Predicting Time Series Stock Returns with Accounting Quality

Transparently Risk Scores as predictors of Future Stock Returns

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The Transparently Risk Engine is employed to generate monthly point-in-time accounting quality risk scores for listed companies from January 2000 to October 2024. The underlying AI/ML model is re-estimated each month only employing data available up to that month. These risk scores are then compared with future 1, 3, 6, 9, 12, 24 and 36 month returns. Importantly, we are not trying to produce a single universal investment strategy, The focus is on evidencing that Transparently's Risk Score is a robust and significant predictor of future stock returns. This is the case. Across all forms of analysis employed we see very strong and statistically significant relationships between the Transparently Risk Score and future stock returns. For example, the overall future 12 month median return spread between decile 1 (low risk) and decile 10 (high risk) companies is 26.7%. Substantial alphas are also evident in regressions of risk score portfolio return spreads against Fama-French factor portfolio returns. The effects are especially strong for Developed Markets, Asia Pacific ex Japan, North America and Europe portfolios. However, there are also significant relationships evident for Emerging Markets.

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Contents

1.0 Introduction

We investigate the relationship between portfolios formed on Transparently Risk Score rankings and future returns.

The universe analysed is comprised of all stocks listed globally anytime from January 2000 until October 2024, excluding banks and insurers, stocks with less than 3 years of financial data and any stocks with insufficient financial data to populate the Transparently Risk Engine [TRE].

While not all stocks have all modelled datapoints, minimum data requirements are in place. For companies that meet the minimum data requirements but where the full dataset is incomplete, the TRE employs a range of missing data protocols to include these stocks in the universe investigated.

This results in a total of 61,306 unique companies and approximately 7.5 million months of observations.[1]

2.0 Process

The Transparently Risk Engine is employed to generate risk scores (accounting quality measures) for each company within each month. These are calculated as point-in-time estimates. In other words, only data available at month end (as determined by announcement dates for company financials) is employed and the entire AI/ML system is re-estimated each month on those respective datasets.

This simulates true historical values for risk scores from the TRE.

A selection of companies are identified as “known manipulators”. These are companies that represent famous examples of historical fraud/manipulative activity. Given these are important for model training, and to remove any model bias, these are deleted from all results presented in this paper.

[1] For more detailed information please refer to *Predicting Corporate Collapse with Accounting Quality, Transparently Risk Scores as predictors of Corporate Collapse*, H. Macalister, 2023.

3.0 Results

3.1 Full universe

Firstly we generate decile scores within each month of observations for both risk scores and future returns. We calculate time series of 1, 3, 6, 9, 12, 24 and 36 month returns for each company and then lead these by a matching period length.

For example, 12 month returns represent the return generated over the 12 month period AFTER each company risk signal is generated by the TRE. We use these returns to model the information contained in the TRE risk signals for future stock returns.

Correlations between risk signal deciles (1-10) and future return deciles (1-10) are provided in table 1. Results are provided for both absolute and relative (compared with a benchmark return that varies by market) returns.

Note that **all correlations are negative. A higher risk score is associated with a worse future return outcome.** In regressions of return deciles on score deciles, the estimated coefficient is very strongly statistically significant for all return periods examined.

Hence, categories of estimated risk are strongly associated with categories of future returns.

Table 1. Correlations between Transparently Risk Score deciles and future return (1-36 month periods) deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The return performance over subsequent 1, 3, 6, 9, 12, 24 and 36 month periods is similarly grouped into deciles. The table provides the correlation coefficients for the risk score deciles and the future return deciles for both absolute and relative returns.

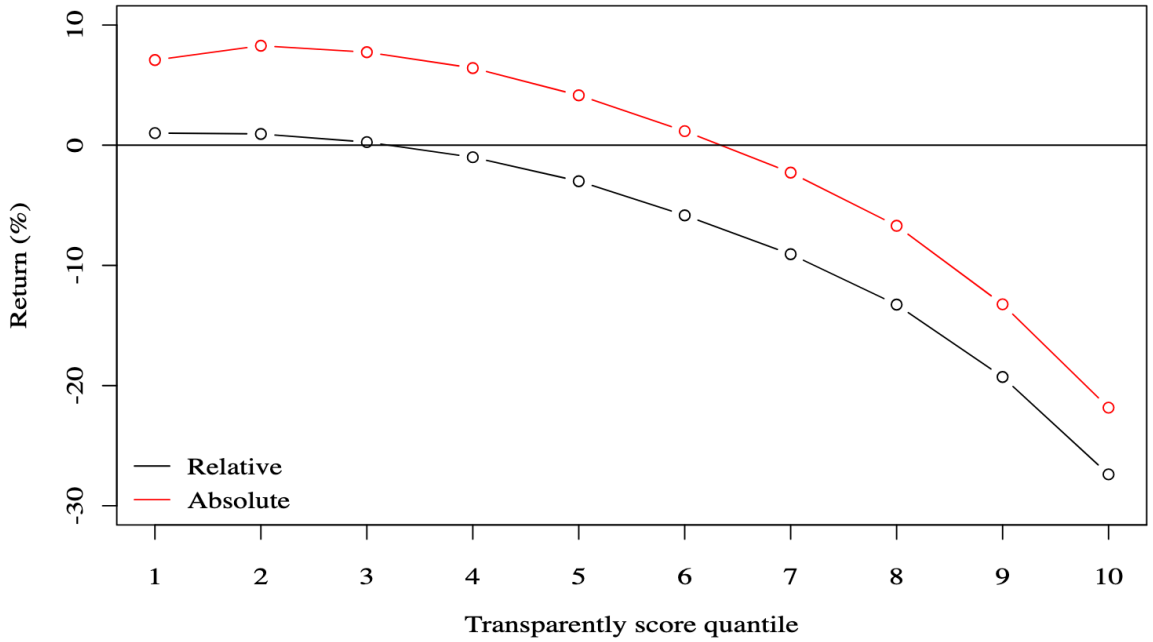
Future return period (months)	1	3	6	9	12	24	36
Relative return correlation	-0.09	-0.13	-0.16	-0.18	-0.19	-0.23	-0.26
Absolute return correlation	-0.08	-0.12	-0.15	-0.17	-0.18	-0.22	-0.24

