Report on leveraged products

Review results

The Netherlands Authority for the Financial Markets (AFM)

The AFM promotes fairness and transparency within financial markets. We are the independent supervisory authority for the savings, lending, investment and insurance markets. The AFM promotes the conscientious provision of financial services to consumers and supervises the honest and efficient operation of the capital markets. Our aim is to improve consumers' and the business sector's confidence in the financial markets, both in the Netherlands and abroad. In performing this task the AFM contributes to the prosperity and economic reputation of the Netherlands.

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Review and findings

This report presents the results of the review of leveraged products conducted by the AFM in late 2012 and early 2013. Leveraged products are structured products sold mainly to retail investors under names such as Turbos, Speeders, Sprinters etc. Their main feature is that they offer the possibility of a leveraged investment in an underlying asset with the potential loss being limited to the amount invested.

The AFM has initially shared its findings with the various providers of these products in the Netherlands. Based on this exchange of information, the providers have taken certain measures that the AFM welcomes. These measures should ensure that investors have the right expectations when taking these products, and that products for which it would seem in advance that there is no realistic possibility of achieving a positive return are no longer offered. The measures are described in section 5, and the AFM's assessment of them is given in section 6.

Regardless of these measures, the AFM will continue to urge the providers to keep searching for ways to better protect investors against foreseeable disappointments and to inform them regarding the risks of leveraged products.

Findings

The AFM has assessed leveraged products offered in the Netherlands based on both qualitative and quantitative analysis. First of all, this assessment revealed the main risks that should be included by the providers in the information they provide, and the providers have stated that they will evaluate their information and adjust it where necessary.

The review was however largely based on a quantitative assessment of the products. The AFM has modelled the probability distribution of the expected return on a direct investment in the underlying asset and an investment in the underlying asset through a leveraged product. The difference between the two investments is clearly shown in the figures showing the results of the expected returns. More specifically, when the leverage increases to a large extent the chance of a positive return is extremely low, especially in case of a longer holding period. The AFM has tried to establish what an investor can expect with regard to realising a positive return if he or she purchases such a product.

Based on this assessment, the AFM is of the opinion that some leveraged products (with an excessive degree of leverage) do not offer sufficient prospect of realising a positive return. This is especially the case if the holding period does not correspond to the volatility of the underlying asset. The way in which the products are structured means that in practice the downside potential is increased to a point where it is highly questionable whether the product still adds value for investors, certainly if their investment horizon is longer than 1 day. The AFM considers that providers of these products should provide more transparency on specific aspects of how the products work, and also that they should set limits on the degree of leverage in these products. The analysis and the findings are presented in section 3.

1 Structure of the report

This report is structured as follows: First of all, we give a brief introduction explaining the rationale for the review, an overview of how leveraged products work and a short overview of the market. This is followed by a description of the structure of the review conducted by the AFM and the findings thereof.

The final section contains the measures taken or to be taken by the providers in response to the findings of the review. This concluding section has been prepared by the AFM and the providers of leveraged products collectively.

2 Leveraged products

The AFM has recently conducted a review of investment products that involve leverage. These are products whereby investors benefit from the increase or decline in value of an underlying asset without investing in that asset directly and only have to put up part of the value of the asset. The remainder is funded by the provider. This creates leverage, and the price movements in the underlying asset are magnified. This review looks at Turbos, Speeders and Sprinters. All these products are referred to as turbos in this report. The review contains both a qualitative aspect, in which the operation, market and risks of these products are considered, and a quantitative element. This latter element consists of the use of a quantitative model to analyse the effect of the degree of leverage on the probability of a positive return for a given holding period.

2.1 Rationale for the review and context

The rationale for the review is mainly the observed increase in the number of leveraged products. This increase concerns both the type of leveraged products available in the market, the number of providers and the number of underlying assets on which the products are based. The risks to which consumers can be exposed to with these products have increased as well as the number of products available. The reason for the increase in risks is that the level of financing added by the providers is increasing, and therefore the degree of leverage as well. In addition to the increase in the number of types of turbos, there are also more alternative types of leveraged products available, with consumers now being offered Contracts for Difference (CfD) and binary options.

2.2 What is a leveraged product?

A turbo is an investment product allowing investors to profit from a rise or fall in the price of various underlying assets such as indices, shares, commodities, currencies and bonds, without investing directly in these assets. The initial investment needed for a turbo is lower than that required for a direct investment in the underlying asset for the same absolute return, because the amount put up by the investor is supplemented with financing from the product provider. This is called leverage, and is the main feature of these investment products. Not every turbo offers the same leverage. The higher the leverage, the greater the exposure to price movement compared to the underlying asset.

2.3 The value of a turbo long

A turbo long position is taken to profit from an *increase* in the price of the underlying asset. Purchase of a turbo long allows an investor to participate in an underlying asset while investing only a fraction of its price. The provider funds the remaining part of the underlying asset. The part put up by the provider is also known as the financing level. The value of a turbo is in principle determined by the level of the underlying asset and the financing level:

Value of turbo long = price of underlying asset – financing level

2.4 The value of a turbo short

A turbo short position is taken with the intention of profiting from a decline in the value of the underlying asset while investing only a fraction of its value. A turbo short is similar to selling the underlying asset in the expectation that the underlying asset can be repurchased at a later date at a lower price (because the price has fallen). The difference between the original price and the later lower price is the profit realised by going short. For turbo shorts, the provider takes the short position

on behalf of the investor. The provider is thus exposed to price risk on this short position, since it has sold the underlying asset on behalf of the investor. The provider requires the investor to put up part of the value of the underlying asset. Together with the investor's deposit, the initial proceeds of the short position (the sale of the underlying asset) form the financing level. Like a turbo long, the value of a turbo short is determined by the price of the underlying asset and the financing level.

Value of turbo short = financing level – price of the underlying asset

2.5 Ratio and exchange rate

If the price of the underlying asset is high, this can form a barrier for investors to purchase a turbo because of the high initial amount that has to be invested. For some turbos therefore, a ratio is used so that a relatively low amount can be invested in the underlying asset. Ratio here is another term for division. If the underlying asset is quoted in a currency other than the currency of the turbo, the exchange rate must also be taken into account when determining the value of the turbo. The value of the turbo is determined by dividing the difference between the price of the underlying asset and the financing level by the exchange rate. The effect of a ratio and the exchange rate on the value of the turbo is shown below in formula form:

Value of turbo long = (price of underlying asset – financing level) / (ratio x exchange rate).

Value of turbo short = (financing level – price of underlying asset) / (ratio x exchange rate).

2.6 Leverage

Leverage is created because an investor in a turbo only puts up a fraction of the price of the underlying asset but still receives the full price change in absolute terms. The degree of leverage determines how much faster the value of the turbo will change as a result of changes in the price of the underlying asset. For instance, a turbo long position on share X with leverage of 5 means that if the price of share X rises 1% the price of the turbo will rise 5 times as fast, thus by 5%. The leverage is determined by the price of the underlying asset at the time of purchase and the financing level, as shown below.

Leverage turbo long = price of the underlying asset / (price of the underlying asset - financing level)

Leverage turbo short = price of the underlying asset / (financing level - price of the underlying asset)

As the leverage is determined by the price of the underlying asset at the time of purchase and a turbo is continuously tradable, the leverage of a turbo will continually change in line with the market. Indeed, the price of the underlying asset continuously changes, and the financing level changes as well with some regularity (for instance due to the costs or proceeds of the financing). The actual leverage is only decided when the consumer sells the turbo.

2.7 The financing level

For a turbo long, the financing level is the part put up by the provider for the purchase of the underlying asset. The provider charges financing costs to the investor in the form of interest on the level of financing on a daily basis. This interest is not paid directly by the investor, it is added to the financing level. The financing level therefore increases with the passage of time because the interest is calculated on the basis of the new financing level (interest on interest). Since the financing level

affects the value of the turbo, the value of a turbo long will decline over time as the financing costs increase, assuming no change in the market.

In the case of a turbo short, interest is received on the sale value of the underlying asset and the initial investment that is paid to the investor. This interest income is also known as financing income.

2.8 Corporate actions

The financing level may change as a result of a dividend distribution or other corporate action as well as due to the financing income or expenses. A turbo does not pay a dividend, although a dividend may well be distributed on the underlying asset. The absolute amount of dividend distributed on the underlying asset will be offset in the financing level of the turbo, so that the dividend distribution in principle has no effect on the value of the turbo. The dividend distribution may affect the value of the turbo at the time that the provider has to deduct tax on the dividend received.

2.9 Stop loss level

If the price of the underlying asset moves in the desired direction, in the case of a turbo long the price of the underlying asset rises and with a turbo short the price of the underlying asset declines. Since prices are moving in the expected direction, the investor realises a positive return in both cases. This paragraph discusses the situation in which the price of the underlying asset does not move in the expected direction. This situation will mean that the investor realises a negative return. Since the investor cannot lose more than his initial investment, large price movements can lead to losses for the providers. The provider therefore includes a mechanism this is known as a stop loss, sometimes also referred to as ‘knock-out’. This mechanism protects the provider against sizeable price movements. A turbo long is automatically closed when the price of the underlying asset reaches the stop loss level or moves below this level. A turbo short also includes a stop loss whereby the stop loss level is placed above the original price of the underlying asset. As long as the price of the underlying asset is falling but does not reach the stop loss level, the turbo is continued. If the stop loss level is reached, the provider will activate the stop loss. This means that the provider will close the turbo position through a purchase or sale once the stop loss level is reached. The value of the turbo after settlement of the open position is known as the residual value, and this is paid to the investor. In practice it may be the case that prices move between the time when the stop loss level is touched and the turbo is settled, meaning that the actual loss will be higher than the investor expects (the residual value).

The stop loss level is set by the provider as a percentage above the financing level for a turbo long and below the financing level for a turbo short. For example, if a turbo long on the AEX has a financing level of 290 and the stop loss is set at 6%, the stop loss level for this turbo comes to 307 (290 times 1.06, after rounding). The stop loss level is also regularly adjusted due to changes in the financing level as a result of financing income and expenses. The stop loss level may also be adjusted due to dividend distribution on the underlying asset. Furthermore, the provider may adjust the percentage on the basis of which the stop loss level is set during the term of the turbo.

2.10 Tradability

Turbos have a market listing and the provider primarily acts as a market maker. This means that under normal market conditions the provider will purchase and sell the turbo during market hours and will continually quote a bid and offer price for the turbo. Turbos can also be traded between investors through the market. This does not, however, apply to all trading platforms on which turbos are traded. Generally there are no other market makers other than the provider itself, however trading also

occurs between the investor and a third party other than the provider. This last point also does not apply to all trading platforms on which turbos are traded.

2.11 Costs

Investors incur costs when investing in turbos. The following costs are relevant to investment in turbos.

