Investment and The Cross–Section of Equity Returns*

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Abstract

Since the seminal contribution of Berk, Green, and Naik (Journal of Finance, 1999), we have witnessed a growing interest in rationalizing the observed cross-sectional relation between investment and stock returns. Unfortunately, however, the extant literature falls short of ensuring that the models in use are consistent with stylized facts on firm dynamics long established by the empirical I&O literature. The contribution of this paper is to study the cross-section of returns in a standard neoclassical model of firm dynamics parameterized to match those stylized facts. We start by characterizing the investment process among public firms in the United States, along the lines of what accomplished by Cooper & Haltiwanger (ReStud, 2006) for the universe of manufacturing establishments. Then, we write down a model of industry dynamics along the lines of Hopenhayn (Econometrica, 1992) augmented with aggregate shocks, capital accumulation, and a time-varying discount factor. The parameters are calibrated to ensure that the simulated investment behavior is consistent with our empirical findings. The goal is to quantify the role of investment as a determinant (and predictor) of the cross-sectoral variation in returns.

Key words. .

JEL Codes:

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1 Introduction

A recent literature has documented a strong statistical relation between investment in physical capital and stock returns, in the cross–section of publicly traded firms in the United States.

Anderson and Garcia-Feeijoo (2006) form portfolios based on investment growth rates and find that subsequent monthly returns are significantly lower for firms that have recently accelerated investment. The evidence in favor of an independent value effect is weakened within portfolios sorted on past investment growth. Finally, they find that firm-specific growth in corporate investment helps explain monthly stock returns in the cross–section in a manner similar to book–to–market.

Consistently, Xing (2008) find that portfolios of firms with low investment rates have significantly higher average returns than those with high investment rates.

Beginning with Berk, Green, and Naik (1999), the theory literature has tried to rationalize this evidence by characterizing the asset pricing implications of models of firm–level investment. Recent contributions to this body of work include Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino (2004), and Zhang (2005).

All of these analysis share a basic methodological problem, in that they do not require the model to be consistent with basic features of the investment process. For example in Zhang (2005), whose model is the closest to ours, the marginal adjustment cost of capital is identically zero when gross investment is zero and is continuously increasing in the absolute value of gross investment. This implies that gross investment will never be zero. This is counterfactual, as we find the inaction rate, i.e. the fraction of observations where no investment takes place, to be about 7%. Furthermore, Zhang (2005) selects the parameters governing idiosyncratic productivity shocks in such a way to match the average annual cross–sectional volatility of asset returns. There is no guarantee that such choice also generates a data–conforming value for the autocorrelation of the investment rate.

This paper fills the gap in the literature, by characterizing the cross–section of asset returns in an equilibrium model of firm dynamics where functional forms and parameter values are chosen in such a way that the resulting investment process shares important features with its data counterpart. We impose that simulated data generates data–conforming values for the mean, standard deviation, and autocorrelation of the investment rate, as well as the inaction rate.

The remainder of the paper is organized as follows. Section 2 characterizes the evidence on the investment process for public firms. The model is introduced in Section 3. Section 4 describes the calibration algorithm. The computation strategy is illustrated in Section 5. The rest needs to be added.

2 Data

The objective of this section is to characterize the investment process among public firms in the United States, along the lines of what accomplished by Cooper and Haltiwanger (2006) for the universe of manufacturing establishments. Our data is from the COMPUSTAT dataset, maintained by Standard & Poor's, for the years 1975–2009.

Letting $PPE_{i,t}$ denote the value of property, plant, an equipment of firm i in year t, our primary measure of firm i's net investment in year t is

$$x_{i,t} = \frac{PPE_{i,t} - PPE_{i,t-1}}{PPE_{i,t-1}}. \tag{1}$$

We consider two sub–samples: non–financial and manufacturing firms, respectively. For every sample year, Tables 2 and 3 (see appendix) report the following cross–sectional moments: the average and median investment rate, the standard deviation of the investment rate, the fraction of firms with negative investment rate (negative investment), the fraction of firms with investment rate in absolute value less than 0.01 (inaction rate), the fraction of firms with investment rate larger than 0.20 (positive spikes), the fraction of firms with investment rate smaller than -0.20 (negative spikes), and the first order autocorrelation. In Table 1, we report the unweighted time–series averages of the moments listed in Tables 2 and 3.

