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Capital Gains Tax and Housing Price Bubble: A Cross-Country Study

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Abstract

Policy makers in housing sector seeks to use instruments by which they can control volatility of housing price and prevent high disturbances of the bubble and price shocks, or at least, reduce them. In the portfolio and speculation theories, it is emphasized that speculative demand for housing is the main cause of shocks and price volatilities in the sector. The theory of housing price bubble also describe the dominance of speculative demand and importance of asset demand in the composition of housing demand as the main cause of housing price shocks. Therefore, capital gains tax, which is used in most developed countries, is regarded one of the strong instruments to control and direct housing speculation to minimize damages to the sector. In this study, an attempt has been paid to investigate the effect of capital gains tax on housing prices using panel data for 18 countries (including Iran) over the period from 1991 to 2004. The results show that the efficiency of capital gains tax in countries with capital gains tax system is higher than that of countries lacking the system. In all estimated equations, the real capital gains tax and its share of total tax, contribute significantly to the stabilization of housing prices and controlling housing price volatility. The intermediate objectives of monetary policy, including pegged interest rates and liquidity play a significant role in achieving the ultimate goals of monetary policy such as the housing price bubble and inflation. In addition, the prices of assets have been among the factors affecting housing prices in countries under study.

Key Words: Capital Gains Tax, Price Bubble, Housing

1- Introduction

Developments of modern tax system in housing sector, the experience of developed countries in this field, and present status of the housing tax system show the deep gap between the existing favorite condition and

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underdevelopment. Modern tax system has helped policy makers very much with thoughtful and indirect control of housing sector respecting laws and regulations and technical administrative methods.

Housing as a shelter plays an important role in the household's economy. It also has determining effects, in the area of macroeconomics, on the key variables of growth, inflation, liquidity and income distribution and is affected by them. In the literature of housing economics, it is approved that housing price is bubble-shaped, and periodic fluctuations in the housing sector affecting the national economy is considered a short and medium-term subject, hence the demand for housing will be under the influence of short-term fluctuations and tax policies play a major role in controlling it. Capital gains tax(CGT) system is substituted for transfer tax system in the housing sector of some countries. The present study provides the economic model of CGT. Examining the impacts of CGT on housing business cycles, it also proposes the plan of housing sector taxes which can be effective in controlling or reducing the periodic fluctuations in the sector.

Theoretical Backgrounds

Capital gains equal the difference between the selling and purchasing value of housing. When acceptable tax costs are deducted from the mentioned figure, taxable capital gain is obtained. In addition to income-generation, one of the most objectives of CGT is controlling housing market fluctuations. In other words, the reduction of business cycles volatilities is defined in terms of basic variables such as price and value added in housing sector. Essentially, gains are computable by two different definitions: real and accrued gains and computable gains. Real gains are measured according to accomplished transactions in the market, that is, a particular portion of or whole property is traded and the capital gained will be subject to tax. When the gains do not go through the market, the computable or attributed gains occur which are not taxable.

Based on the net present value (NPV) method, the price of any asset equals the present value of revenues gained by the investor over the period of holding.

$$P = \frac{R}{(1+i)} + \frac{R}{(1+i)^2} + ... + \frac{R}{(1+i)^n}$$

where *P* denotes price, and *R* denotes housing rental revenue. The right-hand side of the equation is the result of a diminishing geometric progression that by solving it the renowned relation between the price and the rent of a dwelling is obtained as follows:

$$P = \frac{R}{Uc} \tag{2}$$

where U_c is the cost of housing consumption.

The price-rent relation has several important applications in housing economics: firstly, it establishes a relationship between the price, rent, and the equilibrium condition of markets for owner-occupied and rental housing. Secondly, it establishes a relationship between housing (as an asset) market and other markets. Using the latter relationship and other alternatives of investment, people decide to choose which one. Thirdly, one can examine the impacts of exogenous variables on the equilibrium in housing market. For example, capitalization rate consists of elements such as depreciation rate, interest rate, tax rate, and capital gains rate that a change in one of them can result in a new equilibrium in the housing market. In the denominator, we have the cost of capital use denoted by U_c. Using Poterba' method for explanation of the cost of housing capitalization, the price-to-rent ratio is rewritten as follows:

$$\frac{R}{p_H} = \left[(1-\tau)(i+\tau p) + m + \delta - (1-\mu)\pi\right]^{-1} \tag{3}$$

where *R* denotes computable rental rate, τ denotes marginal rate of tax on housing property, τp denotes the amount of tax on housing property, *m* is maintenance costs, δ is the depreciation rate, and π denotes the rate of change in real price of housing (nominal price minus inflation rate).

Hence, utilization costs can be divided into depreciation cost and charging and maintenance cost. Usually two parts of opportunity cost alter, that is, inflation rate and housing capital gains and other parts have fewer changes.

In the literature of housing economics and many of empirical studies, various indices are introduced for measuring bubble among which is the price-rent

ratio. If housing capital gains with the constant rate of μ are taxable, the differentiation of price-rent ratio with respect to CGT rate is:

$$\frac{\partial\left(\frac{P_H}{R}\right)}{\partial\mu} = -\frac{\pi}{\{[(1-\tau)(i+\tau_p)+m+\delta-(1-\mu)\pi]\}^2} < 0 \qquad (4)$$

It is seen that the housing price bubble has a negative relation with CGT and an increased base or rate of CGT leads to the reduction of intensity and/or bursting of the bubble.

