A Best Choice Among Asset Pricing Models? The Conditional Capital Asset Pricing Model In Australia.

Supplementary Information.

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The following pages reports findings, figures and summary statistics that were not included in the article published in *Accounting and Finance*, Volume 44 (2004), number 2, pages 139 to 162.

Table A

Omitted Panel from Table 3
Evaluation of Static CAPM with Human Capital

This table was omitted from Table 3 of the published paper. The variables and techniques are as described in the paper. It corresponds to the analysis reported in JW's Table II, Panel D, p. 23.

The Static CAPM with Human Capital						
Coefficient:	c_0	c_{VW}	c_{prem}	c_{labour}	c_{size}	R-square
Estimate:	1.02	0.05		-0.02		61.98
t-value:	79.19	2.01		-5.35		
p-value:	0.00	5.01		0.00		
Corrected-*t*:	35.46	0.92		-2.49		
Corrected-*p*:	0.00	36.46		1.64		
Estimate:	1.05	0.04		-0.01	-0.01	62.59
t-value:	44.63	2.03		-6.89	-1.24	
p-value:	0.00	4.84		0.00	22.31	
Corrected-*t*:	22.01	1.02		-3.71	-0.61	
Corrected-*p*:	0.00	31.15		0.06	54.46	
Coefficient:	δ_0	δ_{VW}	δ_{prem}	δ_{labour}		HJ-dist
Estimate:	-62.25	5.08		57.19		1.85
p-value:	48.72	49.32		46.89		0.39

Discussion

Inclusion of returns to human capital improves the explanatory power of the static-CAPM but estimates for the effect of β_i^{VW} remain insignificantly different from zero. The estimate for c_{labour} is, however, statistically significant but, in contrast to JW, negative. This variable may be proxying for the consumption state variable as discussed in Breeden (1979) which predicts that returns on investments are relatively high when consumption is low and *vice versa*.

Table B

Comparison with the Factors Used by Groenwold and Fraser (1997)

This table gives the estimates for the cross-sectional regression model:

$$E[R_{it}] = c_0 + c_{VW}\beta_i^{VW} + c_{prem}\beta_i^{prem} + c_{labour}\beta_i^{labour} + c_I\beta_i^I + c_{r90}\beta_i^{r90} + c_{M3}\beta_i^{M3}$$

and for the model for the moments

$$E\left[R_{it}\left(\delta_0 + \delta_{VW} R_t^{VW} + \delta_{prem} R_{t-1}^{prem} + \delta_{labour} R_t^{labour} + \delta_I I_t + \delta_{r90}\, r90_t + \delta_{M3}\, M3_t\right)\right] = 1$$

with either a subset or all of the variables. Here, R_{it} is the price relative (P_t/P_{t-1}) for portfolio *i* (i = 1, 2, … , 49) in quarter *t* (March 1982-December 2001), R_t^{VW} is the return on the All Ordinaries Accumulation Index, R_{t-1}^{prem} is the expected 10-year government bond yield in Australia based on U.S. yields and inflation differentials between the two countries, R_t^{labour} is the growth rate in per capita labour income, I_t is the inflation rate, $r90_t$ is the yield on 90-day bank accepted bills, and $M3_t$ is the growth rate in the M3 monetary aggregate. β_i^{VW} is the slope coefficient in the OLS regression of R_{it} on a constant and R_t^{VW}. The other betas are estimated in a similar way. The regression models are estimated using the Fama-MacBeth procedure. The "corrected *t*- and *p*-values" take sampling errors in the estimated betas into account. The models for the moments are estimated using the Generalised Method of Moments with the Hansen-Jagannathan weighting matrix. The minimized value of the GMM criterion function is the first item under the "HJ-dist", with the associated *p*-value immediately below it. All the R-square and *p*-values are reported as percentages, with all GMM *p*-values derived from a bootstrapping procedure.