Statistic	All Firms	Manufacturing Only
Number of firms	4,974	3,300
Mean investment rate	0.176	0.224
Std. Dev. investment rate	0.444	0.608
Investment autocorrelation	0.261	0.232
Negative	0.204	0.203
Inaction rate	0.066	0.070
Positive spikes	0.258	0.283
Negative spikes	0.058	0.063

Table 1: Summary Statistics.

We compute the same moments with two alternative measures of investment rates. The results are broadly consistent and are not reported here. Our second measure is the ratio of total capital expenditures net of sales of property, plant, and equipment over the previous period's total gross property, plant, and equipment:

$$x_{i,t} = \frac{CAPX_{i,t} - SPPE_{i,t}}{PPE_{i,t-1}}.$$

The third measure uses the perpetual inventory as described in Michael A. Salinger and Summers (1983) to convert the book value of the gross capital stock into its replacement value. This method consists of the following steps:

Step 1 - Estimate the average life of capital goods using the double declining balance method as

$$L_{i,t} = \frac{GK_{t-1} + I_t}{DEP_t}$$

where GK_t is the book value of gross property, plant, and equipment in year t, I_t is the reported spending on plant, property, and equipment in year t (it does not include spending on acquisitions), and DEP_t is the book depreciation in year t.

Step 2 - $L_{i,t}$ varies from firm to firm, and fluctuates from year to year. Therefore we take the cross-sectional average of $L_{i,t}$, that is L_t, and then we take the the average over time of L_t to obtain a unique value L^*.

Step 3 - We use this average value, L^*, in the following formula to define the replacement value of the capital stock

$$K_t = \left(K_{t-1}\left(\frac{P_t}{P_{t-1}}\right) + I_t\right)\left(1 - \frac{2}{L^*}\right)$$

where P_t is the deflator for non-residential investment.

Step 4 - The investment rate is equal to

$$x_{i,t} = \frac{CAPX_{i,t} - SPPE_{i,t}}{K_{i,t-1}}.$$

3 Model

Time is discrete and is indexed by $t = 1, 2, ...$ The horizon is infinite. At time t, a positive mass of price–taking firms produce an homogenous good by means of the production function $y_t = z_t s_t k_t^{\alpha}$, with $\alpha \in (0, 1)$. With k_t we denote physical capital, while z_t and s_t are aggregate and idiosyncratic random disturbances, respectively.

The common component of productivity z_t is driven by the stochastic process

$$\log z_{t+1} = (1 - \rho_z) \log \bar{z} + \rho_z \log z_t + \sigma_z \varepsilon_{z,t+1},$$

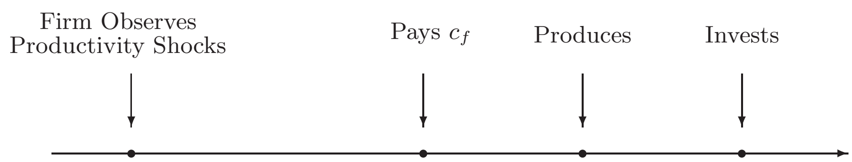

Figure 1: Timing in period t.

where $\varepsilon_{z,t} \sim N(0,1)$ for all $t \geq 0$. The dynamics of the idiosyncratic component s_t is described by

$$\log s_{t+1} = \rho_s \log s_t + \sigma_s \varepsilon_{s,t+1},$$

with $\varepsilon_{s,t} \sim N(0,1)$ for all $t \geq 0$. The conditional distribution will be denoted as $H(s_{t+1}|s_t)$.

Adjusting the capital stock by x requires firms to incur a cost $g(x,k)$. Capital depreciates at the rate $\delta \in (0,1)$.

