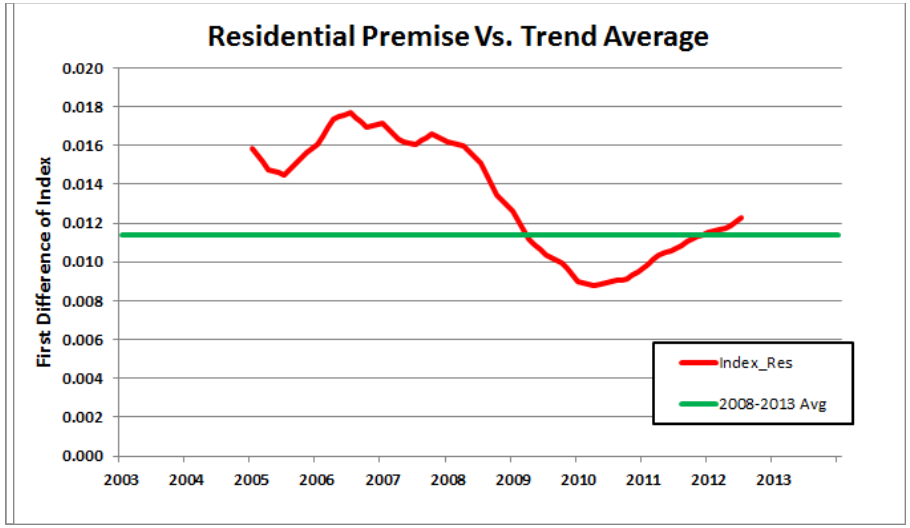


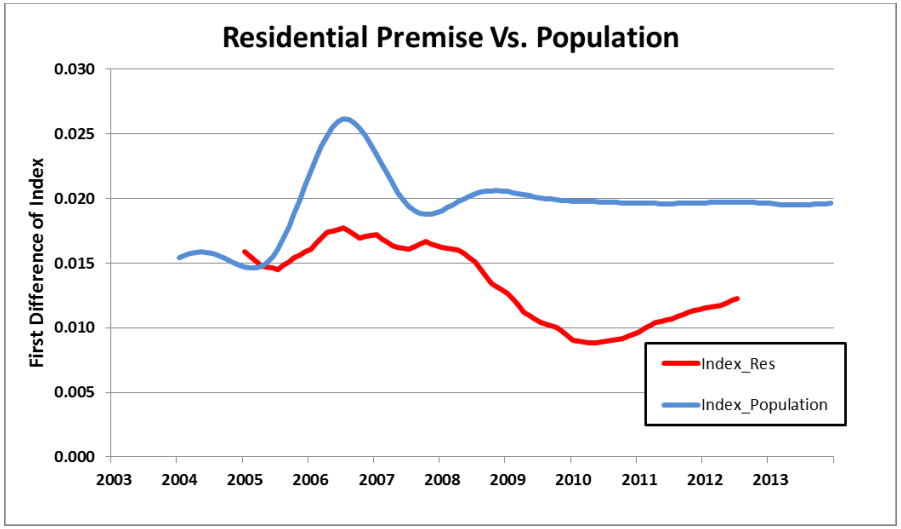


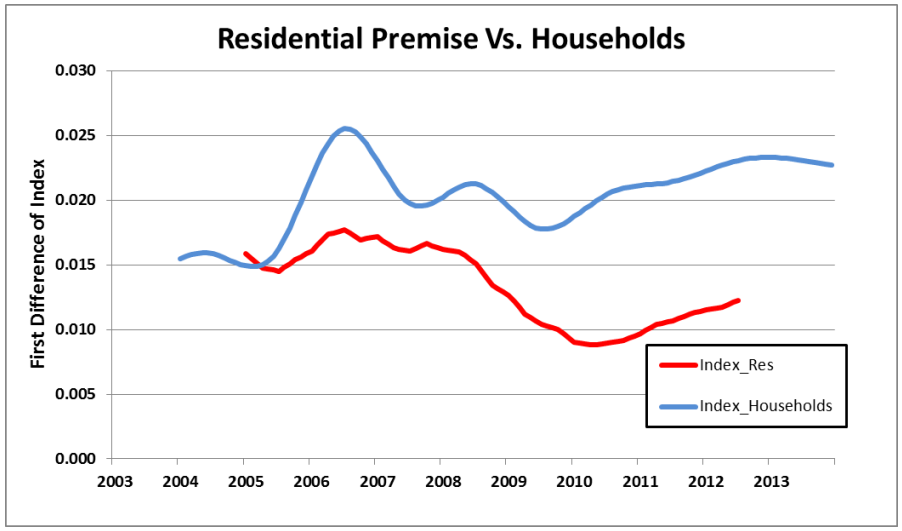


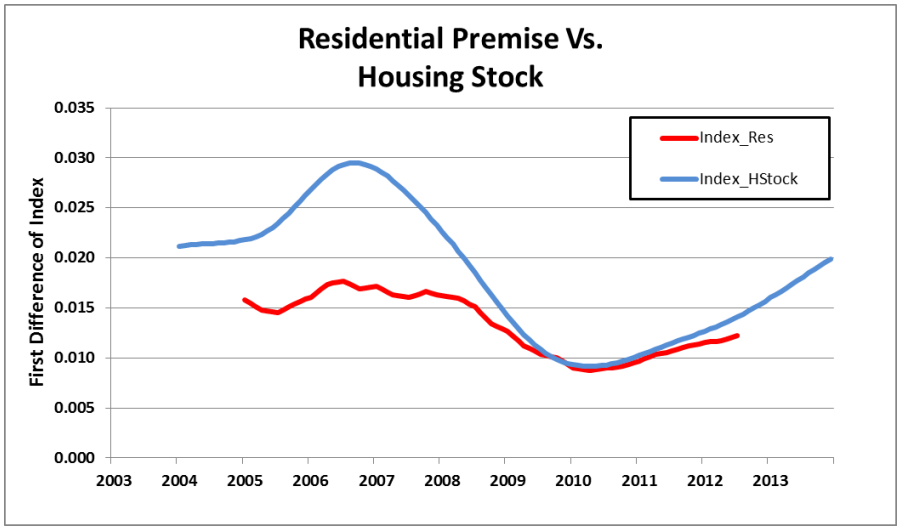
Housing Stock = Physical Building (both occupied and unoccupied)
Households = Family Unit

RESIDENTIAL – ANNUAL DIFFERENCES

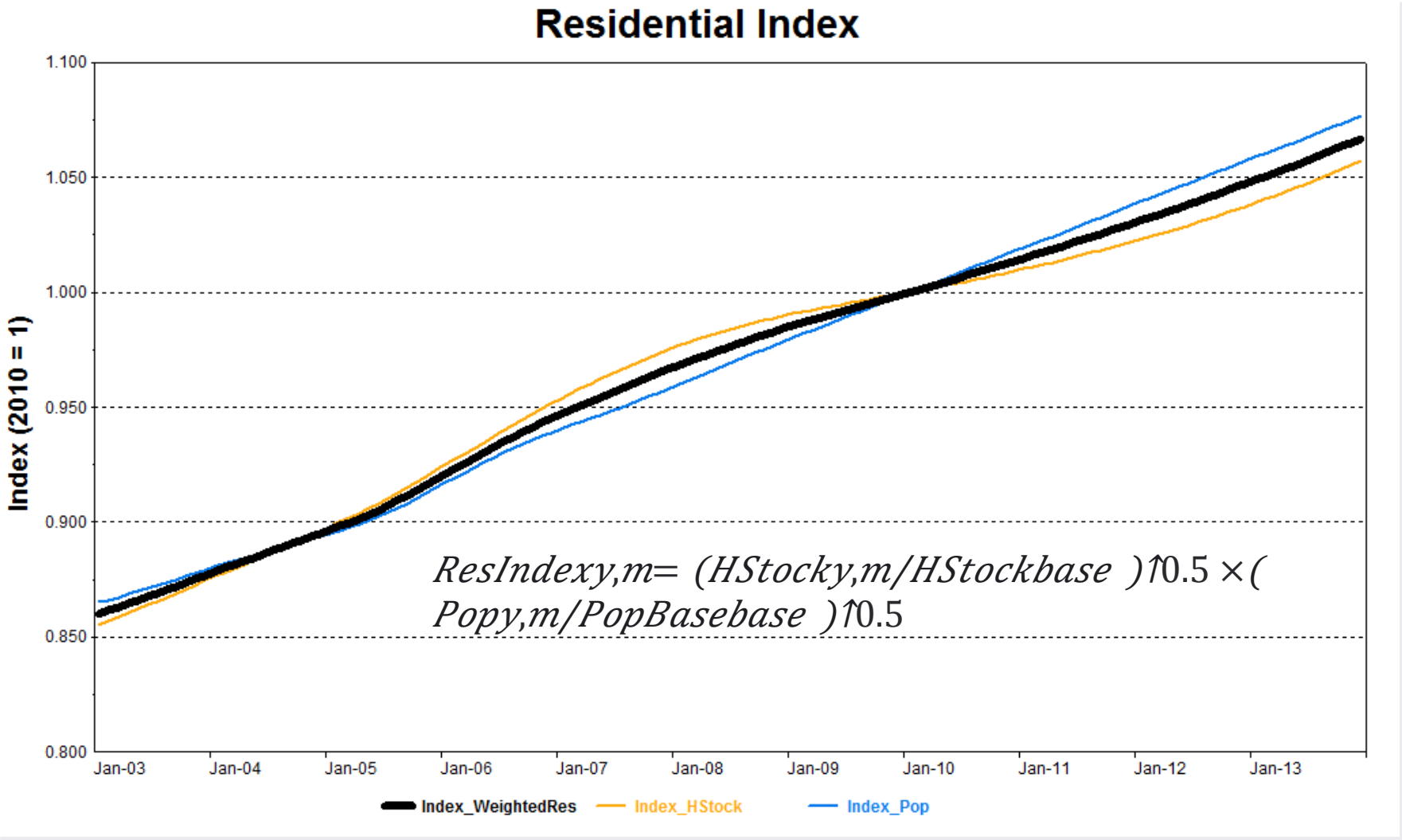




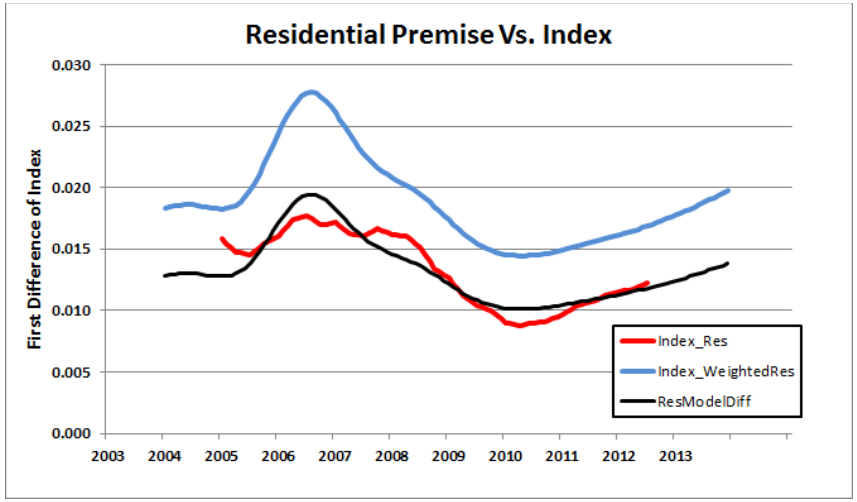


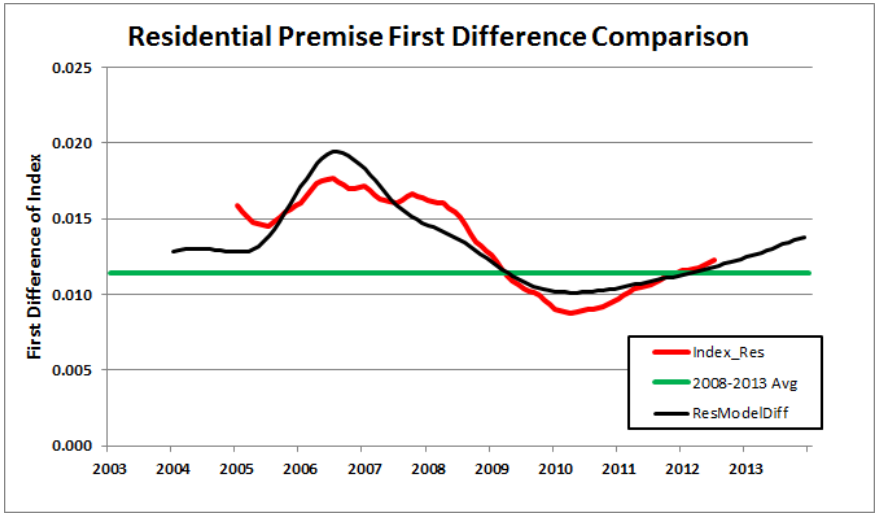


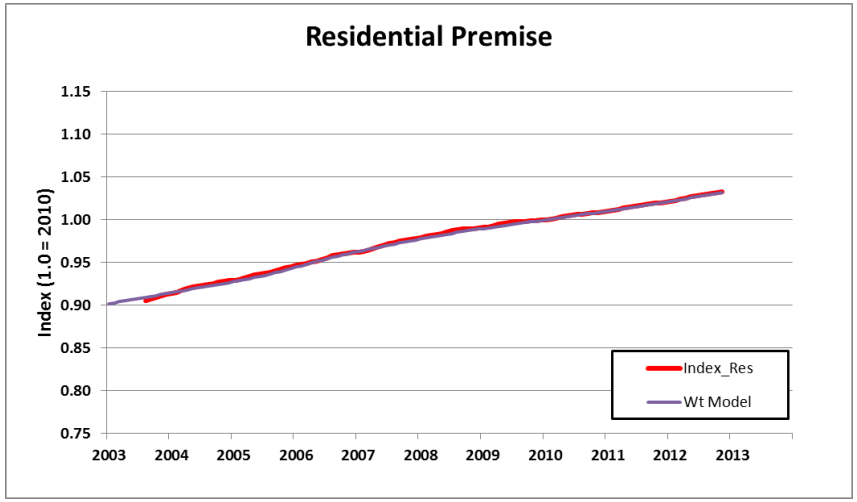
THE WEIGHTED INDEX



WEIGHTED INDEX PERFORMANCE







RESIDENTIAL MODELS

- Alternative models were evaluated to assess the relative strength of competing independent variables.

- Models were estimated over multiple estimation ranges and evaluated both in-sample and out-of-sample:
  - 2004 - 2012 (In-Sample)
  - 2009 - 2012 (In-Sample)
  - 2009 - 2012 (Out-of-Sample); with estimation from 2004-2008

- The trends change after recessions. After 2009, growth flattens out.

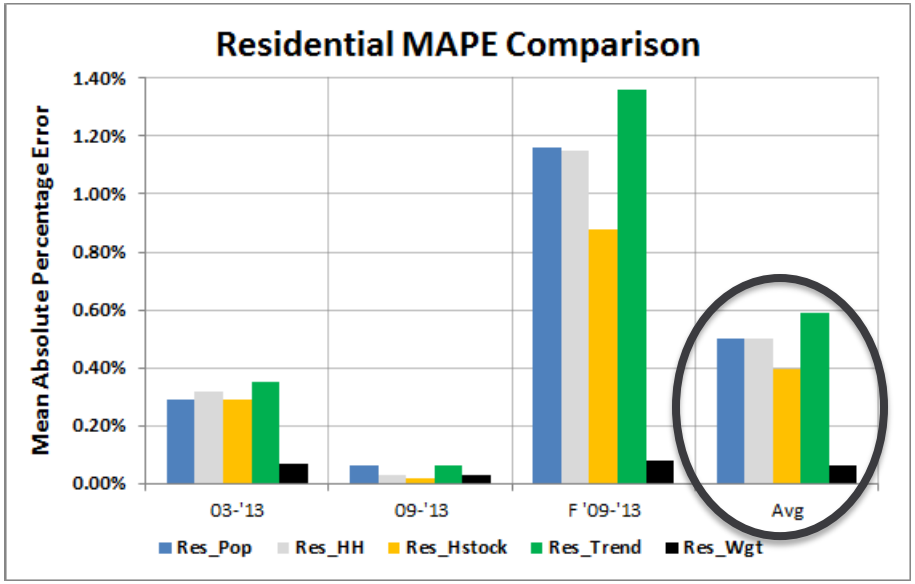
RESIDENTIAL MODEL PERFORMANCE

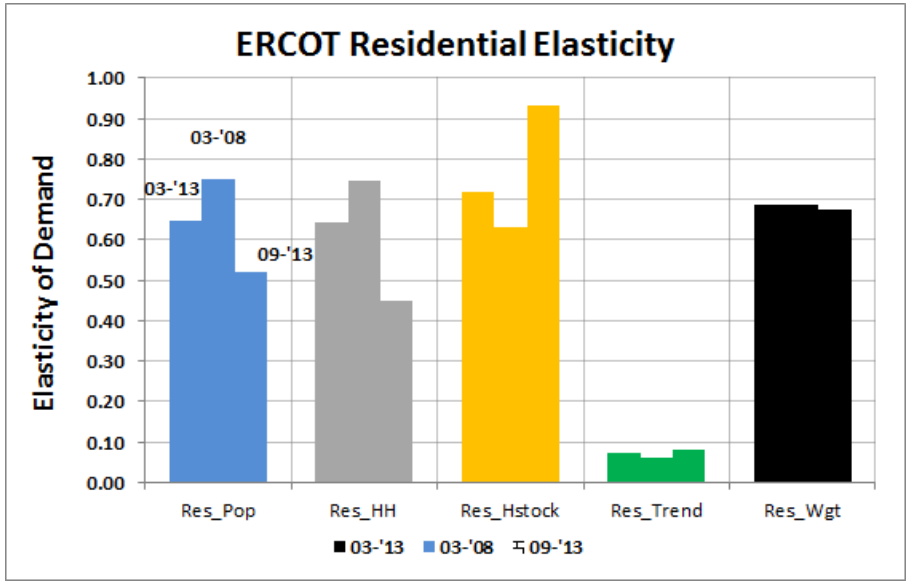
Accuracy

ERCOT Residential MAPE Comparison					
Model		03-'13	09-'13	F '09-'13	Avg
Res_Pop		0.29%	0.06%	1.16%	0.50%
Res_HH		0.32%	0.03%	1.15%	0.50%
Res_Hstock		0.29%	0.02%	0.88%	0.40%
Res_Trend		0.35%	0.06%	1.36%	0.59%
Res_Wgt		0.07%	0.03%	0.08%	0.06%

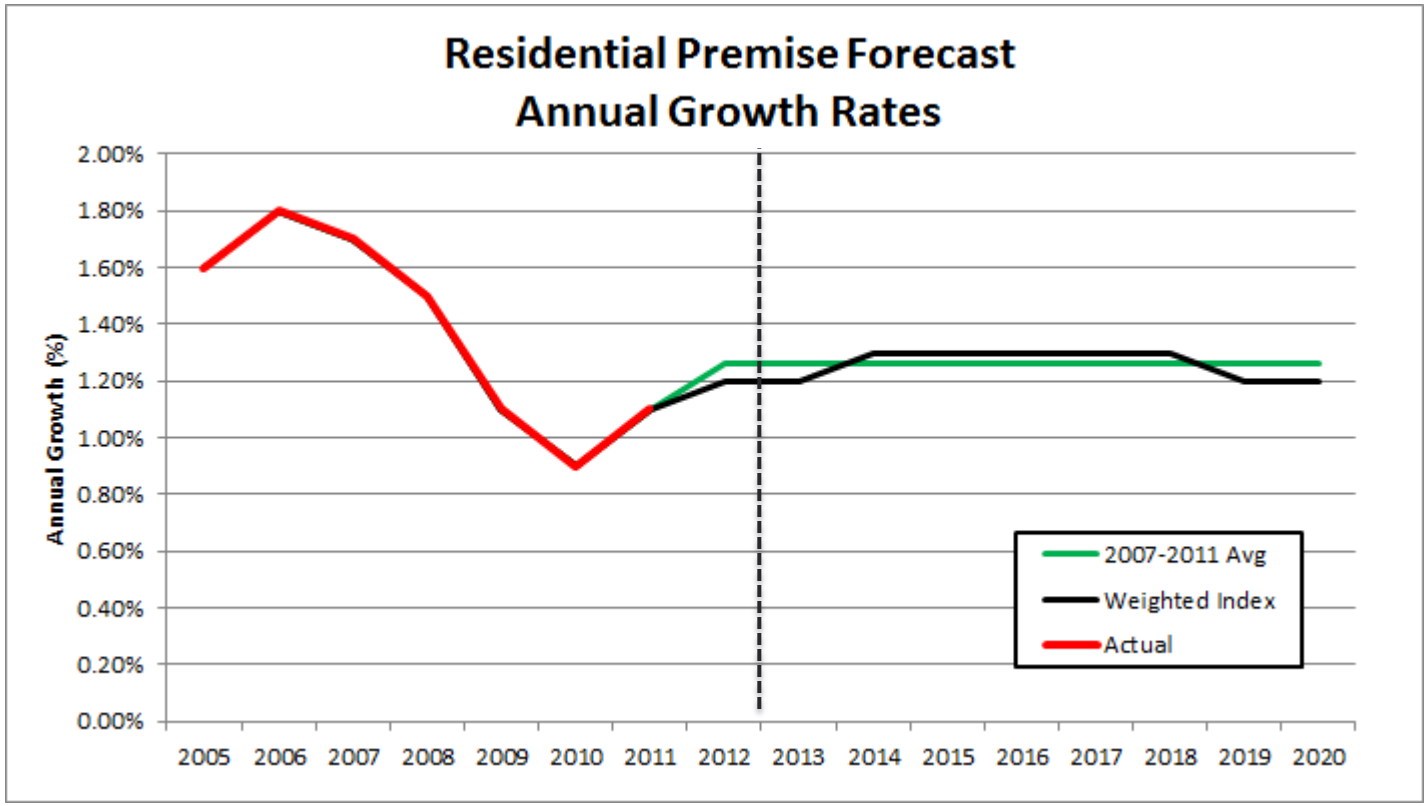
Stability

Elasticity					
Model		03-'13	03-'08	09-'13	CV
Res_Pop		0.647	0.749	0.520	0.18
Res_HH		0.641	0.746	0.449	0.25
Res_Hstock		0.718	0.631	0.930	0.20
Res_Trend		0.073	0.060	0.080	0.14
Res_Wgt		0.687	0.686	0.674	0.01





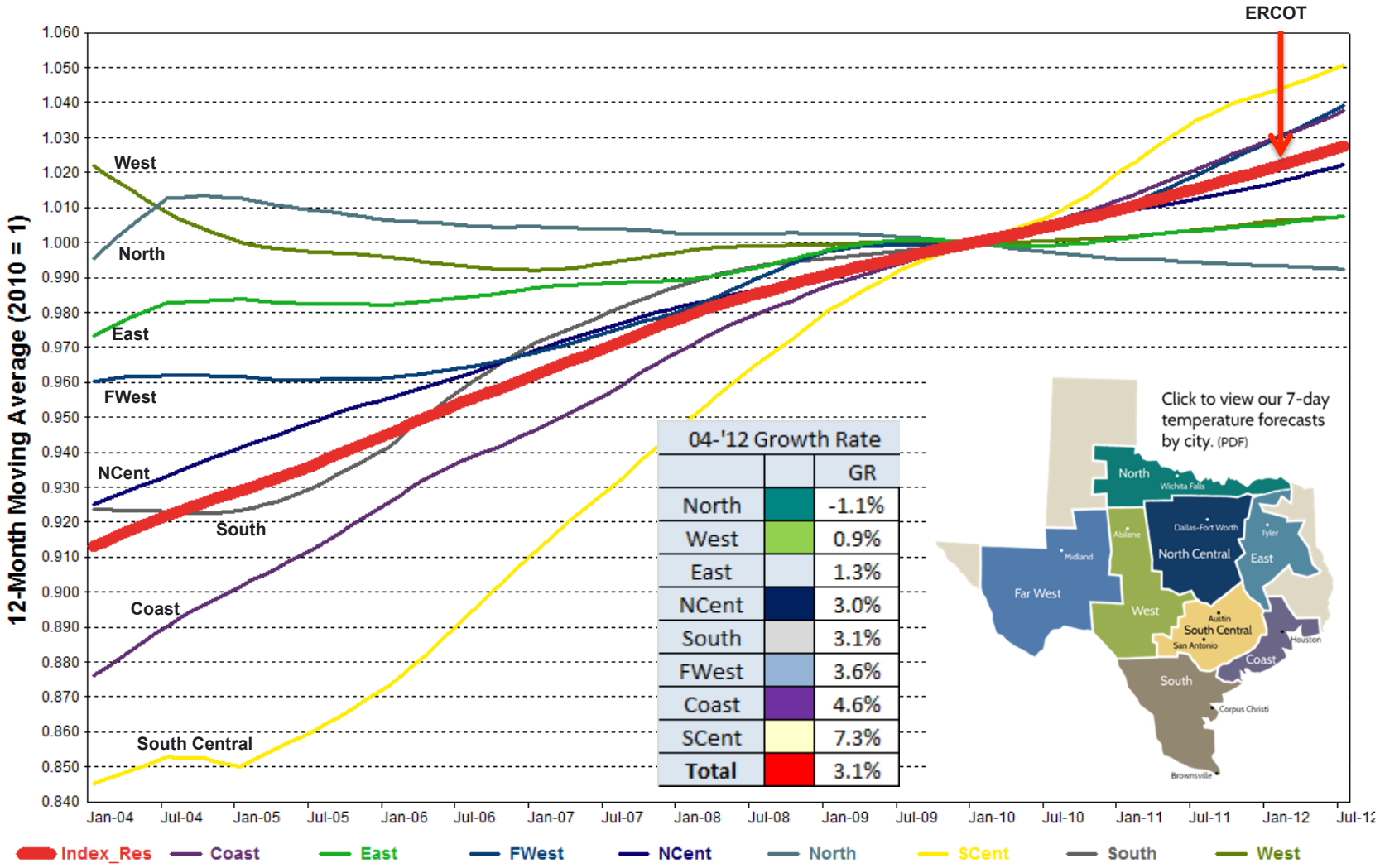
TOTAL RESIDENTIAL GROWTH FORECAST



2007-2011 Average: 1.26% per year (2013-2020)
Weighted Trend Model: 1.26% per year (2013-2020)

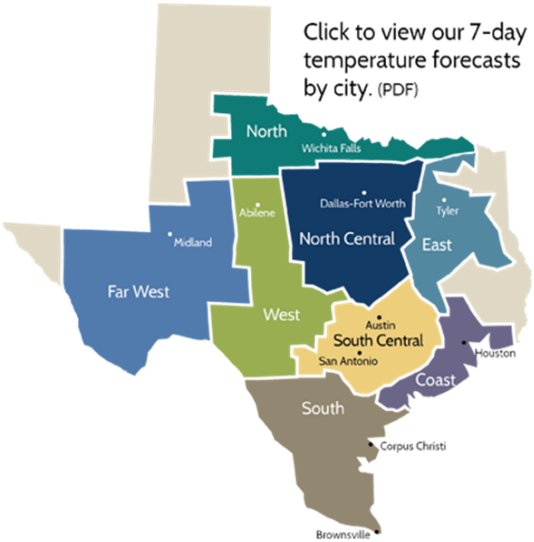
REGIONAL
RESIDENTIAL PREMISES

RESIDENTIAL PREMISES BY REGION



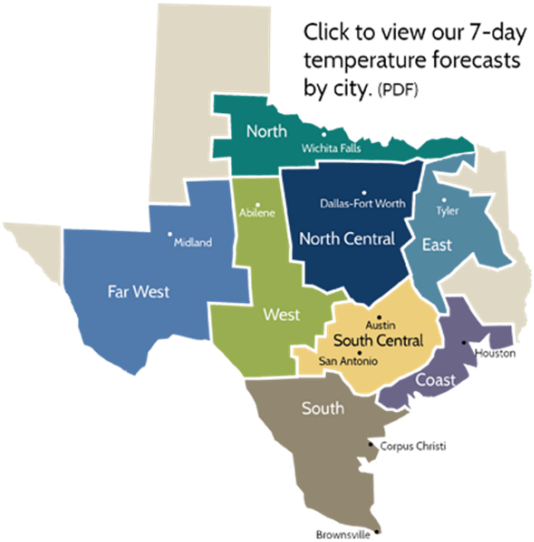
04-'12 Growth Rate		GR
North		-1.1%
West		0.9%
East		1.3%
NCent		3.0%
South		3.1%
FWest		3.6%
Coast		4.6%
SCent		7.3%
Total		3.1%

RESIDENTIAL REGIONAL FORECAST ACCURACY



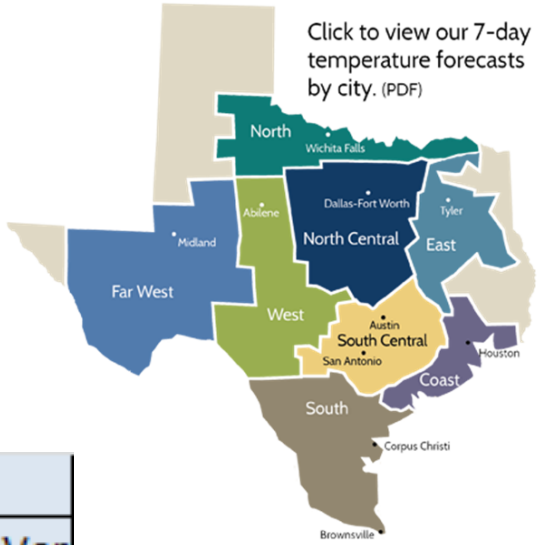
04-'12 Growth Rate			MAPE Comparison ('04 - '12)		
		GR	Trend	Index	Delta
North		-1.1%	0.16%	0.12%	-0.04%
West		0.9%	0.40%	0.39%	-0.01%
East		1.3%	0.16%	0.17%	0.01%
NCent		3.0%	0.28%	0.08%	-0.20%
South		3.1%	0.71%	0.56%	-0.15%
FWest		3.6%	0.49%	0.42%	-0.07%
Coast		4.6%	0.51%	0.16%	-0.35%
SCent		7.3%	0.76%	0.68%	-0.08%
Total		3.1%	0.35%	0.07%	-0.28%

RESIDENTIAL REGIONAL FORECAST ACCURACY 2



Region Average MAPE					
	2004-2012	2004-2008	2004 - 2008; **Out of Sample 2009 - 2012**	2009-2013	Average
Trend	0.43%	0.35%	1.26%	0.13%	0.54%
Index	0.32%	0.33%	0.82%	0.12%	0.40%
Delta	-0.11%	-0.02%	-0.43%	-0.01%	-0.14%

RESIDENTIAL REGIONAL MODEL STABILITY



04-'12 Growth Rate			Elasticity Comparison			
		GR	04-'12	04-'08	09-'12	Coef of Var
North		-1.1%	-0.89	-0.69	-0.99	0.18
West		0.9%	0.05	-0.48	0.44	NA
East		1.3%	0.39	0.31	0.29	0.17
NCent		3.0%	0.57	0.55	0.57	0.02
South		3.1%	0.83	1.02	0.66	0.22
FWest		3.6%	0.94	0.72	1.45	0.36
Coast		4.6%	0.78	0.78	0.79	0.01
SCent		7.3%	1.24	1.12	1.15	0.05
Total		3.1%	0.687	0.686	0.674	0.01

ITRON RESIDENTIAL RECOMMENDATIONS

Recommendation 1:

Implement a Residential Economic Index as the base approach to drive the Residential Premise models. The index should be comprised of Housing Stock and Population and use equal weights.

The index-driven models demonstrate a strong improvement over the Time Trend in terms of both model accuracy and stability at both the ERCOT-level and Regional Level.

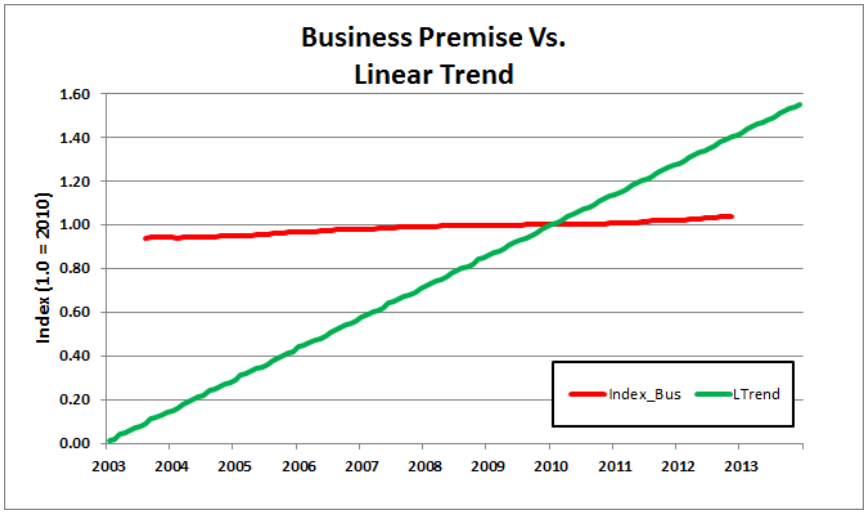
Recommendation 2:

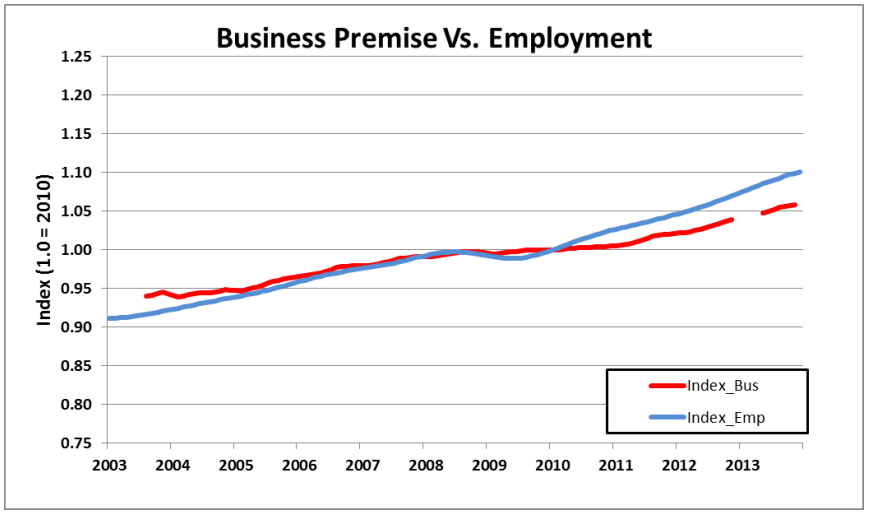
Continue to use the 5 year trend for Zones with a 2004-2012 Compound Annual Growth rate less than 1.0% (West and North).

