Consumption, Wealth, Stock and Housing Returns: Evidence from Emerging Markets

Guglielmo Maria Caporale[*] *Ricardo M. Sousa*[$]

Abstract

We show, using the consumer's budget constraint, that the transitory deviation from the common trend in consumption, aggregate wealth and labour income, labelled as *cay*, forecasts not only the equity risk premium, but also housing returns. The evidence based on a panel of 31 emerging market economies indicates that, when investors expect higher stock returns, consumption temporarily rises above its equilibrium level. A similar response takes place when higher housing returns are expected and financial and housing assets are complements. In contrast, when these assets are substitutes, consumption is reduced. The empirical findings also suggest that the predictive ability of *cay* is high for Brazil, China, Colombia, Israel, Korea, Latvia, and Malaysia. As for housing risk premium, financial and housing assets are perceived as complements in the case of Chile, Russia, South Africa and Thailand and as substitutes in Argentina, Brazil, Hong Kong, Indonesia, Korea, Malaysia, Mexico and Taiwan.

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Keywords: consumption, wealth, stock returns, housing returns, emerging markets.

[*]Centre for Empirical Finance, Brunel University, London UB8 3PH, UK. Email: Guglielmo-Maria.Caporale@brunel.ac.uk.
[$] University of Minho, Department of Economics and Economic Policies Research Unit (NIPE), Campus of Gualtar, 4710-057 - Braga, Portugal; London School of Economics, LSE Alumni Association, Houghton Street, London WC2 2AE, United Kingdom. E-mails: rjsousa@eeg.uminho.pt, rjsousa@alumni.lse.ac.uk.

1. Introduction

The predictability of stock returns is a well known and documented in the empirical finance literature (Fama and French; 1988; Campbell and Shiller; 1988). In addition, the relationship between wealth and macroeconomic aggregates has been shown to provide valuable information about the future dynamics of the equity risk premium as well as its counter-cyclical pattern (Lettau and Ludvigon, 2001; Sousa, 2010a).

More recently, as a result of the euro area sovereign debt crisis, some authors have focused on the determinants of the risk premium associated with government bonds (Sousa, 2013a). By relating the behaviour of bond yields to a set of macro-financial variables, this line of investigation has opened new avenues for assessing how changes in public debt affect consumers' expectations about future returns and how these, in turn, are mapped into their spending patterns (Afonso and Sousa, 2011; Sousa, 2010b).

However, research on the predictability of housing returns is still lacking. This is somewhat surprising, especially in view of the fact that housing represents the most valuable asset in households' portfolios from which they derive not only direct utility, but also collateral services (Banks et al., 2004). Moreover, some of the existing evidence seems suggest that housing is a hedge against unfavourable wealth shocks (Sousa, 2013b).

The 2007-2009 financial turmoil has clearly shown how strong the linkages between the housing sector, the banking and financial sector and, ultimately, the macroeconomy are.[1] Further, its severity and long-lasting, quickly spreading effects have re-emphasised the need to understand better: (i) how changes in asset prices

[1] Wealth dynamics are also of great importance for the conduct of monetary policy (Sousa, 2010c, 2014), for the nexus between monetary stability and financial markets' stability (Granville and Mallick, 2009; Castro, 2011), for the implementation of fiscal policy (Agnello and Sousa, 2011, 2013), and because of its macroeconomic impact (Rafiq and Mallick, 2008).

impact on the macroeconomy (Caporale and Spagnolo, 2003); (ii) how markets' volatility can be transmitted across countries during financial crises (Caporale et al., 2006); and (iii) how emerging markets may be especially vulnerable to global spillovers (Beirne et al., 2010).

In this paper, we try to fill some of the abovementioned gaps in the literature by analysing in particular the joint dynamics of consumption, wealth and income in emerging market economies. More specifically, we use the representative agent's intertemporal budget constraint and combine wealth and macroeconomic data to show that the transitory deviation from the common trend in consumption, aggregate wealth and labour income, labelled as *cay*, can predict not only the equity risk premium (as in the seminal paper of Lettau and Ludvigson (2001) and in the subsequent analysis by Sousa (2010a)), but also housing returns.

In the case of stock returns, the rationale for such a link is well known: the consumption-wealth ratio captures the variation in expectations about the future equity risk premium: when forward-looking investors expect stock returns to be higher in the future, they allow consumption to rise above its equilibrium level, thereby insulating future consumption from fluctuations in the return of financial wealth (Lettau and Ludvigson, 2001; Sousa, 2010a).

As for the housing risk premium, agents' behaviour will depend on how they perceive the degree of substitutability or complementarity between financial and housing assets: if they are seen as complementary, investors will increase consumption above its equilibrium level when they expect a rise in housing returns; if they are treated as substitutes, consumption will instead fall below its equilibrium level.

Using data for a set of 31 emerging market countries, we find that *cay* strongly predicts real stock returns at horizons from three to four quarters. Indeed, it explains

20% (Malaysia), 22% (Israel and Latvia), 23% (China), 25% (Colombia), 39% (Brazil), and 46% (Korea) of the variation of real stock returns over the next four quarters.

