



BSM Alerts

Guide





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The Alerts Guide was prepared by BSM in its mission to share its knowledge with the market and supervised entities and does not constitute professional or financial advice. The document presents suggestions for alerts related to possible atypical situations in offers and transactions, with hypothetical and non-exhaustive examples.

The suggestions presented in the Alerts Guide do not exempt the regulated entities from their responsibilities and controls, nor does its application mean that the regulated entity has fulfilled all its monitoring obligations.

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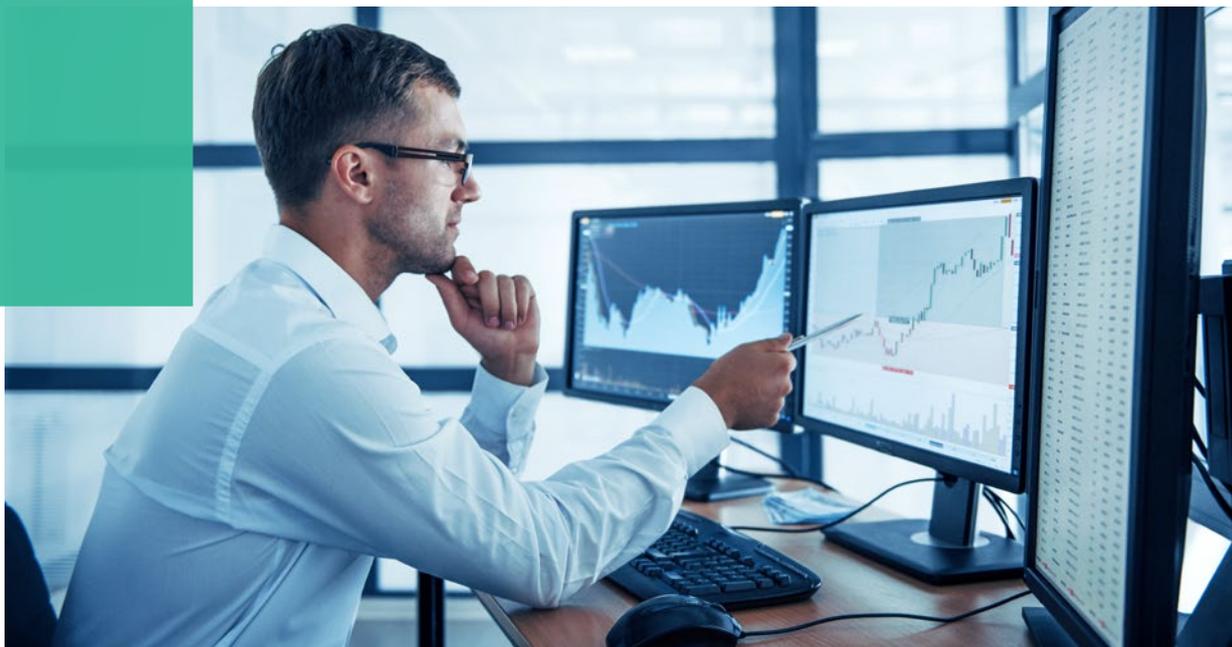
Glossary

The glossary below presents the main terms mentioned throughout the document and their definitions. The concepts were developed for informational and educational purposes. [BSM Glossary](#) is available on its website, and can be an additional source for updated information on the terms and concepts covered in the Alerts Guide.

TERM	DEFINITION
RBA	Risk-based approach.
Information asymmetry	Refers to situations where one party has more information about a product or service than the other party. Such asymmetry tends to cause a market imbalance.
Asset	Securities, rights and other instruments and financial assets, including gold as a financial asset, but excluding derivatives, issued by a corporation or a government entity
B3	B3 S.A. (Brasil, Bolsa, Balcão): Brazilian Stock Exchange and OTC. Company listed in the Novo Mercado (New Market) segment, manager of organized securities markets; provider of central depository, registration, clearing and settlement services, in addition to custody, fungible and non-fungible goods, securities and any other physical and financial assets; among other assignments authorized by the Brazilian Securities and Exchange Commission (CVM), by the Central Bank of Brazil and by its Board of Directors.
Benchmark	Indicator used to compare a set of data with an established standard. It is used to identify possible anomalies or significant deviations from this standard.
BSM	BSM Market Supervision: non-profit legal entity responsible for exercising self-regulatory duties in organized markets, subject to its regulatory or contractual competence.
Principal	Please verify “investor”.
Issuing Company	Companies whose securities are traded on B3’s organized markets.
Account	Arrangement by which an Participant accepts a customer’s financial assets and holds them on behalf of the customer transaction
Cross Market	Cross market transactions are those transactions where investors trade in different markets.

TERM	DEFINITION
CVM	Brazilian Securities and Exchange Commission: federal autarchy with legal personality and own net assets whose objective is to oversight, regulate, discipline and develop the securities market in Brazil.
Day Trade	Strategy consisting of buying and selling an asset on the same day.
Derivatives	Instruments that have securities, financial assets, indices, indicators, rates, goods, currencies, energies, transport, commodities or any other variable as a reference or underlying object.
Material Fact	Important information that can impact investment decisions. Material facts are typically required to be disclosed to investors to ensure transparency and prevent fraudulent practices.
Market Group	Market in which the transactions were performed: Underlying market or derivatives.
Ibovespa	Ibovespa is the main performance indicator for shares traded on B3. It is the result of a theoretical portfolio of assets prepared in accordance with established criteria and gathers companies representing the Brazilian capital market.
Investor	Individual or legal entity, fund or collective investment entity or any similar entity, in Brazil or abroad, that participates as holder of transactions carried out on its own account and order, through a Participant.
Asset Liquidity	Highly liquid assets are those assets that have a high daily trading volume in the financial market; that is, they are easily bought or sold at any time. Low liquidity assets are those assets that have a low daily trading volume, thus making it difficult to buy or sell the asset in the financial market.
Order Book	Environment in which the buy and sell orders registered in the stock exchange trading system are centrally organized.
Money Pass	Illicit practice characterized by carrying out previously agreed buy and sell transactions in the securities market between two parties with the objective of facilitating the transfer of funds between them.

TERM	DEFINITION
Resting order and aggressor order	These are the terms used to describe both sides of a transaction. The resting order is the order that was available in the order book, while the aggressor order is the order that was entered later and generated the trade.
OMC	Transactions in which an investor is at both transaction sides (buy and sell) transaction.
Market Operator	Individual certified and linked to a Participant. Acting on behalf of the Participant in the processes of receiving orders and sending bids from investors, pursuant to applicable regulations. The market operator has an employment relationship or relationship as an independent investment agent with a Participant and necessarily works at the trading desk of that Participant.
Party and Counterparty	Party and counterparty are terms used in transactions on the organized exchange and over-the-counter market to designate the two sides involved in a transaction. In other words, when a security purchase transaction takes place, the sale is the counterparty. The same occurs when a security is sold, where the purchase is the counterparty.
Participant	The trading participant comprises institutions that have the right to access B3's trading environment..
PEP	Cover all people who exercise or have exercised in the last five years, in Brazil or abroad, any position, job or relevant public function or who have family members, representatives or people of their close relationship in such conditions.
Related Parties	Administrators, employees, operators and other agents of the intermediary or issuer.
AML/CFT	Anti-Money Laundering, Combating the Financing of Terrorism and the Financing of the Proliferation of Weapons of Mass Destruction.
RLP	The Retail Liquidity Provider (RLP) allows the brokerage firm, investment bank, multiple bank or other Participant contracted by the brokerage firm to be the counterparty for the buy and sell orders of securities of its retail clients, bringing greater liquidity to clients to carry out their trades on the markets operated by B3.
SEC	Securities and Exchange Commission is an independent agency responsible for regulating the US capital market.
Spread	The price difference between the best ask and the best bid price for an asset in the central order book.
Swing Trade	Different from Day Trade, the opening of a position with a given asset is carried out in one day and the closing of the transaction is carried out in another day, not necessarily consecutive.



Context

The capital market undergoes ongoing changes, such as: entry of new products and services, increase in the number of investors and volume of transactions, higher level of complexity, competitiveness and fragmentation.

Such elements demand the improvement of the ongoing monitoring regarding the surveillance of offers and transactions, aiming to identify irregular market practices and guarantee a safe environment for investors and other agents.

This is a global challenge for regulators and other market participants, who must curb such practices using technology, data analysis science and innovative techniques to identify potential alerts and their effectiveness.

The BSM Alerts Guide was prepared in this context, aiming at fostering the pillar of Knowledge Exchange and Guidance to the market through the dissemination of good practices for identifying opportunities and developing alerts for monitoring and overseeing offers and transactions that capture indications of atypical situations.

Suggestions related to the Alerts Guide can be forwarded by the [BSM Suggestion Channel](#). Questions can be submitted through the bsm@bsmsupervisao.com.br channel or its call center 55 (11) 2565-6200, option 9.

BSM

BSM is the entity responsible for supervising and overseeing the organized markets managed by B3. Aiming at keeping the market integrity and protecting investors and Participants, BSM acts on three pillars:



Knowledge and Guidance

Guides the market regarding the adoption of best practices in its processes and internal controls, besides sharing knowledge about the proper market transaction.



Market Integrity

Monitors, supervises and oversees offers and transactions in the markets for which it is responsible. It audits the Participants authorized to access the organized markets managed by B3 and acts with these Participants to curb irregular practices.



Protection of Investors and Participants

It manages the Loss Reimbursement Mechanism (MRP), which can be triggered when the investor feels harmed by the action or omission of a Participant in the intermediation of security trading on stock exchanges and in custody services.

It provides Participants, investors and regulators with specific service channels that expedite demands and dialogue between such agents.

General aspects

This Guide presents some of the main concepts related to potential atypical situations identified in the securities market, in addition to examples¹ and suggestions for the construction of alerts that indicate signs of atypicality².

Thus, aiming to increase the assertiveness and effectiveness of the analyses that must be performed by Market Participants, BSM recommends that the reader consider the suggestions that can strengthen such duties:

RECURRENCE; the “recurrence” factor can be an important indicator for risk assessment and adopting preventive measures in the market. A recurrent situation consists of the repetition of a previously observed situation, which recurs periodically. In a practical example, if an investor acts in a single suspicious transaction, it must be thoroughly analyzed and investigated. Furthermore, if the transaction involving different assets or market participants is repeated over time, thus characterizing recurrence, the hypothesis of irregularity is strengthened.

¹ The examples presented in the Alerts Guide are hypothetical and, for a better understanding, stocks with a quotation factor equal to one (1) were considered as “assets” in the analyses.

² As set out in CVM Resolution 62, which should not be confused with AML/CFT monitoring, as set out in CVM Resolution 50.

SYSTEMATICITY: in addition to the recurrence factor, which by itself is not enough to determine an irregularity, the transactions systematicity may indicate that the suspicious situation was carried out deliberately and planned, and not as an isolated error or an exception.

MATERIALITY: materiality is related to what is substantial or relevant regarding an investor, the transaction type, among other qualitative and quantitative variables capable of guiding the analyses that show signs of irregularity. Once the materiality thresholds are established, more time can be spent on analysis that are relevant, saving efforts that would be directed to transaction that would not be significant enough to impact the market or the investors decisions.

RBA: the Risk-Based Approach is a methodology that aims to assess and manage risks associated with a given activity or situation. The Risk-Based Approach can be used in the capital market to identify potential problems and suspicious situations that may affect the market safety and integrity. The adoption of RBA is an invitation to change the market's culture. The criteria and metrics chosen by users must be very well described, justified and adequate to each reality. One of the RBA purposes is to concentrate resources and efforts in an efficient and assertive manner.

BENCHMARKS: benchmarks are indicators used to compare a set of data with a reference or observed standard, aiming to identify possible anomalies or significant deviations in relation to this standard. It's also important to evaluate other factors, such as recurrence, systematicity and materiality, not just the benchmarks values to detect possible atypicality.

BSM provides market benchmarks on its website that can be used as parameters for detecting atypical situations. The information is disclosed monthly to facilitate comparability and data processing. However, benchmarks can be calculated with the frequency that best fits the type of analysis to be carried out and according to the policy for overseeing transactions and offers from each Participant.

7. Atypical Transfer of Funds

1.1 Main concepts related to the alert

Atypical transfer of funds is the term used to identify transactions between investors that have unusual and potentially irregular characteristics. Such transactions are generally coordinated and previously agreed between the parties, in which one is the winner and the other is the loser, in a systematic and recurrent manner.

⚠ Atypical transfers of funds are also known as **Money Pass**, and may be evidence of money laundering or concealment of assets, rights and values. It is worth highlighting that CVM Resolution 50 provides for anti-money laundering, combating the financing of terrorism and the financing of the proliferation of weapons of mass destruction (AML/CFT) within the scope of the securities market. This alert does not cover all the items in Article 20º of the referred Resolution, which must be observed when monitoring transactions.

The following table shows an example of a transfer of funds carried out between two investors, which resulted in a profit of R\$ 200,000.00 to one of the investors and a loss of the same amount to the other.

Table 1 – Example of atypical transfer of funds between two investors

Asset	Buyer	Seller	Price (\$)	Quantity	Volume (\$)
XYZ	Investor 1	Investor 2	10.00	100,000	1,000,000.00
XYZ	Investor 2	Investor 1	12.00	100,000	1,200,000.00

According to Table 1, Investor 1 paid R\$ 1,000,000.00 for the purchase of asset XYZ and received R\$ 1,200,000.00 for the sale of the same asset, achieving a positive result of R\$ 200,000.00, while Investor 2 received R\$ 1,000,000.00 for the sale of asset XYZ and paid R\$ 1,200,000.00 for the purchase of the same asset, achieving a negative result of R\$ 200,000.00.

⚠ **Counterparty** is the term used to identify the two sides of a trade. The investor who purchased a security has the investor who sold it as a counterparty. The same happens with the investor who sold a security, the counterparty was the investor who bought it. Knowing the counterparty is only possible for transactions that occur within the same Participant.

1. Atypical Transfer of Funds

Some of the scenarios in which the atypical transfer of funds can be identified are presented below:

- Transactions carried out through the same Participant: in such cases, the Participant has access to the information from final counterparties, since both are clients, and are able to identify the atypical situation.
- When transactions are carried out through different Participants, the concentration of transactions between Participants can characterize a suspicious scenario.

