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Solutions Through Research

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The Texas Housing Affordability Index (THAI) indicates the ability of residents to afford a local home at current prices and interest rates. Comparing index values for different periods indicates whether market conditions are becoming more or less favorable for homebuyers.

THAI values are provided for Texas markets reporting price data to the Real Estate Center. While other affordability measures report on some Texas cities, the THAI is more comprehensive and covers all but a few Texas metropolitan markets. The most current values are reported on a quarterly basis in the data section of the Real Estate Center's Web site—<http://recenter.tamu.edu>.

This publication provides annual indicators for 1989-96. A description of how the index is constructed and the several indicators used to measure affordability in Texas cities follows.

Measuring Affordability

Housing affordability has many aspects. Affording a home means more than being able to purchase one but also being able to maintain it. Because maintenance costs are difficult to estimate accurately, most affordability measures, including the THAI, focus on the difficulties of making the initial purchase. This limited task is not simple.

Buying a home means satisfying a mortgage lender's requirements for approved financing and having adequate cash to handle the down payment and closing costs (plus any moving expenses). The personal wealth data needed to measure the down payment burden are not available on either a timely or local basis. These limitations restrict the scope of any practical affordability measure to the problem of mortgage loan qualifying.

This is why the THAI and similar indexes are patterned on the portion of lenders' qualifying criteria based on the borrower's income. Lenders require borrowers to demonstrate sufficient verifiable income to service mortgage debt with enough leeway for other reasonable living expenses. Basically, **the THAI measures how adequately the typical household income meets the criteria necessary to qualify for a loan to buy the typical home sold in the local market.** The formula for the THAI is:

$$\frac{\text{Median household monthly income} \times \text{Qualifying ratio}}{\text{Monthly mortgage payment}}$$

The qualifying ratio is applied by mortgage loan underwriters to determine the largest loan borrowers can obtain given their income. Most conventional mortgage loans have a qualifying ratio of 28 percent, and this ratio is used to calculate the THAI (Appendix B). Loan payments are based on current mortgage interest rates (using the average interest rate on all mortgage loans closed during the last five days of each month).

Here is an example of how the state-wide index was calculated for 1996. The median house price was \$85,700, requiring a loan amount of \$68,560 (80 percent). At 7.66 percent interest, a 30-year loan had monthly principal and interest payments of \$486.92. The total payment, principal, interest, taxes and insurance (PITI), was estimated to be \$574.56. Median household gross income was an estimated \$42,107, or \$3,508.92 per month. Lenders would allow 28 percent, or \$982.50, to cover the monthly payments. Dividing qualifying income by the payment resulted in a THAI in this case of 1.71.

When the median household has exactly enough income to qualify for the home, the index has a value of 1.00. **Values of the index less than 1.00 signal that homes are less affordable and that home purchase is difficult for more than half of the households. Conversely, values more than 1.00 indicate more than half of the households can afford an average-priced home.** Making these interpretations is most valid when tracking THAI values over time for any one market area. Comparisons between different market areas are less meaningful.

The THAI value at any one time in a locality reflects not only housing market conditions but the way income is distributed among resident households. If significant segments of the population do not participate actively in the housing market (for example, college students in a major university town), THAI values tend to be unrealistically low. Therefore, **comparative values of THAI do not necessarily mean that housing is more affordable in one area than another.**

For example, in the first quarter of 1997, Fort Bend County had a THAI of 2.22 while Galveston's THAI was 1.70. If someone wanted to move to the most affordable housing market, should they choose Fort Bend or Galveston? The median sales price in Fort Bend was

\$106,000 compared to \$69,100 in Galveston. Fort Bend had a higher THAI because the median household income was \$59,700. Galveston's median income was only \$29,700. Housing in Fort Bend County was more affordable for **Fort Bend residents**. The typical Galveston household would not find Fort Bend very affordable.

Data Sources

Calculating the THAI requires data on resident income, current mortgage interest rates and local house prices. The index and related indicators are calculated on a quarterly basis for the most recent period and annually for past years.

THAI income data are supplied by Market Statistics, Inc. The actual statistic used is called Effective Buying Income (EBI), an estimate of disposable or after-tax income. Each September an estimate of median household EBI at the end of the previous year is reported for every U.S. metropolitan area and county. From the EBI for the previous year's end and that for the current year, quarterly EBIs can be interpolated. A simple linear interpolation technique results in mid-quarter estimates of median household income (Appendix A).

Mortgage interest rates are provided by the Federal Housing Finance Board's interest rate survey. Data are available for Dallas-Fort Worth and Houston, as well as for the district that contains Texas (annual rates are reported by state). As a matter of expediency, all areas outside Dallas and Houston are assumed to have interest rates equal to the district average (the annual figures also include Austin and San Antonio).