2-2- The Theory of Housing Price Bubble

Usually in theoretical foundations, most scientists define the bubble emphasizing some key and important concepts, including: rapid rising of prices (Bucker), non-real expectation of future rising of prices (Case and Schiller), deviation of price from fundamental value or fundamental factors of housing market (Garber), or intense movements of prices after the bubble burst (Siegel). Bubble has been variously defined. Some important definitions are introduced in the following. Charles Himmelberg defines bubble as" rapid and continuous rise of an asset's price with the promise of its continuous increase in the future so that new buyers will enter the market in order to acquire profits. But, gradually, price increase will not meet buyers' expectations of future price of the asset, and eventually prices will decline rapidly. At this time, the bubble will burst and prices will go back to previous actual prices." Gary Smith defines bubble as" a situation after which the prices of some assets like stocks and properties rise rapidly over their current levels that is obtained through computation and prediction of income flow." Simply, a bubble forms in the price of an asset when the current price of the asset is high only because people think that the price will rise in the future (Stiglits).

The usual method for testing the bubble is price-to-rent ratio method which is common in both stock market and housing market. The only difference is that in the stock market this relation is the ratio of price-to-cash earning of a stock, and in the housing market it is considered as the ratio of price-to-annual rent of a dwelling.

In this method, the price of an asset like housing has a relatively constant and reasonable relationship with its rent. If the price-rent ratio deviates significantly from its long-run mean, a price bubble can be said that has been

formed. The ratio of housing price to its rent, as well as price-to-earnings ratio states that the price of an asset must equal the discounted present value of future earnings. Gains may be in the form of earnings from renting the dwelling, or the equivalent of rent that the owner does not pay due to personal occupation of the dwelling. When this index goes up, the formation of bubble can be found out, and in case of decreasing and going back to previous level one can said that the bubble has burst.

It is believed, in this method, that if the housing price rises much faster than rents, the growth of price-rent ratio implies the existence of price bubble, because price is more sensitive than rents to positive and negative shocks. Chung and Kim(2004), Himmelberg, *et. al*.(2005), Eschker(2005), Girouard and Kennedy(2006), Taipalus(2006), and Mikhed and Zemcik(2008) have used this method to discover the price bubble.

Review of Literature

Bruce and Holtz-Eakin(1999) have stutied, in their article" Fundamental Tax Reform and Residential Housing", the impacts of amendment of housing demand consumption tax in a dynamic model for both short and long term. They proposed housing tax remedy against housing nominal price changes. Their model is estimated to simulate the effects of tax on housing in short-run and long-run both considering and not considering land. The advantage of this study is using future expectations. This kind of tax alters the value of old and new-built dwellings. Furthermore, it examines the relationship between rental and owner-occupied as well as whole economy in case of taxation. Feltenstein and Anwar Shah have studied the effects of tax incentives on employment and investment within an intertemporal equilibrium model. The main purpose of this study is tax credit of investment and employment in housing sector. Also, the impacts of policies affecting the investment on housing price and consumption are analyzed. The other point in the study is over-estimation of depreciation rate.

In this study, the capitalization rate of housing has been used and land input is regarded in the model. In addition, population and households growth has been considered. The simulation results show that the effect of doubling investment credit equals the effect of cutting housing tax rate by 16.7%. Decreased housing capital tax results in reduced capital cost and increased capital formation. Decreased tax has much effect compared to tax

credit of investment. Also, tax credit cut policy has had weaker effects compared to the latter two incentive policies of capital formation. The Mexican experience indicates that capital tax cut has been more effective than other policies. Moreover, investment policies affect different economic sectors variously.

Diewert and Lawrence(1998) showed that reducing capital taxation improves capital return by 48%. Atkinson *et al* indicated that the optimal rate of capital tax is very low or zero. One important point in the asset taxation literature is achievement of sector goals and avoidance of detrimental impacts of tax on sector efficiency. Vickrey conducted his study in this field for the first time in 1939. Other scientists including Warren (2004) and Sahm (2005) have done profound and widespread studies recently.

Another important question which CGT studies are seek to answer is the effect of CGT on the composition of financial assets portfolio. Orbeck (1991) sees these effects analyzable within a partial equilibrium framework in which the expected price is a given variable. Blasser and Judde (1987) have shown that CGT method, like the investment horizon for saving, affects the optimal composition of assets. Hendershott (1987) and Poterba (1984) have studied the issue of mutual reactions of tax and inflation and believe that population pressures lead to inelasticity of housing supply. Skeener has performed an empirical test on housing being an asset. This test has been carried out through measuring the effect of housing asset of households on their consumption expenditures. Henderson and Ivenid (1983) have named housing capital gains, tax exemption, and negative external costs avoidance as the most important reason to choose an owner-occupied dwelling. Using a general equilibrium model, Klein (1999) has studied the effect of CGT on assets' prices and portfolio selection under the assumption of imperfection of capital market where short-run and immediate selling of assets is impossible.

In the multi-period study, many people maximize the utility of their consumption within the framework of periodical consumption and asset saving decisions. Investment opportunities are determined exogenously.

The results show that after-tax net return is lower for capital-gaining assets without risk. The price of these kinds of assets is much than that of assets without capital gains. The lock-in effect is reflected in assets' price that may compensate or neutralize the capitalization effect of the asset.