Concerning housing returns, the countries in our sample can be clustered in two groups: one including Chile, Russia, South Africa and Thailand, where *cay* has a positive coefficient in the forecasting regressions, hence supporting the existence of complementarity between housing and financial assets; the other including Argentina, Brazil, Hong Kong, Indonesia, Korea, Malaysia, Mexico and Taiwan, where the coefficient of *cay* is negative, therefore implying substitutability between assets. Specifically, at the four quarter-ahead horizon, cay_t explains 23% (Indonesia), 24% (Brazil and Chile), 30% (Argentina), 38% (South Africa) and 47% (Mexico) of real housing returns.

The paper is organised as follows. Section 2 presents the theoretical framework. Section 3 describes the econometric methodology. Section 4 discusses the empirical results. Section 5 offers some concluding remarks.

2. Theoretical framework

We consider the case of a representative consumer for whom the intertemporal budget constraint can be expressed as

$$W_{t+1} = (1 + R_{w,t+1})(W_t - C_t), \tag{1}$$

where W_t represents aggregate wealth, C_t denotes private consumption, and $R_{w,t+1}$ corresponds to the return on aggregate wealth between period t and $t+1$.

Under the assumption that the consumption-aggregate wealth ratio is stationary and that $\lim_{i\to\infty} \rho_w^{\,i}(c_{t+i} - w_{t+i}) = 0,$ Campbell and Mankiw (1989) use the following Taylor expansion approximation of equation (1)

$$c_t - w_t = \sum_{i=1}^{\infty} \rho_w^i r_{w,t+i} - \sum_{i=1}^{\infty} \rho_w^i \Delta c_{t+i} + k_w, \tag{2}$$

where $c \equiv logC$, $w \equiv logW$, and k_w is a constant. According to equation (2), deviations of consumption from its equilibrium relationship with aggregate wealth reflect changes in the returns on aggregate wealth or in consumption growth.

Similarly, one can decompose the aggregate return on wealth as

$$R_{w,t+1} = \omega_t R_{a,t+1} + (1 - \omega_t) R_{h,t+1}, \tag{3}$$

where ω_t is a time varying coefficient and $R_{a,t+1}$ is the return on asset wealth. Campbell (1996) uses the following approximation of equation (3)

$$r_{w,t} = \omega_t r_{a,t} + (1 - \omega_t) r_{h,t} + k_r, \tag{4}$$

where k_r is a constant, and $r_{w,t}$ is the log return on asset wealth.

The log aggregate wealth can be approximated as

$$w_t = \omega a_t + (1-\omega) h_t + k_a, \tag{5}$$

where a_t is log asset wealth, h_t is log human wealth, ω is the mean of ω_t, and k_a is a constant.

Following the suggestion of Campbell (1996), who interprets labour income, Y_t, as the dividend on human capital, H_t, we can define the return to human capital as:

$$1 + R_{h,t+1} = \frac{H_{t+1} + Y_{t+1}}{H_t}. \tag{6}$$

If we log-linearise this relation around the steady state, we obtain

$$r_{h,t+1} = (1 - \rho_h)k_h + \rho_h(h_{t+1} - y_{t+1}) - (h_t - y_t) + \Delta y_{t+1}, \tag{7}$$

where $r \equiv log(1+R)$, $h \equiv logH$, $y \equiv logY$, k_h is a constant of no interest, and the variables without time subscript are evaluated at their steady state value. Imposing the condition that $\lim_{i\to\infty} \rho_h^{\,i}(h_{t+i} - y_{t+i}) = 0$, we can rewrite the log human capital income ratio as a linear combination of future labour income growth and future returns on human capital:

$$h_t - y_t = \sum_{i=1}^{\infty} \rho_h^{i-1}(\Delta y_{t+i} - r_{h,t+i}) + k_h. \tag{8}$$

Replacing equation (4), (7) and (8) into (2), we get

$$c_t - \omega a_t - (1-\omega)(y_t + \sum_{i=1}^{\infty} \rho_h^{i-1} \Delta y_{t+i}) =$$

$$= \omega \sum_{i=1}^{\infty} \rho_w^i r_{a,t+i} + (1-\omega) \sum_{i=1}^{\infty} (\rho_w^i - \rho_h^{i-1}) r_{h,t+i} - \sum_{i=1}^{\infty} \rho_w^i \Delta c_{t+i} + k, \tag{9}$$

where k is a constant. This equation holds ex-post as a direct consequence of the agent's budget constraint, but it also has to hold ex-ante. Taking the time t conditional expectation of both sides gives

$$\underbrace{c_t - \omega a_t - (1-\omega) y_t}_{cay_t} = \omega E_t \sum_{i=1}^{\infty} \rho_w^i r_{a,t+i} + (1-\omega) E_t \sum_{i=1}^{\infty} \rho_h^{i-1} \Delta y_{t+i} - E_t \sum_{i=1}^{\infty} \rho_w^i \Delta c_{t+i} + \eta_t + k, \tag{10}$$

where $\eta_t \equiv (1-\omega) \sum_{i=1}^{\infty} (\rho_w^i - \rho_h^{i-1}) r_{h,t+i}$, is a stationary component.