Source: Transparently Pte Ltd

In Figure 1 we can see 12 month future median returns (absolute and relative) across the full universe and time period investigated for each decile of the Transparently risk score. We can clearly see the strong negative relationship between score decile and future 12 month returns. Also note that this is a non-linear relationship, with high risk score deciles associated with progressively stronger implications for future returns. This effect is evident in all return periods evaluated.

Figure 1. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 2 provides the differences in median relative returns between decile 1 risk scores and decile 10 risk scores for each return period. **The difference in future returns between high risk scores and low risk scores increases from 3.3% over 1 month periods to 26.7% over 12 month periods to 52.6% over 36 month periods.** This is also represented in terms of absolute returns in Figure 1. Notice the strong relationship between score quantile and future return across all return periods.

Table 2. 12 month future return spreads for portfolios formed on Transparently Risk Score deciles (lowest risk decile less highest risk decile)

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future return is calculated over a range of return periods. The spread between the median return for the lowest risk decile (D1) and the highest risk decile (D10) are presented.

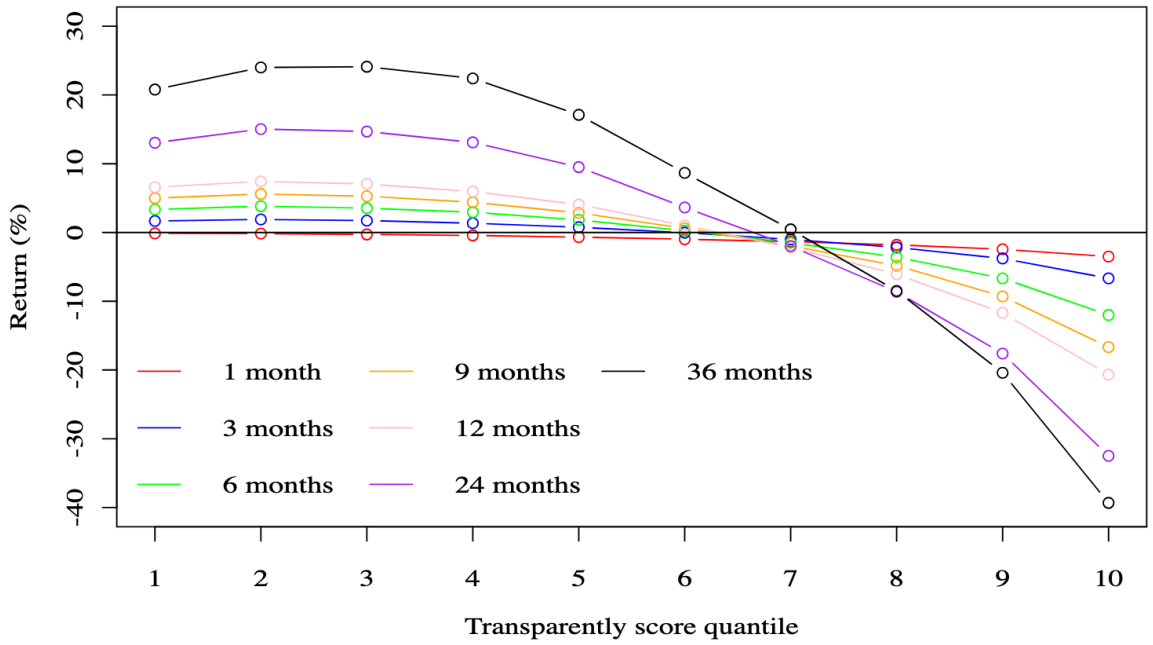
Future return period (months)	1	3	6	9	12	24	36
Spread returns	3.3%	8.7%	15.5%	21.5%	26.7%	42.1%	52.6%

Source: Transparently Pte Ltd

Figure 2 illustrates median absolute returns across all risk score deciles for each of a 1, 3, 6, 9, 12, 24 and 36 month holding period. Note that **all return periods exhibit similar characteristics. Higher risk scores are associated with more adverse return outcomes, and that effect increases with the risk score.**

Figure 2. Median future returns for portfolios formed on Transparently Risk Score deciles across 1-36 month return periods

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future return is calculated for 1, 3, 6, 9, 12, 24 and 36 month periods. Median decile returns are presented for each return period.



Source: Transparently Pte Ltd

Similar behaviour is also evident in mean returns, albeit with lower spread values. Table 3 provides mean returns (5% winsorisation) for each return period, along with *t* statistics in parentheses. All returns are statistically significant at the 10% level or better.