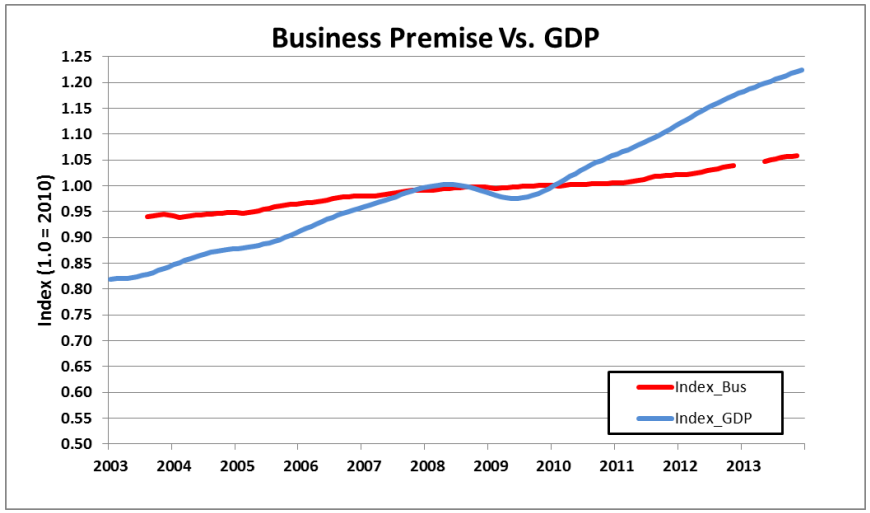
The index-driven models demonstrate a strong improvement over the Time Trend in terms of both model accuracy and stability at both the ERCOT-level and Regional Level.

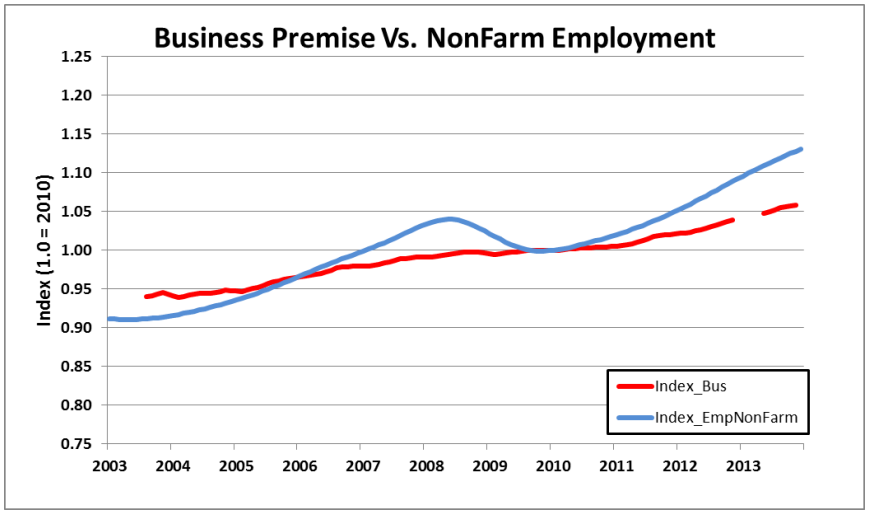
SYSTEM TOTAL
BUSINESS PREMISES

BUSINESS – TRADITIONAL INDICES

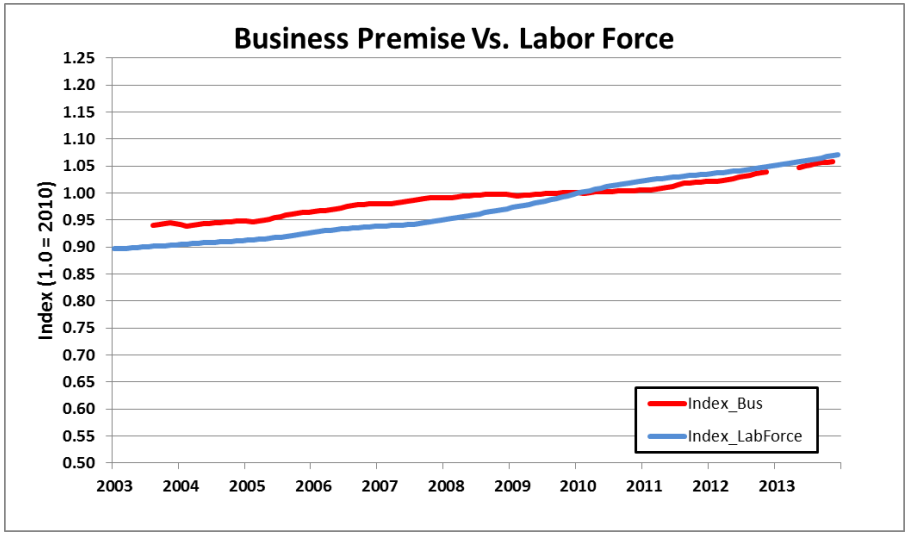


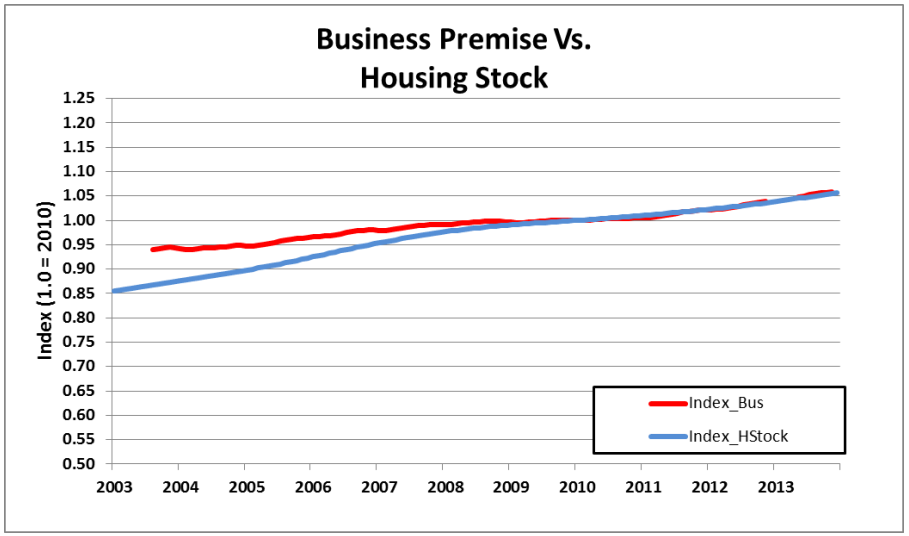


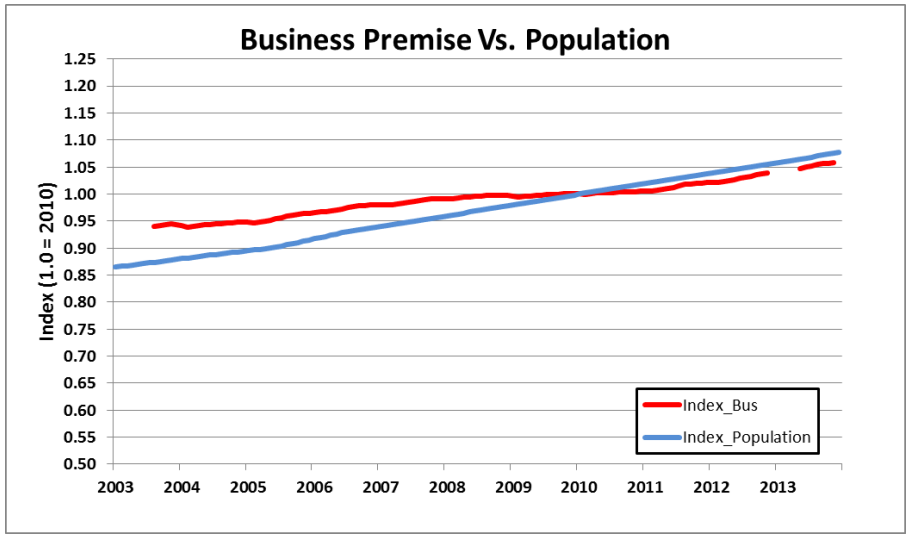




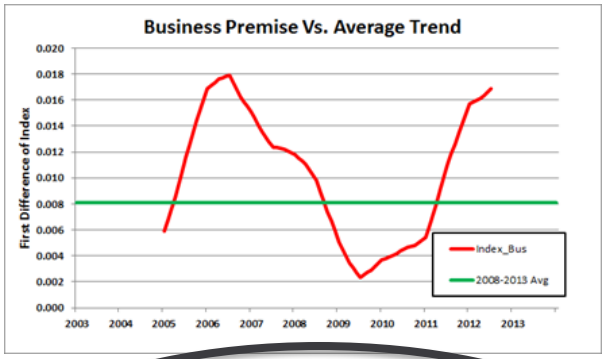
BUSINESS – NON-TRADITIONAL INDICES

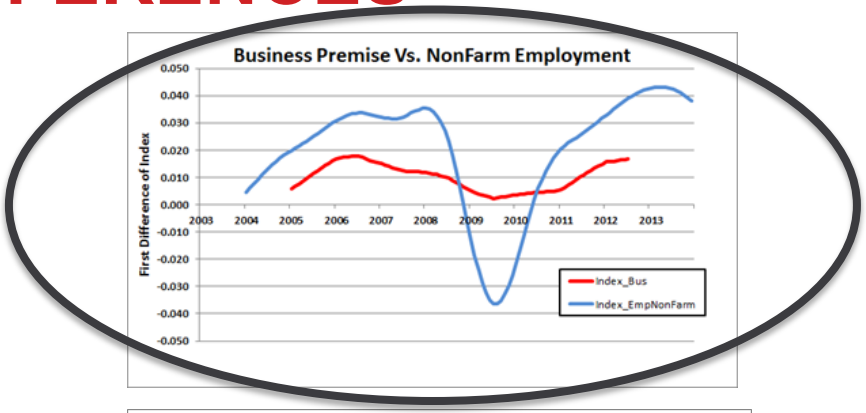


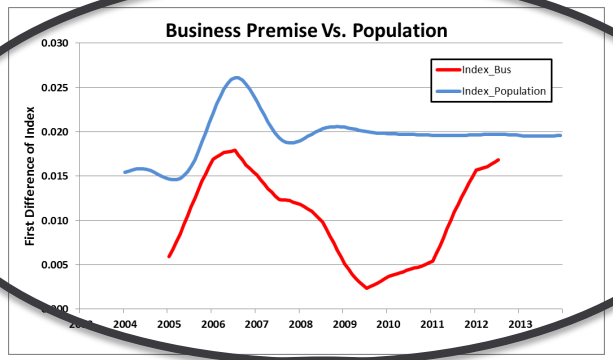


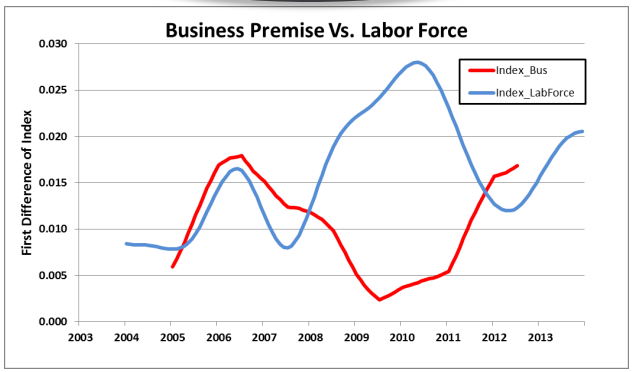


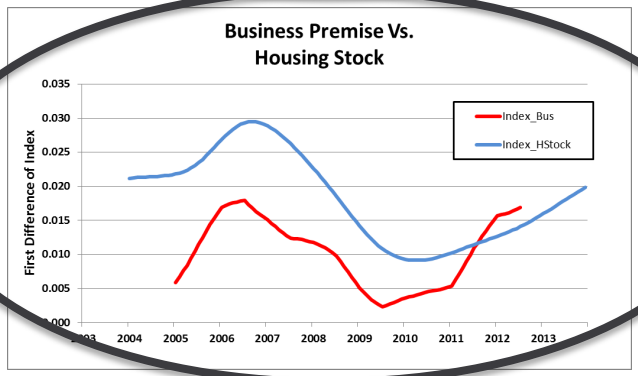
BUSINESS – ANNUAL DIFFERENCES

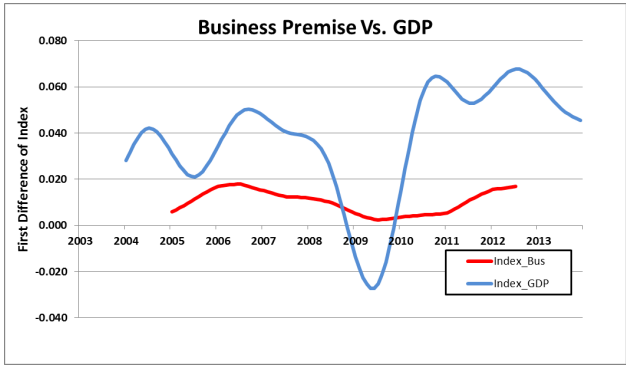




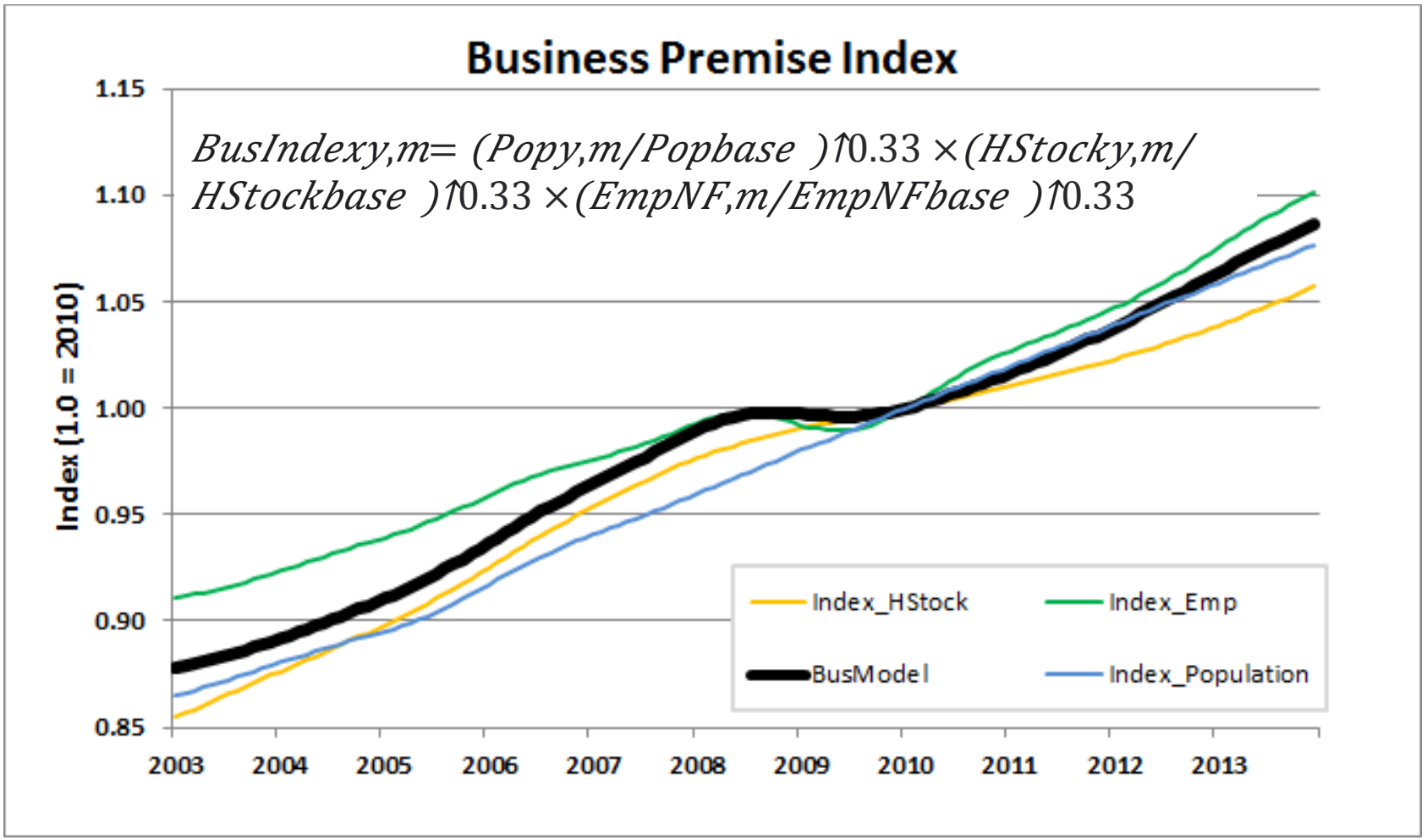




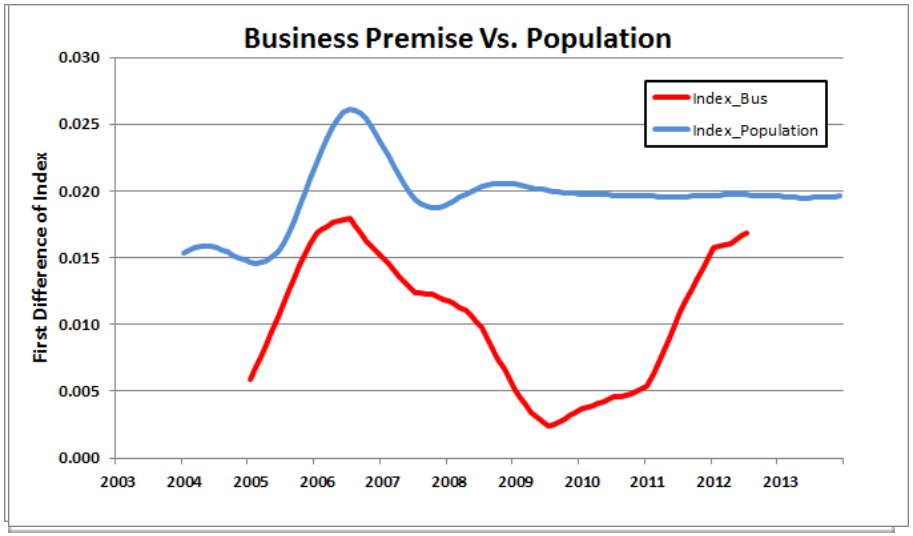


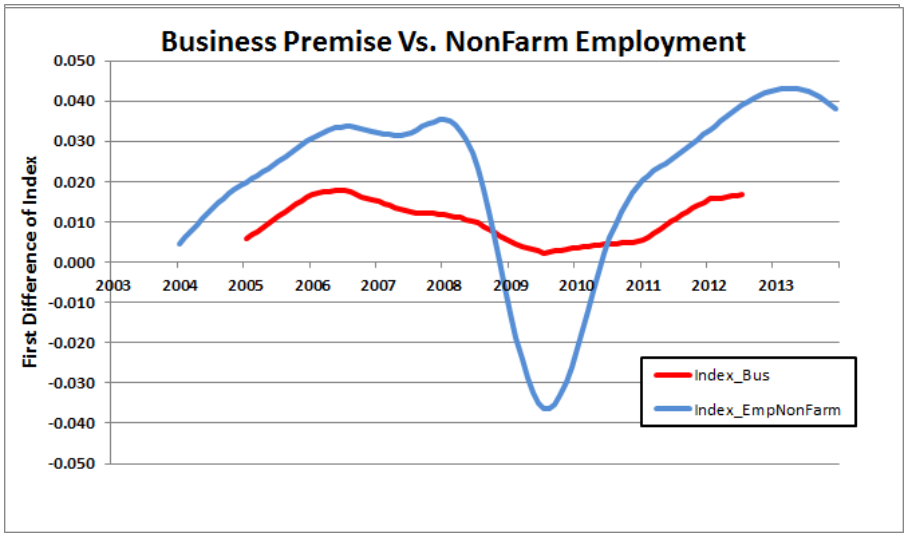


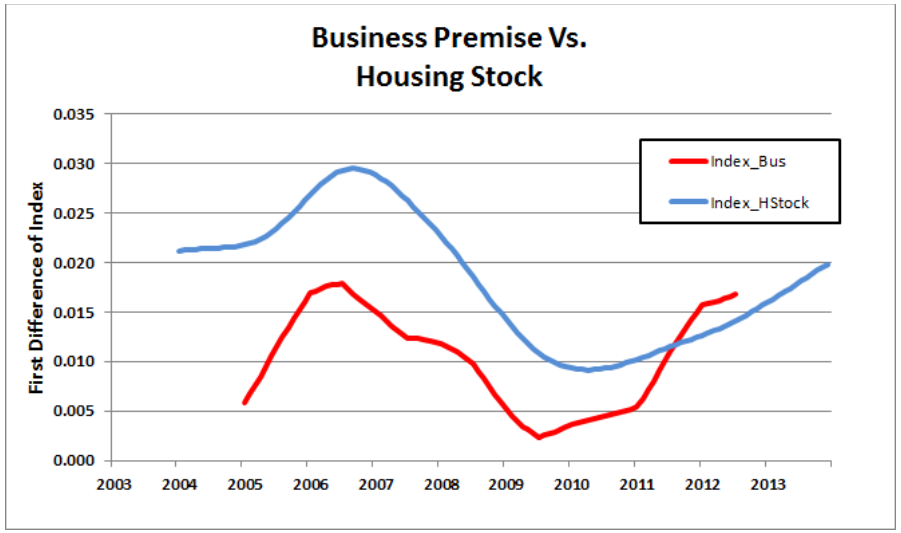
BUSINESS – BUSINESS INDEX

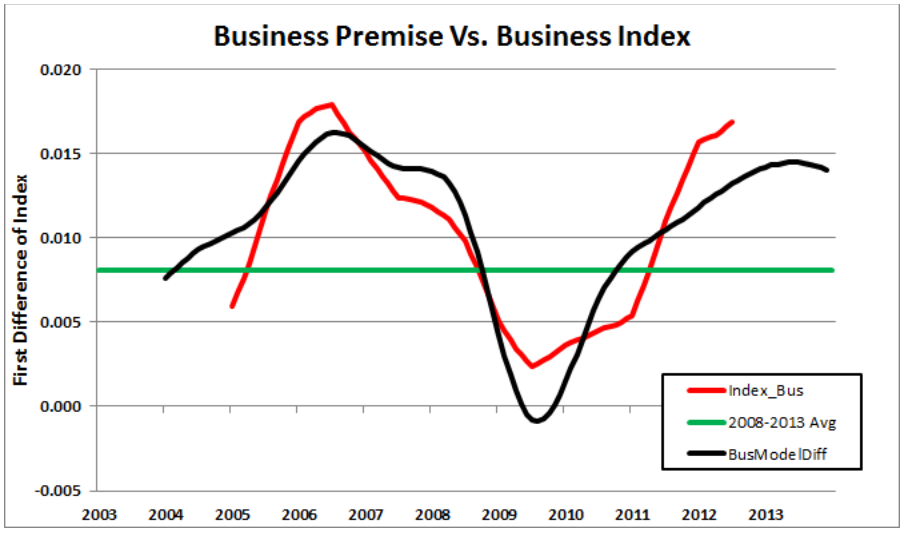


BUSINESS – FIRST DIFFERENCES









BUSINESS MODELS

- Alternative Models were evaluated to assess the relative strength of competing independent variables.

- Models were estimated over multiple estimation ranges and evaluated both in-sample and out-of-sample:
  - 2004 - 2012 (In-Sample)
  - 2009 - 2012 (In-Sample)
  - 2009 - 2012 (Out-of-Sample); with estimation from 2004-2008

- The models were estimated over different time periods, and evaluated both in-sample and out-of-sample to examine their relative stability over time

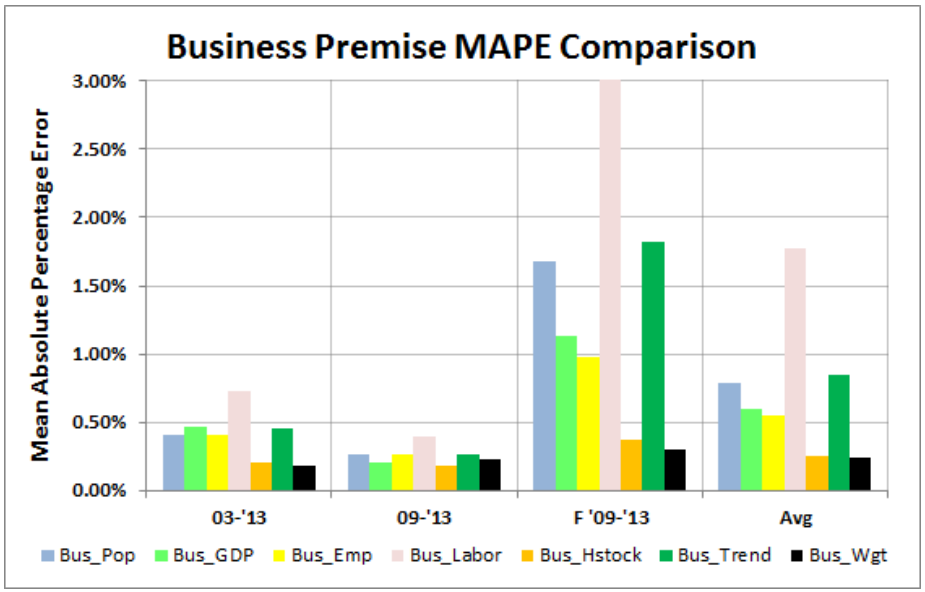
BUSINESS MODEL PERFORMANCE

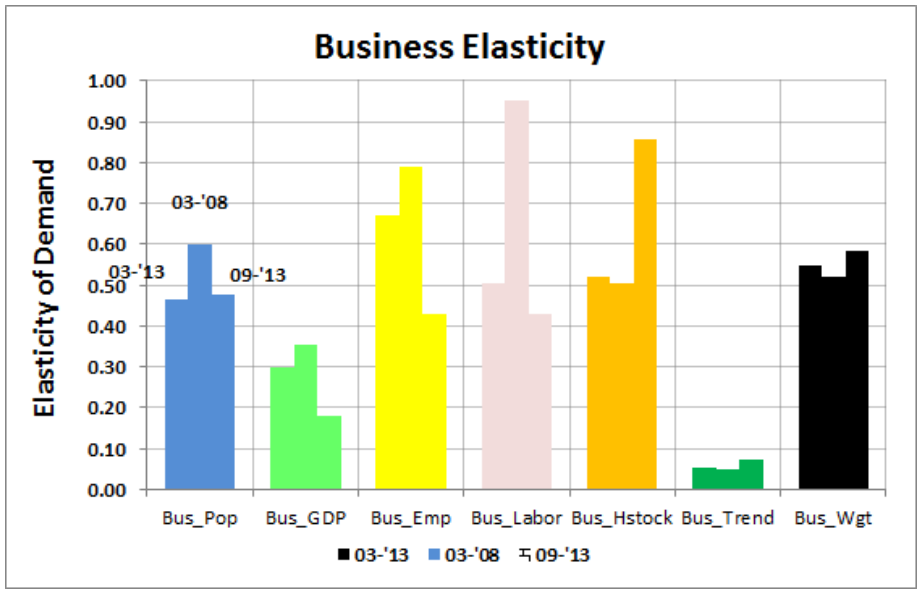
Accuracy

ERCOT Business MAPE Comparison					
Model		03-'13	09-'13	F '09-'13	Avg
Bus_Pop		0.41%	0.26%	1.68%	0.78%
Bus_GDP		0.47%	0.21%	1.13%	0.60%
Bus_Emp		0.41%	0.26%	0.98%	0.55%
Bus_Labor		0.73%	0.40%	4.19%	1.77%
Bus_Hstock		0.21%	0.18%	0.37%	0.25%
Bus_Trend		0.45%	0.26%	1.82%	0.84%
Bus_Wgt		0.12%	0.12%	0.20%	0.15%

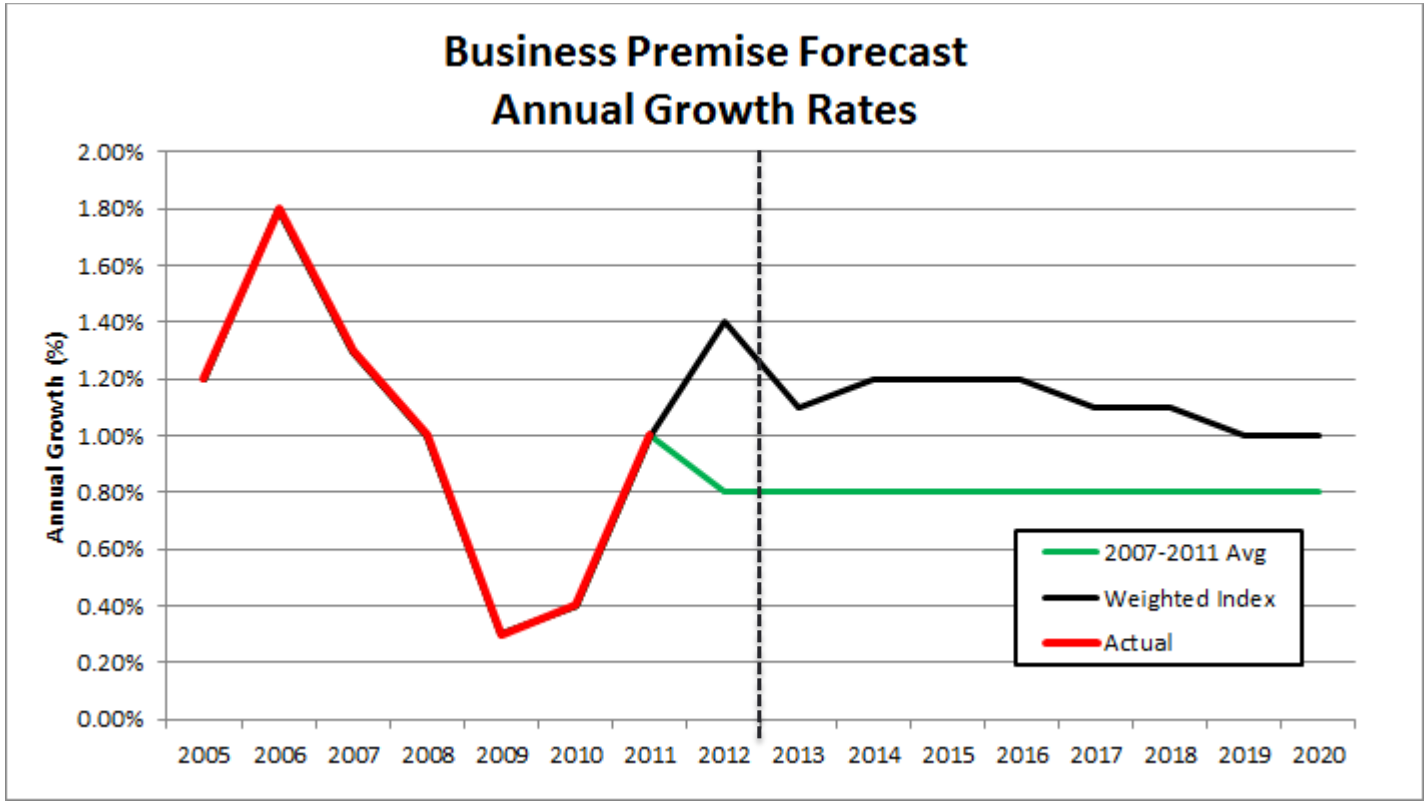
Stability

Elasticity					
Model		03-'13	03-'08	09-'13	CV
Bus_Pop		0.47	0.60	0.48	0.15
Bus_GDP		0.30	0.35	0.18	0.32
Bus_Emp		0.67	0.79	0.43	0.29
Bus_Labor		0.51	0.95	0.43	0.45
Bus_Hstock		0.52	0.51	0.86	0.32
Bus_Trend		0.05	0.05	0.07	0.22
Bus_Wgt		0.55	0.52	0.58	0.05