Actually, this assumption is not unrealistic because interest rates no longer vary by location as they did in the past. The domination of home mortgage finance by national secondary markets has greatly diminished regional disparities. Differences among local market interest rates essentially reflect the mix of fixed- and adjustable-rate loans closed in the area. The THAI formula assumes borrowers can obtain financing at the standard 80 percent loan-to-value ratio and 30-year term. In addition, the formula uses the average contract rate of interest.

Housing price is the median sales price as reported by area boards and associations of Realtors. Because median prices are unavailable prior to 1989, the historical THAI series values cannot be extended to earlier years. Where

THAI values are not reported in the table (indicated by "na"), insufficient median price data were available to calculate the indicator.

Indicators

In addition to the THAI, other indicators reveal affordability conditions. **Each index value includes an estimate of how many area households can afford the typical home.** Also, supplemental THAI's are computed for borrowers who lack sufficient cash for the standard 20 percent down payment.

As noted, a THAI of 1.00 means that half of the households have enough income to qualify to buy the average-priced home. However, THAI values are usually not 1.00, and the interpretation of those values is not straightforward. For example, a THAI value of 1.10 means that more than half of area households can afford a median-priced home. To estimate how many more than half can afford that median-priced home, it is necessary to know the income distribution in the area. The annual *Survey of Buying Power* provides information on the distribution of EBI. Appendix C describes how these data are used to estimate the percentage of households that can afford the median-priced home in each area. The percentages for each year are reported in Table 2.

The affordability concept, as measured by THAI, is most meaningfully applied to the first-time buyer. Most first-time homebuyers do not use 80 percent financing because few have accumulated adequate savings for the required down payment. In most cases, higher ratio loans are readily available with the application of FHA or private mortgage insurance. However, these loans have larger principal balances than comparable standard loans (because more of the cost is being financed), and they require payment of insurance premiums. For FHA-insured loans, a premium is paid at closing (although often financed into the loan principal), and a monthly premium may be charged as well. Therefore, qualifying for a high-ratio loan requires more income.

To indicate the effects of these higher qualifying requirements on affordability, **additional THAI values are calculated for financing with 90 and 95 percent loan-to-value ratios.** Because of the variety of terms used by private mortgage insurance providers on conventional loans, uniform FHA requirements were used to compute these indexes. The FHA requires

payment of an insurance premium at closing equal to a certain percentage of the loan amount, which has varied in recent years.

For the low down payment indicators, it is assumed the premium is financed into the loan. In addition to this premium, the FHA requires a monthly premium on loans greater than 90 percent of value. The 95 percent indicator includes this monthly premium by increasing the

interest rate on the loan by one-half percentage point. Appendix D describes the assumptions underlying these indexes. Tables 3 and 4 show the percentage of households that could afford the median-priced home if all households used FHA-insured financing covering 90 percent and 95 percent, respectively, of value. Comparing these tables to Table 2 indicates how limited down payments affect affordability.