Sousa (2010a, 2011) highlights the importance of the composition of wealth in pricing the risk premium. By disaggregating returns, $r_{a,t}$, into returns on financial assets, $r_{f,t}$, and returns on housing assets, $r_{u,t}$, one can link the trend deviation, cay_t, to the market expectations about future financial and housing asset returns:

$$\underbrace{c_t - \omega a_t - (1-\omega) y_t}_{cay_t} =$$

$$= \omega_f E_t \sum_{i=1}^{\infty} \rho_w^i r_{f,t+i} + \omega_u E_t \sum_{i=1}^{\infty} \rho_w^i r_{u,t+i} + (1-\omega_f - \omega_u) E_t \sum_{i=1}^{\infty} \rho_h^{i-1} \Delta y_{t+i} - E_t \sum_{i=1}^{\infty} \rho_w^i \Delta c_{t+i} + \eta_t + k, \tag{11}$$

where $\eta_t \equiv (1-\omega) \sum_{i=1}^{\infty} (\rho_w^i - \rho_h^{i-1}) r_{h,t+i}$.

As a result, when agents expect future stock returns to be higher, they will temporarily allow consumption to rise. Regarding housing risk premium, the same response from investors is observed when there is complementarity between financial and housing assets, that is, agents will increase consumption when they expect higher

housing returns. However, if financial and housing assets are perceived as substitutes, a fall in current consumption will be linked to the expectations of a rise in future housing returns. This behaviour reflects the degree of separability between financial and housing assets: when they are separable, financial and housing assets will be substitutes, so agents can easily smooth any transitory movement in their asset wealth arising from time-variation in expected returns; if, however, they are not separable, financial and housing assets will be complements, making it more difficult for agents to smooth changes in the composition of wealth. Therefore, valuable information can be extracted from the sign of the coefficients on *cay* in the forecasting regressions for stock and housing returns.

3. Econometric methodology

We use quarterly data spanning the period 1990:1-2008:3 for 31 emerging market economies, namely: 10 from emerging Asia (China, Hong Kong, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand), 6 from Latin America (Argentina, Brazil, Chile, Colombia, Mexico, and Peru), 12 from emerging Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, and Slovenia) and 3 other countries (Israel, South Africa, and Turkey).

The source for real private consumption is Haver Analytics, with the exception of China, Hong Kong, Indonesia, and Singapore for which the data come from CEIC. We use a measure of aggregate consumption and hence cannot distinguish between non-durable and durable consumption. Conventional theories look at the flow of non-durable and services consumption, since durable consumption can be thought of as a replacement and addition to the capital stock. In addition, total consumption measures include expenditure on housing services. Nevertheless, as Mehra (2001) points out, total

consumption is the variable of interest when investigating the consumption-wealth channel. In particular, stock market crashes are more likely to lead to a postponement of durable consumption decisions, while a fall in non-durable consumption might have minor effects (Romer, 1990). Furthermore, durable consumption goods are among the main items on which resources raised by mortgage refinancing are spent.

Income corresponds to the salary or the wage income and is provided by CEIC (for the emerging Asian countries) or by Haver Analytics (for the remaining countries).

Data on asset wealth and asset returns are proxied by the.housing and the stock market price indices. This is in line with studies investigating the role played by housing prices or the (in)direct impact of stock market prices on aggregate consumption (Romer, 1990).

Housing price (residential property) indices are obtained from CEIC (for the emerging Asian countries), the IMF (for the Latin American countries), and Haver Analytics (for the remaining countries). Stock price indices (composite indices) are from the Global Financial Database.

The CPI price index is taken mainly from Haver Analytics, with the exception of Argentina, Brazil, and Chile, for which the data source is the IMF.

Finally, data are transformed in several ways. First, the wealth variables are deflated using the CPI price index (all items), while private consumption is deflated by the national authorities using National Accounts data. Second, income corresponds to real wage or salary provided by National Statistics authorities, except for Argentina, China, Indonesia, Malaysia, Russia, and Thailand, where the nominal wage (or salary) is deflated using the CPI price index.

[INSERT TABLE 1 HERE.]

We start by testing for unit roots in consumption, aggregate wealth and labour income using the Augmented Dickey-Fuller tests and, then employ the method of Engle-Granger to test for cointegration.

Following Stock and Watson (1993), we estimate the following model by dynamic ordinary least squares (DOLS)

$$c_t = \mu + \beta_a a_t + \beta_y y_t + \sum_{i=-k}^{k} b_{a,i} \Delta a_{\text{t-i}} + \sum_{i=-k}^{k} b_{y,i} \Delta y_{\text{t-i}} + \varepsilon_t \tag{12}$$

where the parameters β_a and β_y represent the long-run elasticities of consumption with respect to asset wealth and labour income respectively, Δ denotes the first difference operator, μ is a constant, and ε_t is the error term.

Table 2 provides a summary of the estimates and shows that labour income is the main determinant of consumption over long-run horizons. In addition, both asset wealth and labour income are statistically significant for a large number of countries.

[INSERT TABLE 2 HERE.]

4. Forecasting regressions

4.1. Equity risk premium

In this Section, we assess the predictive ability of cay_t for the future equity risk premium at different horizons. More specifically, we estimate the following forecasting regressions

$$\sum_{h=1}^{H} r_{f,t+h} = \alpha + \lambda cay_{t-1} + \varepsilon_t, \tag{13}$$

where the *H*-period real stock return, $r_{f,t+1} + ... + r_{f,t+H}$, is regressed on the lag of consumption-wealth ratio, cay_{t-1}.

