Customer Risk Profiling: Background Reading from Oxford Risk

CONTENT

1. Introduction

These notes primarily cover the purpose and science behind evidence based approaches to measuring Customer Risk Profiles. They describe customers' perception of risk as compared to the markets'. Risk tolerance and risk capacity are defined and their relationship with customers' goals in the advisory process is expanded. We indicate other potentially useful dimensions of financial personality and conclude with suggestions and comments on global applicability, product mapping and asset allocation.

2. Oxford Risk

Oxford Risk is a spinout company of the University of Oxford, which retains a significant shareholding. Founded by three prominent academics; Professor Lord John Krebs, Professor Alex Kacelnik and Dr. Edward Mitchell have published hundreds of scientific research papers in behavioural ecology, behavioural economics, risk psychology and decision-making. Oxford Risk has considerable access to the resources and skills in the University and the world's finest academics; for example on one current project we have a team drawn from Oxford, Princeton, Stanford, the Home Office and Siemens. Oxford Risk strives to help clients improve results by enabling them to make better-informed decisions; to do this we provide innovative solutions that consider peoples' understanding of risk, their behaviour in risky environments, and their ability to exercise appropriate decisions about the risks they face.

The **Oxford Risk Rating** is a family of risk assessment instruments. **ORR Jobs and Roles** objectively assesses individuals' suitability for employment, particularly where, as with a financial trader, they must 'manage risk' for profit and gain, or, as with a pilot, avoid the high cost downside of failure. These profilers assess individuals' ability to judge risk and take appropriate action in a variety of domains.

Investment advisers are required to demonstrate due diligence and a consistent sales process, in particular they must determine a client's risk attitudes and how well these align with the client's investment aspirations and risk capacity. **ORR Personal Investor** assesses the risk tolerances of retail customers when considering the purchase of investment products. Variants include simple 'single score' instruments and those that reveal other dimensions of financial personality to provide further differentiation, for use with the general public or subgroups, for example, individuals of high net worth. **ORR Personal Investor** provides a scientifically defensible measure to aid the advice process, and is already the choice of or available to, 30,000 advisers.

3. Risk Tolerance, Risk Capacity and Investment Goals

The adviser fact find should explore and discover a customer's risk tolerance, risk capacity and investment goals which can be represented in a three dimensional landscape reflecting the potential trade-offs between an investors aspirations, and the constraints of their risk attitudes and means.

There are almost as many definitions of these terms as there are users. For the purposes of the workshop we shall define:
- **Risk Tolerance** is an individual's underlying attitudes or response, driven by perception, to uncertainty that matters.
- **Risk Capacity** is the extent to which an individual can tangibly cope with potential losses.
- **Investor's Goals** are the aims and aspirations that comprise their investment objectives.

The Investors' Goals are typically two-dimensional; they reduce to quantities of money desired, whether capital sums or income streams, over time. They should be weighted by the individuals priorities, for example they can be categorised as 'must haves', 'should haves' [if possible], 'could haves' [if more important needs are satisfied], and 'would like to haves' [but not at the cost of anything else], or ranked, or indeed both.

Risk Capacity is similarly two-dimensional and also reduces to quantities of money available to invest, whether capital sums or expense streams, over time. They are also weighted, in this instance by the confidence, both investors' and market, they will be available, and by the investors tangible willingness to accept potential losses.

Risk Tolerance provides a general lens that serves to enhance or depress the overall level of risk acceptable to the investor.

It is important to understand that though these factors express investors' goals and constraints they are not immutable, and like measures of asset risk, they are probabilistic rather than deterministic. Where investors' goals can be met without breaching their constraints there is no issue, but the investor can and should be expected to trade off higher levels of risk for higher levels of reward where their desire, or need, is stronger. Risk tolerance is a measure of 'comfort' not an absolute constraint. Even the most risk averse can be expected to discomfort themselves when this is essential to achieve an 'absolute necessity'. The investor may also be wiling to increase their risk capacity by finding more money to invest, for example by cutting back on consumption, or by accepting higher potential losses.

Thus it is perfectly legitimate for the adviser to help the investor iterate between their goals and constraints to reach an acceptable trade off and choice providing the advisor does not bias the process by leading the customer.

