Teaching Note on Black-Litterman Model

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1. The Black-Litterman Formula

Black and Litterman (1992) offer a way to incorporate investor's views into asset-pricing. In a standard portfolio optimization problem, the necessary inputs are expected returns of the n different assets and the covariances among them, which we denote by a n×1 vector μ and a n×n matrix V, respectively. We assume the investor knows V but not μ. However, she believes μ is normally distributed with the mean vector π and the covariance matrix Σ:

$$\mu \sim N(\pi, \Sigma).$$

In addition, we assume that the investor has personal views with which she wants to update the expected returns. The investor's new information is given by:

$$P\mu = Q - \varepsilon.$$

P is a k×n matrix, Q is a k×1 vector and $\varepsilon \sim N(0, \Omega)$ where Ω is a k×k matrix. ε represents the uncertainty in the views. Given the views, the investor updates the expected return to:

$$E(\mu \mid views) = \left[\Sigma^{-1} + P'\Omega^{-1}P\right]^{-1}\left[\Sigma^{-1}\pi + P'\Omega^{-1}Q\right]. \qquad (1)$$

An equivalent formula can be derived in the classical multivariate framework:

$$E(\mu \mid views) = \pi + \Sigma P'\left[P\Sigma P' + \Omega\right]^{-1}\left[Q - P\pi\right]. \qquad (2)$$

With (2), we can easily understand a special case when the investor is certain about her views ($\Omega = 0$), then the updated conditional expected return becomes:

$$E(\mu \mid views) = \pi + \Sigma P'\left[P\Sigma P'\right]^{-1}\left[Q - P\pi\right]. \qquad (3)$$

2. A Numerical Example

There are three assets and the prior distribution of the expected returns is (all numbers are in percentages):[2]

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$$\mu \sim N\left(\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 9.1 & 3 & 6 \\ 3 & 1.1 & 2 \\ 6 & 2 & 4.1 \end{bmatrix}\right).$$

The investor has one personal view. She expects the first asset to outperform the second by 2 percent on average. This view can be represented by:

$$P = \begin{bmatrix} 1 & -1 & 0 \end{bmatrix} \, and \, Q = 2.$$

The investor is not certain with her prediction and $\varepsilon \sim N(0,1)$. This means $\Omega = 1$. Using (1) or (2), we obtain:

$$E(\mu \mid views) = [3.35 \; 1.73 \; 2.54]'.$$

If the view is certain ($\Omega = 0$), then

$$E(\mu \mid views) = [3.9 \; 1.9 \; 2.9]'.$$

As Ω goes from 1 to 0, the conditional expected returns converge. For instance, for $\Omega = 0.1$,

$$E(\mu \mid views) = [3.84 \; 1.88 \; 2.86]'.$$

3. A Real Life Example

Consider a passive investor holding a portfolio of domestic bonds and stocks, on Jan 11, 2005, she saw a Wall Street Journal article where top wall street firms expressed their views on the markets over the next 12 months.[3] This example demonstrates how to incorporate these expert views in the passive investor's portfolio allocation decision.

3.1 Summary of the views

The views expressed in the article can be summarized as follows:

- On the aggregate stock market (S&P 500)

As shown in Table 1, on average, Wall Street forecasts that S&P 500 will reach 1271 in one year. This, together with a historical dividend yield on S&P 500 of 1.5%,[4] translates

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[2] This example is taken from Black and Litterman (1992).
[3] "what wall street's best are telling their clients", by Jane J. Kim, WSJ, Jan 11, 2005. The article is reproduced at the end of this teaching note.
[4] Source: http://www.indexarb.com/dividendYieldSortedsp.html.

to an expected return of 6.34%.[5] However, there is a wide dispersion on the forecasts, reflected by a standard deviation of 3.46%.

- Bond vs. Stock

Most firms believe stock will outperform bond in 2005. Some forecast near zero to 2 percent total returns on US fixed income securities.

- Sector Views

We use Fama and French's industrial classification to place all stocks into 12 sectors.[6] Table 2 then summarizes the views from various firms where a "+" indicates a positive view and a "-" indicates a negative view. We count the number of "+" and "-" received for each sector and classify the them into 5 portfolios: Strong Buy (SB), Buy (B), Neutral (N), Sell (S) and Strong Sell (SS).