The atypical transfer of funds can be identified in **day trade** transaction, when trades are carried out on the same day with the same asset and between the same investors, or **swing trade** transaction, when trades are carried out on different days, with the same asset and between the same investors.

⚠ It is also possible to identify the atypical transfer even if there is no economic logic or economic foundations for this. Apparently legitimate transaction, may have been used as a way to hide the illegal source of funds or to validate a transaction in a regulated market.

1.2 Suggestions for building the alert

Identifying atypical transfers of funds requires a detailed analysis of several financial and transactional information. However, there are indicators and **benchmarks** that can help detect indications of irregularities.

Suggestions of indicators for building the alert will be described below, and then applicable benchmarks for the detection of possible atypical situations.

The following assumptions have been adopted for the examples:

- The indicators and benchmarks are calculated considering pairs of transactions ("Money Pass") between investors, as described in item 1.1.
- The indicators and benchmarks are calculated considering the knowledge of the counterparties' information. In other

words, these transactions have been carried out through the same Participant or the decision center is common among the investors, such as transactions between Funds of the same manager.

- Consider the transaction allocated trades, that is, those in which the Participants responsible for trading have already identified the due accounts in each order.
- Transaction monitoring becomes more complex in situations where transactions are originated without identifying a final client, that is, with the use of interim accounts during trading. This means that it is necessary to consider the trading and post-trading flow when identifying and analyzing such transactions.

Calculation of atypicality indicators

Considering the assumptions described previously, the following indicators can help identify signs of atypical transfers of funds.

a. Counterparty concentration

The counterparty concentration is an indicator that defines the participation of each counterparty in the breakdown of investors' transactions, that is, it indicates with which counterparties the investor traded larger amounts or volumes of transactions.

 In the case of the derivatives market, the “number of contracts” can be considered instead of the “volume” for the counterparty concentration calculation.

Let's assume that, during the analyzed period, Investor 1 carried out buy and sell transactions of a certain asset, identifying evidence of transfers of funds (Money Pass), with five (5) different counterparties (2, 3, 4, 5, 6), as presented in the following table:

Table 2 – Counterparty concentration in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Volume (\$)	Counterparty concentration
1	2	100,000.00	69.4%
1	3	20,000.00	13.9%
1	4	5,000.00	3.5%
1	5	4,000.00	2.8%
1	6	15,000.00	10.4%
TOTAL		144,000.00	100%



The counterparty concentration between Investors 1 and 2 seen from the perspective of Investor 1 is different from the counterparty concentration seen from the perspective of Investor 2, as the quantity traded by Investor 2 in transactions with other counterparties can be different, as presented in the example below:

Table 3 – Counterparty concentration in transactions carried out by Investor 2

Analyzed investor	Counterparty investor	Volume (\$)	Counterparty concentration
2	1	100,000.00	76.9%
2	5	25,000.00	19.2%
2	7	5,000.00	3.8%
TOTAL		130,000.00	100%

⚠ Although the assumption that there is knowledge of the information of the investors that operate with each other is adopted, that is, that the transactions were intermediated by the same Participant, the concentration of transactions between different Participants can also be an atypicality indicator.

In the example below, the concentration between Participants A and B (90%) indicates atypical transfer of funds, which would require additional analysis of such transactions. See below:

Table 4 – Transactions carried out between Participants

Analyzed Participant	Participant	Volume (\$)
A	B	175,000.00
A	C	7,200.00
A	B	7,500.00
A	A	8,200.00
A	B	15,000.00
A	B	12,300.00
A	C	5,000.00
A	F	5,000.00
A	B	8,000.00
Total		243,200.00

Table 5 – Concentration of transactions among Participants

Analyzed Participant	Participant	Counterparty concentration (\$)	Counterparty concentration (%)
A	A	8,200.00	3%
A	B	217,800.00	90%
A	C	12,200.00	5%
A	F	5,000.00	2%
Total		243,200.00	100%

b. Financial result transaction

The calculation of the financial result is important to measure the financial value transferred between the parties. Let's assume that, in a certain period, Investor 1 has carried out several transactions with other three (3) investors, as presented in the example below:

Table 6 – Results of transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Quantity	Buying volume (\$)	Selling volume (\$)	Result (\$)
1	2	80,000	666,250.00	800,020.00	133,770.00
1	2	20,000	700,000.00	799,960.00	99,960.00
1	2	10,000	633,750.00	750,000.00	116,250.00
1	3	10,000	150,000.00	125,000.00	-25,000.00
1	3	60,000	1,055,930.00	1,055,930.00	0.00
1	4	20,000	198,840.00	199,990.00	1,150.00
1	4	30,000	3,324,550.00	3,356,220.00	31,670.00
1	4	10,000	162,900.00	132,040.00	-30,860.00

After calculating the result of each of the transactions between investors, the sum of the total result between the pairs is performed. Once the result is obtained, it is possible to compare it to a defined benchmark to identify a possible atypicality.

Table 7 – Summarized result of transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Result (\$)
1	2	349,980.00
1	3	-25,000.00
1	4	1,960.00

⚠ To calculate the financial result, the following characteristics have been considered:

- **Day trade:** opening and closing a position on the same day – to calculate the result, the “first in, first out” criterion is considered.
- **Swing trade:** opening and closing a position on different days (**not necessarily consecutive**) – the criterion of matching the previous balance with the current balance is considered, that is, excluding previous day trades and swing trades.

I.e.: 1st day (*): purchase of 10 quantities → 2nd day: sale of 10 quantities → 3rd day: purchase of 10 quantities = **1 Swing Trade**

1st day: purchase of 10 quantities → 2nd day: sale of 20 quantities → 3rd day: purchase of 10 quantities = **2 Swing Trades**

c. Success ratio transaction

The success ratio aims to verify how often the investor makes winning trades, that is, earns a profit in the transactions, which may strengthen the hypothesis of irregularity.

To calculate the indicator, one can assign the value one (1) to transactions that resulted in profit and the value zero (0) to transactions that resulted in loss or no result for the investor. Considering the example below, in which Investor 1 has carried out transactions with other three (3) counterparties, we have the following:

Table 8 – Example of marking the success ratio in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Quantity	Buying volume (\$)	Selling volume (\$)	Result (\$)	Winning trade
1	2	80,000	666,250.00	800,020.00	133,770.00	1
1	2	20,000	700,000.00	799,960.00	99,960.00	1
1	2	10,000	633,750.00	750,000.00	116,250.00	1
1	3	10,000	150,000.00	125,000.00	-25,000.00	0
1	3	60,000	1,055,930.00	1,055,930.00	0.00	0
1	4	20,000	198,840.00	199,990.00	1,150.00	1
1	4	30,000	3,324,550.00	3,356,220.00	31,670.00	1
1	4	10,000	162,900.00	132,040.00	-30,860.00	0
1	4	80,000	666,250.00	800,020.00	133,770.00	1

After assigning the values 1 (one) and 0 (zero) to the transactions that resulted in profit, loss or no result, the success ratio will be calculated, which is the ratio between the sum of all transactions carried out by the pair and the sum of all transactions carried out by the pair with a positive result.

Table 9 – Example of success ratio in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	# of transactions	# of winning trades	Success ratio (%)
1	2	3	3	100%
1	3	2	0	0%
1	4	4	3	75%

⚠ It is worth highlighting that it is also necessary to consider whether any investor presented a high **loss ratio**. The suggestion for these cases is to use a ratio constructed in a similar way to the one presented for the success ratio.

For example: Investor 1 has a success ratio of 100% in relation to day trade transactions carried out with Investor 2 and a success ratio of less than 50% in relation to the other investors with whom it operates. On the other hand, Investor 2 did not present a positive result in his/her transactions, therefore, he/she will not have a success ratio.

Table 10 – Example of the success ratio in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Number of transactions	Success ratio (%)
1	2	12	100%
1	3	7	0%
1	4	5	50%
1	5	3	12%
1	6	11	7%

Considering the high success ratio of 1 in relation to 2, we found that 2 has a high loss ratio (100%) compared to A, which strengthens the indication of atypicality.

Table 11 – Example of the loss ratio in transactions carried out by Investor 2

Analyzed investor	Counterparty investor	Number of transactions	Loss ratio (%)
2	1	12	100%

d. Intentionality (time and size indicators) transaction

Time and size indicators seek to identify intentionality and coordination elements of transactions.

Time indicator

This indicator measures how long the **resting orders** remain at the **order book**. Thus, the longer the time the order remains in the book, the greater the chance that the order will be executed by the market, which reduces the chance of coordination in the order insertion.

We verified how long the order remained on the order book before being attacked by the counterparty. This indicator varies from 0 to 1, according to the distribution of time spent in the order book. The closer to 1, the longer the order remained on the book.

⚠ The terms **aggressor order** and **resting order** are used to describe the two sides of a trade. The resting order is the order that was available in the order book, while the aggressor order is the order that was entered later and generated the trade.

Table 12 – Example of time indicator in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Time of resting order	Time of aggressor order / Time of trade	Permanence of the resting order in the book	Time indicator (*)
1	2	13:00:00	13:00:00	00:00	0.00
1	3	14:30:00	15:00:00	00:30	0.50
1	4	15:00:00	16:00:00	01:00	1.00

⚠ (*) To rank time differences in an interval between 0 and 1, we suggest following these steps:

1. Determine the smallest time difference and the largest time difference in the interval to be ranked. For example, if you want to rank time differences between 0 and 60 minutes, the smallest time difference would be 0 and the largest time difference would be 60.
2. Divide the permanence time of the resting order in the order book by the largest time difference obtained in item 1.
3. The result obtained will be the ranking of the time difference within the 0 to 1 range. The closer to 0, the smaller the time difference, and the closer to 1, the greater the time difference.

For example, let's calculate the ranking of the time differences 12 min, 24 min, 36 min and 60 min within the 0 to 1 range, considering that the smallest time difference is 0 and the largest time difference is 60:

- Time difference 12 min = $12 / 60 = 0.2$
- Time difference 24 min = $24 / 60 = 0.4$
- Time difference 36 min = $36 / 60 = 0.6$
- Time difference 60 min = $60 / 60 = 1$

Thus, the ranking of the time differences would be as follows: 0.2 / 0.4 / 0.6 / 1.

Size indicator

In addition to the time indicator, the size indicator can be used to measure the coordination between transactions. For this purpose, it compares the size of the aggressor order and the size of the resting order that generated the trade. Orders with different sizes reduce the chance of coordination of transactions.

Therefore, the greater the difference between the size of bid and ask prices, the lower the likelihood of coordination intent. To calculate said indicator, we divide the minimum value between the quantity of aggressor orders and the quantity of resting orders by the maximum value between the quantity of aggressor orders and the quantity of resting orders, ranging from 0 to 1, where a ratio closer to 1 indicates that the sizes of bid and ask orders are similar, increasing the chance of coordination.

Table 13 – Example of size indicator in transactions carried out by Investor 1

Analyzed investor	Counterparty investor	Qty. of resting orders	Qty of aggressor orders	Qty. of transactions	Size indicator (*)
1	2	10,000	10,000	10,000	1
1	3	1,000,000	100,000	100,000	0.1

(*) The calculation of the size indicator is obtained by dividing the lowest quantity order (be it aggressor or resting) by the largest quantity order (whether aggressor or resting).

⚠ There are investors who operate with high frequency in the stock market, called HFT's or **High-frequency Traders**. These are automated trades that use complex algorithms to carry out the purchase and sale of assets at high speed. Transactions are generally carried out in milliseconds. Therefore, they can impact the calculation of coordination indicators

and make it difficult to detect atypical activities, as well as **market makers**.

Thus, we suggest evaluating the impact this kind of investors' transactions and, if necessary, disregarding them when calculating indicators and benchmarks. The time and size benchmarks provided by BSM already disregard both types of investors.

1.3 Benchmark calculation suggestions

Considering the indicators presented, it is possible to calculate **benchmarks** and identify investors who showed signs of atypical situations in their transactions, comparing them to the market standard.

Before calculating the benchmark, it is recommended that transactions are segregated into groups to compare investors with the same profile, for example:

RLP: identify Investors who traded with **RLP**.

Market group: identify which market group the transactions fall into: Underlying market or Derivatives.

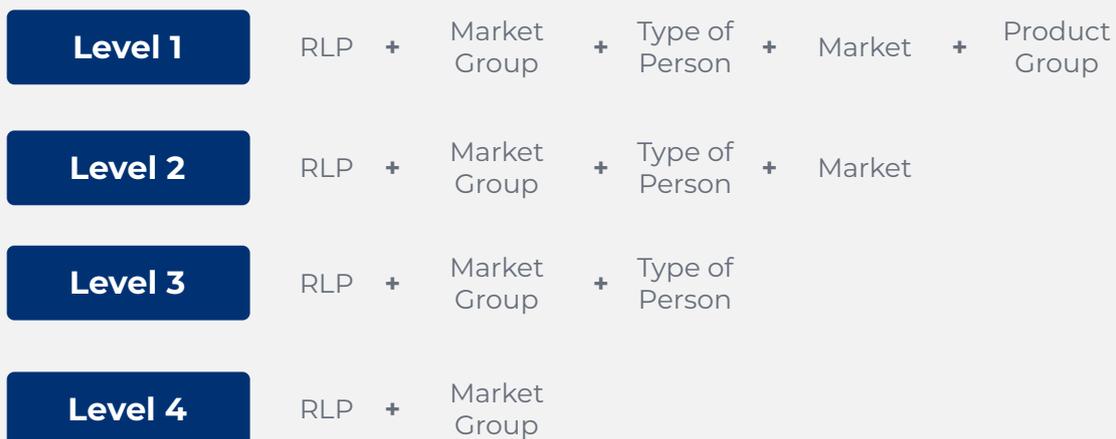
Type of person: target the type of person into: Individuals, Non-Resident Individual, Institutional Legal Entities, Financial Legal Entity, Non-Financial Legal Entity, Non-Resident Legal Entity.

Market: identify the types of securities within the market group:

- Stocks, forwards and options (Spot Market);
- Cash, options and futures (Derivatives Market).

Product group: group the products operated by the investor, using, for example, separations by: a) Agriculture; b) Financial; c) **Ibovespa** (securities whose underlying asset participates in or is related to the Ibovespa); and d) Non-Ibovespa (securities whose underlying asset does not participate in or is not related to the Ibovespa).