4. The Behavioural Science of Risk

Traditional approaches to investment risk do not correspond with what the average customer understands by 'risk'. 'Risk', in everyday language, refers to the chance of something bad happening, but the conventional measure used in the finance industry, volatility, also treats better-than-expected performance as risky.

Financial institutions' failure to reflect risk as investors psychologically individually experience it can lead to misconceived portfolio optimisation techniques with the result that investment managers provide portfolios that do not reflect their clients' true risk/return trade-off.

A more appropriate approach would first assume that better-than-expected possible investment outcomes detract from perceived risk rather than adding to it and that the potential for catastrophic outcomes results in higher perceived risk than a volatility-based risk measure would suggest.

To provide such a risk tolerance scale requires advanced evidence based and decision theoretic principles. Research shows that risk tolerant people do choose riskier investments, but that even the least risk tolerant individuals are prepared to take on some risk.

4.1. What is financial risk?

It is inevitable that to achieve higher returns requires taking more risk. On average those who take risk are rewarded for doing so – but 'on average' provides no guarantees and there remains the possibility that the outcome will be worse than expected. Determining whether the average expected reward is sufficient to compensate for the risks taken requires an understanding of precisely what is meant by risk.

4.1.1. Problems with volatility

The standard definition used in finance is that risk is volatility, (the square root of the average of squared deviations from the expected return). However volatility bears little relation to risk as a psychologically intuitive concept. If investors are to decide how much extra risk to take on in exchange for increased expected returns, they need a measure that reflects risk in a way that is meaningful and important to them as investors, not just a technical definition that financial modellers find mathematically convenient.

Everyday usages of risk commonly refer to the chance of something bad happening. This is a much more natural concept than volatility which treats outcomes that are better than expected as being just as risky as worse than expected outcomes. This is not how most of the world responds to financial risk – the chance that your investment may return 5% more than you expect next year simply does not strike normal people as a 'risk', and to accept lower expected returns in order to reduce such a risk makes no sense. Risk is a downside notion and by failing to recognise this in their portfolio optimisation techniques, a provider could be giving customers portfolios that cannot reflect their true personal risk/return trade-off.

By using volatility as a risk measure, the finance industry is making implicit assumptions about how individuals psychologically react to risk. Figure 1 shows how people would evaluate the risk if they really did interpret risk as volatility. As shown, the expected outcome is a real return of 3%, and there is no psychological risk associated with getting 3%. Any possible amounts less than this, however, are considered negative outcomes and add to the psychological risk of the investment. The worse the possible outcome, the more it adds to the perceived risk of the investment – the thought of a return of -6% causes the investor considerable stress.

**Figure 1 - Implied psychology of risk as volatility**
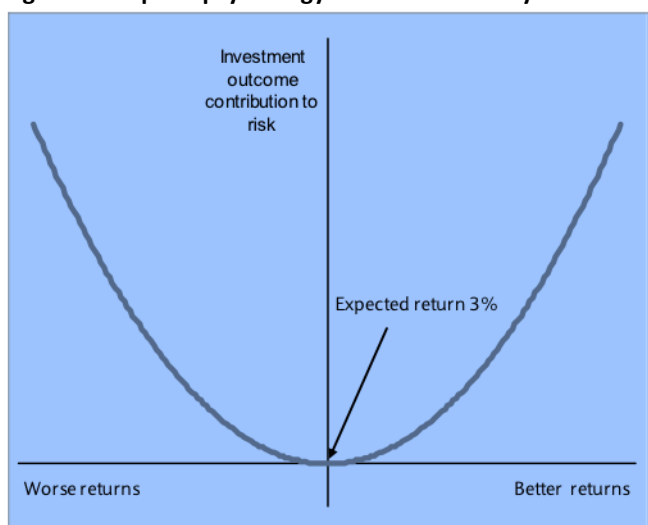
However, note that this curve is symmetrical around the expected return point of 3% so the possibility of getting 6% instead of 3% actually adds to the risk of the investment – and as returns get better and better the measured risk of the investment rises.

