Real Estate Market Efficiency Issues and Evidence

103363110 ANDY CHEN

Market Efficiency defined

- Market efficiency was developed in 1970 by Economist Eugene Fama who's theory efficient market hypothesis (EMH), stated that it is not possible for an investor to outperform the market because all available information is already built into all asset prices. Investors who agree with this statement tend to buy index funds that track overall market performance.

Market efficiency in real estates

- A lot of studies have been done to test the EMH in the real estates, even though no commonly accepted conclusions have been drawn.
- Those studies include single-family housing market, income-property market, urban and rural land markets, and real estates related securities markets, as shown belows

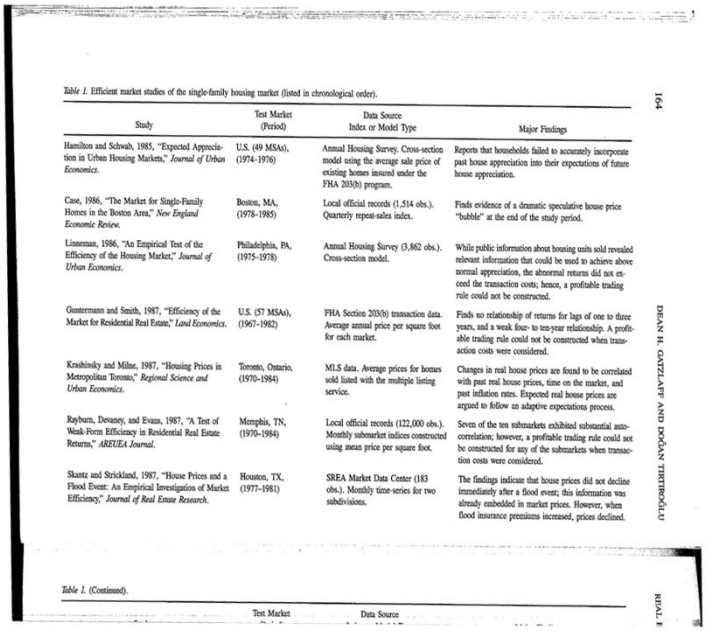

Table 1. Efficient market studies of the single-family housing market (listed in chronological order).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Hamilton and Schwab, 1985, "Expected Appreciation in Urban Housing Markets," *Journal of Urban Economics*.	U.S. (49 MSAs), (1974–1976)	Annual Housing Survey. Cross-section model using the average sale price of existing homes insured under the FHA 203(b) program.	Reports that households failed to accurately incorporate past house appreciation into their expectations of future house appreciation.
Case, 1986, "The Market for Single-Family Homes in the Boston Area," *New England Economic Review*.	Boston, MA, (1978–1985)	Local official records (1,514 obs.). Quarterly repeat-sales index.	Finds evidence of a dramatic speculative house price "bubble" at the end of the study period.
Linneman, 1986, "An Empirical Test of the Efficiency of the Housing Market," *Journal of Urban Economics*.	Philadelphia, PA, (1975–1978)	Annual Housing Survey (3,862 obs.). Cross-section model.	While public information about housing units sold revealed relevant information that could be used to achieve above normal appreciation, the abnormal returns did not exceed the transaction costs; hence, a profitable trading rule could not be constructed.
Gustermann and Smith, 1987, "Efficiency of the Market for Residential Real Estate," *Land Economics*.	U.S. (57 MSAs), (1967–1982)	FHA Section 203(b) transaction data. Average annual price per square foot for each market.	Finds no relationship of returns for lags of one to three years, and a weak four- to ten-year relationship. A profitable trading rule could not be constructed when transaction costs were considered.
Krushinsky and Milne, 1987, "Housing Prices in Metropolitan Toronto," *Regional Science and Urban Economics*.	Toronto, Ontario, (1970–1984)	MLS data. Average prices for homes sold listed with the multiple listing service.	Changes in real house prices are found to be correlated with past real house prices, time on the market, and past inflation rates. Expected real house prices are argued to follow an adaptive expectations process.
Rayburn, Devaney, and Evans, 1987, "A Test of Weak-Form Efficiency in Residential Real Estate Returns," *AREUEA Journal*.	Memphis, TN, (1970–1984)	Local official records (122,000 obs.). Monthly submarket indices constructed using mean price per square foot.	Seven of the ten submarkets exhibited substantial autocorrelation; however, a profitable trading rule could not be constructed for any of the submarkets when transaction costs were considered.
Skantz and Strickland, 1987, "House Prices and a Flood Event: An Empirical Investigation of Market Efficiency," *Journal of Real Estate Research*.	Houston, TX, (1977–1981)	SREA Market Data Center (183 obs.). Monthly time-series for two subdivisions.	The findings indicate that house prices did not decline immediately after a flood event; this information was already embedded in market prices. However, when flood insurance premiums increased, prices declined.

