Time-Varying Expected Consumption Growth and Cross-Sectional Equity Returns

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Outline

- Introduction and Literature Review
- Consumption-based Two-beta Model
- Empirical Specification and Methods
- Results
- Robustness Check
- Conclusions and Future Work

Motivation

- Stock returns exhibit cross-sectional predictive patterns (ME, B/M, E/P, CF/P...). Behavior bias or risks?
- Traditional CCAPM testing typically assumes i.i.d consumption growth and works poorly in explaining the cross-sectional patterns.
- Early evidence shows predictability in economic and consumption growth (e.g. Harvey(1988), Kandel/Stambaugh(1990)).

Goals:

- A risk-based explanation for the cross-sectional return patterns, particularly size and B/M effects.
- A structural link between macroeconomic variables and systematic risks in the financial market through predictability of aggregate cash flow
- Cash-flow perspective for studying intertemporal asset-pricing models

Main Results:

- Non-expected utility together with a VAR assumption on the aggregate consumption growth dynamics leads to an intertemporal asset-pricing model where an asset's expected return is determined by its covariances with two types of consumption growth shocks: the unexpected consumption growth (*"current growth shock"*) and the shock to the expected future growths(*"expected growth shock"*). This leads to a two-beta model for the explaining the cross-sectional asset returns.

- There is strong empirical support for long-term predictability in the aggregate consumption growth;
- The news on *expected consumption growth* contains valuable information for explaining a wide variety of cross-sectional return patterns.

Related Literature

Literature	Comparison
Aggregate cash flow dynamics has asset-pricing implications:	
Bansal/Yaron (2003)	Empirically identify expected growth news;
Bansal/Gallant/Tauchen (2002)	cross-sectional return puzzles;
Tauchen (2004)	link to macroeconomic variables
Macroeconomic variables as risk factors:	
Chen/Roll/Ross (1986)	Equilibrium restrictions from growth predictability
Chen (1991)	
Ferson/Harvey (1999)	
ICAPM:	
Campbell(1996)	Cash flow perspective
Campbell/Vuolteenaho(2003)	

Two Growth Shocks

Assume a market portfolio which pays dividend equal to the consumption and demands return $R_{a,t+1}$.

$$R_{a,t+1} = \frac{P_{t+1} + C_{t+1}}{P_t} \tag{1}$$

It can be shown that

$$r_{a,t+1} - E_t[r_{a,t+1}] = g_{c,t+1} - E_t[g_{c,t+1}] + (E_{t+1} - E_t)[\sum_{j=1}^{\infty} \kappa_{c,1}^{j} g_{c,t+1+j}]$$
$$- (E_{t+1} - E_t)[\sum_{j=1}^{\infty} \kappa_{c,1}^{j} r_{a,t+1+j}] \tag{2}$$

Two Growth Shocks

Two questions:

1. Why is it important to differentiate the two types of shocks?

2. How to identify the two types shocks?

Pricing Kernel

A representative investor maximizes his utility which is assumed to take the recursive form as in Epstein and Zin (1989). That is,

$$U(C_t, E_t(U_{t+1})) = \left[(1-\delta)C_t^{\frac{1-\gamma}{\theta}} + \delta(E_t U_{t+1}^{1-\gamma})^{\frac{1}{\theta}}\right]^{\frac{\theta}{1-\gamma}} \tag{3}$$

where $\theta \equiv \frac{1-\gamma}{1-\frac{1}{\psi}}$. $\gamma > 0$ is the risk-aversion coefficient and $\psi > 0$ is the inter-temporal elasticity of substitution(IES). If $\theta = 1$ or $\gamma = \frac{1}{\psi}$, then (3) is time separable.

From the Euler equation, we can get the log pricing kernel to be

$$m_{t+1} = const - \frac{\theta}{\psi} g_{c,t+1} + (\theta - 1) r_{a,t+1} \tag{4}$$

Applying $E_t[m_{t+1} r_{a,t+1}] = 0$ and assuming joint homoscedasticity for $g_{c,t+1}$ and $r_{a,t+1}$, we get

$$E_t g_{c,t+1} = \mu_m + \psi E_t r_{a,t+1} \tag{5}$$

Substitute into (2), we get

$$\underbrace{r_{a,t+1} - E_t[r_{a,t+1}]}_{\eta_{r,t+1}} = \underbrace{g_{c,t+1} - E_t[g_{c,t+1}]}_{\eta_{c,t+1}} + (1 - \frac{1}{\psi}) \underbrace{(E_{t+1} - E_t)[\sum_{j=1}^{\infty} \kappa_{c,1}^{j} g_{c,t+1+j}]}_{\epsilon_{c,t+1}} \tag{6}$$

Write the pricing kernel in terms of innovations using (6), we have

$$\eta_{m,t+1} = [-\frac{\theta}{\psi} + (\theta - 1)]\eta_{c,t+1} + (\theta - 1)(1 - \frac{1}{\psi})\epsilon_{c,t+1} \tag{7}$$