4.1.2.   Reflecting risks that matter

A much more psychologically accurate and intuitive response to risk is shown in Figure 2. It has the same Expected Utility Theory as the traditional model but uses psychologically plausible assumptions from research into the psychology of risk and financial decision-making.

Figure 2 - Actual psychology of risk as volatility
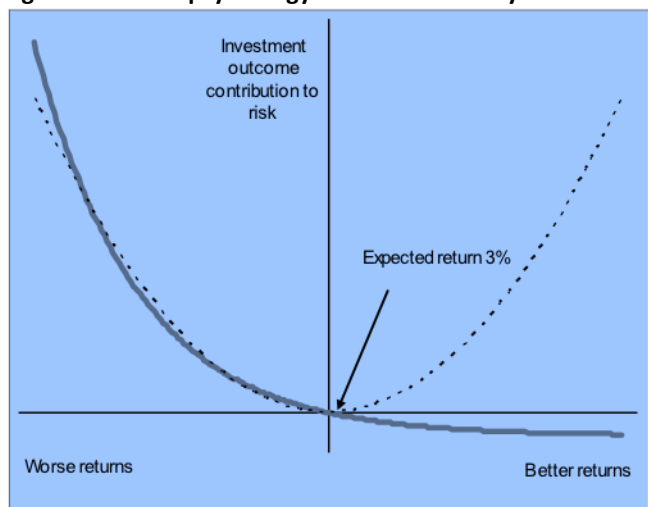
As before, potential outcomes that are worse than expected add to risk, and at an increasing rate but better than expected outcomes that now reduce the perceived risk of the investment. Investments with potential upside thus increase the risk budget so real risks can be taken elsewhere in the portfolio.

Another difference between the psychological approach to risk and the traditional volatility measure is subtler: for most of the downside the two curves are fairly close to each other. However, the psychological measure gets steeper at a faster rate as outcomes get worse and worse. This means that extra emphasis is placed on those possible outcomes that people most fear, the potential for catastrophic losses in the left tail of the returns distribution. Using this measure means that portfolios are optimised to reflect the risks that are most important to investors, but also to take on the upside variation that they would rather embrace than avoid.

4.1.3.   Individual differences

A further difficulty is that the traditional measure of risk assumes that the risk of an investment is exactly the same for everyone. In reality individuals perceive risks differently: a risky investment to one person may seem quite acceptable to another.

Using a psychological approach to measuring risk means we can reflect these differences between people clearly. The lines in the Figure 3 show risk tolerance curves for two different individuals. The grey line reflects the risk attitudes of someone with low risk tolerance: this person will get much more worried at the thought of bad outcomes. The black line reflects the risk attitude of an investor with high-risk tolerance who is not as concerned by negative outcomes, and places greater emphasis on positive outcomes.

Figure 3 – Differences in Risk Tolerance
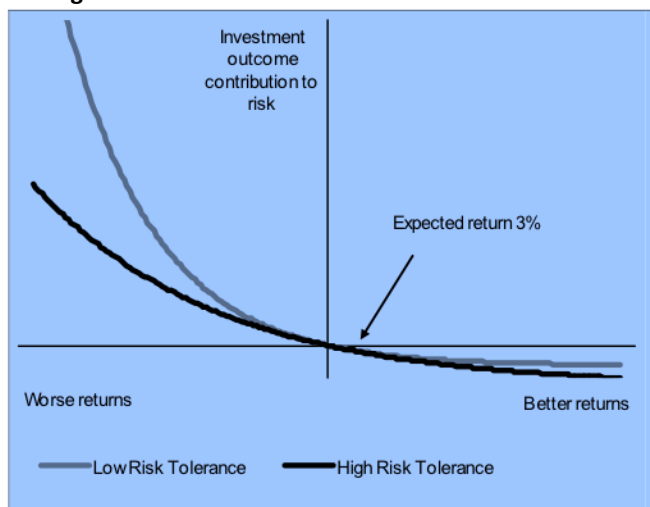
Both of these investors see risk as a downside and are most concerned about extremely bad outcomes. Generally more risk tolerant investors are much more prepared to accept downside risks in their portfolio in exchange for good expected returns. The optimal portfolio for each should reflect the degree to which avoiding bad outcomes is important to as individuals.