Furthermore, the selection of optimal asset portfolio depends not only on the real amount of capital gains and investor's saving horizon but also on the real amount of all investors' savings. The analytical framework of Klein's model is very difficult and complicated for empirical applications as well as welfare effects analysis. Klein's model gives CGT effect and uncertainty consideration.

Trend Analysis and Evolution of Variables

Diagram(1) shows the evolution of variables used in the model over the period from 1991 to 2004. Regarding Diagram(1), we can say that the price-to-rent ratio in the USA, Italy, Denmark, Ireland, the Netherland, Norway, Spain, Finland, and Iran is above and in Japan, Germany, France, England, Canada, Australia , New Zealand, Sweden, and Switzerland is below the total average price-rent ratio. Housing price volatility in countries of Iran (5), Ireland (7.3), Spain (4.4), and Finland (3.4) is significantly more than that of other countries. In this study, two groups of countries are examined; the first group are those which have CGT system, including the United States, England, Canada, Sweden, Ireland, Spain, Norway, New Zealand, Australia, Japan, France, Switzerland, and Denmark, and the second group are the Netherland, Germany, Italy, and Iran.

Norway(1/5,12/9) Denmark(1/4,12/8) USA(0/9,12)	Netherland(2,18/4) Ireland(7/3,15/9) Italy(2/8,14/6) Spain(4/4,14) Iran(5,13) Finland(3/4,12/8)
Japan(1/5,11/8) Canada(1,10) Switzerland(1/2,9/8) Australia(0/7,10) Germany(1,10/8) New Zealand(1,9)× England(1,9/8) France(1/2,8/6)	Sweden(2/4,12)

Diagram (1): Price-to-Rent Ratio in Different Countries μ is Mean and σ is Standard deviation of price-to-rent ratio

Diagram (1). Price-to-rent ratio in different countries
μ is mean and σ is standard deviation of price-to-rent ratio

Table (1) shows that dispersion coefficient of price-rent ratio and real housing price growth in countries having CGT system (first group) is lower than that of countries not having this system, hence suggests that CGT system makes housing sector more stable. The mean and standard deviation of price-rent ratio are lower in the first group than those of the second group and this can be an implication of weaker bubble in the housing sector of the first group.

Table (1). Evolution of housing sector by groups[1] over the period from 1991 to 2004

Group	Dispersion characteristics	Price-rent ratio	Real housing price	Real housing price

[1] The sample consists of 18 high-income OECD countries. The countries are separated into two groups. The first group is made up of the 14 countries where CGT is common which are the USA, England, Canada, Sweden, Ireland, Spain, Norway, New Zealand, Australia, Japan, France, Finland, Switzerland, and Denmark. The second group consists of the 4 countries where CGT does not exist including the Netherland, Germany, Italy, and Iran.

			growth	
First group: countries having CGT system	Mean	11/81	3/11	145507/3
	Standard Deviation	2/14	5/38	35181/3
	Dispersion Coefficient	0/18	1/73	0/24
Second group: countries not having CGT system (including Iran)	Mean	13/94	2/76	13637/1
	Standard Deviation	2/97	8/48	22773/8
	Dispersion Coefficient	0/21	3/07	0/17
Both groups totally	Mean	12/28	3/03	140463/5
	Standard Deviation	2/33	6/07	30669/53
	Dispersion Coefficient	0/19	2/003	0/21

Source: researcher's calculations

The lowest real interest rate is for Ireland and the highest is for Germany and New Zealand. Germany has the lowest real housing price growth (-2.03) and low price-rent ratio (9.8) but, contrary to expectation, has high liquidity rate (5.4) that is, most probably, due to the structure of its capital market with powerful alternatives that make housing have negligible portion in households' assets portfolio. Iran has the highest liquidity rate among the selected countries. Ireland has had the highest and France has had the lowest money growth rate over the studied period.

Table (2). Evolution of variables by groups over the period from 1991 to 2004

Variable	Dispersion characteristics	Real CGT (million dollars)	CGT's share of total tax	CGT's share of tax revenue	Liquidity growth	Real interest rate
First	Mean	31500 00	53/4 1	35/9 4	5/4 9	5/0 7
	Sta			!/91	3/0 6	2/2 5
× USA ×Canada ×New Zealand	d D M	×Australia ×Japan ×Spain		-	10/ 1	2/5 4
	Sta			-	3/2 3	4/2 4
	d D					

Source: researcher's calculations

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*Ireland), b ratio and real housing price

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×Finland bul Γ has been along with low

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en e of total tax in the USA,

alia ıin is higher and in Ireland, England, Norway, Denmark, Finland, Switzerland, and Sweden is lower than total average. Sweden has the lowest mean and highest standard deviation of CGT's shar and of tax revenu SA has the highest CGT's share of tot stralia has the hig "s share of tax revenue.

۲،۶۹ σ

Diagram (2). CGT's share of total tax in the first group

Among the countries in the first group, in the US, Canada, and Japan, CGT forms more than 50 percent of total tax and tax revenue, and the increase of real housing price is less than average of all countries.

Model and statistical data

In this section, a model is introduced for explaining the effects of housing CGT in countries under study. To this purpose, a computing model is provided to explain the housing sector of the countries within the mentioned literature.

