



**D.AI.SY: DECENTRALIZED AI SYSTEM**

**AI-POWERED INVESTING UNLOCKING  
HIGH-RISK HIGH-RETURN ALPHA**

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# Legal Disclaimer

Please read this notice carefully before reading this whitepaper. This legal disclaimer refers to every person and organization that reads this document. This notice is also subject to changes in the future without notice.

This whitepaper does not constitute a legal document. The purpose of whitepaper is to provide background information about the technical aspects underpinning the D.AI.SY project and the market opportunities. Significant efforts have been made to ensure this document contains true and current information.

This document does not constitute professional investment advice nor is it to be considered investment recommendation for purchasing any asset including cryptocurrency.

Potential investors and buyers should consult professional legal, investment, tax, accounting advice for determining the suitability of any investment. Readers alone are responsible for evaluating the merits and risks, the potential benefits and possible consequences of actions connected with participation in the D.AI.SY project.

Whitepapers are not legal documents and have no legal standing in any possible direct or indirect claim for compensation for any kind of damage, including possible damage caused by loss of profit or investment.

# D.AI.SY Project Overview

Endotech Ltd. is an Israeli company working in the field of Artificial Intelligence and finance for more than a decade. It has created some of the most enduring and successful algorithmic breakthroughs in the field. Dr. Anna Becker has worked with banks, hedge funds, trading brokers, family offices and individual traders across the globe to develop proprietary algorithms.

In 2018 Dr. Becker launched the renowned ‘eponymous’ project at Endotech.io to provide high-risk high-return high-probability strategies with their fully automated execution for both retail and institutional traders.

In January 2021, EndoTech announced the Equity Crowd Funding agreement with D.AI.SY Global for the development of superintelligence under the name of D.AI.SY project. D.AI.SY crowdfunding model operates through a smart contract on the blockchain, and allows retail investors to participate in the future of EndoTech. Note – Endotech is not responsible for D.AI.SY marketing operations.

D.AI.SY’s mission is to improve the probabilistic returns by using superintelligence in fundamental analysis. It will become an integral part of EndoTech’s automated investment solution for Endotech network members.

# Executive Summary

D.AI.SY was established by AI algorithm experts with vast investment experience in the financial space. Their goal is to revolutionize the scope of data and understanding that underpins financial markets and capture the alpha therein. D.AI.SY harnesses proven algorithmic tools. to explore, map and harvest repeatable high-risk high-return investment opportunities using super-intelligence AI techniques.

To address this challenge, the joint scientific-investment team is building a robust infrastructure that consists of a full, validated investment datapool, super-intelligent relational understanding, a series of AI tools for identifying and extracting opportunity and automated execution engine to capitalize on alpha.

## **THE RETAIL INVESTMENT INDUSTRY REQUIRES MORE SCIENTIFIC RIGOR TO IDENTIFY AND EXTRACT ALPHA OPPORTUNITIES.**

Current data-base investing tends to harvest small pockets of limited data and is bounded by AI insights rooted in only technical analysis. Unfortunately, those AI pockets often concentrated amongst several hedge funds, unavailable for retail investors seeking high-risk high-return opportunities. Furthermore, that AI alpha has proven sporadic and unpredictable as it is limited both in terms of breadth of data and depth of scientific understanding. Even today's AI-powered hunters lack super-intelligence for prolonged high-risk high-return results. There has yet to be a serious scientific expansion of investment data learning, and it is not accessible to retail investors to participate.

Today's scientific investor is at best descriptive – not predictive. Today's scientific investor is institutional – not retail. Today's scientific investor only surfaces temporal alpha – not sustainable opportunities.

## **D.AI.SY IS THE FIRST COMPREHENSIVE, SCIENTIFIC APPROACH TO INVESTMENT UNDERSTANDING USING RELATIONAL SUPER-INTELLIGENCE.**

D.AI.SY's data ecosystem gathers and validates terabytes of investment data from sources beyond technical data. It integrates, validates and conducts relational causality understanding between elements. In this process, super-intelligence is created to determine the predictive causes of various investments behaviors and outcomes. With refinement and accuracy, this creates repeatable, predictable High-risk high-return trading opportunities.