4.2. Determining risk tolerance

Using a more intuitive model of what risk means to individuals how should a wealth manager determine how to attribute a particular level of risk tolerance to each investor? Many in the industry use ad hoc risk tolerance questionnaires in their fact find processes. However, these commonly confound psychological risk tolerance with customer concerns that should be considered separately. Often questionnaires include investment goals, such as time horizon and income requirements. Whilst important, they are completely distinct from risk tolerance, and including them masks the investors' true ability to tolerate risk. Other questionnaires may require knowledge of financial markets, or investments, or involve numerical calculations biasing the results toward a measure of knowledge, numeracy and investment experience rather than actual risk tolerance.

To deliver the most acceptable customer outcomes, it is important to use a pure risk tolerance scale designed to isolate the fundamental ability of the individual investor to cope with risk.

4.2.1. *Linking evidence based scales to risk attitudes*

An experiment conducted by Professor Martin Weber at Mannheim University using over 3,000 subjects worldwide helps to show how an evidence based scale links to the actual amount of risk that investors would choose for their portfolios. In this experiment each respondent was given the following choice between the potential returns of the five portfolios shown in Figure 1 below. The question was phrased as follows:

*This chart shows the high, low and most likely final values of £12,500 invested in five different portfolios for five years. For example, in Portfolio 1 you will get £13,500 and in Portfolio 5 you end up getting anything between £7,500 and £34,000, but the most likely amount is £19,000. Which portfolio would you prefer? (Note: the question was expressed using the local currency and equivalent magnitude.)*

Figure 4 - Which portfolio do you prefer?
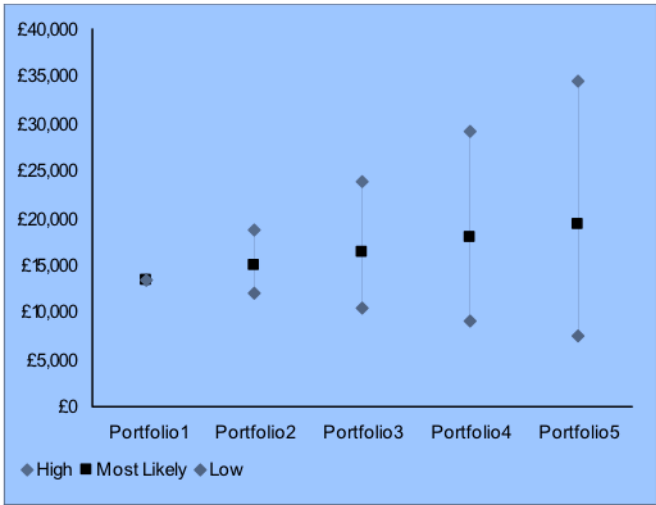
Those subjects who are highly risk tolerant should be more likely to pick Portfolio 5, whereas those with very low risk tolerance would choose the zero-risk Portfolio 1. Subjects' choices from the UK are shown in Figure 5. Respondents showed a wide spread of risk tolerance, but very few went for the completely sure outcome, and as many as 21% chose the riskiest portfolio, which had a possibility of a 40% loss over five years.

Figure 5 - Which portfolio do you prefer?
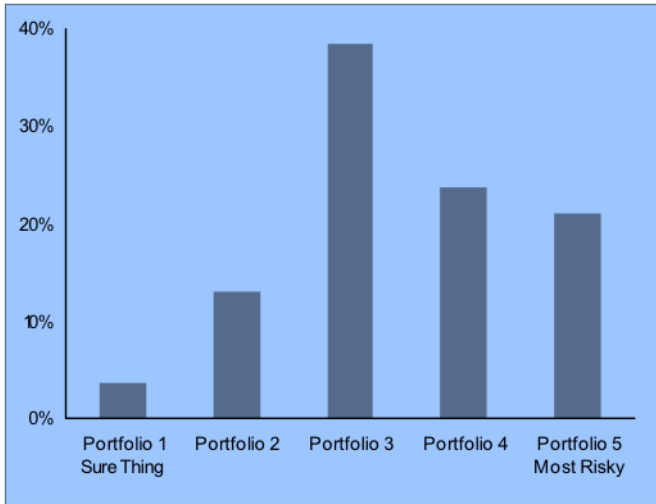
All respondents were given a psychometric risk tolerance questionnaire, which puts each individual in one of five risk profiles, from low risk to high risk. Examining the average portfolio chosen by individuals in each of these risk profiles showed that the amount of objective risk chosen increases with each risk tolerance profile – that is, the average portfolio chosen by those in risk profile 5 is 4.3 (Figure 6). Note that on average even the least risk tolerant individuals are prepared to take on a fair amount of risk over a five-year horizon, choosing on average a portfolio just safer than the medium-risk portfolio on offer.