3.2 Incorporating the views in asset allocation

Step 1: Construct time series of historical return and compute covariance matrix V
We are given the time series of monthly returns and market values on the 12 industrial sectors, from which we can compute the historical returns on the 5 stock portfolios. For example, the Strong Buy (SB) portfolio contains Health and Money sectors; therefore, its return is just the market-value-weighted-average of Health and Money sector returns (see next page):

$$r_{SB,t} = \frac{MV_{Health,t}}{MV_{Health,t} + MV_{Money,t}} r_{Health,t} + \frac{MV_{Money,t}}{MV_{Health,t} + MV_{Money,t}} r_{Money,t}.$$

We are also given the times series of monthly returns on three bond portfolios: Corporate bond (Cbond), Long-term government bond (LTG) and Intermediate-term government bond (ITG). All time series are available from 07/1926 to 10/2003. We can then compute the variance-covariance matrix V of the eight (3 bonds + 5 stocks) asset classes using the covariance function in Excel (Tools -- Data Analysis – covariance, see next page).

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[5] S&P 500 closed at 1211.92 at the end of 2004.
[6] See Prof Ken French's website for detail:
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Formula bar: `=('12indvalue'!K2/SUM('12indvalue'!K2,'12indvalue'!L2)*'12indret'!K2+'12indvalue'!L2/SUM('12indvalue'!K2,'12indvalue'!L2)*'12indret'!L2)/100`

	Durbl	Manuf	Enrgy	Chems	BusEq	Telcm	Utils	Shops	Hlth	Money	Other		SB
1	Durbl	Manuf	Enrgy	Chems	BusEq	Telcm	Utils	Shops	Hlth	Money	Other		SB
2	15.63	3.61	-0.74	7.8	3.14	0.83	7.04	-2.8	1.76	0.2	2.38		IL2)/100
3	3.68	2.43	3.02	5.46	1.99	2.17	-1.73	-0.55	4.35	1.4	4.32		0.025285
4	4.94	0.08	-3.34	4.94	-0.34	2.41	1.98	-4.26	0.63	-1.06	0.26		-0.00402
5	-8.32	-3.21	-0.74	-4.58	-5.37	-0.11	-2.67	-0.95	-0.65	-4.33	-2.63		-0.02883
6	-0.21	3.86	-0.46	6.75	4.78	1.63	3.97	4.05	5.45	0.74	2.3		0.026354
7	9.96	3.63	2.92	3.77	-1.78	1.99	-0.34	2.84	0.15	3.97	3.1		0.023907
8	-0.88	-0.34	1.26	0.26	-0.77	1.96	-1.76	-3.15	4.95	1.23	1.82		0.027342
9	8.89	4.41	1.45	10.06	4.26	3.89	4.6	4.54	1.65	1.9	5.05		0.017967
10	1.7	0.42	-5.8	5.77	0.89	5.56	0.44	2.77	0.89	1.41	1.08		0.011955
11	3.19	0.23	-5.04	2.87	6.17	-2.13	1.64	2.28	3.16	3.61	0.98		0.034249
12	5.9	5.37	4.74	4.87	7.85	3.35	9.36	0.66	4.04	8.21	6.01		0.064994
13	-2.89	-2.6	-3.09	-2.42	2.69	-2.14	-3.59	0.19	0.48	0.83	-2.1		0.006897
14	13.13	10.08	2.87	17.08	13.23	3.73	5.4	9.51	9.84	6.47	6.2		0.076873
15	7.05	2.03	0.09	2.11	6.45	0.43	3.3	12.84	0.11	1.51	-1.43		0.009943
16	5.7	4.34	3.95	6.43	1.32	2.04	8.26	5.09	5.85	4.75	4.57		0.051517
17	-4.43	-6.6	-2.05	-7.45	-7.2	2.28	-4.36	-5.83	4.98	2.93	-4.29		0.036835
18	6.42	11.33	4.07	9.01	10.98	2.83	6.31	10.81	3.81	6.93	4.6		0.057688
19	7.76	3.69	0.34	-0.06	2.02	1.33	2.27	0.05	-0.45	10.02	1.29		0.061957
20	-3.34	-0.48	-1.84	-0.4	-0.46	0.3	5.87	-0.31	2.7	0.44	-1.14		0.012139
21	1.32	-2.42	-0.12	1.26	-0.82	-0.3	-0.82	-1.3	-1.38	-2.14	-1.96		-0.01876
22	27.63	6.16	5.2	12.25	22.04	1.96	6.74	8.79	10.81	7.87	5.36		0.086929
23	1.41	2.01	14.87	0.05	2.31	3.22	10.89	0.57	2.36	6.96	3.87		0.056473
24	5.65	3.96	-5.22	3.55	1.98	6.62	1.58	3.88	9.24	4.08	0		0.055065
25	-3.99	-5.57	-4.07	-3.63	-5.4	-5.47	-3.42	-3.87	-3.17	-9.4	-4.01		-0.07617
26	0.85	2.01	1.05	1.96	-0.09	-1.03	-1.2	4.53	2.68	-0.45	-0.05		0.004658
27	8.88	7.72	2.37	8.9	11.57	4.55	6.29	11.68	15.1	5.05	4.64		0.080552
28	7.95	3.66	5.11	4.52	1.4	0.15	1.33	1.57	-1.5	11.17	1.15		0.071349
29	0.26	3.76	1.98	5.05	1.91	2.07	0.06	4.33	0.08	2.87	0.49		0.018684