Table 1. (Continued).

Test Market	Data Source

Skantz and Strickland, 1987, "House Prices and a Flood Event: An Empirical Investigation of Market Efficiency," *Journal of Real Estate Research.*	Houston, TX, (1977–1981)	SREA Market Data Center (183 obs.). Monthly time-series for two subdivisions.	The findings indicate that house prices did not decline immediately after a flood event; this information was already embedded in market prices. However, when flood insurance premiums increased, prices declined.

Table 1. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Green, Marx, and Essayyad, 1988, "The Effect of Inter-Regional Efficiency on Appraising Single-Family Homes." *The Real Estate Appraiser and Analyst.*	U.S. (73 MSAs), (1966–1973)	FHA Section 203(b) transaction data on existing homes.	Single-family housing markets in the North Central and Northeast states are argued to be more efficient than in the West or South.
Case and Shiller, 1989, "The Efficiency of the Market for Single-Family Homes," *The American Economic Review.*	Atlanta, GA: Chicago, IL; Dallas, TX; and San Francisco, CA, (1970–1986)	SREA Market Data Center (approx. 10,000 obs. per market). Quarterly repeat-sales index.	Reports significant first-order autocorrelation of after-tax excess returns to housing. Assuming no transaction costs, a trading rule was constructed to consistently exploit the autocorrelation in returns.
Mankiw and Weil, 1989, "The Baby Boom, The Baby Bust, and The Housing Market," *Regional Science and Urban Economics.*	U.S., (1947–1987)	Census records, fixed reproducible wealth; and the residential investment deflator relative to the GNP deflator.	Forecastable increases in the demand for housing are reported not to be anticipated by the housing market.
Case and Shiller, 1990, "Forecasting Prices and Excess Returns in the Housing Market," *The AREUEA Journal.*	See Case and Shiller (1989)	See Case and Shiller (1989)	Findings indicate that the ratio of construction costs to price, changes in population, and changes in real per capita income can be used to consistently predict subsequent house price changes.
Gatzlaff, 1990, "The Efficiency of the Single-Family Housing Market: An Empirical Study," Unpublished Ph.D. Thesis.	See Case and Shiller (1989)	See Case and Shiller (1989)	Previous findings of significant autocorrelation in excess returns to housing are not substantially altered by specifying time-varying marginal tax rates or volatility; however, they are highly influenced by inflation expectations.
Turnbull, Sirmans, and Benjamin, 1990, "Do Corporations Sell Houses for Less? A Test of Housing Market Efficiency," *Applied Economics.*	Baton Rouge, LA, (1984–1987)	Transaction data from local realtors (342 obs.).	Findings indicate that houses sold by corporate owners do not sell at a discount. The authors report that "housing markets are sufficiently efficient to maintain the 'single price' hypothesis for identical housing."
Guntermann and Norrbin, 1991, "Empirical Tests of Real Estate Market Efficiency," *Journal of Real Estate Finance and Economics.*	Lubbock, TX, (1970–1981)	MLS and transaction data maintained by local appraisers (9,340 obs.). Quarterly index using the mean price per square foot.	Evidence that markets rapidly adjust toward market equilibrium is reported. Moderate adjustment delays are explained by the existence of large transaction and search costs in the housing market.