Table 3. 12 month future mean return spreads for portfolios formed on Transparently Risk Score deciles (lowest risk decile less highest risk decile)

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future return is calculated over a range of return periods. The spread between the mean return for the lowest risk decile (D1) and the highest risk decile (D10) are presented. *t* statistics are in parentheses and those in bold are statistically significant at the 10% level or better.

Future return period (months)	1	3	6	9	12	24	36
Spread returns	**0.9**	**2.2**	**3.2**	**3.6**	**4.0**	**7.4**	**18.4**
	(2.5)	**(2.9)**	**(2.6)**	**(2.1)**	**(2.0)**	**(2.7)**	**(7.7)**

Source: Transparently Pte Ltd

These results provide **evidence of a robust relationship between the Transparently Risk Score and future stock returns** across all holding periods examined.

The following sections provide summary results for a selection of different stock universes, size ranges and date ranges.

Results are also provided for regressions of Transparently spread returns on Fama-French factor portfolio returns to examine whether there is statistically significant alpha. In all cases examined this is shown to be the case.

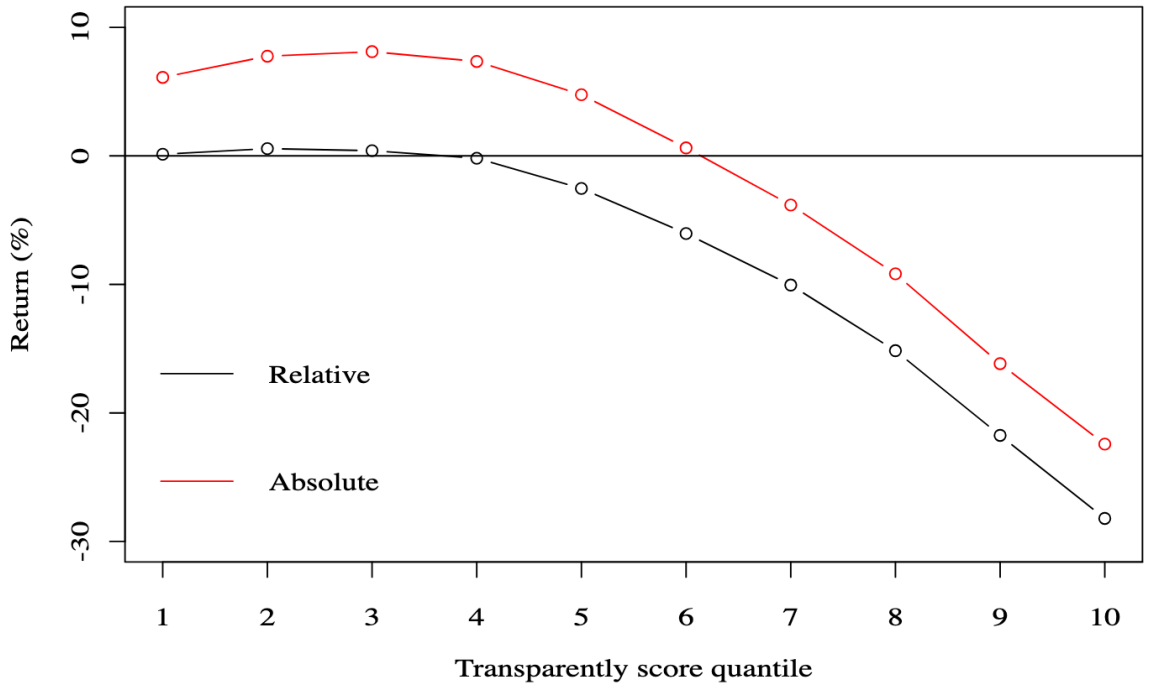
3.2 Developed Markets

Key observations:

- Higher Transparently Risk Scores are strongly associated with more adverse return outcomes.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 28.5%.**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across large caps and small caps and over the two sub-periods examined.**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 3. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 4. Portfolio return spreads for Developed Market portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	-0.1	-3.6	3.5	0.5	-2.5	3.0
3 months	-0.1	-9.3	9.2	1.5	-7.2	8.7
6 months	0.0	-16.5	16.5	3.1	-13.0	16.1
9 months	0.1	-22.8	22.8	4.7	-18.2	22.8
12 months	0.1	-28.2	28.3	6.1	-22.4	28.5
24 months	0.2	-43.7	43.9	12.0	-35.1	47.1
36 months	0.7	-54.3	57.9	18.90	-42.9	61.8
Market cap ranges for 12 month returns						
> 5b USD	-1.0	-27.5	26.5	6.8	-36.2	43.0
> 1b USD	-0.7	-30.8	30.1	6.5	-33.1	39.7
<= 1b USD	0.5	-28.2	-28.7	5.9	-22.3	28.2
Date ranges for 12 month returns						
Jan 2000 +	0.1	-28.2	28.3	6.1	-22.4	28.5
Jan 2010 +	-1.5	-34.3	32.8	6.2	-28.1	34.2

Source: Transparently Pte Ltd

Table 5. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**26.4**	**-0.6**	**-1.5**	0.1			
	(5.2)	**(-3.1)**	**(-3.9)**	(0.7)			
Est. coef.	**24.5**	**-0.5**	**-1.5**	0.2			0.3
	(5.2)	**(2.4)**	**(3.9)**	(1.0)			(1.1)
Est. coef.	**25.4**	**-0.5**	**-1.5**	0.3	0.3	0.0	
	(3.8)	**(-2.2)**	**(-3.6)**	(0.6)	(0.4)	(0.1)	
Est. coef.	**24.3**	**-0.5**	**-1.4**	0.4	0.3	-0.1	0.3
	(3.8)	**(-2.1)**	**(-3.5)**	(0.9)	(0.3)	(-0.2)	(1.0)