Coefficient:	c_0	c_{VW}	c_{prem}	c_{labour}	c_I	c_{r90}	c_{M3}	R-square
Estimate:	1.00	0.04			0.00	-0.02	-0.02	57.45
Corrected-*t*:	27.88	0.72			-0.46	-0.78	-1.65	
Corrected-*p*:	0.00	47.50			64.58	44.09	10.55	
Coefficient:	δ_0	δ_{VW}	δ_{prem}	δ_{labour}	δ_I	δ_{r90}	δ_{M3}	HJ-dist
Estimate:	-24.10	3.76			86.78	-41.43	20.64	1.82
p-value:	49.05	48.20			50.72	43.57	46.77	0.22
Coefficient:	c_0	c_{VW}	c_{prem}	c_{labour}	c_I	c_{r90}	c_{M3}	R-square
Estimate:	1.07	-0.02	-0.04	-0.01	0.02	0.01	-0.01	75.38
Corrected-*t*:	34.47	-0.39	-1.94	-1.23	0.94	0.72	-1.16	
Corrected-*p*:	0.00	70.00	5.88	22.62	35.08	47.82	25.08	
Coefficient:	δ_0	δ_{VW}	δ_{prem}	δ_{labour}	δ_I	δ_{r90}	δ_{M3}	HJ-dist
Estimate:	-61.40	5.49	105.62	23.60	-55.23	-54.36	31.43	1.71
p-value:	42.45	44.46	39.17	42.67	41.54	39.90	46.28	0.51

Discussion

The analysis using the Groenewold & Fraser (1997) factors, reported in the above table, is not as clear-cut as the analysis reported in the published paper. Data sources are as cited in the published paper and the yield on 90-day bank accepted bills and the seasonally-adjusted level of the M3 monetary aggregate is taken from the RBA. With an R^2 of 57.45%, but no statistically significant coefficients after sampling errors have been accounted for (except for the intercept), the findings suggest a degree of correlation between variables. Indeed, the correlation between inflation (*I*) and bank-bill (*r90*) betas is 0.90. The correlation between *r90* and the *M3* monetary aggregate betas is 0.60. When the model is combined with the PL factors in the second half of the table, the R^2 is 75.38%, but only the adjusted *t*-statistic for c_{prem} is close to the critical 5% level. Examination of the data reveals a correlation of 0.88 between the inflation rate and R_t^{prem}, a correlation of 0.65 between *r90* and R_t^{prem}, and a correlation of 0.57 between *r90* and R_t^{labour}. It is not surprising then, to see beta correlations of 0.77 between inflation and R_t^{prem}, 0.84 for *r90* and R_t^{prem}, and 0.68 for *M3* and R_t^{prem}. With such high correlations between factors and uniform insignificance, it remains unclear which factors determine the performance of the model. Given that the PL model outperforms the APT using the value of R^2 as a basis for comparison, and that the theoretical rationale underlying the PL model is far more rigorous than the empirically derived APT factors, we cautiously conclude that the PL model is preferred to the Groenewold & Fraser APT.

Table C

Investigation into the Correlation Between U.S. and Australian Returns (II)

This table gives the estimates for the cross-sectional regression model

$$E[R_{it}] = c_0 + c_{VW}\,\beta_i^{VW} + c_{prem}\,\beta_i^{prem} + c_{labour}\,\beta_i^{labour} + c_{VW-US}\,\beta_i^{VW-US-AUD}$$

and for the model for the moments

$$E\left[R_{it}\left(\delta_0 + \delta_{VW}\,R_t^{VW} + \delta_{prem}\,R_{t-1}^{prem} + \delta_{labour}\,R_t^{labour} + \delta_{VW-US}\,R_t^{VW-US-AUD}\right)\right] = 1$$

with either a subset or all of the variables. Here, R_{it} is the price relative (P_t/P_{t-1}) for portfolio *i* (*i* = 1, 2, … , 49) in quarter *t* (March 1982-December 2001), R_t^{VW} is the return on the All Ordinaries Accumulation Index, R_{t-1}^{prem} is the expected 10-year government bond yield in Australia based on U.S. yields and inflation differentials between the two countries, R_t^{labour} is the growth rate in per capita labour income, and $R_t^{VW-US-AUD}$ is the return on the S&P500 Composite Index in the U.S. expressed in Australian dollars. β_i^{VW} is the slope coefficient in the OLS regression of R_{it} on a constant and R_t^{VW}. The other betas are estimated in a similar way. The regression models are estimated using the Fama-MacBeth procedure. The "corrected *t*- and *p*-values" take sampling errors in the estimated betas into account. The models for the moments are estimated using the Generalised Method of Moments with the Hansen-Jagannathan weighting matrix. The minimized value of the GMM criterion function is the first item under the "HJ-dist", with the associated *p*-value immediately below it. All the R-square and *p*-values are reported as percentages, with all GMM *p*-values derived from a bootstrapping procedure.