If, within the combination of groups, there is not a minimum number of investors to be assessed (which will depend on each universe analyzed), the suggestion is to remove one of the groups to increase the number of investors compared, as follows:



Market benchmarks related to the atypical transfer of funds are calculated and made available by BSM monthly, segregated by the levels above. See link [benchmarks](#).

Considering the indicators presented, we demonstrate below the example of benchmark calculation using the mean and standard deviation statistical measures.

Table 14 – Example of benchmark calculation

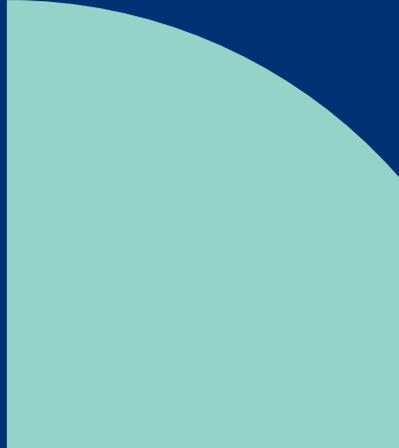
Analyzed investor	Counterparty investor	Counterparty concentration	Success ratio	Result (\$)	Time indicator	Size indicator
1	2	69.4%	100%	349,980.00	1.00	1.00
1	3	13.9%	0%	-25,000.00	0.45	0.10
1	4	3.5%	50%	1,960.00	0.30	0.50
1	5	2.8%	20%	-155,900.00	0.95	1.00
1	6	10.4%	30%	-35,022.00	0.20	0.25
2	1	76.9%	0%	-349,980.00	1.00	1.00
2	3	19.2%	60%	54,500.00	0.30	0.20
2	7	3.8%	10%	-504,900.00	1.00	1.00
3	1	34.1%	100%	25,000.00	0.45	0.10
3	2	33.0%	40%	-54,500.00	0.30	0.20
3	6	32.0%	40%	-155,000.00	0.15	0.10
4	1	35.5%	50%	-1,960.00	0.30	0.50
4	5	20.2%	25%	-45,598.00	0.25	0.30
4	6	44.3%	65%	5,500.00	0.05	0.05
5	1	81.1%	80%	155,900.00	0.95	1.00
5	4	18.9%	75%	45,598.00	0.25	0.30
6	1	63.2%	70%	35,022.00	0.20	0.25
6	3	30.5%	60%	155,000.00	0.15	0.10
6	4	6.3%	35%	-5,500.00	0.05	0.05
7	2	100%	90%	504,900.00	1.00	1.00
Mean		35.0%	50%	133,336.00*	0.47	0.45
Standard deviation		28.1%	29.9%	159,652.75*	0.35	0.38

* For the "mean" and "standard deviation" of the Result, we consider absolute values.

⚠ Comparison by mean and standard deviation is often used to assess whether a set of data is within a range of values considered acceptable or whether there are values that deviate significantly, that is, whether there is atypicality in the data set. Factors such as market volatility and changes in the economic environment should also be considered in the analyses.

⚠ BSM publishes market benchmarks monthly - except the "Result" benchmark since the value depends on the risk assigned to different types of investors by each Participant that intermediate their transactions. See link [benchmarks](#).

2. Insider Trading



2.1 Main concepts related to the alert

Insider Trading consists of the undue use of privileged information related to the businesses of publicly held companies, that is, confidential and relevant information, which, once made public, can influence an investor's decision making³.

The practice exposes one of the main capital market concerns, called information asymmetry⁴.

! **Information asymmetry** is a term that refers to situations where one party holds more information on an asset than the other party. Such asymmetry tends to cause a market imbalance.

! Insider can be segregated into two main types:

Primary Insider: Occurs when the investor who showed suspicious signs has direct access to privileged information of a Company. These are usually people who hold c-level positions, officers, members of the board of directors or key employees.

Secondary Insider: Occurs when the investor who showed suspicious signs obtains privileged information through connections or relationships with primary insiders, that is, there is no direct access to information.

Example of Insider Trading dynamics

See below an example of a possible Insider dynamic. In this case, the hypothesis is transaction the expectation of a positive impact on the assets price when the relevant information was disclosed:

1. Possibility of access to information: in this hypothetical example, the investor purchased a security with the expectation that its price would be positively impacted when the information became public.

³ According to the wording of Article 2 of CVM Resolution 44

⁴ Economicsdiscussion.net. "Joseph E. Stiglitz and his Works in Economics."

- 2. Disclosure of information and market reaction:** a few days later, the [Issuing company](#) disclosed a material fact or information to the market. At this point, it is important to analyze what was the impact and the change in pattern presented by the asset after the company's disclosure. In this example, there was a positive impact on the asset price.
- 3. Execution of the trade earning profit for the investor:** after the market reaction to the material fact or communication, the investor carried out the sale earning a profit. In this example, the investor sold the asset 6 days after the purchase and 2 days after the impact of the information on the asset price, which may vary in each case.

The aforementioned steps are represented in the chart below:

Chart 1 – Example of the dynamics of a possible case of Insider Trading



- ⚠ Identifying indications of insider trading and proving the irregularity of the practice are challenging tasks. The forms of transaction of an insider are countless. In addition to the example presented, in which the investor takes a buying position to supposedly benefit from the asset appreciation, there may be cases in which the investor takes a selling position, whether or not he/she has the asset in his/her portfolio, expecting a supposed asset devaluation, among other possibilities.

Furthermore, it is often difficult to distinguish between privileged information and public information. For example, an investor is considered an insider for having used information about the financial performance of a company that has not yet been disclosed to the public, which cannot be confused with an investor who has used information that is widely known in the industry and acted on opportunities for investments more accurately.

These are some of the reasons that justify that, for the construction of an effective and assertive alert, several factors and data must be considered, highlighting recurrence, systematicity, materiality and registration information (consider, for example, if the investor is a [related person](#) or if he/she has a relationship with people related to the Issuing Company).

2.2 Suggestions for building the alert

Some factors can be considered to increase assertiveness in identifying insider evidence. We will detail these factors in the next topics, with non-exhaustive examples and suggestions on how the alert can be constructed.

Identify disclosure of relevant information by the Issuing Company

The material facts or notices to the market, issued by the company in its disclosure channels, **which may influence the price of the asset or the investor's decision-making, are considered** relevant information⁵. It is worth highlighting that CVM Resolution 44 provides for the disclosure of such information.

⚠ Non-exhaustive examples of relevant information:

- changes in the company's shareholding control;
- acquisitions, incorporations, spin-offs, mergers involving the company and related companies;
- profit or loss of the company and allocation of cash proceeds;
- request for judicial or extrajudicial recovery; and/or
- change of projections disclosed by the company.

Define the analysis period

The suggestion is to segregate periods, adopting as a parameter the date of disclosure of the relevant information to the market, that is, the date on which the information used in the irregular practice has become public domain.

⚠ Examples for defining analysis periods:



Comparative period: period prior to the company's pre-disclosure period, used as a comparative historical basis for identifying atypical situations.

Pre-disclosure period: period prior to the disclosure of material facts or notices to the market.

Disclosure of material fact or notice to the market: date of disclosure of material fact or notice to the market, that is, when the information becomes public.

Company post-disclosure period: period following the disclosure made by the company.

⁵ Disclosures made by publicly held companies on B3 can be consulted at: <https://www.rad.cvm.gov.br/ENET/frmConsultaExternaCVM.aspx>.



It is worth highlighting that the definition of analysis periods will depend on the criteria and perception of who builds the alert, as well as the nature of the information being disclosed (which may be adjustable according to the model presented).

Identify the assets that showed a change in pattern or atypicality in transactions

It is important checking if there was any atypicality in the asset trading that could be related to a possible indication of insider trading, such as:

a. There has been a fluctuation in the asset price, which may be considered:

- **Intraday Fluctuation (IF):** price fluctuation in the same trading session, that is, the comparison between the opening and closing price of the same trading session (d-0):

$$IF = \frac{\text{Closing Price } D_0}{\text{Opening Price } D_0} - 1$$

In an example where the opening price of the day under analysis was R\$ 14.88 and the closing price of the day under analysis was R\$ 15.36, we would have an intraday fluctuation of 3.23%:

$$IF = \frac{15.36}{14.88} - 1 = 3.23\%$$

- **Interday Fluctuation (Inter Fluc):** fluctuation of the closing price of the previous day (d-1) in relation to the opening price of the session under analysis (d0):

$$IF = \frac{\text{Opening Price } D_0}{\text{Closing Price } D_{-1}} - 1$$

In an example where the closing price of the day before the analysis was R\$ 12.35 and the opening price of the day of analysis was R\$ 14.88, we would have an interday fluctuation of 20.49%:

$$IF = \frac{14.88}{12.35} - 1 = 20.49\%$$

b. Detection of changes in the asset's operating pattern in relation to a comparative period. For this purpose, some variables can be considered, such as:

- increase in traded quantity;
- increase in the number of trades;
- increase in volume of trades;
- increase in volatility; and/or
- changes in asset prices.

Relate the asset fluctuation and the nature of investor transactions

- a. If the asset has presented a **positive fluctuation**, investors who would benefit from its appreciation could be selected for analysis. The following are non-exhaustive examples:
 - Investors who decided to buy the asset at a time close to the release of the company's information and, in the post-disclosure period, carried out sales trades, reversing the total or partial position acquired during the pre-disclosure period, and thus obtaining a positive financial result.
 - Investors who bought a call option close to the disclosure of the company's information and, in the post-disclosure period, carried out sales trades, reversing the position or exercising the call option.

- Investors who positioned themselves as buyers in a forward contract at a time close to the disclosure of company information and, in the post-disclosure period, settled the contract; and/or
 - Investors linked to the Company who decided to buy the asset at a time close to the release of relevant information.
- b.** Considering that the asset has presented a **negative fluctuation**, the investors who would benefit from the asset devaluation should be selected for analysis. The following are non-exhaustive examples:
- Investors who did not have custody and carried out share sales transactions in the pre-disclosure period of relevant company information (leasing shares on the market) and, in the post-disclosure period, carried out purchase transactions reversing the position previously acquired, in whole or in part, and obtaining financial benefits.
 - Investors who had custody of the share before the start of the pre-disclosure period and carried out sales orders, reversing the previously acquired position, aiming to avoid potential loss with the asset's devaluation.
 - Investors who bought a put option close to the disclosure of the company's information and, in the post-disclosure period, carried out sales trades, reversing the position or exercising the put option; and/or
 - Investors linked to the Company who were willing to sell the asset at a time close to the disclosure of the relevant information.

⚠ In this context, the following concepts are important:

Full reversal: full position reversal occurs when an investor fully settles his/her current position in a given asset.

Partial reversal: partial position reversal occurs when an investor reverses only a lower part of his/her current position in a given financial asset.

Identify investors who presented a change in transactional profile and/or atypical results

The next suggestions are related to the identification of investors who presented atypical situations in the transactions:

- a.** Identify a possible change in the investor's transactional profile, considering, for example:
- i. Investors who have changed the type of asset they usually trade. For example: the investor does not have a history of transactions with securities of a given company and starts to trade them. The change may not be an issue, but the alteration in the transactional profile may represent an indication of atypicality; and/or
 - ii. Investors that present an atypical increase in the average position or custody of the asset compared to the position of the period prior to the company's disclosure.

⚠ **Suggestion to identify the transactional profile change:** transactional profile change can be identified using different methods. One possibility is to use data comparison metrics, for example, the **Euclidean distance**, which calculates the difference between two points projected onto a plan, as follows:

- **Custody of asset “C” (Axis “x”):**

C_{COMP} = Custody at the end of the comparative period

C_{PRE} = Custody at the end of the Company's pre-disclosure period

- **Average position “P” (Axis “y”)**

P_{COMP}^C = Average quantity placed on BUY position during the comparative period

P_{COMP}^V = Average quantity placed on SELL position during the comparative period

P_{PRE}^C = Average quantity placed on BUY position during pre-disclosure period

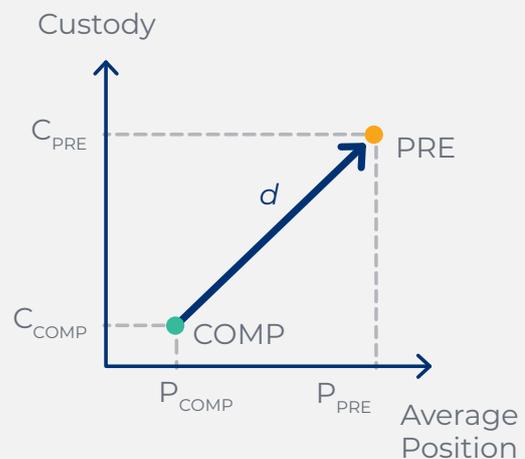
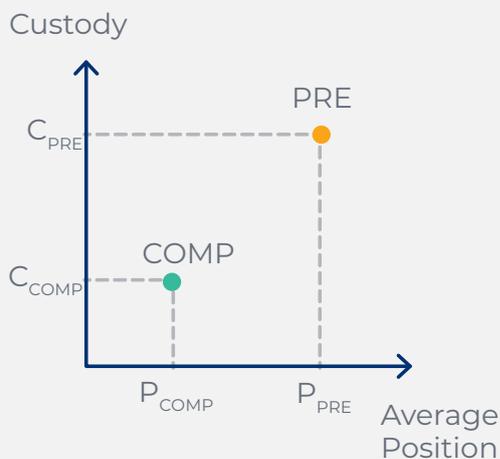
P_{PRE}^V = Average quantity placed on SELL position during pre-disclosure period

Calculation of Euclidean Distance (ED)

Given two points (x_1, y_1) and (x_2, y_2) , the distance between them can be calculated as follows:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}, \text{ i.e., } \sqrt{(C_{COMP} - C_{PRE})^2 + (P_{COMP} - P_{PRE})^2}$$

Graphic representation:



In a simplified and hypothetical example, considering that the information on transactions of three investors who acted in the same period is known, we would have the following:

Investor 1	Investor 2	Investor 3
$C_{COMP} = 100$	$C_{COMP} = 100$	$C_{COMP} = 100$
$C_{PRE} = 180$	$C_{PRE} = 500$	$C_{PRE} = 1.500$
$P_{COMP}^C = 150$	$P_{COMP}^C = 150$	$P_{COMP}^C = 600$
$P_{PRE}^C = 200$	$P_{PRE}^C = 500$	$P_{PRE}^C = 1.340$

$$d_1 = \sqrt{(100 - 180)^2 + (150 - 200)^2} = \mathbf{94}$$

$$d_2 = \sqrt{(100 - 500)^2 + (150 - 500)^2} = \mathbf{531}$$

$$d_3 = \sqrt{(100 - 4000)^2 + (600 - 5200)^2} = \mathbf{94}$$

The change of transactional profile was more significant for Investor 3, and, given his/her representativeness, he/she should be considered for further analysis in a potential insider case.

