AN EMPIRICAL INVESTIGATION OF BANK RISK-TAKING IN EMERGING MARKETS WITHIN A PROSPECT THEORY FRAMEWORK. A NOTE[1]

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Abstract

The purpose of this note is to investigate the validity of some behavioral conjectures as alternative explanations of bank risk-taking behavior. We especially focus on the different valuation of gains and losses relative to a reference point and the changing attitude toward risk conditional on the domain (gains vs. losses) features (Tversky and Kahneman, 1992). We follow a methodology based on Fiegenbaum and Thomas (1988) and the Fishburn (1977) measure of risk, applied to a sample of banks from emerging market economies. Results show that the Tversky and Kahneman (1992) framework could provide an alternative explanation of risk-taking behavior in the banking industry.

Key words: Cumulative Prospect Theory, bank risk taking, emerging market economies.
JEL Classification: C12, C31, D81, F39, G21.

1. Introduction

In order to investigate the deviations of agents from traditional finance models, relying on perfect information and coherent beliefs, behavioral finance models based on cognitive psychology propose specific features of agents' behavior, relaxing the individual rationality hypothesis (Shleifer, 2000; Barberis and Thaler, 2002).

Another crucial feature of a model that aims at explaining trading behavior for example is the hypothesis made on investors' preferences and the way they evaluate risky choices. *Prospect Theory* is one of such theories, due to Kahneman and Tversky (1979) and Tversky and Kahneman (1992). It is the most successful one because of its capacity to capture and fit results obtained in laboratory experiments. Its starting point is a critique of the expected utility theory as a descriptive model of decision making under risk. Following experimental results, agents usually under-weight the probable results compared to certain one (certainty effect), which implies risk aversion when gains are certain and risk loving when losses are certain. Agents also exhibit a lack of coherence in their preferences when the same choice is differently presented (isolation effect and framing).

The Prospect Theory's formulation provides several important features:

1) utility is defined on the gains and losses, and not on the final wealth value,
2) the evaluation function form, particularly its concavity in the gains domain – agents are risk-averse on the gains and risk loving on the losses – with a kink at the origin showing a greater sensibility to losses (loss aversion),
3) non-linear transformation of probabilities: small one are overestimated and agents are more sensible to differences of probabilities at higher probability's levels.

The principals of judgment and perception are possible thanks to the use of the value function. The value is treated as a function of two elements: the asset's value as a reference point and the amplitude of changing from this starting point.

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Prospect Theory features can be applied to study investors behavior (like insufficient or naive diversification or excessive trading) (see Odean, 1998; Odean, 1999; Barber and Odean, 2000, Barber and Thaler, 2001). It has also applications in corporate finance. For instance, Wiseman and Gomez-Mejia (1998) build a behavioral managerial risk taking agency model, through the linkage of corporate governance mechanisms and prospect theory features (especially framing). Their main contribution concerns an alternative risk formulation compared to the agency theory, based on loss aversion and not risk aversion.

In a behavioral framework, preferences will be unstable due to the framing feature, contrary to the agency theory that assumes constant preferences. The same choice can be presented in the potential gains or losses domain, altering traditional agency theory results. In this framework, changing the performance benchmark for the manager affects its reference point (translating the gains and losses domains), and therefore may adversely alter its risk taking behavior. In addition, the use of compensation mix in order to establish proper incentives for the manager, aligned with the principal interests, may also adversely affect agent's risk taking behavior in such a framework.

The application of behavioral finance features to investigate risk-taking in the banking industry is of central interest in this paper. As far as we know, this area has received scarce attention from the behavioral finance perspective[1], although risk-taking remains the core activity of banks. It has been proven that excessive risk taking[2] is the principal bank default factor (see for example Pantalone and Platt, 1987; and O.C.C., 1988). The last 20 years have witnessed several bank failures throughout the world, particularly in emerging market economies (EME) (Bell and Pain, 2000). The interest for bank failures comes mainly from its costs: financial losses for the stakeholders (shareholders, clients, and deposits insurance fund), loss of competitiveness, and a potential destabilization of the financial system, through the contagion mechanisms, when several individual failures lead to a banking crisis. The resolution of these failures is a waste of resources, particularly scarce in EME (Honohan, 1997)[3].