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

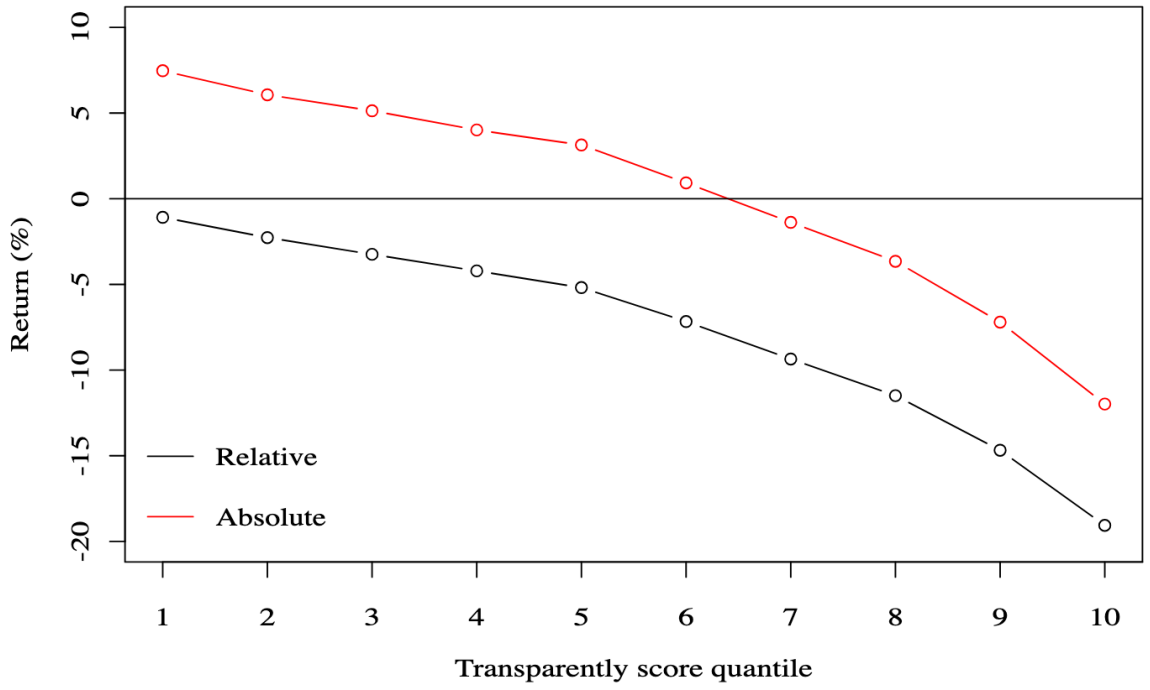
3.2 Emerging Markets

Key observations:

- Higher Transparently Risk Scores are strongly associated with more adverse return outcomes.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 19.5%.**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across large caps and small caps and over the two sub-periods examined (albeit slightly lower spreads for small caps).**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 4. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 6. Portfolio return spreads for Emerging Market portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	-0.3	-2.6	2.3	0.5	-1.6	2.1
3 months	-0.7	-6.5	5.8	1.8	-4.1	6.0
6 months	-1.0	-11.3	10.4	3.8	-7.1	10.9
9 months	-1.0	-15.5	14.5	5.5	-9.8	15.3
12 months	-1.1	-19.1	18.0	7.5	-12.0	19.5
24 months	-0.1	-29.7	29.6	15.9	-17.3	33.2
36 months	0.4	-37.0	37.4	26.9	-19.5	46.4
Market cap ranges for 12 month returns						
> 5b USD	-2.6	-24.6	22.0	4.5	-19.4	23.9
> 1b USD	-2.2	-26.9	24.6	5.6	-20.8	26.4
<= 1b USD	-0.7	-18.8	18.1	8.1	-11.6	19.7
Date ranges for 12 month returns						
Jan 2000 +	-1.1	-19.1	18.0	7.5	-12.0	19.5
Jan 2010 +	-2.3	-20.1	17.9	5.9	-13.2	19.0

Source: Transparently Pte Ltd

Table 7. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**16.9**	**-0.2**	-0.2	-0.1			
	(9.5)	**(-2.1)**	(-1.3)	(-1.0)			
Est. coef.	**16.6**	**-0.1**	-0.2	-0.1			0.0
	(11.3)	**(-2.0)**	(-1.3)	(-0.8)			(0.6)
Est. coef.	**18.0**	-0.1	-0.2	-0.2	-0.3	0.3	
	(12.2)	(-1.4)	(-1.3)	(-0.8)	(-1.2)	(0.9)	
Est. coef.	**17.9**	-0.1	-0.2	-0.1	-0.3	0.2	0.0
	(12.2)	(-1.4)	(-1.3)	(-0.7)	(-1.1)	(0.9)	(0.4)