2.11.1 Financing income and expenses

Financing income and expenses are calculated by the provider for the provision of the financing, and are the main source of revenue for the provider. For a turbo long, the costs are in principle determined by a prevailing rate of interest (such as 3-month Euribor or overnight Libor) + a margin (also called the 'current spread'). In case of a turbo short, the providers assume there will be financing income. This is calculated as the prevailing rate minus the current spread. If the prevailing rate is low, this income is negative. Instead of receiving income, the investor has to pay costs for the financing. If the underlying asset is illiquid, the current spread can be higher than for other underlying assets.

2.11.2 Spread

The market maker quotes prices at which it will purchase or sell the turbo, known as the bid and offer prices. The difference between the bid and offer price is known as the bid-offer spread. The wider the bid-offer spread, the less favourable this is for the investor. The size of the spread depends on the liquidity of the underlying asset. The size of the spread is also determined by the type of product offered and the type of underlying asset.

2.11.3 Bank and broker fees

The bank and/or broker will also charge fees for trading in turbos, such as custody fees for the custody of the turbos and transaction costs. The transaction costs for turbos usually consist of a fixed amount plus a percentage of the order size. Some firms have lower charges for proprietary products. These costs affect the amount that an investor wishes to invest: if the order size is too low, the costs will be seen as too high in relative terms.

2.11.4 Taxation

Investment in turbos may involve tax being withheld from the investor if this is not previously settled through the provider. The tax implications of investing in turbos depend on the individual investor's situation and are therefore ignored for the purpose of this report.

2.11.5 Gap risk premium

A premium is charged on top of the financing level for investments in limited (turbos with a previously set term to maturity) and BEST turbos (for a further description of this type of turbo, see section 2.14). This premium is paid by the investor to the provider and is intended to protect the provider in the event of a sharp fall in the value of the underlying asset. The investor receives all or part of the gap risk premium when the turbo is traded (and not settled). The gap risk premium is set by the issuer. The assumptions and calculations used to establish the premium vary according to the provider concerned.

2.12 Turbos with a commodity as the underlying asset

Leveraged products are also offered that have a commodity as their underlying asset. The price at which the commodities are delivered is known as the spot price. There is no stock market price for most commodities. If a provider of commodity turbos was to invest directly in the underlying asset, it would also have to take physical delivery of the underlying asset. Since actual delivery of many commodities is not desired (such as oil, wheat or pork bellies), these are traded using contracts known as futures. A futures contract is entered into on an exchange. The contract determines the quantity, quality and timing of delivery. The price of a future is the price calculated for the future delivery of the underlying asset on a certain date. Since a turbo in theory is perpetual, as time passes the previously concluded future has to be sold and a new future with a longer term to maturity is purchased. This is necessary in order to avoid having to accept actual delivery of the underlying asset. This process is known as a futures roll-over. For certain precious metals, such as gold and silver, the value of the underlying asset can be determined on the basis of the spot price. This is because the trade in these precious metals is sufficiently liquid. A turbo with a future as the underlying asset may also be chosen when there is little liquidity in the underlying asset, for example government bonds.

2.12.1 Contango and backwardation

Futures with various maturities are offered in the market. A futures curve can thus be created on the basis of the relative prices of futures contracts with different maturities. The most frequently occurring futures curves are a flattening declining curve and a flattening rising curve. These two types of curve are known as contango and backwardation. In a market in contango, the prices for futures with a longer maturity are higher than those with a shorter maturity (negative roll return). The difference in price of the future can be due to various factors, such as storage costs. In a market in backwardation, the prices for futures with a longer maturity are lower than those with a shorter maturity (positive roll return). This difference in price may be due for example to a temporary shortage in the market or expectations of a big harvest in the near future.

2.12.2. Futures roll-over

For a turbo with a future as the underlying asset, the future must be rolled over when the maturity date is approaching. Rolling the future over may affect the turbo. The principle applied by the providers for rolling futures over is that the value of the turbo is not affected by the roll-over. The financing level of the turbo however does change, and therefore also the leverage of the turbo.

2.12.3. What is the effect on a turbo if the underlying asset is a future with a curve in contango?

The financing level of a turbo long in a contango situation changes when the future is rolled over, since the difference in price between the current price and the price of the ‘new’ future (which is higher in a contango market) is added to the financing level.

2.12.4. What is the effect on a turbo if the underlying asset is a future with a curve in backwardation?

The financing level of a turbo long in a backwardation situation changes as a result of the difference in price between the current price and the price of the 'new' future being subtracted from the financing level.

The effect of the roll-over is that the financing level changes. This adjustment ensures that the value of the turbo does not change, however the degree of leverage of the turbo does change. In case of contango, the leverage increases for a turbo long, whereas it decreases in backwardation. The change in the financing level will affect the value of the turbo over time. The change in the financing level will also affect the stop loss, since the financing level changes significantly at that time. When the value of the new future falls or rises towards the original price due to the passage of time, the future will have to be rolled over again and the cycle begins again. For a turbo short, the change to the financing level results in higher leverage in a contango situation and lower leverage in a backwardation situation.

2.13. Various product variants

A feature of a traditional turbo is that the product has no maturity date and that the financing level is not the same as the stop loss level. The stop loss level is a percentage above or below the financing level of a turbo long or short. After the introduction of these traditional turbos, the providers have launched various other types of turbo on the market, such as turbos for which the financing level and the stop loss level are the same, and turbos with this last-mentioned feature but which also have a fixed settlement date.

2.14. BEST turbos

BEST turbos are traditional turbos with no maturity date for which the stop loss level is the same as the financing level. BEST stands for Barrier Equal STrike. Since the stop loss level is at the same level as the financing level, higher leverage can be achieved than with an unlimited variant. The fact that a BEST turbo's stop loss level is the same as the financing level means that if the stop loss is triggered there will never be any residual value to be paid to the investor. The investor can also never lose more than his original investment.

A provider is exposed to a risk with respect to the settlement of a BEST turbo, since it cannot be guaranteed that the settlement of a turbo will be made at the exact level of the stop loss, and therefore at the financing level. It may be the case that a BEST turbo is settled at a price that is lower than the financing level. This can happen when a provider cannot close a position quickly enough, the price of the underlying asset is extremely volatile, or when the underlying asset reaches the stop loss level outside the trading hours of the BEST turbo. The provider cannot recoup this potential loss from the investor, since the investor can never lose more than his original investment. In order to hedge this risk, the provider asks for an additional premium known as the gap risk premium. The amount of this premium is set by the provider and adjusted at its own discretion. The charging of a gap risk premium affects the value of the limited turbo. Since the provider determines the gap risk premium, the pricing of BEST turbos is not completely transparent. The determination of a BEST turbo's value is as follows:

Value of turbo long = (price of underlying asset – financing level) + gap risk premium

(ratio x exchange rate).

2.15. Limited turbos

Limited turbos are also leveraged products with the same stop loss level as the financing level (like BEST turbos). The additional feature is that the life to maturity of the product is limited by means of setting a settlement date. Since the stop loss level is at the same level as the financing level, higher leverage can be achieved than with an unlimited variant. The fact that a limited turbo's stop loss level is the same as the financing level means that if the stop loss is triggered there will never be any residual value to be paid to the investor. On the other hand, the investor can never lose more than his original investment. A limited turbo is therefore really the same as a BEST turbo with the extra element of the settlement date. The provider will also include a gap risk premium with a limited turbo to hedge the risk that the limited turbo is settled at a price that is lower than the financing level. The value of a limited turbo is additionally affected by the existence of an end date as well as by the charging of a gap risk premium. The pricing of a limited turbo is therefore less transparent than for a traditional turbo and the BEST variant. The pricing process can best be compared to that used in the options market. It was not necessary to run calculations for limited turbos for the purpose of this report. They will, however, be discussed further in qualitative terms.

3. The risks of investing in turbos

Just like other investment products, investing in turbos involves risks. This paragraph looks at the risks specifically associated with investing in turbos.

3.1. Price and leverage risk of a turbo

The value of a turbo can fluctuate during its life. The value of the turbo, or its price, depends on the price movements in the underlying asset. It may therefore happen that the price of a turbo falls below the price at which it was purchased during its life to maturity. The leveraged nature of the turbo means that the movements in the price of the underlying asset are magnified in the price of the turbo. The greater the leverage, the more this will be the case.

3.2. Risks related to the pricing of turbos with a gap risk premium

For limited and BEST turbos, there is no buffer between the financing level and the stop loss level. Instead, the provider charges a separate premium known as the gap risk premium. This premium is a percentage above the financing level. The choice of a percentage increases the absolute buffer for the provider as the risk of the stop loss level being reached diminishes. The issuer is free to adjust these percentages. This happens regularly on the basis of liquidity and market sentiment. There is no formula or rule of thumb recognised in the market for this purpose. Since the gap risk premium forms part of the value of the turbo, it is important for investors. The pricing of this gap risk premium and therefore the turbo itself is accordingly not transparent.

3.3. Risks related to investing in BEST turbos

The BEST type of turbo is similar to a limited turbo (see below) as regards the opaqueness of pricing as a result of the gap risk premium. Since there is no previously set maturity date for the turbo, there is no risk that the gap premium will be lost at maturity. Like limited turbos, BEST turbos may feature higher leverage so that the leverage effect is relatively higher compared to that of an unlimited turbo.

3.4. Investing in limited turbos

Since limited turbos have a limited life to maturity, the price of this turbo also depends, in addition to the normal factors, on the remaining life to maturity. This makes the pricing of limited turbos less transparent compared to unlimited turbos. In the pricing process, the provider is permitted to ask an additional amount on sale of the turbo as a risk premium. The amount of this premium can vary over time and per turbo. An investor will lose this premium when the underlying asset reaches the financing level or if the turbo is held until the maturity date. This is a reason not to hold a limited turbo until the maturity date.

3.5. The risk of no or limited residual value with automatic settlement

If a turbo's underlying asset reaches the stop loss level, the turbo is automatically closed by the provider. In normal market circumstances, the residual value that is paid to the consumer after settlement will in principle be the same as the difference between the financing level and the stop loss level. The residual value will always be less than the investor's initial investment. There is no guarantee that the provider will be able to close the turbo at the stop loss level. In volatile market conditions, it may be the case that the price of the underlying asset falls so far below the stop loss level that no residual value remains. In this case the residual value is nil and the investor will have

lost his entire investment. In the case of limited and BEST turbos, the residual value is always nil if the stop loss level is reached. This is because with these types of turbo the stop loss level is always the same as the financing level. The risk that there will no or limited residual value is linked to the movement in the underlying asset and this risk increases when the difference between the price of the underlying asset and the stop loss level narrows. Since the degree of leverage increases when the difference between the price of the underlying asset and the financing level diminishes, this risk is also relatively higher for turbos with higher leverage.