Sheets: views / **12indret** / 12indvalue / asset ret / BLcalculation

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		Cbond	LTG	ITG	SB	B	N	S	SS
2	192607	0.005700	0.000435	0.001339	0.007843	0.012972	0.026925	-0.028	0.092367399
3	192608	0.004400	0.000005	0.000930	0.025285	0.026298	0.043719	-0.0055	0.014558155
4	192609	0.005700	0.003763	0.004969	-0.004021	-0.009283	0.010796	-0.0426	0.026146346
5	192610	0.009700	0.010174	0.005384	-0.028827	-0.016718	-0.024791	-0.0095	-0.057770475
6	192611	0.005700	0.015997	0.004453	0.026354	0.017105	0.036737	0.0405	0.024330746
7	192612	0.005600	0.007813	0.008902	0.023907	0.030547	0.025298	0.0284	0.034700185
8	192701	0.005600	0.007472	0.005671	0.027342	0.007013	0.00877	-0.0315	-0.011350147
9	192702	0.006900	0.008777	0.003832	0.017967	0.031385	0.051613	0.0454	0.063729256
10	192703	0.008300	0.025328	0.003816	0.011955	-0.010857	0.021612	0.0277	0.011079436
11	192704	0.005500	-0.000490	0.001561	0.034249	-0.021908	0.019205	0.0228	0.034312768
12	192705	-0.001100	0.010864	0.002034	0.064994	0.047581	0.064839	0.0066	0.074446668
13	192706	0.004300	-0.006890	0.002945	0.006897	-0.026922	-0.020228	0.0019	-0.017114261
14	192707	0.000300	0.004970	0.004288	0.076873	0.060068	0.071704	0.0951	0.104986602
15	192708	0.008300	0.007600	0.000260	0.009943	0.009832	0.002648	0.1284	0.05685176
16	192709	0.014900	0.001798	0.006016	0.051517	0.037793	0.05039	0.0509	0.055125582
17	192710	0.005500	0.009858	-0.003450	0.036835	-0.032759	-0.036104	-0.0583	-0.050183929
18	192711	0.006800	0.009705	0.008318	0.057688	0.068961	0.059008	0.1081	0.073618676
19	192712	0.006800	0.007151	0.003729	0.061957	0.019847	0.014131	0.0005	0.046871216
20	192801	0.002700	-0.003600	0.004613	0.012139	-0.008556	-0.004884	-0.0031	0.002325506
21	192802	0.006120	-0.000360	-0.01876	-0.01811	-0.021326	-0.013	0.001366351	
22	192803	0.004100	0.004545	0.001044	0.086929	0.050392	0.060114	0.0879	0.194699728
23	192804	0.001400	-0.000360	-0.000260	0.056473	0.070629	0.019471	0.0057	0.044315645
24	192805	-0.007800	-0.007710	-0.000640	0.055065	0.000683	0.008324	0.0388	0.03579277
25	192806	-0.002400	0.004135	0.001655	-0.076168	-0.049801	-0.040855	-0.0387	-0.0410907
26	192807	-0.001000	-0.021740	-0.008950	0.004658	0.01128	0.008272	0.0453	-4.78191E-05
27	192808	0.003000	0.007647	0.005015	0.080552	0.051972	0.055722	0.1168	0.086285599
28	192809	0.003000	-0.004060	0.002764	0.071349	0.035681	0.018637	0.0157	0.045426863
29	192810	0.008300	0.015761	0.003216	0.018684	0.029805	0.008164	0.0433	0.005565665
30	192811	-0.003600	0.000336	0.001886	0.090485	0.134594	0.094167	0.1395	0.132456019
31	192812	0.008400	0.000439	-0.000740	0.0064	-0.003454	0.003453	-0.0254	0.018321869
32	192901	0.004300	-0.008990	-0.002850	0.067213	0.029268	0.078319	-0.037	0.076797185
33	192902	0.003000	-0.015690	-0.001840	-0.001183	0.020982	-0.008411	-0.0301	-0.010158383
34	192903	-0.008700	-0.014370	0.000457	0.027755	0.038562	-0.034554	-0.0571	-0.003758823
35	192904	0.001900	0.027509	0.008863	-0.017369	0.019214	0.015578	0.0285	0.016848878
36	192905	-0.004500	-0.016170	-0.006130	-0.046097	-0.085475	-0.026975	-0.0713	-0.041215739
37	192906	-0.004600	-0.010990	0.010694	0.062679	0.078876	0.085548	0.0793	0.15719758
38	192907	0.002000	-0.000030	0.006616	0.070938	0.043885	0.051282	0.0028	0.059602353
39	192908	0.002000	-0.003410	0.005240	0.059343	0.103311	0.076563	0.0696	0.08011152
40	192909	0.003400	0.002750	-0.001380	-0.048254	-0.049029	-0.055766	-0.0506	-0.040224514
41	192910	0.007300	0.038195	0.016815	-0.26828	-0.14577	-0.128593	-0.2421	-0.298621886
42	192911	-0.001800	0.023646	0.018022	-0.139673	-0.104573	-0.10106	-0.119	-0.17184556