VAR

The consumption growth is modelled as following a VAR process as

$$\begin{bmatrix} g_{c,t+1} \\ x_{t+1} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} g_{c,t} \\ x_t \end{bmatrix} + \begin{bmatrix} \eta_{c,t+1} \\ \eta_{x,t+1} \end{bmatrix} \tag{8}$$

or

$$Z_{t+1} = AZ_t + \omega_{t+1}$$

Define a $K \times 1$ vector $e1$ which has first element being 1 and the rest being 0. Hence $e1'Z_t$ picks out the consumption growth from the vector Z_t. We can then get

$$\eta_{c,t+1} = \omega_{1,t+1} \tag{9}$$

$$\epsilon_{c,t+1} = e1'\kappa_{1,c}A(I - \kappa_{1,c}A)^{-1}\omega_{t+1} = \delta'\omega_{t+1} \tag{10}$$

Two-Beta Model

The following equation needs to hold for any asset in the economy.

$$E_t[r_{i,t+1} - r_{f,t+1}] + \frac{\sigma_{i,t}^2}{2} = -Cov_t(m_{t+1}, r_{i,t+1}) \tag{11}$$

$$\begin{aligned} E_t[r_{i,t+1} - r_{f,t+1}] + \frac{\sigma_{i,t}^2}{2} &= \gamma Cov_t(\eta_{c,t+1}, r_{i,t+1}) + (\gamma - \frac{1}{\psi})Cov_t(\epsilon_{c,t+1}, r_{i,t+1}) && (12) \\ &= \gamma \sigma_\eta^2 \beta_{i,\eta} + (\gamma - \frac{1}{\psi})\sigma_\epsilon^2 \beta_{i,\epsilon} && (13) \end{aligned}$$

where

$$\begin{aligned} \beta_{i,\eta} &= \frac{Cov(\eta_{c,t+1}, r_{i,t+1})}{\sigma_\eta^2} && (14) \\ \beta_{i,\epsilon} &= \frac{Cov(\epsilon_{c,t+1}, r_{i,t+1})}{\sigma_\epsilon^2} && (15) \end{aligned}$$

Empirical Methods

1. Estimate the VAR system and obtain the time-series of $\eta_{c,t}$ and $\epsilon_{c,t}$.
2. Run time-series regression of each portfolio return series separately on $\eta_{c,t}$ and $\epsilon_{c,t}$ to obtain $\beta_{i,\eta}$ and $\beta_{i,\epsilon}$.

$$
\begin{aligned}
r_{i,t} &= \alpha_i + \beta_{i,\eta}\eta_{c,t} + u_{i,t} \\
r_{i,t} &= \phi_i + \beta_{i,\epsilon}\epsilon_{c,t} + \nu_{i,t}
\end{aligned}
$$

3. Run cross-sectional regression of average return on the betas.

$$
\begin{aligned}
\bar{r}_i &= \lambda_0 + \lambda_1\beta_{i,\eta} + e_i \\
\bar{r}_i &= \lambda_0 + \lambda_2\beta_{i,\epsilon} + e_i \\
\bar{r}_i &= \lambda_0 + \lambda_1\beta_{i,\eta} + \lambda_2\beta_{i,\epsilon} + e_i
\end{aligned}
$$

GMM Moment conditions for step 2-3

$$
\begin{aligned}
E[u_{i,t}] &= 0; \\
E[u_{i,t}\eta_{c,t}] &= 0; \\
E[\nu_{i,t}] &= 0; \\
E[\nu_{i,t}\epsilon_{c,t}] &= 0; \\
\sum_{i=1}^{N} E\{r_{i,t} - \lambda_0 - \lambda_1\beta_{\eta,i} - \lambda_2\beta_{\epsilon,i}\} &= 0; \\
\sum_{i=1}^{N} E\{[r_{i,t} - \lambda_0 - \lambda_1\beta_{\eta,i} - \lambda_2\beta_{\epsilon,i}]\beta_{\eta,i}\} &= 0; \\
\sum_{i=1}^{N} E\{[r_{i,t} - \lambda_0 - \lambda_1\beta_{\eta,i} - \lambda_2\beta_{\epsilon,i}]\beta_{\epsilon,i}\} &= 0;
\end{aligned}
$$

Data

VAR Data

- $g_{c,t}$, the growth of real per capita consumption;
- $Term_t$, the yield spread between 10-year T-bill and 3-month T-bill
- Div_t, the deseasonalized dividend-price ratio for the CRSP stock index
- Nrf_t, the quarterly risk free rate measured by the one-month T-bill rates compounded over the quarter
- $Infl_t$, realized inflation rate in period t from PCE index
- Rrf_t, quarter risk free rate $= (1 + Nrf_t)/(1 + Infl) - 1$
- Def_t, the yield spread between the Moody's rated Baa bonds and Aaa bonds