Table 1. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Hosios and Pesando, 1991, "Measuring Prices in Resale Housing Markets in Canada: Evidence and Implications," *Journal of Housing Economics.*	Toronto, Canada, (1974–1989)	Local official records compiled by Teela Market Surveys (52,581 obs.). Quarterly repeat-sales index.	Substantial persistence in the movement of real house prices is reported. In addition, house price movements are found to have a significant seasonal component.
Tirtiroğlu, 1991, "Information Processing by Markets and Market Efficiency, Unpublished Ph.D. Thesis.	Connecticut (19 towns), (1982–1988)	Local official records. AV index construction method.	Finds that movements in house values in one town are correlated with lagged movements in prices in a neighboring town.
Gyourko and Voith, 1992, "Local Market and National Components in House Price Appreciation," *Journal of Urban Economics.*	U.S. (56 MSAs), (1971–1989)	WEFA Group. Time-series cross-section data on the median price of existing home sales.	Reports persistence in price trends.
Meese and Wallace, 1992, "Testing the Present Value Relation for Housing Prices: Should I Leave My House in San Francisco?" Working Paper.	Alameda and San Francisco Counties, (1970–1988)	Selling prices from the California Market Data Cooperative (111,747 and 36,197 obs.). Rent index from local newspaper listings, nonparametric house price index.	Reports persistent errors between the modeled short-run present value prices of housing and the actual prices. However, long-run results are found to be consistent with the housing price present value expectations. The authors suggest that the findings are consistent with a market characterized by high transaction costs.
Tirtiroğlu, 1992, "Efficiency in Housing Markets: Temporal and Spatial Dimensions," *Journal of Housing Economics.*	See Tirtiroğlu (1991)	See Tirtiroğlu (1991)	See Tirtiroğlu (1991)
Kim and Suh, 1993, "Speculation and Price Bubbles in Korean and Japanese Real Estate Markets," *Journal of Real Estate Finance and Economics.*	Korean Housing Market, (1974–1989)	House price index compiled by the Korean Housing Bank	Evidence suggests that the relative price of housing is predictable.
Clapp, Dolde, and Tirtiroğlu, 1994, "Imperfect Information and Investor Inferences from Housing Price Dynamics," Working Paper.	San Francisco, Boston, Connecticut, and the U.S. (periods vary)	Quarterly indices obtained from previous studies.	House price changes are reported to be influenced by lagged price changes in neighboring market areas, but not in nonneighboring localities.

Table 1. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings

Information and Investor Inferences from Housing Price Dynamics," Working Paper.	Connecticut, and the U.S. (periods vary)	vious studies.	lagged price changes in neighboring market areas, but not in nonneighboring localities.

Table 1. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Clapp and Giaccotto, 1994, "The Influence of Economic Variables on Local House Price Dynamics," *Journal of Urban Economics*.	Connecticut (4 towns), (1982–1988)	Local official records, *AV* index construction method.	Predictable changes in local (un)employment, population, and income are found to predict changes in local market house prices.
Clapp and Tirtiroğlu, 1994, "Positive Feedback Trading and Diffusion of Asset Price Changes: Evidence from Housing Transactions," *Journal of Economic Behavior and Organization*.	See Tirtiroğlu (1991)	See Tirtiroğlu (1991)	House price changes are found to be diffuse across markets. The pricing process is argued to be consistent with biases in human judgment and decision-making.
Tirtiroğlu and Clapp, 1994, "Spatial Barriers and Information Processing in Housing Markets: An Empirical Investigation of Effects of Connecticut River on Housing Returns," Working Paper.	Connecticut towns located along the Connecticut River, (1982–1990)	Local official records. *AV* index construction method.	Evidence indicates that spatial barriers (i.e., the Connecticut River) reduces the diffusion of information.
Gatzlaff, 1995, "Excess Returns, Inflation and the Efficiency of the Housing Market," *The AREUEA Journal*.	See Gatzlaff (1990)	See Gatzlaff (1990)	Findings indicate that while autocorrelated after-tax excess returns are substantially diminished when tests are restricted to allow for autocorrelated unanticipated inflation, some serial dependency remains.