We assume that the supply of capital is infinitely elastic and normalize its price at 1. The demand for the final good is given by the function $D(p) = p^\eta$, where p denotes the price and $\eta < 0$.

All operating firms must pay a fixed cost $c_f > 0$ per period and discount future cash flows by means of the discount factor M_{t+1}. Following Zhang (2005), we assume that

$$\log M_{t+1} = \log \beta + \left[\gamma_0 + \gamma_1 \log \frac{z_t}{\bar{z}}\right] \log \frac{z_t}{z_{t+1}}.$$

The timing is summarized in Figure 1.

At all $t \geq 0$, the distribution of operating firms over the two dimensions of heterogeneity is denoted by $\Gamma_t(k,s)$. Finally, let $\lambda_t \in \Lambda$ denote the vector of aggregate state variables and $J(\lambda_{t+1}|\lambda_t)$ its transition operator. Below we will show that $\lambda_t = \{\Gamma_t, z_t\}$.

3.1 The firm's optimization program

Given the aggregate state λ, capital in place k, and idiosyncratic shock s, the incumbent's value function $V(\lambda,k,s)$ is the fixed point of the following functional equation:

$$V(\lambda,k,s) = pszk^\alpha - x - g(x,k) - c_f + \int_\Lambda \int_\Re M(z,z')V(\lambda',k',s')dH(s'|s)dJ(\lambda'|\lambda),$$
$$\text{s.t. } k' = k(1-\delta) + x$$

3.2 Recursive Competitive Equilibrium

For given Γ_0, a recursive competitive equilibrium consists of (i) value functions $V(\lambda, k, s)$, (ii) policy functions $x(\lambda, k, s)$ and (iii) bounded sequences of product prices $\{p_t\}_{t=0}^{\infty}$ and firms' measures $\{\Gamma_t\}_{t=1}^{\infty}$ such that, for all $t \geq 0$,

1. $V(\lambda, k, s)$, and $x(\lambda, k, s)$ solve the firm's problem;
2. The product market clears: $\int szk^{\alpha} d\Gamma_t(k, s) = D(p_t) \; \forall \; t \geq 0$,
3. For all Borel sets $\mathcal{S} \times \mathcal{K} \in \Re \times \Re^+$ and $\forall \; t \geq 0$,

$$\Gamma_{t+1}(\mathcal{S} \times \mathcal{K}) = \int_{\mathcal{S}} \int_{\mathcal{B}(\mathcal{K}, \lambda_t)} d\Gamma_t(k, s) dH(s'|s),$$

where $\mathcal{B}(\mathcal{K}, \lambda_t) = \{(k, s) \text{ s.t. } V(\lambda_t, k, s) > 0 \text{ and } k(1-\delta) + x(\lambda_t, k, s) \in \mathcal{K}\}$.

4 Calibration

Investment adjustment costs are the sum of a fixed portion and of a convex portion:

$$g(x, k) = \chi(x) c_0 k + c_1 \left(\frac{x}{k}\right)^2 k, \;\; c_0, c_1 \geq 0,$$

where $\chi(x) = 0$ for $x = 0$ and $\chi(x) = 1$ otherwise. Notice that the fixed portion is scaled by the level of capital in place and is paid if and only if gross investment is different from zero.

One period is assumed to be one year. Consistent with most macroeconomic studies, we assume that $\delta = 0.1$ and $\alpha = 0.3$.

The remaining parameters were chosen in such a way that a number of statistics computed using a panel of simulated data are close to their empirical counterparts. Since the model is highly non–linear, it is not possible to match parameters to moments. However, the mechanics of the model clearly indicates what are the key parameters for each set of moments.

The parameters of the process driving the idiosyncratic shock, along with those governing the adjustment costs, were chosen to match the mean and standard deviation of the investment rate, the autocorrelation of investment, and the rate of inaction. The targets of our calibration are the moments computed in Section 2.