Several explanations of the excessive risk taking sources can be found in the literature[4]: inefficient corporate governance mechanisms (Gorton and Rosen, 1995; Knopf and Teall, 1996; Simpson and Gleason, 1999; Anderson and Fraser, 2000), inadequate bank capital regulation (see Jeitschko and Jeung, 2005), intense market competition (Keeley, 1990; Cordella and Yeyati, 2002; Repullo, 2004; Boyd and Nicolo, 2005), and an adverse regulatory, institutional and legal environment (Barth et al., 1999, 2000, 2001, 2002; La Porta et al., 1997, 1998, 2000).

Alternative explanations of excessive risk taking in banks seem neglected. As risk-taking decisions are made upon human subjective judgment and especially perception of risk, it seems quite natural to engage in the behavioral perspective to better investigate and understand this process. Effectively, the final decisions concerning credit approvals and loan terms are based on many different attributes, from which experience and the judgment of the credit staff continue to play a significant role (Crouhy et al., 2001).

Bowman (1980, 1982) findings are of particular interest in this perspective because they provide the basis of the so-called *risk-return paradox*. The prospect theory's feature stipulates that risk attitude is determined by the outcome's relation to a reference point and not the outcome's level. Therefore, some testable hypotheses are provided by Kahneman and Tversky (1979) framework: when performance is below a given target level, decision makers should be risk seeking, and when performance is above the target level, they should be risk-averse.

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[1] Shen and Chih (2005) empirically investigate earnings management in banks within a prospect theory framework.

[2] This can be defined as a level of risk-taking that amplifies the bank's probability of default above an acceptable level by the different partners of the bank, especially the shareholders and the regulator.

[3] For example, the banking crises in Indonesia (1997) and Thailand (1997-1998) cost about 50-55% and 42.3% of the GDP (fiscal contribution) respectively in terms of restructurization.

[4] See Godlewski (2006) for a survey.

Fiegenbaum and Thomas (1988) tested these predictions using accounting data, defining benchmark returns as median returns, and dividing the firms of their sample in two groups – above and below target. Their results strongly corroborated the presented prospect theory predictions.

Jegers (1991) replicates Fiegenbaum and Thomas (1988)'s methodology using Belgian accounting data, testing some new return and risk variables, like ROA (return on assets) in addition to ROE (return on equity), which should take into account managerial performance view, and cash flow on equity, and a coefficient of variation, defined as the standard deviation of returns divided by the average return, in addition to the variance of returns. Jegers (1991) calculates each firm's time average return, ranks firms according to these values, and divides the firms into 2 equally sized groups: those with above and respectively below target returns, the target being defined as the median return. Then, for each group, Spearman rank correlations between return and risk and the negative association ratio are calculated. The results corroborate those of Fiegenbaum and Thomas (1988).

Finally, Johnson (1994) also places his analysis of risk-taking in banks in a behavioral finance framework, following Fiegenbaum and Thomas (1988), and using Fishburn (1977) measure of risk, defined as dispersion about the mean outcome. Johnson (1994) tests several measures of return and risk for a sample of US commercial banks for the 1970-1989 period. He uses standard measures of return like ROA and ROE, as well as primary capital ratio. Risk is measured as standard deviation of outcome. The study aims at examining historical data to determine whether there is any evidence consistent with prospect theory, by measuring the relationship between outcome variability and distance from target. Targets are defined as the median values of return variables. Banks are classified in two separate groups according to this target, and correlation between distance to target and standard deviations are computed. The statistical tests are based on Kendall τ correlation coefficient. The obtained results also corroborate Fiegenbaum and Thomas (1988) conclusions.

Following this literature, we aim to empirically investigate risk taking in the banking industry in emerging markets in a *Cumulative Prospect Theory* framework. We focus on the banking industry in a specific framework – emerging market economies – where risk-taking behavior can become adverse, generating excessive risks and therefore amplifying bank's default probability, thus affecting negatively the whole economy. The specificities of these economies, mainly historical heritage (political, economic, social, moral, …), restructuring process in progress, rapidly evolving economic reality, inadequate regulatory, institutional and legal environment, may foster excessive risk taking, affecting the perception of risk by the bankers. For example, an evolving economic environment forces the banker to constantly adapt his appreciation of risk. An inadequate institutional or legal environment may bias banker's risk perception. Therefore, an investigation of this risk perception in a behavioral finance framework is important.