The D.AI.SY data ecosystem ensures transparent, decentralized and vibrant investment information for super-intelligence mining. With the creation of D.AI.SY's Data Pools platform it is possible to broaden and deepen the sources of scientific investment study and apply new informatics programs to their understanding.

## **D.AI.SY IS FOCUSING ITS INITIAL RESEARCH ON APPLICATION IN HIGHLY LIQUID, VOLATILE ASSETS.**

The work is difficult. The approach is known. The challenge is bold. The returns are great. To focus the scientific work, the D.AI.SY team will be concentrating the initial efforts on a narrow investment set,

with a super-intelligence approach to prove the approach. The team understands that by limiting the scope to highly liquid, volatile assets, it will be easier to identify opportunities for member activation. Furthermore, through the established Endotech algorithmic investing, it will be easier to capitalize on identified, sustained Alpha opportunities.

**NEW SCIENTIFIC APPROACH TO GENERATE NEW INVESTMENT RESULTS.**

Through Endotech, D.AI.SY will expose new financial investment data, use super-intelligence to understand relationships between stimulus and leverage proven AI tools to capture market alpha. It's first target is tradeable, predictable alpha rooted in volatility.

# Background

While historic investment strategies centered around conservative savings plans, the latest generations have shown that investing is no longer savings-focused. A growing number of retail investors are no longer content with traditional, long term, slow growth strategies. Simply put, they want aggressive returns.

As individuals press on with their traditional work days, they have developed a penchant for more aggressive investments. Often, having secured their savings targets, they then look to other vehicles for higher risk, higher return investments. We have seen a generation of investors move from passive savers to active investors that are “leaning in” to market opportunities to seek out higher return opportunities. The flourishing foreign exchange, ETF and Crypto markets are just some examples of this new drive towards aggressive upside.

While the investment industry creates new high-risk high-return vehicles, it is important to highlight that despite the incredible progress in financial knowledge, fundamental analysis, scientific rigour, the probability of netting a high-risk high-return is, at best, unpredictable.

While data abounds in technical analysis, these high-risk high-return algorithms are threatened by time-horizon. Endotech’s decades of experience in algorithmic investing has proven the alpha. However, there is a reality that even advanced technical analytical algorithms cannot account for fundamental shifts. Inevitably, their results will be time-bound. It’s with this lens that Endotech embarks on D.AI.SY – to extend its scientific rigour to retail algorithmic investing rooted in fundamental analysis.

Hedge Funds have explored the use of deep data on fundamental analysis. While this appears to be oxymoronic, it isn’t. There are specific data signals that can be derived from fundamental analysis that can be systematically identified and activated. And, their super-natural, enduring results are dramatic. However, the data work and systematic execution that has been applied to date is limited and restricted: Limited by their modeling approach of deep learning (instead of deep reasoning) and restricted to high-net worth individuals or algorithmic developers.

The early and dramatic financial opportunity in systematic fundamental analysis has been shown: There are proven examples of use of data science for fundamental-derived signals to inform enduring systematic trading.

D.AI.SY is set to capture fundamental analysis signals, cleanse them and map them to a definitive data pool for systematic modelling. Harnessing the proven methodology from other scientific fields, this data pool will provide the training ground to develop models well beyond today’s Sharpe ratio of 2.

With super-intelligence, D.AI.SY will surface, and then execute these high-risk high-return opportunities for retail investors to auto-trade.



This scientific undertaking will revolutionize the scope of data and understanding that underpins financial markets and capturing the alpha therein through proven algorithmic tools. D.AI.SY is set to explore, map and harvest repeatable high-risk high-return investment opportunities using super-intelligence AI techniques.