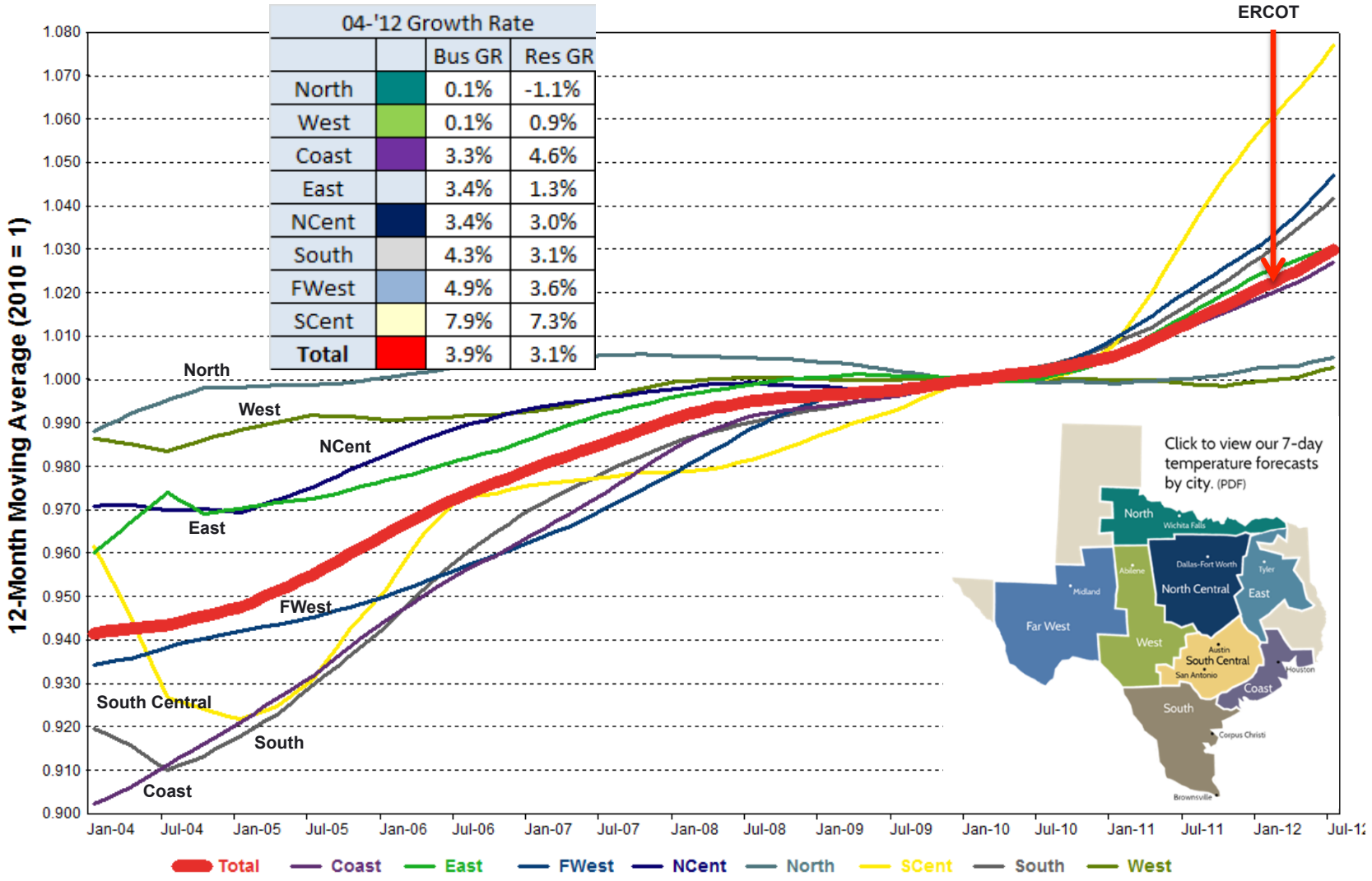
TOTAL BUSINESS GROWTH FORECAST



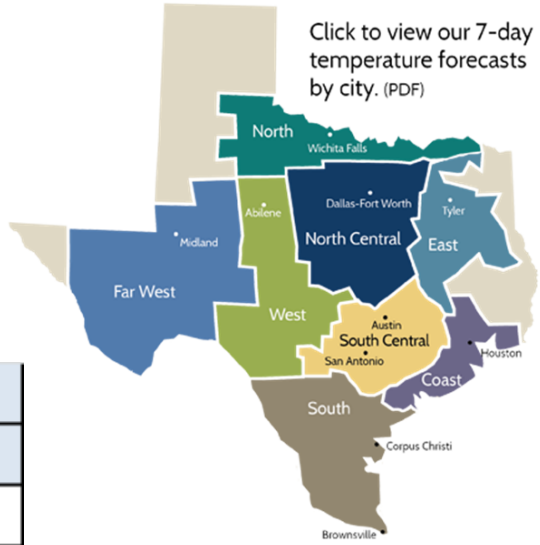
2007-2011 Average: 0.80% per year (2013-2020)
Weighted Trend Model: 1.11% per year (2013-2020)

REGIONAL
BUSINESS PREMISES

BUSINESS PREMISES BY REGION

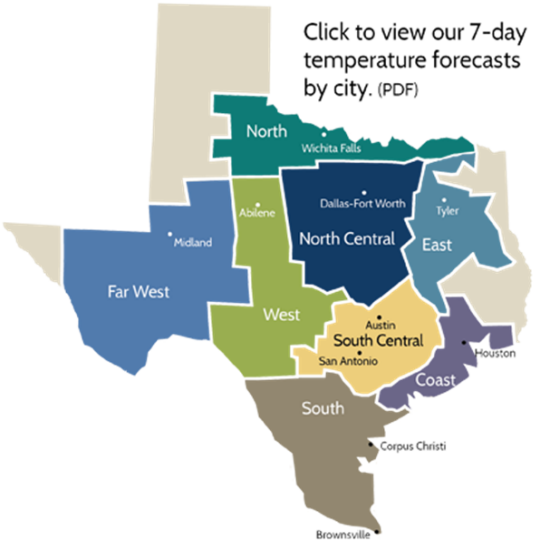


BUSINESS REGIONAL FORECAST ACCURACY



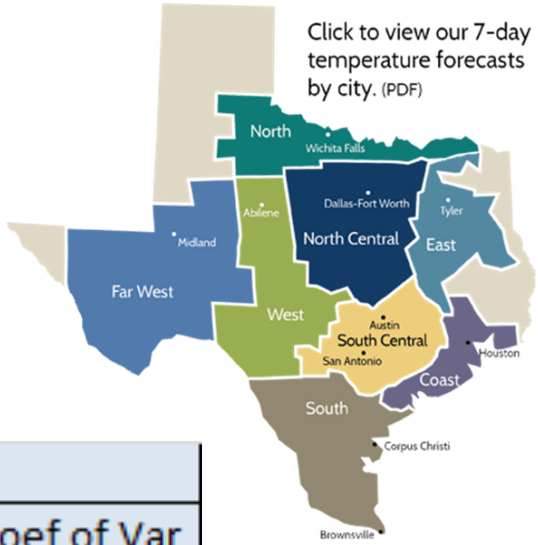
04-'12 Growth Rate				MAPE Comparison ('04 - '12)		
		Bus GR	Res GR	Trend	Index	Delta
North		0.1%	-1.1%	0.27%	0.21%	-0.06%
West		0.1%	0.9%	0.20%	0.19%	-0.01%
Coast		3.3%	4.6%	0.75%	0.21%	-0.54%
East		3.4%	1.3%	0.33%	0.22%	-0.11%
NCent		3.4%	3.0%	0.40%	0.25%	-0.15%
South		4.3%	3.1%	0.73%	0.37%	-0.36%
FWest		4.9%	3.6%	0.34%	0.84%	0.50%
SCent		7.9%	7.3%	1.09%	1.11%	0.02%
Avg MAPE				0.51%	0.43%	-0.09%
Total		3.9%	3.1%	0.45%	0.12%	-0.33%

BUSINESS REGIONAL FORECAST ACCURACY 2



Region Average MAPE					
	2004-2012	2004-2008	2004 - 2008; **Out of Sample 2009 - 2012**	2009-2013	Average
Trend	0.51%	0.33%	1.41%	0.33%	0.64%
Index	0.43%	0.27%	0.80%	0.21%	0.43%
Delta	-0.09%	-0.06%	-0.61%	-0.12%	-0.22%

BUSINESS REGIONAL MODEL STABILITY



04-'12 Growth Rate				Elasticity Comparison			
		Bus GR	Res GR	04-'12	04-'08	09-'12	Coef of Var
North		0.1%	-1.1%	0.33	0.96	0.06	1.02
West		0.1%	0.9%	0.31	0.67	0.01	1.01
Coast		3.3%	4.6%	0.68	0.71	0.52	0.16
East		3.4%	1.3%	0.78	1.24	0.74	0.30
NCent		3.4%	3.0%	0.41	0.40	0.53	0.17
South		4.3%	3.1%	0.84	0.98	0.73	0.15
FWest		4.9%	3.6%	1.04	0.69	1.80	0.48
SCent		7.9%	7.3%	0.76	0.56	1.38	0.48
Total		3.9%	3.1%	0.60	0.62	0.57	0.04

ITRON BUSINESS RECOMMENDATIONS

Recommendation 1:

Implement a Business Economic Index as the base approach to drive the Business Premise models. The index should be comprised of Housing Stock, Population, and Non-Farm Employment, using equal weights.

The index-driven models demonstrate a strong improvement over the Time Trend in terms of both model accuracy and stability at both the ERCOT-level and Regional Level.

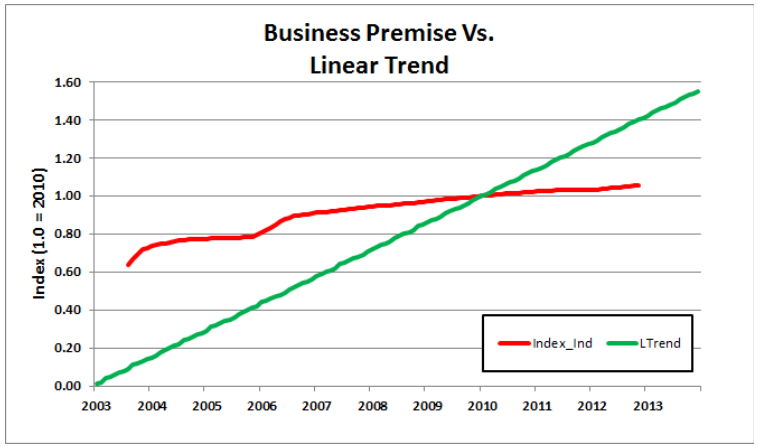
Recommendation 2:

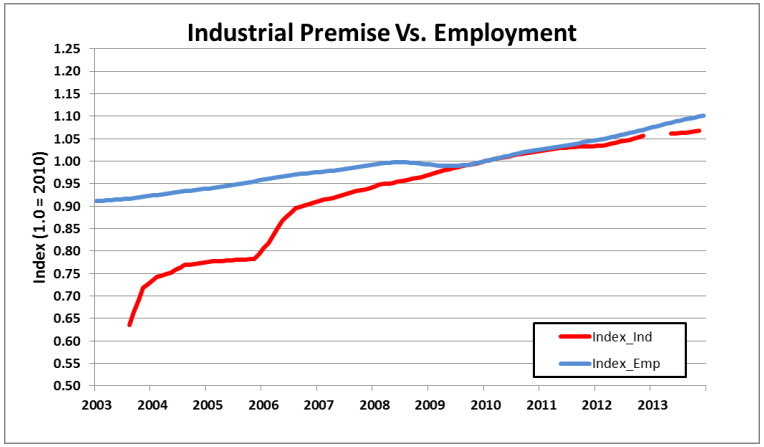
Continue to use the 5 year trend for the Far West region.

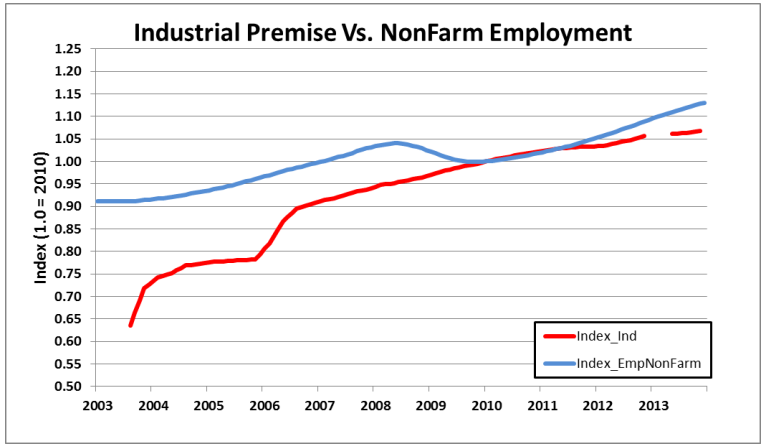
The growth in the Far West is more accurately projected using a linear trend.

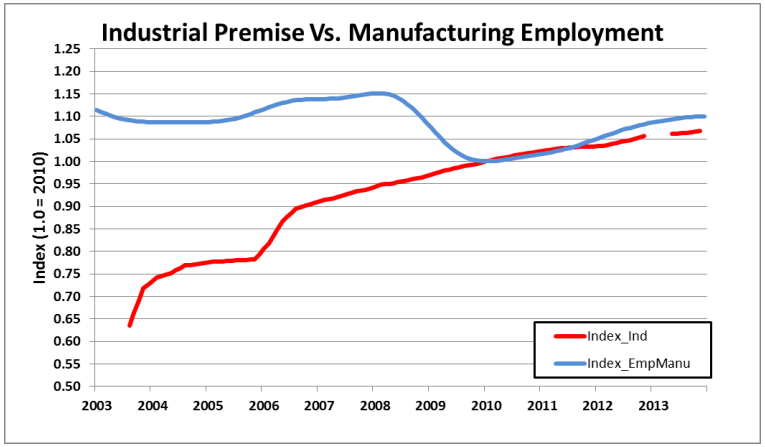
SYSTEM TOTAL
INDUSTRIAL PREMISES

INDUSTRIAL – INDICES (NON TRADITIONAL)

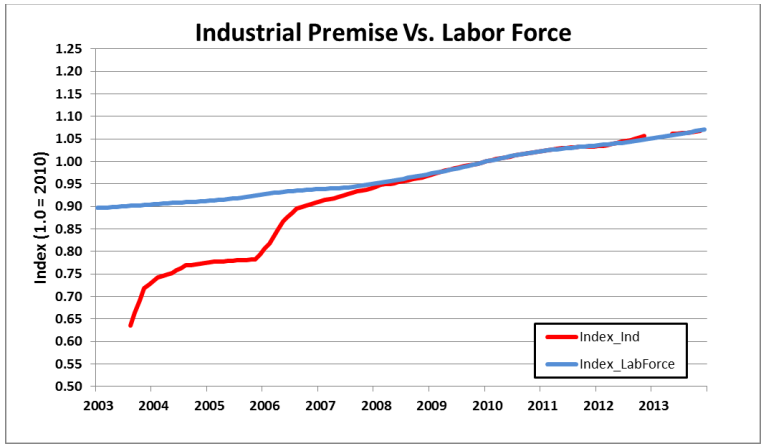


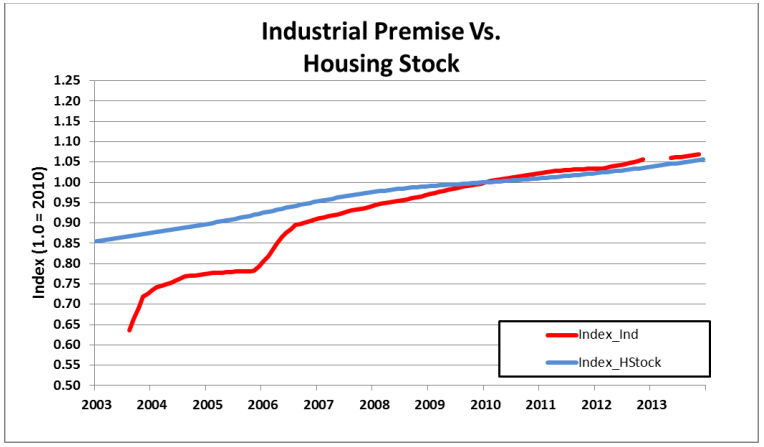


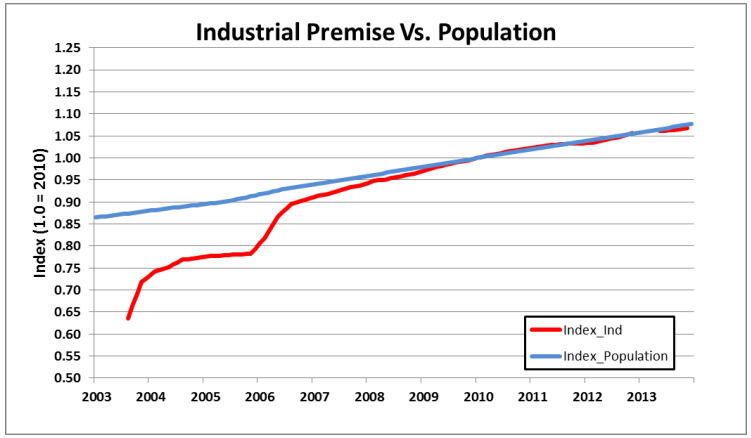


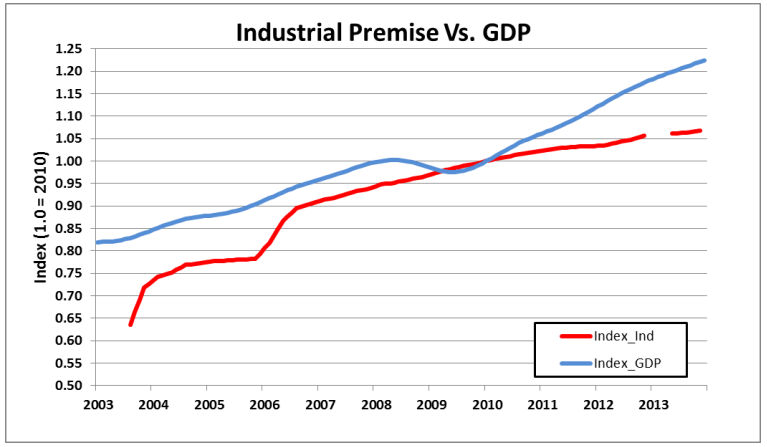


INDUSTRIAL – INDICES (NON TRADITIONAL)

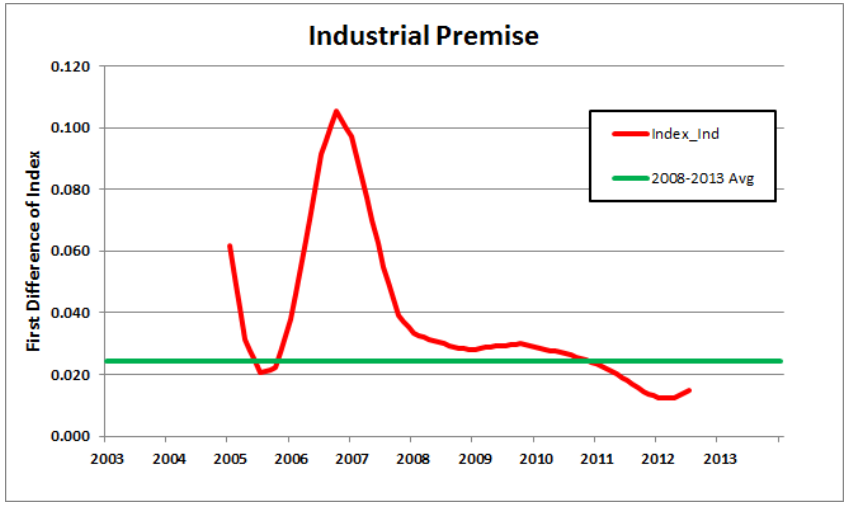


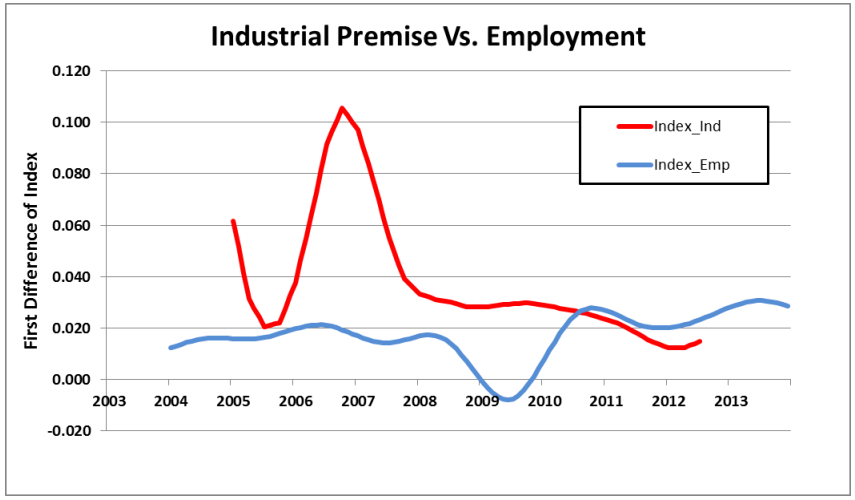


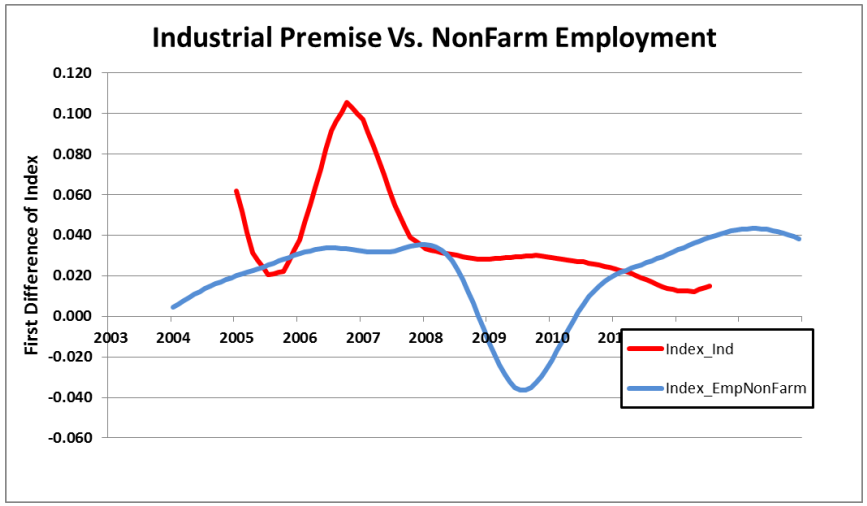


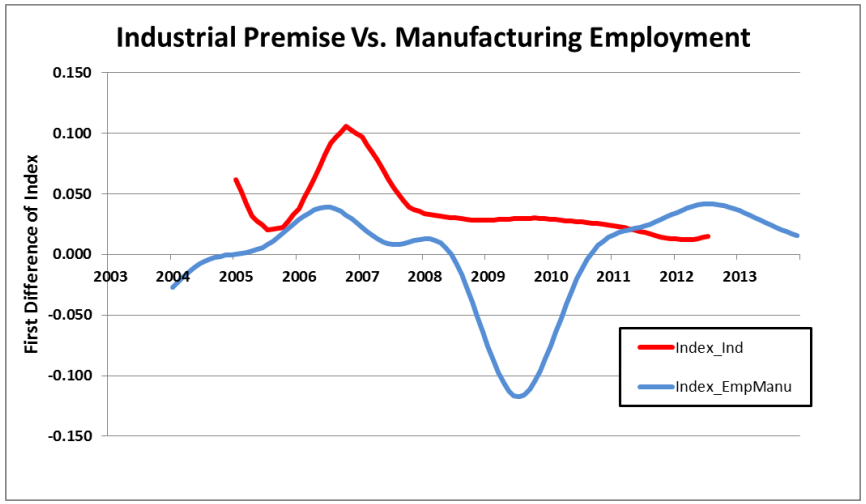


INDUSTRIAL – DIFFERENCES

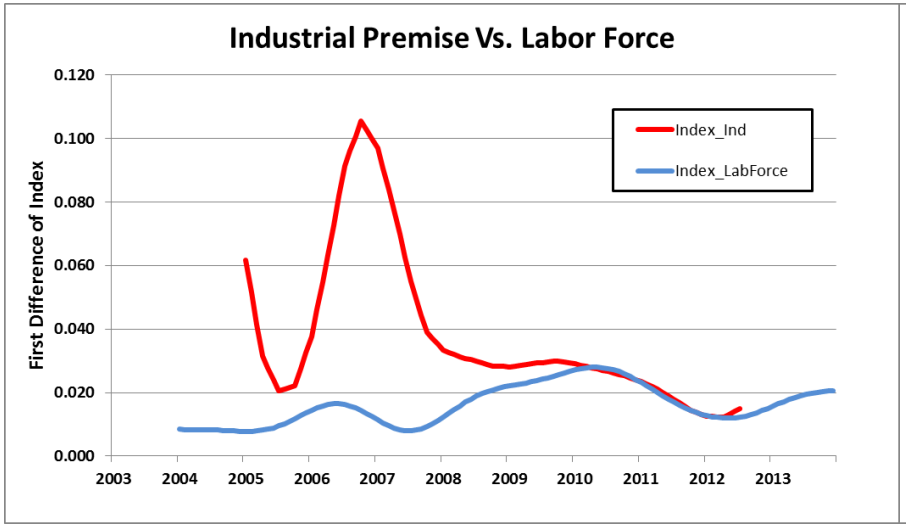


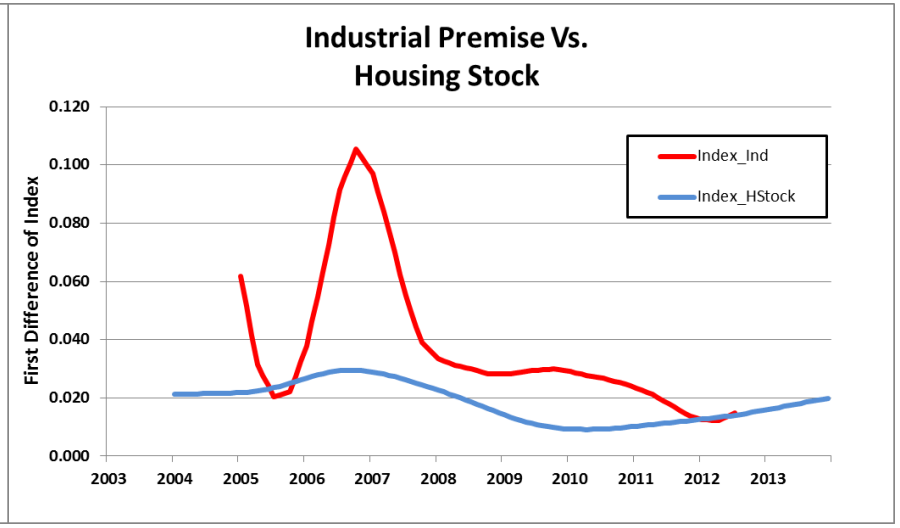


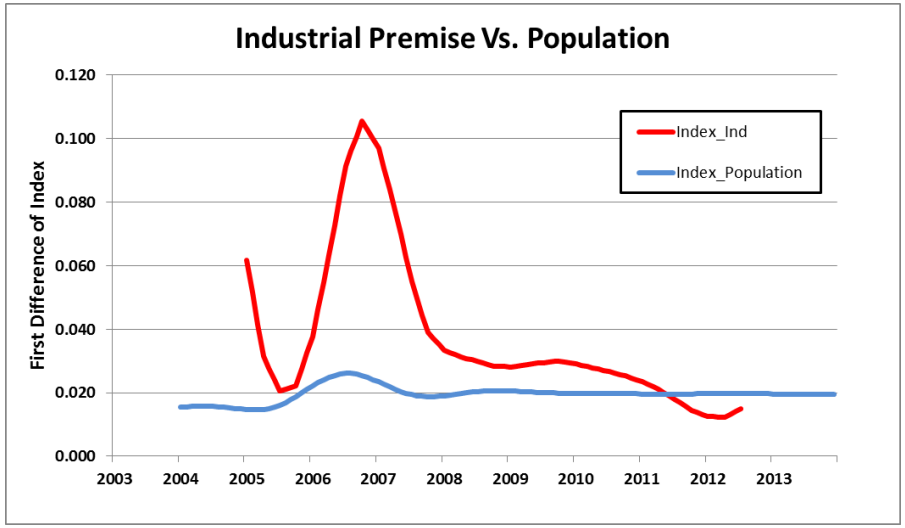


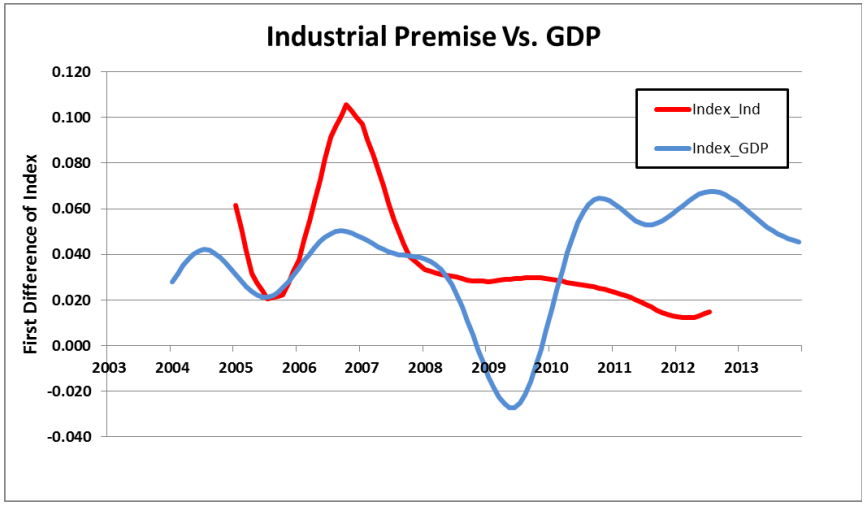


INDUSTRIAL DIFFERENCES









INDUSTRIAL MODELS

- Alternative Models were evaluated to assess the relative strength of competing independent variables.

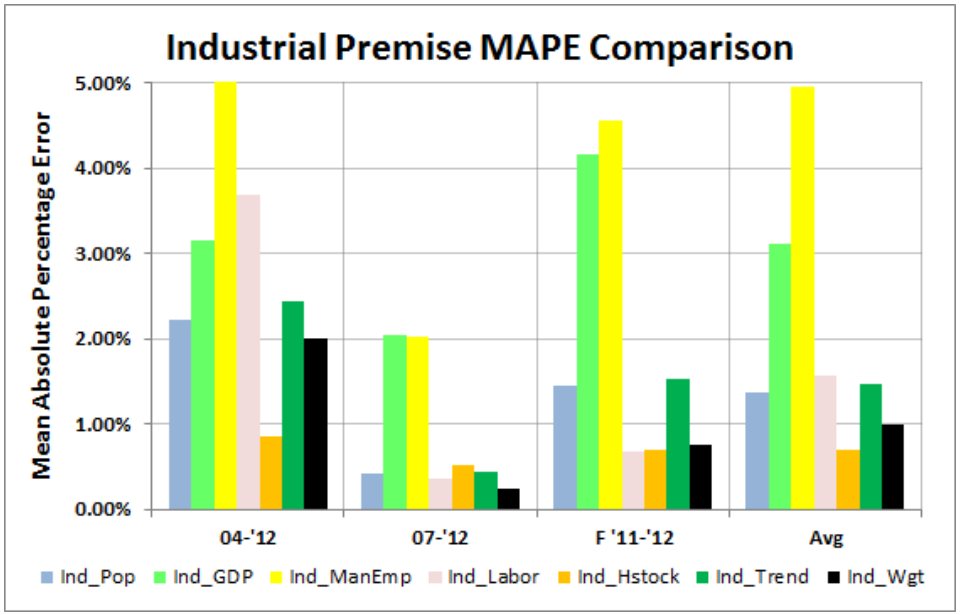
- A sharp spike in Industrial Premises occurs in 2007. The spike is not closely represented by any of the core economic indices. Itron chose to evaluate the data from 2007 forward in pursuit of a driving economic variable or composite of economic variables.