In this model, the volatilities of housing price bubble is written as a function of monetary policy variables (liquidity and interest rate), real national income per capita, CGT, and assets' price as follows:

$$\frac{ph}{R} = f\{rr, m, gni, cgt, exr\}$$

$\frac{ph}{R}$ is an index of housing price bubble; in this model, the dependent variable is made up of three variables indicating price-rent ratio and real housing price. rr denotes real interest rate, m real liquidity, exr denotes real exchange rate, gni is per capita real national income, and cgt is real capital gains tax.

For the present study we need time series data of price-to-rent ratio, housing price, interest rate, liquidity, per capita national income, and exchange rate to examine the effects of CGT on housing price volatilities. The source of data of taxes, interest rate, liquidity, and per capita national income is the official website of World Development Indicators (WDI) and the source of data of price-to-rent ratio and housing price is *habitat* website, and exchange rate and international financial data come from IFS website.

Data for interest rate in Iran is obtained from Iranian central bank (www.cbi.ir) which is transformed to real data. Other variables have adjusted using CPI(2000). Data of housing price bubble is obtained using the price-rent method explained in section two.

1. Selected countries and the time period of research

Selected countries for the present research are 18 countries, including the USA, Japan, Germany, France, Italy, England, Canada, Australia, Denmark, Spain, Ireland, the Netherland, Norway, New Zealand, Sweden, Switzerland, and Iran. We set out to examine the effect of monetary policy on the housing price bubble for the period from 1991 to 2004.

Also, due to limited data of price-rent ratio and housing prices, especially for developing countries, this study is dedicated only to 18 countries. Although large differences exist in economic and social conditions and housing market of studied countries, one of the major advantages of

panel data model is that the in the studied countries provides suitable conditions to estimate the model coefficients, and also the heterogeneity in the countries is considered in the estimated coefficients of the model.

In this study, 18 countries are examined that usually have differences in all areas of economic, political, social and cultural. Thus lots of dissimilarities exist between the data of these countries that to resolve them, GLS method has been used in this research.

Unit root test

To test the stationarity, the unit root test is used. If the calculated statistic is less than the critical values of the table, the null hypothesis implying the existence of unit root is accepted. The unit root test for panel data proposed by Levin is more common amongst the various tests. This test has been used in the current paper for all the variables. Table 3 shows the stationarity status of the variables. The test results suggest that the p-value of Levin statistic is less than 5 percent. Thus, the null hypothesis implying the existence of unit root among the variables is rejected. Therefore, all the variables are stationary at this level.

Table 3: Unit Root Test

Variable	Levin Statistics (P-value)	Status
CGT	-3.655 (0.0001)	Stationary
M2	-6.071 (0.000)	Stationary
EXR	-4.319 (0.000)	Stationary
PE	-1.860 (0.030)	Stationary

GNI	-1.770 (0.040)	Stationary
RR	-4.290 (0.000)	Stationary
TT	-26.309 (0.000)	Stationary

Cointegration test

The next stage is to test the cointegration. To achieve this, Pedroni's test is used. Table 4 shows the relevant results. As it is seen, the Pedroni's test statistic implies a long-run and cointegrated relationship between the model's variables suggesting that the null hypothesis is rejected.

Table 4: Cointegration Test

Null Hypothesis	**Model**	**Pedroni test (P-value)**	**Status**
No cointegration	Model 1- with CGT	-1.875 (0.030)	Rejected null hypothesis and approved cointegration
No cointegration	Model 2- with TT	-1.923 (0.027)	Rejected null hypothesis and approved cointegration cointegration

Model estimation and interpretation of results

In this section, using annual data in the period 1991 -2004 and using panel data model, parameters of equation (5) were estimated and required tests were performed.

Hausman test

Based on common effects (in all models) and probability value of statistic F, panel data method has been accepted, because in all these models, the hypothesis H_0 has been rejected.

H_0 : The model cannot be estimated by panel methods
H_1 :The model can be estimated by panel methods

If the calculated F is greater than the critical value of F table (p less than 0.05), the alternative hypothesis, H_1, is accepted, meaning that the model can be estimated using panel method. Thus in the estimation of common effects models, H_0 has been rejected while H_1 is accepted. In order to choose a fixed effects model against a random effects model, Hausman test (H) is used. Hausman test tests the specification of random effects model against fixed effects model. Accordingly, the model was estimated both in fixed and random effects cases, then the obtained coefficients were compared. In the estimation of fixed effects (FE), it is assumed that the intercept is the same for each country. The intercept for each country is different which can or cannot be correlated with model's explanatory variables. This method is known as the least squares dummy variable model (LSDV).

Furthermore, this model does not consider time effects, but only the country- specific effects of each country are considered as individual effects. While in random effects model, individual effects are constant over time but they change among countries.

Furthermore, Hausman statistic is sufficient to select these two effects as a preferable model and to provide enough explanation. The null hypothesis in Hausman test is as follows:

$H_0 : \alpha = \alpha_S$

$H_1 : \alpha \neq \alpha_S$

The null hypothesis means that there is no relationship between residual of intercept and explanatory variables and they are independent of each other. While the alternative hypothesis means that there is a relationship between the residual and explanatory variables, and since in this situation we encounter bias and inconsistency, so it is better to use fixed effects methods if the hypothesis is accepted.

Under H_0, fixed and random effects are both consistent but the fixed effects approach is inefficient. That is, in case of rejection of the null hypothesis, the fixed effects method is consistent, but random effects method is inconsistent and we should use fixed effects method.