We set ρ_z and σ_z, which shape the dynamics of aggregate productivity, and the demand elasticity η, in order to generate certain values for the standard deviation and auto–correlation of industry output, as well as the standard deviation of employment (relative to output).

The targets for the first two are the standard deviation and autocorrelation of (linearly de–trended) non–farm private value added from 1947 to 2008, from the Bureau of Economic Analysis. We computed them to be 0.04 and 0.782, respectively. The third target is the standard deviation of (linearly de–trended) employment, also in the non–farm private sector and for the same period, from the Bureau of Labor Statistics. According to our computations, it equals 0.923 times the standard deviation of output.

Finally, the parameters governing the stochastic discount factor (β, γ_0, and γ_1) were chosen to match the first and second unconditional moments of the risk–free rate and the unconditional mean of the Sharpe ratio. Let R_t^f denote the time-t risk–free rate. That is, let

$$R_t^f \equiv \frac{1}{E_t(M_{t+1})}.$$

In Appendix we show that its unconditional mean is

$$E(\log R_t^f) = -\log\beta - 0.5\sigma_z^2\gamma_0^2 - \frac{\sigma_z^2}{1-\rho_z^2}\left[\gamma_1(1-\rho_z) + 0.5\sigma_z^2\gamma_1^2\right].$$

The unconditional variance of the same variable is

$$E[(\log R_t^f - E[\log R_t^f])^2] = \frac{\sigma_z^2\gamma_0^2}{1-\rho_z^2}((1-\rho_z)+\sigma_z^2\gamma_1)^2 + \frac{2\sigma_z^4\gamma_1^2}{(1-\rho_z^2)^2}\left((1-\rho_z)+0.5\sigma_z^2\gamma_1\right)^2.$$

Finally, it can be proven that the Sharpe ratio at time t is equal to

$$\frac{\sigma_t[M_{t+1}]}{E_t[M_{t+1}]} = \sqrt{\left(e^{\sigma_t^2}-1\right)},$$

where $\sigma_t = \sigma_z(\gamma_0 + \gamma_1 \log\frac{z_t}{\bar{z}})$.

5 Computation

In order to formulate their choices, firms need to forecast the price in the next period. The product market clearing condition implies that the equilibrium price at time t satisfies the following restriction:

$$\log p_t = \frac{1}{\eta}\log(z_t) + \frac{1}{\eta}G_t, \tag{2}$$

with $G_t = \log\left[\int sk^\alpha d\Gamma_t(k,s)\right]$. The log–price is an affine function of the logarithm of aggregate productivity and of a moment of the distribution.

Unfortunately, the dynamics of G_t depends on the evolution of Γ_t. It follows that the vector of state variables λ_t consists of the distribution Γ_t and the aggregate shock z_t. Faced with the formidable task of approximating an infinitely–dimensional object, we follow Krusell and Smith (1998) and conjecture that G_{t+1} is an affine function of G_t and $\log z_{t+1}$. Then, (2) implies that the equilibrium wage follows the following law of motion:

$$\log p_{t+1} = \beta_0 + \beta_1 \log p_t + \beta_2 \log z_{t+1} + \beta_3 \log z_t + \varepsilon_{t+1}. \tag{3}$$

When computing the numerical approximation of the equilibrium allocation, we will impose that firms form expectations about the evolution of the price assuming that (3) holds true. This means that the aggregate state variables reduce to the pair (p_t, z_t). The parameters $\{\beta_0, \beta_1, \beta_2, \beta_3\}$ will be set equal to the values that maximize the accuracy of the prediction rule. The algorithm is described in detail in Appendix A.

6 Simulations and Analysis

To be added.

7 Conclusion

To be added.

A Numerical Approximation

Our algorithm consists of the following steps.

1. Guess values for the parameters of the price forecasting rule $\hat{\beta} = \left\{\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3\right\}$;

2. Approximate the firm's value function;

3. Simulate the economy for T periods, starting from an arbitrary initial condition (z_0, Γ_0);

4. Obtain a new guess for $\hat{\beta}$ by running regression (3) over the time–series $\{p_t, z_t\}_{t=S+1}^{T}$, where S is the number of observation to be scrapped because the dynamical system has not reached its ergodic set yet;

5. If the new guess for $\hat{\beta}$ is close to the previous one, stop. If not, go back to step 2.

A.1 Approximation of the value function

The firm's value function is approximated by value function iteration.