Return Data

- $r_{m,t}$, the CRSP value-weighted index return in excess of the risk-free rate
- 25 Size-B/M double-sorted portfolios;
- Size, B/M, Earning/Price, Cash-flow/Price sorted deciles;

Table 1: Consumption Growth Prediction: Univariate

1993.1–2002.4

Variable	$q1$	$q2$	$q3$	$q4$	$q5$	$q6$	$q7$	$q8$
$Term_t$	0.085	0.160	0.233	0.286	0.314	0.321	0.313	0.288
	(0.032)	(0.052)	(0.065)	(0.080)	(0.093)	(0.102)	(0.112)	(0.125)
Div_t	-0.195	-0.250	-0.275	-0.310	-0.299	-0.302	-0.323	-0.325
	(0.132)	(0.214)	(0.275)	(0.351)	(0.420)	(0.481)	(0.538)	(0.604)
Rrf_t	-0.008	0.002	0.050	0.110	0.155	0.248	0.361	0.460
	(0.093)	(0.165)	(0.233)	(0.282)	(0.319)	(0.357)	(0.391)	(0.438)
$Infl_t$	-0.212	-0.406	-0.607	-0.771	-0.886	-1.011	-1.108	-1.151
	(0.062)	(0.117)	(0.174)	(0.240)	(0.298)	(0.354)	(0.411)	(0.467)
Def_t	-0.055	-0.073	-0.089	-0.027	0.018	0.086	0.181	0.243
	(0.128)	(0.253)	(0.377)	(0.481)	(0.570)	(0.644)	(0.704)	(0.760)

Table 2: Consumption Growth Prediction: Multivariate

Horizon	Intercept	$Term_t$	Div_t	Rrf_t	$Infl_t$	$Adj.\ R^2$
$q1$	0.225	0.012	0.554	-0.218	-0.443	0.148
	(0.091)	(0.041)	(0.234)	(0.090)	(0.116)	.
$q2$	0.475	0.003	1.368	-0.463	-0.970	0.234
	(0.167)	(0.074)	(0.436)	(0.166)	(0.192)	.
$q3$	0.695	-0.008	2.222	-0.677	-1.503	0.305
	(0.230)	(0.103)	(0.604)	(0.229)	(0.253)	.
$q4$	0.840	-0.019	2.826	-0.816	-1.902	0.307
	(0.303)	(0.134)	(0.727)	(0.301)	(0.317)	.
$q5$	0.978	-0.046	3.398	-0.949	-2.249	0.300
	(0.401)	(0.165)	(0.883)	(0.398)	(0.385)	.
$q6$	1.063	-0.092	3.934	-1.028	-2.586	0.300
	(0.500)	(0.193)	(1.025)	(0.496)	(0.454)	.
$q7$	1.069	-0.133	4.258	-1.028	-2.798	0.279
	(0.600)	(0.222)	(1.115)	(0.595)	(0.547)	.
$q8$	1.026	-0.184	4.470	-0.980	-2.909	0.246
	(0.712)	(0.257)	(1.319)	(0.707)	(0.664)	.