Figure 6 – Average portfolio chosen by risk tolerance profile?
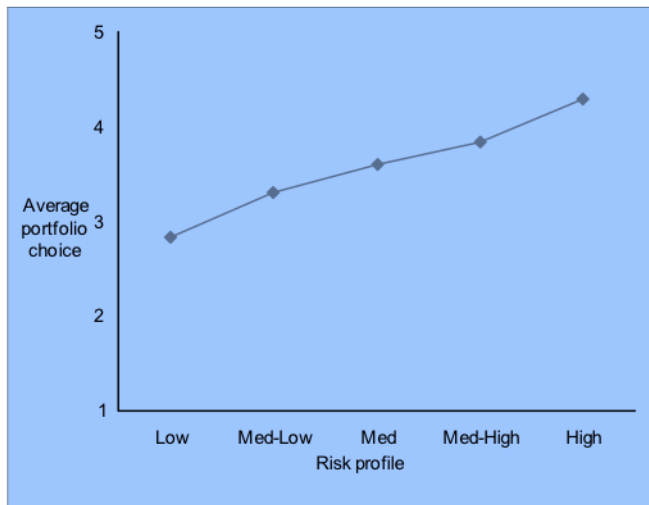
4.3. Recommendation

Advisers should measure risk tolerance in a way that relates to the actual risk that individuals are prepared to take in their portfolios. Oxford Risk would connect each risk tolerance profile directly to an appropriate psychologically intuitive downside risk curve. Using individuals' risk tolerance offers the prospect of minimising only those risks that actually matter to each individual, and not using the portfolio risk budget to reduce upside 'risks' that the investor would happily accept.

5. Principles in measuring risk tolerance

Since MiFiD came into force in November 2007, banks regulated in Europe have been required to assess their clients' preferences on risk-taking. Unfortunately MiFiD gives no guidance on how to do this accurately.

Accurate measurement requires a well-designed, objective, and statistically robust process, based on years of psychological research into risk tolerance. Many banks' risk tolerance questionnaires fail to meet these standards. A good risk tolerant instrument will not confuse risk tolerance with investment objectives or other aspects of personality, or expect clients to have extensive financial knowledge; and they will be properly tested and shown to be stable across the market cycle and reflect more than future beliefs.

5.1. Better than regulatory requirements?

Risk attitude is a highly abstract and amorphous constellation of different psychological attributes: what the finance industry calls 'risk tolerance' is only one component. Investors do not have good introspective access to each of these components separately, which makes it extremely difficult for the individual to assess their own risk tolerance objectively and accurately.

Yet it's quite possible to satisfy the regulatory requirements and still deliver a poor customer outcome.

5.2. Coping with confounds

When measuring risk tolerance it is all too easy to measure something else by accident. A pure assessment of risk tolerance needs the questions asked to be free of 'confounding factors', the incidental factors that can cause the risk tolerance score to be systematically biased. Some of

these other factors are important when determining how to invest, but they should be measured and understood separately from risk tolerance.

### 5.2.1. Do not confound risk tolerance with investment objectives

Objectives such as the investor's time horizon, annual income requirements, and liquidity requirements are important when determining how much risk is appropriate for their portfolio, but these are not psychological factors; they may influence the appropriate risk of a portfolio, but they do not change the investor's fundamental psychological ability to tolerate risk. As the investor's financial circumstances change, the appropriate portfolio will change, but the risk tolerance, if properly measured, will remain stable. It is not that investment objectives should be ignored, but rather that they should be considered separately to risk tolerance. Risk tolerance should be seen in the context of the investment objectives, not obscured by them.