1. Start by defining grids for the state variables p, z, k, s. Denote them as Ψ_p, Ψ_z, Ψ_k, and Ψ_s, respectively. The price grid is equally spaced and centered around the equilibrium price of the stationary economy. The capital grid is constructed following the method suggested by McGrattan (1999). The grids and transition matrices for the two shocks are constructed following Tauchen (1986). For all pairs (s, s') such that $s, s' \in \Psi_s$, let $H(s'|s)$ denote the probability that next period's idiosyncratic shock equals s', conditional on today's being s. For all (z, z') such that $z, z' \in \Psi_z$, let also $G(z'|z)$ denote the probability that next period's aggregate shock equals z' conditional on today's being z, and let $M(z, z')$ denote the associated discount factor.

2. For all triplets (p, z, z') on the grid, the forecasting rule yields a price forecast for the next period (tildes denote elements not on the grid):

$$\log(\tilde{p}') = \hat{\beta}_0 + \hat{\beta}_1 \log(p) + \hat{\beta}_2 \log(z') + \hat{\beta}_3 \log(z).$$

   In general, $\tilde{p}'$ will not belong to the grid of prices. There will be contiguous grid points (p_i, p_{i+1}) such that $p_i \leq \tilde{p}' \leq p_{i+1}$. Now let $J(p_i|p, z, z') = 1 - \frac{\tilde{p}' - p_i}{p_{i+1} - p_i}$, $J(p_{i+1}|p, z, z') = \frac{\tilde{p}' - p_i}{p_{i+1} - p_i}$, and $J(p_j|p, z, z') = 0$ for all j such that $j \neq i$ and $j \neq i+1$. This will allow us to evaluate the value function for values of the price which are off the grid, by linear interpolation;

3. For all grid elements (p, z, k, s), guess values for the value function $V_0(p, z, k, s)$;

4. The revised guess of the value function, $V_1(p, z, k, s)$, is determined as follows:

$$V_1(p,z,k,s) = \max \Bigg[0, \max_{k' \in \Psi_k} \; pszk^{\alpha} - x - c_0 k\chi - c_1 \left(\frac{x}{k}\right)^2 k - c_f + \sum_j \sum_i \sum_n M(z,z_j) V_0(p_i, z_j, k', s_n) H(s_n|s) J(p_i|p,z,z_j) G(z_j|z)\Bigg],$$

$$\text{s.t. } x = k' - k(1-\delta),$$

$$\chi = 1 \text{ if } k' \neq k \text{ and } \chi = 0 \text{ otherwise .}$$

5. Keep on iterating until $\sup \left|\frac{V_{t+1}(p,z,k,s) - V_t(p,z,k,s)}{V_t(p,z,k,s)}\right| < 10.0^{-6}$. Denote the latest value function as $V_\infty(p, z, k, s)$.

A.2 Simulation

1. Given the current firm distribution Γ_t and aggregate shock z_t, compute the equilibrium price $\tilde{p}_t$ by equating product demand and product supply:

$$D(p) = z_t \sum_m \sum_n s_n k_m^{\alpha} \Gamma_t(s_n, k_m)$$

2. For all $z' \in \Psi_z$, compute the conditional price forecast $\tilde{p}_{t+1}(z')$ as follows:

$$\log[\tilde{p}_{t+1}(z')] = \hat{\beta}_0 + \hat{\beta}_1 \log(\tilde{p}_t) + \hat{\beta}_2 \log(z') + \hat{\beta}_3 \log(z_t).$$