Figure 1: Time-Variation in Expected Consumption Growth

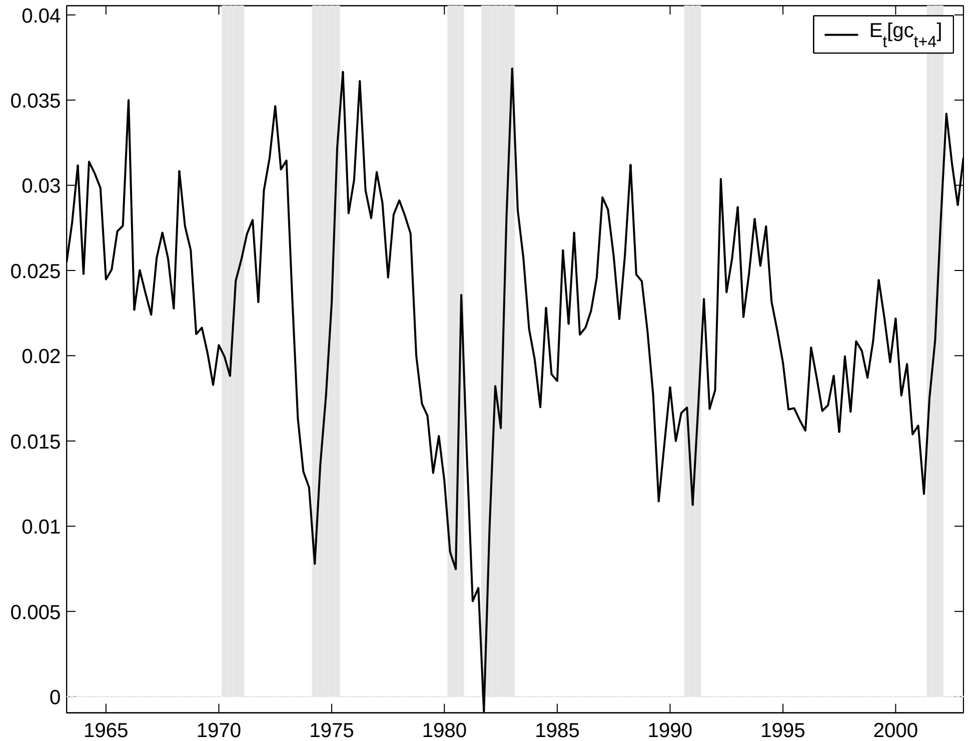


Table 3: VAR Estimations

	$g_{c,t}$	$Term_t$	Div_t	Rrf_t	$Infl_t$	$Adj.\ R^2$
$g_{c,t+1}$	0.299	0.022	0.392	-0.181	-0.311	0.229
	(0.061)	(0.038)	(0.179)	(0.069)	(0.088)	
$Term_{t+1}$	-0.355	0.875	0.373	0.184	-0.144	0.785
	(0.117)	(0.047)	(0.296)	(0.113)	(0.147)	
Div_{t+1}	0.028	-0.003	0.884	0.017	0.053	0.925
	(0.014)	(0.004)	(0.054)	(0.015)	(0.024)	
Rrf_{t+1}	-0.001	0.038	-0.334	0.890	0.223	0.610
	(0.065)	(0.030)	(0.174)	(0.056)	(0.113)	
$Infl_{t+1}$	0.153	-0.044	0.212	0.009	0.837	0.795
	(0.050)	(0.027)	(0.171)	(0.051)	(0.099)	

VAR Implied Long-Run Statistics

$$Z_{t+1} = AZ_t + \omega_{t+1}$$
$$V = E(\omega_{t+1}\omega'_{t+1})$$
$$C(0) = \sum_{j=0}^{\infty} A^j V A^{j\prime}; \quad C(j) = A^j C(0)$$
$$V_k = kC(0) + \sum_{j=1}^{k-1} (k-j)[C(j) + C(j)'];$$
$$W_k = \sum_{j=1}^{k} (I-A)^{-1}(I-A^j)V(I-A^j)'(I-A)^{-1\prime}$$