	Investor 1	Investor 2
Risk Tolerance	High	Low
Investment Horizon	Short-Term	Long-Term
Confounded Output	Medium	Medium

The table above shows two potential investors, one with high and one with low psychological risk tolerance. Investor 1 should not take on a large amount of risk despite high-risk tolerance because of a short-term time horizon. Investor 2 on the other hand could take on a reasonable amount of risk despite low risk tolerance, as the investment would be over a long period. Both risk tolerance and time horizon affect the optimal level of risk in a portfolio, but it is important to reflect them separately. By bundling questions on time horizon into the risk tolerance questionnaire, both investors could emerge looking exactly the same, as if they have moderate risk tolerance. The use of time horizon confounds the accurate measurement of risk tolerance.

With just the two dimensions it is easy to see, but when there are a large number of different investment factors confounding the measure it becomes impossible to discern what is driving the ultimate score, and impossible to say what is the actual risk tolerance. By combining scores on a number of distinct dimensions, this approach also tends to push all investors towards the middle. Figure 7 shows how the distribution of scores on a typical pure risk tolerance measure is pushed towards the middle profile when investment objective questions are included in the measure.

Figure 7 – Effect of confounding factors
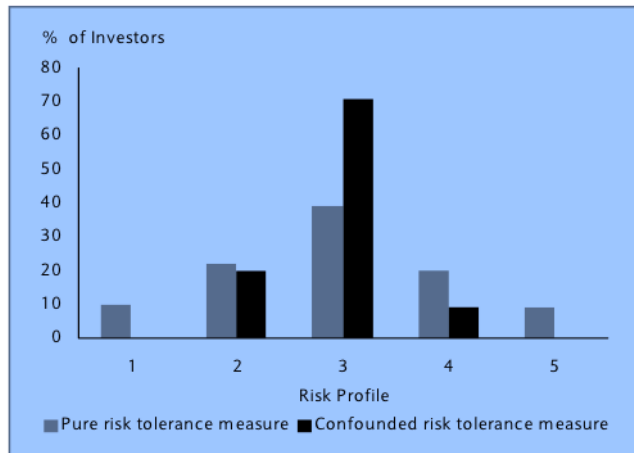
5.2.2. Do not confound with other aspects of risk attitude or other personality dimensions

It is not only non-psychological objectives that can be confounded with risk tolerance and research shows that attitudes to risk in domains other than financial investing, such as health risks (smoking, unsafe sex, drug use), participation in dangerous sports, or risk taking in a gambling environment, are unrelated to financial risk attitudes. Yet such questions, particularly involving attitudes to gambles, are frequently used in assessing financial risk tolerance.

Ensuring that other aspects of financial personality do not confound risk tolerance measures is far more difficult than simply excluding financial objectives. This is particularly true when trying to separate it from other closely related aspects of risk attitude. For example, investors' portfolios should be optimised to reflect their long-run rational tolerance for risk, but we all have strong short-run emotional reactions to risk that can cause us to take actions detrimental to our own long-run objectives.

5.2.3. Do not require respondents to have knowledge of finance or investing, or the respondent to perform numerical computation or probabilistic reasoning.

Neither knowledge of finance nor mathematical ability should feature in risk tolerance. If people with specific knowledge or ability find it easier to respond to the questions assessing risk tolerance then the resulting scores may be a biased measure of how much risk they can cope with psychologically. Those without strong financial knowledge, experience or numeracy skills, are as a result at risk of being allocated to portfolios that achieve systematically lower returns than they could and should achieve given the true amount of risk they should take on.

Questions that require the respondent to perform calculations become a test of the individual's numeracy rather than their risk tolerance. People are particularly inconsistent at expressing their preferences when it comes to probabilistic reasoning, so explicit trade-offs between potential returns and probabilistic representations of risk are extremely difficult to interpret. Questions should not refer to investment types, financial instruments or asset classes of which some people may have low experience or understanding.