For every z', there will be contiguous grid points (p_i, p_{i+1}) such that $p_i \leq \tilde{p}_{t+1}(z') \leq p_{i+1}$. Now let $J_{t+1}(p_i|z') = 1 - \frac{\tilde{p}_{t+1}(z') - p_i}{p_{i+1} - p_i}$, $J_{t+1}(p_i|z') = \frac{\tilde{p}_{t+1}(z') - p_i}{p_{i+1} - p_i}$, and $J_{t+1}(p_j|z') = 0$ for all j such that $j \neq i$ and $j \neq i+1$;

3. Draw the aggregate productivity shock z_{t+1};

4. Determine the distribution at time $t + 1$. For all (k, s),

$$\Gamma_{t+1}(k,s) = \sum_m \sum_n \Gamma_t(k_m, s_n) H(s|s_n) \Upsilon_{m,n}(p_t, z_t, k)$$

where

$$\Upsilon_{m,n}(p_t, z_t, k) = \begin{cases} 1 & \text{if } k'(p_t, z_t, k_m, s_n) = k \\ 0 & \text{otherwise.} \end{cases}$$

Table 2: **Non–Financial Firms**

Year	N	Mean	Std. Dev.	Median	Inaction	Negative	Pos. Spike	Neg. Spike	Autocorrelation
1975	4422	0.136	0.156	0.093	0.048	0.044	0.198	0.000	0.377
1976	4501	0.134	0.153	0.094	0.055	0.046	0.196	0.002	0.390
1977	4411	0.151	0.176	0.106	0.049	0.047	0.231	0.002	0.476
1978	4254	0.169	0.194	0.117	0.046	0.044	0.269	0.001	0.459
1979	4034	0.187	0.227	0.129	0.047	0.037	0.293	0.001	0.419
1980	4014	0.199	0.257	0.132	0.045	0.043	0.309	0.002	0.365
1981	3994	0.257	0.427	0.135	0.042	0.042	0.344	0.003	0.481
1982	4048	0.223	0.367	0.115	0.048	0.047	0.299	0.004	0.286
1983	4230	0.214	0.386	0.102	0.054	0.051	0.268	0.005	0.270
1984	4229	0.271	0.469	0.124	0.050	0.047	0.340	0.001	0.309
1985	4128	0.220	0.365	0.114	0.062	0.057	0.306	0.004	0.212
1986	4277	0.227	0.410	0.105	0.069	0.061	0.292	0.004	0.223
1987	4441	0.256	0.500	0.108	0.074	0.055	0.300	0.004	0.286
1988	4413	0.222	0.407	0.105	0.077	0.047	0.282	0.000	0.239
1989	4367	0.183	0.288	0.098	0.078	0.048	0.249	0.002	0.218
1990	4366	0.166	0.262	0.090	0.086	0.039	0.225	0.000	0.291
1991	4496	0.141	0.208	0.078	0.098	0.040	0.192	0.000	0.295
1992	4467	0.168	0.283	0.081	0.095	0.032	0.216	0.000	0.400
1993	4727	0.211	0.366	0.093	0.077	0.024	0.260	0.000	0.424
1994	4777	0.237	0.390	0.109	0.067	0.023	0.309	0.000	0.374
1995	4963	0.241	0.370	0.118	0.059	0.022	0.329	0.000	0.334
1996	5429	0.316	0.551	0.128	0.050	0.020	0.368	0.000	0.426
1997	5462	0.297	0.509	0.131	0.055	0.022	0.367	0.000	0.353
1998	4961	0.248	0.413	0.120	0.059	0.025	0.331	0.000	0.273
1999	5293	0.318	0.780	0.112	0.069	0.035	0.319	0.000	0.262
2000	5184	0.294	0.571	0.110	0.074	0.025	0.323	0.000	0.322
2001	5181	0.175	0.270	0.086	0.100	0.034	0.244	0.000	0.127
2002	5097	0.122	0.206	0.060	0.135	0.039	0.159	0.000	0.145
2003	4922	0.120	0.205	0.059	0.133	0.033	0.155	0.000	0.138
2004	4593	0.196	0.446	0.072	0.102	0.027	0.203	0.000	0.504
2005	4376	0.229	0.500	0.084	0.088	0.025	0.249	0.000	0.320
2006	4274	0.264	0.558	0.099	0.082	0.021	0.293	0.000	0.312
2007	4043	0.264	0.529	0.105	0.081	0.018	0.304	0.000	0.316
2008	3914	0.219	0.374	0.098	0.088	0.024	0.288	0.000	0.257
2009	4105	0.124	0.203	0.061	0.134	0.028	0.164	0.000	0.148