The rest of the note is organized as follows. Section 2 describes the methodology and the data used in this study. Section 3 presents the results and their discussion. Finally, section 4 concludes and proposes further research perspectives.

2. Methodology and data

In the present study, we follow Johnson (1994)'s methodology for the formalization of the tested hypothesis in order to provide empirical evidence dealing with bank risk taking based on prospect theory features.

We use a pooled sample of 894 commercial banks for the 1996-2001 period from two main areas of emerging market economies – South-East Asia and South and Latin America (see Table 1). The accounting data come from *Bankscope*.

Table 1

Banks' in sample frequency by country

Country	Banks	Frequency
Argentina	151	16.89
Bolivia	23	2.57
Colombia	104	11.63
Ecuador	63	7.05
Indonesia	68	7.61
Korea (South)	33	3.69
Mexico	95	10.63
Malaysia	82	9.17
Peru	100	11.19
Thailand	54	6.04
Venezuela	121	13.54
	894	100

Source: Bankscope.

We calculate several return and risk measures, following the existing literature, but also trying to propose some alternative measures. The definition of the variables used in this study and their descriptive statistics are provided in Table 2.

Table 2

Variables definition and descriptive statistics

Variable	Calculation	M.	Med.	S.D.	Min.	Max.
ROE	Net Income/Equity	-2,97	7,86	193,16	-4864,15	2057,90
ROA	Net Income/Total Assets	0,26	0,73	5,84	-112,21	23,66
EQTA	Equity/Total Assets	10,80	9,86	8,19	-120,92	53,45
SPREAD1	Interest Income/Total Loans	26,31	21,71	16,53	4,57	162,68
SPREAD2	Interest Income/Total Operating Income	11,62	8,50	10,07	1,53	111,01
NPLGL	Non Performing Loans/Gross Loans	11,09	7,40	11,50	0,00	89,59
LLRNPL	Loan Losses Reserves/Non Performing Loans	98,81	70,24	104,45	3,18	846,15
LLRGL	Loan Losses Reserves/Gross Loans	6,71	5,16	6,17	0,00	60,24
NLTA	Net Loans/Total Assets	57,04	57,41	13,69	25,38	92,35

M.: mean, Med.: median, S.D.: standard deviation, Min.: minimum, Max.: maximum.

Concerning the return measures, we use “traditional ones”, like the ROE (reflecting rather the shareholder point of view), the ROA (reflecting rather the management point of view) and the EQTA (reflecting the shareholder, the management and the regulator points of view). We also use SPREAD1 and SPREAD2 measures that focus more precisely on the bank's credit activity and should give a more adequate perspective on return in commercial banks.

Concerning the risk measures, apart from the standard deviations of the return variables discussed above, we also investigate the usefulness of standard deviations of the “loss measures” mainly NPLGL (reflecting a potential loss for the bank), LLRNPL, LLRGL (both reflecting management's

perception of risk and its coverage with reserves which alter the profitability of the bank) and NLTA (which reflects both potential future returns but also potential problems in term of reserves and/or losses).

We also investigate the framing issue, testing the correlations between risk and return measures in different domains – gains versus losses. Therefore, we test the significance of the correlation coefficient between measures of return and risk crossing the domains (gains and losses). The Kendall τ correlation coefficient measures the strength of the relationship between two variables, and like Spearman's rank correlation, is carried out on the ranks of the data. It ranges from +1 to -1, with a positive correlation indicating that the ranks of both variables increase together, whilst a negative correlation indicates that the rank of one variable increases the other one decreases. Its main advantage is the possibility for direct interpretation of the statistic in terms of probabilities of observing concordant or discordant pairs.

Our tests rely on time average and their standard deviations measures, as well as median of these variables. The medians of the employed measures represent the target levels – the reference points for the bank. We work with 9 zones which are: Zone 1 – ROE, Zone 2 – ROA, Zone 3 – EQTA, Zone 4 – SPREAD1, Zone 5 – SPREAD2, Zone 6 – NPLGL, Zone 7 – LLRNPL, Zone 8 – LLRGL, Zone 9 – NLTA.

3. Results and discussion

The Fishburn's measures of risk are the distance of the variable from the target level. For each zone, we split the sample in 2 areas: ABOVE and BELOW, corresponding respectively to banks above and below the target level – the median of the variable corresponding to the zone. In Tables 3 and 4, we compute Kendall τ correlation coefficients between the standard deviation of the variable and the distance to the target level corresponding to the zone and by area.