Coefficient:	c_0	c_{VW}	c_{prem}	c_{labour}	$c_{VW-US-AUD}$	R-square
Estimate:	1.02	0.03			0.04	8.02
Corrected-*t*:	67.11	1.07			1.49	
Corrected-*p*:	0.00	28.94			14.42	
Coefficient:	δ_0	δ_{VW}	δ_{prem}	δ_{labour}	$\delta_{VW-US-AUD}$	HJ-dist
Estimate:	-2.35	4.57			-1.40	1.89
p-value:	52.21	57.10			66.72	0.16
Coefficient:	c_0	c_{VW}	c_{prem}	c_{labour}	$c_{VW-US-AUD}$	R-square
Estimate:	1.02	0.01	-0.03	-0.01	0.11	73.83
Corrected-*t*:	26.90	0.13	-1.94	-0.86	1.30	
Corrected-*p*:	0.00	89.66	5.85	39.39	20.00	
Coefficient:	δ_0	δ_{VW}	δ_{prem}	δ_{labour}	$\delta_{VW-US-AUD}$	HJ-dist
Estimate:	-5.27	5.07	57.83	2.92	-3.24	1.78
p-value:	46.02	57.20	52.90	45.68	66.30	0.33

Figure A

The Conditional CAPM with Human Capital: Fitted expected returns versus realized average returns.

Each of the 49 scatter points in the graph represents a portfolio, with the *realized average return* as the horizontal axis and the *fitted expected return* as the vertical axis. For each portfolio *i*, the realized average return is the time-series average of the portfolio return, and the fitted expected return is the fitted value for the expected return, $E[R_i]$, in the following regression model:

$$E\left[R_{it}\right] \;=\; c_0 + c_{VW}\,\beta_i^{VW} + c_{prem}\,\beta_i^{prem} + c_{labour}\,\beta_i^{labour},$$

where β_i^{VW} is the slope coefficient in the OLS regression of the portfolio return on a constant and the return on the All Ordinaries Accumulation Index, β_i^{prem} is the slope coefficient in the OLS regression of the portfolio return on a constant and the expected 10-year government bond yield in Australia based on U.S. yields and the inflation differential between the two countries, and β_i^{labour} is the slope coefficient in the OLS regression of the portfolio return on a constant and the growth rate in per capita labour income. The straight line in the graph is the 45° line from the origin.