Table 2. Efficient market studies of the income-property market (listed in chronological order).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Greer, 1974, "Risk, Return, and Efficiency in the Market for Real Property," Unpublished Ph.D. Thesis.	Denver, CO, Apartment Market, (1968–1973)	Local transaction data (135 obs.).	Tests show that investors with inside information were not able to earn significantly higher risk-adjusted returns than those predicted by a market model.
Gau, 1984, "Weak Form Tests of the Efficiency of Real Estate Investment Markets," *Financial Review*.	Apartment and office submarkets in Vancouver, B.C., (1971–1980)	Local transaction data (120 obs.). Price per square foot, gross income multiplier, and price per suite indices constructed using one transaction per month.	This study reports a general absence of significant autocorrelation in returns.
Brown, (1985), "The Information Content of Property Valuations," *Journal of Valuation*.	Retail, office, and industrial properties in the UK, (1979–1982)	Returns generated using valuation and cashflow data on a monthly basis.	This study reports a lack of serial dependence in monthly, quarterly, and semi-annual returns. The hypothesis that the serial correlation coefficients were all significantly different from zero was rejected for all lags and holding periods tested.
Gau, 1985, "Public Information and Abnormal Returns to Real Estate Investment," *AREUEA Journal*.	Vancouver, B.C., Apartment market, (1971–1980)	See Gau (1984)	Findings indicate that investors were unable to earn abnormal risk-adjusted returns on the basis of new government tax policy information or interest rate movements.
Isakson and McInish, 1988, "The Efficiency of the Market for Multi-Family Housing," Unpublished Manuscript.	18 U.S. cities, Apartment markets, (1978–1983)	IREM income and expense data. Annual returns are calculated as the ratio of annual net operating income per square foot to current investment per square foot for each city.	Findings are consistent with a weak-form efficient hypothesis for lags of one year, but not consistent for lags of two or three years.
McIntosh and Henderson, 1989, "The Efficiency of the Office Properties Market," *Journal of Real Estate Finance and Economics*.	Office submarkets in Dallas-Ft. Worth, TX, (1979–1985)	Local transaction data (73 obs.). Price per square foot of rental area, gross income multiplier, and net income multiplier indices constructed using one transaction per month.	Serial correlation tests of price and return measures indicate a lack of significant autocorrelation.

Table 2. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings

McIntosh and Henderson, 1989, "The Efficiency of the Office Properties Market," *Journal of Real Estate Finance and Economics.*	Office submarkets in Dallas-Ft. Worth, TX, (1979–1985)	Local transaction data (73 obs.). Price per square foot of rental area, gross income multiplier, and net income multiplier indices constructed using one transaction per month.	Serial correlation tests of price and return measures indicate a lack of significant autocorrelation.

Table 2. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Evans, 1990, "A Transfer Function Analysis of Real Estate Capitalization Rates," *Journal of Real Estate Research.*	U.S. income property markets, (1975–1988)	American Council of Life Insurance Companies' capitalization rates for commitments on multifamily and nonresidential properties.	The analysis indicates a one-quarter lag in the relationship between the stock and real estate markets, suggesting that the real estate market is slow to adjust to changes in the business cycle.
Dokko, Edelstein, Pomer, and Urdang, 1991, "Determinants of the Rate of Return for Nonresidential Real Estate: Inflation Expectations and Market Adjustment Lags," *AREUEA Journal.*	U.S. income property markets, (1975–1984)	Properties selected from six large commingled Real Estate Funds for Pension Trusts (102 obs.).	When parcel location and land use are added as explanatory variables, the coefficient of the lagged rate of return are not significantly positive. Evidence suggests that the effects of a given economic shock dissipate quickly.
Londerville, 1992, "Commercial Real Estate Market Efficiency," Working Paper.	Vancouver, B.C., Apartment market, (1971–1985)	Local official records (809 obs.). Risk adjusted Sharpe indices are calculated for portfolios as well as the total group of properties.	Tests indicate no difference in Sharpe indices constructed for individual portfolios versus the full group of properties; hence, consistent excess returns are not achievable.