Table 1. Texas Housing Affordability Index, 1989-96

MSA	1989	1990	1991	1992	1993	1994	1995	1996
Abilene	1.30	1.77	2.16	2.24	2.16	2.00	2.06	2.00
Amarillo	1.41	1.36	1.54	1.88	1.95	1.91	1.86	1.89
Arlington	1.22	1.37	1.73	1.99	2.22	2.23	2.20	2.25
Austin	na	1.13	1.30	1.46	1.51	1.55	1.47	1.28
Beaumont	1.32	1.45	1.47	1.63	1.81	1.73	1.85	1.81
Brazoria Co.	1.97	2.06	2.34	2.36	2.50	2.51	2.56	2.40
Brownsville	na	na	na	1.44	1.44	1.38	1.35	1.33
Bryan-College Station	1.01	1.03	1.15	1.28	1.36	1.28	1.33	1.43
Corpus Christi	1.09	1.21	1.44	1.75	1.86	1.76	1.79	1.90
Dallas	0.98	0.99	1.13	1.38	1.53	1.55	1.57	1.51
Denton	na	na	na	na	2.25	2.13	1.97	na
El Paso	0.97	1.02	1.20	1.45	1.57	na	1.49	1.52
Fort Bend Co.	na	na	na	na	2.37	2.31	2.30	2.29
Fort Worth	1.11	1.28	1.52	1.85	2.02	2.14	2.18	na
Galveston	1.25	1.26	1.24	1.47	1.47	1.49	1.47	1.55
Garland	na	na	na	na	na	2.88	2.88	na
Harlingen	1.09	na	na	na	na	na	1.64	1.64
Houston	1.33	1.42	1.55	1.77	1.98	1.73	1.77	1.76
Irving	1.13	1.17	1.34	1.59	1.69	1.83	1.80	na
Killeen-Ft. Hood	na	na	na	na	1.77	1.69	1.70	1.66
Longview	1.26	1.32	1.56	1.68	1.87	1.82	1.77	na
Lubbock	1.09	1.18	1.35	1.60	1.77	1.81	1.80	1.84
Lufkin	na	na	1.83	2.01	2.25	2.18	2.06	1.84
McAllen	na	na	na	1.28	na	1.30	1.23	1.19
Montgomery Co.	na	na	na	na	1.86	1.86	1.84	1.76
Nacogdoches	na	na	na	na	na	na	na	1.60
N.E. Tarrant Co.	1.02	1.17	1.46	1.67	1.92	1.94	1.86	na
North NASA	na	na	na	na	1.79	1.72	1.73	1.82
Odessa-Midland	1.50	1.51	1.64	1.84	2.06	na	2.06	na
Palestine	na	na	na	2.29	2.42	2.26	2.51	2.56
Paris	na	na	na	na	na	na	2.02	2.11
Plano	na	na	na	na	na	1.88	1.78	na
Port Arthur	1.70	1.81	1.70	1.67	1.75	1.64	1.83	1.85
San Angelo	1.34	1.49	1.62	2.00	2.11	2.08	2.15	2.09
San Antonio	1.13	1.21	1.42	1.59	1.68	1.74	1.76	1.67
San Marcos	na	na	na	na	na	na	1.55	1.54
Sherman-Denison	1.33	1.53	na	2.22	2.36	2.44	2.27	2.22
Temple-Belton	1.12	1.16	1.37	1.67	1.75	1.72	1.57	1.58
Texarkana	1.25	1.35	1.56	1.75	1.97	1.82	1.88	1.78
Tyler	na	1.35	na	1.65	1.87	1.74	1.77	1.82
Victoria	1.44	1.52	1.69	1.94	2.13	2.08	2.17	2.30
Wichita Falls	1.27	1.44	1.66	2.03	2.16	2.07	2.03	2.20
Texas	1.09	1.18	1.35	1.58	1.74	1.71	1.72	1.71
United States	0.89	0.92	1.04	1.23	1.36	1.35	1.31	1.31

Source: Real Estate Center at Texas A&M University

**Table 2. Percentage of Households Able to Afford Median-Priced Home
(20 Percent Down Payment), 1989-96**

MSA	1989	1990	1991	1992	1993	1994	1995	1996
Abilene	62.4	74.0	80.0	80.5	79.5	77.0	77.9	75.2
Amarillo	65.0	64.8	67.8	74.9	75.6	74.8	73.7	73.8
Arlington	59.7	64.8	74.5	80.6	83.2	83.1	82.5	82.2
Austin	na	55.6	60.3	66.6	67.3	68.1	67.1	64.7
Beaumont	60.1	63.5	63.8	68.3	70.7	69.0	70.7	70.9
Brazoria Co.	77.4	78.7	81.5	82.6	83.6	83.5	83.9	81.4
Brownsville	na	na	na	65.0	64.8	63.2	61.8	62.0
Bryan-College Station	50.6	51.4	55.2	59.1	60.7	58.6	59.2	62.1
Corpus Christi	53.2	57.7	64.1	71.2	72.7	71.0	71.0	72.2
Dallas	49.4	51.8	54.9	65.3	68.9	69.2	69.6	68.4
Denton	na	na	na	na	81.8	80.3	78.1	na
El Paso	48.0	50.2	57.0	66.0	68.8	na	66.9	66.9
Fort Bend Co.	na	na	na	na	84.3	83.6	83.4	82.9
Fort Worth	54.2	60.3	66.8	74.6	76.8	78.0	78.3	na
Galveston	59.6	59.9	59.5	65.1	64.6	64.8	63.4	66.1
Garland	na	na	na	na	na	89.7	89.5	na
Harlingen	55.4	na	na	na	na	na	67.3	68.4
Houston	62.7	65.2	68.0	73.5	76.6	71.6	72.0	71.9
Irving	56.9	58.4	65.4	73.9	76.2	78.6	77.6	na
Killeen-Ft. Hood	na	na	na	na	78.1	76.3	76.5	72.7
Longview	59.5	61.0	67.2	69.8	72.8	71.7	70.7	na
Lubbock	53.8	57.5	62.4	68.9	71.7	72.0	71.9	72.1
Lufkin	na	na	71.5	75.8	78.4	77.2	76.0	72.5
McAllen	na	na	na	60.5	na	60.4	58.9	58.4
Montgomery Co.	na	na	na	na	74.5	74.4	74.1	72.4
Nacogdoches	na	na	na	na	na	na	na	67.0
N.E. Tarrant Co.	50.2	56.7	65.8	73.8	77.6	80.3	78.9	na
North NASA	na	na	na	na	75.4	73.9	73.6	75.5
Odessa/Midland	66.4	67.9	70.9	73.8	76.6	na	76.7	na
Palestine	na	na	na	78.8	79.7	77.9	80.4	79.7
Paris	na	na	na	na	na	na	73.7	75.1
Plano	na	na	na	na	na	78.3	85.0	na
Port Arthur	68.1	69.9	68.8	68.0	69.0	67.3	70.0	72.0
San Angelo	63.1	67.0	69.4	77.2	78.4	77.7	78.6	76.5
San Antonio	55.3	58.5	64.1	69.7	71.1	72.1	72.5	70.5
San Marcos	na	na	na	na	na	na	64.9	64.9
Sherman-Denison	62.5	67.6	na	78.9	80.0	72.1	78.8	77.3
Temple-Belton	55.0	56.3	62.3	69.3	70.5	69.6	66.6	67.4
Texarkana	59.2	61.8	66.7	71.1	74.0	71.5	72.7	71.1
Tyler	na	62.4	na	70.2	73.8	71.4	71.6	72.3
Victoria	65.0	67.3	70.5	74.2	76.3	75.5	76.3	77.0
Wichita Falls	61	66.2	70.4	77.1	78.7	77.2	76.6	77.3
Texas	53.7	56.9	61.6	68.7	71.5	70.7	71.0	70.6
United States	44.4	46.0	50.8	58.3	63.7	63.0	62.2	62.1