Model estimation with real CGT

Price-to-rent ratio equation (5), introduced by using GLS, is estimated step by step through the estimation of the set of variables. Initially, only the variables of CGT and real money stock are entered into the model. The results are shown in column (1) of Table (5). As it is seen from the data in table, for this equation, a significant, negative relationship exists between CGT and price-rent ratio and a significant, positive relationship between real money stock and price-rent ratio.

In the second column of the table, the real interest rate for the period from 1991 to 2004 is entered. In the second regression, we get negative sign for coefficient of real interest rate. Also, the significance of CGT and money stock coefficients increases in this regression.

In the next column of Table (5), the other independent variables, including real per capita national income and real exchange rate, are also added into the price-rent model step by step.

It is seen that the significance of coefficients and non-weighted determination coefficient is increasing with adding new variables into the table which is fully in accordance with expectation. This shows that not only CGT but also other variables of monetary policy and assets' prices influence the price-rent ratio. Model estimation results for the total sample over the period from 1991 to 2004 based on fixed effects estimation method (FEM) are presented in Table (5).

The p-value of Leamer test is zero suggesting that the null hypothesis expressing the use of pooled data can be rejected. Thus, utilizing the panel data model is approved. Furthermore, the p-value of Hausman statistic is also obtained zero suggesting that the fixed effects estimation method is more appropriate for the model.

Table (5). Estimation of bubble equation with real CGT as independent variable with fixed effects method

Dependent variable: PE	(1)	(2)	(3)	(4)
C	8/05	7/83	5/81	5/62
CGT	-3/70E-13 (-2/69)*	-(3/90E-13 (-2/72)	-(3/61E-13) (-2/80)	-(3/83E-13) (-3/10)
M2	(1/05E-13) (26/1)	(1/19E-13) (18/10)	(1/17E-13) (25/65)	(1/33E-13) (20/68)
RR	-	-0/11 (-5/79)	-0/16 (-8/18)	-0/13 (-6/29)
GNI	-	-	0/0001 (5/99)	0/0001 (5/84)
EXR	-	-	-	-0/001 (-2/86)
R^2 weighted	0/99	0/99	0/99	0/99
non-weighted R^2	0/74	0/76	0/82	0/82
R adjusted	0/99	0/99	0/99	0/99
D-W	1/82	1/80	1/95	1/92
F-stat	3227	2129	3132	2778
F_{Leamer} (P-value)	**16.163 (0.000)**	**17.463 (0.000)**	**20.834 (0.000)**	**20.4271 (0.000)**
Hausman test (P-value)	**46.260 (0.000)**	**53.975 (0.000)**	**46.162 (0.000)**	**46.10097 (0.000)**

*Numbers in the parentheses represent t-statistic.

Mechanism of affecting

In this section, effective mechanisms, the significance, and magnitude of coefficients are analyzed. That is, the effect of variable CGT, variables of monetary policy, assets' prices and per capita income on rent-price ratio, selected as an indicator to evaluate housing price bubble, is examined.

- **Capital gains tax**: As it is obvious from Table (5), the effect of CGT on price-to-rent ratio in all the estimated regressions is negative and significant. Also the coefficient and significance of CGT increases as we move to the left hand side of the table.
- **Money stock**: the effect of real money stock as the second mechanism of affecting, as it is obvious from the table, on price-to-rent ratio is positive and highly significant. This is the most important variable affecting the price-rent ratio and consequently the formation of the housing price bubble. Theories also suggest a positive relationship between money stock and housing price bubble. This is in accordance with many empirical studies conducted.
- **Interest rates**: This is the third mechanism affecting price-rent ratio. According to the estimation performed in the table (5), this effect is negative and statistically significant. In many studies, expansionary monetary policy is one of the important factors affecting the housing price bubble and increased interest rate provides a proper ground for bubble collapse (*cet. par.*). Increased interest rate cause several effects. On the one hand, interest rate is a component of housing costs, thus if increased, consumption as well as mortgage costs rise which will lead to demand and price decrease. Schiller (2003) has also emphasized that the demand for housing declines and the growth rate of prices moderates through the implementation of contractionary monetary policy. On the other hand, interest rates increase the cost of financing the construction that can reduce newly-built housing supply. Usually housing supply response to interest rate or other variables is milder than demand reaction to the mentioned variables.
- **Per capita income**: real per capita income as the fourth variable affecting the housing price bubble has a positive and significant effect. Theories also suggest a positive relationship between per capita income and the housing price bubble.
- **Exchange rate**: here, the real exchange rate as the final affecting mechanism is studied. Estimation results in Table (5) show that the real exchange rate reduces price-to-rent ratio as an indicator for the housing price bubble. The effect of exchange rate on the price-to-rent ratio is negative and statistically significant.

It is worth mentioning that the estimated coefficient signs are as expected theoretically. The model's explanation power (R^2) is 0.99 and Dorbin-Watson (DW) is 1.95, which represents the validity of the fitted model and lack of correlation between explanatory variables.

Model estimation with CGT's share of total tax

To avoid reviewing the estimation steps, this time the equation is estimated using the CGT's share of total tax as the independent variable. Hausman statistics $p-value$ is obtained zero according to which the fixed-effects model method is more appropriate option to estimate. The estimation results for the period 1991-2004 are presented in Table (6).