Covariance matrix (output):

	Cbond	LTG	ITG	SB	B	N	S	SS
Cbond	0.000413							
LTG	0.000395	0.000518						
ITG	0.000202	0.000247	0.000168616					
SB	0.000304	0.000273	0.000121423	0.0039				
B	0.000195	0.000135	4.99392E-05	0.002949	0.002947			
N	0.000255	0.000198	7.79296E-05	0.00309	0.00269	0.002909		
S	0.000263	0.000217	9.75936E-05	0.003157	0.002639	0.002845	0.003595	
SS	0.000248	0.000017	6.93713E-05	0.003448	0.003088	0.00303	0.003194	0.004147

Covariance dialog:
- Input
  - Input Range: `$B$1:$I$929`
  - Grouped By: (●) Columns ( ) Rows
  - [✓] Labels in first row
- Output options
  - (●) Output Range: `$K$2`
  - ( ) New Worksheet Ply:
  - ( ) New Workbook
- Buttons: OK / Cancel / Help

Sheets: views / 12indret / 12indvalue / **asset ret** / BLcalculation

Step 2: Determine the prior expected return μ

There are two ways to compute the prior expected return μ. The most intuitive way will be to use historical averages. However, as pointed out by Black-Litterman (1992) among others, the main problem of this approach is that extreme optimal portfolio weights are often observed. Table 3 show the expected returns of the 8 assets computed using their historical average and the asset weights of the optimal risky portfolio that maximize the Sharpe Ratio.[7] Indeed, we see an extreme long position in Long-term government bond (LTG) and an extreme short position in Intermediate-term government bond (ITG), which is apparently unrealistic.

An alternative approach is to set the prior expected returns to be the equilibrium expected returns. In equilibrium, the market portfolio is a mean-variance efficient portfolio:

$$w_{mkt} = \lambda V^{-1}(\mu - R_f),$$

which means:

$$\mu = R_f + \frac{1}{\lambda}Vw_{mkt}. \qquad (4)$$

In a standard asset pricing model,[8] $1/\lambda$ is the relative risk aversion. In this example, we set it to be 1. From the market value of 12 industrial sectors at 11/04, we can compute the relative weights of the 5 stock portfolios. In addition, we assume: (1) Cbond accounts for 50% of the total bond portfolio and LTG and ITG each accounts for 25%; (2) bond portfolio accounts for 1/3 of the market portfolio and stock accounts for the remaining 2/3. The resulting weights of the 8 assets in the market portfolio are shown in last column of Table 3. Then the implied equilibrium expected returns are computed using (4).

The matrix operations are handled in Excel by MMULT (matrix multiplication), MINVERSE (matrix inverse) and TRANSPOSE (matrix transpose). To output the results in Excel, remember to press Control + Shift + Enter at the same time.[9] (see next page)

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[7] A risk free rate of 3% is used.
[8] One-period asset pricing model with time-additive power utility such as CAPM.
[9] An example of matrix operation in Excel is available at
http://www.kellogg.northwestern.edu/faculty/schaumburg/ftp/460/Programs/Linear_Equations_Excel.pdf.