Source: Real Estate Center at Texas A&M University

**Table 3. Percentage of Households Able to Afford Median-Priced Home
(10 Percent Down Payment), 1989-96**

MSA	1989	1990	1991	1992	1993	1994	1995	1996
Abilene	55.1	68.5	75.0	76.3	75.3	72.4	73.6	71.5
Amarillo	58.2	58.3	61.3	70.0	71.0	70.2	69.0	69.9
Arlington	51.3	57.2	68.5	76.8	79.1	78.7	78.2	79.3
Austin	na	49.1	54.2	60.3	61.7	62.5	61.5	59.3
Beaumont	54.1	57.7	58.3	62.9	66.1	64.3	66.2	66.5
Brazoria Co.	73.2	74.6	78.1	79.0	80.4	80.3	80.9	78.7
Brownsville	na	na	na	59.3	59.2	57.5	55.8	56.3
Bryan-College Station	45.1	45.8	49.0	52.6	55.0	54.0	54.7	57.0
Corpus Christi	46.9	51.4	57.7	66.0	68.1	66.4	66.4	68.1
Dallas	40.8	43.9	47.2	59.2	63.0	63.4	64.0	63.0
Denton	na	na	na	na	77.9	75.9	73.5	na
El Paso	42.0	44.3	50.3	59.4	63.0	na	61.6	62.0
Fort Bend Co.	na	na	na	na	80.6	80.1	79.8	79.3
Fort Worth	48.1	53.9	60.6	69.7	72.5	73.9	74.3	na
Galveston	52.6	52.9	52.9	59.3	59.0	59.4	57.8	61.0
Garland	na	na	na	na	na	87.4	87.2	na
Harlingen	48.0	na	na	na	na	na	62.2	63.6
Houston	56.2	59.0	61.8	68.6	72.1	66.7	67.3	67.6
Irving	47.5	49.1	57.2	70.1	69.8	72.8	71.9	na
Killeen-Ft. Hood	53.1	na	na	na	72.6	70.6	71.0	68.6
Longview	57	54.9	61.5	64.6	68.3	67.1	65.9	na
Lubbock	46.9	50.6	55.6	63.2	66.8	67.2	67.1	68.0
Lufkin	na	na	66.8	71.4	74.6	73.3	71.9	68.4
McAllen	na	na	na	53.7	na	54.1	53.3	52.1
Montgomery Co.	na	na	na	na	69.7	69.8	69.4	67.9
Nacogdoches	na	na	na	na	na	na	na	62.1
N.E. Tarrant Co.	40.7	48.2	58.7	70.1	72.3	75.2	73.8	na
North NASA	na	na	na	na	70.1	68.5	68.2	71.0
Odessa/Midland	60.3	61.8	65.2	68.7	72.3	na	72.4	na
Palestine	na	na	na	74.9	76.1	74.0	76.8	76.7
Paris	na	na	na	na	na	na	69.3	71.4
Plano	na	na	na	na	na	73.3	80.3	na
Port Arthur	63.5	65.6	64.5	63.2	64.7	62.6	65.6	67.8
San Angelo	56.1	60.5	63.2	72.5	74.2	73.5	74.6	73.0
San Antonio	48.9	52.2	57.7	63.9	66.0	67.2	67.7	66.0
San Marcos	na	na	na	na	na	na	60.2	60.7
Sherman-Denison	55.6	61.6	na	74.7	76.3	76.8	74.9	73.9
Temple-Belton	48.1	49.8	55.7	64.0	65.6	64.6	62.0	62.5
Texarkana	52.7	55.6	61.0	65.9	69.7	66.8	68.1	66.8
Tyler	na	56.2	na	64.5	69.1	66.6	66.8	68.2
Victoria	58.7	61.3	65.0	69.3	72.1	71.2	72.0	73.5
Wichita Falls	53.7	59.9	64.4	72.5	74.5	72.9	72.1	73.9
Texas	47.3	50.7	55.6	63.0	66.6	65.9	66.2	66.3
United States	35.9	37.4	42.5	50.6	57.3	56.6	55.7	56.1