The parameter related to the effect of CGT's share, tt , on the price-rent ratio, pe ,is negative and significant. This result accords with many of materials in the literature and empirical findings. The degree of significance of this variable is higher than that of actual CGT. The parameter related to the effect of $m2$ on the price-rent ratio pe is, as expected, positive and significant. In this equation, like the previous estimation, the real money stock is the most important variable affecting the price-to-rent ratio and the housing price bubble. The degree of significance of this variable is lower than that of the previous model.

Table (6).Estimation of bubble model with CGT's share of total tax using (FE) method

Dependent variable: PE	(1)	(2)	(3)	(4)
C	10/53	10/25	8/18	8/06
TT	-0/08 (-4/48)	-0/08 (-3/51)	-0/07 (-3/73)	-0/07 (-3/81)
M2	(1/05E-13) (50/13)	(1/19E-13) (25/70)	(1/17E-13) (31/08)	(1/29E-13) (17/21)
RR	-	-0/11 (-6/04)	-0/16 (-8/14)	-0/14 (-6/82)
GNI	-	-	0/0001 (5/55)	0/0001 (5/35)
EXR	-	-	-	-0/0009 (-1/83)
R^2 weighted	0/99	0/99	0/99	0/99
non-weighted R^2	0/74	0/76	0/82	0/82

R adjusted	0/99	0/99	0/99	0/99
DW	1/80	1/78	1/98	1/96
F-stat	3847	1672	2526	2359
F_{Leamer} (P-value)	**16.28 (0.000)**	**17.56 (0.000)**	**22.46 (0.000)**	**21.479 (0.000)**
Hausman test (P-value)	**82.75 (0.000)**	**91.14 (0.000)**	**103.82 (0.000)**	**80.131 (0.000)**

- Numbers in the parentheses represent t-statistic.

The parameter related to the effect of interest rate, rr, on price-rent ratio, is negative and significant. This result accords with many of materials in the literature and empirical findings which were fully described in the previous section about the mechanism of interest rate's effect on the bubble.

That is, interest rate reduction in selected countries has led to the formation of housing price bubble. Therefore, increased interest rates can control the bubble growth and prevent bubbles inflation. The significance degree of this variable is higher than that of the previous model. The fourth variable is per capita national income. As expected, this parameter also affects the price-rent ratio positively and significantly. The last considered variable is the real exchange rate whose effect, as expected, on the price-rent ratio is negative and significant. It is worth mentioning that the estimated coefficients are as expected theoretically. The model's explanation power (R^2) is 0.99 and Dorbin-Watson (DW) is 1.96, which represents the validity of the fitted model and lack of correlation between explanatory variables.

Adding new variables listed in the table increases the significance of coefficients and non-weighted coefficient of determination that it is fully in accordance with expectation. This shows that not only CGT but also other monetary policy variables and asset price affect price-rent ratio. Interestingly, model estimation with the housing price bubble has exactly the same results as the price-to-rent ratio estimation.

Table (7). Effects of variables on housing price bubble

Variables	Effect	Liquidity	CGT	Per	Interes	Exchange

				capita National income	t rate	rate
First eq. with real CGT	Bubble increase	0/21	-	0/05	-	-
	Bubble decrease	-	-0/095	-	-0/03	-0/01
Second eq. with CGT's share of total tax	Bubble increase	0/13	-	0/05	-	-
	Bubble decrease	-	-0/08	-	-0/04	-0/0099

Source: researcher's calculations

The effects of variables on bubble equation can be calculated using the below formula:

$$\Delta pe = \alpha_1 \Delta m2 + \alpha_2 \Delta cgt + \alpha_3 \Delta gni + \alpha_4 \Delta rr + \alpha_5 exr$$

Results shown in Table (5) indicate that real liquidity increases the bubble and real CGT and its share of total tax have been of the important factors affecting the bubbles cut. Then per capita income, and interest rate and exchange rate, respectively, have been effective variables in rise and fall of the bubble.

Conclusion and policy implication

1. Housing price fluctuations cause social damages to households and make the effective demand for housing reduce or delay, hence reduce the growth of value added of housing sector. This can lead to economic growth reduction since the importance of housing sector in national economy.

2. One of the most important macroeconomic variables in policy making is interest rates. On the other hand, according to economic theories, increased interest rates reduce the growth of housing price bubble. The results of estimation suggest that in all estimated equations, real interest rate has had negative and significant effect on the housing sector. Monetary authorities can use the interest rate instrument to control housing price bubble. Relative stability in the housing market reduces economic volatility and helps long-term stable equilibrium. Many studies consider expansionary

monetary policy as of major factors affecting the housing price bubble and interest rates increase as a proper ground for the bubble collapse (*cet. par*.). Increased interest rates brings several impacts.

On the one hand, interest rate is a component of housing consumption cost. Thus increased interest rates will increase consumption as well as mortgage costs, hence demand and price reduction. This issue has also been emphasized by Schiller (2003) that the demand for housing will decline and the growth rate of prices will moderate through the implementation of contractionary monetary policy. Interest rates increase the cost of construction financing and can reduce newly built housing supply. Usually housing supply response to interest rate or other variables is lower and milder than that of demand.

3. The estimations results suggest that in all estimated equations, money stock has had positive effect and strongly significant on housing sector. Intense liquidity growth, *cet. par*., causes housing price bubble form, hence intense disruption in economic resources allocation. So in case of lack of absorption of liquidity in capital market, the possibility of its transfer into the housing market and the creation of price shocks in this market is high. Under these circumstances, the monetary authorities can prevent it through the implementation of prudent monetary policies.