It is worth considering that the profile change can occur in different directions:

Vector	Type of change
	<ul style="list-style-type: none"> Decreased average buy position. Increased custody.
	<ul style="list-style-type: none"> Increased average buy position. Increased custody.
	<ul style="list-style-type: none"> No change in the average buy position. Increased custody.

b. Compare with the financial result of other investors:

- i. Consider whether any investor stood out by presenting statistically significant financial results compared to other investors of the same profile who operated in the same period.
- ii. Investors who showed an atypical increase in the financial result when compared to the result obtained in the period prior to the company's disclosure.

Suggestion for calculating the Financial Result (FR)⁶

The proposal is to apply a metric that quantifies the financial result obtained by the investor:

When the asset appreciates

Calculate the profit that the investor obtained carrying out the sell transactions in the company's pre-disclosure period and the sales transactions in the company's post-disclosure period.

If the investor's buy and sell transactions have **different quantities**, we can use the following formula: **FR = MQ x (AP - BP)**, where:

- **MQ = Matched Quantity:** is the smallest quantity of the investor between sell transactions carried out in the pre-disclosure period and sales transactions carried out in the post-disclosure period: $\min(\sum \text{buy qty}, \sum \text{sell qty})$
- **AP = Ask Price:** average price weighted by the sales quantity in the investor's post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$
- **BP = Bid Price:** average price weighted by the buy quantity in the investor's post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$

Two examples demonstrating the calculation are presented below:

Table 15 – Insider Trading: Example of calculating the financial result when there is an asset appreciation and the same amount traded in the buy and sell transaction

Asset	Amount traded by the investor	Price (\$)	Volume traded by investor (\$)	Period	Type of transaction	
XYZ	150,000	3.20	480,000.00	Pre-disclosure	Buy	
Total investor purchase in the pre-disclosure period		150,000	3.20	480,000.00		
XYZ	70,000	3.60	252,000.00	Post-disclosure	Sell	
XYZ	80,000	3.56	284,800.00	Post-disclosure	Sell	
Total investor sales in the post-disclosure period		150,000	3.5787	536,800.00		

⁶ The examples consider the calculation of the average price obtained by dividing the total volume traded by the total quantity traded. There are other ways that can be used to calculate the financial result — for example, the FIFO (First in, First out) method.

2. Insider Trading

Considering the formulas:

- **AP = $(\sum(P \times qty) / \sum qty)$** , we have
 $AP = ((3.60 \times 70,000 + 3.56 \times 80,000) / (70,000 + 80,000))$, that is,
 $AP = 3.5787$
- **BP = $(\sum(P \times qty) / \sum qty)$** , we have
 $BP = ((3.20 \times 150,000) / (150,000))$, that is, $BP = 3.20$
- **FR = MQ x (AP - BP)**, we have
 $FR = 150,000 \times (\$ 3.5787 - \$ 3.20)$, that is, $FR = \$ 56,800.00$

Table 16 – Insider Trading: Example of calculating the financial result when there is an asset appreciation and with different amounts traded in the purchase and sale

Asset	Amount traded by the investor	Price (\$)	Volume traded by investor (\$)	Period	Type of transaction
XYZ	150,000	3.20	480,000.00	Pre-disclosure	Buy
XYZ	120,000	3.22	386,400.00	Pre-disclosure	Buy
Total investor purchase in the pre-disclosure period	270,000	3.208889	866,400.00		
XYZ	70,000	3.60	252,000.00	Post-disclosure	Sell
XYZ	90,000	3.56	320,400.00	Post-disclosure	Sell
Total investor sales in the post-disclosure period	160,000	3.5775	572,400.00		

Considering the formulas:

- **AP = $(\sum(P \times qty) / \sum qty)$** , we have
 $AP = ((3.60 \times 70,000 + 3.56 \times 90,000) / (70,000 + 90,000))$, that is,
 $AP = 3.5775$
- **BP = $(\sum(P \times qty) / \sum qty)$** , we have
 $BP = ((3.20 \times 150,000 + 3.22 \times 120,000) / (150,000 + 120,000))$, that is, $BP = 3.208889$
- **FR = MQ x (AP - BP)**, we have
 $FR = 160,000 \times (\$ 3.58 - \$ 3.208889)$, that is, $FR = \$ 58,997.78$

When the asset depreciates

Calculate the profit that the investor obtained carrying out sales trades in the company's pre-disclosure period and purchase trades in the company's post-disclosure period.

If the investor's buy and sell transactions have **different quantities**, we can use the following formula: **FR = MQ x (AP - BP)**, where:

- **MQ = Matched Quantity:** is the smallest amount of the investor between purchase transactions carried out in the post-disclosure period and sales transactions carried out in the pre-disclosure period: $\min(\sum \text{buy qty}, \sum \text{sell qty})$
- **AP = Ask Price:** average price weighted by quantity sold in the investor's pre-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$
- **BP = Bid Price:** average price weighted by the purchase quantity in the investor's post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$

An example demonstrating the calculation is presented below:

Table 17 – Insider Trading: example of calculating the financial result when there is asset devaluation

Asset	Amount traded by the investor	Price (\$)	Volume traded by investor (\$)	Period	Type of transaction
XYZ	40,000	6.30	252,000.00	Pre-disclosure	Sell
XYZ	50,000	6.41	320,400.00	Pre-disclosure	Sell
Total investor sales in the pre-disclosure period	90,000	6.36	572,400.00		
XYZ	45,000	5.10	229,500.00	Post-disclosure	Buy
XYZ	45,000	5.05	227,250.00	Post-disclosure	Buy
Total investor purchase in the post-disclosure period	90,000	5.075	456,750.00		

Considering the formulas:

- **AP = $(\sum(P \times \text{qty}) / \sum \text{qty})$** , we have
 $AP = ((6.30 \times 40,000 + 6.41 \times 50,000) / (40,000 + 50,000))$, that is,
 $AP = 6.36$
- **BP = $(\sum(P \times \text{qty}) / \sum \text{qty})$** , we have
 $BP = ((5.10 \times 45,000 + 5.05 \times 45,000) / (45,000 + 45,000))$, that is,
 $BP = 5.075$
- **FR = MQ x (AP - BP)**, we have
 $FR = 90,000 \times (\$ 6.36 - \$ 5.075)$, that is, $FR = \$ 115,650.00$

Cases in which there was a reversal of position

For cases in which the investor carried out a partial reversal of a position acquired in a period prior to the company's pre-disclosure period, a simulated result can be calculated with the purpose of measuring the value that the investor stopped losing by making sales before information disclosure, using the following formula: $FR = QS \times (AP - MP)$, where:

- **QS = Quantity Sold:** is the quantity sold by the investor in the pre-disclosure period: $\sum \text{sales qty}$
- **AP = Ask Price:** average price weighted by quantity sold in the investor's pre-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$
- **MP = Average Market Price:** average price weighted by the quantity in the post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$

An example demonstrating the calculation is presented below:

Table 18 – Insider trading: example of calculating the financial result when there is a reversal of position – pre-disclosure period

Asset	Amount traded by the investor	Price (\$)	Volume traded by investor (\$)	Period	Type of transaction
XYZ	40,000	6.30	252,000.00	Pre-disclosure	Sell
XYZ	50,000	6.41	320,400.00	Pre-disclosure	Sell
Total investor sales in the pre-disclosure period	90,000	6.36	572,400.00		

Table 19 – Insider Trading: example of calculating the financial result when there is a reversal of position – post-disclosure period

Asset	Total amount traded on the market	Average price (\$)	Total volume traded on the market (\$)	Period
XYZ	1,731,000	5.59	9,676,290.00	Post-disclosure
Total traded on the market	1,731,000	5.59	9,676,290.00	

Considering the formulas:

- **AP = $(\sum(P \times \text{qty}) / \sum \text{qty})$** , we have
 $AP = ((6.30 \times 40,000 + 6.41 \times 50,000) / (40,000 + 50,000))$, that is,
 $AP = 6.36$
- **MP = 5.59**
- **FR = QS x (AP - MP)**, we have
 $FR = 90,000 \times (\$ 6.36 - \$ 5.59)$, that is,
 $FR = \$ 69,300.00$

Selection of investors

After calculating the indicators, it is possible to select the investors that showed the greatest evidence of atypicality and include registration information that helps assessing a possible irregularity, such as:

- Segmentation: identify whether the investor is a resident or non-resident individual, financial or non-financial legal entity, institutional investor, etc.;
- Economic activity;
- Registration information of **account(s)** used, such as opening date and account number;
- Information whether the investor is a **PEP (Politically Exposed Person)**;
- Registration address;
- Registration email;
- **Related parties**: identify investors who have a direct relationship with the Issuing Company and consequent privileged access to confidential information, such as employees, service providers, officers and members of the board of directors.

⚠ Selection of investors for analysis

A suggestion to identify investors who show signs of profile change and/or atypical results, and thus be able to analyze such cases, is to create a graphical visualization by quadrants that separates the results into four groups, aiming to group these investors according to the highest degree of influence among the suggested indicators.

The transactional profile breakdown information (previously calculated by the Euclidean distance) can be allocated on the X axis and the financial result on the Y axis, applying the following formulas to define the quadrants of the chart:

- Half of the Y-Axis = (maximum financial result of all investors + minimum financial result of all investors) / 2
- Half of the X Axis = (maximum result obtained in the formula for breaking down the transactional profile of all investors + minimum result obtained in the formula for breaking down the operating profile of all investors) / 2

Suggested metrics:

Financial Result

$$RF = \text{Financial result}$$

$$\overline{RF} = \text{Financial result average}$$

Euclidean Distance

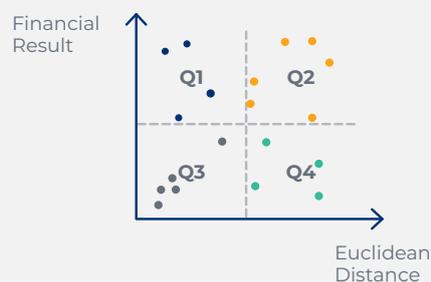
$$DE = \text{Euclidean Distance}$$

$$\overline{DE} = \text{Euclidean Distance average}$$

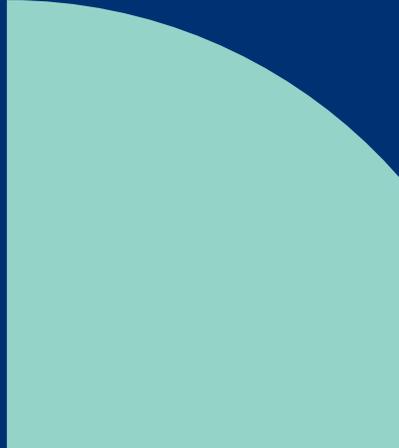
Limits and graphic representation: thus, it is possible to verify that the investors who are in the 4th quadrant (Q4) are the ones that stood out the most in the indicators compared to the others. It is worth highlighting that this comparison can only be made with knowledge of the information on operation transactions and custody of investors.

Limits:

- Q_2 : $RF \geq \overline{RF}$ and $DE \geq \overline{DE}$
- Q_1 : $RF \geq \overline{RF}$ and $DE \leq \overline{DE}$
- Q_4 : $RF \leq \overline{RF}$ and $DE \geq \overline{DE}$
- Q_3 : $RF \leq \overline{RF}$ and $DE \leq \overline{DE}$



3. Layering



3.1 Main concepts related to the alert

Layering is a form of price determination that occurs when an investor inserts or modifies supposedly fictitious orders with the purpose of creating artificial liquidity in the asset's order book.

In layering, the investor inserts or modifies purchase or sale orders without the real intention of executing them, thus forming layers in the book with the purpose of doing trades on the opposite side at better prices. The layer can be canceled before or after the trade is executed,

Such practice is considered irregular as it harms fair competition and may lead other investors to make investment decisions based on artificially created information. Two examples of layering dynamics will be described below, one with order insertion and the other with order modification.

! CVM Resolution 62 defines as **artificial conditions of demand, supply or price of securities** “those created as a result of negotiations by which its Participants or intermediaries, by intentional action or omission, directly or indirectly cause changes in the flow of purchase or sale orders of securities.”

Examples of layering dynamics

a. Example of layering with insertion of orders:

The following table shows the order book for an asset before the action of the investor who allegedly carried out the layering practice:

Table 20 – Order book before the action of the investor who allegedly carried out the layering practice⁷

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:31.431	B	100	19.02	19.59	100	E	11:12:38.786
11:13:15.209	D	200	19.01	19.60	100	F	11:13:24.726
11:12:04.756	C	500	18.93	19.64	200	G	10:18:26.293
10:29:30.996	G	5,000	18.75	19.68	200	D	09:45:01.064

⁷ Orders are ranked according to the best price priority principle. In the case of purchase, the higher the price, the higher the priority, and in the case of sale, the lower the price, the higher the priority. Orders with equal prices are sorted according to the registration or modification time, that is, previously inserted or modified orders have priority.

3. Layering

At the time shown, the spread of the asset was R\$ 0.57 (the difference between the best ask price in the amount of R\$ 19.59 and the best bid price in the amount of R\$ 19.02).

⚠ **Spread** is the term used to refer to the difference the best ask and the best bid for an asset in the order book.

Through Participant C, the investor entered several put sell orders that reduced the asset's spread to R\$ 0.25. The following table shows the moment after insertion of the investor's sell orders, highlighted in grey.