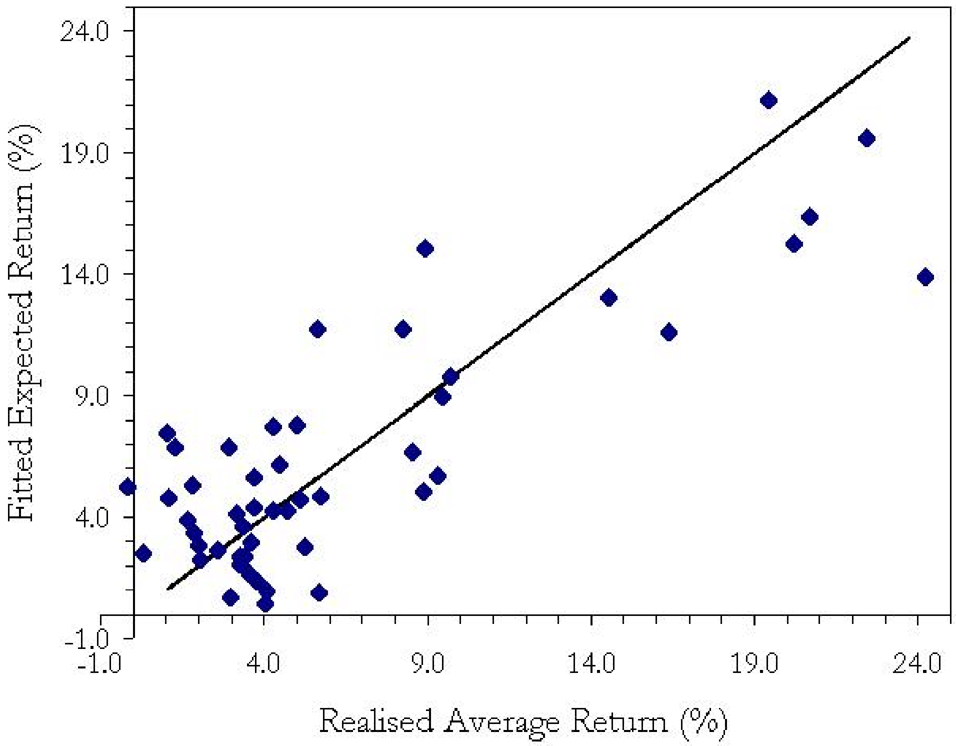


Figure B

The Static-CAPM: Fitted expected returns versus realized average returns.

Each scatter point in the graph represents a portfolio, with the *realized average return* as the horizontal axis and the *fitted expected return* as the vertical axis. For each portfolio *i*, the realized average return is the time-series average of the portfolio return, and the fitted expected return is the fitted value for the expected return, $E[R_i]$, in the following regression model:

$$E[R_{it}] = c_0 + c_{VW}\,\beta_i^{VW}$$

Where β_i^{VW} is the slope coefficient in the OLS regression of the portfolio return on a constant and the return on the All Ordinaries Accumulation Index. The straight line in the graph is the 45° line from the origin.

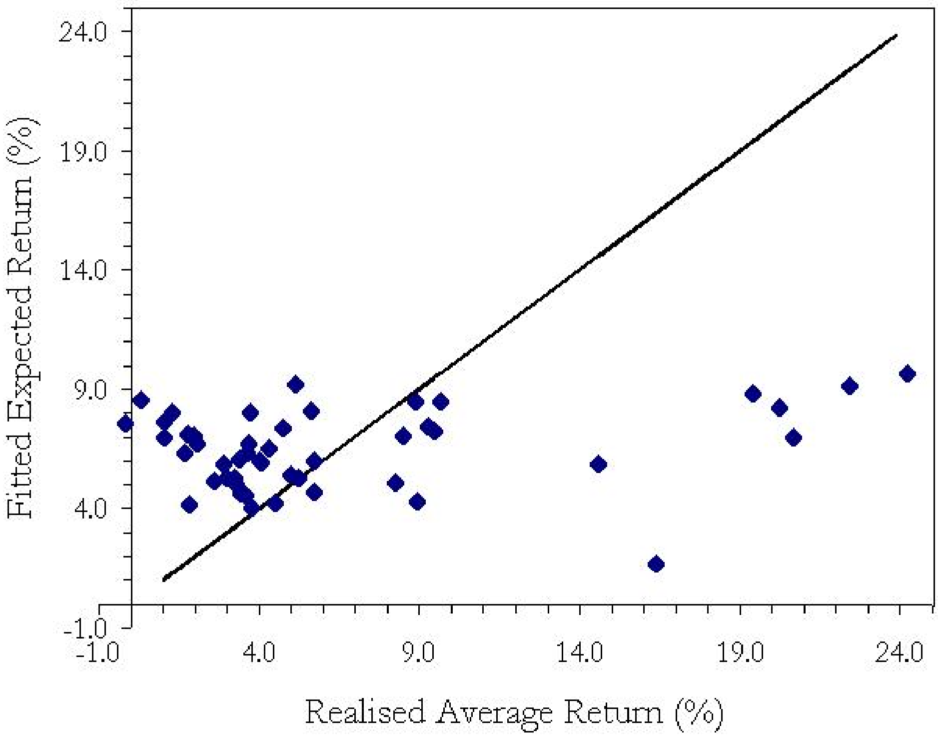


Figure C

The Static-CAPM with Market Capitalisation: Fitted expected returns versus realized average returns.