In Table 3, we can see that cay_t: (i) is statistically significant in a large number of countries; (ii) is relatively large in magnitude; and (iii) has a positive sign.

Moreover, it accounts for a sizeable percentage of the variation in future real returns, especially at horizons of three or four quarters. Indeed, the adjusted R square is 20% (Malaysia), 22% (Israel and Latvia), 23% (China), 25% (Colombia), 39% (Brazil), and 46% (Korea) at the four quarter-ahead horizon. In contrast, its forecasting power is poor for countries such as Argentina, Chile, Estonia, Hong Kong, Indonesia, Peru, Philippines, Poland, Russia, Singapore and Taiwan.

[INSERT TABLE 3 HERE.]

4.2. Housing risk premium

We now turn our attention to the regressions for the housing risk premium. In particular, we use the lag of the consumption-wealth ratio, cay_{t-1}, to forecast the *H*-period real housing return, $r_{u,t+1} + ... + r_{u,t+H}$ as follows:

$$\sum_{h=1}^{H} r_{u,t+h} = \alpha + \lambda cay_{t-1} + \varepsilon_t , \tag{14}$$

Table 4 shows that cay_t explains a large share of the variation in the future housing risk premium, in particular, at the four quartert-ahead horizon, where it predicts 23% (Indonesia), 24% (Brazil and Chile), 30% (Argentina), 38% (South Africa) and 47% (Mexico) of the real housing returns.

We also find that the sign of the coefficient of cay_t is: 1) positive for Chile, Russia, South Africa and Thailand, suggesting that financial and housing assets are perceived as complementary; and 2) negative for Argentina, Brazil, Hong Kong, Indonesia, Korea, Malaysia, Mexico and Taiwan, indicating that the two classes of assets are seen as substitutes.

[INSERT TABLE 4 HERE.]

4.3. Nested comparisons

In order to verify the robustness of the previous results, we compare the mean-squared forecasting error (MSE) from a series of one-quarter-ahead out-of-sample forecasts obtained from a forecasting equation that include *cay* with the MSE associated with predictive equations that exclude *cay*. Therefore, we make nested forecasts comparing the model that includes *cay* with the *constant expected returns* benchmark model.

Table 5 summarises the results for both the stock and housing risk premium and shows that the inclusion of *cay* in the forecasting models leads to an improvement in predictive accuracy relative to the benchmark model.

[INSERT TABLE 5 HERE.]

5. Conclusion

In this paper, we show, using the consumer's budget constraint, that the trend deviations of consumption, aggregate wealth and labour income, *cay*, capture expectations about the future equity risk premium and the housing risk premium. We find that, when agents expect higher stock returns, they allow consumption to rise above

its equilibrium level. A similar behaviour can be observed when investors expect higher housing returns and financial and housing assets are complements. However, if these assets are substitutes, then consumption is allowed to fall below its common trend with aggregate wealth and labour income.

Using data for a set of 31 emerging market countries, we show that the forecasting power of *cay* for the equity risk premium is especially high in the case of Brazil, China, Colombia, Israel, Korea, Latvia, and Malaysia. With regard to the housing risk premium, there are two groups of countries. In the first (including Chile, Russia, South Africa and Thailand), the coefficient associated to *cay* in the predictive regressions is positive, i.e. housing and financial assets are complements. In the second (including Argentina, Brazil, Hong Kong, Indonesia, Korea, Malaysia, Mexico and Taiwan), *cay* has a negative coefficient and, therefore, agents perceive financial and housing assets as substitutes.