3.6. Stop loss level may be reached outside the turbo's trading hours

The stop loss level for the underlying asset may be reached at times outside the hours during which the turbo itself can be traded. Many commodities are for instance traded on US markets and due to the time difference it is not always possible to trade both the underlying asset and the turbo simultaneously. There is thus a possibility that the investor will not be able to trade his turbo when the underlying asset approaches the stop loss level. Different providers apply different procedures when the underlying position is closed. Providers have different procedures regarding the timing of settlement. Some providers settle the position immediately (also outside the turbo's trading hours). Investors in this case receive the residual value that is established during the night. Others choose not to settle the position until the opening of trading hours. In this case, there are two possible twee scenarios. Either there is no residual value, and the investor receives no further payment for the turbo. Or the price of the underlying asset has remained above the financing level, in which case the investor receives the difference between the underlying asset and the financing level at the time of settlement. There are also providers which do not effect a knock-out if the price of the underlying asset falls below the stop loss outside the turbo's trading hours and then rises again above the stop loss level.

3.7. Credit risk on the issuer

Turbos are financial constructions. This means that in case a provider becomes insolvent, investors will only receive a fraction of the value, and in the worst case they may lose their entire investment. It is also the case that investors in turbos have no claim on the underlying asset. For example, this means that if a stop loss level is reached or if the provider becomes insolvent, the residual value in the physical underlying asset is not paid out.

3.8. Liquidity risk

The secondary market in turbos is not guaranteed. There is therefore no guarantee that after issuance a turbo can be traded in a liquid market. In practice, providers conclude a contract with the exchange on which the turbos are traded that they will act as liquidity providers or market makers and thus offer investors the opportunity to buy or sell turbos for nearly 100% of the time. The providers are however not obliged to guarantee liquidity. Depending on the platform selected, it may also be the case that the contract with the exchange also includes agreements regarding the maximum spread within which the liquidity providers operate. The risk for investors in the case of there being no market is that there may be no party willing to purchase the turbo. In the worst case therefore, the investor must be prepared to hold the turbo until the end (when the stop loss is reached). It is important to note here that the AFM has so far not received any complaints of this nature. Turbos are also increasingly being traded on other platforms (OTC) besides on the exchange (multilateral). The AFM has not reviewed the liquidity agreements between the providers and these other platforms.

3.9. Exchange rate risk for a turbo on underlying assets quoted in a different currency

In case of an underlying asset that is traded in a currency other than the euro, the value of a turbo is partly determined by the exchange rate. This means that the investor incurs an exchange-rate risk. An appreciation in the foreign currency against the euro has a positive effect, however a depreciation of the foreign currency against the euro will have a negative effect on the value of the turbo.

3.10. Risks related to investing in turbos with a future as underlying asset

The price of a future can differ from the spot price of a particular underlying asset in the market (before delivery). Investors should be aware that the underlying asset in this case is not the spot price, it is the price of the future. Liquidity in a futures market can vary, and this can significantly affect the price of futures as an underlying asset. Since futures have a fixed maturity date, they are rolled over before the underlying future's maturity date to a 'new' future with a longer time to maturity than that of the current future. Futures with different maturities will normally have different prices. In a contango situation, the financing level is adjusted higher on roll-over and the degree of leverage increases. If the spot price remains the same, a contango situation is detrimental to turbo long positions. In a backwardation situation, the financing level is adjusted lower on roll-over and the degree of leverage for a turbo long decreases. If the spot price remains unchanged, a backwardation situation is detrimental for turbo short positions (see also the explanation of turbos with futures as the underlying asset).

3.11. Turbos are callable

Providers may terminate turbos prematurely without the investor's agreement and without the stop loss level being reached. The reason for premature termination may be for instance that the provider is no longer in a position to hedge the risk, or because legislation and regulation have been changed. The settlement of turbos that have been called depends on the price of the underlying asset.

3.12. Delays in the settlement procedure

When a turbo is closed out, there is a period between closure and actual settlement. The final terms usually state the length of this period. It may be the case that when an underlying asset hits its stop loss there will be a certain period of time before the turbo is actually settled (for instance when a turbo reaches its stop loss level outside trading hours), which can mean that the residual value is less (or more) than it theoretically could have been. Delays may also occur in the actual payment on settlement for various reasons. It normally takes three business days before investors receive their money. Some parties pay the residual value in advance. But there is a risk that the settlement procedure will take longer than expected.

3.13. Conflicts of interest

Various conflicts of interest may arise in connection with turbos. The first is between the provider that issues the turbos but also carries out other activities (as explained above. The issuer can influence the value of the turbos by taking certain actions). Another potential conflict of interest is that of the provider as the market maker. The provider is firstly not obliged to maintain a market, and secondly it is not obliged to publish the model it uses to establish the spread. It is also free to change this model if it so wishes. The implication therefore is that the provider is free to set the spreads, within the limits of the regulated market. The spreads are thus not necessarily the most favourable spreads for investors. Finally, there may be a conflict of interest between the role of provider and the role of

calculation agent (the party that establishes the residual value). Usually this is the same party, and this party is therefore free to determine (within agreed maximum time periods) the timing of the closure of the positions in the underlying assets after the stop loss has been hit. In the case of an unlimited turbo, this can have a big impact on the residual value. This does not apply to BEST and limited turbos, since for these instruments the residual value equals nil. The AFM has not yet received any complaints regarding these conflicts of interest. The providers also provide transparent information on the risks of a conflict of interest by including this in the section on risk factors in the prospectus (and any other documentation).

4. Findings of the AFM's review

The AFM's review has made use of a quantitative analysis of leveraged products. Appendix 1 contains an overview of the way in which the model for this was designed. The key principles of the model are as follows:

- 10-year historical data on the underlying asset has been used;
- 5000 samples were used for each analysis (based on Monte Carlo);
- The holding periods were 5 and 20 days for unlimited turbos, and 2 and 5 days for BEST turbos[1].

The AFM made a selection of 60 products from the available supply of turbos and entered these instruments in the model. The selection consisted of 40 unlimited turbos with low, medium and the highest available degrees of leverage. 20 BEST turbos were also entered in the model. The data entered were those published on the provider websites on 9 November 2012. The underlying assets used were the AEX, DAX, Shell, ING, Gold and EUR/USD.

The analysis produced a figure showing the probability of achieving a certain return (the vertical axis) against the amount of the return (horizontal axis). If for example a figure shows "20%" on the vertical axis and "45%" on the horizontal axis, this means there is a 20% probability on the basis of 10 years' history of the underlying asset that the investor will realise a 45% return (for example by holding a BEST turbo for 2 days).
The AFM has chosen to use historical data for the underlying asset because this means that returns and volatility do not have to be estimated and in this case this means there is a reasonable approximation of reality. It is of course also the case that historical data never provide a reliable prediction of the future movements of an underlying asset.

The modelling of reality has certain inherent limitations. For one thing, the model uses standard holding periods which of course may be different in practice. The scenarios are moreover expressed in percentages and not absolute amounts. For the calculation of probability distribution for BEST turbos, the gap risk premium has been left out of consideration.

The results of the analysis clearly show that turbos with high leverage have a high probability of a loss, or a small probability of a positive return (especially for longer holding periods). The AFM considers this feature to be a cause for concern, since investors that are not investing on an intraday basis are thus likely to lose all or part of their investment in a very short space of time. The AFM thinks that the providers of these products should provide more information on this feature of leverage, and also that they should set limits for this factor.

[1] *Based on subsequent discussions with the providers, we have concluded that the holding period for turbos with higher leverage is usually shorter. We did not however decide to carry out new calculations.*

4.1. Some examples[2]

4.1.1. AEX as the underlying asset

Most turbos sold have the AEX as their underlying asset. This underlying asset therefore appears frequently in the turbos selected. Several results are presented below for turbos with the AEX as underlying asset for various degrees of leverage and holding periods.

The first figure shows the probability distribution for a turbo long with the AEX as the underlying asset, with a leverage of 40.6 and a holding period of 5 days. The potential returns of the turbo are shown in the horizontal axis in categories (or 'buckets'). The vertical axis shows the probability that the return shown in the horizontal axis will be realised:

Text in figures (applies to all figures in this section):

- *Header: "Return distribution for turbo"*
- *Blue line: turbo*
- *Red line: underlying asset*
- *Horizontal axis: More than x%, less than y%*

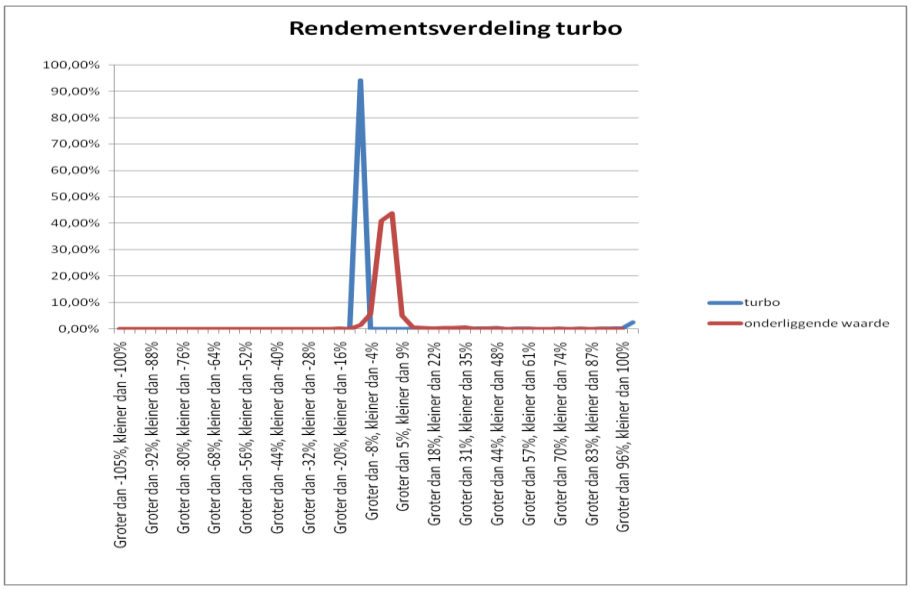

Figure 1: Turbo long AEX, leverage 40.6, holding period 5 days.

[2] *The last category in the horizontal axis in the figures is 'less than 100% included'. This should be 'greater than 96%'. In some cases, this leads to a peak at the end of the horizontal axis.*

The first category in the horizontal axis in the figures is 'less than 100% included'. This may also be exactly 100%. For BEST turbos, the peak visible in this category is also exactly 100% in all cases.

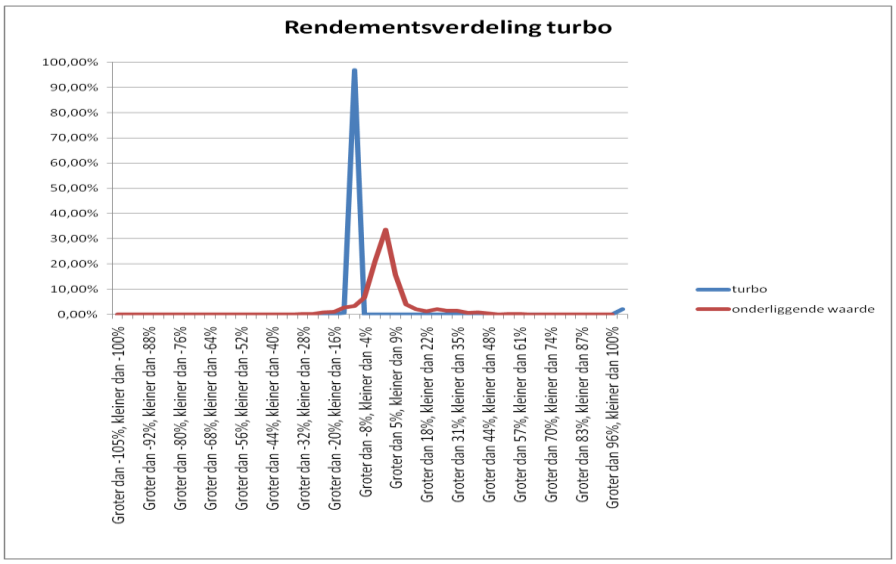

Figure 2: Turbo long AEX, leverage 40.6, holding period 20 days.