- Models were estimated over multiple estimation ranges and evaluated both in-sample and out-of-sample:
  - 2007 - 2012 (In-Sample)
  - 2007 - 2010 (In-Sample)
  - 2011 - 2012 (Out-of-Sample); with estimation from 2007-2010

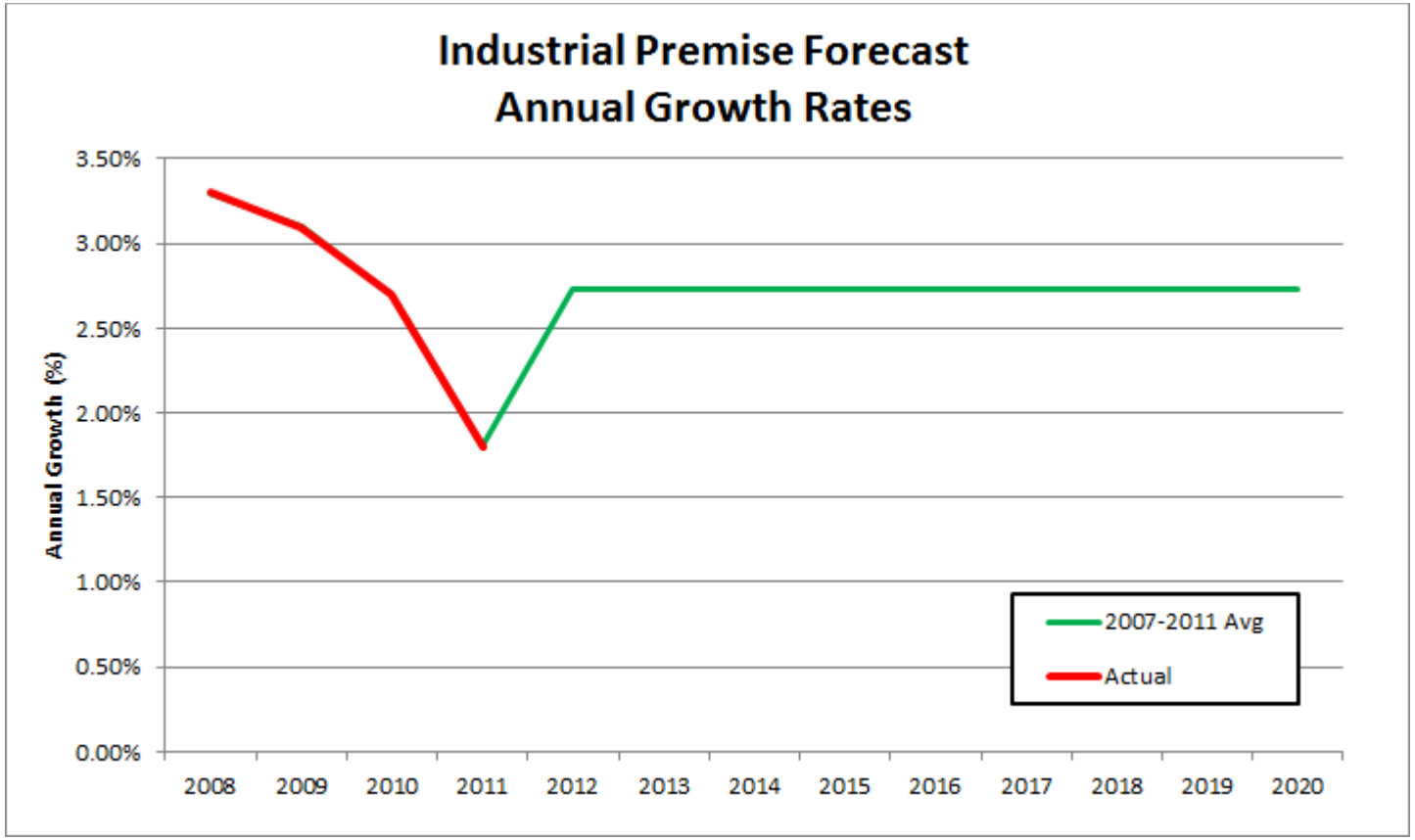
- The models were estimated over different time periods, and evaluated both in-sample and out-of-sample to examine their relative stability over time

INDUSTRIAL MODEL ACCURACY

ERCOT Industrial MAPE Comparison					
Model		04-'12	07-'12	F '11-'12	Avg
Ind_Pop		2.23%	0.43%	1.45%	1.37%
Ind_GDP		3.15%	2.04%	4.17%	3.12%
Ind_ManEmp		8.30%	2.02%	4.57%	4.96%
Ind_Labor		3.69%	0.36%	0.68%	1.58%
Ind_Hstock		0.86%	0.52%	0.69%	0.69%
Ind_Trend		2.45%	0.45%	1.53%	1.48%
Ind_Wgt		2.01%	0.24%	0.75%	1.00%



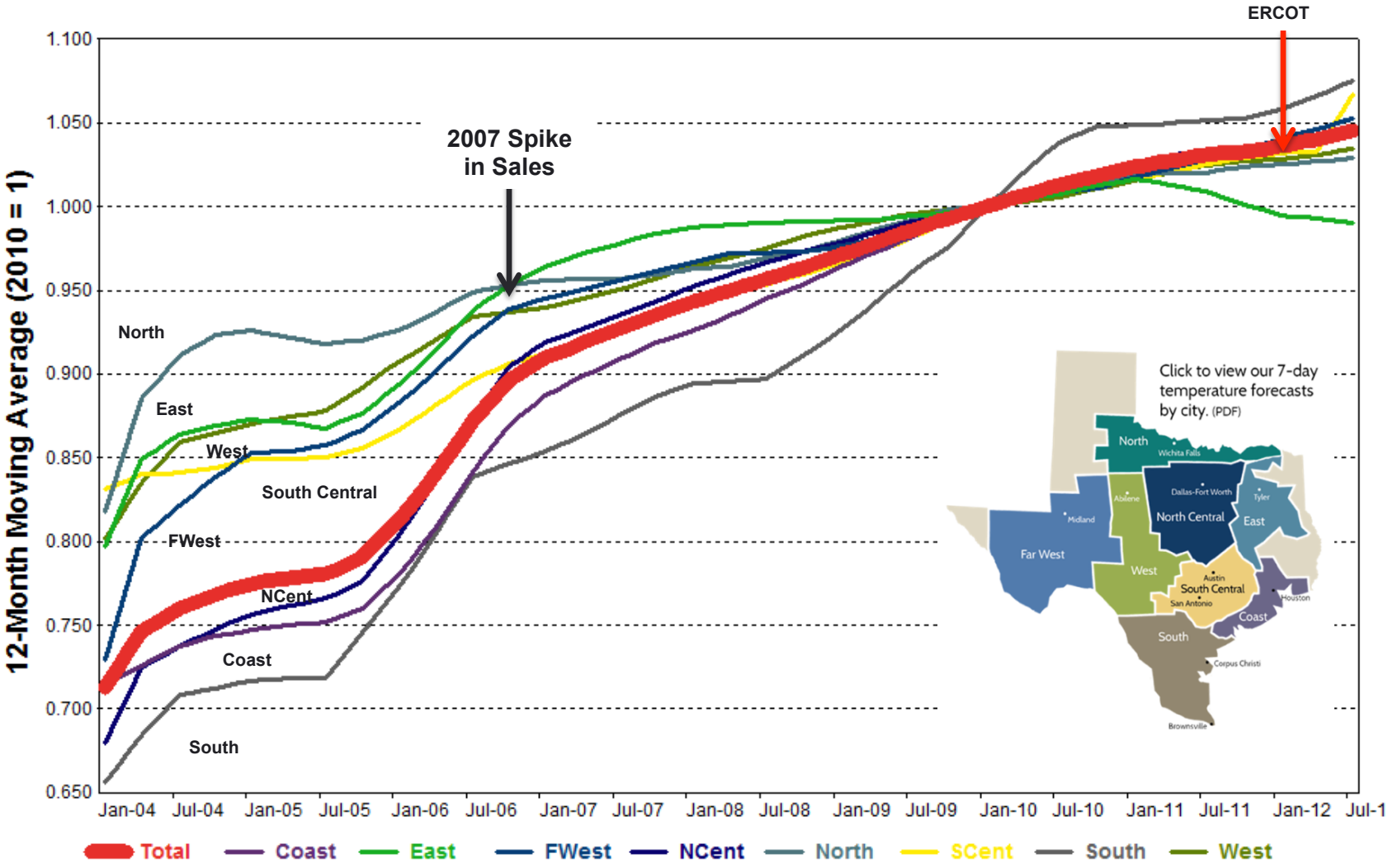
TOTAL INDUSTRIAL GROWTH FORECAST



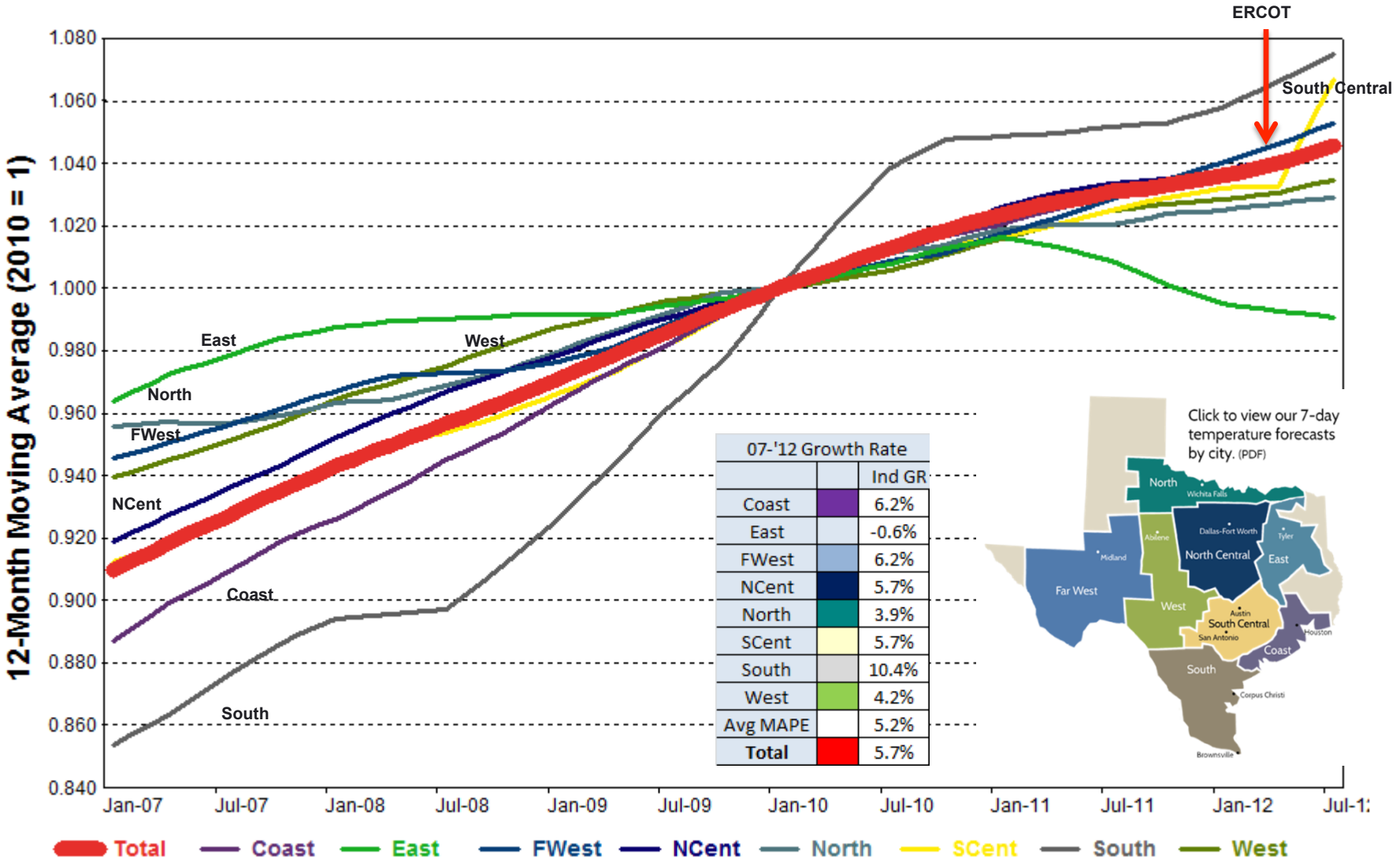
2007-2011 Average: 2.72% per year (2013-2020)

REGIONAL
INDUSTRIAL PREMISES

INDUSTRIAL PREMISES BY REGION

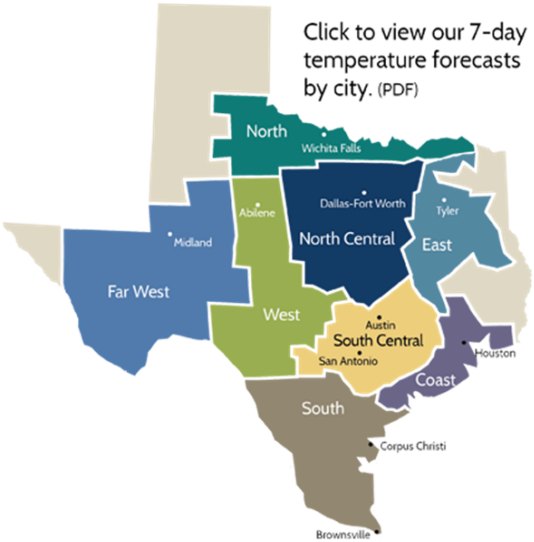


INDUSTRIAL PREMISES BY REGION



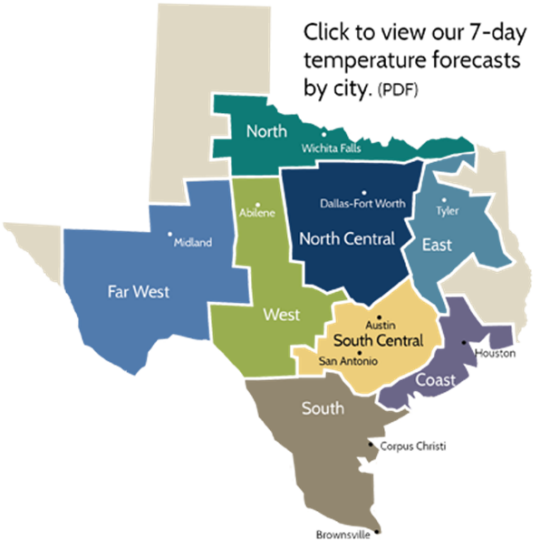
07-'12 Growth Rate		Ind GR
Coast		6.2%
East		-0.6%
FWest		6.2%
NCent		5.7%
North		3.9%
SCent		5.7%
South		10.4%
West		4.2%
Avg MAPE		5.2%
Total		5.7%

BUSINESS REGIONAL FORECAST ACCURACY



07-'12 Growth Rate			MAPE Comparison ('07 - '12)		
		Ind GR	Trend	HS	Delta
East		-0.6%	0.63%	0.55%	-0.08%
North		3.9%	0.36%	0.74%	0.38%
West		4.2%	0.32%	0.21%	-0.11%
NCent		5.7%	0.41%	0.41%	0.00%
SCent		5.7%	0.41%	0.55%	0.14%
Coast		6.2%	0.69%	0.59%	-0.10%
FWest		6.2%	0.24%	0.74%	0.50%
South		10.4%	1.23%	0.27%	-0.96%
Avg MAPE		5.2%	0.54%	0.51%	-0.03%
Total		5.7%	0.45%	0.52%	0.07%

INDUSTRIAL REGIONAL FORECAST ACCURACY 2



Industrial Region Average MAPE				
	2007-2012	2007-2010	2007 - 2010; **Out of Sample 2011 - 2012**	Average
Trend	0.54%	0.36%	1.44%	0.78%
Index	0.51%	0.39%	0.98%	0.63%
Delta	-0.03%	0.03%	-0.46%	-0.15%

ITRON INDUSTRIAL RECOMMENDATIONS

Recommendation 1:

Continue to use a 5 year rolling average growth rate to drive the Industrial Premise models.

The Industrial Premise data demonstrate a sharp spike in 2007 (10.3%), which is not closely represented by any of the core economic indices. Itron evaluated the data from 2007 forward in search of a driver that explains the recent growth in Industrial Premises.

The variable which best explained the recent history was Housing Stock.
Housing Stock also outperformed alternative economic index variables.

However, the implementation of Housing Stock as the chief economic driver of Industrial Premises did not yield a profound improvement over ERCOT's existing method.

Recommendation 2:

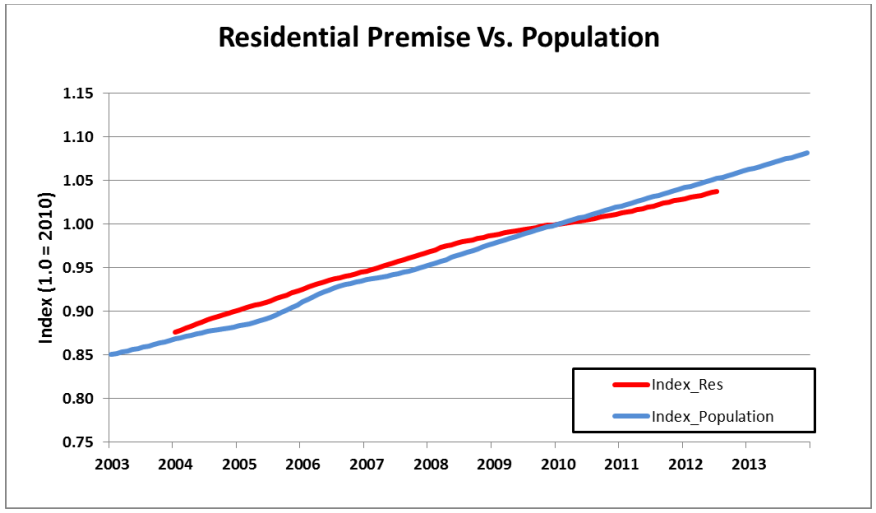
In the South region, a 2 year rolling average growth rate should be implemented (2010 Forward).

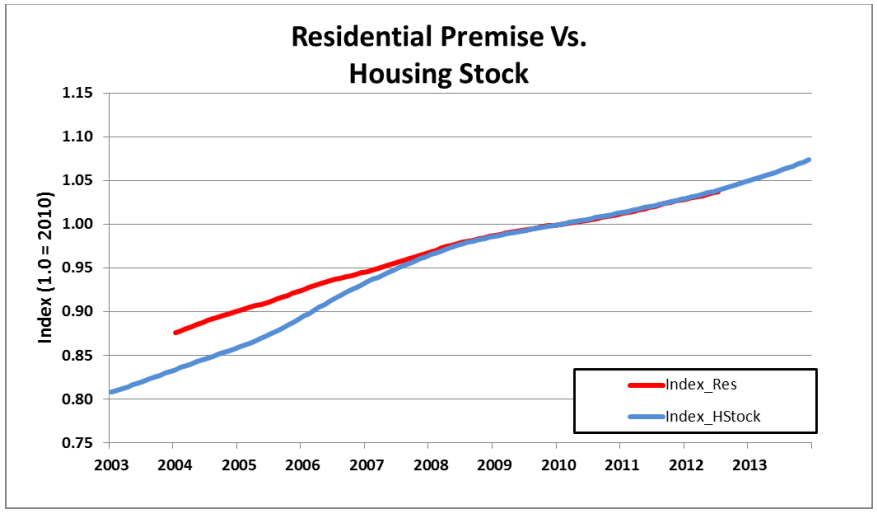
The growth rate for the South Region Industiral Premises is sharply reduced in 2010.

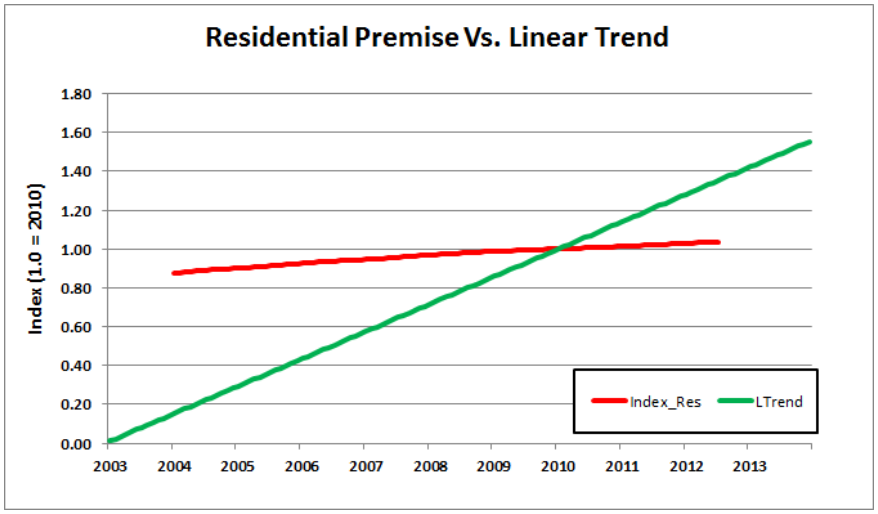
Currently, the 5-year rolling average growth rate generates a reasonable forecast for the other seven zones.
ERCOT should monitor the the Regional Industrial Premise growth rates to identify shifts in the data that require special treatment.

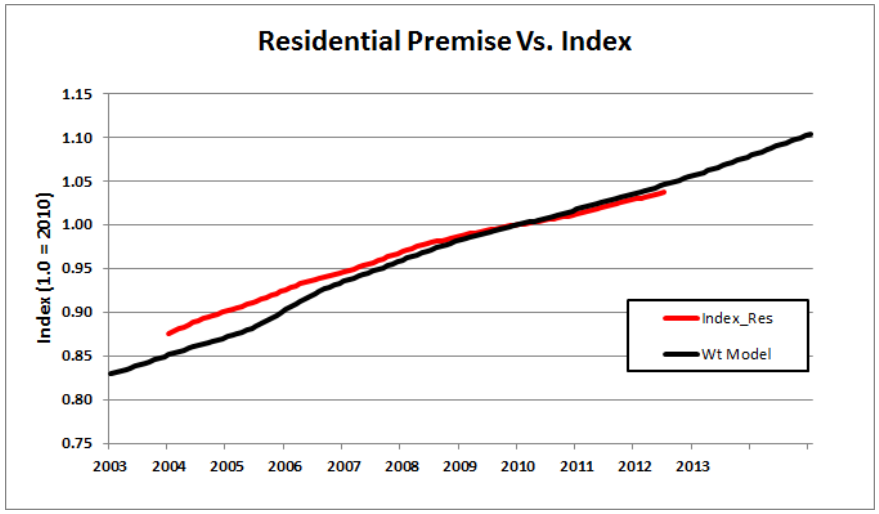
APPENDIX 1:
RESIDENTIAL REGIONAL INDICES