Each scatter point in the graph represents a portfolio, with the *realized average return* as the horizontal axis and the *fitted expected return* as the vertical axis. For each portfolio *i*, the realized average return is the time-series average of the portfolio return, and the fitted expected return is the fitted value for the expected return, $E[R_i]$, in the following regression model:

$$E[R_{it}] \quad = \quad c_0 + c_{size}\log(ME_i) + c_{VW}\,\beta_i^{VW}$$

Where β_i^{VW} is the slope coefficient in the OLS regression of the portfolio return on a constant and the return on the All Ordinaries Accumulation Index, and the portfolio size, $\log(ME_i)$, is calculated as the equally-weighted average of the logarithm of the market value (in million dollars) of the stocks in portfolio *i*. The straight line in the graph is the 45° line from the origin.

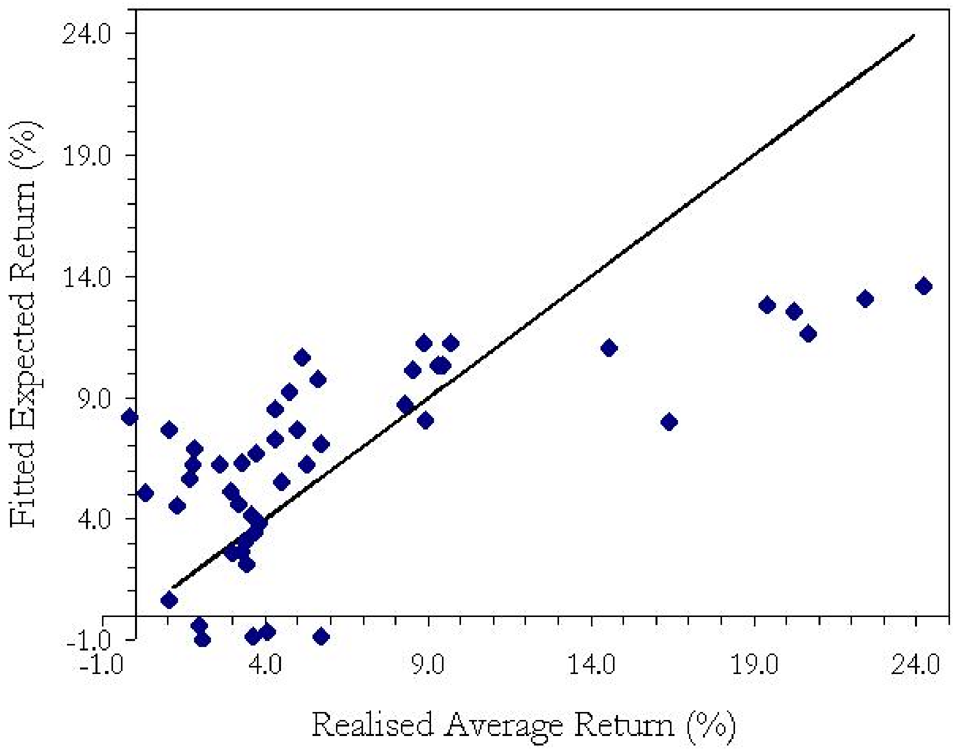


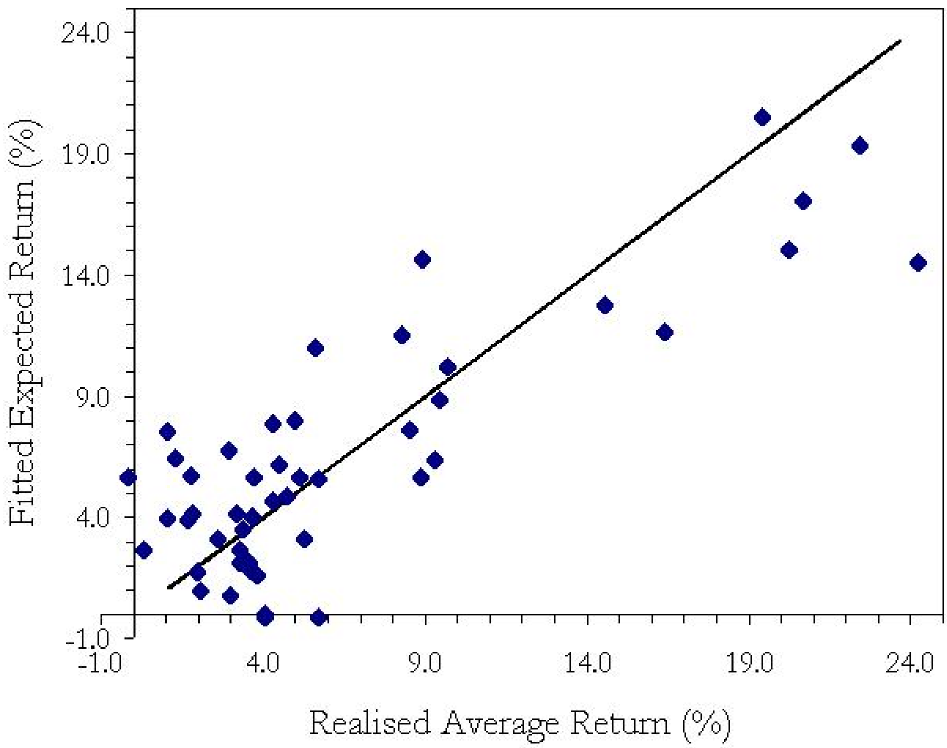
Figure D

The Conditional CAPM with Human Capital and Market Capitalisation: Fitted expected returns versus realized average returns.

Each scatter point in the graph represents a portfolio, with the *realized average return* as the horizontal axis and the *fitted expected return* as the vertical axis. For each portfolio *i*, the realized average return is the time-series average of the portfolio return, and the fitted expected return is the fitted value for the expected return, $E[R_i]$, in the following regression model:

$$E[R_{it}] \quad = \quad c_0 + c_{size} \log(ME_i) + c_{VW}\ \beta_i^{VW} + c_{prem}\ \beta_i^{prem} + c_{labour}\ \beta_i^{labour}$$

Where β_i^{VW} is the slope coefficient in the OLS regression of the portfolio return on a constant and the return on the All Ordinaries Accumulation Index, β_i^{prem} is the slope coefficient in the OLS regression of the portfolio return on a constant and the expected 10-year government bond yield in Australia based on