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

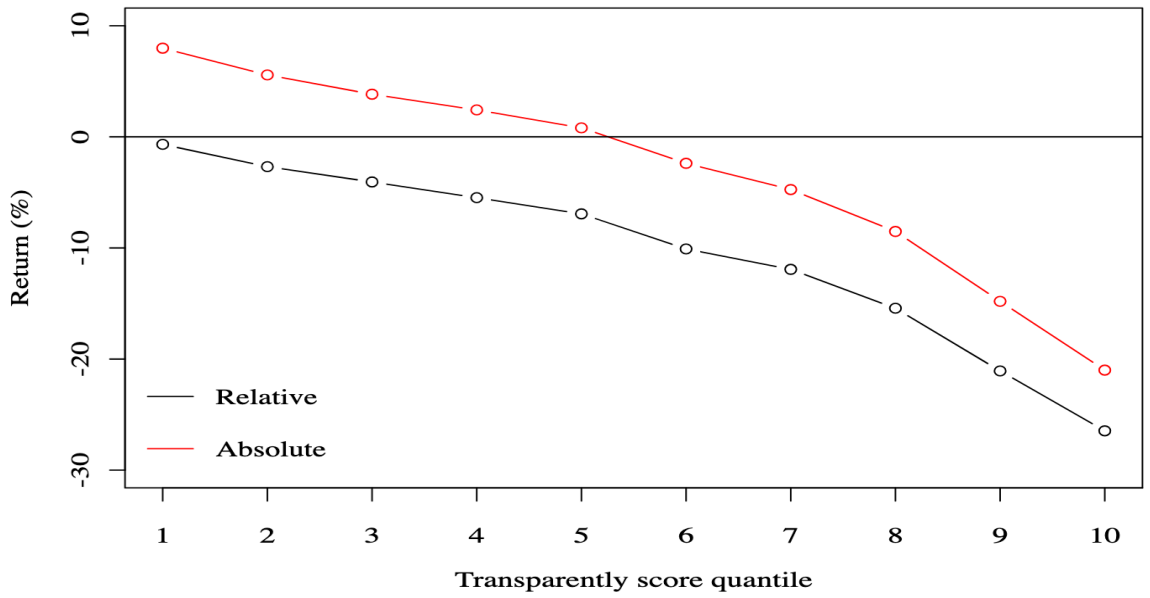
3.3 Asia Pacific ex Japan

Key observations:

- Companies listed in Australia, China, Hong Kong, New Zealand, Singapore and Taiwan.
- Higher Transparently Risk Scores are strongly associated with more adverse return outcomes.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 29.0%.**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across large caps and small caps and over the two sub-periods examined.**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 5. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 8. Portfolio return spreads for Asia Pacific ex Japan portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	-0.3	-3.3	3.0	0.6	-2.3	3.0
3 months	-0.6	-8.9	8.3	2.0	-6.8	8.7
6 months	-0.7	-15.7	15.0	4.0	-12.3	16.3
9 months	-0.6	-21.5	20.9	6.0	-17.2	23.2
12 months	-0.7	-26.5	25.8	8.0	-21.0	29.0
24 months	0.8	-41.1	41.9	16.5	-33.2	49.7
36 months	1.6	-51.5	53.1	27.9	-41.1	69.0
Market cap ranges for 12 month returns						
> 5b USD	-3.5	-27.0	23.5	4.8	-32.8	37.5
> 1b USD	-2.7	-31.1	28.3	5.7	-25.1	30.8
<= 1b USD	0.3	-26.4	26.7	9.1	-20.9	30.0
Date ranges for 12 month returns						
Jan 2000 +	-0.7	-26.5	25.8	8.0	-21.0	29.0
Jan 2010 +	-0.9	-28.5	27.5	6.3	-24.1	30.5

Source: Transparently Pte Ltd

Table 9. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**22.7**	**-0.3**	**-0.9**	-0.18			
	(5.4)	**(-2.2)**	**(-3.33)**	(-1.3)			
Est. coef.	**20.7**	-0.3	**-0.9**	-0.2			0.3
	(5.9)	(-1.6)	**(-3.1)**	(-0.9)			(1.3)
Est. coef.	**27.4**	**-0.4**	**-0.9**	-0.4	-0.9	0.3	
	(7.4)	**(-1.7)**	**(-2.8)**	(-0.3)	(-1.4)	(0.4)	
Est. coef.	**26.1**	**-0.4**	**-0.9**	0.0	-0.9	0.1	**0.3**
	(6.9)	**(-1.7)**	**(-2.9)**	(0.1)	(-1.6)	(0.1)	**(1.7)**