COAST – RESIDENTIAL INDICES

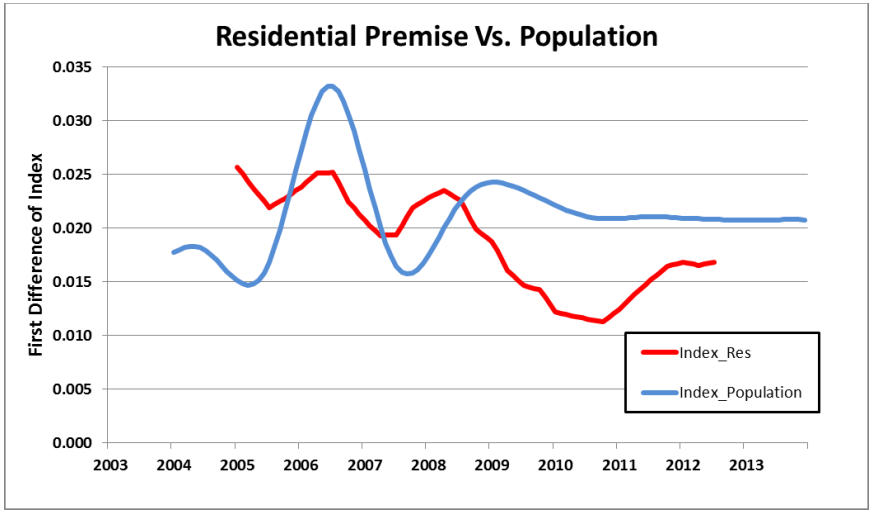


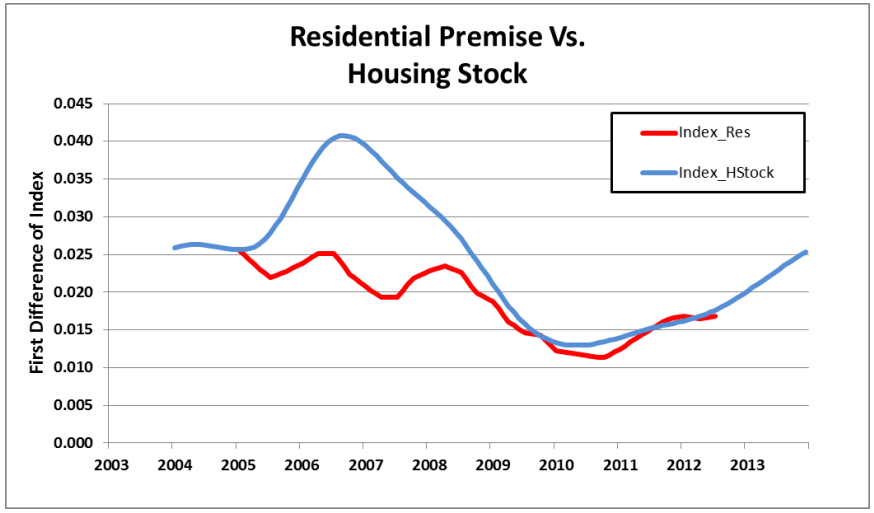


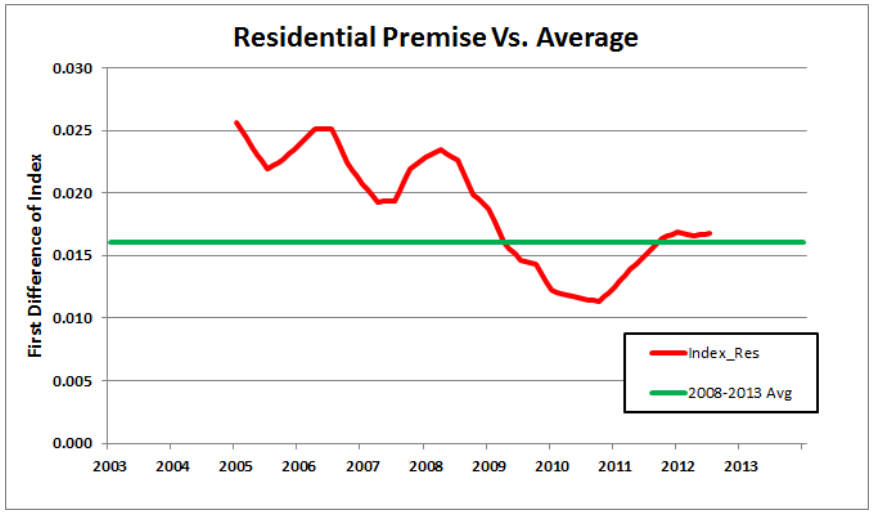


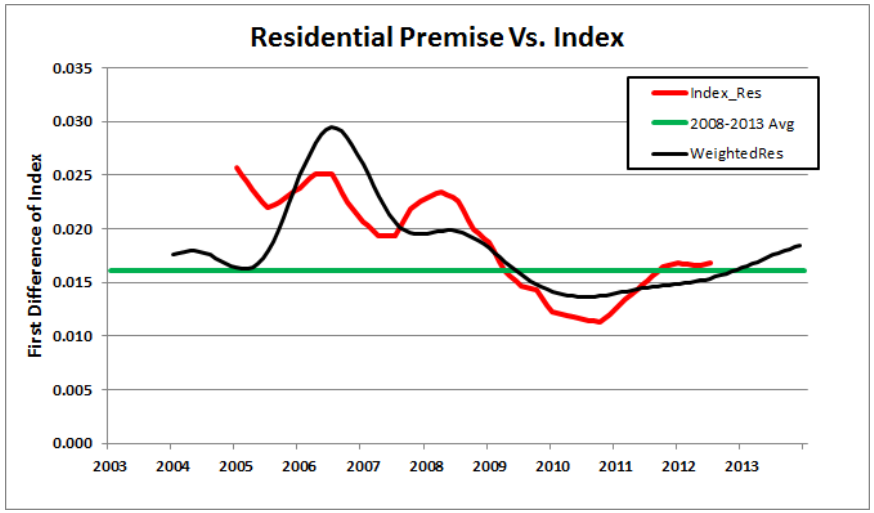


COAST – RESIDENTIAL DIFFERENCES

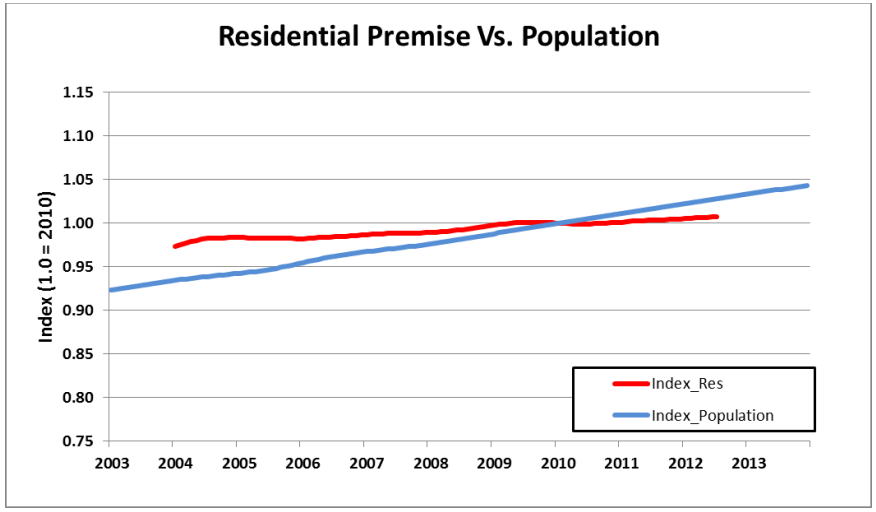


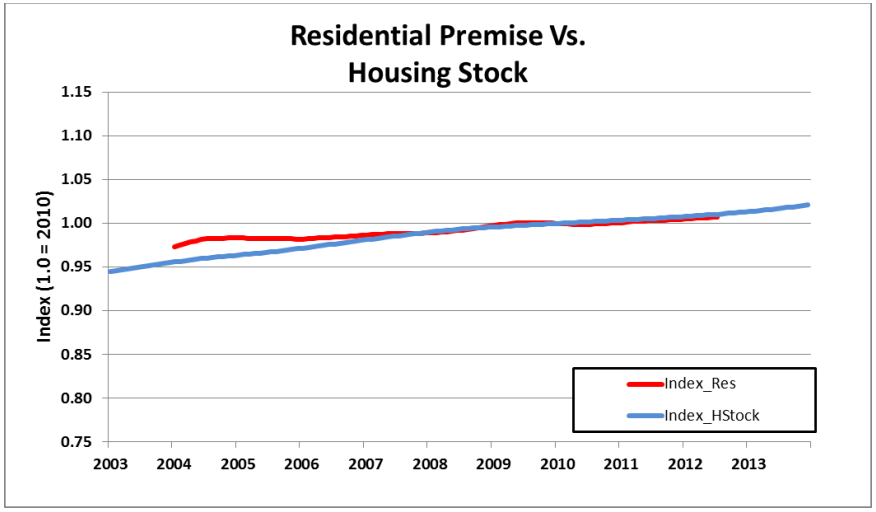


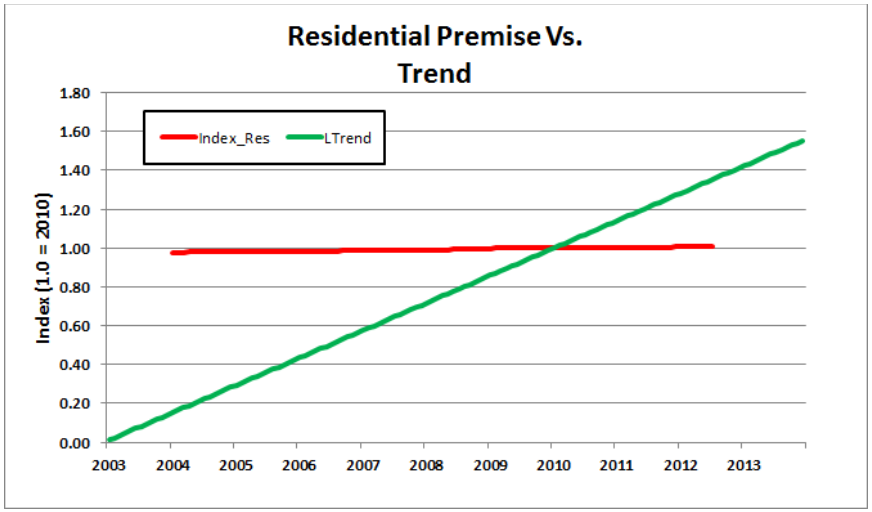


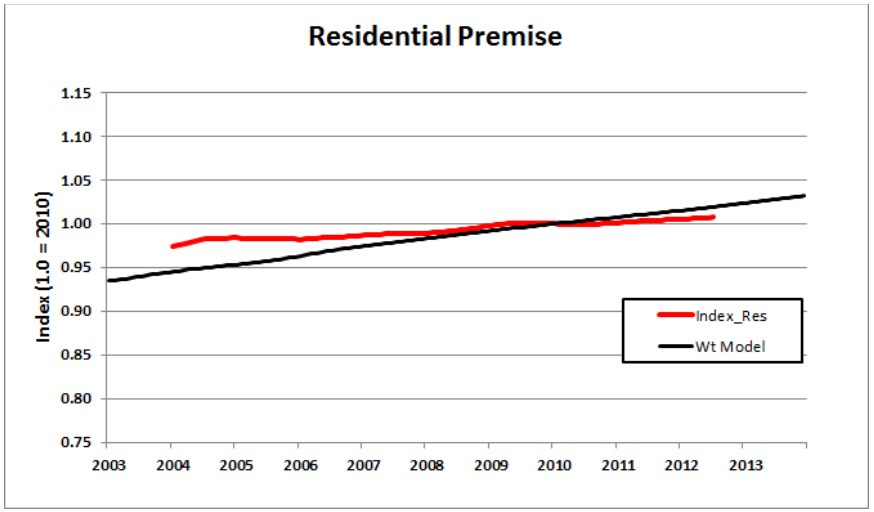


EAST – RESIDENTIAL INDICES

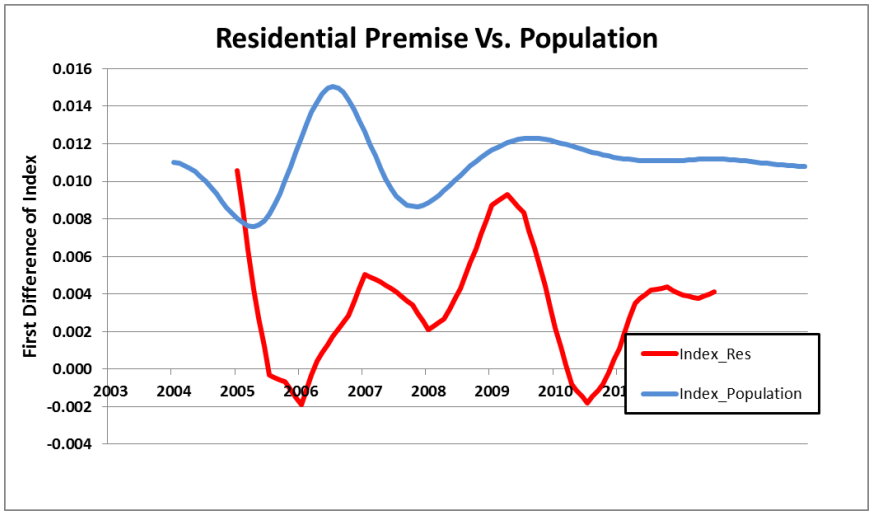


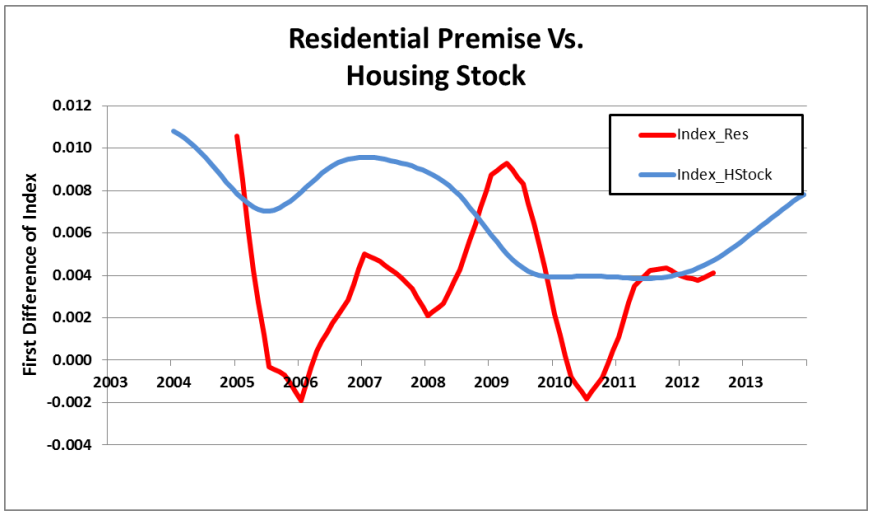


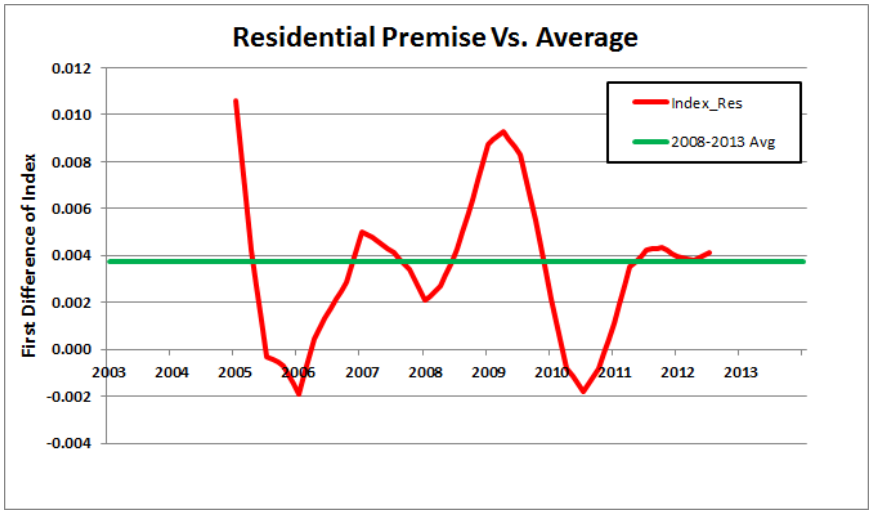


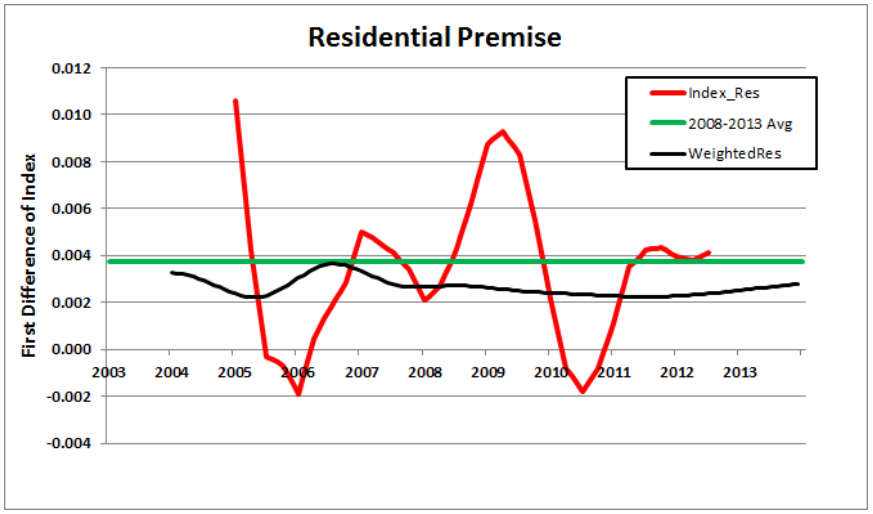


EAST – RESIDENTIAL DIFFERENCES

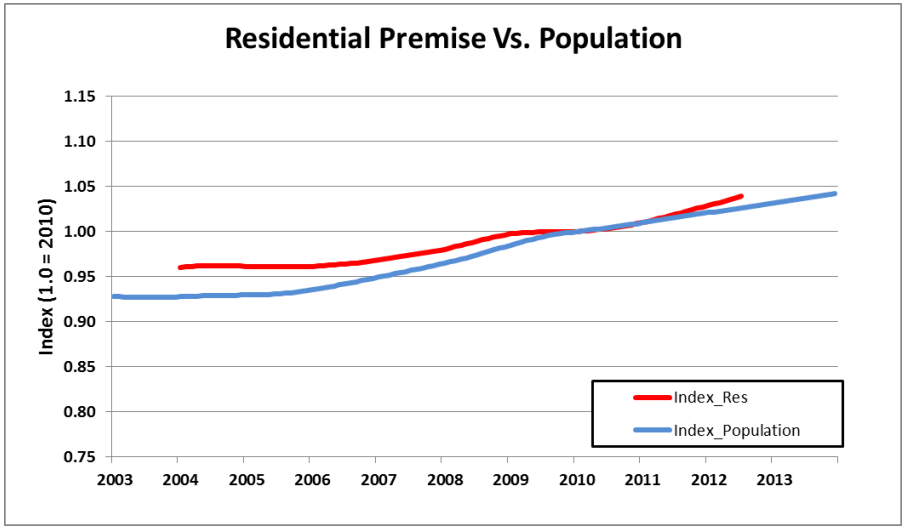


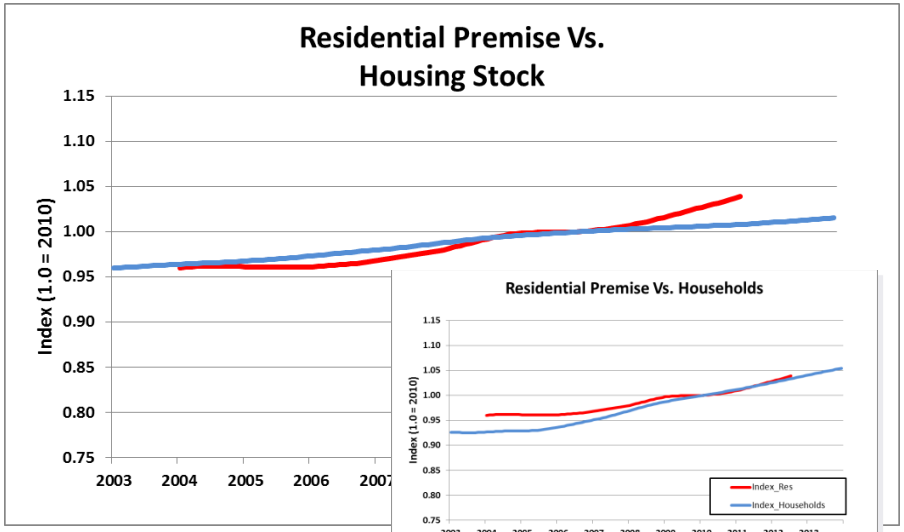


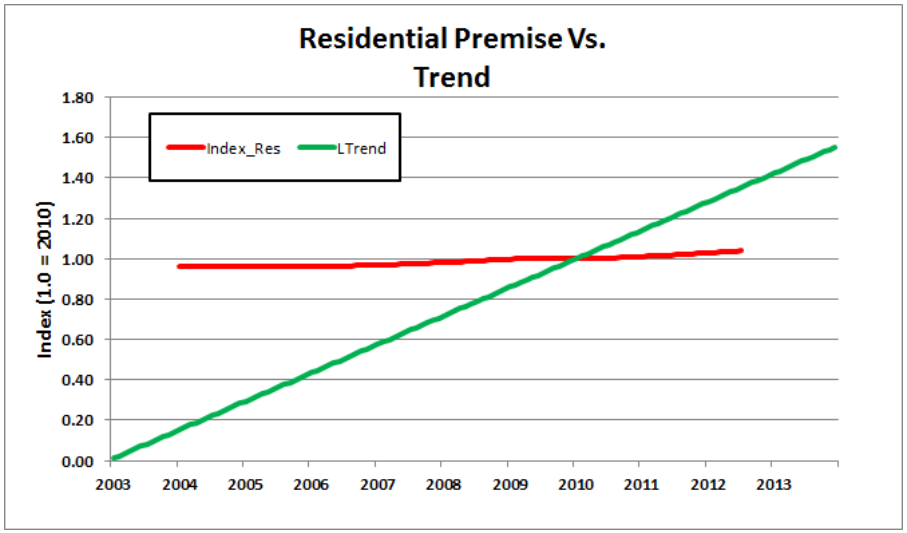


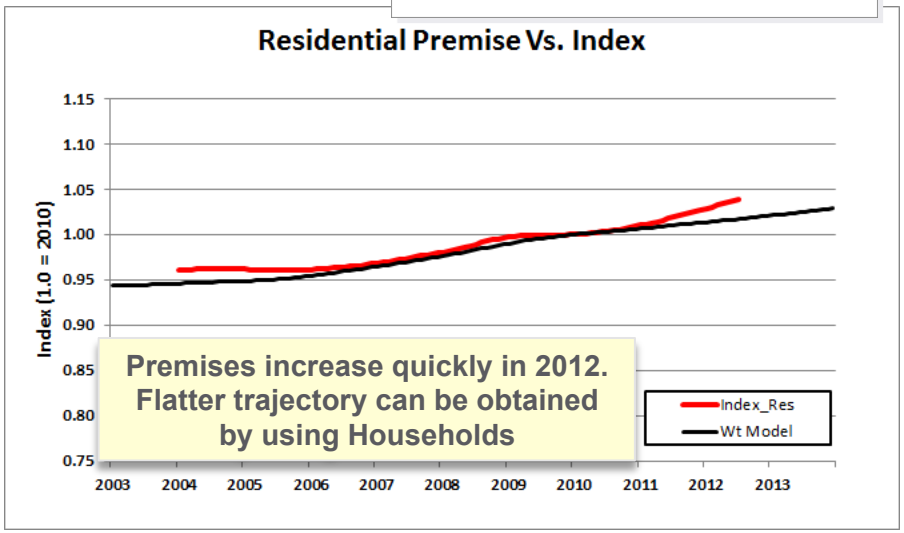


FWEST – RESIDENTIAL INDICES

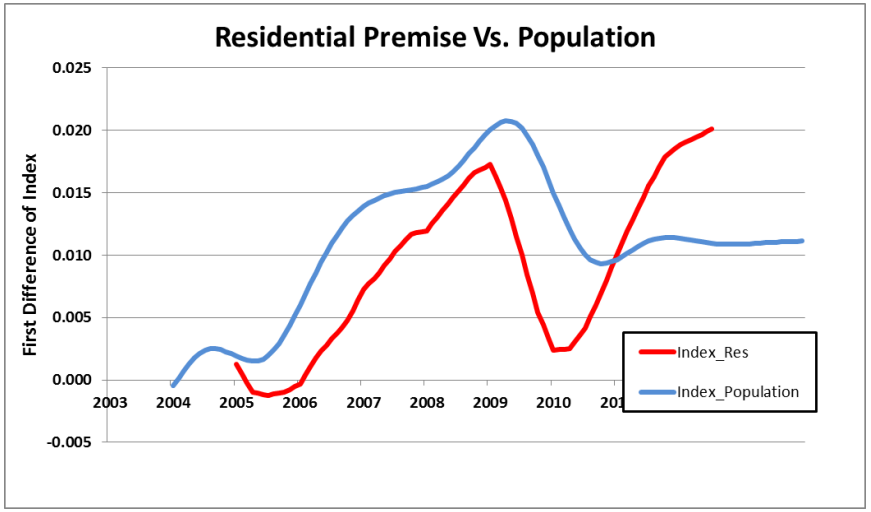


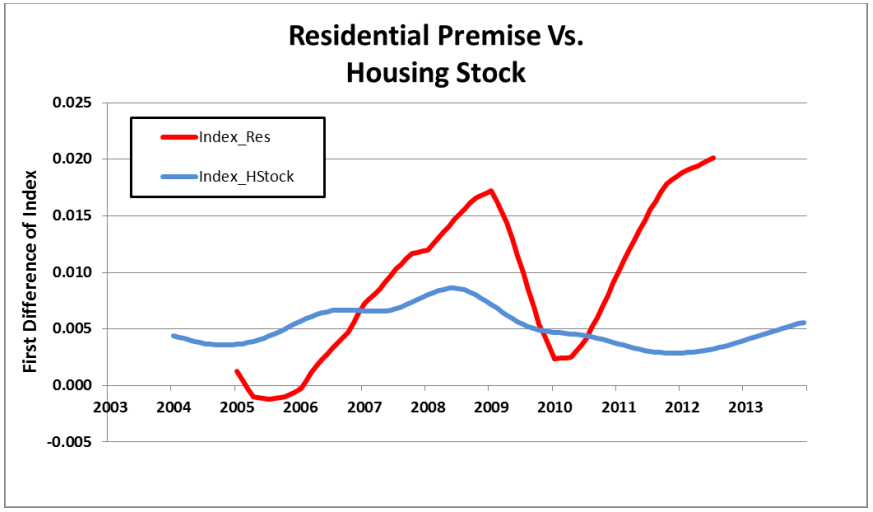


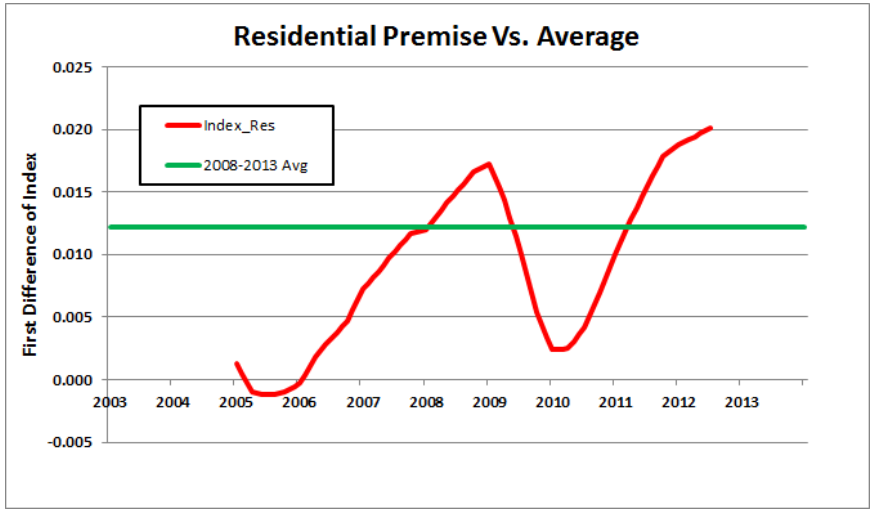


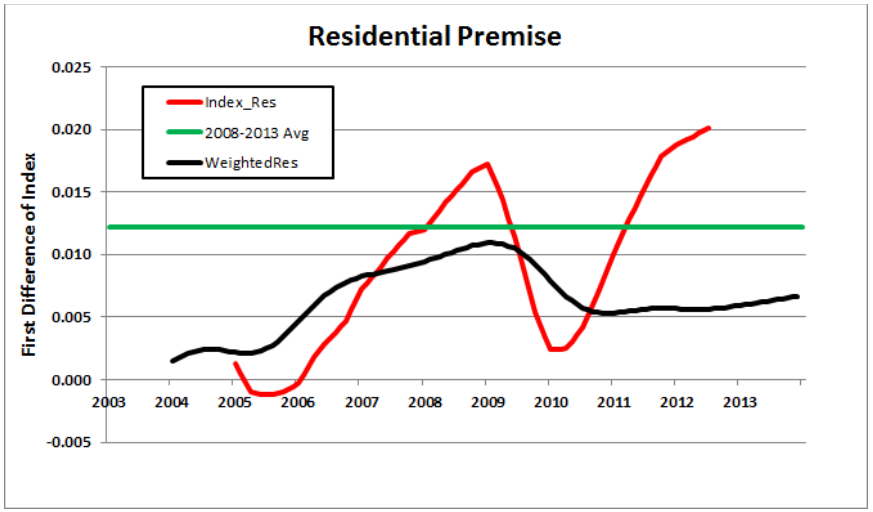


FWEST – RESIDENTIAL DIFFERENCES









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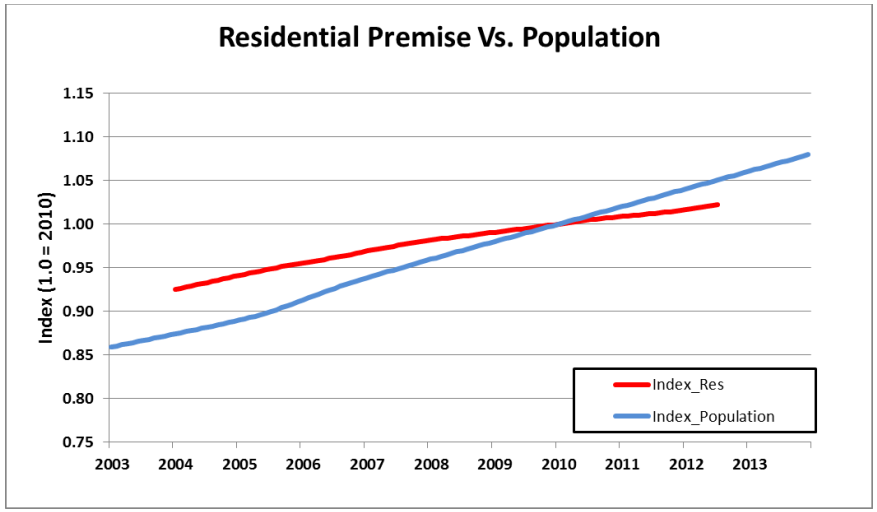
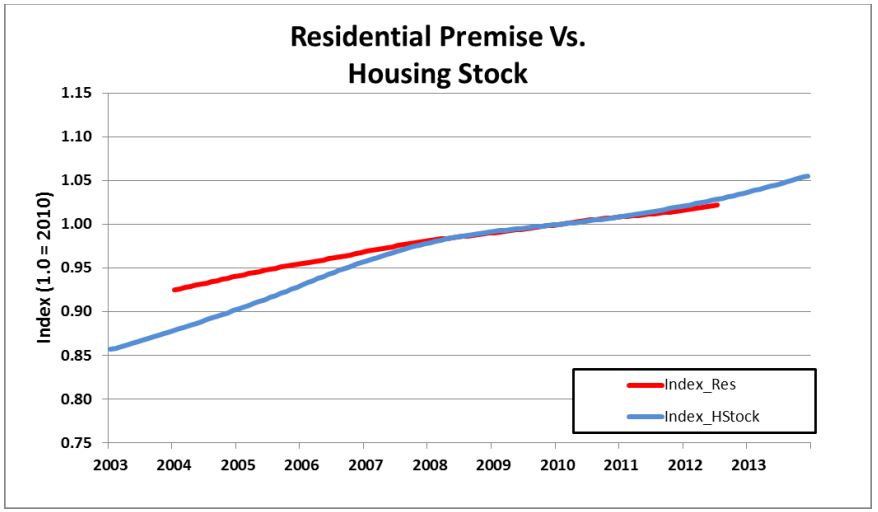
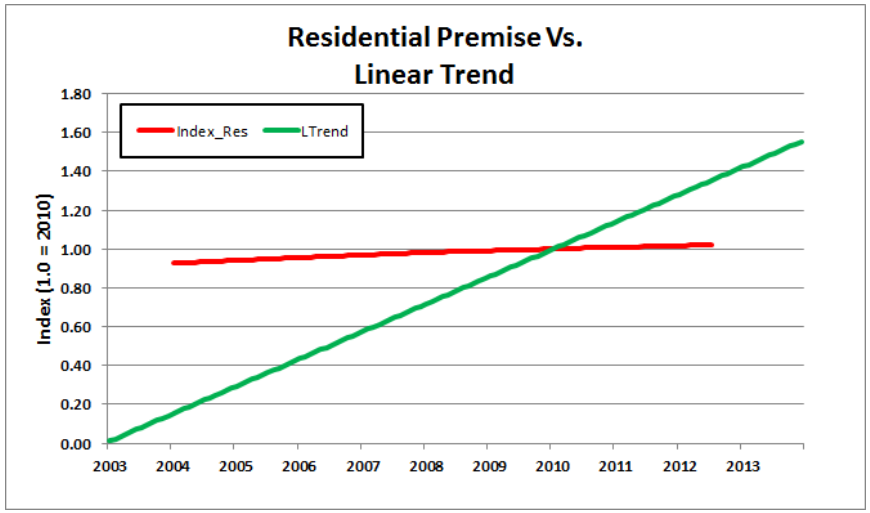
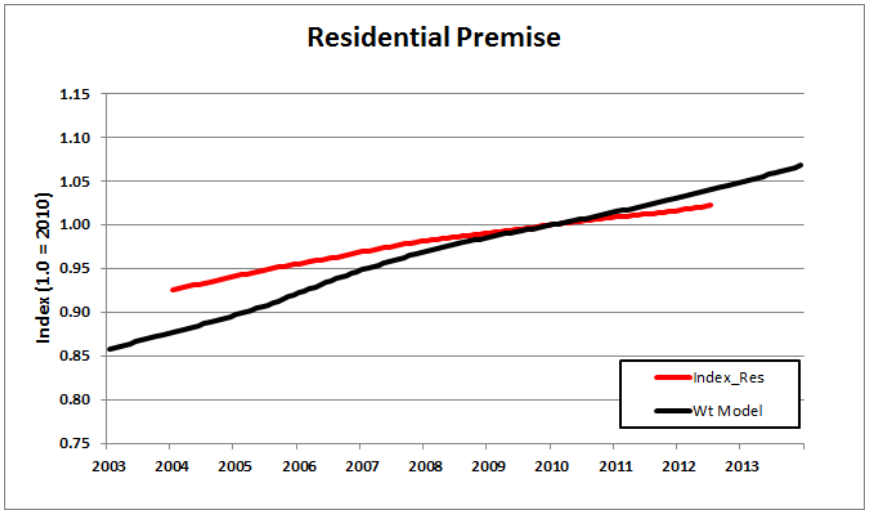
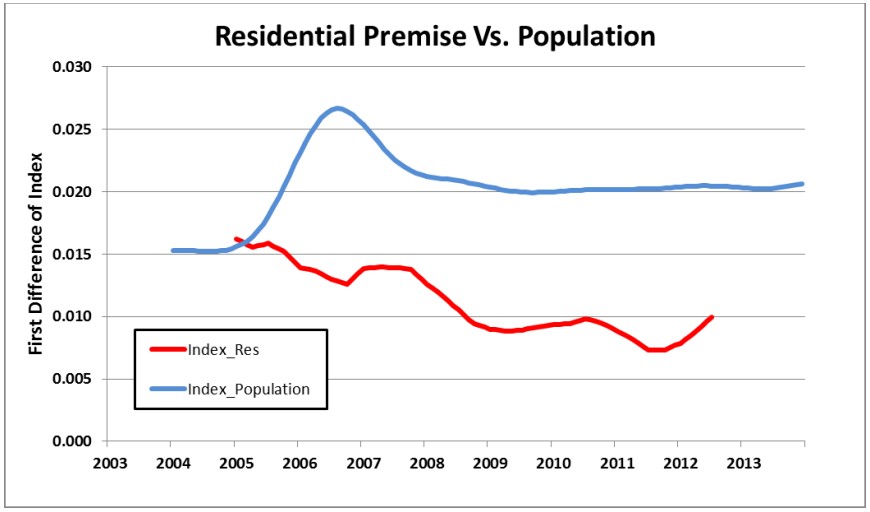


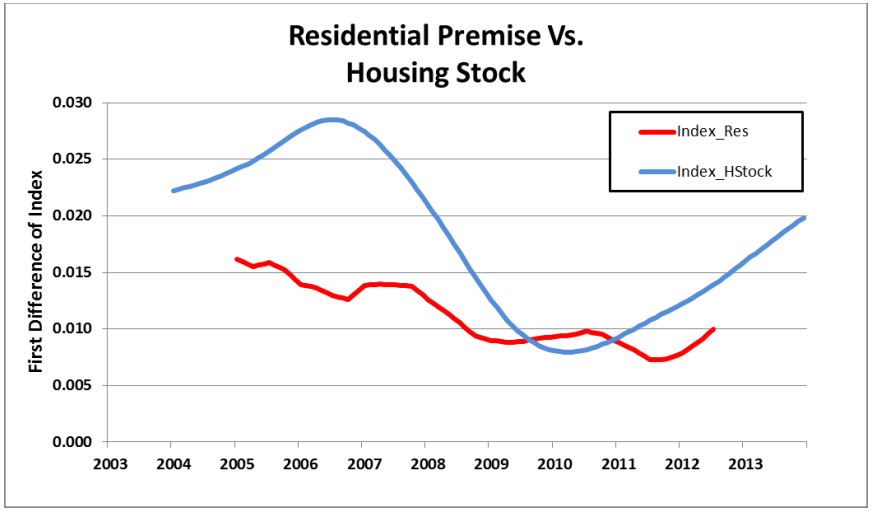


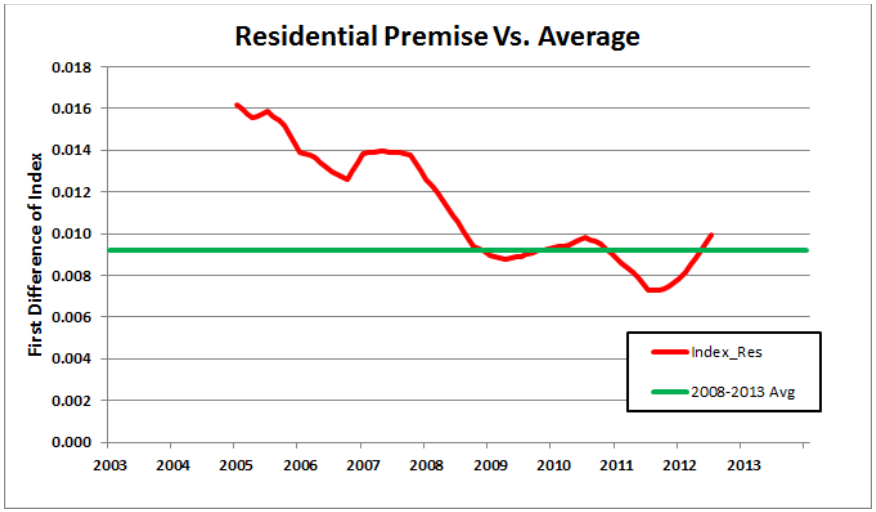


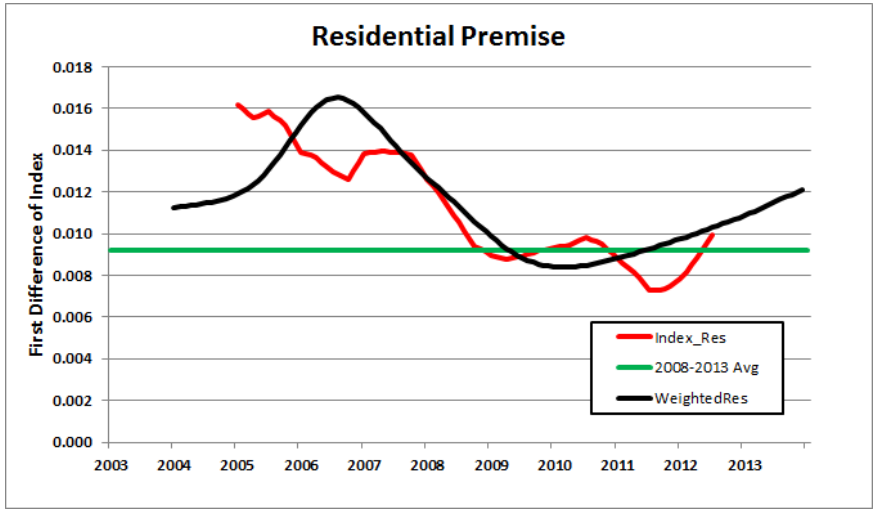


NCENT – RESIDENTIAL DIFFERENCES

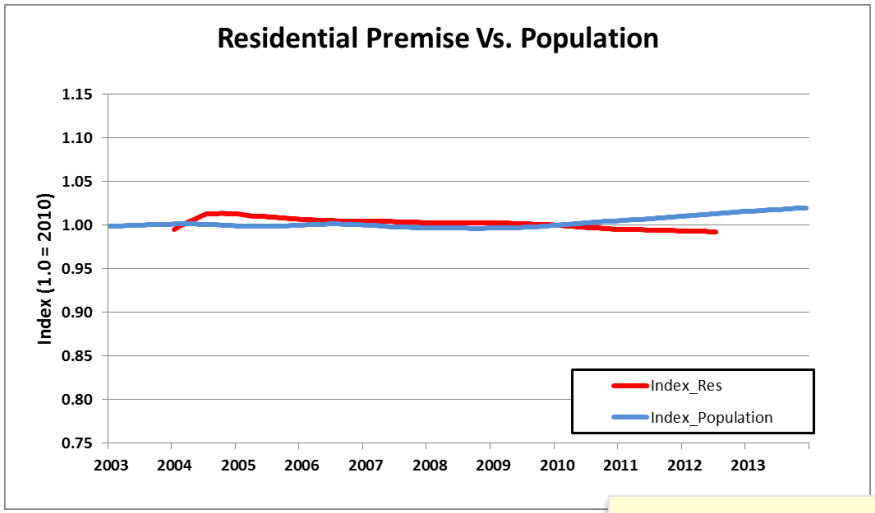


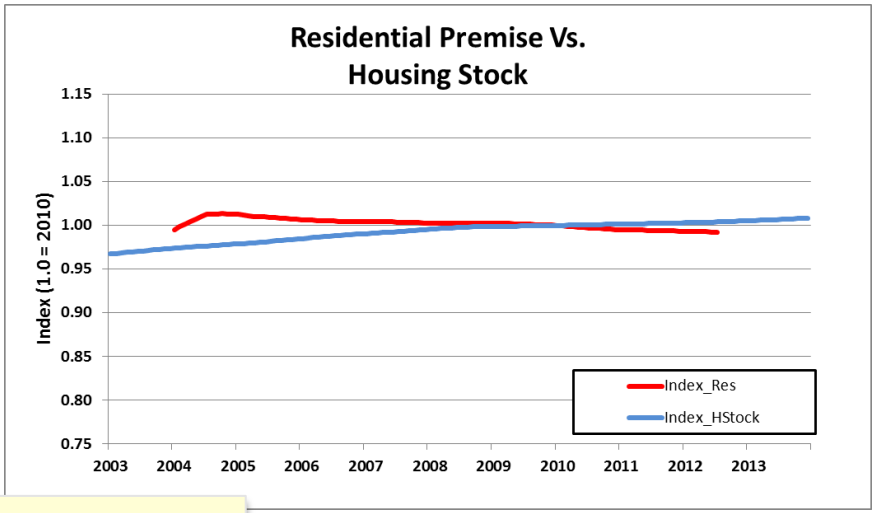




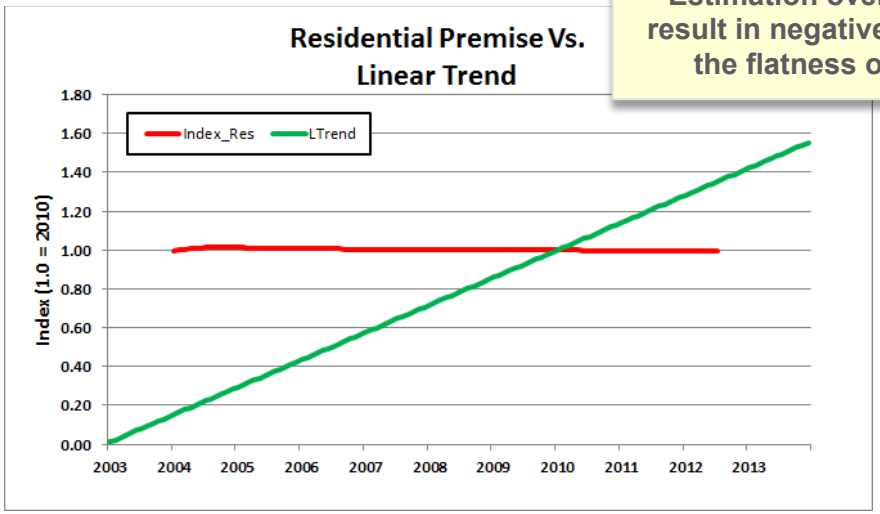


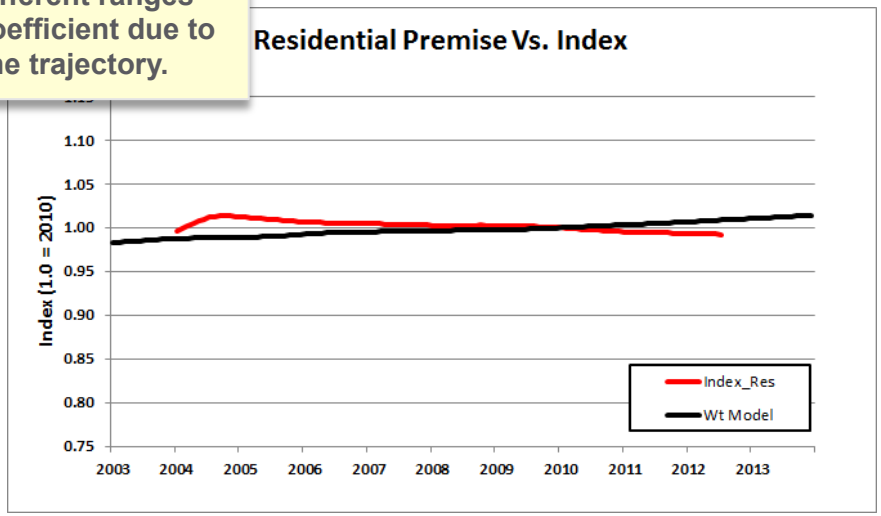
NORTH – RESIDENTIAL INDICES



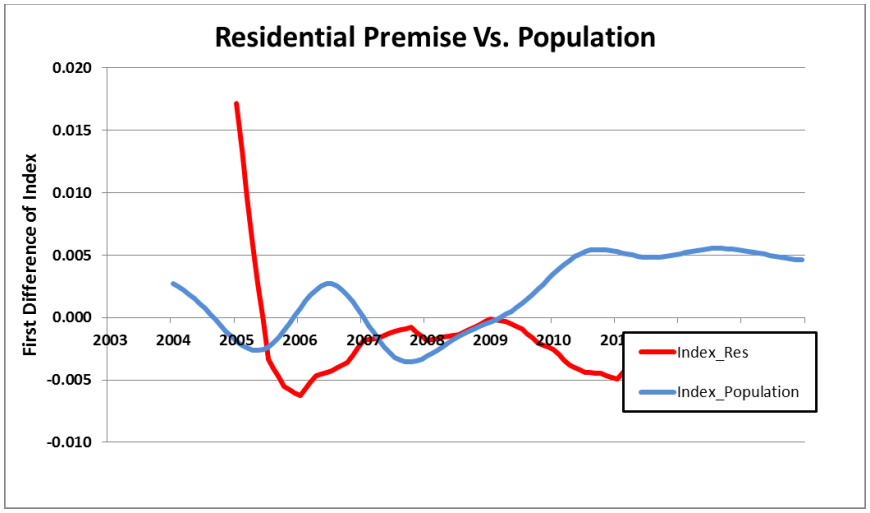


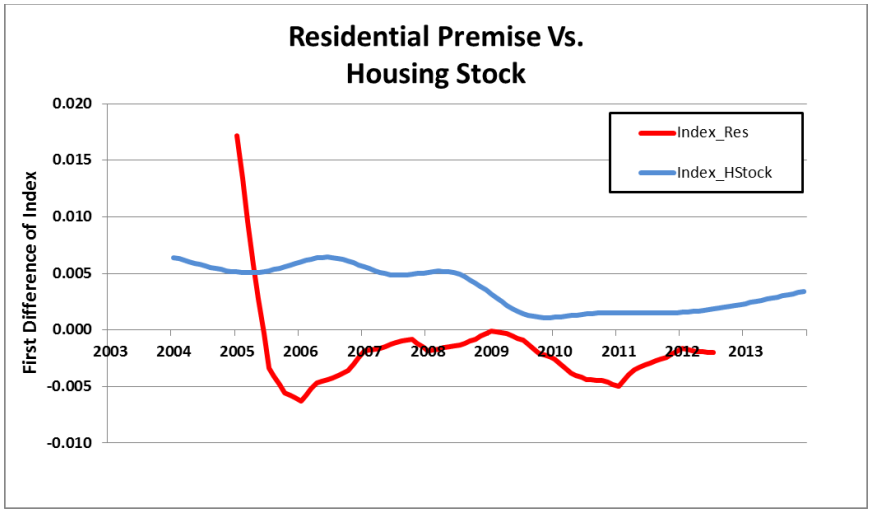
Estimation over different ranges result in negative coefficient due to the flatness of the trajectory.