Table 3: **Manufacturing Firms**

Year	N	Mean	Std. Dev.	Median	Inaction	Negative	Pos. Spike	Neg. Spike	Autocorrelation
1975	2561	0.084	0.153	0.061	0.069	0.171	0.137	0.024	0.304
1976	2572	0.087	0.169	0.061	0.074	0.178	0.141	0.030	0.351
1977	2483	0.107	0.184	0.075	0.058	0.145	0.171	0.025	0.337
1978	2357	0.126	0.193	0.091	0.053	0.130	0.215	0.028	0.305
1979	2228	0.142	0.239	0.097	0.042	0.125	0.232	0.033	0.320
1980	2188	0.139	0.236	0.096	0.037	0.138	0.226	0.032	0.260
1981	2162	0.174	0.331	0.096	0.050	0.135	0.262	0.023	0.335
1982	2134	0.146	0.311	0.072	0.066	0.175	0.213	0.031	0.298
1983	2207	0.159	0.414	0.063	0.069	0.200	0.196	0.043	0.325
1984	2168	0.220	0.474	0.091	0.053	0.176	0.284	0.043	0.294
1985	2128	0.172	0.378	0.091	0.051	0.184	0.269	0.052	0.178
1986	2163	0.166	0.384	0.086	0.061	0.190	0.259	0.059	0.196
1987	2224	0.185	0.452	0.083	0.062	0.180	0.270	0.054	0.257
1988	2207	0.165	0.425	0.080	0.062	0.180	0.241	0.062	0.238
1989	2183	0.135	0.355	0.072	0.067	0.195	0.221	0.068	0.215
1990	2172	0.127	0.327	0.074	0.064	0.184	0.210	0.059	0.285
1991	2264	0.105	0.279	0.054	0.093	0.215	0.175	0.048	0.220
1992	2273	0.153	0.418	0.060	0.079	0.211	0.217	0.045	0.372
1993	2398	0.168	0.417	0.066	0.068	0.201	0.233	0.042	0.318
1994	2425	0.194	0.423	0.085	0.056	0.162	0.276	0.041	0.271
1995	2513	0.195	0.396	0.093	0.055	0.167	0.291	0.043	0.313
1996	2720	0.250	0.510	0.098	0.053	0.162	0.325	0.039	0.338
1997	2711	0.218	0.495	0.094	0.059	0.187	0.308	0.058	0.330
1998	2428	0.167	0.364	0.090	0.056	0.185	0.267	0.054	0.211
1999	2570	0.147	0.391	0.066	0.063	0.238	0.247	0.070	0.255
2000	2487	0.197	0.545	0.065	0.068	0.230	0.257	0.066	0.341
2001	2473	0.117	0.370	0.048	0.094	0.267	0.205	0.083	0.202
2002	2463	0.042	0.308	0.032	0.101	0.309	0.148	0.099	0.169
2003	2374	0.045	0.261	0.038	0.099	0.288	0.141	0.092	0.178
2004	2244	0.115	0.436	0.049	0.088	0.238	0.163	0.066	0.216
2005	2156	0.105	0.424	0.038	0.090	0.288	0.174	0.073	0.157
2006	2101	0.161	0.494	0.061	0.095	0.217	0.222	0.056	0.322
2007	1937	0.152	0.460	0.067	0.087	0.217	0.233	0.065	0.311
2008	1827	0.113	0.413	0.040	0.102	0.283	0.204	0.085	0.255
2009	1900	0.046	0.231	0.026	0.143	0.304	0.120	0.064	0.112

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