Table 3. Efficient market studies of urban and rural land markets (listed in chronological order).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Adams *et al.*, 1968, "Undeveloped Land Prices During Urbanization: A Micro-Empirical Study Over Time," *Review of Economics and Statistics.*	Philadelphia, PA, Urban Land Market, (1945–1962)	Local transaction data (1111 obs.). Analysis of cross-section observations pooled over time.	Authors indicate that land development trends were anticipated and rationally priced by the market.
Davies, 1977, "An Examination of the Market for Urban Single-Family Detached Lots," *Journal of Regional Science.*	London, Ontario, Urban Land Market, (1966–1973)	The Teela Digest. The montly median sale price of lots sold.	Evidence suggests that builders form expectations about future prices and costs primarily on the basis of the rate of change in the profitability of building and selling houses four months prior to the current period. The adoption of restrictive land use policies triggered an immediate and sustained increase in prices due to increased costs and uncertainty.
Burt, 1986, "Econometric Modeling of the Capitalization Formula for Farmland Prices," *American Journal of Agricultural Economics.*	Illinois Farmland, (1960–1983)	Illinois value series for high-quality grainland and data from the University of Illinois farm record program.	Suggests that farmland values are determined primarily by land rents and that values are not driven by speculative forces.
Carey, 1990, "Feeding the Fad: The Federal Land Banks, Land Market Efficiency, and the Farm Credit Crisis," Unpublished Ph.D. Thesis.	U.S. Farmland and Illinois Grain Farms, (1910–1988 and 1959–1985)	Agricultural Finance Databook; and National Financial Summary of Farm Market Developments and Agriculture Resources: Agricultural Land Values, Market Situation and Outlook Report.	This study reports large deviations in agricultural land values from market fundamentals. These deviations are attributed to market psychology and failures of the Farm Credit System.
Scott, 1990, "The Efficiency of the Office Properties Market," *Journal of Real Estate Finance and Economics.*	U.S. Farmland, (1912–1984)	USDA farmland value and income series. Average value per acre and income per acre indices are used.	Results somewhat support the notion that land prices reflect market fundamentals; however, recent price movements suggest the opposite.
Falk, 1991, "Formally Testing the Present Value Model of Farmland Prices," *American Journal of Agricultural Economics.*	Iowa Farmland, (1921–1986)	USDA farm value series (1921–1949); Iowa State University Extension Service's land value series (1950–1986).	Findings indicate that the changes in the excess returns to Iowa farmland are predictable.
Tegene and Kuchler, 1991, "A Description of Farmland Investor Expectations," *Journal of Real Estate Finance and Economics.*	Midwest Farmland, (1921–1989)	USDA. The nominal value per acre and rent per acre series are deflated by the personal consumption expenditure component of the gross national product.	The results suggest that the market follows an adaptive expectations pricing process.
Falk, 1992, "Predictable Excess Returns in Real Estate Markets: A Study of Iowa Farmland Values," Working Paper.	See Falk (1991)	See Falk (1991)	The results suggest that there exist simple profitable trading strategies available to investors in the Iowa farmland market.

Table 4. Efficient market studies of real estate-related securities markets.