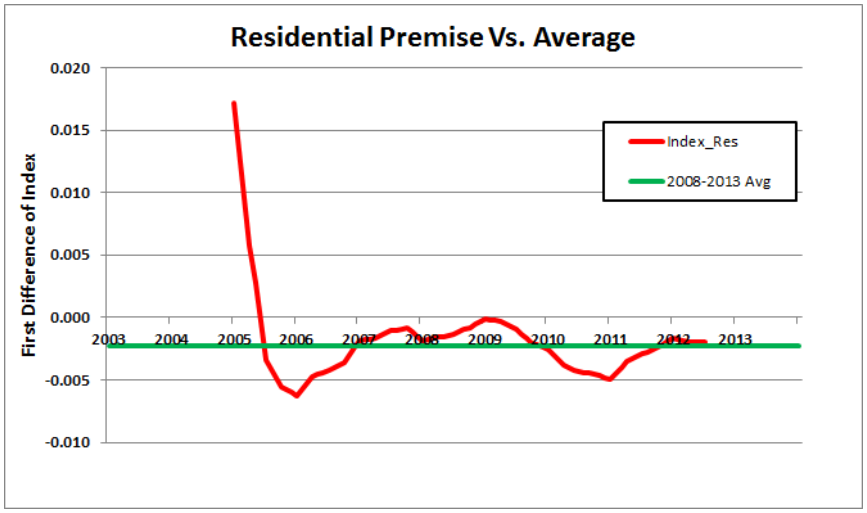


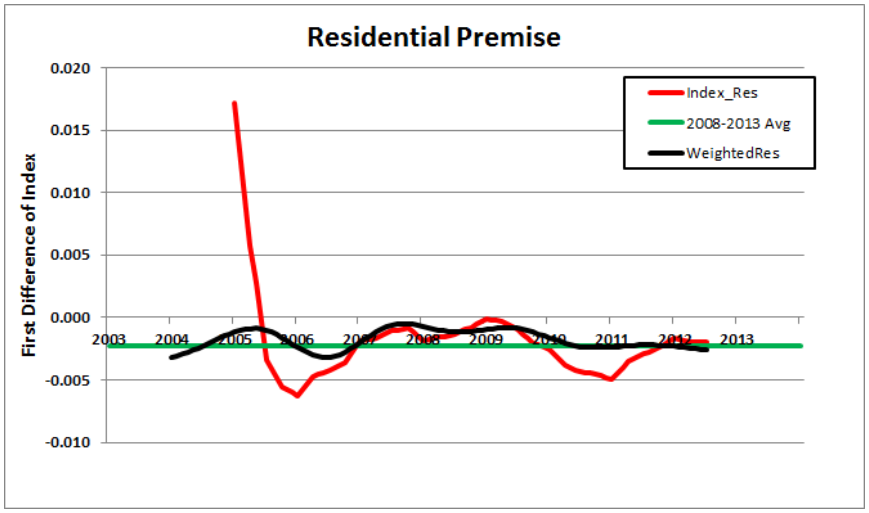


NORTH – RESIDENTIAL DIFFERENCES

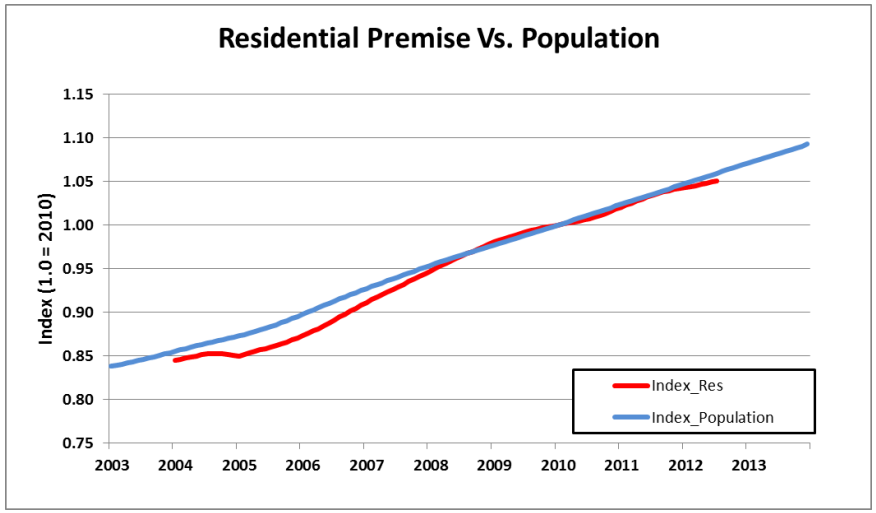


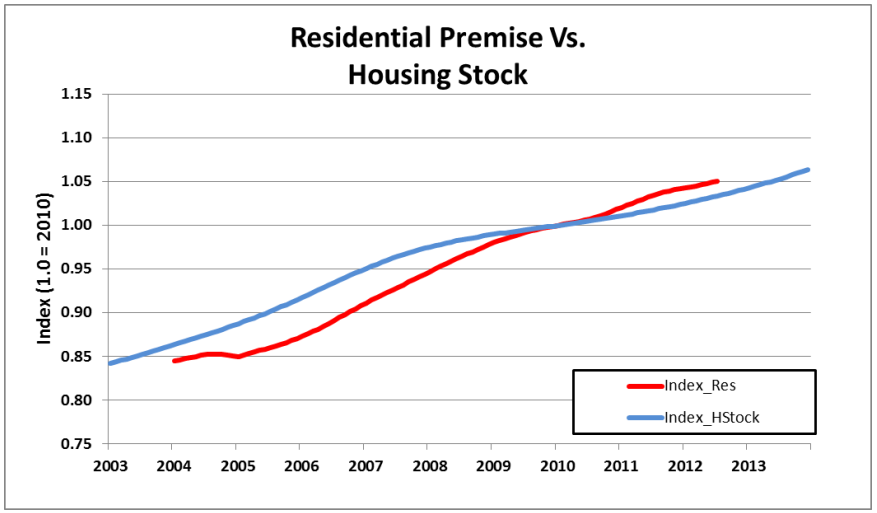


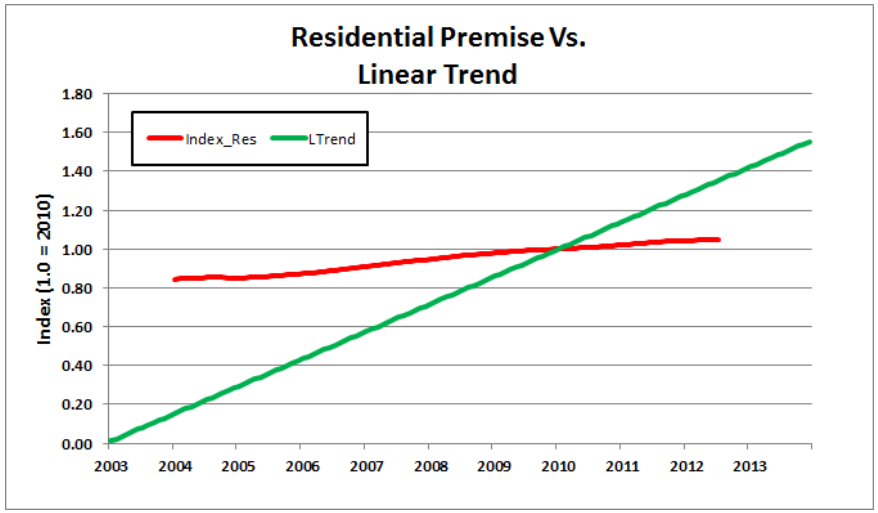


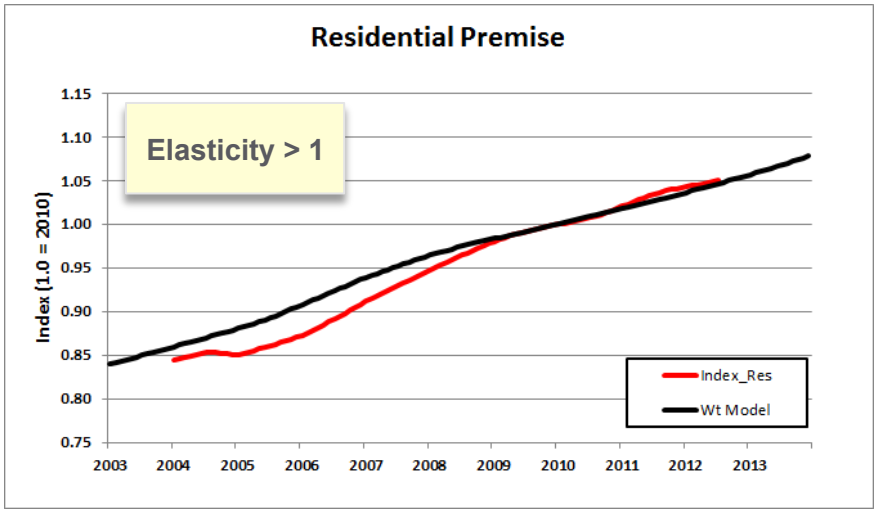


SCENT – RESIDENTIAL INDICES

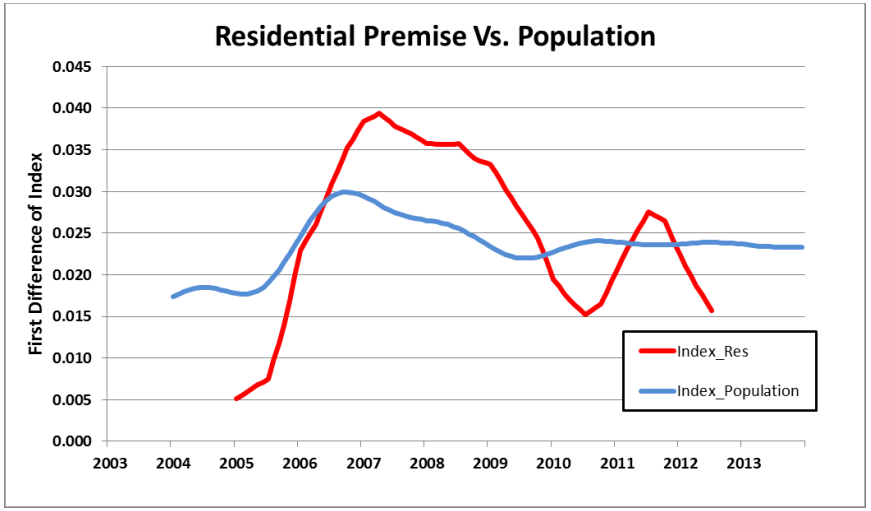


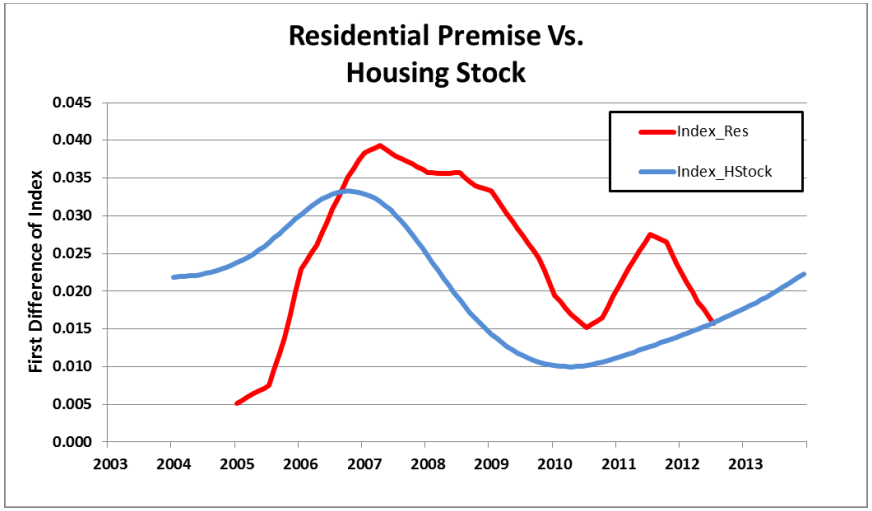


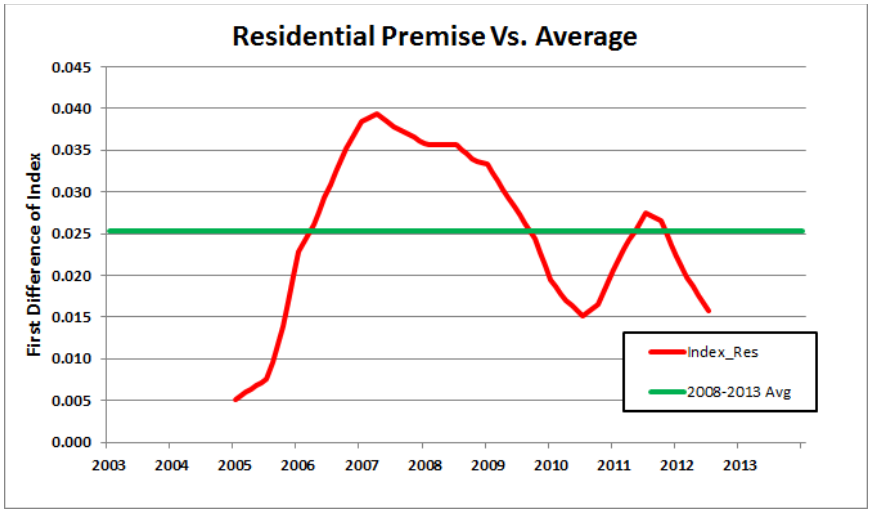


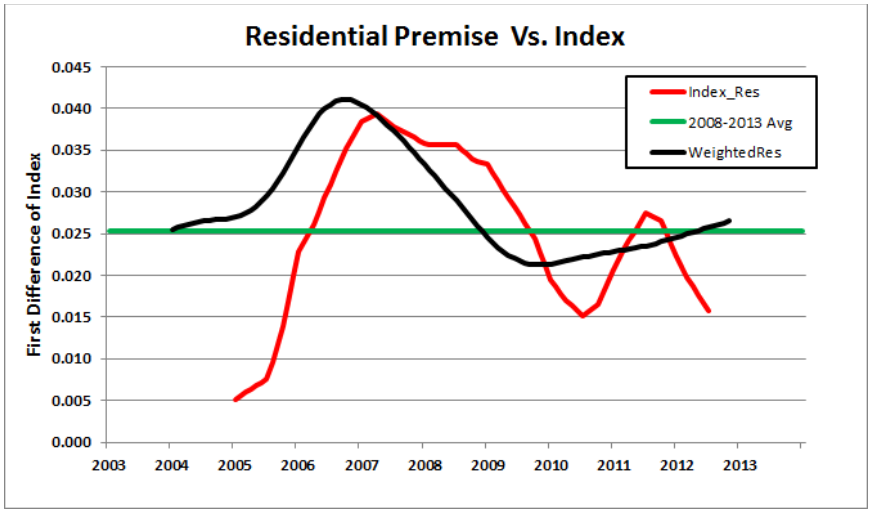


SCENT – RESIDENTIAL DIFFERENCES

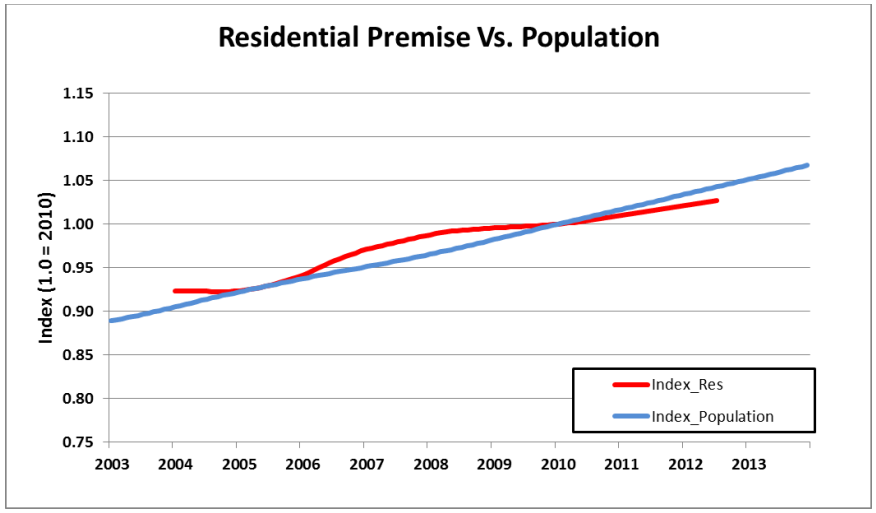


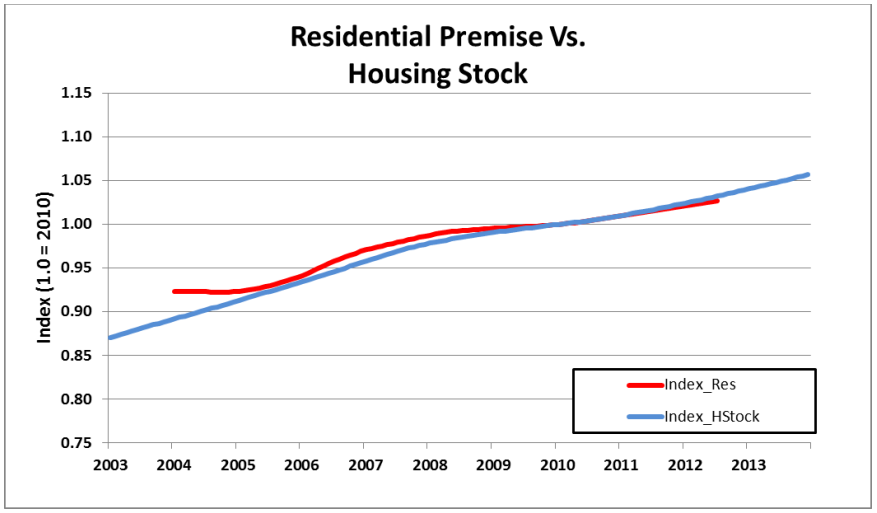


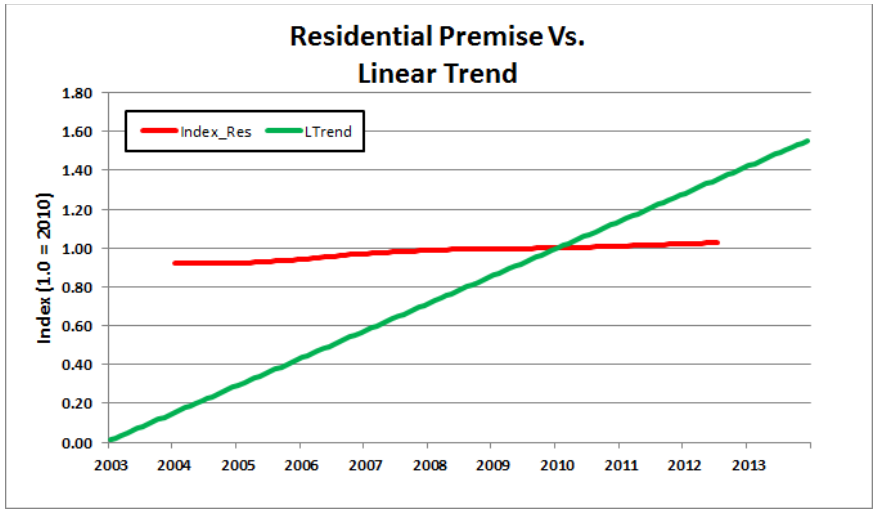


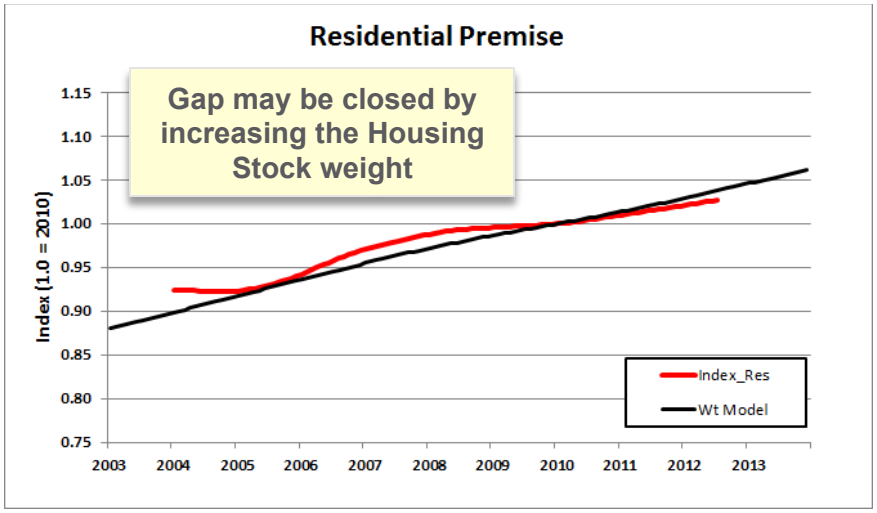


SOUTH – RESIDENTIAL INDICES

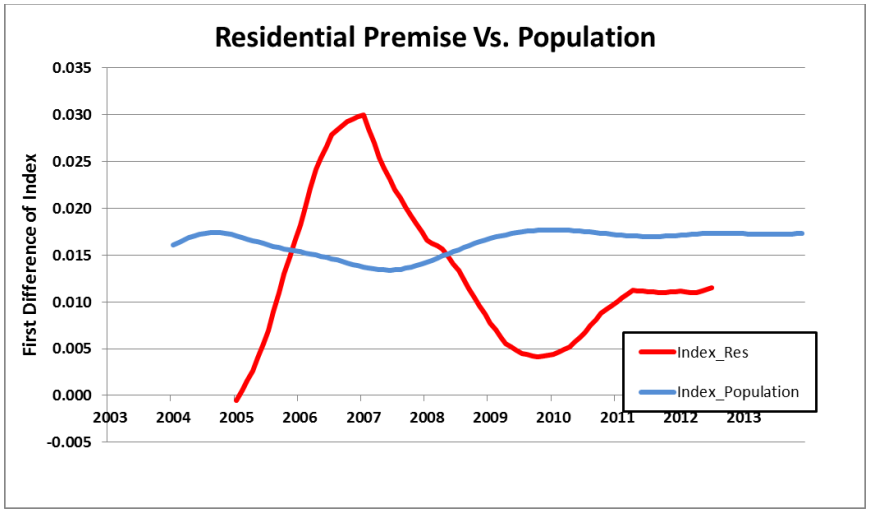


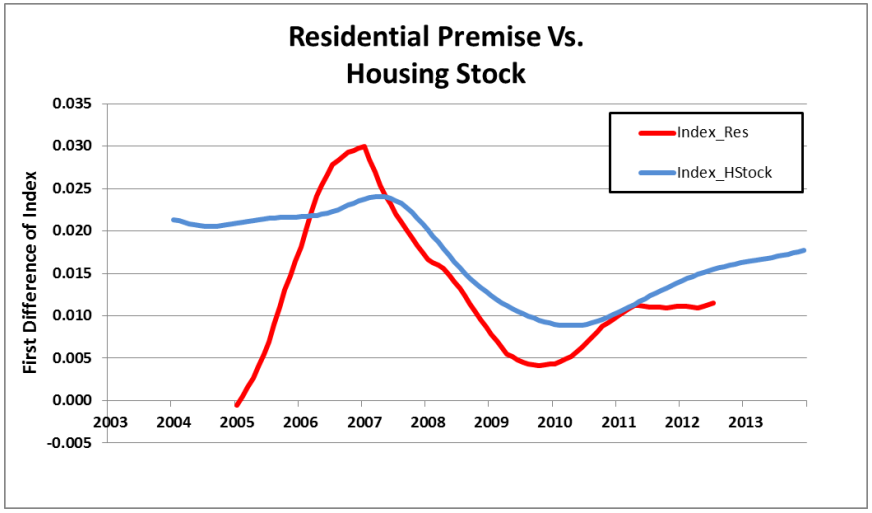


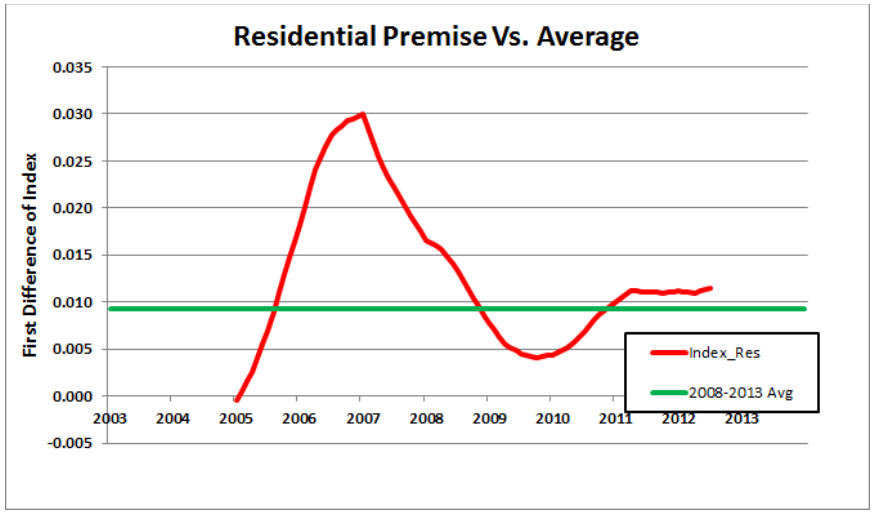


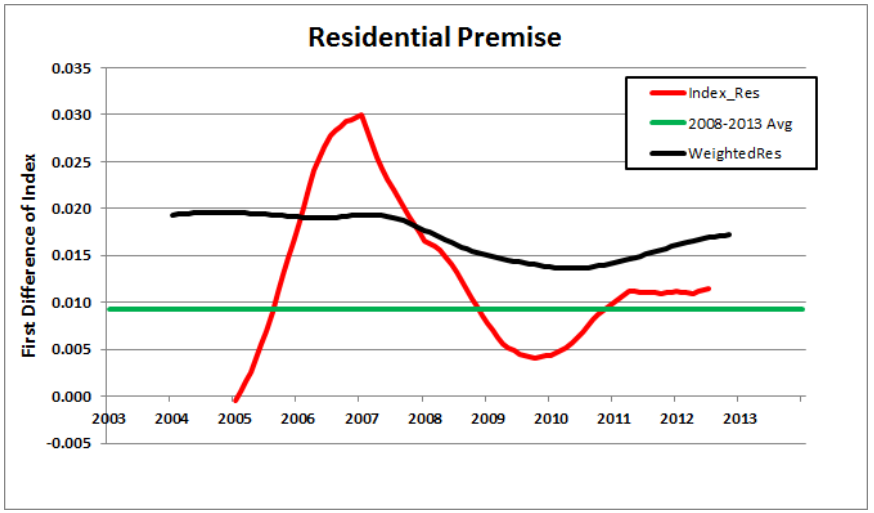


SOUTH – RESIDENTIAL DIFFERENCES

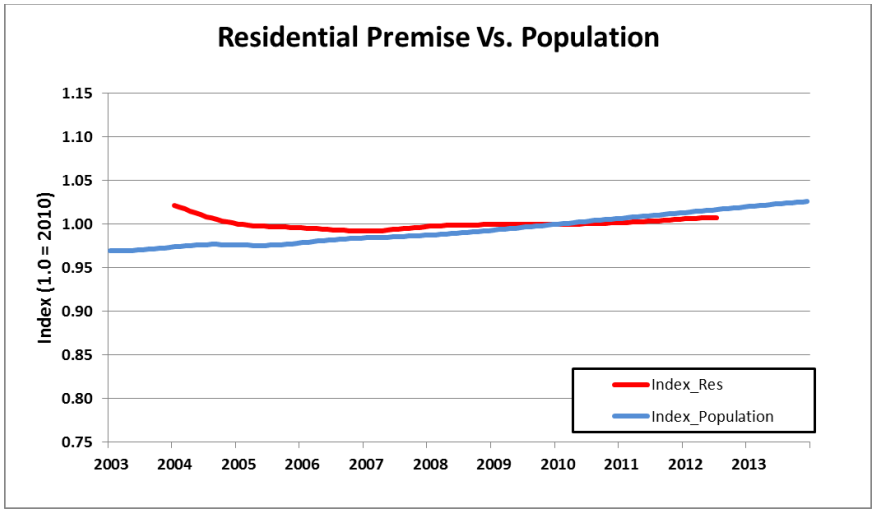


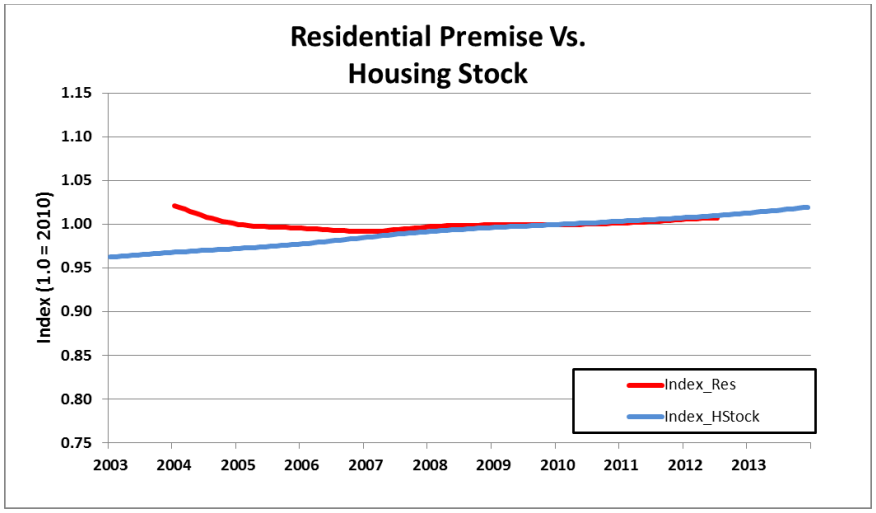


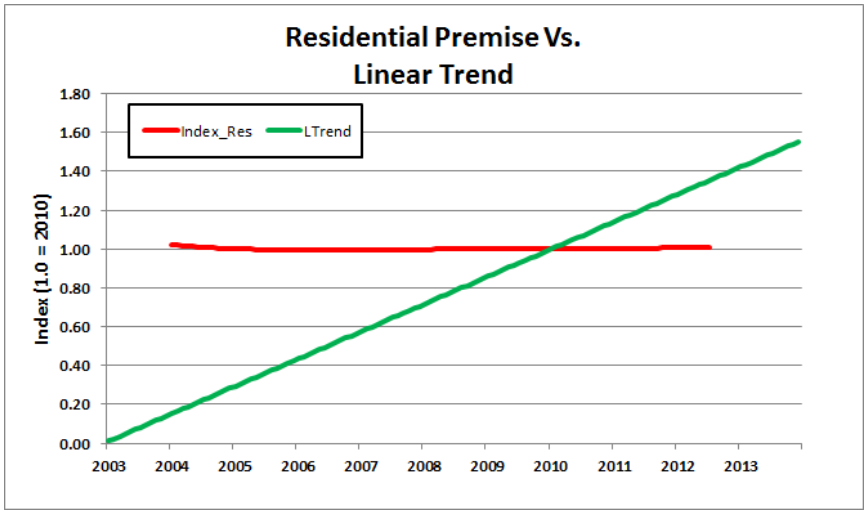


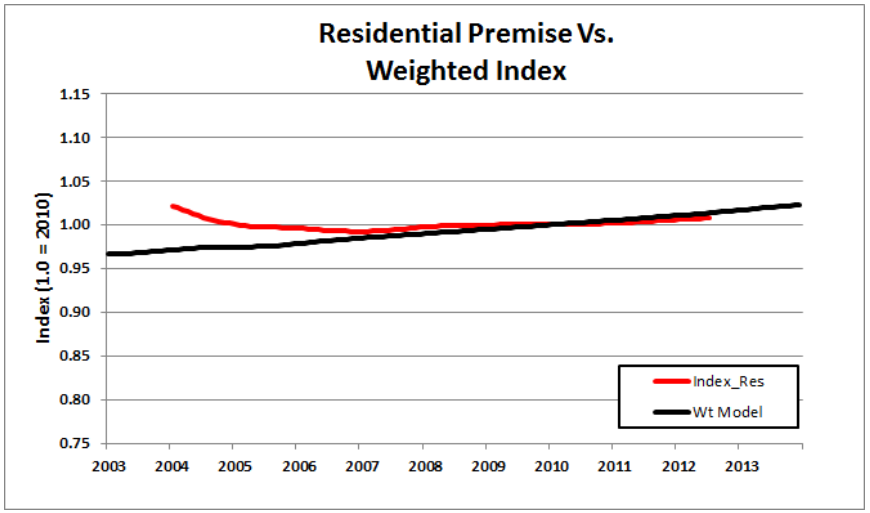


WEST – RESIDENTIAL INDICES

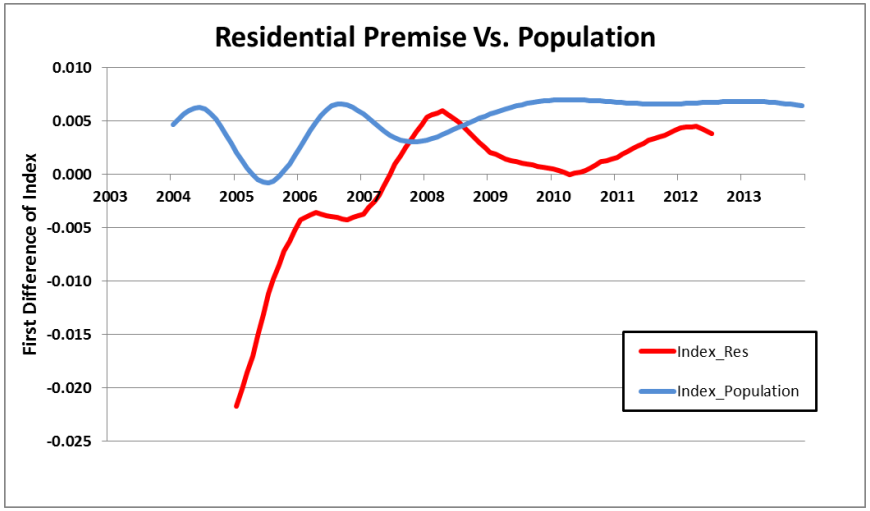


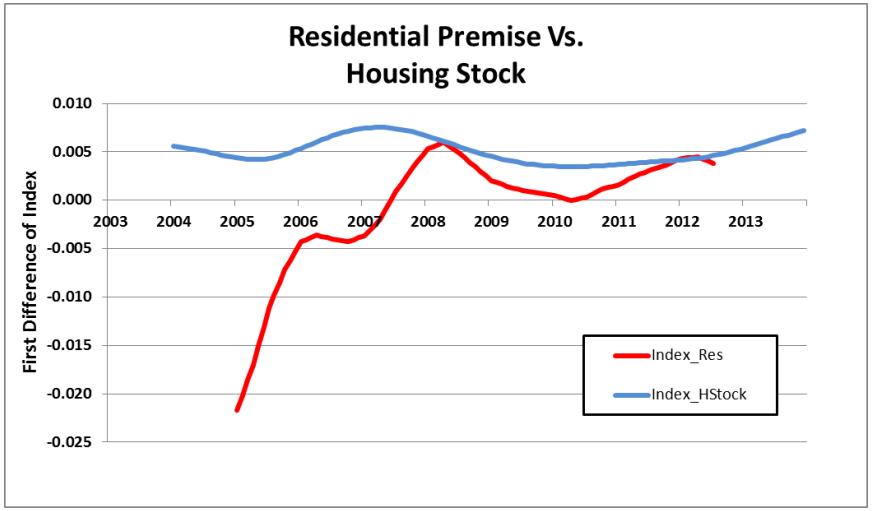