$$\boxed{R^2(k) = 1 - \frac{e1'W_k e1}{e1'V_k e1}}$$

$$\boxed{VR(k) = \frac{e1'V_k e1}{k e1'C(0)e1}}$$

Figure 2: Long-run Consumption Growth Predictability Implied by VAR

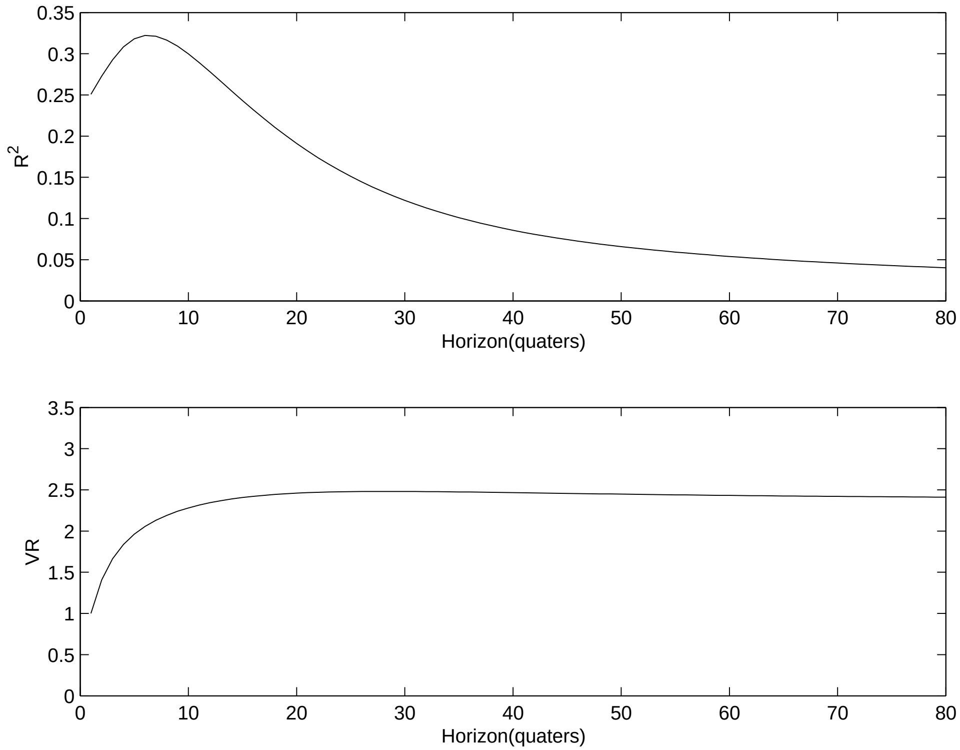
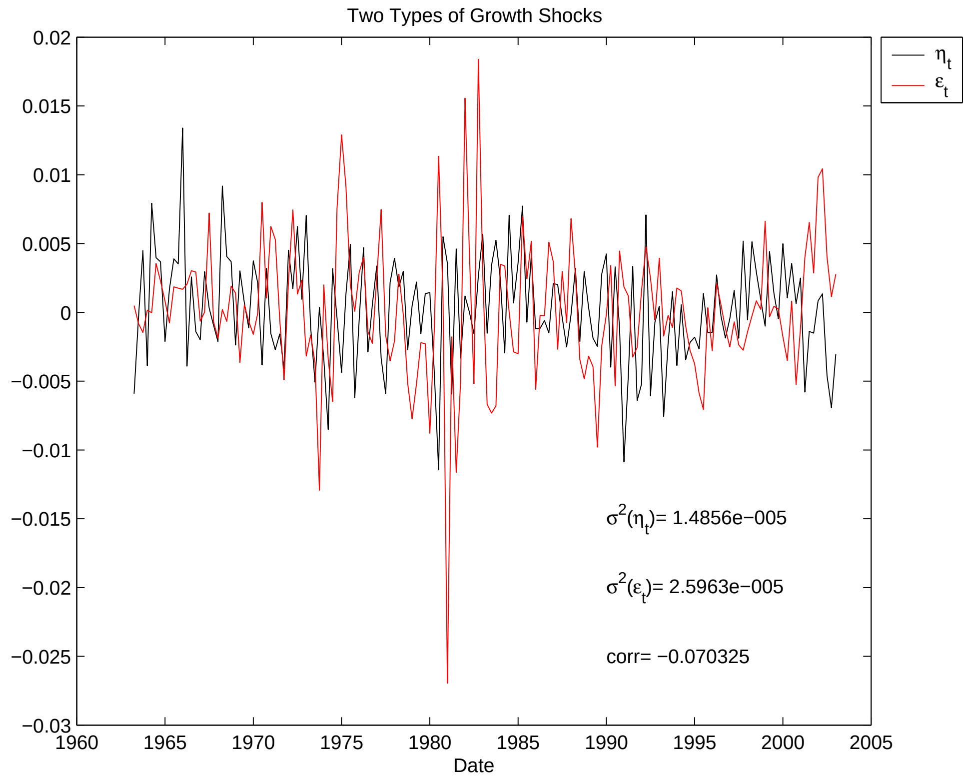


Figure 3: Time-Series of Two Shocks



$$\eta_{c,t} = \omega_{1,t}$$

$$\epsilon_{c,t} = e1'\kappa_c A(I - \kappa_c A)^{-1}\omega_t$$

Table 4: Exposure to Fama-French 3 Factors

	ME1	2	3	4	ME5	ME1	2	3	4	ME5
			Average Excess Returns					s.e.		
BM1	0.931	1.196	1.251	1.582	1.308	0.031	0.024	0.022	0.021	0.020
2	2.466	2.025	2.137	1.477	1.326	0.028	0.022	0.022	0.018	0.017
3	2.631	2.723	2.166	2.122	1.433	0.027	0.024	0.021	0.019	0.016
4	3.326	2.948	2.607	2.540	1.720	0.028	0.025	0.022	0.021	0.017
BM5	3.637	3.153	3.057	2.721	1.762	0.031	0.026	0.025	0.022	0.020
			β_{MKT}					s.e.		
1	1.038	1.075	1.036	1.031	1.016	0.049	0.032	0.027	0.038	0.023
2	0.978	1.000	1.033	1.052	1.021	0.035	0.025	0.033	0.024	0.034
3	0.924	1.003	0.996	1.050	0.926	0.039	0.026	0.030	0.023	0.038
4	0.904	1.021	1.046	1.078	1.005	0.047	0.023	0.035	0.041	0.030
5	1.023	1.080	1.055	1.100	1.043	0.037	0.038	0.036	0.050	0.038
			β_{SMB}					s.e.		
1	1.455	1.028	0.729	0.369	-0.270	0.068	0.044	0.044	0.066	0.040
2	1.336	0.969	0.584	0.312	-0.225	0.052	0.053	0.042	0.073	0.050
3	1.159	0.764	0.499	0.218	-0.232	0.054	0.041	0.041	0.047	0.050
4	1.112	0.702	0.418	0.202	-0.190	0.059	0.034	0.049	0.046	0.034
5	1.195	0.814	0.616	0.407	-0.122	0.049	0.050	0.051	0.066	0.072
			β_{HML}					s.e.		
1	-0.411	-0.444	-0.509	-0.504	-0.314	0.085	0.060	0.043	0.050	0.052
2	0.075	0.139	0.165	0.230	0.124	0.048	0.096	0.105	0.132	0.107
3	0.307	0.377	0.467	0.468	0.281	0.051	0.094	0.112	0.108	0.081
4	0.437	0.614	0.694	0.596	0.586	0.039	0.089	0.113	0.080	0.092
5	0.730	0.808	0.817	0.746	0.641	0.048	0.048	0.059	0.076	0.063