Table 21 – Order book after the investor cancels the orders that created the artificial liquidity

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.27	100	C	11:13:48.213
11:13:31.431	B	100	19.02	19.28	400	A	11:13:47.801
11:13:15.209	D	200	19.01	19.29	100	C	11:13:47.796
11:12:04.756	C	500	18.93	19.31	100	C	11:13:46.820
11:12:41.018	D	100	18.90	19.33	100	C	11:13:46.621
10:29:30.996	G	5,000	18.75	19.35	100	C	11:13:46.412
10:10:11.916	H	200	18.60	19.37	100	C	11:13:46.230
10:10:11.916	H	300	18.58	19.37	100	D	11:13:46.234
10:12:06.963	E	200	18.53	19.38	100	C	11:13:45.693
10:12:06.964	B	300	18.52	19.39	100	C	11:13:44.197
10:12:06.964	D	200	18.51	19.40	100	C	11:13:43.493
10:10:11.916	F	300	18.50	19.50	100	C	11:13:41.572
10:12:06.964	G	200	18.50	19.58	100	C	11:13:39.389
10:14:39.977	H	900	18.50	19.59	100	E	11:12:35.874

⚠ Participants intermediate transactions of several investors. Therefore, it is important to be clear that information about the analyzed investors must be known to identify atypical situations.

3. Layering

After inserting the investor's order, which supposedly created artificial liquidity, the market's reaction can be seen, with the insertion of a sell order at the price of R\$ 19.26 (highlighted in blue), as presented in the table below.

Table 22 – Order book at the time the market reacted to artificial liquidity

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.26	400	A	11:13:48.218
11:13:31.431	B	100	19.02	19.27	100	C	11:13:48.213
11:13:15.209	D	200	19.01	19.29	100	C	11:13:47.796
11:12:04.756	C	500	18.93	19.31	100	C	11:13:46.820
11:12:41.018	D	100	18.90	19.33	100	C	11:13:46.621
10:29:30.996	G	5,000	18.75	19.35	100	C	11:13:46.412
10:10:11.916	H	200	18.60	19.37	100	C	11:13:46.230
10:10:11.916	H	300	18.58	19.37	100	D	11:13:46.234
10:12:06.963	E	200	18.53	19.38	100	C	11:13:45.693
10:12:06.964	B	300	18.52	19.39	100	C	11:13:44.197
10:12:06.964	D	200	18.51	19.40	100	C	11:13:43.493
10:10:11.916	F	300	18.50	19.50	100	C	11:13:41.572
10:12:06.964	G	200	18.50	19.58	100	C	11:13:39.389
10:14:39.977	H	900	18.50	19.59	100	E	11:12:35.874

After the market's reaction, the investor, with the apparent purpose of buying the asset at a lower price, entered an order at the price of R\$ 19.26 (highlighted in grey) and carried out the trade.

Table 23 – Order book at the time the investor carried out the trade

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:13:49.624	C	400	19.26	19.26	400	A	11:13:48.218
11:12:38.431	B	100	19.02	19.27	100	C	11:13:48.213
11:13:31.431	B	100	19.02	19.29	100	C	11:13:47.796
11:13:15.209	D	200	19.01	19.31	100	C	11:13:46.820
11:12:04.756	C	500	18.93	19.33	100	C	11:13:46.621
11:12:41.018	D	100	18.90	19.35	100	C	11:13:46.412
10:29:30.996	G	5000	18.75	19.37	100	C	11:13:46.230
10:10:11.916	H	200	18.60	19.37	100	D	11:13:46.234
10:10:11.916	H	300	18.58	19.38	100	C	11:13:45.693
10:12:06.963	E	200	18.53	19.39	100	C	11:13:44.197
10:12:06.964	B	300	18.52	19.40	100	C	11:13:43.493
10:12:06.964	D	200	18.51	19.50	100	C	11:13:41.572
10:10:11.916	F	300	18.50	19.58	100	C	11:13:39.389
10:12:06.964	G	200	18.50	19.59	100	E	11:12:35.874

⚠ In this example, the order of the investor who supposedly carried out the layering practice was aggressive, that is, it was inserted after Participant C's order and generated the trade at a price of R\$ 19.26. One of the possible variations would be for the investor to have entered the order first and have his/her order attacked by the market.

Next, the investor canceled all the sell orders that he/she had previously entered:

Table 24 – Order book after the investor cancels the orders that created the artificial liquidity

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.37	100	D	11:13:46.234
11:13:31.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:15.209	D	200	19.01	19.59	100	E	11:12:38.786
11:12:04.756	C	500	18.93	19.60	100	F	11:13:24.726
10:29:30.996	G	5,000	18.75	19.64	200	G	10:18:26.293

⚠ One of the possible practice variations is, instead of canceling the order that generated the apparent liquidity, the investor changes the order for a worse price.

For cases in which the investor **cancels** or **changes** the order, the cancellation or changing can be identified both before and after the investor's trade is carried out.

b. Example of layering with order modification:

The following table shows the order book for an asset before the action of the investor who allegedly carried out the layering practice:

Table 25 – Order book before the action of the investor who allegedly carried out the layering practice⁸

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:31.431	B	100	19.02	19.59	100	E	11:12:38.786
11:13:15.209	D	200	19.01	19.60	100	F	11:13:24.726
11:12:04.756	C	500	18.93	19.64	200	G	10:18:26.293

At the time shown, the asset spread was R\$ 0.57 (the difference between the best ask price in the amount of R\$ 19.59 and the best bid price in the amount of R\$ 19.02).

The investor, through Participant C, entered a sell order and modified it several times to supposedly change the asset price. The following table shows the moment when the investor entered the buy order, highlighted in grey.

⁸ Orders are ranked according to the best price priority principle. In the case of purchase, the higher the price, the higher the priority, and in the case of sale, the lower the price, the higher the priority. Orders with equal prices are sorted according to the registration or modification time, that is, previously inserted or modified orders have priority.

Table 26 – Order book at the time the investor entered the order initiating the layering practice

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.58	100	C	11:13:39.389
11:13:31.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:15.209	D	200	19.01	19.59	100	E	11:12:38.786
11:12:04.756	C	500	18.93	19.60	100	F	11:13:24.726
11:12:41.018	D	100	18.90	19.64	200	G	10:18:26.293

A few moments later, the investor changed the order price from R\$ 19.58 to R\$ 19.45, as shown in the following table.

Table 27 – Order book at the time the investor created artificial liquidity by modifying the order for the first time

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.45	100	C	11:13:40.445
11:13:31.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:15.209	D	200	19.01	19.59	100	E	11:12:38.786
11:12:04.756	C	500	18.93	19.60	100	F	11:13:24.726
11:12:41.018	D	100	18.90	19.64	200	G	10:18:26.293

Moments later, the investor again modified the order price from R\$ 19.45 to R\$ 19.30, as presented in the following table.

Table 28 – Order book at the time the investor created artificial liquidity by modifying the order for the second time

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.30	100	C	11:13:41.572
11:13:31.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:15.209	D	200	19.01	19.59	100	E	11:12:38.786
11:12:04.756	C	500	18.93	19.60	100	F	11:13:24.726
11:12:41.018	D	100	18.90	19.64	200	G	10:18:26.293

3. Layering

After modifying the investor's order, one can see the market's reaction, with the insertion of a sell order at a price of R\$ 19.29 (highlighted in blue), as presented in the following table.

Table 29 – Order book at the time the market reacted to artificial liquidity

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.29	400	A	11:13:43.218
11:13:31.431	B	100	19.02	19.30	100	C	11:13:41.572
11:13:15.209	D	200	19.01	19.59	100	E	11:12:35.874
11:12:04.756	C	500	18.93	19.59	100	E	11:12:38.786
11:12:41.018	D	100	18.90	19.60	100	F	11:13:24.726

After the market's reaction, the investor, with the apparent purpose of buying the asset at a lower price, entered a bid offer at the price of R\$ 19.29 (highlighted in grey) and carried out the trade.

Table 30 – Order book at the time the investor carried out the trade

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:13:45.456	C	400	19.29	19.29	400	A	11:13:43.218
11:12:38.431	B	100	19.02	19.30	100	C	11:13:41.572
11:13:31.431	B	100	19.02	19.59	100	E	11:12:35.874
11:13:15.209	D	200	19.01	19.59	100	E	11:12:38.786
11:12:04.756	C	500	18.93	19.60	100	F	11:13:24.726

Subsequently, the investor canceled the sales order that he/she had entered.

3.2 Suggestions for building the alert

We will detail some suggestions on how to identify indications of atypicality. For this purpose, four steps will be segregated which, when identified, form a **layering cycle**.

- An investor **creates artificial liquidity** in the order book, on the opposite side to the one he/she wants to trade, by inserting or modifying what we will call "artificial orders".
- **Market reaction** (other investors) to artificial liquidity created by the investor.
- Investor **carries out the trade**.
- Investor **cancels orders** that generated artificial liquidity or **changes orders** for worse prices.

- ⚠ The four phases of the **layering cycle** do not necessarily need to be carried out in the same order as presented above. An alert can be generated if one or more cycles are identified, depending on the risk approach and criteria used in the alert.

Creation of artificial liquidity

As previously mentioned, liquidity creation can occur by inserting or modifying an order (on the opposite side to the one where one really wants to execute the trade), aiming to reduce the spread.

For cases of layering with insertion of orders, the suggestion is to consider creating two or more layers of orders inserted in the first price levels, aiming to obtain the spread reduction.

For cases of layering indications with order modification, the suggestion is to consider orders that have been modified to the first price levels and with better prices before executing the trade on the opposite side of the order book.

- ⚠ In example *a* presented in item 3.1, the investor who supposedly carried out the practice entered orders at 11 different price levels (between R\$ 19.58 and R\$ 19.27) and better than the price of the best sell order available on the book before the beginning of the creation of apparent liquidity (R\$ 19.59). It is worth recalling that the order layers may contain other price levels filled with orders from other Participants or investors.

- ⚠ In example *b* presented in item 3.1, the investor who supposedly carried out the practice entered an order at a better price level (R\$ 19.58) than the best sell order available in the book before the beginning of the creation of apparent liquidity (R\$ 19.59) and modified the order until reaching the price of R\$ 19.30.

- ⚠ The definition of the first price levels will depend on the characteristics of the asset's order book, mainly on the **depth** of the book, which indicates the number of existing bid and ask prices for the asset at a given moment.

Market reaction

At this phase, the market must react to the artificial liquidity created by the investor who supposedly carried out the layering practice.

- ⚠ In the examples presented in item 3.1, the market reacted to the apparent liquidity created by the supposed layering practice by inserting an order with the price of R\$ 19.29. The market reaction may have been carried out through the same Participant as the investor who allegedly carried out the practice or through another Participant.

Trade execution

Having identified the previously mentioned signs of atypicality, the investor must have traded on the opposite side to the one that inserted the order that generated the artificial liquidity. In this way, the effects of possible irregularity reinforce the hypothesis of atypicality, since the investor managed to carry out the transaction at a better price (buying at a lower price or selling at a higher price) than the asset had before the start of the transaction.

Cancellation of artificial liquidity

The cancellation of artificial orders can occur before or after the execution of the trade. At this phase, some points should be considered:

- **Price level of orders at the time of cancellation**

For the phase of the cycle where the cancellation of artificial orders takes place, if the cancellation occurs **before** the trade is executed, at the time of cancellation, the order(s) must be among the first price levels.

If cancellation occurs after the trade, at the time of execution, the artificial orders must be among the first price levels.

- ⚠ In example c presented in item 3.1, the trade was executed at a price of R\$ 19.29, and the artificial order, which was subsequently canceled, was placed at the second price level (R\$ 19.30) at the time of execution of the trade.

- **Interval between cycle phases**

It is important considering the time elapsed between the supposed creation of artificial liquidity and its cancellation. For this purpose, it is possible to calculate an average time benchmark between trades of the asset and compare it with the time interval between orders that generated artificial liquidity (time of insertion or last modification) and the cancellation of orders.

⚠ For example *b* presented in item 3.1, assuming that an average time of 3 seconds (00:00:03.00) between trades of the asset was calculated, the investor who supposedly carried out the irregular practice modified the order for the last time at 11:13:41.572 and canceled it at 11:13:43.219. This represented an interval of 1 second and 674 milliseconds (00:00:01.674), which is less than the average time between trades for the asset in question. This fact strengthens the hypothesis of atypicality, since the investor's order remained in the book for a period shorter than the average of market offers, thus increasing the indication that the order was artificially inserted and changed.

⚠ The average time benchmark between asset trades is calculated and made available by BSM monthly. See link [benchmarks](#).

Calculation of the potential profit earned

Aiming to measure the potential result that the investor obtained when carrying out the layering practice, we can calculate the difference between the price of the best offer entered in the book before the beginning of the creation of the artificial layer by the investor and the price at which the investor carried out the trade, multiplied by the amount traded by the investor, according to examples 1 and 2:

- **Example 1**

In this example, the best ask available in the book before the investor's action was R\$ 19.59:

Table 31 – Order book before investor action

Bid		Ask					
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.59	2,000	E	11:12:35.874
11:13:31.431	B	100	19.02	19.59	100	E	11:12:38.786
11:13:15.209	D	200	19.01	19.60	100	F	11:13:24.726
11:12:04.756	C	500	18.93	19.64	200	G	10:18:26.293
11:12:41.018	D	100	18.90	19.68	200	D	09:45:01.064

3. Layering

After identifying the other phases of the layering cycle, we consider that the investor has carried out a trade at the price of R\$ 19.26 involving 2,000 shares, as presented below:

Table 32 – Order book at the time the investor carried out the trade

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:13:49.624	C	2,000	19.26	19.26	2,000	A	11:13:48.218
11:12:38.431	B	100	19.02	19.27	100	C	11:13:48.213
11:13:31.431	B	100	19.02	19.29	100	C	11:13:47.796
11:13:15.209	D	200	19.01	19.31	100	C	11:13:46.820
11:12:04.756	C	500	18.93	19.33	100	C	11:13:46.621

In that case⁹, the potential profit earned by the investor is calculated as follows:

- R\$ 19.59 (best price at which the investor could buy the asset before the alleged layering practice) – R\$ 19.26 (price at which the investor bought the asset after the supposed layering practice) = R\$ 0.33
- R\$ 0.33 X 2,000 (amount purchased by the investor with the alleged practice of layering) = **R\$ 660.00**

In this example, there was enough depth for the investor to purchase 2,000 shares at the price of R\$ 19.59 each. If there was no quantity available in the book at the first price level, we would have to consider the other price levels until reaching the quantity traded by the investor, which will be demonstrated in Example 2.