Source: Real Estate Center at Texas A&M University

**Table 4. Percentage of Households Able to Afford Median-Priced Home
(5 Percent Down Payment), 1989-96**

MSA	1989	1990	1991	1992	1993	1994	1995	1996
Abilene	49.9	64.7	71.4	73.2	71.9	68.9	70.2	68.5
Amarillo	54.2	54.3	57.1	66.3	67.4	66.6	65.4	66.6
Arlington	45.5	51.9	64.2	73.8	75.4	75.2	74.8	75.8
Austin	na	44.6	49.8	55.6	57.2	58.1	57.1	54.8
Beaumont	50.6	54.5	55.0	58.9	62.6	61.2	63.2	62.9
Brazoria Co.	69.6	71.2	75.6	76.3	77.8	77.7	78.2	76.4
Brownsville	na	na	na	55.1	54.8	52.9	51.5	51.6
Bryan-College Station	41.6	42.3	45.6	47.8	51.8	50.7	51.2	53.9
Corpus Christi	42.7	47.4	53.7	62.2	64.7	63.1	62.9	64.8
Dallas	34.8	38.3	41.8	54.4	58.2	58.8	59.6	58.5
Denton	na	na	na	na	74.4	72.5	69.9	na
El Paso	38.0	40.2	46.2	54.6	59.1	na	57.5	58.1
Fort Bend Co.	na	na	na	na	77.7	77.4	77.0	76.3
Fort Worth	43.9	49.8	56.7	66.0	69.0	70.7	71.2	na
Galveston	48.3	49.5	49.4	55.1	54.6	55.5	54.6	56.9
Garland	na	na	na	na	na	85.2	84.7	na
Harlingen	42.8	na	na	na	na	na	58.9	59.7
Houston	51.7	54.7	57.4	65.0	68.5	63.0	63.7	64.1
Irving	41.0	42.5	51.2	66.3	64.7	68.3	67.4	na
Killeen-Ft. Hood	na	na	na	na	68.2	65.9	66.4	65.2
Longview	49.1	50.9	57.7	60.7	64.6	63.6	62.6	na
Lubbock	42.9	46.6	51.5	59.0	63.0	63.7	63.8	64.5
Lufkin	na	na	63.5	68.1	71.6	70.2	68.7	65.0
McAllen	na	na	na	48.8	na	50.7	49.8	47.0
Montgomery Co.	na	na	na	na	65.9	66.2	65.8	64.1
Nacogdoches	na	na	na	na	na	na	na	58.0
N.E. Tarrant Co.	35.3	42.2	53.6	66.4	68.1	71.2	69.8	na
North NASA	na	na	na	na	65.8	64.2	64.0	67.0
Odessa/Midland	56.5	57.7	61.2	65.0	68.8	na	69.2	na
Palestine	na	na	na	72.0	73.3	71.0	74.0	74.2
Paris	na	na	na	na	na	na	65.9	68.3
Plano	na	na	na	na	na	69.3	76.0	na
Port Arthur	60.4	62.6	61.5	59.7	61.3	58.9	62.1	64.3
San Angelo	51.7	56.0	59.1	69.1	70.9	70.1	71.5	70.1
San Antonio	44.7	48.1	53.7	59.7	62.1	63.4	63.8	62.3
San Marcos	na	na	na	na	na	na	56.5	57.2
Sherman-Denison	51.8	57.4	na	71.6	73.3	73.9	71.8	71.1
Temple-Belton	44.3	45.9	51.8	60.0	61.9	61.4	58.6	58.9
Texarkana	48.2	51.2	57.0	62.1	66.2	63.1	64.6	63.2
Tyler	na	52.2	na	60.4	65.5	63.0	63.1	64.8
Victoria	54.7	57.5	61.3	65.8	68.7	67.8	68.8	70.7
Wichita Falls	48.7	55.4	60.0	69.0	71.2	69.5	68.6	71.1
Texas	42.8	46.3	51.3	58.7	62.8	62.2	62.5	62.7
United States	31.1	33.0	37.8	44.9	52.2	51.5	51.0	51.2

Source: Real Estate Center at Texas A&M University

Analysis of Affordability in El Paso

Recent reports show border cities Laredo and El Paso to be among the nation's least affordable housing markets. Oddly, while El Paso is among the cities covered by the THAI, it does not appear to be particularly unaffordable (Laredo is not covered because house price data are unavailable). How could El Paso fare so poorly in other surveys measuring the same thing? Does the THAI methodology overestimate affordability?