Table 3

Correlations results between standard deviation and distance to benchmark measures (gain domains)

Area	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
	(ROE)	(ROA)	(EQTA)	(SPREAD1)	(SPREAD2)
ABOVE	-0.0851**	-0.0962***	-0.0418	-0.1706***	-0.1498**
BELOW	0.1675	0.1772*	0.0115	0.0464	-0.0357

Kendall τ correlation coefficients between the standard deviation and the distance to median are shown for each zone, by area. ***, ** and *: statistically significant at 1%, 5% and 10% levels respectively.

Concerning the correlation results in the gain domains for the Zones 1-5, we observe significant and negative Kendall τ coefficients for each zone (except Zone 3 corresponding to the EQTA variable) in the ABOVE area. We can interpret these results in the following way: for banks located above the target level in the gains domain, bankers exhibit a risk averse behavior, as the standard deviation and the distance to median are negatively correlated. It may correspond to a "defensive attitude", as being above the target in terms of outcome implies preserving the privileged position, and therefore exhibiting risk aversion. For banks located below the target level, the relationship between these 2 measures is not significant.

Table 4

Correlations results between standard deviation and distance to benchmark measures (loss domains)

Area	Zone 6	Zone 7	Zone 8	Zone 9
	(NPLGL)	(LLRNPL)	(LLRGL)	(NLTA)
ABOVE	-0.1182*	-0.0635*	-0.0824	-0.0996***
BELOW	0.0045	-0.1734	-0.028	0.0513

Kendall τ correlation coefficients between the standard deviation and the distance to median are shown for each zone, by area. *** and *: statistically significant at 1% and 10% levels respectively.

Concerning the correlation results in the loss domains for the Zones 6-9, we observe mixed evidence. In the ABOVE area, except for the Zone 9, corresponding to the NLTA variable, other Kendall coefficients are weakly significant and negative, the coefficient being not significant for Zone 8 (LLRGL). For banks above the target levels in terms of potential losses (NPLGL) or their coverage (LLRNPL), bankers exhibit a risk aversion behavior. Having, for example, a level of NPLGL above the target level implies a more risk averse attitude, as these potential losses may drive the bank into default. The Kendall correlation coefficients for the BELOW area are all not significant.

In Tables 5 and 6 we propose to cross the domains (gains vs. losses) in order to investigate the framing issue which is one of the crucial feature of Prospect Theory. The same choice may be presented in alternative ways (as a gain versus as a loss), affecting the editing phase of an agent, and therefore affecting its preferences. We do this in the following manner: in Table 5 we compute Kendall correlation coefficients between standard deviations of gain measures (ROE, ROA, SPREAD1, SPREAD2) and distance to median losses measures (NPLGL, LLRNPL, LLRGL, NLTA, corresponding to the Zones 6-9). In Table 6, we invert the measures, showing Kendall coefficients between standard deviations of loss measures and distance to median gains measures (Zones 1-5).

Table 5

Correlations results between standard deviation and distance to benchmark measures (cross gain vs. loss domains)

	Zone 6		Zone 7		Zone 8		Zone 9	
	(NPLGL)		(LLRNPL)		(LLRGL)		(NLTA)	
	ABOVE	BELOW	ABOVE	BELOW	ABOVE	BELOW	ABOVE	BELOW
SDROE	0.0859	0.0901***	-0.0294	-0.0758	0.0748	0.089**	-0.0811**	-0.0478
SDROA	0.0977	0.0919***	-0.0287	-0.0963	0.085	0.0958**	-0.0835**	-0.079
SDSPREAD1	0.0979	0.0955***	-0.0181	-0.0881	0.0843	0.1037***	-0.0779**	-0.16
SDSPREAD2	0.0784	0.0788***	-0.0209	-0.1167	0.0573	0.0956**	-0.075**	-0.0257

Kendall τ correlation coefficients between the standard deviation and the distance to median are shown for each zone, by area. ***, ** and *: statistically significant at 1%, 5% and 10% levels respectively.

Concerning the results shown in Table 5, we observe significant Kendall τ correlation coefficients only for the BELOW areas for Zone 6 and Zone 8, and for the ABOVE area for Zone 9. The results for the BELOW areas seem to indicate that banks located below target levels in terms of potential losses (NPLGL) and their (costly) coverage (LLRGL) exhibit risk loving behavior, as the relationships between the distance to median and standard deviations of return measures is significantly positive. Being under such target "leaves room" for aggressive risk taking within the bank.