Table 5: Exposure to the two types of consumption risks for FF25

	ME1	2	3	4	ME5	ME1	2	3	4	ME5
	Average Excess Returns					s.e.				
BM1	0.931	1.196	1.251	1.582	1.308	0.031	0.024	0.022	0.021	0.020
2	2.466	2.025	2.137	1.477	1.326	0.028	0.022	0.022	0.018	0.017
3	2.631	2.723	2.166	2.122	1.433	0.027	0.024	0.021	0.019	0.016
4	3.326	2.948	2.607	2.540	1.720	0.028	0.025	0.022	0.021	0.017
BM5	3.637	3.153	3.057	2.721	1.762	0.031	0.026	0.025	0.022	0.020
	β_η					s.e.				
1	8.598	6.684	5.378	5.187	3.811	2.769	2.761	2.737	2.700	2.164
2	8.516	5.346	4.634	4.210	2.096	2.322	2.137	2.075	1.969	1.767
3	6.223	4.839	4.168	3.366	2.558	2.144	2.088	1.957	2.015	1.496
4	6.017	4.367	3.543	2.714	1.870	2.063	2.187	2.218	2.302	1.700
5	5.995	5.725	4.424	3.947	3.070	2.379	2.477	2.302	2.515	1.753
	β_ϵ					s.e.				
1	-1.844	-1.462	-0.721	-0.909	-1.198	2.593	2.402	1.992	1.888	1.547
2	-0.502	-0.583	-0.059	-0.983	-1.435	2.327	2.060	1.975	1.894	1.475
3	0.181	0.137	-0.024	-0.357	-1.568	2.041	1.896	1.788	1.859	1.428
4	0.361	0.248	0.345	0.211	-0.304	2.048	1.902	1.856	1.955	1.529
5	0.645	0.136	0.175	-0.051	-0.341	2.133	2.086	1.971	2.099	1.503

Table 6: Exposure to the Campbell(1996) Factors for FF25

	ME1	2	3	4	ME5	ME1	2	3	4	ME5
			Average Excess Returns					s.e.		
BM1	0.931	1.196	1.251	1.582	1.308	0.031	0.024	0.022	0.021	0.020
2	2.466	2.025	2.137	1.477	1.326	0.028	0.022	0.022	0.018	0.017
3	2.631	2.723	2.166	2.122	1.433	0.027	0.024	0.021	0.019	0.016
4	3.326	2.948	2.607	2.540	1.720	0.028	0.025	0.022	0.021	0.017
BM5	3.637	3.153	3.057	2.721	1.762	0.031	0.026	0.025	0.022	0.020
			β_a					s.e.		
1	1.656	1.576	1.456	1.350	1.041	0.110	0.097	0.084	0.080	0.038
2	1.411	1.280	1.168	1.092	0.918	0.089	0.086	0.068	0.079	0.048
3	1.213	1.126	1.004	0.977	0.755	0.092	0.090	0.087	0.070	0.042
4	1.140	1.040	0.940	0.944	0.749	0.093	0.094	0.093	0.076	0.068
5	1.163	1.073	0.991	0.981	0.784	0.105	0.107	0.103	0.105	0.080
			β_h					s.e.		
1	-1.418	-1.380	-1.274	-1.184	-0.958	0.130	0.124	0.103	0.087	0.063
2	-1.227	-1.159	-1.051	-1.022	-0.850	0.114	0.094	0.082	0.061	0.057
3	-1.100	-1.030	-0.928	-0.909	-0.698	0.090	0.084	0.079	0.061	0.060
4	-1.035	-0.959	-0.877	-0.875	-0.700	0.087	0.078	0.064	0.069	0.056
5	-1.044	-0.971	-0.902	-0.916	-0.723	0.089	0.086	0.091	0.084	0.074
			β_{CAPM}					s.e.		
1	1.647	1.556	1.442	1.318	1.032	0.071	0.066	0.058	0.059	0.022
2	1.387	1.269	1.168	1.076	0.907	0.061	0.063	0.052	0.066	0.044
3	1.199	1.126	1.003	0.965	0.757	0.081	0.071	0.074	0.060	0.043
4	1.119	1.044	0.951	0.945	0.748	0.085	0.074	0.077	0.064	0.058
5	1.168	1.076	0.983	0.984	0.789	0.084	0.081	0.086	0.083	0.063