Two other indexes cover selected local markets, including some of the metropolitan areas included in the THAI survey. The more widely known of these is the Housing Opportunity Index (HOI) calculated by the National Association of Home Builders. This index is compiled quarterly for 185 metropolitan areas—of which 12 are in Texas. In a recent report, Laredo was ranked 173 and El Paso 137 among these areas in terms of affordability, making them among the least affordable markets in the nation.

The other index is an annual measure created by the Ernst and Young-Kenneth Leventhal Real Estate Group and the Koll National Real Estate Index. Their Composite Housing Costs (CHC) ratio compares the annual costs of housing to annual median income. The composite is for ownership and rental housing, but they provide separate ratios for single-family homes and rental homes. In terms of CHC, El Paso has been reported to be among the ten least affordable markets in the nation.

The THAI is expressed as an "index" (or more properly, a ratio). In addition, an estimate of the proportion of households able to afford the median priced home is made for each area covered by the THAI. The HOI is in the form of an estimate of the proportion of homes sold that a median-income family could afford. The CHC is the ratio of the after-tax costs of principal, interest and property tax payments to median income.

Similar terms are used to calculate each index, but data are derived from different sources. House price data for THAI come from local Multiple Listing Services, while the HOI uses price distributions provided by TRW-REDI, Inc., and the CHC uses price data from Coldwell Banker's Home Price Comparison

Index. Income data for the THAI and CHC are in the form of disposable income reported in the *Survey of Buying Power*. The HOI uses household income as measured by the Department of Housing and Urban Development (HUD).

To compare the measures, the numbers for the HOI (third quarter 1996) and CHC (1996) were collected. The measures were then replicated using the methodology of HOI and CHC but with the data used to produce the THAI for the corresponding time. The purpose of this exercise was to see if the discrepancy in results was caused by differing data sets or the fact that THAI uses a different methodology. The results are shown in Tables 1 and 2.

The THAI data suggest a more affordable situation in almost every area when compared to the HOI. The primary reason for this pattern is the higher home price used in the HOI calculation. It is possible that the prices reported by TRW-REDI include more new homes than the group sold through the MLS. For El Paso, however, the difference in results is caused by NAHB's lower income estimate. The comparison for CHC is less consistent. The CHC ratio is markedly higher than the THAI-based ratio for El Paso, apparently because of higher estimates of housing costs. Income estimates are virtually identical for the two surveys.

These comparisons show that lower affordability indicated in some areas results from using different data series. These data produce either housing prices higher than those reported by local sources or lower incomes as measured by HUD. Such differences are inevitable because data series can be defined in many ways. While the HOI compiled with THAI data consistently ran higher than NAHB's numbers, the house prices were lower or, in some cases, the incomes higher than NAHB's data. No consistent pattern appeared in the comparison to the CHC ratio. If the focus is on movement in the THAI (or any other index), however, the user will be observing changes in affordability in that particular market area—whether positive (increasing THAI) or negative (declining THAI). Inappropriate comparisons may result if the focus is on comparing single numbers for one area with those for another or if absolute numbers from one ratio (the THAI, for example) are compared with absolute numbers from an alternative index measure.

**Table 1. Housing Opportunity Index Compiled by NAHB and Replicated with THAI Data
Third Quarter 1996**

City	Index		Median Price		Median Income	
	NAHB	THAI	NAHB	THAI	NAHB	THAI
Amarillo	67.4	84.3	81,000	74,100	36,400	42,000
Austin	50.3	52.3	124,000	107,400	44,900	41,100
Beaumont	70.1	79.2	74,000	73,200	37,300	39,000
Brazoria County	66.7	86.4	107,000	73,700	46,900	51,200
Dallas	58.6	61.3	116,000	101,400	48,300	44,300
El Paso	52.4	65.5	80,000	79,100	28,900	34,200
Fort Worth	69.3	-	93,000	-	47,500	-
Houston	63.1	69.2	100,000	84,600	46,000	43,500
Laredo	20.1	-	95,000	-	24,900	-
Lubbock	66.7	79.8	83,000	71,800	36,300	38,600
San Antonio	59.8	71.8	88,000	84,400	36,000	41,400
Tyler	60.7	76.2	100,000	84,500	38,200	44,200

**Table 2. Ratio of Single-family Housing Costs to Income as Compiled by Leventhal
Real Estate Group and Replicated with THAI Data
Annual 1996**

City	Ratio		Median Income	
	Leventhal	THAI	Leventhal	THAI
Austin	30.6	32.5	37,000	35,200
Dallas-Fort Worth	20.2	24.8	42,200	36,500
El Paso	35.5	26.2	28,800	28,900
Houston	19.4	25.8	41,300	36,400
San Antonio	25.3	24.1	32,600	34,600

Appendix A

Household Income Estimates

The equation for housing affordability requires a current measure of median household income for each reported housing market. The THAI uses median EBI. Year-end estimates of EBI are reported for each county, metropolitan statistical area and major city in the nation, as well as for states and the nation as a whole in the annual *Survey of Buying Power*. The survey is available in September of the following year. In addition, the Real Estate Center forecasts an end-of-the-year EBI for all Texas MSAs based on the most recent EBI estimate and other economic data.