Formula bar: `=TRANSPOSE(MMULT(B10:I17,TRANSPOSE(B3:I3)))*K3`

A	B	C	D	E	F	G	H	I	J	K	L	M
1 Data from 1926 to 2004												
2	Cbond	LTG	ITG	SB	B	N	S	SS	rf	1/lamda		
3 Eqm Weights	16.67%	8.33%	8.33%	22.06%	11.84%	10.65%	5.91%	16.22%	3%	1		
4 Implied Eqm Exc Ret	=TRANSP	0.32%	0.15%	2.84%	2.39%	2.44%	2.54%	2.85%				
5 Implied EqmRet	3.35%	3.32%	3.15%	5.84%	5.39%	5.44%	5.54%	5.85%				
6												
7 Hist return	5.95%	5.53%	5.45%	13.02%	11.14%	11.16%	12.17%	12.20%				
8 Opt weights using hist ret	21.54%	-54.34%	119.76%	6.24%	8.08%	-4.50%	4.72%	-1.49%	too extreme			
9												
10 var - cov	0.0050	0.0047	0.0024	0.0036	0.0023	0.0031	0.0032	0.0030				
11	0.0047	0.0062	0.0030	0.0033	0.0016	0.0024	0.0026	0.0020				
12	0.0024	0.0030	0.0020	0.0015	0.0006	0.0009	0.0012	0.0008				
13	0.0036	0.0033	0.0015	0.0468	0.0354	0.0371	0.0379	0.0414				
14	0.0023	0.0016	0.0006	0.0354	0.0354	0.0323	0.0317	0.0371				
15	0.0031	0.0024	0.0009	0.0371	0.0323	0.0349	0.0342	0.0364				
16	0.0032	0.0026	0.0012	0.0379	0.0317	0.0342	0.0432	0.0384				
17	0.0030	0.0020	0.0008	0.0414	0.0371	0.0364	0.0384	0.0498				
18												
19 views (P)				P					Q			Omega
20 target ret of S&P	0.00	0.00	0.00	0.33	0.18	0.16	0.09	0.24	6.34%	0.0012	0.0000	0
21 stock beats bond	-0.50	-0.25	-0.25	0.33	0.18	0.16	0.09	0.24	4.00%	0.0000	0.0009	0
22 Strong Buy beats the mkt by 2%	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	8.34%	0.0000	0.0000	0.0009
23 Buy beats the mkt by 1.5%	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	7.84%	0.0000	0.0000	0
24 Sell is short of the mkt by 1.5%	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	4.84%	0.0000	0.0000	0
25 Strong Sell is short of the mkt by 2%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	4.34%	0.0000	0.0000	0
26												
27												
28 Updated ER	3.36%	3.33%	3.15%	6.14%	5.62%	5.68%	5.77%	6.08%				
29 Updated optimal weights	14.33%	7.16%	7.16%	28.83%	13.79%	11.06%	5.51%	12.15%				

Sheet tabs: views / 12indret / 12indvalue / asset ret \ BLcalculation /

Count=8

Step 3: Quantify the views

We quantify the views and translate them into *P*, *Q* and *Ω* as shown in Table 4.

The first row in Table 4 represents the view on aggregate stock market --- its expected return is 6.34% and the view has a variance of 0.0012 (since the standard deviation is 3.46% as in Table 1).

The second row in Table 4 captures the view that stock will outperform the bond by 4%. We are more confident about this view and therefore the variance of the view is smaller --- 0.0009.

The third to sixth row in Table 4 represent views on sectors. We assume SB (SS) portfolio has an expected return of 2% above (below) that of the aggregate stock market, and the B (S) portfolio has an expected return of 1.5% above (below) that of the aggregate stock market. The views on SB and SS are more certain and their variance is 0.0009. As a comparison, we are less certain about the views on S or B, and we assign a higher variance of 0.0036.

Step 4: Compute the updated expected returns and optimal portfolio weights

The final step is to compute the expected returns conditional on the views using (1) or (2). We choose $\Sigma = 0.0025 * V$.

These conditional expected returns together with the covariance matrix V can then be used in any portfolio optimization model to obtain the optimal portfolio weights. Table 5 reports the conditional expected returns, the resulting portfolio weights and their changes from the market portfolio weights (the last column in Table 3).

The updated asset allocations are very intuitive and are consistent with the views. Since we believe stock will outperform the bond, there is a noticeable shift from bond investment to stock investment. In addition, SB and B portfolios receive more weights and S and SS receive less.

Table 1: Forecast of S&P 500 after one year by various firms

Firm	Forecast	Expected return
Banc of America	1200	0.52%
Goldman Sachs	1325	10.83%
Lehman Bro	1300	8.77%
Merrill Lynch	1240	3.82%
Morgan Stanley	1250	4.64%
PNC Advisors	1300	8.77%
Prudential	1250	4.64%
Smith Barney	1300	8.77%
mean	1270.63	6.34%
Std dev	41.96	3.46%

Table 2: Sector views

Firm	NoDur	Durbl	Manuf	Enrgy	Chems	BusEq	Telcm	Utils	Shops	Hlth	Money	Other
Banc of America	+	-		+	+	-	-	-		+	+	
Goldman Sachs	-					+	+	-		+		
Lehman Bro	-		+		+			-				
Merrill Lynch	+	-			-	-	+	+		+		
Morgan Stanley		-				-			-	+	+	+
PNC Advisors			+	-	+			-			+	
Prudential		-		+		-	+					
Smith Barney						-				+		+/-
Classification	N	SS	B	B	N	SS	B	SS	S	SB	SB	N