Panel A: Real Estate Securities Market

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Locke, 1986, "Real Estate Market Efficiency," *Land Development Studies*.	British and Australian Real Estate-Related Securities, (1980s)	British and Australian property indices.	Tests of autocorrelation and runs tests are found to be consistent with the EMH. In addition, the majority of the returns were found to be lognormally distributed.
Darrat and Glascock, 1989, "Real Estate Returns, Money and Fiscal Deficits: Is the Real Estate Market Efficient?" *Journal of Real Estate Finance and Economics*.	U.S. real estate-related securities, (1965–1986)	CRSP tapes, University of Chicago.	Report evidence of a significant relationship between lagged monetary policy and real estate returns; however, trading rules were not explored to determine if consistent abnormal profits were achievable.
Colwell and Park, 1990, "Seasonality and Size Effects: The Case of Real-Estate-Related Investment," *Journal of Real Estate Finance and Economics*.	28 equity REITs and 33 mortgage REITs (1964–1986)	CRSP tapes, University of Chicago.	Evidence of size-related seasonality in real estate-related investments.
Scott, 1990, "Do Prices Reflect Market Fundamentals in Real Estate?" *Journal of Real Estate Finance and Economics*.	The market for REITs, (early 1970s–1986, periods vary)	CRSP tapes, University of Chicago.	Regression tests and mean tests indicate prices do not always track market fundamentals, and in many cases volatility is greater than *ex post* market fundamentals.
McIntosh, Liang, and Tompkins, 1991, "An Examination of the Small-Firm Effect within the REIT Industry," *Journal of Real Estate Research*.	The market for REITs, (1974–1988)	CRSP tapes, University of Chicago. The National Association of Real Estate Investment Trusts.	Report evidence that REIT investors could have earned abnormal returns by acquiring the securities of smaller REITs, even when the possible causes of the small-firm effect as described in the financial efficient markets literature were considered.
Bharati and Gupta, 1992, "Asset Allocation and Predictability of Real Estate Returns," *Journal of Real Estate Research*.	The market for REITs (1973–1990)	CRSP tapes, University of Chicago.	Results suggest that trading rules may be able to outperform buy-and-hold strategies even when considering transactions costs.
Liu and Mei, 1992, "The Predictability of Returns on Equity REITs and Their Co-Movement with Other Assets," *Journal of Real Estate Finance and Economics*.	Equally-weighted equity REIT return series using all available REITs on the CRSP tapes, (1971–1989)	CRSP tapes, University of Chicago.	Evidence indicates that expected excess returns to REITs are more predictable for equity REITs than for small cap stocks, value-weighted stocks, and bonds. In addition, risk premia appear to vary over time.

Table 4. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Darrat and Glascock, 1993, "On the Real Estate Market Efficiency," *Journal of Real Estate Finance and Economics*.	U.S. real estate-related securities, (1965–1989)	CRSP tapes, University of Chicago. VAR model.	Report that changes in industrial production, risk premia, interest rate term structure, and the monetary base were quickly and fully capitalized by the real estate market. However, evidence of a significant lagged relationship between fiscal policy and real estate returns existed. Trading rules were not explored to determine if consistent abnormal profits were achievable.
Mei and Liu, 1993, "The Predictability of Real Estate Returns and Market Timing," Working Paper.	Returns constructed using equity REITs and real estate-related firms, (1971–1989)	CRSP tapes, University of Chicago.	Reports that an *ex ante* trading strategy can be constructed to earn excessive risk-adjusted returns, relative to the overall stock market, for the period studied.

Panel B: The Mortgage and Mortgage-Backed Securities Markets

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Klaman, 1961, *The Postwar Residential Mortgage Market*.	Primary mortgage market, (1946–1956)	Quarterly data on conventional mortgage contract rates from major insurance companies.	Report a consistent four-quarter lag in the movements of mortgage interest rate changes behind those of changes in bond yields. In addition, substantial regional differences in yields are reported.
Guttentag and Beck, 1970, *New Series on Home Mortgage Yields Since 1951*.	Primary mortgage market, (1954–1960)	Monthly data on FHA, VA, and conventional residential loans from large insurance companies.	Estimated that changes in mortgage yields lagged changes in bond yields by approximately four to seven months.
Hilliard and Haney, 1982, "The Evolutionary Relationship Between Bond Markets and Mortgage Markets: A Cross-Spectral Analysis," *Housing Finance Review*.	Primary mortgage market, (1951–1962) and (1963–1972)	NBER series constructed by Guttentag and Beck (1970) and the FHLBB series. Conducted cross-spectral analysis.	Estimated that mortgage yields lagged long-term government bond yields by approximately three months during the 1950s and one month in the 1960s.
Edmister and Merriken, 1988, "Pricing Efficiency in the Mortgage Market," *AREUEA Journal*.	Primary mortgage market, (May 1981 to Oct. 1982)	Daily yields computed from mortgage terms quoted by lenders in New Jersey and New York.	Mortgage contracts were generally found to be efficiently priced relative to the bond market. However, some mortgages were observed to be smoothed with an autoregressive lag lasting up to thirteen weeks.