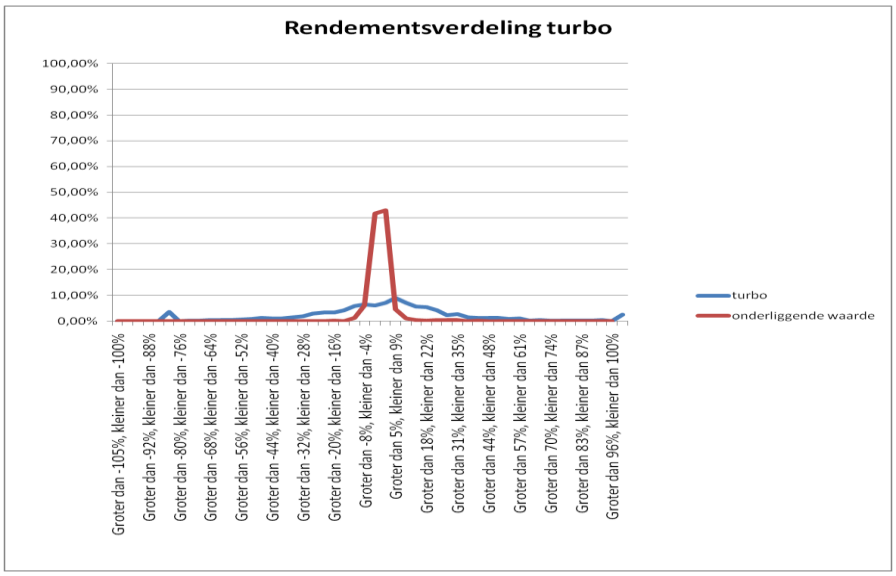

Figure 3: Turbo long AEX, leverage 10.3, holding period 5 days.

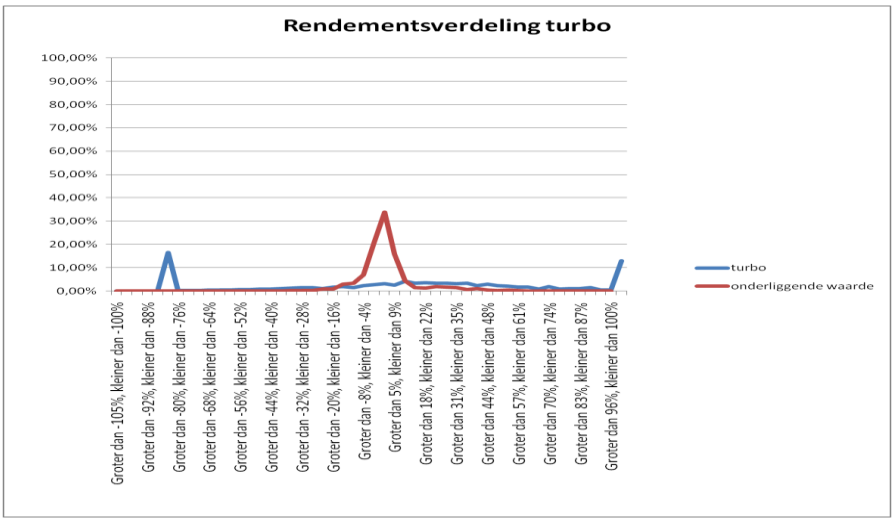

Figure 4: Turbo long AEX, leverage 10.3, holding period 20 days.

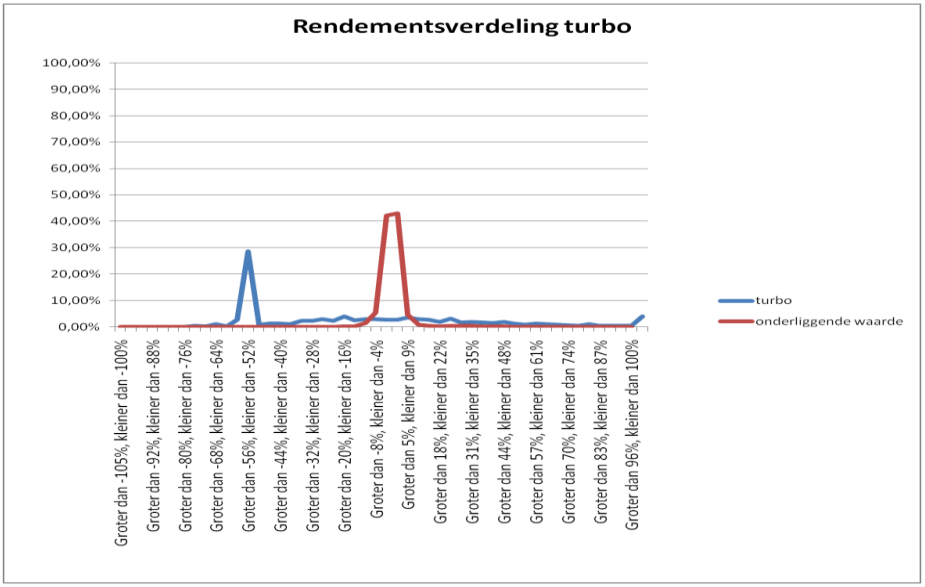

Figure 5: Turbo short AEX, leverage 22.6, holding period 5 days

4.1.2. RDS and ING as underlying asset

In addition to several turbos with the AEX as underlying asset, the AFM has also calculated scenarios for several turbos with an individual share as the underlying asset. These shares are ING and Royal Dutch Shell:

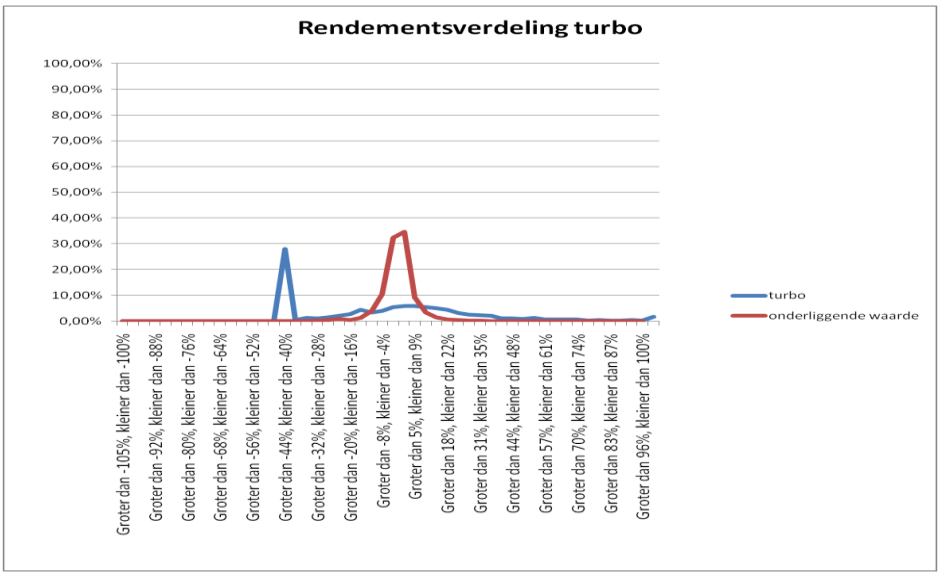

Figure 6: Turbo long ING, leverage 7.7, holding period 5 days

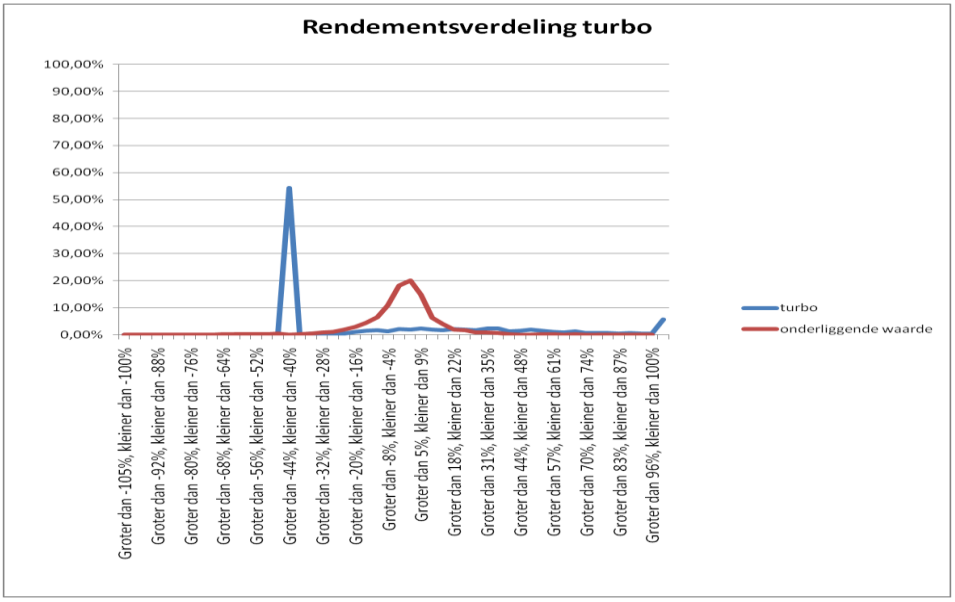

Figure 7: Turbo long ING, leverage 7.7, holding period 20 days

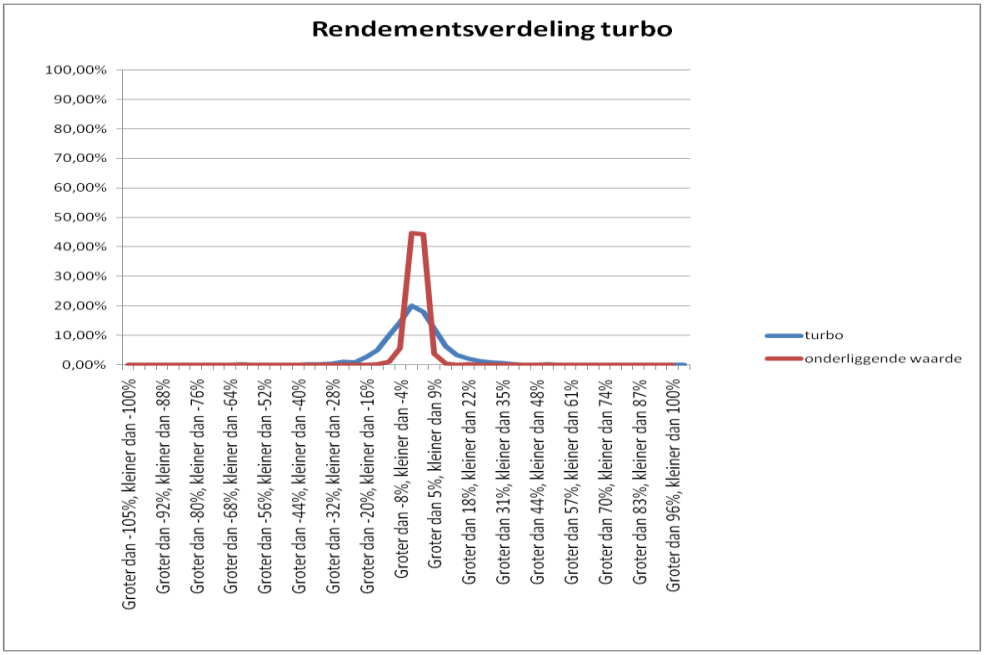

Figure 8: Turbo long RDS, leverage 3.7, holding period 5 days

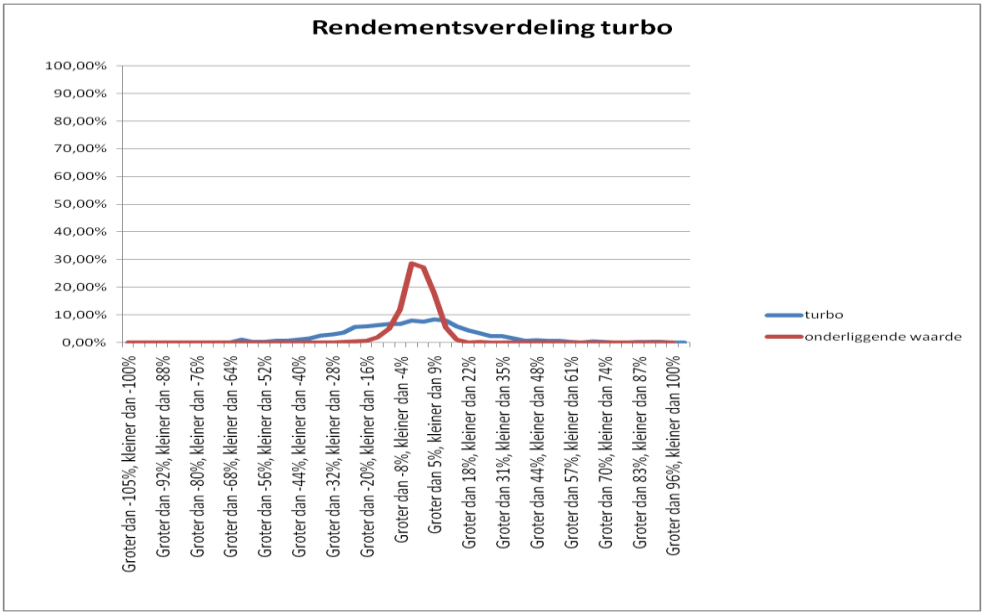

Figure 9: Turbo long RDS, leverage 3.7, holding period 20 days

4.1.3. Gold as the underlying asset

The AFM calculated scenarios for turbos with gold as the underlying asset:

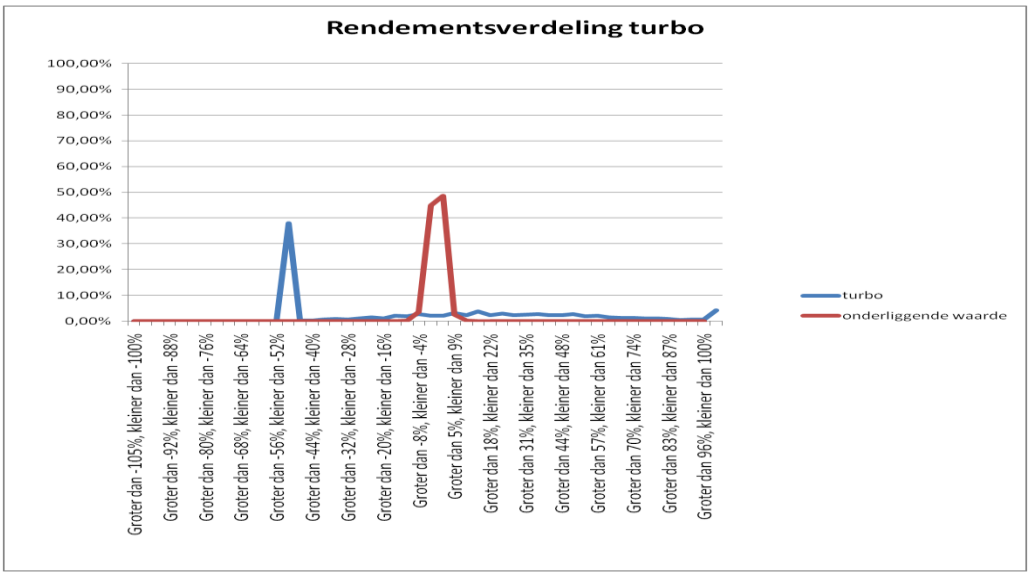

Figure 10: Turbo long Gold, leverage 26.2, holding period 5 days.

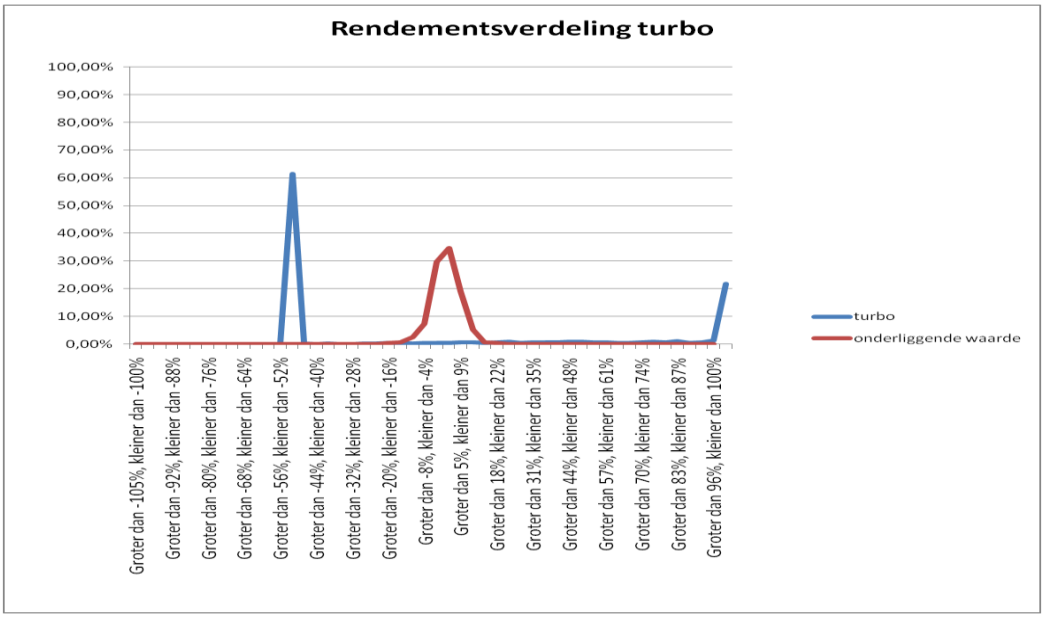

Figure 11: Turbo long Gold, leverage 26.2, holding period 20 days.

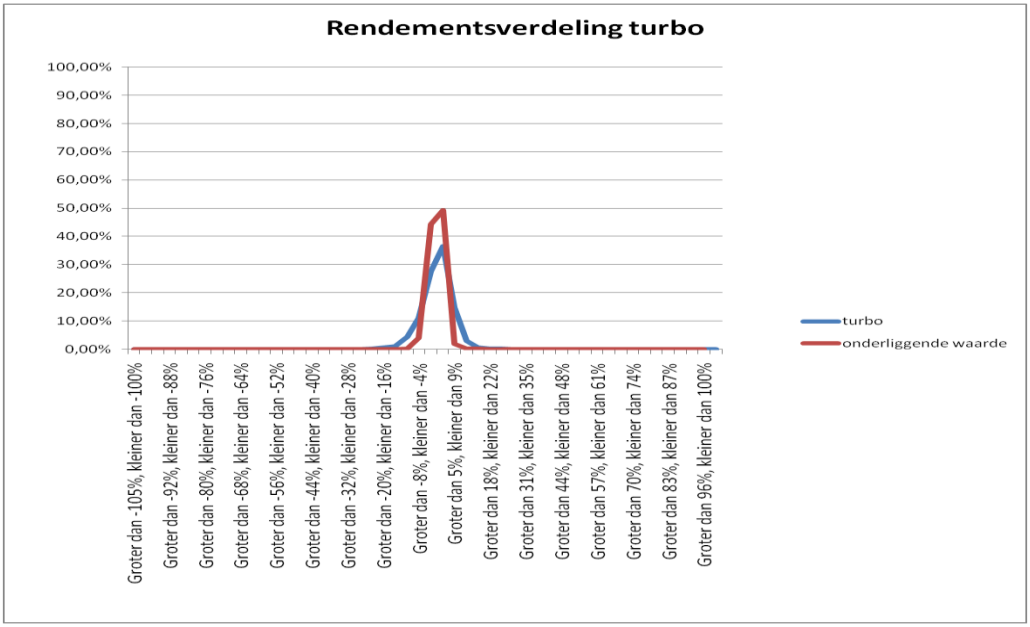

Figure 12: Turbo long Gold, leverage 2.3, holding period 5 days.