* NoDur: Consumer NonDurables -- Food, Tobacco, Textiles, Apparel, Leather, Toys
   Durbl: Consumer Durables -- Cars, TV's, Furniture, Household Appliances
   Manuf: Manufacturing -- Machinery, Trucks, Planes, Off Furn, Paper, Com Printing
   Enrgy: Oil, Gas, and Coal Extraction and Products
   Chems: Chemicals and Allied Products
   BusEq: Business Equipment -- Computers, Software, and Electronic Equipment
   Telcm: Telephone and Television Transmission
   Utils: Utilities
   Shops: Wholesale, Retail, and Some Services (Laundries, Repair Shops)
   Hlth: Healthcare, Medical Equipment, and Drugs
   Money: Finance
   Other: Everything Else -- Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment

Table 3: The optimal asset weights when expected returns are computed using historical average

Asset	Historical return	Optimal weights	Market implied return	market weights
Cbond	5.95%	21.54%	3.35%	16.67%
LTG	5.53%	-54.34%	3.32%	8.33%
ITG	5.45%	119.76%	3.15%	8.33%
SB	13.02%	6.24%	5.84%	22.06%
B	11.14%	8.08%	5.39%	11.84%
N	11.16%	-4.50%	5.44%	10.65%
S	12.17%	4.72%	5.54%	5.91%
SS	12.20%	-1.49%	5.85%	16.22%

Table 4: views

P								Q	Ω					
0	0	0	0.33	0.18	0.16	0.09	0.24	0.0634	0.0012	0	0	0	0	0
-0.5	-0.25	-0.25	0.33	0.18	0.16	0.09	0.24	0.04	0	0.0009	0	0	0	0
0	0	0	1	0	0	0	0	0.0834	0	0	0.0009	0	0	0
0	0	0	0	1	0	0	0	0.0784	0	0	0	0.0036	0	0
0	0	0	0	0	0	1	0	0.0484	0	0	0	0	0.0036	0
0	0	0	0	0	0	0	1	0.0434	0	0	0	0	0	0.0009

Table 5: Expected returns and optimal asset allocation conditional on the views

Asset	Expected return cond. on the views	optimal weights cond. on the views	Change from the market weights
Cbond	3.36%	14.33%	-2.34%
LTG	3.33%	7.16%	-1.17%
ITG	3.15%	7.16%	-1.17%
SB	6.14%	28.83%	6.78%
B	5.62%	13.79%	1.95%
N	5.68%	11.06%	0.41%
S	5.77%	5.51%	-0.40%
SS	6.08%	12.15%	-4.06%

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MONEY

What Wall Street's Best Are Telling Their Clients

**Investment Firms Push
Large Stocks and Short Bonds;
A Comeback for Telecom?**

By JANE J. KIM
Staff Reporter of THE WALL STREET JOURNAL
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Wall Street's annual race to predict what will happen in the markets over the next 12 months is on.

In recent weeks, major banks have been presenting their biggest clients with forecasts as well as asset-allocation and investment strategies geared to 2005. **Goldman Sachs** Group Inc. sees the Standard & Poor's 500-stock index at 1325 by year-end (it closed yesterday at 1190), while Bank of America Securities, a unit of **Bank of America** Corp. has a target of 1200. Prudential Equity Group, a unit of **Prudential Financial** Inc., is bullish on energy stocks; PNC Advisors, the investment-management arm of **PNC Financial Services Group** Inc., is unenthusiastic about them.

But, from a review of what some of the biggest outfits are recommending, a number of common themes and strategies emerge. Most agree that the economy will grow at a steady if somewhat slower pace -- with stock returns, like last year's, in the mid-to-upper single digits. Nearly all advocate putting more money overseas and, given the likelihood of higher interest rates, shifting to bonds with shorter maturities. The general leaning is toward large-cap stocks -- rather than small-cap or medium-cap ones -- because they tend to hold up better in a slower economy.

FORECASTING THE MARKET

See a chart[0] of what different firms are predicting -- and how they fared in their 2004 forecasts.

Technology stocks remain somewhat out of favor, with "cautious" outlooks on them from Bank of America, Merrill Lynch & Co. Inc., and Prudential Equity Group. By contrast, there is fairly widespread optimism about health-care stocks, and even the long-battered telecom sector is attracting new fans.

In recent years, the reports -- which are usually updated once a month -- have tended to fall on the conservative side. Typically, the forecasts are laid out by a firm's investment strategy team and then discussed and then voted on by a broader investment policy committee. Some say that process weeds out more-extreme views.

Indeed, stocks did better than most Wall Street analysts expected last year. The consensus estimate last year was that earnings would grow 12.8%, according to Thomson Financial. Instead, earnings are poised to grow 19.4% year over year.

WHAT'S AHEAD FOR 2005

COMPANY	OUTLOOK
Banc of America Securities	Says stocks look riskier this year and has cut its recommended allocation to 55%.