Table 4. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Haney, 1988, "Sticky Mortgage Rates: Some			

Finance Review. Edmister and Merriken, 1988, "Pricing Efficiency in the Mortgage Market," *AREUEA Journal.*	Primary mortgage market, (May 1981 to Oct. 1982)	Daily yields computed from mortgage terms quoted by lenders in New Jersey and New York.	Mortgage contracts were generally found to be efficiently priced relative to the bond market. However, some mortgages were observed to be smoothed with an auto-regressive lag lasting up to thirteen weeks.

Table 4. (Continued).

Study	Test Market (Period)	Data Source Index or Model Type	Major Findings
Haney, 1988, "Sticky Mortgage Rates: Some Empirical Evidence," *Journal of Real Estate Research.*	Primary mortgage market, (1973–1981)	Effective mortgage rates reported by the Federal Home Loan Bank Board and Salomon Brothers' yield series for GNMA securiteis. Conducted cross-spectral analysis.	Reports that the secondary mortgage market appears to be fully integrated with the capital market. However, changes in the primary mortgage market are estimated to lag changes in the bond market by three weeks.
Roth, 1988, "Volatile Mortgage Rates—A New Fact of Life?" *Economic Review.*	Primary mortgage market, (1972–1987)	Monthly mortgage rates from the FHLMC Primary Mortgage Market Survey.	Reports that correlations between monthly changes in the 10-year Treasury rate and in the FHLMC mortgage rate have dramatically increased from 1972 to 1987 due to the growth of the secondary mortgage market.
Reichenstein, 1989, "Martingales and Efficient Forecasts of Effective Mortgage Rates," *Journal of Real Estate Finance and Economics.*	U.S. mortgage and mortgage-backed securities markets, (1972:1–1979:3) and (1979:4–1987:4)	Effective rates on new commitments for 30-year, conventional fixed-rate mortgages and bond-equivalent yields on GNMA securities from the FHLBB and the Federal Reserve System.	Findings reject the efficiency of no-change forecasts of the 30-year conventional rate and GNMA rate for the period 1972 to 1979. The results support the efficiency of one- through three-quarter-ahead no-change predictions from 1979 to 1987.
Quigley and Van Order, 1990, "Efficiency in the Mortgage Market: The Borrowers Perspective," *AREUEA Journal.*	Primary mortgage market, (1976–1989)	Mortgage history data on 30-year, fixed-rate mortgages from the FHLMC.	While borrowers were generally found to exercise their prepayment options consistent with a contingent-claims model, they were slow to exercise the option.
Ma and Goebel, 1991, "On the Seasonalities of Mortgage-Backed Security Prices," *Journal of Real Estate Research.*	Mortgage-backed securities market, (1980–1988)	Daily prices from Data Resources Incorporated.	Significant negative Monday returns are found to occur during "bear-market" periods. In addition, the returns of GNMA pass-through securities are found to be abnormally high on days prior to a holiday.
Haney, 1992, "Primary Mortgage Market Integration into the Capital Markets," Working Paper.	Primary mortgage market, (1971–1992)	See Haney (1988).	Mortgage rates on single-family mortgages persistently lagged bond market rates well into the 1980s. However, rate movements in mortgage market are now found to be contemporaneous with rate movements in the capital market.

Some General Conclusions

- Existing studies report that income properties markets are more efficient than housing markets, but less efficient than corporate security markets.
- However, due to the fact that the number of studies conducted is quite limited, and of those completed, are mostly considerably restricted by a lack of adequate data, so such findings are considered to be very preliminary.

Suggestions for future research

- The paper has provided some suggestions for future research, including but not limited to:
  - Studies that develop efficient and reliable techniques to estimate price changes and returns in real estate assets for national, regional and metropolitan and local markets;
  - Studies that test alternative market equilibrium models and the sensitivity of previous EMH test results, to changes in the model specifications;
  - Studies that test conditions of intra-market, inter-market, and full market efficiency.