4.1.4. BEST variants

The AFM calculated scenarios for several BEST turbos in addition to the scenarios calculated for unlimited turbos. The probability distribution for three BEST turbos is shown below:

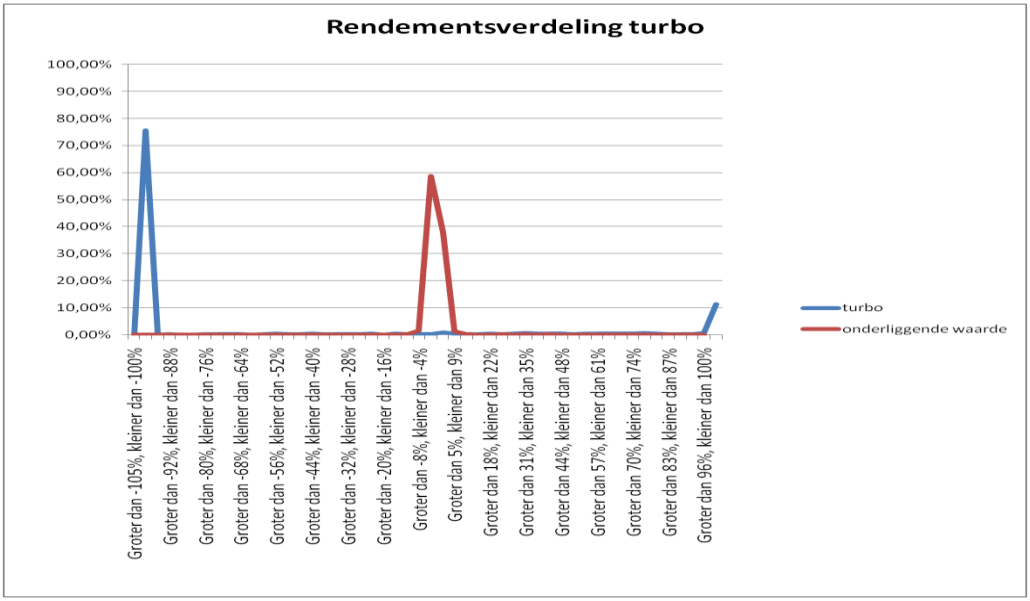

Figure 13: BEST Turbo short AEX, leverage 195.4, holding period 2 days.

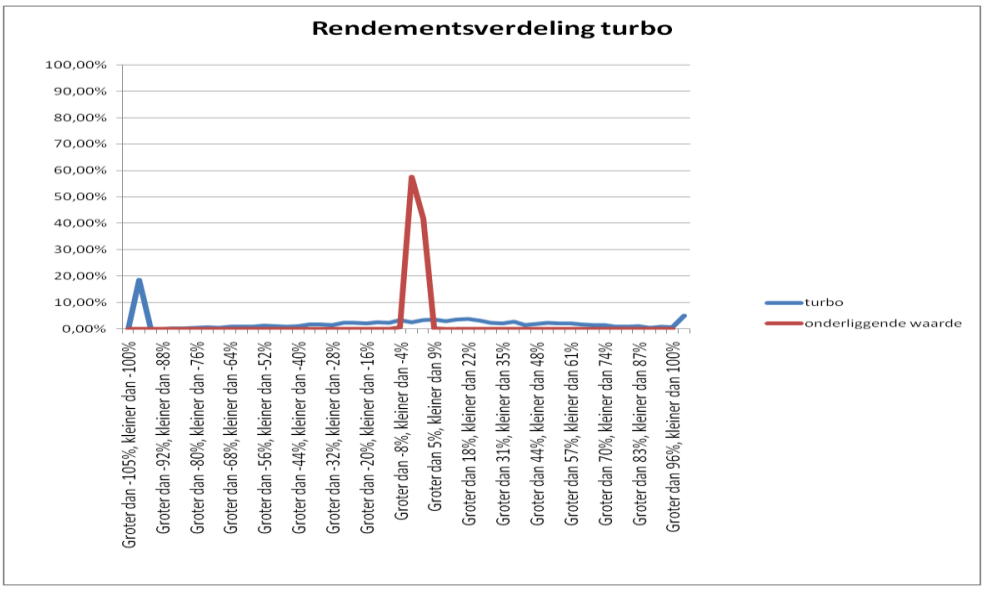

Figure 14: BEST Turbo short AEX, leverage 53.9, holding period 2 days.

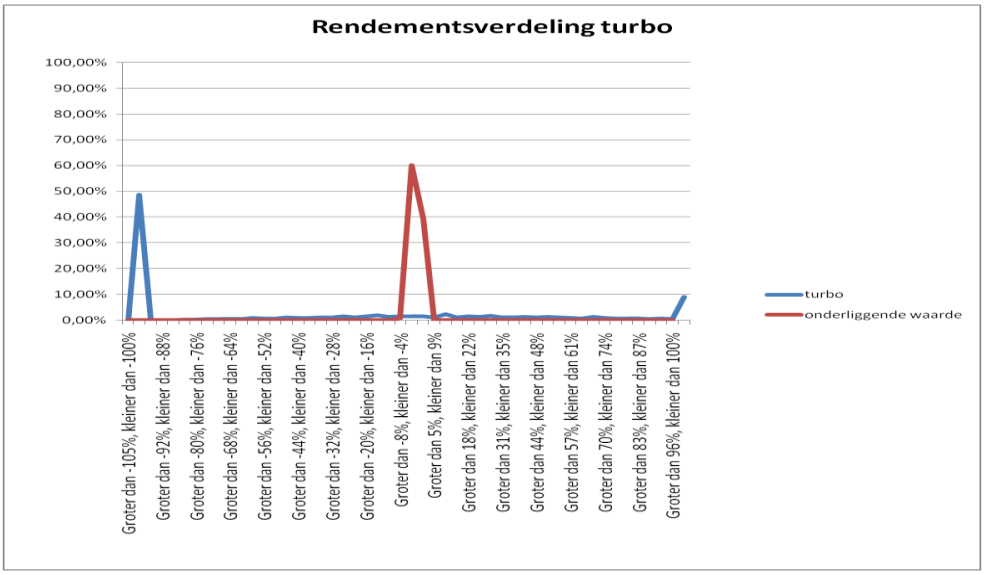

Figure 15: BEST Turbo short AEX, leverage 99.6, holding period 2 days.

4.1.5. Calculation of other leverages

In addition to calculating scenarios for turbos available in the market, the AFM has made a probability distribution for each of the underlying assets whereby a potential leverage (of 1 to 200) is compared to the probability of a return of more than 0%. We have included an example of such a 'theoretical' probability distribution below.

Text in figure:

- *Vertical axis: Probability of a negative return*
- *Bluie line: hypothetical turbo long AEX*
- *turbo provider (x5)*

leverage

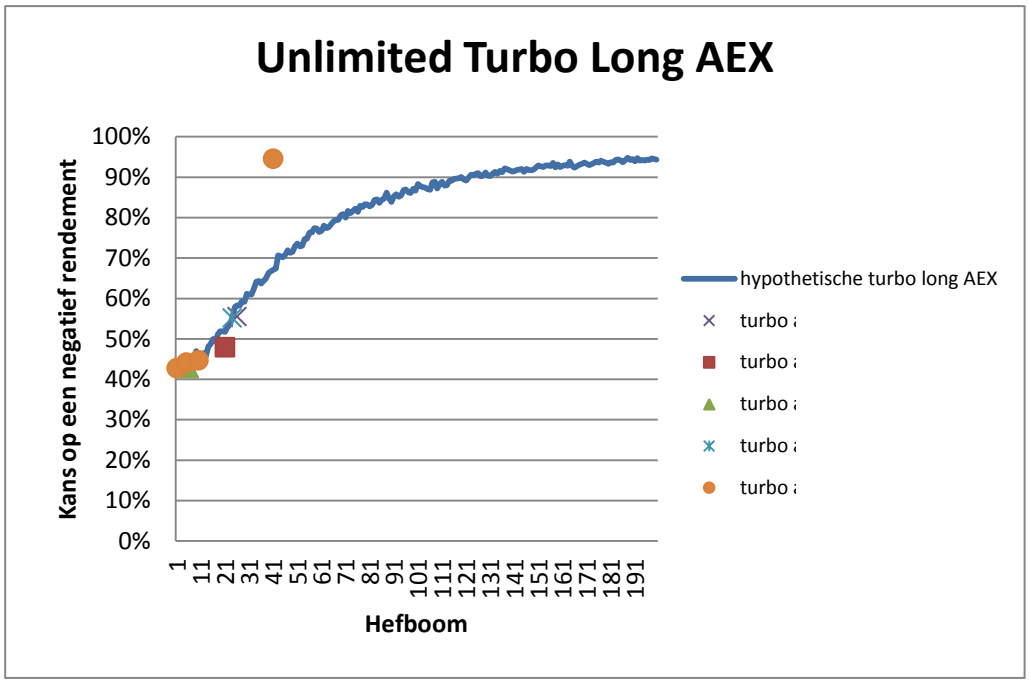

Figure 16: Probability distribution for turbo long AEX with leverage of 1 to 200 (holding period 2 days)

5. Response from the providers

The following text is a response by the providers to the findings of the AFM.

The AFM took the initiative in mid-2012 to review the operation and risks of a number of leveraged products, namely turbos, sprinters and speeders etc. The total range of leveraged products is much larger than this. Options, futures, warrants and contracts for difference (CfDs) are also products that feature leverage. The providers take the view that these products should have been included in the review as well as turbos, sprinters and speeders etc. (hereinafter, “turbos”).

As part of its review, the AFM has designed a theoretical model for the purpose of simulation of a number of situations in relation to the trading and returns of leveraged products. This model is based on a number of assumptions made by the AFM, partly on the basis of consumer research. Some of these assumptions are essential for the findings of the model. In particular, the so-called holding period (the period during which the investor owns the turbo) plays an important role. The providers see that investors hold turbos for an average period of 1 – 2 days. Turbos with high leverage are usually traded by investors intraday, meaning that the holding period is less than 1 day. The use of a holding period that does not fully reflect investor behaviour means that the findings of the AFM’s theoretical model do not always correspond to actual investor behaviour.

In consultation with the AFM, the providers have moreover decided to take various measures to increase the transparency of leveraged products and to mitigate the risk of holding turbos for more than 1 day. Further details and explanation of the measures are provided below.

5.1. Providers to set up a common website with additional information on leveraged products

The embedded stop-loss mechanism is one of the most important features of a turbo. It is very important that investors understand this mechanism. Because turbos have a stop-loss, investors can never lose more than their initial investment. This however can occur with some other leveraged products, such as options, futures and CfDs. For instance, for products for which margin has to be posted it may be the case that additional payments have to be made. In discussion with the AFM, the providers of turbos have decided to put more emphasis on the stop-loss mechanism in the information they provide and the effect this has on the expected returns and maturities. The information provided will include the following:

A turbo’s stop-loss only has to be hit once for the turbo to be closed by the provider. In this case, the residual value will be paid to the investor, which in any case will never be less than nil. The inclusion of the stop-loss mechanism means that turbos have a different risk-return profile than that of the underlying asset. The value of a traditional long turbo is the same as the difference between the price of the underlying asset and the financing level. The stop-loss level is set between the price of the underlying asset and the financing level. For a turbo, the difference between the financing level and the stop-loss level acts as a buffer for the settlement in case the stop-loss is hit. The risk that settlement will occur at the financing level is for the investor. When the stop-loss is hit, the position is closed by the provider. Depending on the price at which the position is closed, the residual value of the turbo is established and paid to the investor. Various scenarios are possible:

1. The settlement price is higher than the financing level: the residual value is equal to the difference between the financing level and the settlement price;

2. The settlement price is lower than the financing level: the residual value is nil. The provider then has a loss equal to the difference between the financing level and the settlement price.