By and large, this year's reports are split into two camps. More-optimistic strategists see notable growth opportunities, noting that companies are sitting on piles of cash; that bodes well for increased business spending and for mergers and acquisition activity. The doubters worry about slowing profits, widening U.S. budget and trade deficits, rising interest rates and the specter of inflation.

Here is what Wall Street's best and brightest say is in store for what is

Goldman Sachs	Says the projected increases in inflation and interest rates will not prevent further gains in U.S. stock prices.
Lehman Brothers	Recommends that investors hold 65% in stocks, 20% in bonds and 15% in cash this year.
Merrill Lynch	More bearish than most other firms. Recommends that investors hold 45% in stocks, 45% in bonds and 10% in cash.
Morgan Stanley Individual Investor Group	Expects stocks to trade in a tighterrange over the next few years, with equity markets delivering returns of about 6% to 8% annually.
PNC Advisors	Expects 10% total returns from stocks, says international equities will outperform U.S. stocks.
Prudential Equity Group	Has a bearish position on bonds and advises a tilt toward value and large-cap stocks
Smith Barney	Says stocks will rally;recently raised its '05 price target for S&P 500 to 1300

already shaping up to be a bumpy year.

Stocks

By and large, Wall Street is recommending that investors put more money into stocks. But they will have to work a little harder at finding the right companies.

That is why investors may want to consider sectors in which consumer demand isn't likely to wane even if the economy is sluggish, such as health care and consumer staples like food, beverage and tobacco. After a tough year, the health-care sector is relatively cheap right now, and long-term demographic trends and rising health care costs make the sector an attractive place to invest in, says Benjamin Pace, U.S. chief investment officer for Deutsche Bank's Private Wealth Management Group, a unit of **Deutsche Bank** AG. He likes biotech companies such as **Gilead Sciences** Inc., which he says has a strong product line. Meanwhile, automotive, retailing and restaurant companies may suffer if consumers have less discretionary income to spend this year.

Companies' strong balance sheets should boost spending on machinery, plants and equipment. That would benefit industrial companies such as **Union Pacific** Corp., whose business of transporting goods, such as shipping coal to power plants or grain to western ports, is picking up, Mr. Pace says.

Lehman Brothers, for example, added **General Electric** Co. to its Core and Growth U.S. Equity Strategy model portfolios last month. Tom Wirth, a portfolio manager at Chemung Canal Trust Co., says he has "significantly increased" the firm's position in GE and expects industrials and basic materials companies to lead the markets this year. Energy stocks, such as **Schlumberger** Ltd., should also do well given the outlook for increased drilling activity, says David Darst, chief investment strategist at **Morgan Stanley**'s Individual Investor Group.

Large-capitalization stocks, generally thought of as higher quality, are often a favorite in periods where profits are decelerating. Much of Wall Street thinks these stocks as a whole are attractively valued relative to small-cap value stocks, which have had a strong run over the past several years. Current valuations make companies with a market cap between $10 billion to $50 billion more attractive than small-capitalization stocks or even megacap stocks worth more than $100 billion, Mr. Darst says. That means investors should choose a company like a **Target** Corp. over a **Wal-Mart Stores** Inc., for example, or an **Allergan** Inc. rather than one of the big drug companies, he suggests.

Within international markets, investors should increase their allocation to emerging markets such as Asia and, to a lesser extent, Latin America, from Europe and Japan, whose economies are expected to grow more slowly, says Arun Motianey, director of investment research at Citigroup Private Bank, a unit of **Citigroup** Inc.

Bonds

Rising interest rates and higher inflation are generally bad news for bonds. The value of existing bonds drops, since investors can get higher interest payments on new bonds. As a result, many experts are advising investors to trim their bond exposure, or at least move to bonds with shorter durations, which are less volatile. Citigroup Private Bank downgraded its short-term view on U.S. Treasurys to "bearish" last month. Many have also grown more cautious on high-yield, or junk, bonds, whose yields are no longer as attractive, relative to their risk.

The best opportunities in fixed income, strategists say, are abroad. PNC Advisors' chief investment strategist Jeff Kleintop, who expects close to zero returns on bonds, last month recommended international bonds, given his outlook for a decline in the dollar and the fact that interest rates are unlikely to rise as much in Europe and Japan as they will in the U.S.

Mortgage-backed bond funds, which invest in pools of home-mortgage securities, are also a good opportunity given that rates are rising, says Mary Miller, director of fixed income at **T. Rowe Price Group** Inc. That is because their higher yields will serve to cushion any price drops and there is less chance that homeowners will pay off their mortgages early. One such fund is Accessor Mortgage Securities, which is highly rated by investment researcher Morningstar Inc. Municipal-bond funds are also attractive for tax-conscious investors since the funds are relatively cheap compared with taxable alternatives.