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

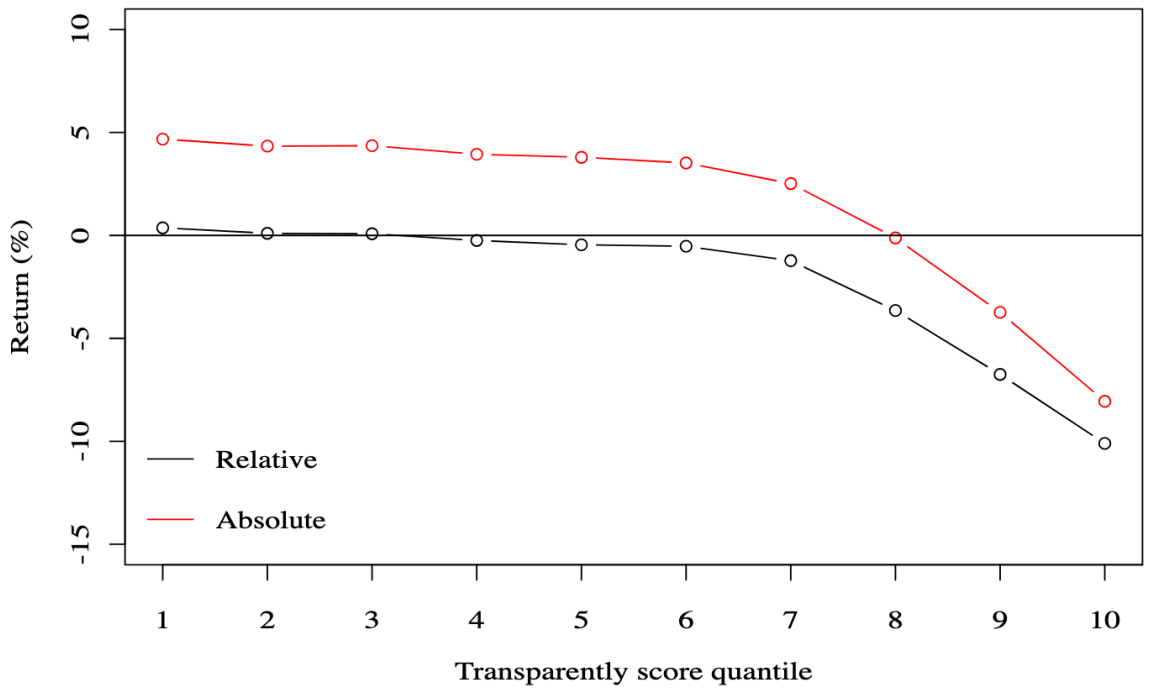
3.3 Japan

Key observations:

- Higher Transparently Risk Scores are strongly associated with more adverse return outcomes, although the effect is smaller than that observed in other stock universes evaluated.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 12.7%.**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across the two sub-periods examined and is stronger for mid-caps than for large-caps and small-caps.**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 6. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 10. Portfolio return spreads for Japan portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	0.0	-2.0	1.9	0.4	-1.5	1.9
3 months	0.0	-4.4	4.4	1.2	-3.4	4.6
6 months	0.1	-6.9	7.0	2.4	-5.4	7.9
9 months	0.3	-8.7	9.0	3.6	-6.8	10.4
12 months	0.4	-10.1	10.5	4.7	-8.1	12.7
24 months	0.3	-15.2	15.5	9.8	-10.1	19.8
36 months	1.0	-18.3	19.3	16.3	-8.5	24.8
Market cap ranges for 12 month returns						
> 5b USD	-2.2	-15.5	13.2	0.6	-14.0	14.6
> 1b USD	-1.7	-26.9	25.2	3.0	-25.6	28.6
<= 1b USD	1.0	-9.9	10.9	5.2	-7.8	13.0
Date ranges for 12 month returns						
Jan 2000 +	0.4	-10.1	10.5	4.7	-8.1	12.7
Jan 2010 +	-1.4	-11.9	10.6	5.5	-6.5	12.0

Source: Transparently Pte Ltd

Table 11. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**11.1**	**-0.4**	**-0.7**	**-0.2**			
	(5.7)	**(-2.9)**	**(-3.3)**	**(-2.1)**			
Est. coef.	**10.6**	**-0.4**	**-0.7**	**-0.2**			0.1
	(5.5)	**(-2.7)**	**(-3.5)**	**(-1.9)**			(0.7)
Est. coef.	**9.0**	**-0.3**	**-0.7**	-0.1	**0.5**	-0.0	
	(3.2)	**(-2.3)**	**(-3.8)**	(-0.3)	**(1.8)**	(-0.0)	
Est. coef.	**8.8**	**-0.3**	**-0.7**	-0.1	**0.5**	-0.0	0.1
	(3.2)	**(-2.3)**	**(-4.0)**	(-0.2)	**(1.8)**	(-0.1)	(0.6)