# Market Analysis

## ENORMOUS, GLOBAL INVESTOR OPPORTUNITY

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Investing has become so prevalent globally, that investors now ‘swipe’ to trade. While there is no definitive number of retail investment accounts, the growth is obvious worldwide. Even as global coronavirus infections continue to mount and more companies issue profit warnings, stockbroker switchboards from Sydney to Singapore have lit up with calls from masses wanting to invest.

Furthermore, the breadth and scale of the COVID-19 lockdowns and business closures across the globe are also unprecedented, prompting governments to pump in trillions of dollars in support and central banks to slash interest rates, fuelling the supply of cheap cash. Many small investors seem to feel this is an unrivalled opportunity – particularly as markets have rallied in 2020. Almost invariably across all key global markets, we can see enormous upswings of activity.

## RETAIL MARKET OPPORTUNITY

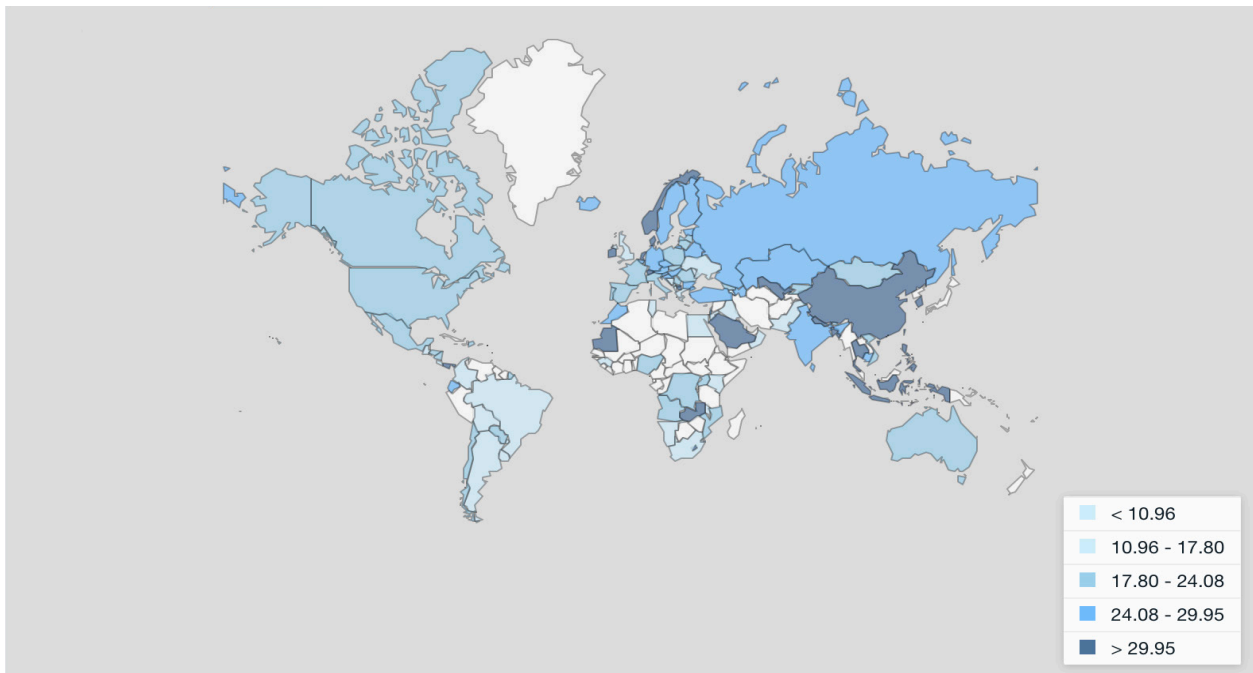
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The United States Federal Reserve Bulletin suggests that 51% of American families own stocks and the majority of those are direct holdings. More than that, millions more American families are active in other asset categories like foreign exchange and crypto currencies.

Of course, this thirst for investment is not limited to any region or investment class. Retail investors seek high-return opportunities across different markets and assets in droves with hundreds of millions retail foreign exchange traders and crypto currencies.