Table 7: Cross-sectional Test Results

	λ_0	λ_η	λ_ϵ	λ_a	λ_h	λ_m	λ_g	λ_{smb}	λ_{hml}	$Adj.\ R^2$
β_η	**1.957**	0.045	.	.	.	.	.	.	.	-0.032
	(0.704)	(0.145)	.	.	.	.	.	.	.	
β_ϵ	2.557	.	0.977	.	.	.	.	.	.	0.811
	(1.891)	.	(0.522)	.	.	.	.	.	.	
$\beta_\eta \& \beta_\epsilon$	2.221	0.073	**0.990**	.	.	.	.	.	.	0.833
	(1.131)	(0.141)	(0.258)	.	.	.	.	.	.	
β_a	**2.959**	.	.	-0.709	.	.	.	.	.	0.009
	(1.054)	.	.	(1.044)	.	.	.	.	.	
β_h	**2.993**	.	.	.	0.817	.	.	.	.	0.001
	(1.171)	.	.	.	(1.293)	.	.	.	.	
$\beta_a \& \beta_h$	1.467	.	.	-10.596	-12.402	.	.	.	.	0.022
	(1.190)	.	.	(6.236)	(7.338)	.	.	.	.	
$CAPM$	**2.943**	.	.	.	.	-0.699	.	.	.	0.005
	(1.090)	.	.	.	.	(1.085)	.	.	.	
$CCAPM$	1.460	.	.	.	.	.	0.180	.	.	0.033
	(0.880)	.	.	.	.	.	(0.198)	.	.	
$FF3$	2.717	.	.	.	.	-1.308	.	0.680	**1.444**	0.764
	(1.585)	.	.	.	.	(1.463)	.	(0.530)	(0.517)	