• Example 2

In this example, the best ask available in the book before the investor's action was R\$ 19.59:

Table 33 – Order book before investor action

Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:12:38.431	B	100	19.02	19.59	400	E	11:12:35.874
11:13:31.431	B	100	19.02	19.59	100	E	11:12:38.786
11:13:15.209	D	200	19.01	19.60	100	F	11:13:24.726
11:12:04.756	C	500	18.93	19.64	200	G	10:18:26.293
11:12:41.018	D	100	18.90	19.68	200	D	09:45:01.064

⁹ In this example, a share with a quotation factor equal to one (1) was considered as a product. For other products, the particularities and specific characteristics must be evaluated in the calculation.

3. Layering

After identifying the other phases of the layering cycle, we consider that the investor has carried out a trade at the price of R\$ 19.26 involving 800 shares, as presented below:

Table 34 – Order book at the time the investor carried out the trade

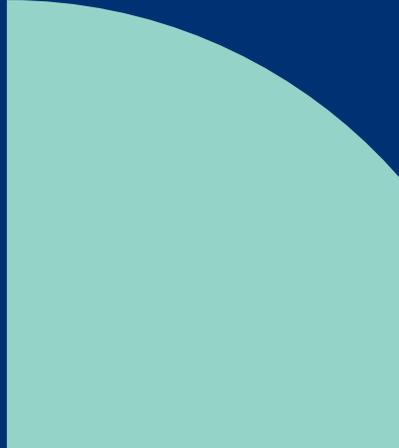
Bid				Ask			
Hour	Part	Qty	Price (\$)	Price (\$)	Qty	Part	Hour
11:13:49.624	C	800	19.26	19.26	800	A	11:13:48.218
11:12:38.431	B	100	19.02	19.27	100	C	11:13:48.213
11:13:31.431	B	100	19.02	19.29	100	C	11:13:47.796
11:13:15.209	D	200	19.01	19.31	100	C	11:13:46.820
11:12:04.756	C	500	18.93	19.33	100	C	11:13:46.621

In the example, the potential result earned by the investor is calculated as follows:

- Quantity available at the best price level before alleged layering (500) multiplied by the result of subtracting the best price at which the investor could buy before the practice (R\$ 19.59) and the price at which the investor effectively bought the share (R\$ 19.26), that is, $500 \times (\text{R\$ } 19.59 - \text{R\$ } 19.26) = \text{R\$ } 165.00$
- Quantity available at the second best price level before the layering practice (100) multiplied by the result of subtracting the best price at which the investor could buy before the practice (R\$ 19.60) and the price at which the investor effectively bought the share (R\$ 19.26), that is, $100 \times (\text{R\$ } 19.60 - \text{R\$ } 19.26) = \text{R\$ } 34.00$
- Quantity available at the third best price level before the layering practice (200) multiplied by the result of subtracting the best price at which the investor could buy before the practice (R\$ 19.64) and the price at which the investor effectively bought the share (R\$ 19.26), that is, $200 \times (\text{R\$ } 19.64 - \text{R\$ } 19.26) = \text{R\$ } 76.00$
- The total result is the sum of what the investor would be able to execute at each price level until reaching the size of the order executed with the supposed layering practice, that is, $\text{R\$ } 165.00 + \text{R\$ } 34.00 + \text{R\$ } 76.00 = \text{R\$ } 275.00$

 The asset's order book plays a key role in the layering analysis since it provides information related to the dynamics of orders that are essential to identify atypical situations.

4. Spoofoing



4.1 Main concepts related to the alert

Spoofing is a form of price manipulation that, like layering, creates artificial liquidity in the asset's book, but using an order that is disproportionate to those in the book, with the purpose of influencing investors to overcome the artificial order and generate trades on the opposite side of the book.

! CVM Resolution 62 defines as **artificial conditions of demand, supply or price of securities** “those created as a result of negotiations by which its participants or intermediaries, by intentional action or omission, directly or indirectly cause changes in the flow of purchase or sale orders of securities.”

Example of Spoofing dynamics

The following table shows the order book just before the action of the investor who allegedly acted irregularly:

Table 35 – Order book before the action of the investor who allegedly carried out the practice of spoofing¹⁰

Bid				Ask			
Hour	Part	Qty.	Price (\$)	Price (\$)	Qty.	Part	Hour
12:17:22.966	B	6,000	10.20	10.35	300	A	11:55:27.836
12:14:13.963	A	400	10.19	10.35	4,000	B	12:16:20.841
12:17:22.967	A	200	10.18	10.36	200	A	12:15:31.607
12:15:21.564	F	1,000	10.17	10.36	3,000	C	12:16:20.762
12:16:12.498	B	200	10.16	10.36	100	E	12:16:28.221

At the time presented, the asset spread was R\$ 0.15, resulting from the difference between the best ask price (in the amount of R\$ 10.35) and the best bid price (in the amount of R\$ 10.20).

The investor highlighted in gray entered an offer to sell 5,000 shares at the price of R\$ 10.34, as presented below:

¹⁰ Orders are ranked according to the best price priority principle. In the case of purchase, the higher the price, the higher the priority, and in the case of sale, the lower the price, the higher the priority. Orders with equal prices are sorted according to the registration or modification time, that is, previously inserted or modified orders have priority.

Table 36 – Order book at the time the investor entered the order he/she wished to trade

Bid				Ask			
Hour	Part	Qty.	Price (\$)	Price (\$)	Qty.	Part	Hour
12:17:22.966	B	6,000	10.20	10.34	5,000	D	12:17:22.989
12:14:13.963	A	400	10.19	10.35	300	A	11:55:27.836
12:17:22.967	A	200	10.18	10.35	4,000	B	12:16:20.841
12:15:21.564	F	1,000	10.17	10.36	200	A	12:15:31.607
12:16:12.498	B	200	10.16	10.36	3,000	C	12:16:20.762

Next, the investor entered a buy order for 100,000 shares (highlighted in gray) at a price of R\$10.18, generating artificial liquidity in the order book, as presented below:

Table 37 – Order book at the time the investor entered the order that generated the artificial liquidity

Bid				Ask			
Hour	Part	Qty.	Price (\$)	Price (\$)	Qty.	Part	Hour
12:17:22.966	B	6,000	10.20	10.34	5,000	D	12:17:22.989
12:14:13.963	A	400	10.19	10.35	300	A	11:55:27.836
12:17:23.002	D	100,000	10.18	10.35	4,000	B	12:16:20.841
12:17:22.967	A	200	10.18	10.36	200	A	12:15:31.607
12:15:21.564	F	1,000	10.17	10.36	3,000	C	12:16:20.762

After the creation of artificial liquidity, the market reacted to the pressure created by the investor by inserting the bid order for 5,000 shares at the price of R\$ 10.34 (highlighted in blue) and attacking the initial ask offer by the investor, carrying out the trade, according to the following table.

Table 38 – Order book at the time the investor carried out the trade

Bid				Ask			
Hour	Part	Qty.	Price (\$)	Price (\$)	Qty.	Part	Hour
12:17:23.967	A	5,000	10.34	10.34	5,000	D	12:17:22.989
12:17:22.966	B	6,000	10.20	10.35	300	A	11:55:27.836
12:14:13.963	A	400	10.19	10.35	4,000	B	12:16:20.841
12:17:23.002	D	100,000	10.18	10.36	200	A	12:15:31.607
12:17:22.967	A	200	10.18	10.36	3,000	C	12:16:20.762
12:17:13.703	C	1,000	10.17	10.36	100	E	12:16:28.221

⚠ In this example, the offer of the investor who carried out the alleged spoofing practice was attacked, that is, the investor had inserted an ask order in the order book and another investor (market) entered a bid offer, generating a trade at a price of R\$ 10.34. One of the possible variations would be for the investor to have inserted the order after the market reaction (aggressor), as shown in the layering example.

Subsequently, the investor cancels the significant order that generated the artificial liquidity in the book. The orders cancellation does not necessarily have to occur after the investor's trades has been carried out, but may occur before.

4.2 Suggestions for building the alert

We will detail some suggestions on how to identify signs of irregularity. For this purpose, four steps will be segregated which, when identified, form a **spoofing cycle**.

- An investor **creates artificial liquidity** in the order book, on the opposite side to the one he/she wants to trade, using the insertion or modification of expressive orders, which we will call here an "artificial order".
- **Market reaction** (other investors) to artificial liquidity created by the investor.
- Investor **carries out the trade**.
- Investor **cancels the order** that generated the artificial liquidity or **changes the order** for worse prices.

- ⚠ The four steps of the **spoofing cycle** do not necessarily need to be implemented in the same order as presented above. An alert can be generated if one or more cycles are identified, depending on the risk approach and criteria used in the alert.

Creation of artificial liquidity

The creation of artificial liquidity can occur by inserting a significant order when the investor inserts or modifies one or more buy or sell orders (on the opposite side to the one that really wants to execute the trade).

The suggestion to identify the orders that are significant is to use a benchmark of the average number of orders for the asset, which consists of calculating the average number of bid and ask orders per asset and compare it to the size of the artificial offer.

To ensure greater probability that the expressive order generates pressure in the book, the suggestion is to consider only the orders that are inserted in the first price levels and that represent a relevant percentage of the orders in the book.

- ⚠ In the example presented in item 4.1, assuming that the average number of bids for the aforementioned asset was 7,500, the investor who supposedly carried out the practice entered an order for 100,000 shares on the buy side, with this order being almost 14 times greater than the benchmark, which can impact the dynamics of the orders.

Market reaction

At this phase, the market must react to the artificial liquidity created by the investor who supposedly carried out the spoofing practice.

- ⚠ The average number of order benchmark is calculated and made available monthly by BSM. See link [benchmarks](#).

Trade execution

Having identified the previously mentioned signs of atypicality, the investor must have traded on the opposite side to the one that inserted the order that generated the artificial liquidity. Thus, the effects of the possible irregularity materialize, since the investor managed to carry out the transaction with a better price than the asset presented before the beginning of the action.

Cancellation of artificial liquidity

The cancellation of the artificial order can occur before or after the execution of the trade. At this phase, some points should be considered:

- **Price level of orders at the time of cancellation**

For the phase of the cycle where the cancellation of the artificial orders takes place, if the cancellation occurs **before** the trade is executed, the orders must be among the first price levels at the time of the cancellation.

If cancellation occurs **after** the trade, the artificial order must be among the first price levels at the time of the trade execution.

⚠ The definition of the first price levels will depend on the characteristics of the asset's order book, mainly on the **depth** of the book, which indicates the number of existing bid and ask prices for the asset at a given moment.

⚠ In example c presented in item 4.1, the trade was executed at a price of R\$ 10.34, and the artificial order, which was subsequently canceled, was placed at the second price level (R\$ 10.18) at the time of execution of the trade.

- **Interval between cycle phases**

It is important considering the time elapsed between the creation of artificial liquidity and its cancellation. For this purpose, it is possible to calculate an average time benchmark between trades of the asset and compare it with the time interval between orders that generated artificial liquidity (time of insertion or last modification) and the cancellation of orders.

⚠ Considering an average time between asset trades of 2 seconds (00:00:02.000), in the example presented in item 4.1, the investor who supposedly carried out the irregular practice entered the order at 12:17:23.002 and canceled it at 12:17:23,987, which represented an interval of 985 milliseconds (00:00:00.985), which is less than the average time between trades for the asset in question. This short interval strengthens the hypothesis of atypicality, since the investor's order remains in the book for a period shorter than the average of market orders, which indicates that the order was inserted artificially, and not with the intention of being traded.

- ⚠ The average time benchmark between trades is calculated and made available by BSM monthly. See link [benchmarks](#)

Calculation of the potential profit earned

To measure the potential result that the investor obtained with the supposed spoofing practice, we can calculate the price difference between the best offer in the book before the beginning of the creation of the artificial layer by the investor and the price at which the investor carried out the trade, multiplied by quantity traded by the investor, as presented in item 4.1:

- Before the investor's action, the best bid available in the book was R\$10.20.
- After the supposed creation of artificial liquidity, the investor carried out a trade at a price of R\$ 10.34 (that is, the investor managed to sell at a better price than that available in the order book before the practice was carried out).

In this example¹¹, the potential result earned by the investor was calculated as follows:

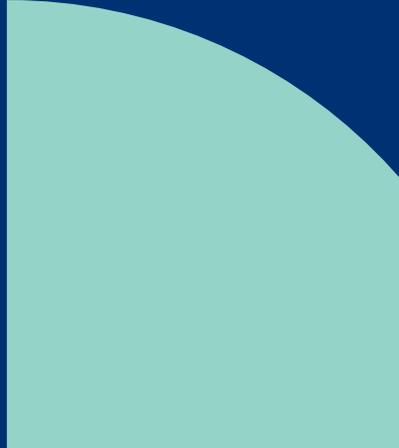
- R\$ 10.34 (price at which the investor sold with the alleged spoofing practice)
- R\$ 10.20 (best price at which the client could sell before the alleged spoofing practice)
- 5,000 (amount that the client sold with the alleged spoofing practice), that is,
 $R\$ 0.14 \times 5,000 = \mathbf{R\$ 700.00}$

- ⚠ In this example, there was depth (sufficient offers) for the investor to sell 5,000 contracts at a price of R\$ 10.20 each. However, if the quantity was not available in the book at the first price level, we would have to consider the other price levels until reaching the quantity traded by the investor.

- ⚠ The asset's order book plays a key role in the spoofing analysis since it provides information related to the dynamics of orders that are essential to identify atypical situations

¹¹ In this example, a share with a quotation factor equal to one (1) was considered as a product. For other products, the particularities and specific characteristics must be evaluated in the calculation

5. Front Running



5.1 Main concepts related to the alert

Front running transactions are those that offer an undue advantage to an investor who, supposedly having prior knowledge that a certain transaction will be carried out, anticipates it, thus gaining a financial benefit.

! CVM Resolution 62 defines **unfair practice** as “the one that results, directly or indirectly, effectively or potentially, in a treatment for any of the parties, in securities trading, that places it in an undue position of imbalance or inequality in the face of the other participants in the transaction.”