5.2.4. Do not require respondent to have knowledge about current market condition, confuse past behaviours with optimal actions, or rely on future beliefs/expectations more than risk tolerance

It is important that their risk tolerance reflects an investor's innate long-term ability to cope with future risks, rather than just their reactions to past investment performance. Some risk questionnaires confuse past actions with optimal actions mistakenly asking about what individuals have done in the past without any kind of assessment about whether those past decisions were optimal, or even appropriate. Referring to past investment outcomes carries a strong risk of biasing the results by focussing attention on previous gains or losses.

Past decisions may have been good or bad, or may through sheer luck or misfortune have turned out well or badly, but this should not affect the optimal portfolio decision for the future, which should be to get the best possible expected returns given an accurate assessment of how much risk the individual can cope with. Past investment behaviour is often not a reliable indicator of the optimal action for an investor.

A good instrument does not confuse risk tolerance with future beliefs. That investors' sentiment changes and they avoid more risky investments after a market downturn does not indicate a fundamental change in their underlying risk tolerance. Although risk tolerance may change to some degree after a market downturn, much more of the change in behaviour can be explained by changes in belief; if they think there is now a much higher likelihood of assets decreasing in value, they will quite rationally reduce exposure to these assets. To provide investors with an optimal portfolio the provider needs to match the future risks in the market with their level of risk tolerance. When market expectations change the appropriate portfolio can and should change, even if investors' risk tolerance is unchanged. The risks themselves have increased, not attitudes to them.

5.2.5. Ensure stability over the market cycle

Because investing is a long-term activity it is highly undesirable to use a measure of risk tolerance that is unstable over the market cycle. Risk tolerance should reflect a deep-seated and stable aspect of personality, changing only slowly or infrequently over a lifetime.

One reliable measure was tested before and after the 2007 - 2008 market crash. Figure 8 below shows the results. The distribution of scores is remarkably similar for both periods. Interestingly, insofar as risk tolerance has changed over this period, it has not systematically decreased. Instead, there has been a slight tendency for individuals to become more extreme in both directions: more low risk takers than before, but also a bigger proportion of highly risk-tolerant people.

Figure 8 – Stability across the market cycle
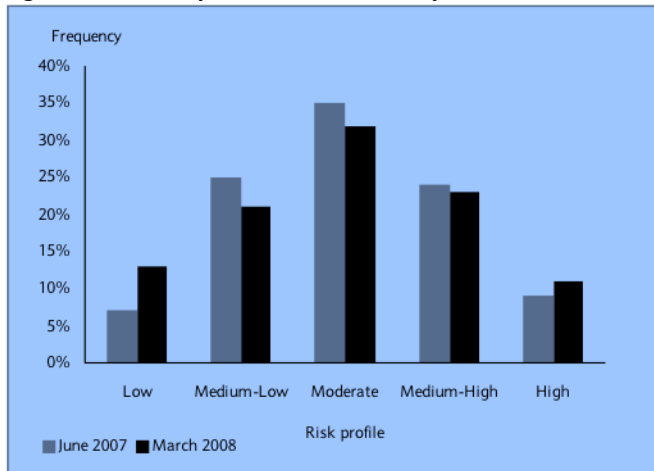
5.2.6. Only use questions that discriminate effectively between individuals. Avoid 'social context' and over complicated questions

Other apparently insignificant features of questions can cause the scale to be ineffective. A seemingly sensible question may fail in statistical tests because it doesn't elicit sufficient disagreement amongst respondents. If all respondents give the same answer to a question, then it serves no function at all in discriminating between different degrees of risk tolerance. A good question will elicit responses across the whole range of options.

The respondent knows that at some stage somebody else is going to look at their responses and determine their risk tolerance and some individuals may want to reflect a certain personality or to look like a clever or particularly sophisticated investor. To minimise this problem the available responses to each question should not have a social context, that is, people should not feel uncomfortable if they respond to a question honestly.

Simplicity is desirable; all questions should be clear and simple enough to be answered by any investor without having to ask for clarification from the adviser, and without wondering whether there is a right answer. Complex questions become difficult to understand and can disengage the respondent from the process. Simpler questions are less ambiguous, more likely to be interpreted similarly by different individuals regardless of differences in background and less susceptible to inaccurate answers. They are also quicker to answer, important for advisers where customers want a good experience and insight and not administrative burdens.