Figure 4: Goodness of Fit

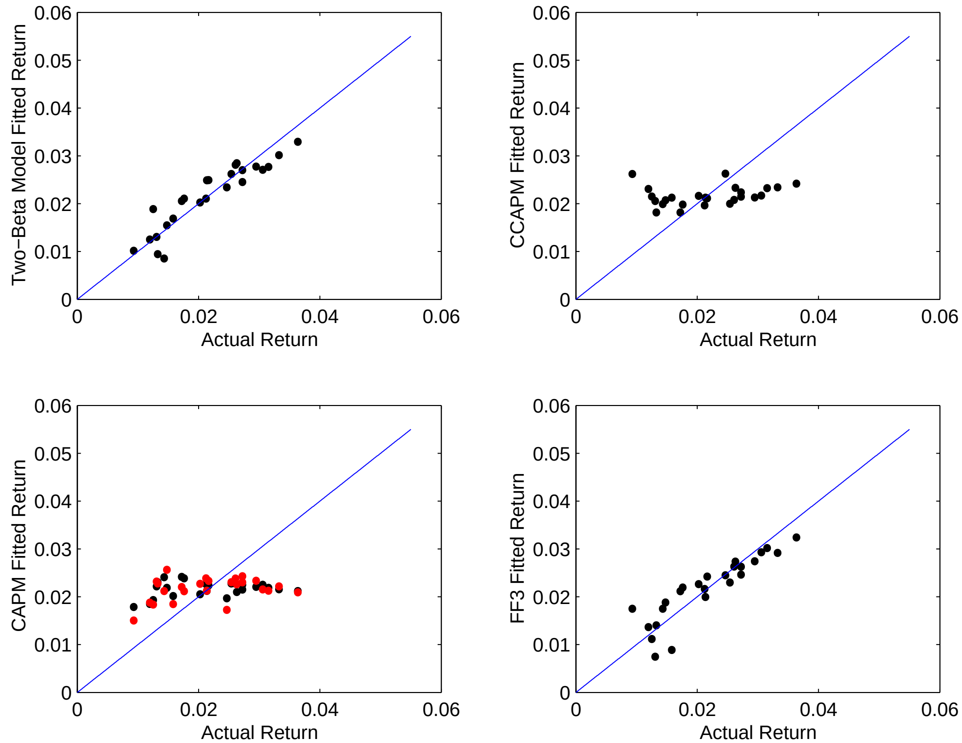


Table 8: Cross-sectional Results for Fama-French 25 Portfolios

	λ_0	λ_η	λ_ϵ	λ_{mkt}	λ_{smb}	λ_{hml}	$log(ME)$	$log(BM)$	$Adj.\ R^2$
$\beta\eta, \beta\epsilon, FF3$	2.707	0.140	**0.663**	-1.105	-0.028	0.747	.	.	0.883
	(2.687)	(0.150)	(0.230)	(3.013)	(1.374)	(0.734)	.	.	
$Size$	**4.268**	.	.	.	.	.	**-0.249**	.	0.187
	(0.832)	.	.	.	.	.	(0.097)	.	
B/M	2.251	.	.	.	.	.	.	**0.861**	0.607
	(0.095)	.	.	.	.	.	.	(0.139)	
$Size + B/M$	**3.696**	.	.	.	.	.	**-0.172**	**0.790**	0.700
	(0.513)	.	.	.	.	.	(0.060)	(0.124)	
$\beta\eta, \beta\epsilon, Size$	1.885	0.093	**1.016**	.	.	.	0.030	.	0.825
	(3.183)	(0.236)	(0.442)	.	.	.	(0.214)	.	
$\beta\eta, \beta\epsilon, B/M$	2.010	0.102	**0.705**	.	.	.	.	0.397	0.889
	(1.390)	(0.175)	(0.269)	.	.	.	.	(0.386)	
$\beta\eta, \beta\epsilon, Size, B/M$	0.503	0.195	**0.786**	.	.	.	0.131	0.446	0.895
	(2.540)	(0.158)	(0.270)	.	.	.	(0.180)	(0.454)	

Robustness Checks

- Other predictive variables in the VAR system.
- Different sets of portfolios;
- Sub-sample studies (for example, pre-1990 sample).

Table 9: Robustness to Choices of Information Variables: FF25 portfolios

Model	λ_0	λ_η	λ_ϵ	$\bar{R}^2$
$Term + Div + nrf + Def$	2.498	-0.003	**0.872**	0.783
	(0.910)	(0.160)	(0.230)	
$Term + Div + Rrf + Infl + Def$	3.080	0.423	**0.979**	0.739
	(1.033)	(0.185)	(0.260)	
$Term + Div + Rrf + Infl$	2.684	0.072	**0.980**	0.833
	(0.973)	(0.147)	(0.265)	
$Div + Infl + Term$	2.461	0.109	**0.937**	0.836
	(0.962)	(0.132)	(0.246)	
$Div + Rrf + Infl$	1.473	0.087	**1.258**	0.612
	(0.969)	(0.155)	(0.377)	
$Div + Rrf + Term$	2.261	-0.268	**0.677**	0.750
	(0.981)	(0.136)	(0.173)	
$Rrf + Infl + Term$	0.933	-0.205	**0.912**	0.530
	(1.072)	(0.130)	(0.217)	
$Div^{rep} + Rrf + Infl + Term$	1.828	-0.122	**0.793**	0.686
	(0.923)	(0.133)	(0.205)	

Table 10: Cross-sectional Results for Size,B/M, E/P, CF/P Portfolios

	λ_0	λ_η	λ_ϵ	λ_a	λ_h	λ_m	λ_g	λ_{smb}	λ_{hml}	$Adj.\ R^2$
β_η	1.335	0.134	.	.	.	.	.	.	.	0.084
	(0.785)	(0.125)	.	.	.	.	.	.	.	
β_ϵ	2.354	.	**0.685**	.	.	.	.	.	.	0.611
	(1.289)	.	(0.336)	.	.	.	.	.	.	
$\beta_\eta \& \beta_\epsilon$	1.893	0.120	**0.674**	.	.	.	.	.	.	0.692
	(1.067)	(0.131)	(0.307)	.	.	.	.	.	.	
β_a	2.108	.	.	-0.270	.	.	.	.	.	-0.019
	(1.001)	.	.	(0.956)	.	.	.	.	.	
β_h	2.368	.	.	.	0.579	.	.	.	.	-0.004
	(1.083)	.	.	.	(1.154)	.	.	.	.	
$\beta_a \& \beta_h$	3.715	.	.	12.824	16.048	.	.	.	.	0.228
	(1.913)	.	.	(7.734)	(9.445)	.	.	.	.	
$CAPM$	1.602	.	.	.	.	-0.178	.	.	.	-0.023
	(1.030)	.	.	.	.	(0.982)	.	.	.	
$CCAPM$	0.662	.	.	.	.	.	0.224	.	.	0.188
	(0.930)	.	.	.	.	.	(0.139)	.	.	
$FF3$	-0.298	.	.	.	.	1.365	.	0.629	1.063	0.891
	(1.245)	.	.	.	.	(1.292)	.	(0.529)	(0.505)	

Conclusions

- There is significant predictability in consumption growth! The expected growth co-varies with the business cycles.
- A VAR specification identifies two distinct types of growth shocks. The expected growth shock is a significantly priced risk factor in the financial market.
- Find a risk-based explanation for size and B/M effects in terms of exposures to expected growth news.
- Macroeconomic news related to business cycles serve as financial market risk factors in a manner that is consistent with their predictability to aggregate growth.
- Aggregate cash-flow dynamics is important for intertemporal asset pricing.

Future Work

- Individual asset cash flow dynamics and its implications for the asset risk premium. (particularly interesting for the momentum effect).
- Allow time-varying volatilities and hence time-varying risk premia and volatility risk (Tauchen (2004)).
- Mechanisms for hedging macroeconomic and aggregate consumption risks.