In addition to traditional turbos, various providers offer variants (limited and best) for which the stop-loss and the financing level are the same. Setting these at the same level means the leverage for these products is higher than it is for traditional turbos. It also means that the residual value is always nil. For these products, the risk of settlement is fully borne by the provider. To compensate for the extra risk, investors pay a fee known as a gap premium. This is a surcharge on the value as calculated for a traditional turbo (price of underlying asset less financing level). The amount of the surcharge depends on the underlying asset and the risk perception (the difference between the price of the underlying asset and the stop-loss) of the provider at the time of the trade. For instance, when an important economic event (such as a G7 meeting) is imminent or when a company is about to announce important news, the gap premium will be higher. Since the gap premium is a surcharge that is included in the price of a limited or a best turbo, the investor receives the premium back when he sells the turbo. The amount of the gap premium can vary at all times. If the stop-loss is hit, the investor loses the gap premium. The pricing of products with the same stop-loss level and financing level is less transparent than for traditional turbos, because while the investor knows the amount of the gap premium he cannot himself calculate its exact composition.

5.2. More and clearer warnings on provider websites

Since the AFM's model cannot be replicated by the providers, the providers have developed a model for making the risks of a stop-loss for turbos and variants thereof more comprehensible. One aspect that is important to an investor is the possibility (or probability) that the stop-loss will be triggered while the investor owns the turbo. The providers of turbos have developed a model that explains this further. The likelihood that a stop-loss will be hit depends mainly on:

- The volatility of the underlying asset = volatility;
- The period that the turbo is owned by the investor = the holding period;
- The level of the stop-loss compared to the level of the underlying asset = the stop-loss buffer.

Information on the likelihood of the stop-loss being reached with respect to volatility, holding period and the stop-loss buffer is provided in the figures below. For the purpose of the figures, it makes no difference whether the instrument is a traditional, limited or best turbo, since we are looking at the stop-loss buffer and not the leverage.

Text in figure:

- *Vertical axis: Probability of reaching stop-loss (x3)*

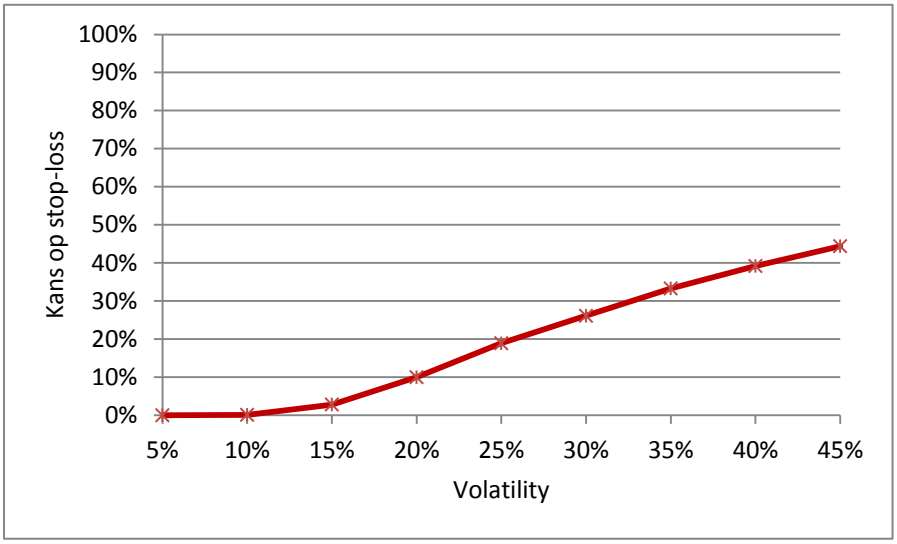

Figure 1: AEX – Stop-loss buffer: 2% and Holding Period: 1 day

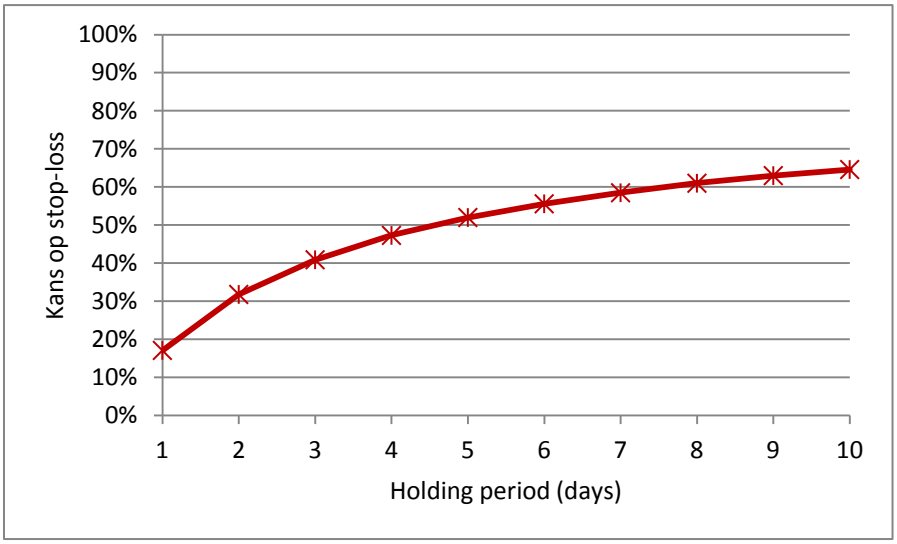

Figure 2: AEX – Stop-loss buffer: 2% and Volatility: 20%.

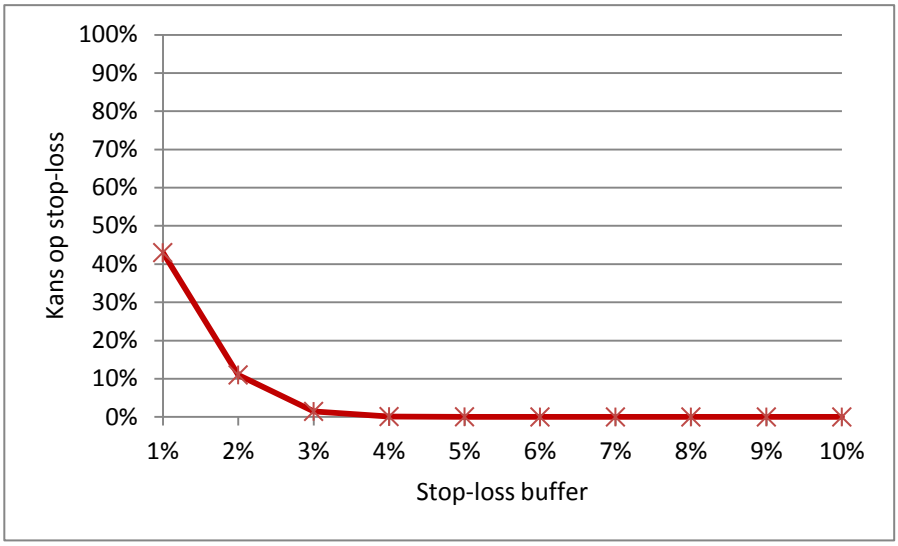

Figure 3: AEX – Volatility: 20% and Holding Period: 1 day

The following can be inferred from the figures with regard to the stop-loss mechanism:

• The greater the volatility of the underlying asset, the greater the chance that the stop-loss will be hit;
• The longer a turbo is held, the greater the chance that the stop-loss will be hit;
• The nearer the stop-loss level is to the current price, the greater the chance that the stop-loss will be hit.

The providers of turbos will add these analyses to their collective website and include them in their marketing material. This will make investors aware of this information before buying or selling turbos. The providers will stress that the above is a theoretical approximation of reality. In reality, there is ultimately only one outcome for the investor. The figures should not be seen as any form of advice or recommendation to buy or sell a particular turbo.

5.3. Formation of a providers' association

The providers have moreover decided to set up a structured products association. The association will initially focus on further improving the provision of information on turbos and describing the differences between the variants thereof. In addition, the association will strive to affiliate itself to EUSIPA (a European structured products association). The association will also be the party responsible for setting up and managing the collective providers' website.

5.4. The product offering of the providers

The providers of turbos have drawn up a number of guidelines for the issuance of new turbos. In this, the theoretical probability that a turbo's stop-loss will be hit plays an important role. The current policy on issuance takes very limited account of this. The guidelines will result in the issuance of turbos that have a stop-loss buffer that is greater in relation to the price of the underlying asset than currently is the case. No change will be made to turbos already issued in which investors hold positions. For the providers, it is important that investors can be assured that the providers will continue to provide good liquidity in their turbos. The providers have set themselves the target of implementing these measures and guidelines by 1 October 2013.

The providers have decided to use a different model to explain how the stop-loss mechanism works. The result of this model is that a probability of the stop-loss being hit can be calculated for turbos. The guidelines have been formulated by the providers on the basis of their discussions with the AFM regarding its review of turbos in general and its express request to issue turbos that give investors a better chance of achieving a positive return for a given holding period.

In the experience of the providers, the majority of investors in turbos in the Netherlands are active investors or day-traders, and not traditional buy and hold investors. The research conducted by the providers shows that investors in high leverage turbos generally hold their positions on average for less than 1 day. The providers can establish this because they act as counterparties for the market as a whole. It is regularly the case that investors will sell their position within one hour. These investors particularly look for high leverage so that they can profit from small movements in the financial markets without incurring a serious price risk. The embedded stop-loss means that their losses are always capped.

The research conducted by the providers also shows that when investors do hold high leverage turbos for longer, the chance of the stop-loss being triggered, and therefore the loss of the initial investment, is greater (against a small chance of a very high return). The providers will devote further effort to making investors aware of this risk.

5.5. Guidelines for the issuance of turbos and variants in the primary market

At the request of the AFM, the providers have decided to collectively formulate guidelines for the issuance of turbos. The current providers of turbos in the Dutch market will observe these guidelines. The substance of these guidelines will be made known only to the AFM. A brief description of the guidelines is provided below:

- The chance of a stop-loss being hit will be calculated for each underlying asset on the basis of a model developed by the providers. The assumptions regarding volatility and the holding period will be key factors in this model. The holding period will be assumed to be 1 day, since research shows that this is the average holding period for high leverage products. Volatility will be estimated on the basis of the historical development of 10-day volatility. The historical development of 10-day volatility is a key factor. The model has then calculated the chance of a stop-loss being hit within 1 day for the various stop-loss buffers. The stop-loss buffer here is the difference between the price of the underlying asset and the stop-loss;
- The providers may decide to increase the stop-loss buffer for the different variants, but not to reduce it. Every six months it will be reviewed whether the assumptions are still in line with the market and the new stop-loss buffers will be agreed by the providers. These stop-loss buffers will only be shared with the AFM, but in principle investors will be able to calculate them.
- The base guideline for the various turbo variants for the providers is the volatility of the AEX as the underlying asset. The providers will additionally establish stop-loss buffers for each other asset class or underlying asset. This guideline will lead to significantly fewer high leverage turbos being issued in the Netherlands by the providers, but only turbos that meet the AEX criteria that will be notified to the AFM;
- For the secondary market, if at the end of the trading day a turbo with no outstanding volume has a stop-loss buffer that is lower than the value notified to the AFM, the turbo in question will be withdrawn from trading. Turbos with outstanding volume will be continued.