As to the ABOVE results, we observe significantly negative Kendall coefficients between the distance to target in terms of NLTA and the standard deviation of the return measures. This may be interpreted as a feature of risk aversion on the side of the banker, as being above a target level of loans volume compared to total assets restrain the risk taking attitude materialized in terms of standard deviations of return variables. This volume of loans represents potential revenues but may also transforms into NPL, enhancing the bank's risk of default, contrary to NPLGL or LLRGL variables, which are proxies of *ex post* excessive risk taking, already materialized.

Table 6

Correlations results between standard deviation and distance to benchmark measures (cross loss vs. gain domains)

	Zone 1		Zone 2		Zone 3		Zone 4		Zone 5	
	(ROE)		(ROA)		(EQTA)		(SPREAD1)		(SPREAD2)	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
SDNPLGL	-0.0511	0.1455	-0.069**	0.0214	-0.1321**	0.0371	-0.2177***	0.0101	-0.1931***	-0.0183
SDLLRNPL	-0.05	0.1195	-0.067**	-0.0013	-0.1118*	0.035	-0.2075***	0.0007	-0.1823***	-0.0272
SDLLRGL	-0.0545	0.1221	-0.0738**	0.0013	-0.1264**	0.0338	-0.2108***	0.0103	-0.1877***	-0.0187
SDNLTA	-0.0585*	0.1169	-0.0771**	0.0013	0.1165*	0.0359	-0.2135***	0.0004	-0.1789***	-0.0145

Kendall τ correlation coefficients between the standard deviation and the distance to median are shown for each zone, by area. ***, ** and *: statistically significant at 1%, 5% and 10% levels respectively. A.: ABOVE, B.: BELOW.

Turning to the interpretation of the results in Table 6, we observe significant negative Kendall τ correlation coefficients only for the ABOVE areas for Zones 2-5. Concerning the Zone 2, corresponding to the ROA, we can interpret these results as indicating risk averse behavior rather on the management side, as the relationship between the distance to the ROA target and the standard deviation of losses measures is negative[1]. Concerning the Zone 3, corresponding to the EQTA variable, we also observe significantly negative Kendall τ correlation coefficients between the distance to EQTA target and standard deviations of losses measures (except for the standard deviation of NLTA). We can interpret this result in a similar manner as for the Zone 2, except that it may reflect in this case the shareholders point of view, as they are the main contributor to the bank's equity. Banks located above the EQTA target exhibit risk avert behavior, as the distance to this target is a proxy measure of the equity cushion or franchise value, which expected loss seems to discipline the risk taking behavior. Finally, concerning the results for the Zones 4 and 5, we also observe significantly negative Kendall correlation coefficients between the distances to SPREAD1 and SPREAD2 target levels and the standard deviations of loss measures. This may also be interpreted as risk adverse behavior feature, as being located above such level implies a more prudent and conservative risk taking behavior.

Overall, we observe that in a loss framework, being below a target level seems to affect bank risk taking in a risk loving fashion. On the contrary, in a gain framework, being above a target level has a significant impact on risk taking, in a rather risk averse fashion.

4. Conclusion

Cumulative Prospect Theory provides an alternative framework for risk taking analysis, especially excessive risk taking in banks, which remains the major determinant of their failure. Although, the literature dealing with these issues remains scarce.

[1] This relationship is not significant for the Zone 1 (ROE – shareholder point of view).

This note provides an empirical insight into the investigation of the usefulness of the behavioral framework for risk-taking analysis in banks from emerging market economies.

The results tend to support the usefulness and pertinence of the Cumulative Prospect Theory features as alternative explanation for risk taking behavior within banks. Banks located above target level (measured in several different ways) tend to exhibit risk adverse behavior.

However, further investigation is needed in order to better understand the behavioral finance contribution to risk taking analysis in banks. First, other benchmark variables should be tested (for example mean or maximum values, as well as benchmark values calculated for best agency rated banks). Second, it would be interesting to apply tournament and ranks theories (Brown et al., 1996; Busse, 2001; Taylor, 2003) especially to investigate rating grades effect on risk taking behavior, and the quantification of rating's default probability, in order to test the probabilities' deformation with an adequate methodology – a crucial prospect theory feature.

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