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

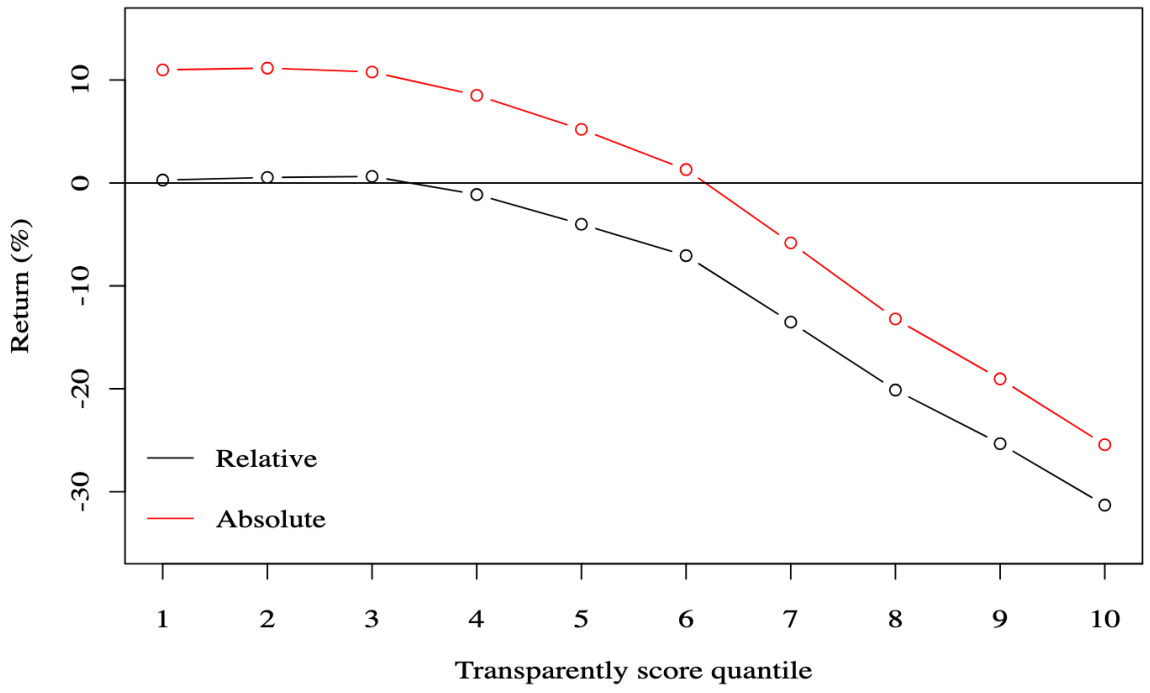
3.4 North America

Key observations:

- Higher Transparently Risk Scores are very strongly associated with more adverse return outcomes.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 36.4% (the strongest observed across all sub-groups examined).**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across the two sub-periods examined and is stronger for large-caps and mid-caps relative to small-caps.**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 7. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 12. Portfolio return spreads for North America portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	0.0	-3.9	3.9	1.0	-2.8	3.7
3 months	0.0	-10.2	10.2	3.0	-8.0	11.0
6 months	0.1	-18.3	18.4	5.8	-14.6	20.4
9 months	0.2	-25.3	25.5	8.5	-20.5	29.0
12 months	0.3	-31.3	31.6	11.0	-25.4	36.4
24 months	0.5	-48.3	48.8	21.6	-39.9	61.5
36 months	-0.1	-59.7	59.6	33.3	-48.9	82.3
Market cap ranges for 12 month returns						
> 5b USD	-1.4	-42.1	40.7	10.2	-49.2	59.4
> 1b USD	-0.6	-36.8	36.2	10.5	-43.7	54.2
<= 1b USD	2.2	-31.2	33.5	12.2	-25.3	37.5
Date ranges for 12 month returns						
Jan 2000 +	0.3	-31.3	31.6	11.0	-25.4	36.4
Jan 2010 +	-2.6	-40.3	37.6	10.4	-32.5	42.8

Source: Transparently Pte Ltd

Table 13. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**26.0**	**-0.5**	**-2.5**	0.3			
	(5.1)	**(-2.3)**	**(-3.5)**	(1.6)			
Est. coef.	**22.8**	-0.4	**-2.5**	**0.4**			0.4
	(4.3)	(-1.4)	**(-3.7)**	**(1.9)**			(1.5)
Est. coef.	**21.6**	-0.4	**-2.4**	0.4	1.0	0.2	
	(2.9)	(-1.2)	**(-4.5)**	(0.8)	(0.8)	(0.3)	
Est. coef.	**19.8**	-0.3	**-2.3**	0.7	0.9	-0.0	0.4
	(2.5)	(-0.9)	**(-4.6)**	(1.4)	(0.8)	(-0.0)	(1.3)

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

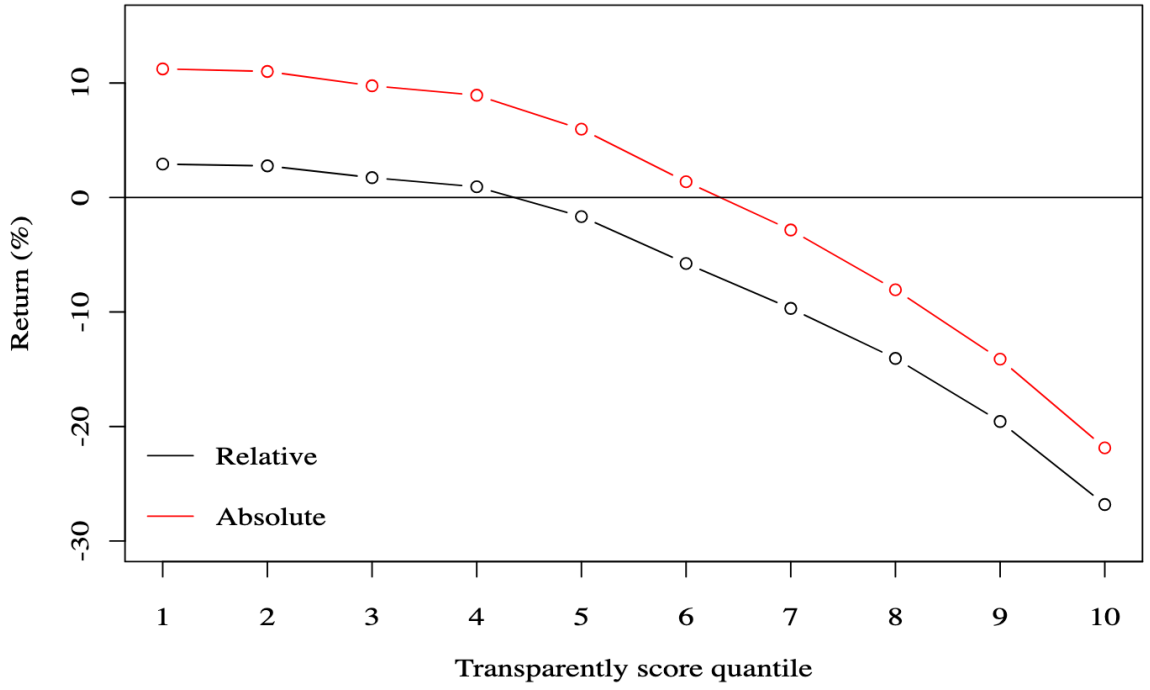
3.5 Europe

Key observations:

- Higher Transparently Risk Scores are very strongly associated with more adverse return outcomes.
- **The 12 month median future return spread between decile 1 and decile 10 risk score stocks is 33.1%.**
- This effect is evident across all return periods evaluated (1, 3, 6, 9, 12, 24 and 26 months).
- **This effect is evident across the two sub-periods examined and is stronger for mid-caps and small-caps relative to large-caps.**
- In Fama-French regressions there is a statistically significant alpha for the Transparently spread remaining after accounting for the equity risk premium, size, valuation, momentum, profitability, and investment levels.