U.S. yields and the inflation differential between the two countries, β_i^{labour} is the slope coefficient in the OLS regression of the portfolio return on a constant and the growth rate in per capita labour income, and the portfolio size, $\log(ME_i)$, is calculated as the equally-weighted average of the logarithm of the market value (in million dollars) of the stocks in portfolio *i*. The straight line in the graph is the 45° line from the origin.



Descriptive Statistics for Monthly Data

	r90	AU-Tbill	AU-10yr-Gov	R^{VW}	RBA-Target	M3	VW-US	US-10yr-Gov	USD/AUD	HML	SMB
Unit of Measure	% Yield (p.a.)	% Yield (p.a.)	% Yield (p.a.)	Mthly Price Relative	% Yield (p.a.)	Mthly % Chg	Mthly Price Relative	% Yield (p.a.)	Level	Mthly Price Relative	Mthly Price Relative
Mean	10.0638	9.5212	10.2991	1.0123	10.1057	-0.8713	1.0104	7.8932	1.3872	1.0097	1.0412
Median	8.2600	8.1850	10.3200	1.0143	7.6000	-0.7871	1.0117	7.3400	1.3508	1.0098	1.0301
Maximum	21.5000	19.3950	16.5000	1.1617	27.5000	1.8337	1.1318	14.4400	2.0595	1.1524	1.3164
Minimum	4.2500	4.1400	4.9400	0.5787	4.2500	-4.6248	0.7824	4.3000	0.9149	0.8664	0.8666
Std. Dev.	4.7282	4.3637	3.3050	0.0533	4.8879	0.7132	0.0442	2.3402	0.2195	0.0453	0.0813
Skewness	0.4150	0.4706	-0.0868	-2.1631	0.5274	-0.9608	-0.6694	0.9215	0.7173	0.0004	0.7500
Kurtosis	1.7440	1.8651	1.5623	20.1901	2.1987	7.2310	5.8441	3.1710	3.8504	3.9880	3.5469
Jarque-Bera	22.6643	21.7367	20.9708	3142.1500	17.5472	215.9417	98.8123	34.2570	27.8144	5.8569	15.2931
Probability	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0535	0.0005
Sum	2415.3150	2285.0790	2471.7900	242.9449	2425.3700	-209.1096	242.4849	1894.3700	332.9234	145.3906	149.9383
Sum Sq. Dev.	5342.9635	4550.9718	2610.5503	0.6799	5709.9677	121.5820	0.4673	1308.9442	11.5155	0.2932	0.9448
Sample Period	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.82 - Dec.01	Jan.90 - Dec.01	Jan.90 - Dec.01
Observations	240	240	240	240	240	240	240	240	240	144	144