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Table 1 - Data sources

Country	Consumption	Income	Property Index	Equity Index	CPI Index
Argentina	Haver: private consumption (real GDP)	Haver: total salary index (deflated by CPI index)	IMF: house price index	GFD: Buenos Aires SE General Index	IMF: national CPI
Brazil	Haver: private consumption (real GDP)	Haver: real average earnings of employed persons	IMF: house price index	GFD: Brazil Bolsa de Valores de São Paulo	IMF: national CPI
Bulgaria	Haver: individual consumption expenditure (real GDP)	Haver: average monthly wage of employed under labor contact	Haver: housing prices (residential buildings)	GFD: Sofia SOFIXD index	Haver: CPI
Chile	Haver: private consumption (real GDP)	Haver: real hourly wage index	IMF: house price index	GFD: Santiago SE Indice General de Precios de Acciones	IMF: national CPI
China	CEIC: private consumption deflated with the GDP deflator, interpolated	CEIC: average earning per employee (deflated by CPI index)	CEIC: residential property price index	GFD: Shanghai SE composite	Haver: national average CPI index
Colombia	Haver: private final consumption (real GDP)	Haver: real wages	IMF: house price index	GFD: Colombia IGBCD index	Haver: CPI
Croatia	Haver: household consumption expenditure (real GDP)	Haver: average monthly earnings	Haver: house price index	GFD: CRBEXD index	Haver: CPI
Czech Republic	Haver: households' final consumption expenditure (real GDP)	Haver: average monthly wages (total economy)	Haver: house price index	GFD: Prague PXD index	Haver: CPI
Estonia	Haver: personal consumption (real GDP)	Haver: average monthly gross wages	Haver: house price index	GFD: Estonia OMX index	Haver: CPI
HK	CEIC: private consumption (real GDP)	CEIC: real wage index (missing obs. interpolated)	CEIC: domestic premise property price index	GFD: Hang Seng composite index	Haver: CPI composite index
Hungary	Haver: private final consumption expenditure (real GDP)	Haver: average monthly net earnings (whole economy)	Haver: house price index	GFD: Bulgaria BUX index	Haver: CPI
India	Haver: private final consumption expenditure (real GDP)	Haver: wages per Monday worked (all employees)	CEIC: house price index	GFD: India BSE100 index	Haver: CPI
Indonesia	CEIC: private consumption (real GDP)	Haver: average of mining, hotel and manufacturing wages (deflated by CPI index)	CEIC: residential property price index (either 12, 13 or 14 cities)	GFD: Jakart SE composite index	Haver: CPI total
Israel	Haver: private consumption expenditure (real GDP)	Haver: monthly wage index per employee post (manufacturing)	Haver: house price index	GFD: Israel ILTLVAD index	Haver: CPI
Latvia	Haver: households and non-profitable institutions serving households' final consumption expenditure (real GDP)	Haver: average gross monthly wages and salaries	Haver: house price index	GFD: Latvia OMX index	Haver: CPI
Lithuania	Haver: private consumption expenditure (real GDP)	Haver: average monthly gross earnings (total)	Haver: house price index	GFD: Lithuania OMX index	Haver: CPI
Korea	Haver: private consumption (real GDP)	CEIC: monthly earnings all industries (deflated by CPI index)	CEIC: total housing price index	GFD: Korea stock price index (KOSPI)	Haver: CPI all items
Malaysia	Haver: private consumption (real GDP)	CEIC: monthly earnings manufacturing (deflated by CPI index)	CEIC: house price index	GFD: Malaysia KLSE composite	Haver: CPI all items
Mexico	Haver: private consumption (real GDP)	Haver: real remunerations in manufacturing	IMF: house price index	GFD: Mexico SE Indice de Precios y Cotizaciones	Haver: CPI all items
Peru	Haver: private consumption (real GDP)	Haver: wages (real index)	IMF: house price index	GFD: Peru IGRAD index	Haver: CPI
Philippines	Haver: private consumption expenditure (real GDP)	Haver: compensarion of employees	CEIC: house price index	GFD: Philippines PSID index	Haver: CPI
Poland	Haver: individual consumption (real GDP)	Haver: net average monthly wage and salary earnings	Haver: house price index	GFD: Romania BETCD index	Haver: CPI
Romania	Haver: individual consumption (real GDP)	Haver: net average monthly wage and salary earnings	Haver: house price index	GFD: Romania BETCD index	Haver: CPI
Russia	Haver: private consumption (real GDP)	Haver: nominal accrued monthly wages (deflated by CPI index)	Haver: prices for existing homes	GFD: Moscow Times Rouble Index	Haver: CPI all items
Singapore	CEIC: private consumption (real GDP)	CEIC: average real monthly earnings, total	CEIC: private residential property price index	GFD: FTSE Straits Times index	Haver: CPI all items
Slovakia	Haver: final consumption of households (real GDP)	Haver: average monthly nominal wage (total industry)	Haver: house price index	GFD: Slovakia SAXD index	Haver: CPI
Slovenia	Haver: final consumption of households (real GDP)	Haver: average monthly net earnings (labor market)	Haver: house price index	GFD: Slovenia SBID index	Haver: CPI
South Africa	Haver: private consumption (real GDP)	Haver: real remuneration per worker	Haver: ABSA house price index	GFD: FTSE JSE all share index	Haver: CPI (metropolitan área) all items
Taiwan	Haver: private consumption (real GDP)	CEIC: average real monthly earnings: industry and service	CEIC: Sinyi residential property price index	GFD: Taiwan SE capitalization weighted index	Haver: CPI all items
Thailand	Haver: private consumption (real GDP)	CEIC: average monthly wage (deflated by CPI index)	CEIC: average of housing price indices of single detached house and town house including land	GFD: Thailand SET general index	Haver: CPI all commodities
Turkey	Haver: final consumption expenditure of resident households (real GDP)	Haver: index of earning per production workers in manufacturing (total)	Haver: house price index	GFD: Turkey XU100D index	Haver: CPI

Table 2 - Long-run relationship between consumption, financial wealth, and labour income

