Alexander Hillert

Application of calendar-time portfolios: idiosyncratic volatility puzzle

Leibniz Institute for Financial Research SAFE
Research Data Center

Agenda

1. Idiosyncratic volatility puzzle
2. Ang et al. (2006): replication in Stata
3. Replication and out-of-sample results

Idiosyncratic volatility puzzle (1)

Idiosyncratic volatility (IVol) and cross-section of expected stock returns

- Idiosyncratic risk can be eliminated through diversification.
- In the Capital Asset Pricing Model, idiosyncratic volatility is unrelated to expected returns.
- When sorting stocks by IVol we expect no difference in average (risk-adjusted) returns of the high-IVol and low-IVol portfolio.

Idiosyncratic volatility puzzle (2)

IVol and cross-section of stock returns – empirical analysis

- Ang et al. (2006) analyze the IVol-return relation empirical using calendar-time portfolios.
- IVol is the standard deviation of residuals in a regression of daily excess returns in the Fama and French (1993) 3-factor model.
- Formation frequency: monthly, i.e., at the end of each month, IVol is estimated and quintile portfolios are formed.
- Holding period: one month.
- Value-weighted portfolio returns.
- Sample period: July 1963 to December 2000.
- Stock data come from CRSP.

IVol anomaly – Introduction (3)

IVol and cross-section of stock returns – empirical results

- Portfolio 1 (5): 20% of stocks with lowest (highest) IVol.
- Average return of the low-IVol (high-IVol) portfolio is 1.04% (-0.02%) per month.
- High-minus-low portfolio yields -1.06% per month (t-statistic of -3.10).
- Return difference becomes even larger after adjusting for systematic risk in the CAPM or Fama/French (1993) 3-factor model (-1.38% and -1.31%, respectively).
- Standard deviation of portfolio returns increases from 3.83% to 8.16%.

Excerpt from Panel B of Table VI in Ang et al. (2006).

Rank	Mean	Std. Dev.	CAPM Alpha	FF-3 Alpha
1	1.04	3.83	0.11	0.04
			[1.57]	[0.99]
2	1.16	4.74	0.11	0.09
			[1.98]	[1.51]
3	1.20	5.85	0.04	0.08
			[0.37]	[1.04]
4	0.87	7.13	−0.38	−0.32
			[−2.32]	[−3.15]
5	−0.02	8.16	−1.27	−1.27
			[−5.09]	[−7.68]
5-1	−1.06		−1.38	−1.31
	[−3.10]		[−4.56]	[−7.00]

Agenda

1. Idiosyncratic volatility puzzle
2. Ang et al. (2006): replication in Stata
3. Replication and out-of-sample results

Replication in Stata

Replication of Ang et al. (2006)'s result

- I will show you a replication in Stata.
- My replication code is available on the SAFE Data Center webpage.
- To run the code, you need to have access to the CRSP stock market database.

- In this video, we will focus only on the portfolio sort.
  → IVol estimation will be explained in a separate video.

Agenda

1. Idiosyncratic volatility puzzle
2. Ang et al. (2006): replication in Stata
3. Replication and out-of-sample results

Replication result

Replication result

IVol quintile	Mean	Std. Dev.
1	1.04%	3.82%
2	1.16%	4.71%
3	1.20%	5.85%
4	0.83%	7.10%
5	-0.03%	8.15%
5-1 return	-1.06% *(-3.21)*	
5-1 CAPM Alpha	-1.38% *(-4.68)*	
5-1 FF-3 Alpha	-1.34% *(-7.30)*	

Original result

Rank	Mean	Std. Dev.	CAPM Alpha	FF-3 Alpha
1	1.04	3.83	0.11	0.04
			[1.57]	[0.99]
2	1.16	4.74	0.11	0.09
			[1.98]	[1.51]
3	1.20	5.85	0.04	0.08
			[0.37]	[1.04]
4	0.87	7.13	−0.38	−0.32
			[−2.32]	[−3.15]
5	−0.02	8.16	−1.27	−1.27
			[−5.09]	[−7.68]
5-1	−1.06		−1.38	−1.31
	[−3.10]		[−4.56]	[−7.00]

Excerpt from Panel B of Table VI in Ang et al. (2006).

- Close to perfect replication of Ang et al. (2006)'s results. ☺
- Differences could arise from changes in CRSP data due to error corrections.

Out-of-sample result

Out-of-sample test in the post 2000 period

- Ang et al. (2006)'s data ends in 2000.
  → we can perform an out-of-sample test from Jan 2001 to Dec 2023.

Results

- Low-IVol stocks still outperform high-IVol stocks after risk adjusting returns.
- Return difference smaller than in original sample period.
  → consistent with McLean and Pontiff (2016).

IVol quintile	Mean	Std. Dev.
1	0.80%	3.92%
2	0.78%	5.11%
3	0.77%	6.40%
4	0.61%	7.93%
5	0.51%	9.77%
5-1 return	-0.29%	
	(-0.60)	
5-1 CAPM Alpha	-0.87%	
	(-2.24)	
5-1 FF-3 Alpha	-0.94%	
	(-2.91)	

References

- Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006). The cross-section of volatility and expected returns. The journal of Finance, 61(1), 259-299.
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1), 3-56.
- McLean, R. D., & Pontiff, J. (2016). Does academic research destroy stock return predictability?. The Journal of Finance, 71(1), 5-32.

Thank you very much for watching!

Questions and feedback are very welcome!

Contact us at datacenter@safe-frankfurt.de.