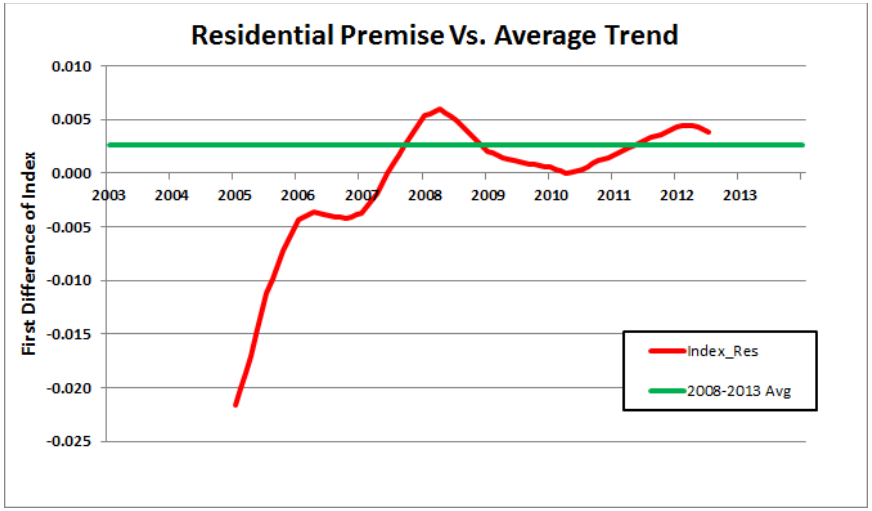


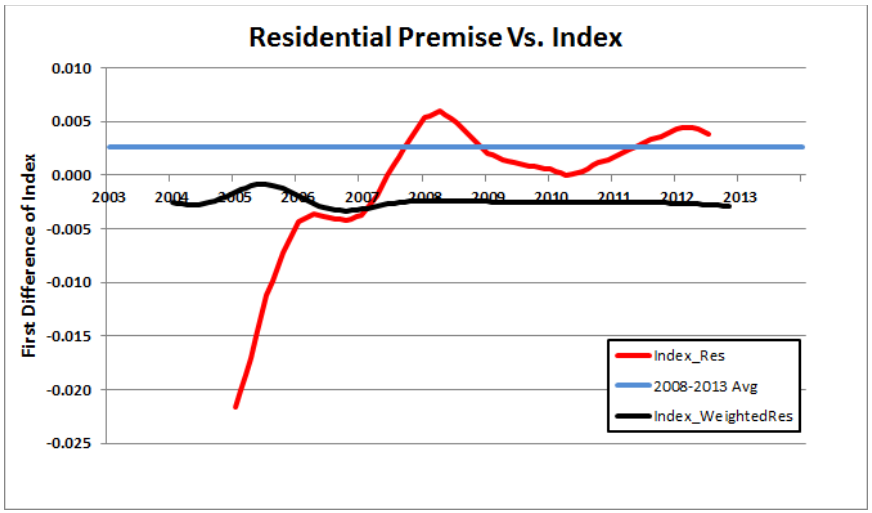


WEST – RESIDENTIAL DIFFERENCES

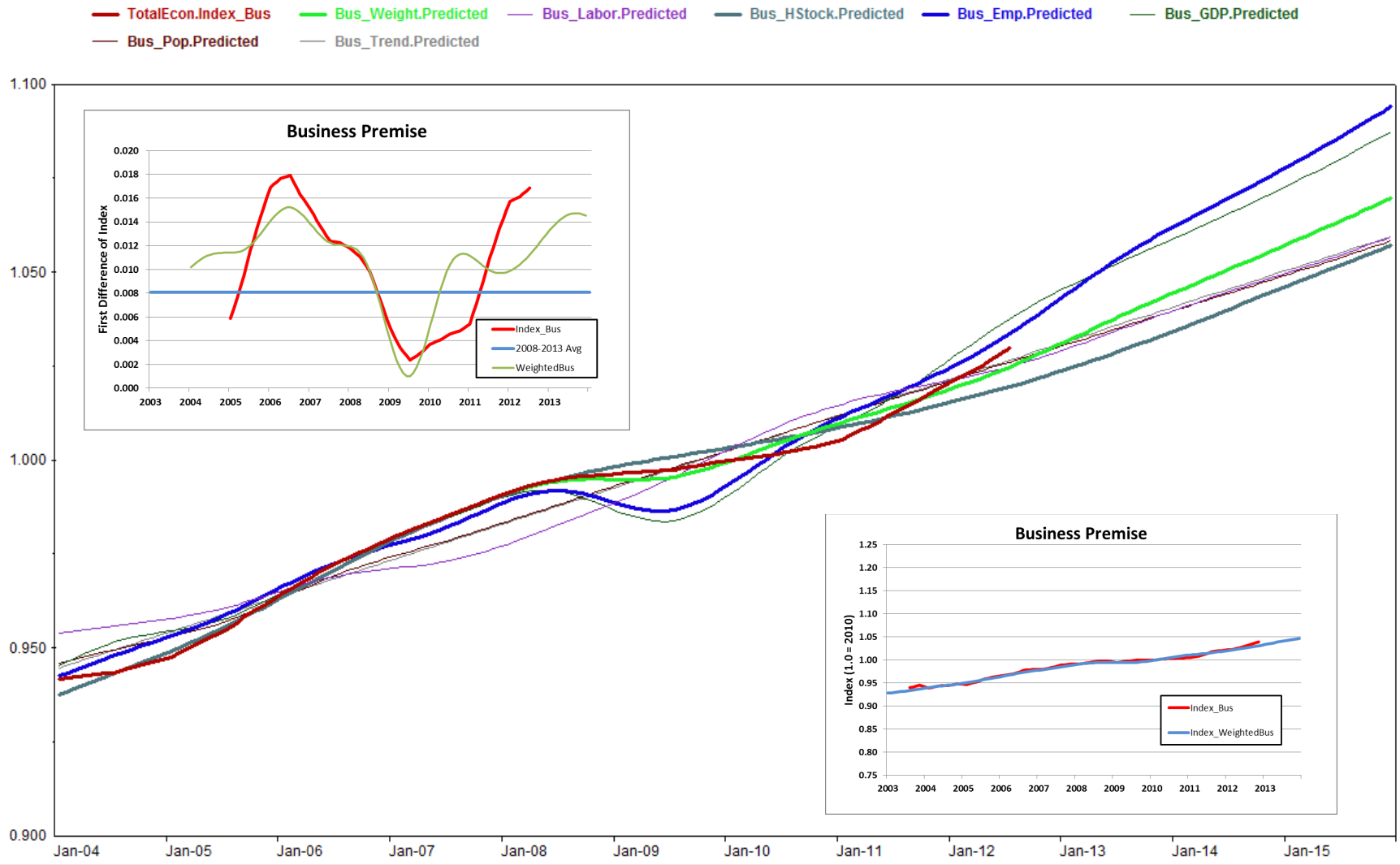






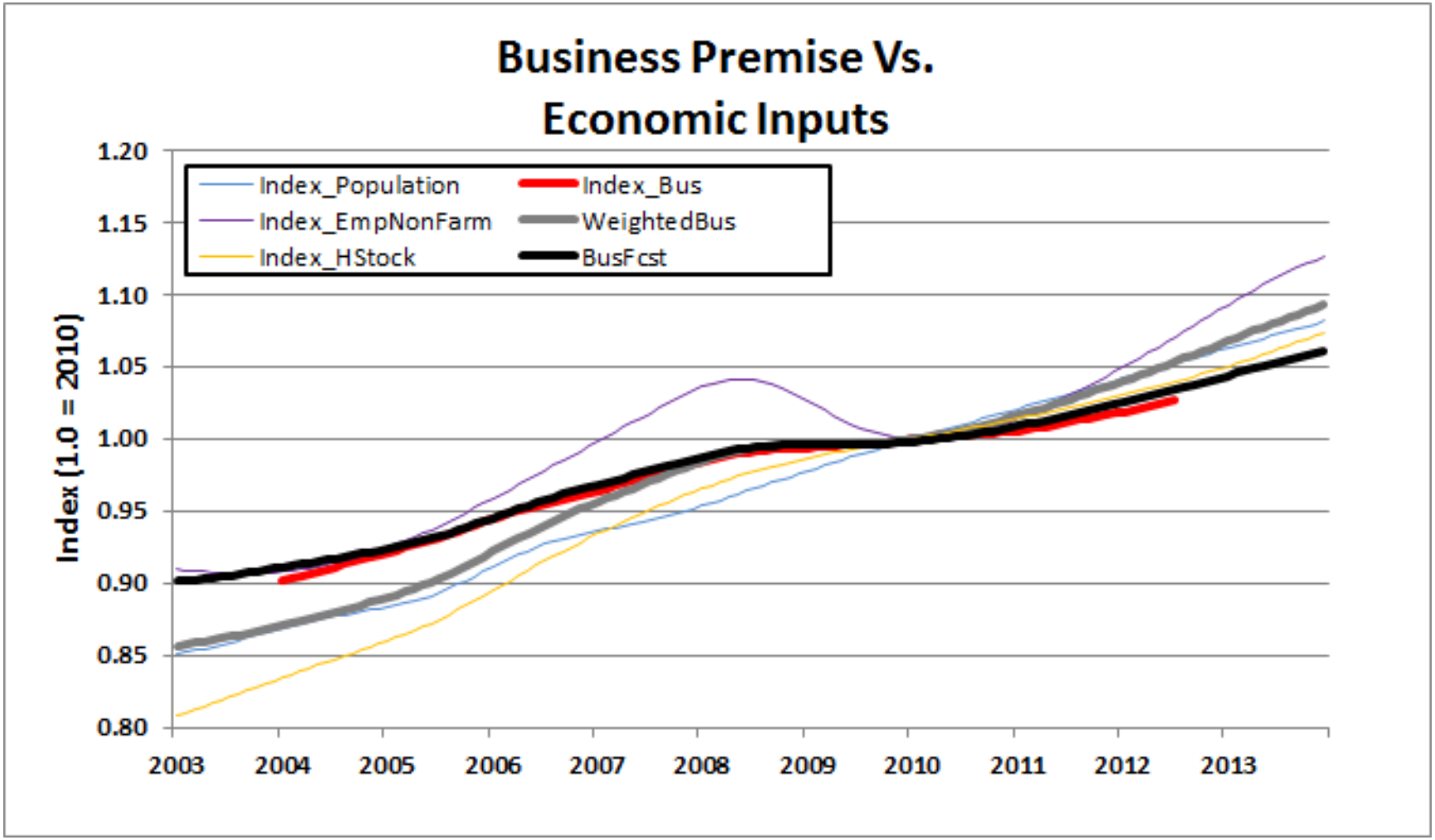


MODEL FIT

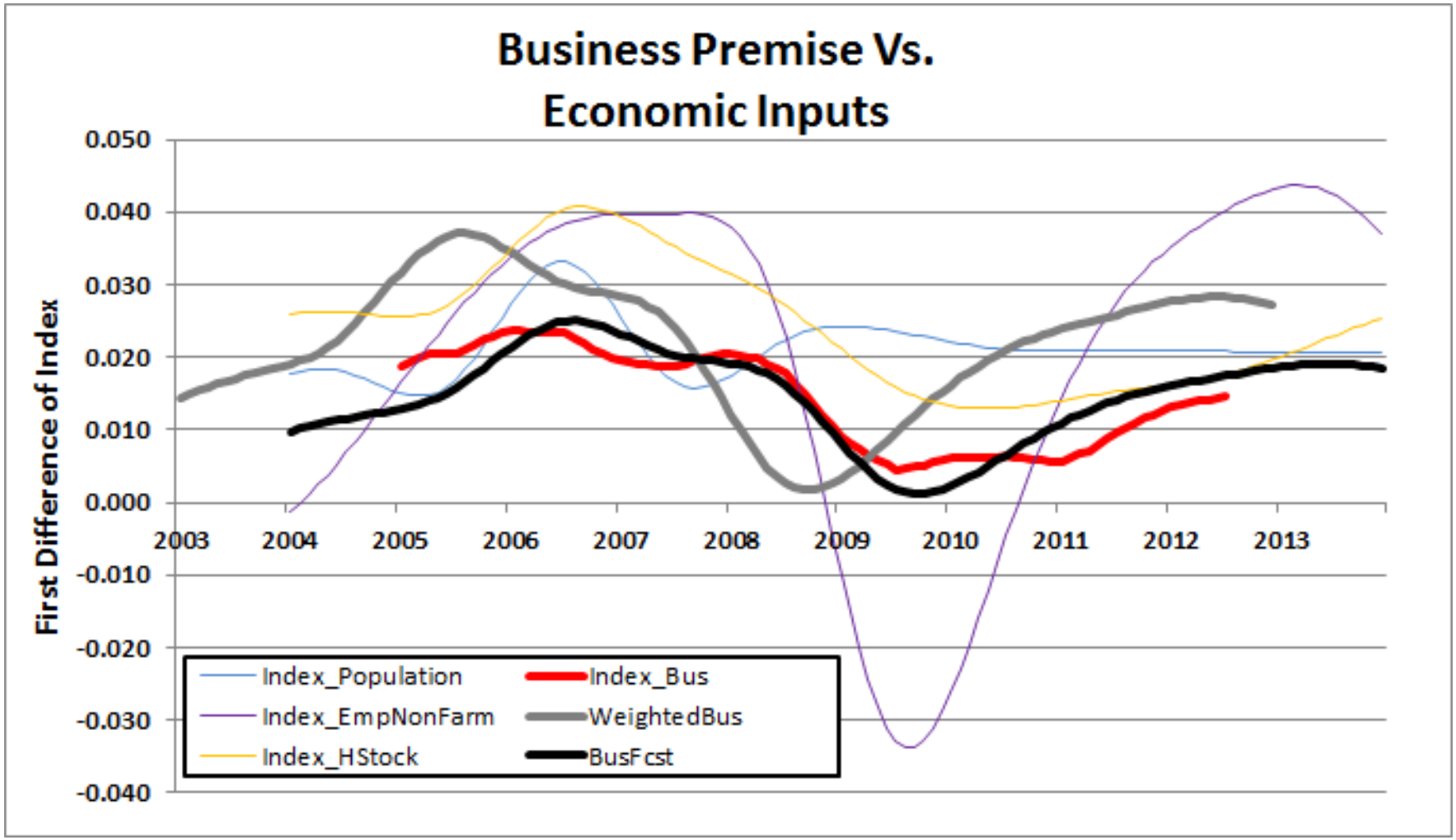

TotalEcon.Index_Bus
Bus_Weight.Predicted
Bus_Labor.Predicted
Bus_HStock.Predicted
Bus_Emp.Predicted
Bus_GDP.Predicted
Bus_Pop.Predicted
Bus_Trend.Predicted
1.100
1.050
1.000
0.950
0.900
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Business Premise
First Difference of Index
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Index_Bus
2008-2013 Avg
WeightedBus
Business Premise
Index (1.0 = 2010)
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Index_Bus
Index_WeightedBus

APPENDIX 2:
BUSINESS REGIONAL INDICES

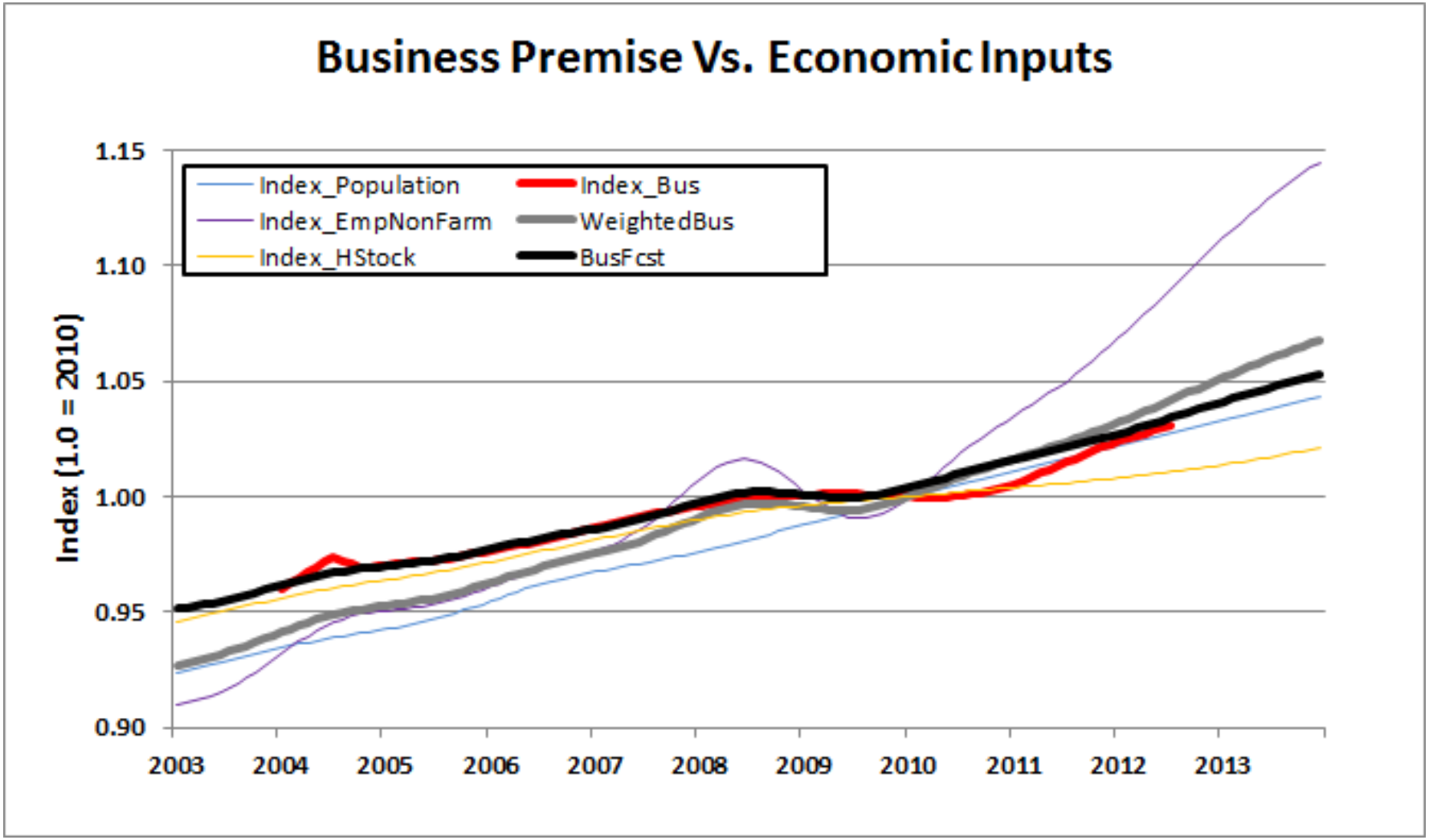
COAST – BUSINESS INDICES



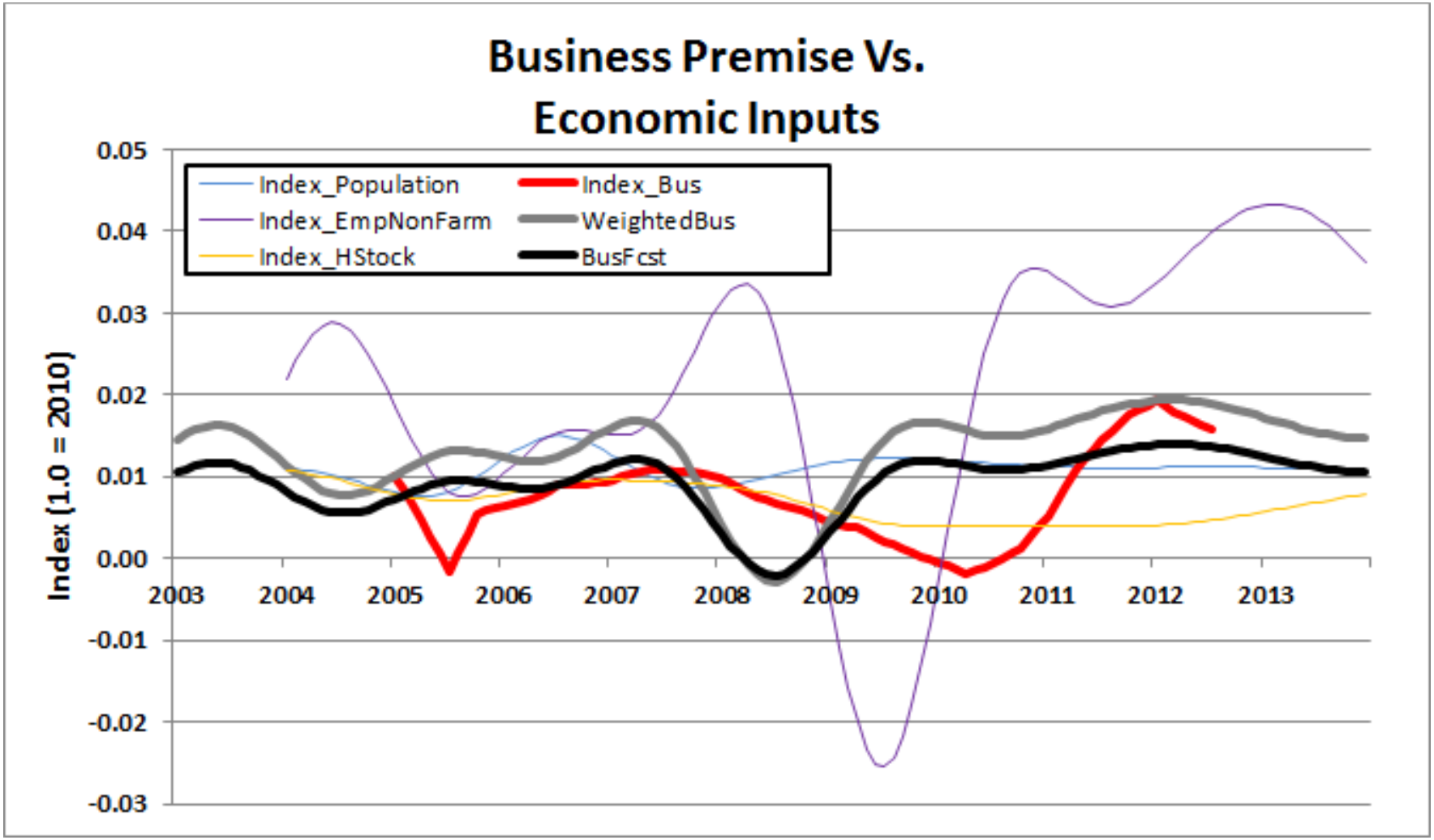
COAST – BUSINESS DIFFERENCES



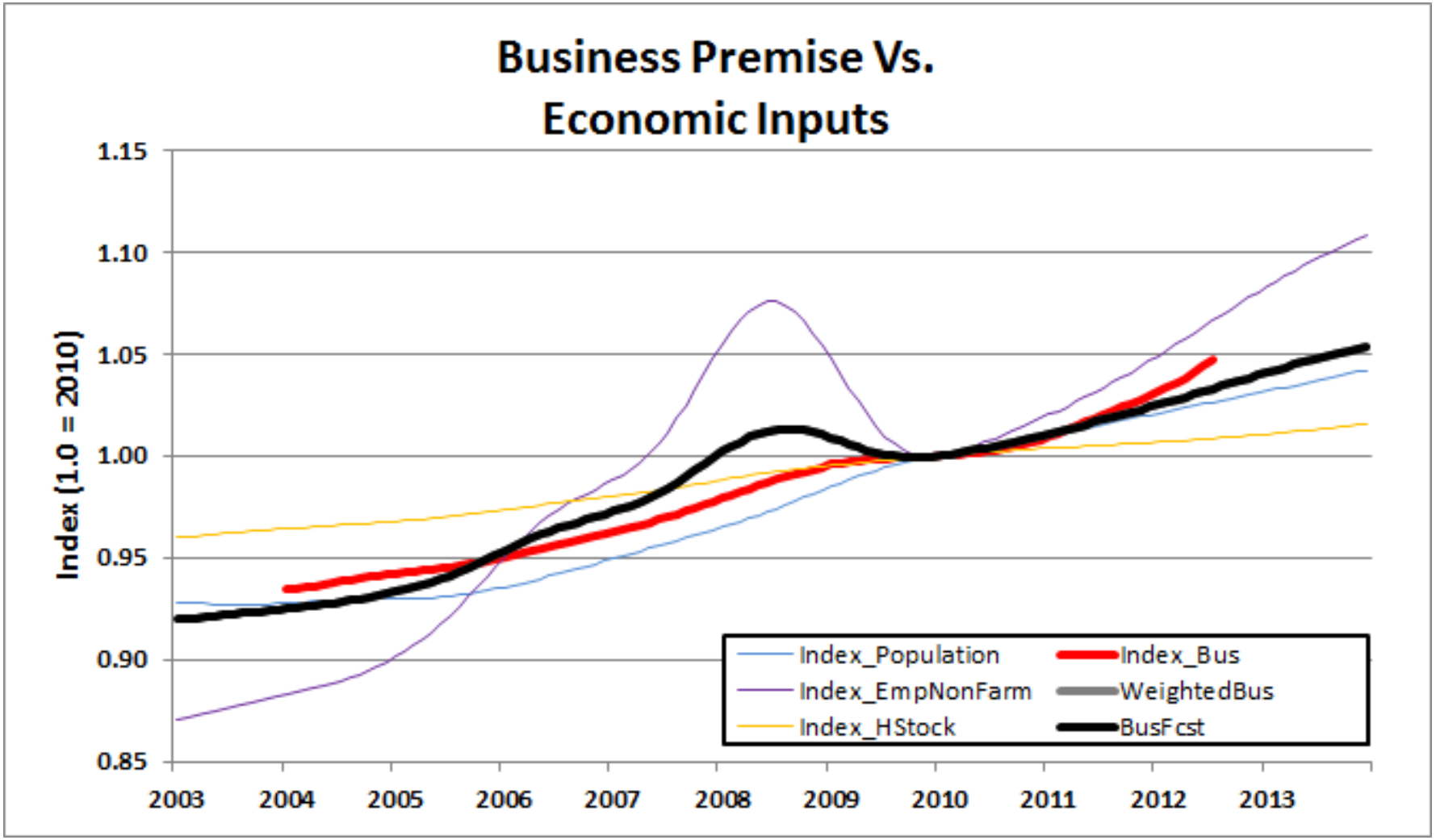
EAST – BUSINESS INDICES



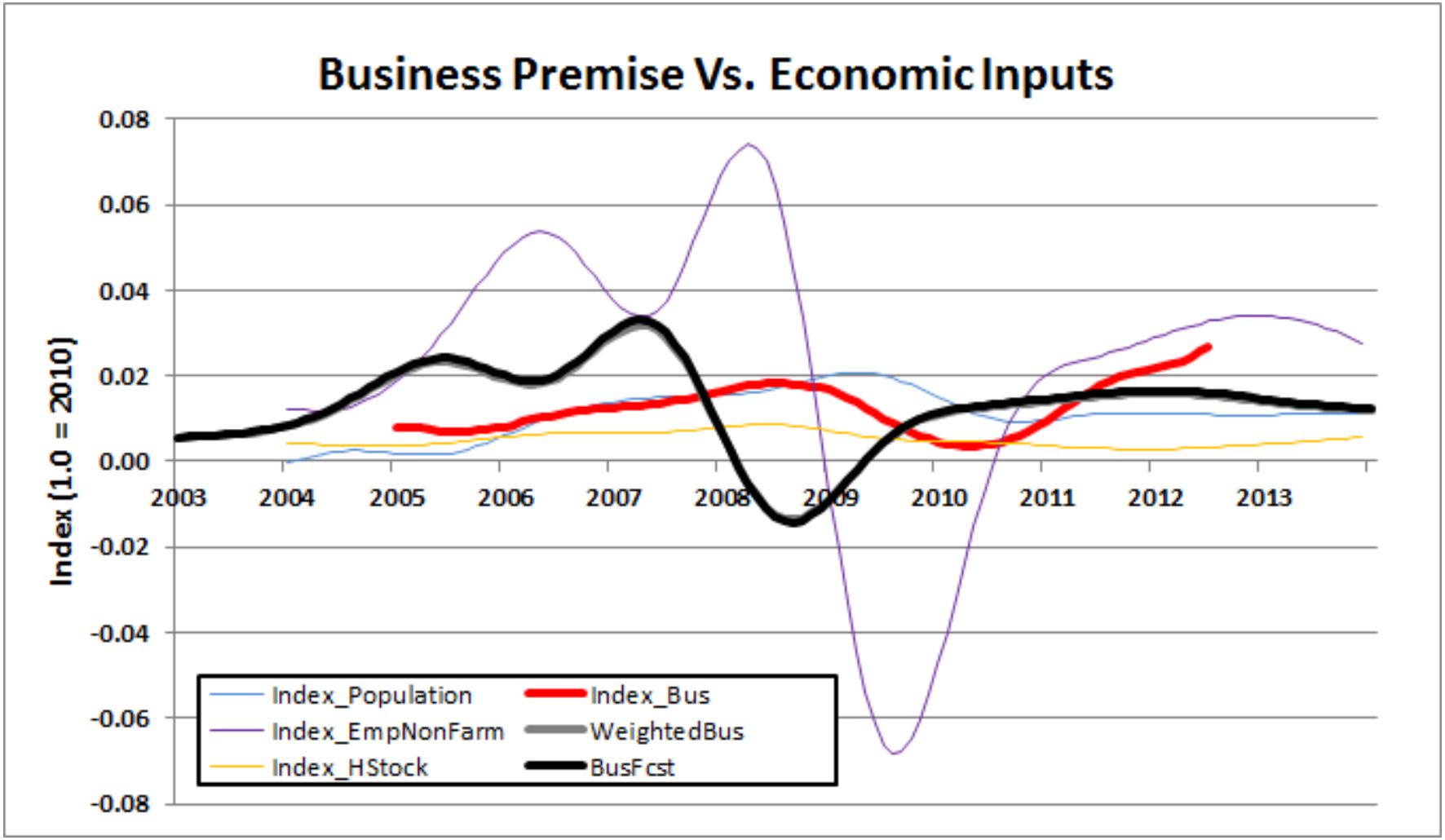
EAST – BUSINESS DIFFERENCES



FWEST – BUSINESS INDICES



FWEST – BUSINESS DIFFERENCES



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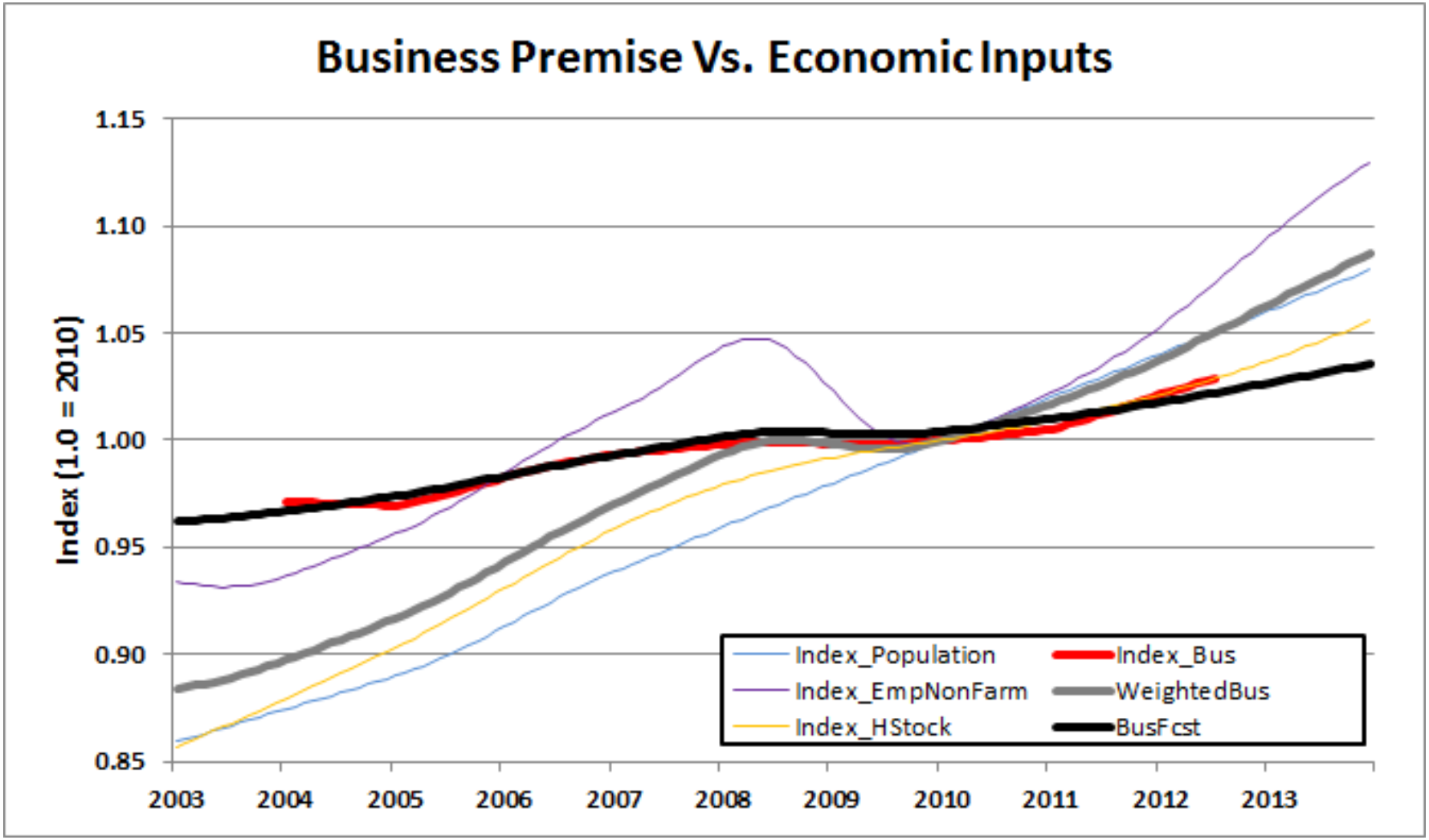