Consequently, estimating THAI values for quarters on a timely basis requires some manipulation of income estimates. For the second, third and fourth quarters, mid-quarter estimates are obtained by interpolating between the estimate for the end of the previous year ($INCE[y-1]$) and the forecast for end of the current year ($INCFE[y]$):

$$\text{Quarter 2 INCOME} = INCE[y-1] + .375 (INCF[y] - INCE[y-1])$$

$$\text{Quarter 3 INCOME} = INCE[y-1] + .625 (INCF[y] - INCE[y-1])$$

$$\text{Quarter 4 INCOME} = INCE[y-1] + .875 (INCF[y] - INCE[y-1])$$

Note that the interpolation is set to provide mid-quarter estimates to match the other

quarterly averaged figures in the equation. The annual THAI values shown in this report are based on mid-year interpolation of year-end EBI estimates.

The method for the first quarter is somewhat different because no current estimate or forecast is available at the time the index must be estimated. First quarter income is extrapolated from the previous year's forecast ($INCF[y-1]$) and the previous two-year's estimate ($INCE[y-2]$):

$$\text{Quarter 1 INCOME} = INCE[y-2] + 1.0125 (INCF[y-1] - INCE[y-2])$$

In essence, the methodology assumes the income growth rate during the previous year continues through the first quarter of the next year. In addition, the method assumes that income growth is constant during the year.

When data become available for the current year, all indexes for that year are recalculated, using the new information on income.

In 1996, Market Statistics changed their methodology for calculating EBI, switching from a "personal income" method to a "money income" method of defining income. Money income is a less inclusive measure that is about 18 percent lower than personal income on a national basis. To maintain continuity, all income estimates used for THAI were increased by 18 percent for 1996.

Appendix B

Support for THAI Equation

Mortgage lenders, when underwriting conventional mortgage loans, commonly apply the ratios mandated by the Federal National Mortgage Association for loans purchased by that agency. This means that a borrower, with relatively little long-term debt, can qualify for a loan if the payments are no more than 28 percent of monthly income. This ratio is periodically, although infrequently, adjusted according to lenders' experience with borrower default rates. In this case, the payment includes the tax and insurance escrow payment in addition to loan principal and interest payments (PITI). For THAI, the percentage of income applied is adjusted to account for the use of principal and interest (PI) payments instead of PITI and for the use of EBI instead of gross income.

Information on housing costs is contained in the *American Housing Survey*, published by the census bureau in odd-numbered years. For the South region (which includes Texas) the following median monthly housing costs were reported:

	1991	1993	1995
Principal and interest (PI)	\$433	\$452	\$480
Insurance	32	34	38
Taxes	40	45	49
Total PITI	\$505	\$531	\$567
PITI / PI	1.17	1.17	1.18

EBI is intended as an after-tax, disposable income measure. Mortgage loan qualifying, however, is based on gross income. The 1990 Census of Population reports the median household gross income for Texas as \$27,016. For the same period (December 1989), Texas median household EBI is reported as \$23,975. Based on these figures, gross income is approximately 13 percent higher than EBI.

From these relationships, a ratio can be calculated:

$$\text{THAI} = \frac{.28 \text{ Income}}{\text{PITI}}$$

$$\text{Income} = 1.13 \text{ EBI}$$

Before 1995:

$$\text{PITI} = 1.17 \text{ PI}$$

$$\text{THAI} = \frac{.28 \times 1.13 \text{ EBI}}{1.17 \text{ PI}} = \frac{.27 \text{ EBI}}{\text{PI}}$$

After 1995:

$$\text{PITI} = 1.18 \text{ PI}$$

$$\text{THAI} = \frac{.28 \times 1.13 \text{ EBI}}{1.18 \text{ PI}} = \frac{.27 \text{ EBI}}{\text{PI}}$$

Appendix C

Method for Estimating Percentage of Households Able to Afford the Median-Priced Home

An estimate of the percentage of households in the market area that can qualify to buy the median-priced home is included for each THAI value. This estimate is based on the distribution of household incomes in the area. An estimate of this distribution is reported annually in the *Survey of Buying Power*, the same source used for median household income in the THAI equation. The distribution is expressed as the percentage of all households having EBI within specified brackets. The income brackets used in the survey are \$10,000 - \$19,999; \$20,000 - \$34,999; \$35,000 - \$49,500; and \$50,000 and more (starting in 1996, the lower bracket was no longer reported). This information is converted to a cumulative income distribution showing the percentage of households earning more than \$10,000; \$20,000; \$35,000 and \$50,000, respectively. The income needed to qualify for the median-priced home is calculated and this cumulative distribution is used to indicate how many households earn at least that amount of EBI.