	a	y	ADF t-statistic	Critical values	ADF t-statistic		a	y	ADF t-statistic	Critical values	ADF t-statistic
			Lags: 1	5%	10%				Lags: 1	5%	10%
Argentina	0.07***	0.98***	-1.70	-1.95	-1.61	Lituania	0.04*	1.09***	-1.36	-1.95	-1.61
	(9.41)	(28.22)					(1.84)	(15.24)			
Brazil	0.05***	1.38***	-3.84	-1.95	-1.61	Malaysia	-0.05***	2.22***	-4.50	-1.95	-1.61
	(3.15)	(12.39)					(-3.15)	(61.59)			
Bulgaria	-0.01	0.98***	-0.46	-1.95	-1.61	Mexico	0.01	1.97***	-2.61	-1.95	-1.61
	(-0.56)	(14.42)					(1.42)	(32.78)			
Chile	0.04**	1.54***	-3.01	-1.95	-1.61	Peru	-0.03***	1.45***	-2.01	-1.95	-1.61
	(2.48)	(34.94)					(-3.66)	(29.11)			
China	0.00***	0.90***	0.36	-1.95	-1.61	Philippines	-0.05***	1.84***	-4.74	-1.95	-1.61
	(3.82)	(698.73)					(-3.74)	(26.98)			
Colombia	-0.04***	1.66***	-2.87	-1.95	-1.61	Poland	-0.01*	0.87***	-4.62	-1.95	-1.61
	(-3.39)	(17.59)					(-1.92)	(57.84)			
Croatia	-0.04***	1.27***	-3.40	-1.95	-1.61	Romania	0.02	1.37***	-1.43	-1.95	-1.61
	(-4.01)	(27.27)					(0.89)	(16.00)			
Czech	-0.01**	0.87***	-2.92	-1.95	-1.61	Russia	0.06***	1.16***	-2.74	-1.95	-1.61
Republic	(-2.20)	(34.25)					(7.13)	(37.29)			
Estonia	0.06***	0.95***	-1.92	-1.95	-1.61	Singapore	-0.27***	1.66***	-2.34	-1.95	-1.61
	(5.60)	(41.87)					(-3.88)	(22.53)			
Hong	0.23***	0.49***	-2.53	-1.95	-1.61	Slovakia	-0.02*	0.92***	-2.41	-1.95	-1.61
Kong	(8.22)	(5.44)					(-1.93)	(26.88)			
Hungary	-0.07***	1.23***	-1.34	-1.95	-1.61	Slovenia	-0.02	0.80***	-2.39	-1.95	-1.61
	(-6.81)	(41.93)					(-1.19)	(19.68)			
India	-0.06***	1.22***	-5.06	-1.95	-1.61	South	0.00	1.64***	-1.94	-1.95	-1.61
	(-5.31)	(36.57)				Africa	(0.03)	(9.14)			
Indonesia	-0.01**	1.08***	-2.26	-1.95	-1.61	Taiwan	-0.02	1.11***	0.12	-1.95	-1.61
	(-2.23)	(44.94)					(-1.09)	(46.89)			
Israel	0.30***	0.32	-2.97	-1.95	-1.61	Thailand	-0.04***	1.16***	-1.11	-1.95	-1.61
	(4.81)	(0.72)					(-10.05)	(39.19)			
Korea	-0.05***	0.94***	-2.84	-1.95	-1.61	Turkey	-0.04**	1.45***	-2.74	-1.95	-1.61
	(-5.49)	(70.11)					(-2,37)	(25.20)			
Latvia	-0.15**	1.44***	-1.33	-1.95	-1.61						
	(-2.47)	(11.83)									

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. *, **, *** denote statistical significance at the 10, 5, and 1% level, respectively.