Figure 8. Median 12 month future returns for portfolios formed on Transparently Risk Score deciles

Each month stocks are assigned a decile based on ranking by the Transparently Risk Score. The future 12 month return is calculated. Median decile returns are presented.



Source: Transparently Pte Ltd

Table 14. Portfolio return spreads for Europe portfolios

Each month companies are allocated to a risk score decile (D1 through to D10). Median returns are presented for decile 1, decile 10 and the difference between decile 1 and decile 10 returns.

	Relative			Absolute		
Return periods	D1	D10	D1 - D10	D1	D10	D1 - D10
1 month	0.1	-3.5	3.6	0.9	-2.7	3.6
3 months	0.5	-8.7	9.2	2.9	-7.1	9.9
6 months	1.4	-15.3	16.7	6.0	-12.5	18.4
9 months	2.2	-21.4	23.5	8.8	-17.5	26.3
12 months	2.9	-26.8	29.7	11.2	-21.9	33.1
24 months	5.5	-42.4	47.8	20.7	-34.8	55.5
36 months	8.4	-52.9	61.3	30.2	-43.7	73.9
Market cap ranges for 12 month returns						
> 5b USD	1.4	-4.5	6.0	8.8	-6.0	14.8
> 1b USD	2.1	-28.1	30.2	10.0	-25.9	35.9
<= 1b USD	3.8	-26.8	30.6	12.5	-21.8	34.4
Date ranges for 12 month returns						
Jan 2000 +	2.9	-26.8	29.7	11.2	-21.9	33.1
Jan 2010 +	0.9	-29.8	30.7	8.5	-25.0	33.4

Source: Transparently Pte Ltd

Table 15. Regressions of 12 month spread returns on Fama-French factor portfolio returns

Monthly time series spreads for 12 month median returns in decile 1 less decile 10 are regressed on Fama-French factor portfolio returns for the matching universe selection. Regressions are of the form illustrated below, where *ERP* refers to equity risk premium, *SMB* represents small minus big portfolio returns, *HML* is high minus low book-to-price portfolio returns, *RMW* is robust versus weak (high minus low profitability) portfolio returns, *CMA* is conservative minus aggressive (low versus high investment firms) portfolio returns and *WML* represents winners minus losers (price momentum) portfolios.

$$Spread = \boldsymbol{\alpha} + \boldsymbol{\beta}_1 ERP + \boldsymbol{\beta}_2 SMB + \boldsymbol{\beta}_3 HML + (\boldsymbol{\beta}_4 RMW + \boldsymbol{\beta}_5 CMA + \boldsymbol{\beta}_6 WML) + \boldsymbol{\epsilon}$$

Estimated coefficients are provided for 4 regressions with different combinations of the independent variables. Newey-West standard errors are used to calculate *t* statistics (provided in parentheses) to account for autocorrelation. Coefficients in bold are statistically significant at the 10% level or better.

	Alpha	ERP	SMB	HML	RMW	CMA	WML
Est. coef.	**29.2**	**-0.4**	**-0.6**	**0.2**			
	(10.9)	**(-3.3)**	**(-1.8)**	**(1.8)**			
Est. coef.	**27.5**	**-0.3**	**-0.6**	**0.2**			**0.2**
	(13.0)	**(-4.2)**	**(-2.1)**	**(2.8)**			**(2.7)**
Est. coef.	**26.0**	**-0.3**	**-0.5**	0.3	**0.7**	-0.1	
	(10.3)	**(-1.9)**	**(-2.2)**	(1.0)	**(2.2)**	(-0.3)	
Est. coef.	**25.1**	**-0.3**	**-0.5**	0.4	**0.6**	-0.2	**0.2**
	(11.4)	**(-2.4)**	**(-2.4)**	(1.6)	**(2.3)**	(-0.7)	**(2.7)**

Source: Transparently Pte Ltd, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

4.0 Concluding Remarks

Key points:

- The Transparently Risk Engine is employed to generate monthly point-in-time accounting quality risk scores for listed companies from January 2000 to October 2024.
- The underlying AI/ML model is re-estimated each month only employing data available up to that month. These risk scores are then compared with future 1, 3, 6, 9, 12, 26 and 36 month returns.
- **Across all forms of analysis employed we see very strong and statistically significant relationships between the Transparently Risk Score and future stock returns.**
- **For example, the overall future 12 month median return spread between decile 1 (low risk) and decile 10 (high risk) companies is 26.7%.**
- Substantial alphas are also evident in regressions of risk score portfolio return spreads against Fama-French factor portfolio returns.
- The effects are especially strong for Developed Markets, Asia Pacific ex Japan, North America and Europe portfolios. However, there are also significant relationships evident for Emerging Markets.

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