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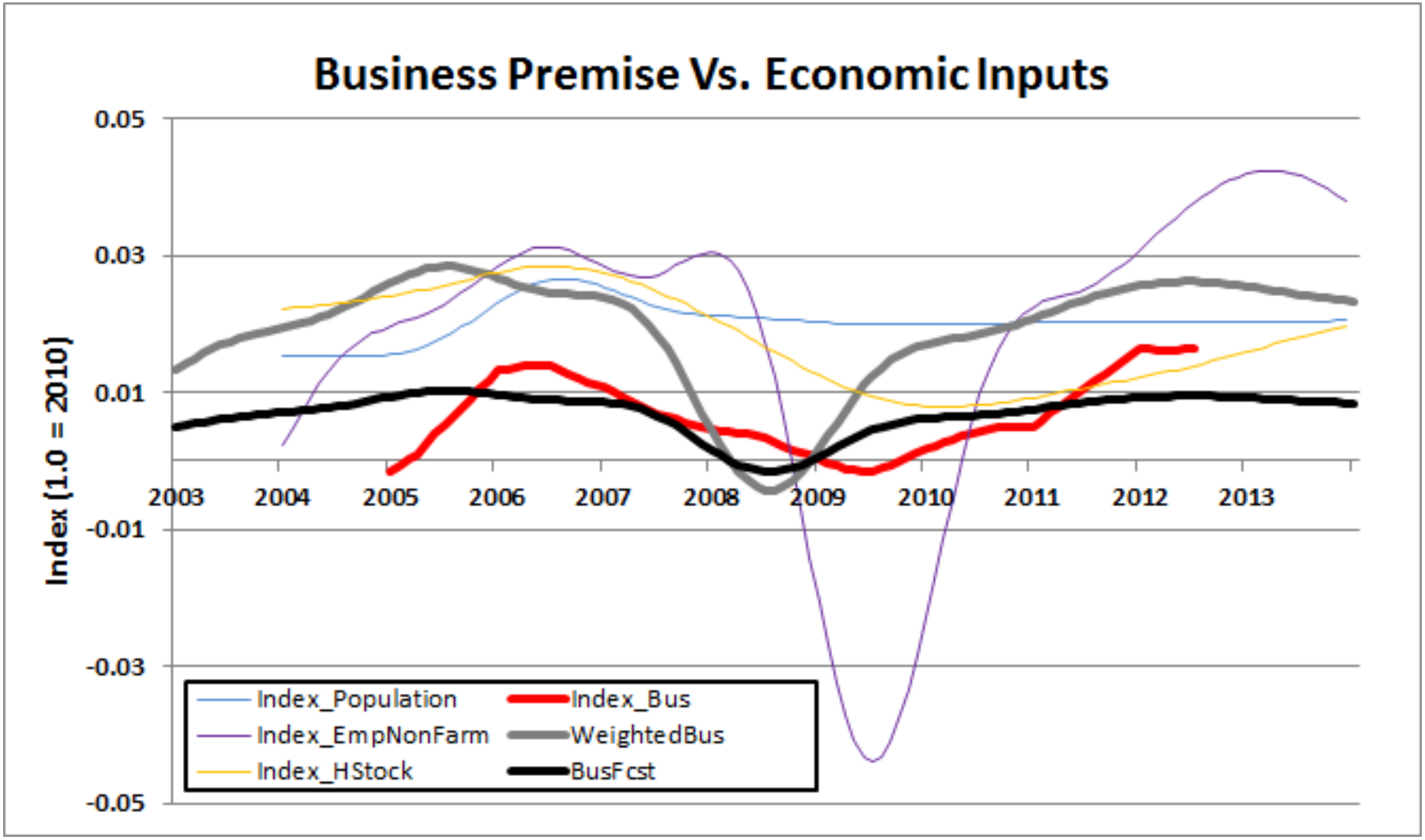

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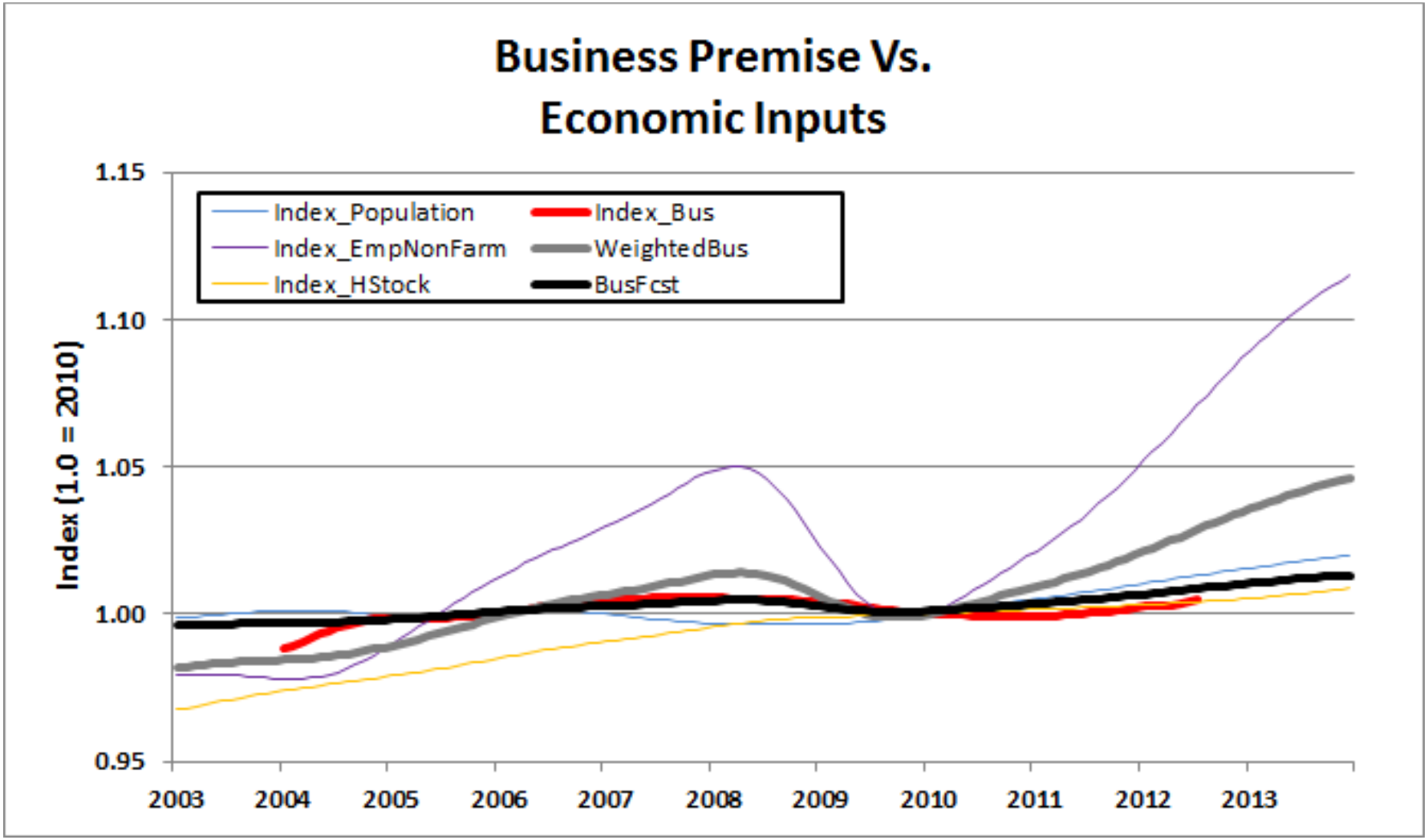

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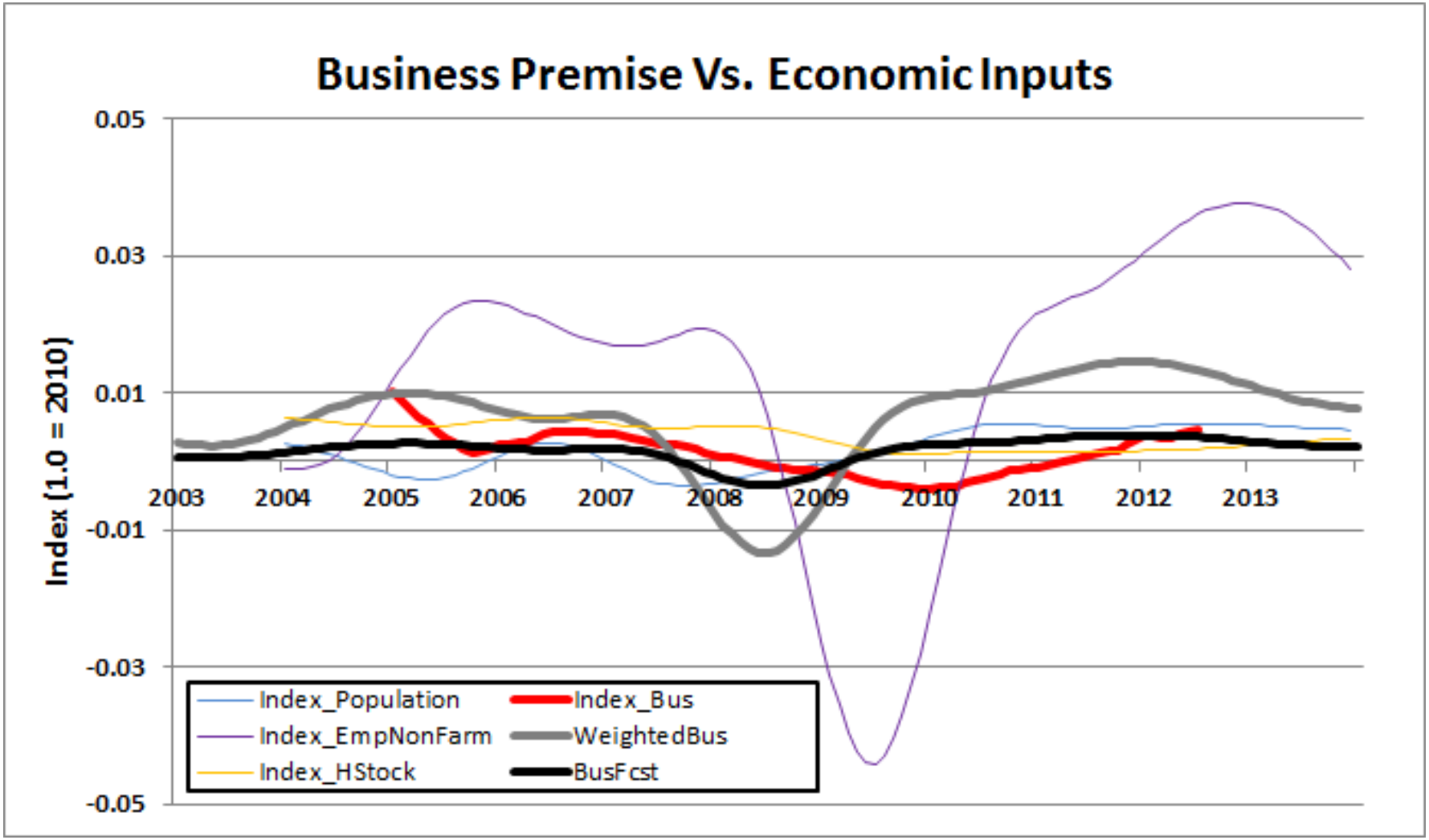

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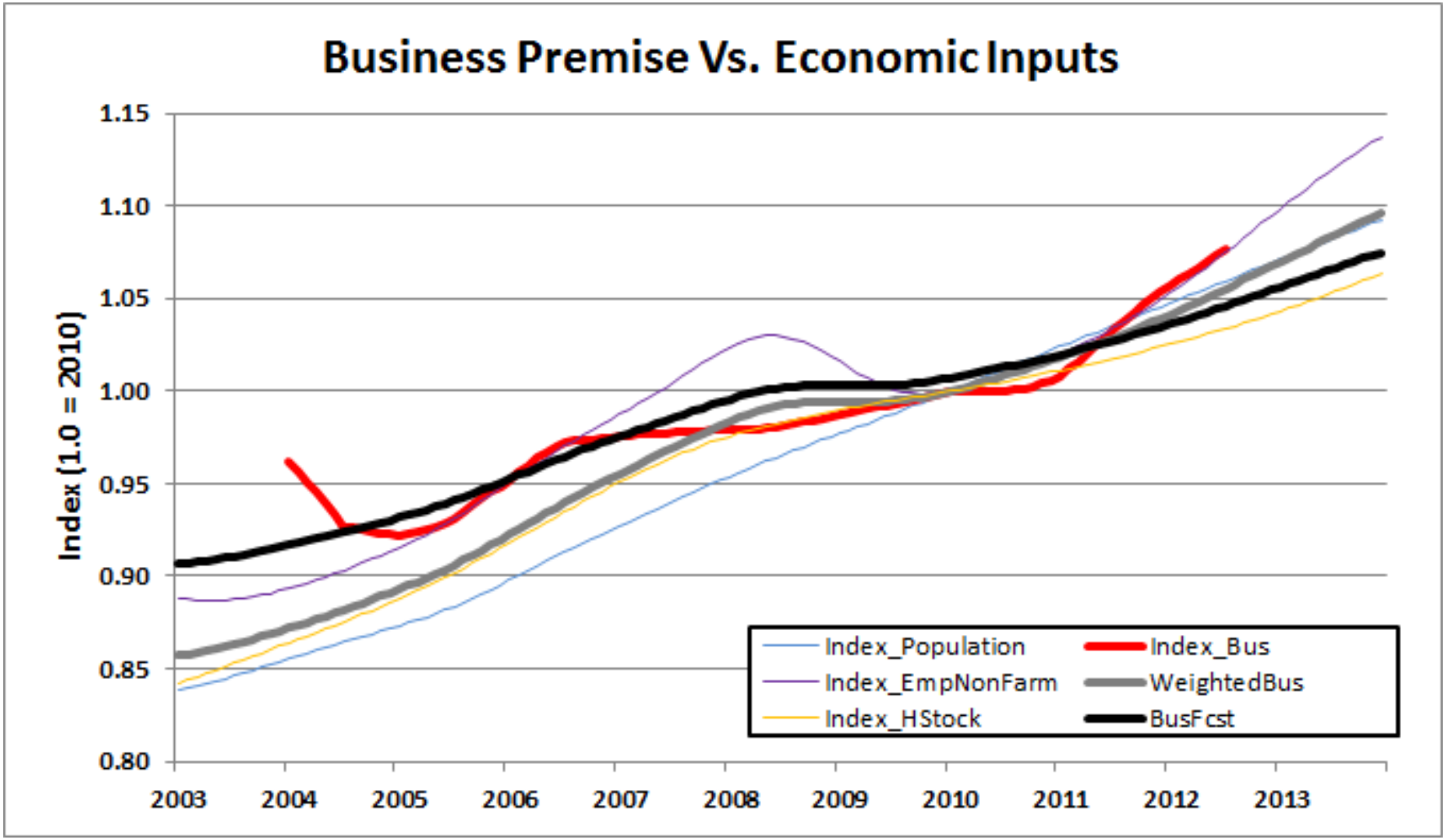

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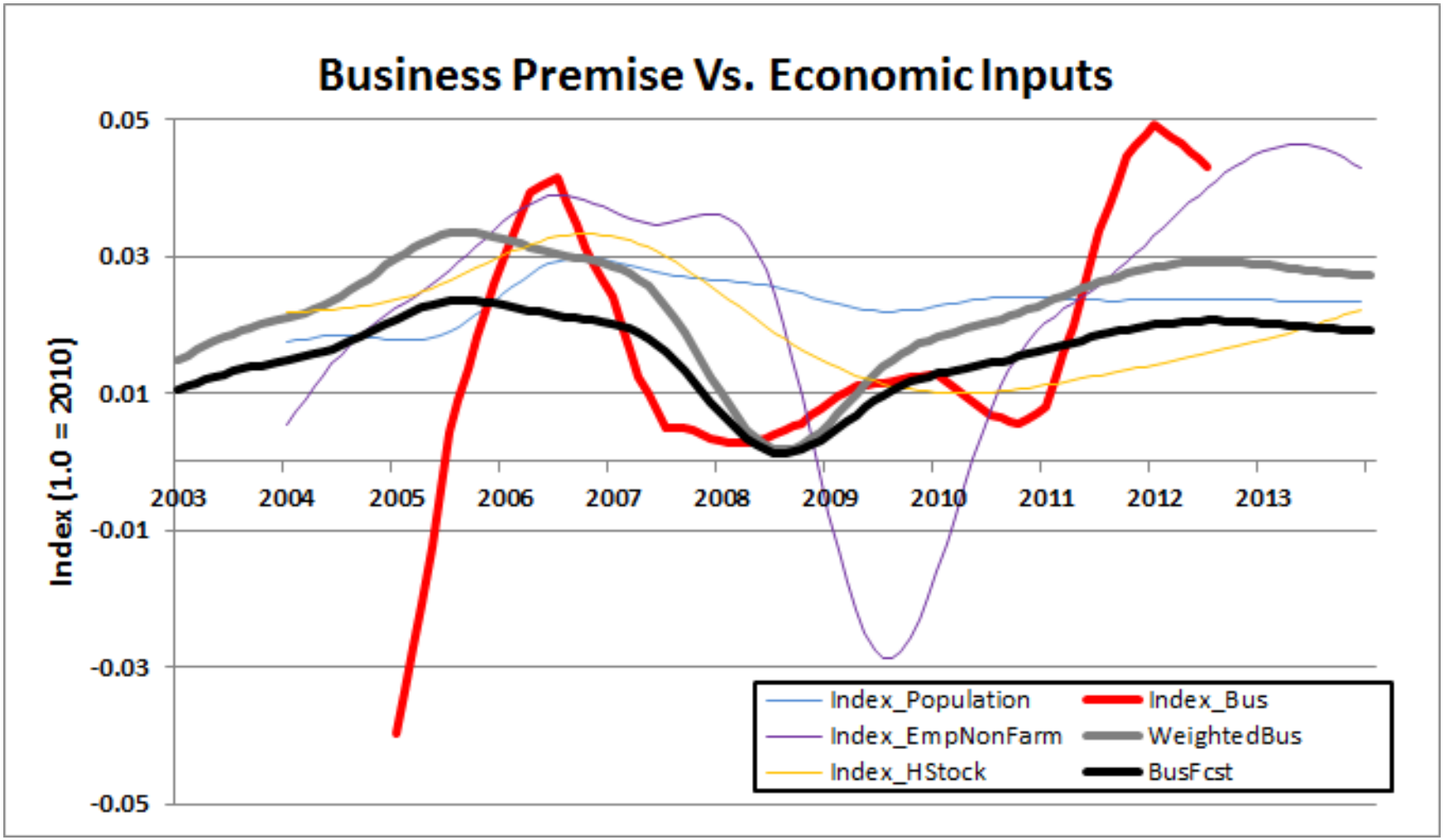

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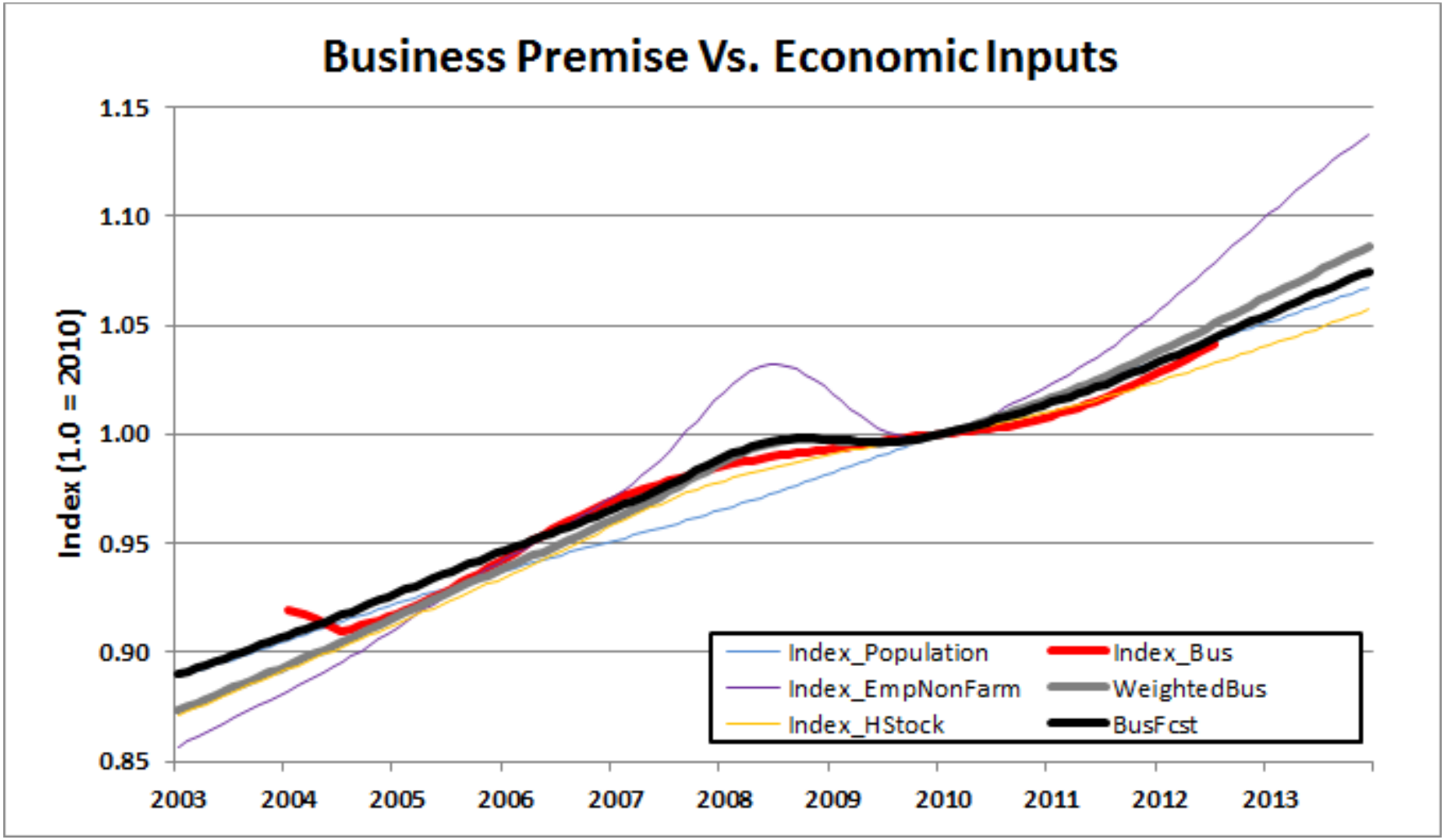
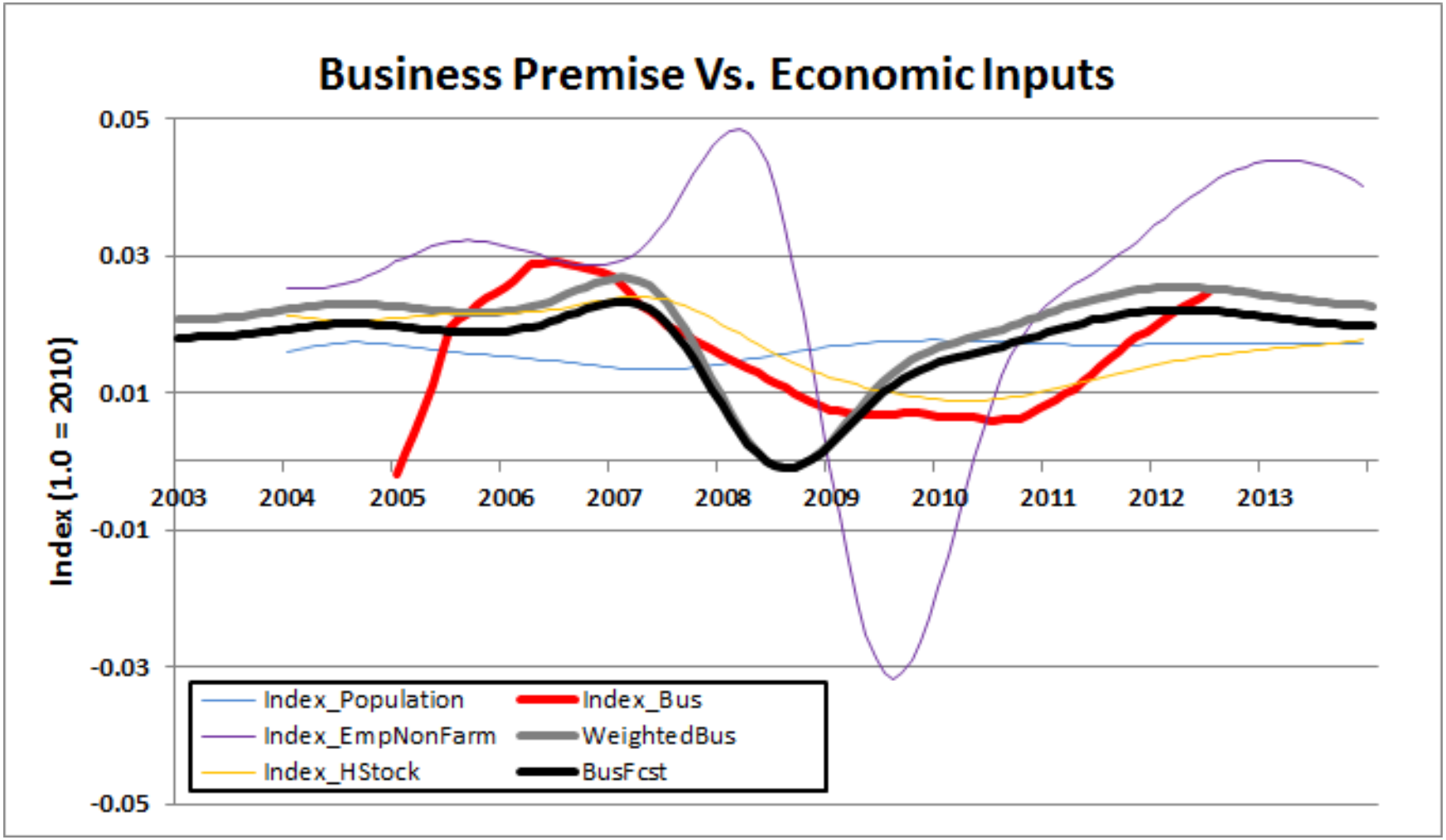


SOUTH – BUSINESS DIFFERENCES



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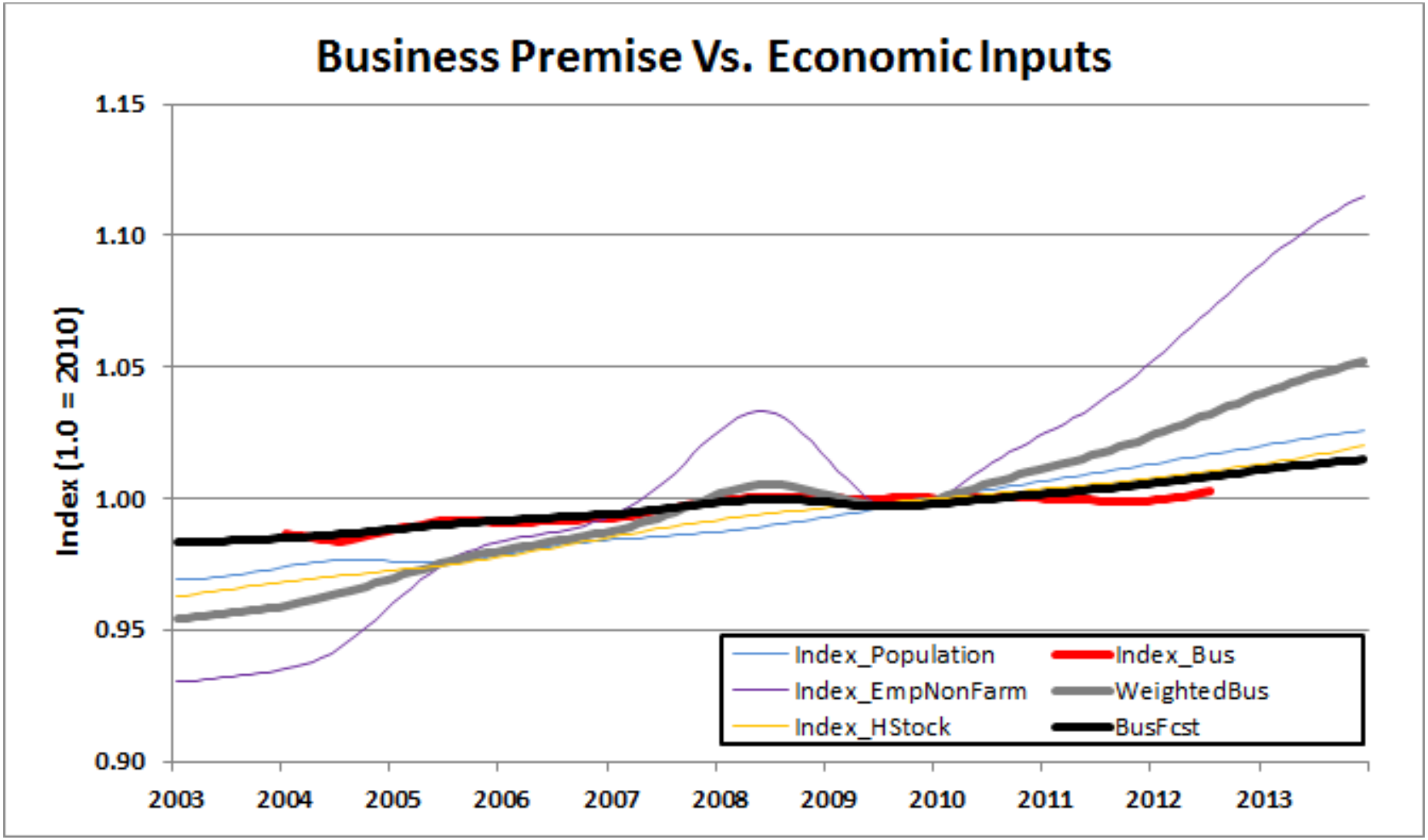
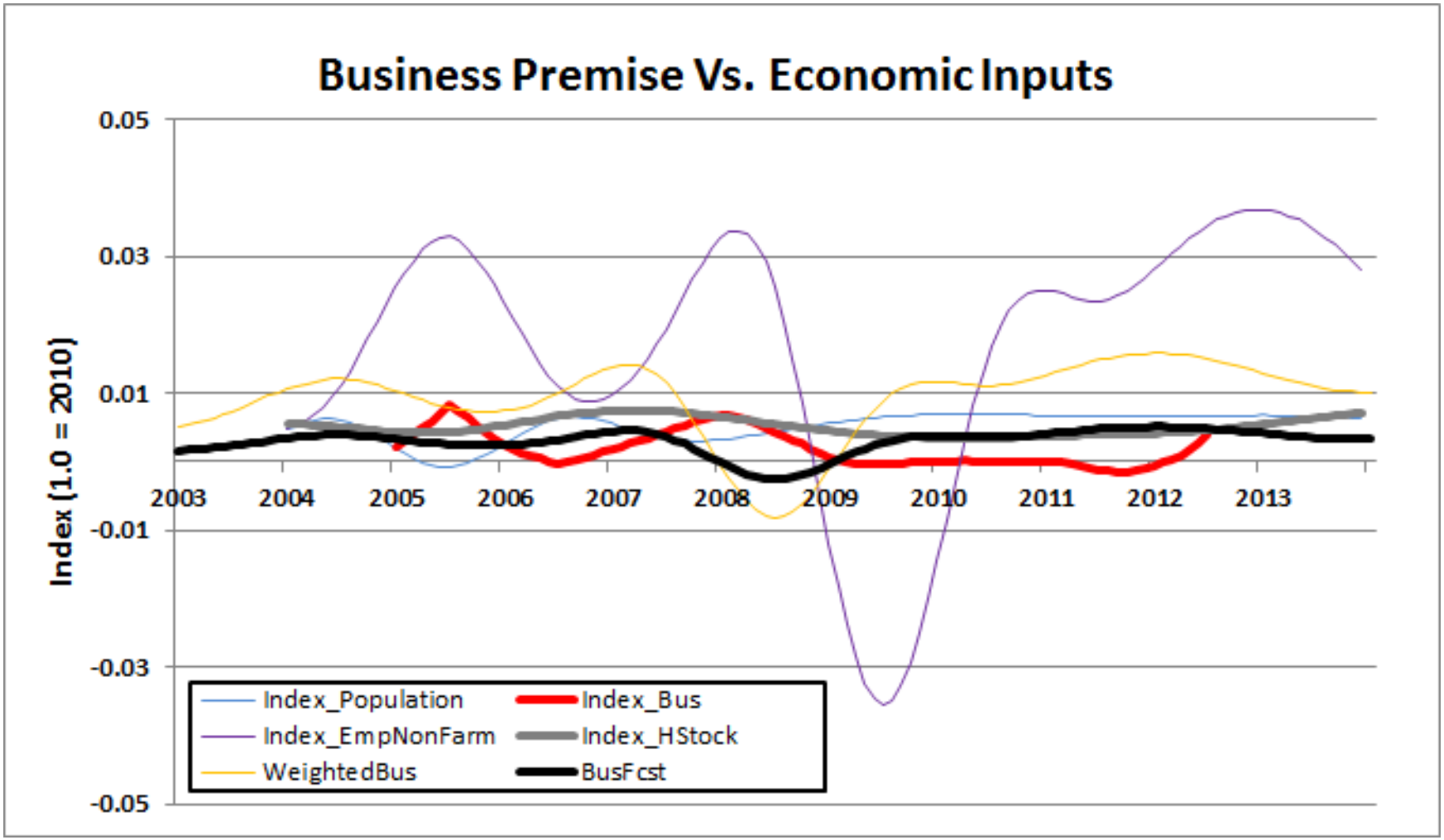
WEST – BUSINESS DIFFERENCES