4. Housing market control will not be possible simply by applying monetary policies, but complementary fiscal policies, especially, tax reform policies will be inevitable. Tax policy is considered as one of the powerful and effective tools to control the price volatility of housing in housing policies literature. One of the powerful tools of controlling and steering the housing speculation to minimize its losses on the housing sector is capital gain tax (CGT) which is broadly used in most advanced and developed countries. Thus, CGT puts the combination of price volatility and housing investment in a situation that provides better conditions in terms of efficiency compared to countries that lack this tax system.

Thus, capital gain taxation is defensible if it can reduce price risk as well as increase investment growth. Estimation results also confirm this and suggest that in all estimated equations, real CGT and its share of total tax and total tax revenue have had significant negative effect on housing price bubble and real price.

5. Experience with financial crisis in 2008 shows that policies encouraging housing asset and lack of speculation control cause housing reserves grow too much, hence housing price bubble form. Although Iran still is in shortage of housing as shelters, housing asset has largely increased its share of households' portfolio, hence creating malfunction in macroeconomic objectives, leads to emergence of shocks in the housing market.

6. Real exchange rate reduces price-to-rent ratio as an indicator of housing price bubble. The effect of exchange rate on price-to-rent ratio is negative and statistically significant.

7. Real per capita income and GDP have been among the important variables affecting the housing sector, and have had significant positive effect on this sector in all estimated equations.

8. The average efficiency of capital gains tax in countries having this tax system is more than that of countries lacking this tax system.

References

1. Gholizadeh, Ali Akbar (1999), Housing price theory in Iran, Noor-e-Elm Publication, Hamedan.
2. Gholizadeh, Ali Akbar, Housing economics: Theoretical and Practical Foundations, Lecture Note (in publishing).
3. Department of Housing and Urban Development, Housing Master Plan: Final Document.
4. Gholizadeh, Ali Akbar and Kamyab, Behnaz. (2009 a). Effect of monetary policy on housing price bubble in boom and recession periods in Iran, Quantitative Economics, next issue.
5. Gholizadeh, Ali Akbar and Kamyab, Behnaz. (2009 b). Effect of monetary policy on housing price bubble : a cross-country study, Economic Researches, next issue.
6. Gholizadeh, Ali Akbar and Kamyab, Behnaz. (2009 c). Reaction of monetary policy to housing price bubble : a Iranian case study, Iranian Economic Researches, next issue.
7. Gholizadeh, Ali Akbar (2000), Appropriate tax system and credit facilities of housing sector in Iran, Department of Management and Planning.
8. Agence France Presse, “Japan’s ruling LDP to finalize capital gains tax reforms” October 3, 2001. For further information, see David L. Birch, “Who Creates Jobs?” Public Interest 65 (1981).
9. Ahearne، Alan G.، Ammer John، Doyle Brian M، Kole Linda S، and Robert F. Martin، 2005. “House Prices and Monetary Policy: A Cross-Country Study،” International Finance Discussion Papers 841 (Washington: Board of Governors of the Federal Reserve System، September).
10. Assenmacher-Wesche Katrin ، Gerlach Stefan ،2008،"ensuring financial stability: financial structure and the impact of monetary policy on asset prices"، research

department Swiss National Bank institute for monetary and financial stability Johann Wolfgang Goethe University، Frankfurt March 26، 2008، Working Paper No. 361، ISSN 1424-0459.

11. Alworth, J., Arachi, G., and Hamaui, R. (2002). Adjusting capital income taxation: Some lessons from the italian experience. Working Paper No. 23/10, Department of Economics, Universit`a di Lecce.
12. American Council for Capital Formation, "Capital Gains Taxation and U.S. Economic Growth," December 16, 1999, URL: http://www.accf.org/December99test.htm
13. Auerbach, A. J. (1991). Retrospective capital gains taxation. American Economic Review, 81(1):167–178.
14. Auerbach, A. J. and Bradford, D. F. (2002). Generalized cash-flow taxation. Working Paper, University of California, Berkeley.
15. Balcer, Y. and Judd, K. L. (1987). Effects of capital gains taxation on life-cycle investment and portfolio management. The Journal of Finance, 42:743–757.
16. Banks, J., Blundell, R., and Smith, J. P. (2002). Wealth portfolios in the UK and the US. NBER Working Paper 9128.
17. Boadway, R. and Keen, M. (2003). Theoretical perspectives on the taxation of capital income and financial services. In Honohan, P., editor, Taxation of Financial Intermediation: Theory and Practice for Emerging Economies Of course, this is no general result but hinges on the special structure of the chosen example. chapter 2, pages 31–80. New York: World Bank and Oxford University Press.
18. Bradford, D. F. (1995). Fixing realization accounting: Symmetry, consistency and correctness in the taxation of financial instruments. Tax Law Review, 50:731–785.
19. Cecchetti ، S.، Genberg، H.، Lipsky، J.، and S. Wadhwani ، 2000، "Asset Prices and Central Bank Policy،" Geneva Reports on the World Economy No. 2 (London: Centre for Economic Policy Research، July).
20. Clark S. Judge, "The Tax That Ate the Economy," Wall Street Journal, June 24, 1991, editorial page. The 49 percent rate was the effective top rate in the late 1970s after accounting for all phase outs of deductions.
21. Christiansen, V. (1995). Normative aspects of differential, state-contingent capital income taxation. Oxford Economic Papers, 47(2):286–301.
22. Collins, J. H. and Kemsley, D. (2000). Capital gains and dividend taxes in firm valuation: evidence of triple taxation. The Accounting Review, 75:405–427.
23. Congressional Budget Office, "Indexing Capital Gains," August 1990.Victor Canto and Harvey Hirschorn, "In Search of a Free Lunch," Laffer and Canto Associates, San Diego, November 1994.
24. Constantinides, G. M. (1983). Capital market equilibrium with personal tax. Econometrica, 51(3):611–636.
25. Cunningham, N. B. and Schenk, D. H. (1992). Taxation without realization: A 'revolutionary' approach to ownership. Tax Law Review, 47:725–814.
26. Dammon, R. M., Spatt, C. S., and Zhang, H. H. (2001). Optimal consumption and investment with capital gains taxes. The Review of Financial Studies, 14:583–616.
27. De Lucia Clemente ، 2007، Did the FED Inflate a Housing Price Bubble? A Cointegration Analysis between the 1980s and the 1990s ، BNP Paribas، Paris، France ، Working paper n. 82، May 2007.
28. Filardo Andrew J، 2001،" should monetary policy respond to asset price bubble? Some experimental results"، Research Division Federal Reserve Bank of Kansas City، July 2001، RWP 01-04.
29. Finance Committee, February 15, 1995; and Raymond Keating, "Eliminating Capital Gains Taxes: Lifeblood for an Entrepreneurial Economy," Small Business Survival Committee, Washington, 1995.