Descriptive Statistics for Quarterly Data					
	AU-Inflation	AU-GDP	R^{labour}	$R^{prem(-1)}$	US-Inflation
Unit of Measure	Qtly %	Qtly % Chg	Qtly Price Relative	% Yield (p.a.)	Qtly %
Mean	1.1531	0.8177	1.0126	9.4348	-0.7936
Median	0.9131	0.8436	1.0125	7.9599	-0.7269
Maximum	3.7242	3.3148	1.0414	25.1399	0.8974
Minimum	-0.4580	-1.7929	0.9965	1.5364	-2.6455
Std. Dev.	0.9526	0.8742	0.0088	5.4918	0.5546
Skewness	0.4758	-0.1788	0.9502	0.8097	-0.2964
Kurtosis	2.5257	3.4235	4.3422	3.0046	4.6383
Jarque-Bera	3.7689	1.0242	18.0432	8.7414	10.1177
Probability	0.1519	0.5992	0.0001	0.0126	0.0064
Sum	92.2481	65.4135	81.0088	754.7809	-63.4859
Sum Sq. Dev.	71.6955	60.3765	0.0061	2382.6644	24.2947
Sample Period	Mar.82 - Dec. 01	Mar.82 - Dec. 01	Mar.82 - Dec. 01	Mar.82 - Dec. 01	Mar.82 - Dec. 01
Observations	80	80	80	80	80

Correlation Matrix for the Cross-Sectional Variation in Betas (Excluding SMB and HML)

	β^{VW}	β^{prem_O}	β^{labour_O1}	β^{labour_O2}	β^{UTS}	β^{GDP}	β^{UI}	β^{I}	β^{r90}	β^{M3}	β^{VW-US}	$\beta^{USD/AUD}$	$\beta^{VW-US-AUD}$
β^{VW}	1.00												
β^{prem_O}	0.00	1.00											
β^{labour_O1}	0.00	0.84	1.00										
β^{labour_O2}	0.00	0.00	0.54	1.00									
β^{UTS}	-0.24	-0.46	-0.52	-0.25	1.00								
β^{GDP}	-0.04	0.59	0.49	0.00	-0.40	1.00							
β^{UI}	0.58	0.24	0.05	-0.28	-0.33	0.35	1.00						
β^{I}	0.58	0.77	0.66	0.04	-0.59	0.44	0.59	1.00					
β^{r90}	0.34	0.84	0.76	0.11	-0.75	0.48	0.41	0.90	1.00				
β^{M3}	-0.39	0.68	0.57	0.00	-0.54	0.60	0.12	0.32	0.60	1.00			
β^{VW-US}	0.93	0.05	0.07	0.07	-0.25	-0.20	0.47	0.60	0.36	-0.36	1.00		
$\beta^{USD/AUD}$	0.39	-0.48	-0.37	0.07	-0.20	-0.06	0.18	-0.14	-0.29	-0.39	0.26	1.00	
$\beta^{VW-US-AUD}$	0.87	0.08	0.15	0.15	-0.25	-0.26	0.45	0.59	0.38	-0.33	0.96	0.26	1.00

SMB and HML Correlation Matrix

	β^{VW}	β^{prem_O}	β^{labour_O2}	β^{SMB}	β^{HML}
β^{VW}	1.00				
β^{prem_O}	0.00	1.00			
β^{labour_O2}	0.00	0.00	1.00		
β^{SMB}	0.56	-0.68	-0.41	1.00	
β^{HML}	0.13	-0.35	0.10	0.42	1.00

The reported correlations are for the cross-sectional variation in betas over the 49 portfolios. The SMB and HML factors are separated from the other data as these betas are estimated over a differing time period (March 1990 to December 1991 rather than March 1982 to December 2001).