Example:

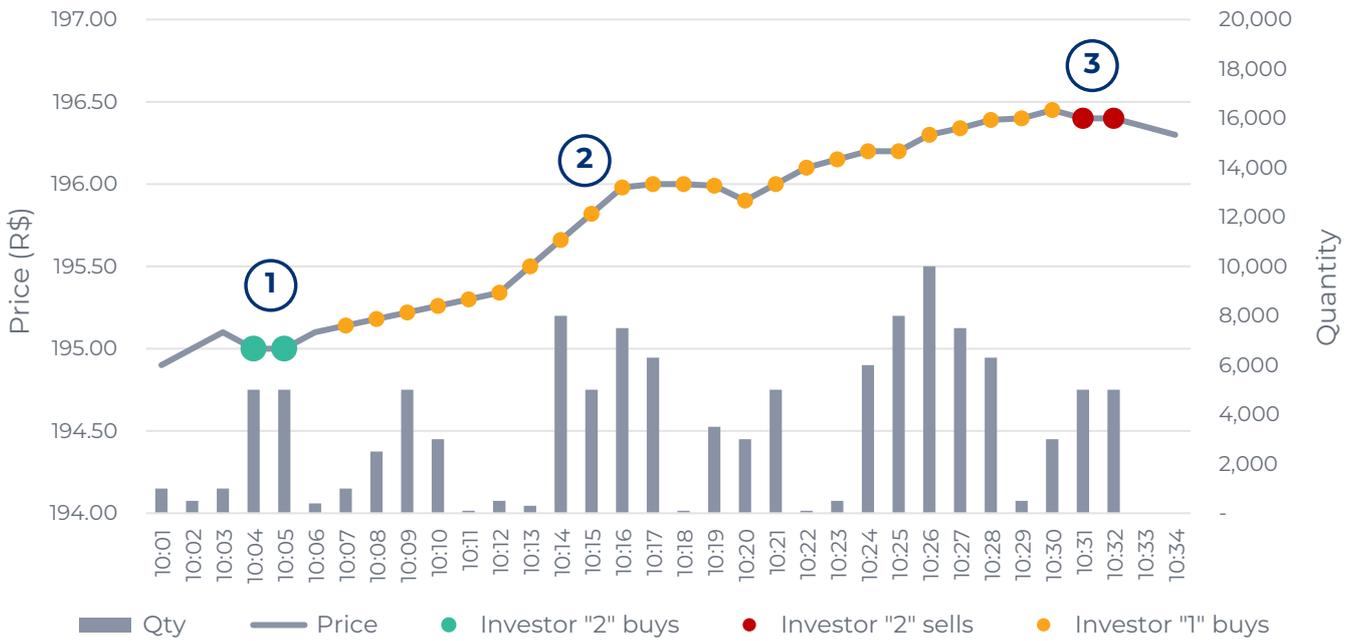
Investor 1 wants to carry out a buy transaction for a certain asset. Knowing this information and transaction, as it involves a significant lot, could impact the asset price, Investor 2 takes a position before it is executed. During or after Investor 1's transaction, Investor 2 reverses its position, earning a financial benefit.

The hypothetical steps of the transaction and the chart illustrating the dynamics of the irregularity are presented below.

1. Investor 2 positions himself/herself by carrying out buy transactions (highlighted in green), anticipating the transactions of Investor 1.
2. Investor 1 carries out the buy transaction with a significant amount, and the asset appreciates (highlighted in yellow).
3. During Investor 1's transactions, Investor 2 carries out sell transactions against Investor 1, earning a profit (highlighted in red).

! In the example above, Investor 2 carries out sell transactions against Investor 1, earning a profit, which increases the indications of coordination between investors. In another scenario, Investor 2's sell transactions could have been carried out against other investors (market), which should also be considered when identifying atypicality.

Chart 2 – Example of Front Running dynamics



In the example presented in the chart, Investor 2 bought 10,000 shares at the price of R\$ 195.00 and sold 10,000 shares at the price of R\$ 196.40, earning a profit of R\$ 14,000.00. Investor 1 purchased 100,000 shares at an average price of R\$ 195.96 each (started transactions at a price of R\$ 195.14 and ended at a price of R\$ 196.40).

⚠ It is also possible to identify situations in which the investor can anticipate a sell transaction, considering that the asset will depreciate. Aiming to obtain the benefit, the investor performs sell transactions before the devaluation and reverses his/her position by carrying out buy transactions.

5.2 Suggestions for building the alert

To identify indications of irregularity, some factors are important and can be considered in the construction of the alert, such as:

- Identify whether there were periods, within each of the trading sessions, in which the asset appreciated or depreciated.
- Identify investors who traded with price fluctuations and may have been responsible for the asset appreciation or depreciation.
- Identify investors who benefited from the asset appreciation or depreciation, positioning themselves earlier and reversing their positions later.

• **Suggestions for identifying asset appreciation or depreciation periods**

To identify such periods, the suggestion is to divide the trading session into intervals and calculate the price weighted moving average.¹² If the price weighted moving average increases over time, there is an indication of asset appreciation. If the price weighted moving average decreases over time, there is an indication of the asset’s depreciation.

! One suggestion is to divide the trading session considering intervals, depending on the behavior of asset prices and liquidity. The more liquid the asset, the smaller the interval used and the less liquid the asset, the larger the interval to be used.

In the following example, the price weighted moving average (which we will call “Average price”) was calculated, considering a 60-minute interval and dividing the sum of the traded volume by the sum of the traded quantity.

$$\text{Average price} = \frac{\sum \text{Volume in defined interval}}{\sum \text{Quantity in defined interval}}$$

Table 39 – Example of calculating the price weighted moving average

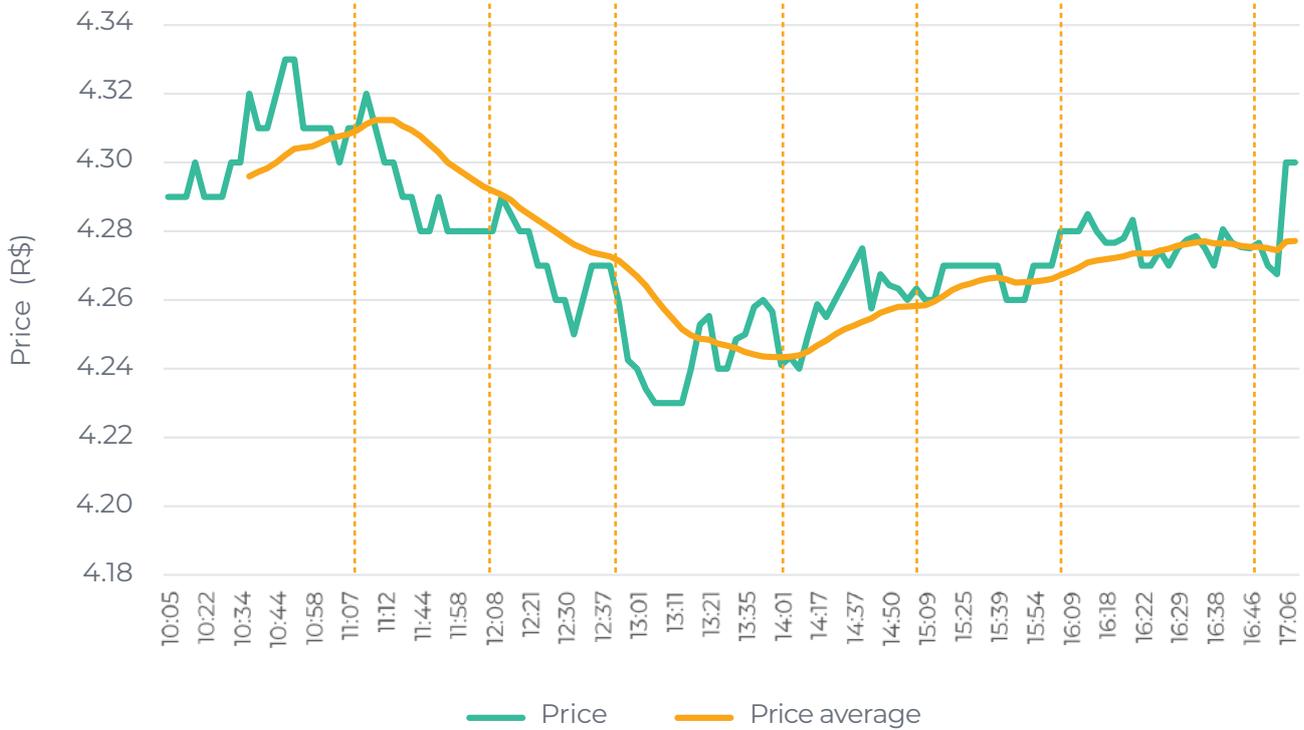
Hour	Qty.	Volume (\$)	Price (\$)	Average price (\$)
10:05	800	3,448.00	4.31	4.30
10:07	200	864.00	4.32	
10:07	200	864.00	4.32	
10:09	200	862.00	4.31	
10:09	100	432.00	4.32	
10:17	400	1,724.00	4.31	
10:22	500	2,160.00	4.32	
10:25	2,000	8,660.00	4.33	
10:30	700	3,031.00	4.33	
10:33	400	1,732.00	4.33	
10:34	200	864.00	4.32	
10:40	300	1,296.00	4.32	
10:41	300	1,287.00	4.29	
10:43	200	858.00	4.29	
10:44	900	3,861.00	4.29	
10:45	100	429.00	4.29	
10:49	100	429.00	4.29	
10:49	11,500	49,335.00	4.29	

¹² Examples of average variations that can be considered include: simple moving average, weighted moving average, exponential moving average, double exponential moving average, triple average index, Hull moving average.

5. Front Running

The chart below shows the price weighted moving average marking throughout the day, considering 60-minute intervals:

Chart 3 – Marking of the price moving average considering 60-minute intervals



Based on the chart, it is possible to infer that:

- Between 10:00 am and 11:00 am, the asset showed an increase in the price moving average, indicating an appreciation.
- Between 11:00 am and 02:00 pm, the asset showed a decrease in the moving average, indicating depreciation.
- Between 2:00 pm and 4:00 pm, the asset resumed appreciation.
- Between 4:00 and 5:00, the asset remained stable, that is, this period will not be selected for analysis.
- As of 5:00 pm, the asset showed an increase in the price moving average, indicating appreciation.

The periods of appreciation and depreciation mentioned will be referred herein as “ramps”, which represent the analysis interval in which the asset presented directional fluctuation, positive or negative, delimiting the minimum and maximum prices reached in this interval.

To identify which assets showed more significant oscillations, we suggest calculating the following indicator:

- “Ramp” price variation (minimum and maximum price of the asset in the interval)

$$\text{Ramp price change} = \left(\frac{\text{Maximum price}}{\text{Minimum price}} - 1 \right)$$

To exemplify the calculation, we will use the previous example. See below:

Table 40 – Example of ramp price variation calculation

Interval	Period	Minimum price (\$)	Maximum price (\$)	Ramp price change
1	10:00 am to 11:00 am	4.29	4.33	0.93%
2	11:00 am to 12:00 pm	4.28	4.32	0.93%
3	12:00 pm to 01:00 pm	4.24	4.31	1.65%
4	01:00 pm to 02:00 pm	4.21	4.26	1.19%
5	02:00 pm to 03:00 pm	4.24	4.27	0.71%
6	03:00 pm to 04:00 pm	4.26	4.27	0.23%
7	04:00 pm to 05:00 pm	4.27	4.29	0.47%

• **Suggestions for identifying investors responsible for oscillations**

To identify whether there was any investor responsible for the asset appreciation or depreciation in a given interval, the indicators below can be calculated.

Indicator of trades performed with directional price fluctuation

The greater the proportion between trades with fluctuation by the investor in relation to trades with fluctuation by other investors who operated in the period (market), the greater the probability that transactions were carried out with the purpose of manipulating prices.

- Buy trades for positive fluctuation:

$$\frac{\text{\# of buy trades with positive investor fluctuation}}{\text{\# of buy trades with positive market fluctuation}}$$

- Sell trade for negative fluctuation:

$$\frac{\text{\# of sell trades with negative investor fluctuation}}{\text{\# of sales trades with negative market fluctuation}}$$

Assuming that, in a certain interval, 380 trades with positive fluctuation were carried out, Investors 1, 2 and 3 presented the following numbers:

Table 41 – Example of trades carried out with positive fluctuation

Trades with fluctuation	Investor 1	Investor 2	Investor 3	Other investors	Total
Total buy trades with positive fluctuation	182	67	34	97	380

Using the formula indicated in this topic, we brought the indicator in percentage of buy trades with positive fluctuation carried out by investors in relation to the market:

Table 42 – Example of calculating the percentage of positive fluctuation

Trades with fluctuation	Investor 1	Investor 2	Investor 3	Other investors
Percentage of buy trades with positive fluctuation against the market	48%	18%	9%	25%

The indicators show that Investor 1 accounted for 48% of the buy trades carried out with positive fluctuation.

Aggressor indicator

The greater the proportion between the investor’s aggressor trades in relation to the aggressor trades of the other investors that operated in the period (market), the greater the probability that transactions were carried out with the purpose of manipulating prices.

- "Buy" aggressor indicator:

$$\frac{\text{\# of trades where the investor was the aggressor (buy side)}}{\text{\# of trades where other investors (market) were the aggressors (buy side)}}$$

- "Sell" aggressor indicator

$$\frac{\text{\# of trades where the investor was the aggressor (sell side)}}{\text{\# of trades where other investors (market) were the aggressors (sell side)}}$$

To exemplify the indicator, we present below the trades carried out in a time interval. The last column shows the responsible for the aggressor order, that is, the one that generated the trade.

Table 43 – Example of aggressor indicator

Time of trade	Price (\$)	Qty.	Buyer participant	Buyer investor	Seller participant	Seller investor	Aggressor
10:22:39.494	1.14	100	B		A	Investor 3	Seller
10:22:41.494	1.14	100	D		B		Buyer
10:22:57.494	1.14	100	B		A	Investor 1	Buyer
10:26:39.494	1.15	100	B		A	Investor 4	Buyer
10:28:32.494	1.19	1,600	A	Investor 1	B		Buyer
10:36:48.958	1.21	800	A	Investor 1	C		Buyer
10:48:01.381	1.19	500	A	Investor 1	A	Investor 4	Buyer
10:51:05.976	1.20	900	A	Investor 2	C		Seller
10:54:09.726	1.24	1,200	A	Investor 1	B		Buyer
10:58:17.955	1.28	700	A	Investor 1	C		Buyer
10:59:23.762	1.28	100	A	Investor 1	C		Buyer

In this case, of the 11 trades executed, 9 had the “Buyer” offer as the aggressor. We verified that Investor 1, which carried out the transactions intermediated by Participant A, was responsible for 6 of the orders that had the “Buyer” as the aggressor, representing 67% of the aggressor trades.