30. Gordon, R. H. and Bradford, D. F. (1980). Taxation and the stock market valuation of capital gains and dividends. Journal of Public Economics, 14:109–136.
31. National Venture Capital Association web page: http://www.nvca.org/ffax.html
32. Patrick Hendershott, Yunhi Won, and Eric Toder, "Economic Efficiency and the Tax Treatment of Capital Gains," National Chamber Foundation, Washington, 1990. emphasis added.
33. National Venture Capital Association, 1991 Annual Report (Washington: NVCA, 1992). And NVCA web page: http://www.nvca.org/ffax.html
34. Jane G. Gravelle- Capital Gains Taxes: An Overview -CRS Report for CONGRESS- Order Code 96-769 Updated January 24, 2007.
35. Klein, P. (1999). The capital gains lock-in effect and equilibrium returns. Journal of Public Economics, 71:355–378.
36. Konrad, K. A. (1991). Risk taking and taxation in complete capital markets. Geneva Papers on Risk and Insurance Theory, 16(2):167–177.
37. Kovenock, D. J. and Rothschild, M. (1987). Notes on the effect of capital gains taxation on non-austrian assets. In Razin, A. and Sadka, E., editors, Economic Policy in Theory and Practice, pages 309–339. McMillan, London.
38. Land, S. B. (1996). Defeating deferral: A proposal for retrospective taxation. Tax Law Review, 52:45–117.
39. Landsman, W. R. and Shackelford, D. A. (1995). The lock-in effect of capital gains taxes: evidence from the RJR Nabisco leveraged buyout. National Tax Journal, 48:245–259.
40. Lang, M. H. and Shackelford, D. A. (2000). Capitalization of capital gains taxes: vidence from stock price reactions to the 1997 rate reduction. Journal of Public Economics, 6:69–85.
41. Mas-Colell, A., Whinston, M., and Green, J. (1995). Microeconomic Theory. Oxford University Press, New York.
42. Meade, J. E. (1978). The Structure and Reform of Direct Taxation. Allen and Unwin, London.
43. Norman B. Ture and B. Kenneth Sanden, The Effects of Tax Policy on Capital Formation (New York: Financial Executives Research Foundation, 1977); Jude Wanniski, "Capital Gains in a Supply Side Model," Statement before the Senate
44. Poterba, J. M. (1987). How burdensome are capital gains taxes? Journal of Public Economics, 33:157–172.
45. Rendleman, R. J. and Shackelford, D. A. (2003). Diversification and the taxation of capital gains and losses. NBER Working Paper 9674, Cambridge, MA.
46. Sahm, M. (2005). Imitating accrual taxation on a realization basis. Mimeo, University of Munich.
47. Sandmo, A. (1985). The effects of taxation on savings and risk taking. In Auerbach, A. and Feldstein, M., editors, Handbook of Public Economics, volume 1, chapter 5, pages 265–311. North-Holland, Amsterdam.
48. Shuldiner, R. (1992). A general approach to the taxation of financial instruments. Texas Law Review, 71(2):243–350.
49. Stephen Moore and Phil Kerpen : A Capital Gains Tax Cut: The Key to Economic Recovery- I P I C E N T E R F O R T A X A N A L Y S I S –OC 2001
50. Stiglitz, J. E. (1983). Some aspects of the taxation of capital gains. Journal of Public Economics, 21:257–294.
51. Vickrey, W. (1939). Averaging of income for income tax purposes. The Journal of Political Economy, 47(3):379–397.
52. Warren, A. C. (1993). Financial contract innovation and income tax policy. Harvard Law Review, 107:460–492.
53. Warren, A. C. (2004). US income taxation of new financial products. Journal of Public Economics, 88(5):899–923.