5.3. Recommendation

There are many issues to be aware of when designing risk tolerance assessment tools. Many questionnaires used in the industry fail to meet scientific standards of efficacy and yet can easily pass the standard set by EU regulators. An accurate objective measure of risk tolerance would be invaluable in helping customers determine an appropriate level of long-term risk in their portfolio. A Wealth Management firm specific Customer Risk Profiler could be enhance the customer experience and be a significant differentiator in the adviser market.

6. **Dimensions of Financial Personality**

Although risk tolerance is the most salient dimension of financial personality there are others that can help discriminate between investor or customer types, and particularly those in subgroups such as 'high net worth', or who might be classed as more 'sophisticated' or 'active'. Other questions and dimensions would help in determining the appropriateness for a customer of investments with special risk characteristics, such as structured products.

Weber, Noisic and Merkle at the University of Mannheim have suggested the additional dimensions are useful in classifying investor types and for discriminating between customers. Attitudes to risk might include risk tolerance, composure and market engagement, while financial decision-making style might include perceived financial expertise, delegation and belief in skill.

6.1. Composure

Composure is the degree of short-term anxiety the individual will feel. While Risk Tolerance reflects an individual's long-term, coldly rational risk and return trade-off, Composure reflects how they will feel in the short-term about greater uncertainty and volatility in markets. Individuals with low composure would be more stressed by short-term uncertainty, and are unlikely to remain in volatile markets as long as more composed individuals do.

6.2. Fear of Catastrophic Loss

Fear of Catastrophic Loss is a domain-specific measure of how much catastrophic risk the individual worries about in financial markets. It is a less stable personality trait, as these perceptions can change with experience and the environment. However it is one of the most discriminating traits for predicting who engages in self-directed trading, as only those who can cope with financial market risk voluntarily shift savings into market-linked investments.

6.3. Perceived Financial Expertise

Perceived Financial Expertise is not an objective measure of financial expertise or literacy but is the degree to which the individual feels competent and knowledgeable about finance. Higher measurements indicate increased comfort with making financial decisions, and an increased self-perception of being informed and up-to-date.

6.4. Delegation

Delegation measures how much an individual would want to hand over the day-to-day management of their finances to a financial advisor.

6.5. Belief in Skill

Belief in Skill is the investors feeling that a skilled fund manager (not themselves) can "beat the market".

6.6. The effect of circumstances

Financial personality and circumstances interact. It is important to remember that each customer's financial personality is assessed because aggregated statistical analysis reveals patterns and *individuals are not the average*. For example, while on average women and older individuals have lower risk tolerance, there are still many older women who have higher risk tolerance than some young men.

Examining the relationship between increasing wealth, income and risk tolerance, and putting age, gender, income and wealth level together into a statistical model, we can estimate the different effects on risk tolerance by each of these variables, without confusing them for the effects of each other. (Factor Analysis.)

For example the results of a respected UK study show that:
Higher income is slightly associated with higher risk tolerance, with risk tolerance only affected by income stream once it is large relative to wealth levels. At that point decisions about investing can include offsets from more income, which may allow the investor to take on more risk.

Individuals with higher wealth tend to have higher risk tolerance. This seems intuitive - as we become more affluent, we worry less about losing a given percentage of our wealth. The implication being that a £1,000 loss of someone with £10,000 in total wealth is more significant than £100,000 loss of £1 million, a phenomena explained by economists using Utility Theory.

Older individuals tend to have lower risk tolerance.

These factors resolve in a dynamic that changes over time. With increasing risk tolerance tends to decline. However, with increasing age there is a tendency to earn higher incomes and accumulate wealth, which are associated with increases in risk tolerance. There is a good reason for assessing customers' financial personality at intervals, or at least at different stages in their lives, or after significant events, such as marriage, the birth of a child, or a significant change in their wealth.

7. Acknowledgements & Sources

This material has been compiled from a variety of Oxford Risk, academic and other sources.

In particular we would like to acknowledge the contributions from Greg Davis, Guest Lecturer at LSE and Honorary Research Fellow at University College London and Professor Martin Weber and his Business Administration Finance and Banking group at Mannheim University.

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