Table 3 - Forecasting the equity risk premium

	Forecast Horizon *H*						Forecast Horizon *H*				
	1	2	3	4	8		1	2	3	4	8
Argentina	0.34	0.37**	0.09	0.70	2.24	Lituania	-1.43*	-3.35***	-4.58***	-4.95***	-6.73***
	(0.35)	(0.25)	(0.08)	(0.51)	(1.18)		(-1.76)	(-2.86)	(-3.20)	(-3.43)	(-2.67)
	[0.00]	[0.00]	[0.00]	[0.01]	[0.04]		[0.09]	[0.20]	[0.21]	[0.17]	[0.19]
Brazil	4.64**	5.09***	5.84***	7.16***	6.24***	Malaysia	1.39**	3.24***	4.68***	4.47***	1.99
	(2.03)	(2.80)	(4.01)	(3.08)	(2.55)		(2.03)	(3.09)	(4.96)	(3.00)	(1.21)
	[0.38]	[0.37]	[0.40]	[0.39]	[0.23]		[0.11]	[0.25]	[0.31]	[0.20]	[0.03]
Bulgaria	6.25**	7.35**	13.53***	7.53*	2.73	Mexico	0.94*	1.95***	2.20**	2.59**	4.99***
	(2.58)	(2.25)	(2.89)	(1.89)	(0.58)		(1.91)	(2.51)	(2.44)	(2.43)	(4.42)
	[0.26]	[0.16]	[0.31]	[0.07]	[0.01]		[0.03]	[0.07]	[0.07]	[0.07]	[0.18]
Chile	0.69	0.86	2.32	4.74**	2.54	Peru	-0.96	-1.50	1.07	1.04	-1.20
	(0.90)	(0.63)	(1.24)	(2.50)	(1.40)		(-1.49)	(-1.15)	(1.27)	(1.04)	(-0.66)
	[0.01]	[0.01]	[0.04]	[0.14]	[0.04]		[0.02]	[0.03]	[0.01]	[0.01]	[0.00]
China	-0.88***	-1.96***	-3.00***	-3.43***	-3.14***	Philippines	0.06	-0.10	-0.56	-0.97*	-2.74***
	(-2.88)	(-3.72)	(-3.96)	(-3.50)	(3.35)		(0.10)	(-0.11)	(-0.74)	(-1.90)	(-3.42)
	[0.20]	[0.28]	[0.29]	[0.23]	[0.11]		[0.00]	[0.00]	[0.01]	[0.03]	[0.14]
Colombia	1.86**	3.77***	5.51***	6.45***	12.57***	Poland	1.48*	1.84	4.29**	2.92	5.09
	(2.38)	(3.99)	(5.06)	(4.99)	(6.26)		(1.76)	(1.51)	(2.53)	(1.47)	(1.20)
	[0.11]	[0.22]	[0.27]	[0.25]	[0.38]		[0.05]	[0.04]	[0.12]	[0.04]	[0.07]
Croatia	-1.20	-2.78	-7.50**	-7.13*	-0.68	Romania	-2.47**	-4.42**	-4.26*	-5.08*	-1.39***
	(-0.74)	(-0.93)	(-2.46)	(-1.73)	(-0.11)		(-2.52)	(-2.18)	(-1.77)	(-1.97)	(-0.51)
	[0.02]	[0.04]	[0.16]	[0.12]	[0.00]		[0.09]	[0.13]	[0.0.07]	[0.08]	[0.00]
Czech	3.10***	5.94***	8.07***	8.68***	12.46***	Russia	-0.06	0.58	1.78	2.45	2.64*
Republic	(2.84)	(4.13)	(4.54)	(4.09)	(3.62)		(-0.06)	(0.55)	(1.45)	(1.33)	(1.65)
	[0.13]	[0.24]	[0.25]	[0.19]	[0.19]		[0.00]	[0.00]	[0.02]	[0.02]	[0.02]
Estonia	1.59	2.32	4.85*	5.35*	0.30	Singapore	-0.35	-0.65	-1.03	-1.33*	-1.17**
	(1.36)	(1.12)	(1.84)	(1.65)	(0.11)		(-0.98)	(-1.25)	(-1.53)	(-1.95)	(-2.07)
	[0.04]	[0.04]	[0.09]	[0.08]	[0.00]		[0.03]	[0.05]	[0.08]	[0.11]	[0.07]
Hong	0.46	0.80	1.01	1.46**	2.31***	Slovakia	1.67**	2.62***	3.78***	4.74***	9.28***
Kong	(1.50)	(1.58)	(1.60)	(2.10)	(2.95)		(2.32)	(2.61)	(2.91)	(2.77)	(3.27)
	[0.02]	[0.04]	[0.04]	[0.06]	[0.11]		[0.10]	[0.09]	[0.11]	[0.10]	[0.17]
Hungary	0.60	1.56	3.25***	4.50***	6.15***	Slovenia	-0.68	-3.16	-6.29**	-6.84**	-2.86
	(0.89)	(1.51)	(2.70)	(3.08)	(3.05)		(-0.48)	(-1.43)	(-2.34)	(-2.34)	(-0.77)
	[0.001	[0.03]	[0.08]	[0.11]	[0.12]		[0.00]	[0.04]	[0.09]	[0.09]	[0.01]
India	-2.31***	-2.35***	-2.62**	-2.62*	-1.96	South	0.15	0.28*	0.35**	0.41**	0.74***
	(-4.24)	(-2.78)	(-2.07)	(-1.73)	(-0.97)	Africa	(1.48)	(1.89)	(1.99)	(2.17)	(3.42)
	[0.15]	[0.07]	[0.06]	[0.05]	[0.01]		[0.02]	[0.04]	[0.04]	[0.05]	[0.09]
Indonesia	1.84	3.67	4.35	5.68*	10.40**	Taiwan	-0.16	-0.27	-0.30	-0.81	-1.79
	(1.01)	(1.54)	(1.41)	(1.67)	(2.19)		(-0.34)	(-0.38)	(-0.37)	(-0.92)	(-1.36)
	[0.02]	[0.04]	[0.04]	[0.06]	[0.15]		[0.00]	[0.00]	[0.00]	[0.01]	[0.03]
Israel	0.35	0.72*	1.46***	1.88***	2.74***	Thailand	0.15	1.09	3.04	3.67*	7.06***
	(1.38)	(1.81)	(2.89)	(3.44)	(4.85)		(0.18)	(0.16)	(1.47)	(1.65)	(2.74)
	[0.03]	[0.07]	[0.16]	[0.22]	[0.33]		[0.00]	[0.01]	[0.05]	[0.05]	[0.08]
Korea	-1.45*	-3.68***	-6.27***	-8.16***	-8.77***	Turkey	0.76	1.51	1.17	-1.23	-3.67*
	(-1.62)	(-3.37)	(-6.21)	(-7.47)	(-6.87)		(0.82)	(0.83)	(0.54)	(-0.52)	(-1.95)
	[0.06]	[0.20]	[0.38]	[0.46]	[0.39]		[0.02]	[0.03]	[0.01]	[0.01]	[0.06]
Latvia	0.82	-0.04	-0.44	-4.59***	-0.38						
	(1.06)	(-0.03)	(-0.22)	(-2.93)	(-0.19)						
	[0.05]	[0.00]	[0.00]	[0.22]	[0.00]						

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** denote statistical significance at the 10, 5, and 1% level, respectively.