Price variation indicator for trades carried out by the investor (minimum and maximum price) in relation to the price variation of the ramp

$$\frac{(\text{maximum investor price}/\text{minimum investor price})-1}{(\text{maximum ramp price}/\text{minimum ramp price})-1}$$

To exemplify the indicator, we present below the comparison between the trades carried out by one of the investors with the market.

Table 44 – Example of comparing an investor’s trades with the market

Interval	Period	Minimum price (\$)	Maximum price (\$)	Ramp price change	Investor 1 minimum price (\$)	Investor 1 maximum price (\$)	Investor 1 price variation	Variation indicator
1	10:00 am to 11:00 am	4.29	4.34	1.17%	4.31	4.32	0.23%	19.91%
2	11:00 am to 12:00 pm	4.23	4.32	2.13%	4.28	4.32	0.93%	43.93%
3	12:00 pm to 01:00 pm	4.23	4.34	2.60%	4.23	4.33	2.36%	90.91%
4	01:00 pm to 02:00 pm	4.24	4.28	0.94%	4.26	4.27	0.23%	24.88%
5	02:00 pm to 03:00 pm	4.25	4.27	0.47%	4.25	4.25	0.00%	0.00%
6	03:00 pm to 04:00 pm	4.27	4.27	0.00%	4.27	4.27	0.00%	0.00%
7	04:00 pm to 05:00 pm	4.27	4.28	0.23%	4.27	4.27	0.00%	0.00%

The indicator shows how much the fluctuations made by the investor accounted for the market fluctuation in each of the periods, with emphasis on interval 3, which represented 90.91%.

Investor buy and sell trade indicators

- Buy trades:

$$\frac{\text{\# of investor buy trades}}{\text{\# of investor buy and sell trades}}$$

- Sell trades:

$$\frac{\text{\# of investor sell trades}}{\text{\# of investor buy and sell trades}}$$

This indicator aims to complement the previous one, evaluating whether the investor trades in the asset purchase and sale. An example table to illustrate the situation is presented below:

Table 45 – Example of investor trades indicator

Investor	Number of but trades	Number of sell trades	Buy trade indicator	Sell trade indicator
Investor 1	2	10	0.17	0.83
Investor 2	200	220	0.48	0.52
Investor 3	20	10	0.67	0.33
Investor 4	1,500	1,600	0.48	0.52
Investor 5	30	5	0.86	0.14
Investor 6	2,000	2,000	0.50	0.50
Investor 7	5	5	0.50	0.50

The closer to 1, the greater the indication that the investor is trading only on one side (buying or selling).

• **Suggestions for identifying benefiting investors**

To identify whether there was any investor who benefited from the asset appreciation or depreciation, indicators such as the following can be calculated:

Reversal percentage

This is the comparison between the amount opened before and during the ramp and the amount reversed during and after the ramp.

- When the asset appreciates:

$$\frac{\text{Qty sold during or after the ramp}}{\text{Qty bought before or during the ramp}}$$

- When the asset presents devaluation:

$$\frac{\text{Qty bought during or after the ramp}}{\text{Qty bought before or during the ramp}}$$

⚠ **Opening a position** occurs when an investor decides to start a new position by buying an asset that he/she did not previously own.

Position reversal happens when an investor decides to close an existing position in an asset, either selling his/her position or buying a position he/she had sold to close it, which can occur in full or in part, as detailed in this Guide.

Calculation example: consider Investor A who opened a position with asset XYZ, buying 100,000 units before the asset showed a supposed appreciation (amount bought before the ramp). After the asset's appreciation, this investor reversed his/her position by 100,000 units, that is, presented a reversal percentage of 100%. A high percentage of reversals may indicate a higher level of investor intentionality, that is, the investor was able to identify the right moment to open and reverse his/her positions and make a profit.

Financial result obtained by the investor¹³

FR = MQ x (AP – BP), where:

- **MQ = Matched Quantity:** is the investor's smallest quantity between buy and sell transactions: $\min(\sum \text{buy qty}, \sum \text{sell qty})$
- **AP = Ask Price:** average price weighted by the investor's sales quantity: $(\sum(P \times \text{qty}) / \sum \text{qty})$
- **BP = Bid Price:** average price weighted by investor buy quantity: $(\sum(P \times \text{qty}) / \sum \text{qty})$

An example demonstrating the ¹⁴calculation is presented below:

¹³ The examples consider the calculation of the average price, obtained by dividing the total volume operated by the total quantity operated. There are other ways that can be used to calculate the financial result, for example, the FIFO (First in, First out) method.

¹⁴ In this example, a share with a quotation factor equal to one (1) was considered as a product. For other products, the particularities and specific characteristics must be evaluated in the calculation.

Table 46 – Example of investor financial result

Asset	Quantity	Price (\$)	Volume (\$)	Type of transaction
XYZ	40,000	6.30	252,000.00	Sell
XYZ	50,000	6.41	320,400.00	Sell
Total sales transactions by the investor	90,000	6.36	572,400.00	
XYZ	45,000	5.10	229,500.00	Buy
XYZ	45,000	5.05	227,250.00	Buy
Total buy transactions by the investor	90,000	5.075	456,750.00	

Considering the formulas:

- **AP = $(\sum(P \times qty) / \sum qty)$** , we have
 $AP = ((6.30 \times 40,000 + 6.41 \times 50,000) / (40,000 + 50,000))$, that is,
 $AP = 6.36$
- **BP = $(\sum(P \times qty) / \sum qty)$** , we have
 $BP = ((5.10 \times 45,000 + 5.05 \times 45,000) / (45,000 + 45,000))$, that is,
 $BP = 5.075$
- **FR = MQ x (AP - BP)**, we have $FR = 90,000 \times (\$ 6.36 - \$ 5.075)$, that is, $FR = \$ 115,650.00$

Comparison of the investor’s average price with the best opening price (Opening comp.) and position reversal (Reversal comp.)

- When the asset appreciates:

$$\text{Opening comp.} = \frac{\text{Qty purchased / volume purchased from investor}}{\text{Minimum ramp price}}$$

$$\text{Reversal comp.} = \frac{\text{Investor qty sold / volume sold}}{\text{Max ramp price}}$$

5. Front Running

- When the asset presents devaluation:

$$\text{Opening comp.} = \frac{\text{Investor qty sold / volume sold}}{\text{Max ramp price}}$$

$$\text{Reversal comp.} = \frac{\text{Qty purchased / volume purchased from investor}}{\text{Minimum ramp price}}$$

Thus, it is possible to analyze whether the investor opened and reversed his/her position at the points on the ramp where it would be possible to obtain the greatest benefit from its fluctuation, that is, whether he/she purchased an asset at the minimum price of the ramp and sold it at its maximum price.

Comparison of the investor's position opening and reversal time with the ramp time

$$\text{Opening} = |\text{Opening time of position} - \text{Ramp start time}|$$

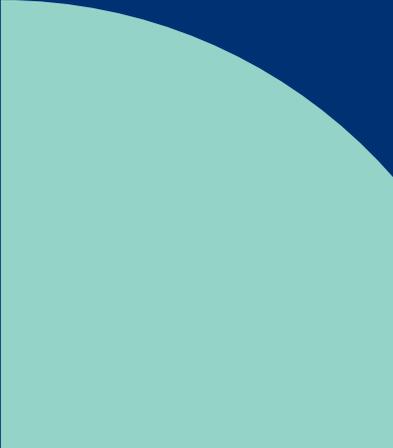
$$\text{Reversal} = |\text{Reversal time of position} - \text{Ramp end time}|$$

Comparison of the investor's position opening and reversal times with the start and end times of the ramp can indicate whether the investor took advantage of buying or selling opportunities at favorable times, strengthening the atypicality hypothesis. The further away from the ramp the investor acts, the smaller the indications of coordination and intentionality regarding the irregularity.

Selection of ramps and investors that need to be analyzed

For a more assertive selection of investors, the suggestion is to rank them by indicator or define a score to capture those that stood out the most. The most relevant cases can be selected for analysis. However, it is worth recalling that the indicators should not be analyzed separately.

6. Day Trade Ranking



6.1 Main concepts related to the ranking

Day trade transactions (in which positions are opened and closed on the same day) are usually carried out by investors who are more likely to take risks. These are attractive transactions due to the possibility of short-term gains. Their monitoring transaction is necessary, since, in this strategy, irregular performance in the capital market can also be identified.

In this Guide, we will present a ranking of investors who carried out day trading as one of the ways to monitor data related to transactions of this type.

6.2 Suggestions for building the ranking

The suggestion is that different variables and indicators are considered in the ranking, in addition to the result obtained with day trade transactions, for the identification of atypical situations.

We suggest below non-exhaustive examples of indicators from which investors can be evaluated, based on transactional characteristics. In the examples, a monthly analysis period was considered:

Example 1

Day trader indicator: an investor can be considered a day trader when the number of days on which he/she performed a day trade divided by the number of days on which the investor traded is greater than or equal to a predefined percentage, for example, 70%.

Example 2

“High day trade frequency” indicator: investor can be included in this profile when the number of days they carry out day trade transactions is greater than or equal to a predefined number, for example, 15 days.

Moreover, it is suggested to use the transactional variables of investors that could be considered in the ranking construction. It is worth highlighting that the information on transactions and registration data of the analyzed investors is known.

Registration variables related to the investor (non-exhaustive examples)

- Segmentation: identify whether the investor is a resident or non-resident individual, financial or non-financial legal entity, institutional investor, etc.
- Economic activity.
- registration information of [accounts](#) used in day trade transactions, such as opening date and account number.
- Identify whether the investor is a High Frequency Trader (HFT).
- Identify whether the investor is a market maker.
- Find out if the investor is a [politically exposed person \(PEP\)](#).
- Registration address.
- Registration email.
- Find out if the investor is a person related to the Issuing Company of the asset with which he/she carried out the transaction or to the Participant who intermediated his/her transactions.

Variables related to investors' transactions in the period defined for analysis (non-exhaustive examples)

- Market segment in which the investor operated: for example, spot market or derivatives.
- Number of assets traded.
- Number of assets with which the investor carried out day trade transactions.
- Number of days operated.
- Number of days on which the investor carried out day trade transactions.
- Total volume traded by the investor.
- Investor operated day trade volume.
- Result of day trades.
- Return proportional to the total operated by the investor.
- Number of days in which the investor presented a positive result in the day trades (Success ratio in day trades).
- Number of days in which the investor had a negative result in the day trades (Loss ratio in day trades).
- Main investor that acted in the counterparty of the transactions (or main Participant that acted in the counterparty of the transactions, when there is no data on other investors).

⚠ Analyzing the investor's registration information can help detect atypical situations and prevent possible illegal activities in the capital market. For example, the situation where an investor with a conservative investment profile and a modest income starts to carry out risky and high value day trades would be an indication of suspicious activity.

Calculation of the result obtained in day trades

The calculation of the result can be performed by different methods. The FIFO (first in, first out) method is presented below¹⁵, which is because the assets acquired first are the first to be sold.

In this method, the financial result in a day trade (FR_{dt}) is the sum of the volume operated in a day trade (Vol_{dt}), considering that the purchase and sale amounts are the same:

$FR_{dt} = \sum Vol_{dt} = \sum Sell Vol (-) \sum Buy Vol$, where:

- **Sell Vol:** quantity sold by the investor multiplied by the ask price
- **Buy Vol:** quantity purchased by the investor multiplied by the bid price

¹⁵ In this example, a share with a quotation factor equal to one (1) was considered as a product. For other products, the particularities and specific characteristics must be evaluated in the calculation

Table 47 – Example of calculating the financial result using the FIFO method

Asset	Hour	Buy quantity	Bid price (\$)	Buying volume (\$)	Sell quantity	Ask price (\$)	Selling volume (\$)	# Day Trades	Day Trade volume (\$)	Day Trade result (\$)
XYZ	10:20:05.123	70,000	25.05	1,753,500.00					-1,753,500.00	
XYZ	10:20:06.888				70,000	25.20	1,764,000.00	70,000	1,764,000.00	10,500.00
XYZ	10:25:12.728	90,000	26.08	2,347,200.00					-2,347,200.00	
XYZ	10:20:06.888				20,000	26.12	522,400.00		522,400.00	
XYZ	12:20:03.111				40,000	26.05	1,042,000.00	90,000	1,042,000.00	200.00
XYZ	14:20:06.818				30,000	26.10	783,000.00		783,000.00	
XYZ	14:20:08.221	30,000	25.90	777,000.00						Not considered
Financial result								160,000		10,700.00

Another way to calculate the result would be by the average price of transactions:

$FRdt = MQ \times (AP - BP)$, where:

- **FRdt = Day trade financial result**
- **MQ = Matched quantity:** is the smallest quantity of the investor between sell transactions carried out in the pre-disclosure period and sales transactions carried out in the post-disclosure period: $\min(\sum \text{buy qty}, \sum \text{sell qty})$
- **AP = Ask Price:** average price weighted by the sales quantity in the investor's post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$
- **BP = Bid Price:** average price weighted by the buy quantity in the investor's post-disclosure period: $(\sum(P \times \text{qty}) / \sum \text{qty})$

Table 48 – Example of calculating the financial result using the average price method

Asset	Hour	Buy qty.	Bid price (\$)	Buying volume (\$)	Sell qty.	Ask price (\$)	Selling volume (\$)
XYZ	10:20:05.123	70,000	25.05	1,753,500.00			
XYZ	10:20:06.888				70,000	25.20	1,764,000.00
XYZ	10:25:12.728	90,000	26.08	2,347,200.00			
XYZ	10:20:06.888				20,000	26.12	522,400.00
XYZ	12:20:03.111				40,000	26.05	1,042,000.00
XYZ	14:20:06.818				30,000	26.10	783,000.00
XYZ	14:20:08.221	30,000	25.90	777,000.00			
Total		190,000	25.67	4,877,700.00	160,000	25.69	4,111,400.00

Table 49 – Example of calculated financial result

Buy qty.	Bid price (\$)	Ask price (\$)	Day trade result (\$)
160,000	25.69	25.67	3,863.16
Financial Result			3,863.16

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