The following example provides more detail. Suppose, for the subject market area, EBI is distributed as:

EBI	Percentage of Households
\$10,000 - 19,999	25
20,000 - 34,999	20
35,000 - 49,999	22
50,000 or more	18

This can be converted into a cumulative distribution:

EBI	Percentage Earning at Least This Amount
\$10,000	85
20,000	60
35,000	40
50,000	18

Suppose the median-priced home, at prevailing mortgage interest rates, requires a monthly payment of \$720. The monthly payment, divided by 27 percent and annualized, calls for a qualifying EBI income of \$32,000 (applying the THAI criteria). The problem is estimating the percentage of households that

have EBI of at least \$32,000. This is done by interpolating between known points on the cumulative income distribution.

The simplest way of doing this is to assume the curve of the distribution is straight between the \$20,000 and \$35,000 points (actual data from census years show this to be a fairly good assumption). Because \$32,000 is .8 of the difference between \$20,000 and \$35,000, the percentage should be .8 of the difference from 60 and 40 percent, or 44 percent.

As mentioned earlier, the EBI distributions are intended to represent the same period of time as are the median EBI figures, that is the end of the previous year. To match the distributions to the mid-point of the current quarter, they must be updated. The method used for THAI purposes assumes that no fundamental change in the shape of the distribution occurs during the year. In other words, the distribution at the beginning of the year is simply shifted by the same amount as the median.

An example explains how this is done. First, the distribution reported in the *Survey of Buying Power* is converted to a cumulative distribution. The amount of shift in the median is calculated by dividing the new median EBI by the end-of-the-year EBI figure and subtracting 1.0. For the example, suppose the median has shifted upward by 10 percent (.10) by the mid-point in the current quarter. Also suppose the distribution in the example is the same one shown in the previous example. The percentage of households in the \$10,000 - \$19,999 bracket is multiplied by 10 percent (in this case, the result is 2.5 percent). This amount is added to the old cumulative distribution for those making \$10,000 or more. The new distribution is 85 percent plus 2.5 percent, or 87.5 percent. In like fashion, the other brackets of the distribution are updated:

Bracket	Percentage	10 Percent	Cumulative Old	New
\$20,000 - 34,999	20	2	60	62
\$35,000 - 49,999	22	2.2	40	42.2
\$50,000 +	18	1.8	18	19.8

Appendix D

Low Down Payment Indexes

Two additional affordability indexes were created to reflect the difficulties of home buying with insufficient cash for a 20 percent down payment. The THAI is based on a mortgage loan covering 80 percent of the price of the home, whereas the supplemental indexes assume loan-to-value ratios of 90 percent and 95 percent, respectively. The 90 percent index indicates the affordability of homes if all households had to qualify for loans covering 90 percent of cost. The 95 percent index should be interpreted similarly, except that all financing is assumed to cover 95 percent of cost. The purpose of these indexes is to indicate how affordability is affected by limitations on available cash for home purchases.

The following assumptions were incorporated into construction of the indexes:

1. All loans are FHA insured. The reason for this assumption is that FHA rules are well known and uniform. To the extent that conventional, privately insured loans are more affordable than FHA, the indexes will understate actual affordability.
2. FHA loans require payment of a Mortgage Insurance Premium (MIP) when the loan is

closed, as well as a periodic premium for loans covering more than 90 percent of value. Before 1993, MIP was 3.8 percent of the loan amount. In 1993, it dropped to 3 percent and again reduced to 2.25 percent in 1995. The new indexes use this schedule and assume the entire MIP is financed into the loan. For practical purposes, this means that the 90 percent index is based on a loan of 93 percent (for 1993 and 1994) and the 95 percent index is based on a loan amount of 98 percent of median home price.

3. The 95 percent index incorporates an FHA periodic premium of .5 percent of the outstanding principal per year, divided equally among monthly payments.
4. The index value indicates what the THAI would be if all households had to use a 90 or 95 percent loan, just as the regular THAI value indicates affordability assuming all households have access to enough cash to make a 20 percent down payment. Likewise, these assumptions underlie the estimated percentage of households that can afford the median-priced home.

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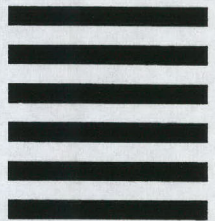
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