The reason for this guideline is that turbos are attractive to most investors because of their liquidity. Measures that would limit the liquidity of turbos could harm the product because of the potential for problems in the secondary market.

The collective guidelines adopted by the providers of turbos with respect to the primary and secondary markets are substantial, partly due to the fact that they do not currently apply to other leveraged products in the market. The providers will continue to follow developments in the market closely and will amend their guidelines as and when necessary. The guidelines will in principle not be adjusted without a reason to do so, and this will always be in consultation with the AFM.

6. Assessment of measures taken by leveraged product providers

After discussion with the AFM, the providers of leveraged products stated that they would introduce a number of measures to ensure that investors would purchase leveraged products with the right expectations. These measures are stated by the providers in section 5, and are discussed further below.

6.1. Setting up a website with additional information on leveraged products

The providers have stated they will set up a website that will provide more information on how leveraged products work. This information will not be sales-oriented, it will enable investors to better understand how the products work, and especially how leverage works.

Investors will thus better understand how leverage affects their chance of achieving a positive return, and especially the fact that leverage highly magnifies the chance of a negative return in return for the chance of a very high return in the short term.

The AFM considers this to be a very positive development, since investors will be able to better understand the counter-intuitive element of leveraged products, which particularly in case of higher degrees of leverage is that the downside potential is strongly magnified in comparison to the upside, especially with a longer holding period.

6.2. More and better warnings on provider websites

The providers have stated that they will devote more attention on the websites they use to offer these products to the risks associated with investing in these products. This applies to the providers' mobile applications as well as their websites.

The AFM is positive with respect to this initiative, since investors will be in a better position to be aware of the risks associated with these products before they decide to purchase them.

6.3. Formation of an issuers' association

During the discussions that the AFM had with the various providers, it emerged that a coordination mechanism would certainly add value. This would make it possible to facilitate market-wide initiatives more effectively and to develop a general market stance. Such a forum would also enable market standards to be formulated that could be applied by all the providers of such products. This association will also most likely be open to other providers as well as the providers of leveraged products.

The AFM considers the formation of such an association to be a positive contribution to the further development of a professional and fair market for structured products for retail investors.

6.4. Adjusting the product offering

In its conversations with the providers, the AFM stated its view that products offering a very slight chance of a positive return (especially with a longer holding period) in exchange for an extremely small chance of a high return) add little value for investors. From the fragmented data available to the AFM, it also emerges that investors in these products achieve very little return. The adjustments currently proposed by the providers are in principle seen as positive by the AFM in order to address this problem. However, the measures will have to be periodically evaluated.

Then one will be able to establish whether the desired effect has been achieved. An important difference between the providers and the AFM regarding the way in which turbos are considered is that the AFM looks at the probability of achieving a certain return, while the providers are currently looking at the probability of the stop-loss being triggered. This evaluation also needs to consider whether the different degree of volatility, that forms the basis of the model used by the providers, still adequately reflects reality and the purpose of the measures. In addition, the providers need to provide maximum transparency regarding the various criteria they use in the implementation of the measures.

The AFM shares the concern that there is an uneven playing field between various investment products that include leverage. However the degree of leverage made available by the providers of turbos is certainly the highest in the market. This is not so much the case on issue, but it certainly becomes the case as a result of changes in the price of the underlying asset. The fact that the providers are now taking a step in the right direction is very positive, however we have to see in practice whether investors will start to avoid products (especially in the secondary market) that offer little or no prospect of realising a positive return and in particular those that feature longer holding periods. The AFM also takes the view that providers of other investment products such as CfDs, options and futures that add little or no value for investors should also reassess their product offerings. The considerations mentioned in this report could contribute to a good analysis of these products as well. The AFM will certainly encourage the providers of these products to conduct this type of analysis as well.

7. Appendix 1: Design of the AFM's quantitative model

The purpose of the quantitative model is to establish the expected returns of turbos using a Monte Carlo simulation. More specifically, the purpose of the model is to quantify the effect of the leverage (and the stop-loss) on the expected return.

The starting point for the model is that the investment is a position in the turbo. The investor purchases the turbo at the initial net asset value IW_0. The investment return on the turbo is realised on the end value EW. The risk of the turbo investment is defined as the return risk: the chance of realising an investment return of up to $\underline{r}$: $\mathrm{Prob}\left[\frac{\mathrm{EW}-\mathrm{IW}}{\mathrm{IW}} * 100\% \leq \underline{r}\right]$.

1.1. Input parameters for the model

The essential features of the turbo are: the underlying asset, the initial price of the underlying asset S_0, the interest rate for the financing level, the initial financing level FN_0, the capital buffer percentage b and the initial stop-loss level SL_0. Based on the prospectus for the specific turbo, the following data are entered in the model:

a). Type turbo (long/ short)
b). Underlying asset of the turbo and interest rate for the financing level
c). Leverage of the turbo
d). Capital buffer percentage of the turbo

The initial financing level is derived from the initial price of the underlying asset and the leverage. The model calculates the initial stop-loss level on the basis of the capital buffer percentage and the initial financing level. The model normalises the initial underlying asset at 100. The financing level and the stop-loss level are expressed as a percentage of the underlying asset. The historical price data per scenario during the Monte Carlo simulation are also normalised at 100 for t=0.

1.2. Strategy of the investor

The investor purchases the turbo at t = 0 and sells it voluntarily at $t = T$ or is forced to exit after a knock-out at $t = \tau \leq T$. Time (t) is measured in trading days. In case of a voluntary exit, the investor receives the net asset value IW_T. The model takes no account of transaction costs. In case of a forced exit, the investor receives the residual value RW_τ. For unlimited turbos the holding periods chosen for the calculation are 5 days and 20 days. For BEST turbos, the holding periods chosen are 2 days and 5 days. Proceeds at time t are realised at the end of the trading day t.

1.3. Net asset value of turbo

The model calculates three values for the determination of EW: net asset value at T, time τ and the residual value RW_τ. These values depend on the value development of the turbo prior to the moment of exit and the type of turbo. The turbo may be long (designed to benefit from an increase in the price of the underlying asset S) or short (designed to benefit from a decline). The net asset value on day t is calculated as:

$$\mathrm{IW}_t = \begin{cases} S_t - FN_t \ (\text{long}) \\ FN_t - S_t \ \ (\text{short}) \end{cases}$$

The financing level FN_t depends on the financing level of the preceding day and the type of product:

$$FN_t = \begin{cases} FN_{t-1} * (1 + r_k)(\text{long}) \\ FN_{t-1} * (1 + r_o)(\text{short}) \end{cases}$$

In case of a long position, financing costs r_k are charged to the investor. This reduces the net asset value of the product. In case of a short position, financing costs r_o are paid to the investor. This increases the net asset value of the product (if interest rates are at a high enough level for this to be positive for the investor). The interest expenses or income are included in the financing level on a daily basis. The financing costs (or income) parameter $r_k(r_o)$ is the sum of (the difference between) the variable interest rate r_v and the fixed interest surcharge r_c. The interest rate and the interest surcharge depend on the issuer.

1.4. Stop-loss event

The stop-loss moment τ is the first moment on the trading day on which the underlying asset reaches the stop-loss level SL_τ. The stop-loss event varies per turbo type:

$$\text{stoploss als } \begin{cases} S_\tau \leq SL_\tau \text{ (long)} \\ S_\tau \geq SL_\tau \text{ (short)} \end{cases}$$

The value of the stop-loss level SL_τ is determined as:

$$SL_t = \begin{cases} (1 + b) * FN_{t^*} \text{ (long)} \\ (1 - b) * FN_{t^*} \text{ (short)} \end{cases}$$

Parameter b is the capital buffer (percentage) that is input in the model. In the model, the capital buffer is a percentage of the financing level. The time t^* is the trading day on which the stop-loss level is adjusted to the financing level for the last time. Contrary to the financing level, for unlimited turbos the stop-loss level is not adjusted every trading day. The timing of adjustments is issuer-specific, for instance:

$$t^* = \begin{cases} 0 \text{ als } t \in [0,20) \\ 20 \text{ als } t \in [20,40) \\ \text{etc} \end{cases}$$

(increase of SL every 20 trading days)

1.5. Residual value

The residual value RW_τ received by the investor on the occasion of the stop-loss event is, with immediate settlement by the issuer, equal to:

$$\mathrm{RW}_\tau = \begin{cases} SL_\tau - FN_\tau \,(\text{long}) \\ FN_\tau - SL_\tau \,(\text{short}) \end{cases}$$

1.6. Turbo product in special cases

The model deviates from the above if;

1) The underlying asset S is quoted in a foreign currency;

2) The underlying asset pays a dividend.

1) Underlying S is FX

Financing costs (or proceeds) are now based on the difference between the domestic variable interest rate and the foreign variable interest rate:

$r_k = r_v^F - r_v^D + r_c$ and $r_o = r_v^F - r_v^D - r_c$

2) Underlying S pays a dividend

For both long and short positions, the financing level is adjusted downwards by the dividend paid on the ex-dividend date t^*. Financing costs or proceeds remain the same:

$$FN_{t^*} = \begin{cases} FN_{t^*-1} * (1 + r_k) - \text{div (long)} \\ FN_{t^*-1} * (1 + r_o) - \text{div (short)} \end{cases}$$

The stop-loss level is adjusted to the financing level on the ex-dividend date.

$$SL_{t^*} = \begin{cases} (1 + b) * FN_{t^*} \,(\text{long}) \\ (1 - b) * FN_{t^*} \,(\text{short}) \end{cases}$$

1.7. Simulation

The model calculates the turbo return for a large number of historical scenarios. Each scenario is taken from the historical series of the closing price of the underlying asset, the daily low or high price of the underlying asset, the level of the relevant financing interest rate(s), and the amount of the dividend paid, if applicable. The scenario duration (in trading days) can be indicated in the model. The number of scenarios per simulation can also be entered in the model. The default choice is for 5,000 scenarios per simulation. If available, 10 years of historical data for the underlying asset is used. The model assumes that each historical scenario has an equal chance of occurring in future.

The probability distribution of the turbo return is calculated as follows: N scenarios generate N turbo returns. These are ranked from minimum to maximum. The model then divides the returns in 50 return buckets. The range per bucket is (maximum return – minimum return)/50. Bucket i runs from minimum return + range*(i-1) (lower limit) to minimum return + range*i (upper limit). So the lower limit of the first bucket (i=1) is the minimum return and its upper limit is the minimum return + range. The lower limit of the last bucket (i=50) is the minimum return + range*49 and its upper limit is the minimum return + range*50 = minimum return+ maximum return – minimum return = maximum return.

The buckets are the “points” of the probability distribution of the turbo return. The probability per bucket is calculated as the number of scenarios with a return that falls in the bucket divided by the total number of scenarios. A scenario return r_i falls in bucket j if:

$ondergrens\ j \leq r_i < bovengrens\ j$. For the last bucket (j=50) the second inequality is $\leq$.

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