Table 4 - Forecasting the housing risk premium

	Forecast Horizon *H*						Forecast Horizon *H*				
	1	2	3	4	8		1	2	3	4	8
Argentina	-0.14***	-0.57***	-1.14**	-1.5***	-3.06***	Lituania	No housing data				
	(-1.02)	(-1.36)	(-2.05)	(-2.68)	(-8.25)						
	[0.01]	[0.10]	[0.24]	[0.30]	[0.08]						
Brazil	-0.02*	-0.13*	-0.41*	-0.5**	0.57**	Malaysia	-0.02***	-0.07***	-0.08***	-0.27***	0.32***
	(-0.13)	(-0.43)	(-1.71)	(-2.8)	(-2.03)		(-0.16)	(-0.44)	(-0.44)	(1.6)	(1.42)
	[0.06]	[0.09]	[0.09]	[0.24]	[0.14]		[0.0005]	[0.003]	[0.003]	[0.03]	[0.06]
Bulgaria	No housing data					Mexico	0.09***	-0.23**	-0.36***	-0.56***	-0.67***
							(-1.56)	(-3.34)	(-4.95)	(-5.41)	(-7.29)
							[0.05]	[0.21]	[0.43]	[0.47]	[0.66]
Chile	0.56***	0.82***	1.14***	1.37***	1.1**	Peru	No housing data				
	(5.39)	(3.53)	(2.94)	(2.89)	(1.33)						
	[0.19]	[0.21]	[0.22]	[0.24]	[0.14]						
China	1.19*	-1.50*	-2.50*	-11.10*	-135.92***	Philippines	No housing data				
	(-0.33)	(-0.22)	(-0.2)	(-0.47)	(-3.84)						
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]						
Colombia	No housing data					Poland	No housing data				
Croatia	No housing data					Romania	No housing data				
Czech	No housing data					Russia	-0.09*	-0.02*	0.28*	1.25**	4.00***
Republic							(-0.42)	(-0.06)	(0.58)	(1.82)	(3.15)
							[0.003]	[0.00]	[0.04]	[0.05]	[0.30]
Estonia	No housing data					Singapore	-0.19**	0.24*	0.18*	0.11*	-0.002*
							(1.69)	(1.12)	(0.62)	(0.33)	(-0.01)
							[0.01]	[0.03]	[0.09]	[0.02]	[0.00]
Hong	-0.60***	0.96***	-1.15***	-1.23***	-1.12***	Slovakia	No housing data				
Kong	(-4.09)	(-3.67)	(3.15)	(-2.96)	(-1.68)						
	[0.21]	[0.16]	[0.12]	[0.09]	[0.04]						
Hungary	No housing data					Slovenia	No housing data				
India	No housing data					South	-0.112***	0.246***	0.38***	0.529***	1.17***
						Africa	(4.46)	(5.01)	(5.68)	(6.44)	(9.45)
							[0.21]	[0.26]	[0.32]	[0.38]	[0.56]
Indonesia	-0.62**	-0.82**	1.31***	-1.80***	-4.04***	Taiwan	-0.16*	-0.27*	-0.29*	-0.81*	-1.79*
	(2.21)	(-2.43)	(-3.07)	(-4.8)	(-7.91)		(-0.34)	(-0.38)	(-0.37)	(-0.92)	(-1.36)
	[0.13]	[0.10]	[0.16]	[0.23]	[0.46]		[0.06]	[0.06]	[0.05]	[0.03]	[0.01]
Israel	No housing data					Thailand	0.37*	0.84**	0.86**	0.70**	-1.05***
							(0.98)	(2.16)	(2.23)	(2.58)	(3.23)
							[0.028]	[0.15]	[0.12]	[0.08]	[0.10]
Korea	0.04*	0.02*	-0.16***	-0.32*	-0.87**	Turkey	No housing data				
	(0.54)	(-0.13)	(-0.77)	(-1.27)	(-2.22)						
	[0.00]	[0.00]	[0.01]	[0.02]	[0.04]						
Latvia	No housing data										

Notes: Newey-West (1987) corrected t-statistics appear in parenthesis. Adjusted R-square is reported in square brackets. *, **, *** denote statistical significance at the 10, 5, and 1% level, respectively.

Table 5 - Nested forecast comparisons

	Real stock returns	Real housing returns	Real stock returns	Real housing returns
	$MSE_{cay}/MSE_{constant}$		$MSE_{cay}/MSE_{constant}$	
Argentina	1.006	1.012	Lituania	0.967
Brazil	0.794	1.019	Malaysia	0.951
Bulgaria	0.873		Mexico	0.991
Chile	1.004	0.915	Peru	0.996
China	0.903	1.013	Philippines	1.007
Colombia	0.953		Poland	0.986
Croatia	1.006		Romania	0.969
Czech Republic	0.941		Russia	1.010
Estonia	0.989		Singapore	0.992
Hong Kong	0.995	0.892	Slovakia	0.961
Hungary	1.005		Slovenia	1.008
India	0.933		South Africa	0.996
Indonesia	1.003	0.947	Taiwan	1.007
Israel	0.996		Thailand	1.008
Korea	0.976	1.005	Turkey	1.003
Latvia	0.989			

Notes: MSE represents the mean-squared forecasting error. *, **, *** denotes statistical significance at the 10, 5, and 1%percent level, respectively.