Many firms also recommend Treasury Inflation Protected Securities. These vehicles are a good hedge against rising prices because their principal payments, unlike those of ordinary Treasurys, are adjusted every six months for inflation.

Alternative Investments

A number of strategists are increasing their recommended dose of alternative investments -- such as commodities and hedge funds. A "voracious" demand for commodities, especially from markets such as China and India that are building up the infrastructure in their countries, is likely to help keep the price of commodities relatively high for at least next three to five years, Mr. Pace of Deutsche Bank says. The bank, for example, is recommending that clients invest in commodities such as oil, gas, gold, silver, aluminum, steel and other so-called soft commodities, such as soybeans, wheat and corn. Investors can also buy mutual funds that invest in commodities or an exchange-traded fund such as iShares Goldman Sachs Natural Resources Index, he notes.

Last week, Morgan Stanley raised its recommended allocation to private equity and venture-capital funds, given a stronger climate for initial public offerings and mergers and acquisitions. The firm, however, has a cautious view on real estate investment trusts, which had a strong run last year, given valuations and the outlook for rising interest rates.

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What the Strategists See for 2005

Many Wall Street investment advisers predict stocks will have a good, but not great, year, and most are bearish on bonds. Here's what they're telling their clients to expect this year, and how their stock targets for 2004 fared. (The actual year-end close of the Dow Jones Industrial Average was 10783, while the S&P 500 closed at 1212.) Asset-allocation recommendations are typically for an investor with a moderate-risk tolerance.

FIRM	OVERALL STOCKS	OVERALL BONDS	SECTORS	WHAT IT SAID IN 2004
Banc of America Securities	Stocks are a riskier bet in 2005. Recommended allocation: 55% stocks. DJIA: 11000; S&P 500: 1200.	Investors should have at least 10% of their portfolio in Treasury Inflation Protected Securities, 10% in bonds and 25% in cash.	Favors the energy, materials, consumer-staples, health-care and financial sectors. Cautious on technology, consumer discretionary, telecommunications and utilities.	DJIA: 11000; S&P 500: 1160
Goldman Sachs	Economic and profit growth to continue in 2005; says projected increases in inflation and interest rates will not prevent further gains in U.S. stock prices. Asset allocation: 75% stocks. S&P 500: 1325.	Stocks will outperform bonds. The firm's model portfolio is underweight fixed income and is neutral on commodities.	Likes sectors that favor economic growth, notably information technology, and says health care offers attractive value right now. Cautious on consumer staples and utilities.	S&P 500: 1250
Lehman Brothers	Raised earnings target for S&P 500 to 7.9% earnings growth this year, up from 7.6%. Asset allocation: 65% stocks. S&P 500: 1300.	Sees the 10-year Treasury note yield at 5% by year-end. Recommends 20% bond allocation.	Likes industrials and materials and dislikes consumer staples and utilities.	S&P 500: 1150
Merrill Lynch	The firm is more bearish than most, with a 12-month	Recommends that investors hold 45% in stocks, 45% in bonds and	Favors consumer staples, utilities, health care and	S&P 500:

	expected return of 3% and a 12-month S&P 500 target of 1240.	10% in cash. Says stocks and bonds have posted historically similar returns.	telecommunications and cautions against tech, consumer cyclicals and materials.	1010
Morgan Stanley Individual Investor Group	Expects stocks to trade in a tighter range over the next few years, with equity markets delivering returns of about 6% to 8% annually. S&P 500: 1250. Asset allocation: 45% stocks.	Projects 2% total returns for U.S. fixed income, with a 4% return on coupons and a 2% capital loss on prices as interest rates rise. Recommends 28% allocation in fixed income, 24% in alternative investments, 3% cash.	Favors capital goods, diversified financials and health-care equipment and services. Cautious on autos and auto components, retailing and technology.	N/A
PNC Advisors	Expects stocks to return a 10% this year (including dividends) and says international equities will outperform U.S. stocks. S&P 500: 1275 to 1325.	Expects U.S. bonds will produce near-zero returns, underperforming an expected 3% return on cash. Recommends that investors hold 70% in stocks and 30% in bonds.	Likes basic materials, industrials and financials but is cautious on energy and utilities.	S&P 500: 1125 to 1200
Prudential Equity Group	Advises a tilt toward value and large-cap stocks. S&P 500: 1250. Asset allocation: 60% stocks.	Has a bearish position on bonds. Recommends 20% bond allocation and 10% in cash.	Likes the energy and telecommunications sectors and is cautious on technology and consumer-discretionary firms.	N/A
Smith Barney	Expects stocks will rally this year. S&P 500: 1300.	For 2005, predicts a flattening of the yield curve and only a modest rebound in long-term rates.	Recommends media, pharmaceuticals, biotech, managed-care; cautious on materials and capital goods.	S&P 500: 1025

Source: the companies

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