With gross savings plateauing in the last decade, investors look for new investment vehicles. It is now clear that investing no longer means savings. And Investing is no longer limited to conservative, long term investment.

## GROSS SAVINGS (% OF GDP)



A fuller global analysis can be found in the **Appendix**

<https://data.worldbank.org/indicator/NY.GNS.ICTR.ZS>

# INVESTMENT VEHICLES FOR HIGH-RISK HIGH-RETURN INVESTMENT

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## 1. SUSTAINED HIGH-RISK HIGH-RETURN INVESTMENTS

While sustained high-risk high-return investment is a new retail ambition, it has long been the goal of hedge fund managers. Despite the fact that Hedge funds actually under-performed the market in 2020, there are good reasons to believe that certain hedge fund algorithmic approaches to investment represent a good model for high risk High-Return retail investors.

For example, Renaissance Technologies, based in the United States, currently has \$84 billion under management and has been delivering superior and consistent high-risk high-return for three decades. Founded in 1982 by James Harris Simons – a famous American mathematician who deciphered Soviet codes during the Cold War. Until 2009, Renaissance Technologies is a quantitative trading fund whose strategies are based on statistical and mathematical analysis. And their Medallion investment funds have the best history of profitability on Wall Street – 60% per annum for 30 years.

## 2. RETAIL INVESTORS HAVE NOT HAD HIGH-RISK HIGH-RETURN VEHICLES

While certain hedge funds have been able to master financial wizardry through combinations of fundamental and technical analysis, combined with excellence in execution, these vehicles are not accessible to the millions of retail investors identified above.

As such, these hedge funds are for only extremely high net individuals, foundations or institutions. As of today, there are no financially robust investment vehicles available to retail investors to capitalize on sustained high-risk high-return investment approaches. Are there opportunities to create similarly successful mechanisms for the millions of retail investors?

## 3. HEDGE FUNDS HAVE PROVEN ALGORITHMIC OPPORTUNITY AND BOUNDARIES

As to 2020, hedge funds have approximately \$9.6 trillion under general management. Despite the strongest market volatility, over the past year, the 20 best performing hedge funds in the world earned \$63.5 billion for their clients, breaking a decade's record, writes Reuters.

While large sectors of the economy were forced to close, and millions of people lost their jobs, the top 20 hedge funds in the world were able not only to earn decent money, but also to exceed the profit indicators of 2019 of \$59.3 billion. At the same time, 2020 was not as profitable as the previous one for hedge funds in general when they made \$178 billion.

According to Hedge Fund Research, the average return of a hedge fund in 2020 was 11.6%, which is 16% less than the growth of the S&P 500 index.

There is however a huge disparity in returns. Some hedge fund managers, such as Saba Capital's Boaz Weinstein and Pershing Square's Bill Ackman, have taken advantage of these

extraordinary conditions, correctly calling some of the big market moves. Others have been caught out.

In macro trading — betting on global bonds, currencies and other assets — years of famine have been replaced by a time of plenty. Some of the moves have been spectacular, such as the fall in the US 10-year yield from 1.9 per cent to 0.7 per cent, as its price surged. Funds such as Brevan Howard, Caxton Associates and Rokos Capital Management are enjoying some of their best gains in years.

Some of the highest-profile computer-driven fund firms, on the other hand, have found their models unable to cope well with wild market swings. In some cases the switch between sectors of the market such as faster-growing stocks and cheap stocks has caught them off guard.

Jim Simons' Renaissance Technologies, David Harding's Winton Group and California-based artificial intelligence pioneer Voleon Group are among those who have nursed losses from the first-quarter rout that were not made up in the market rebound. US quant giant AQR's Equity Market Neutral fund — which is designed to hedge out the risk of equity market moves — is down nearly 15 per cent this year.

In equity investing, Lansdowne Partners and Larry Robbins's Glenview Capital are among those down sharply this year, even as funds such as Ross Turner's Pelham Capital are making double-digit gains, according to numbers sent to investors.

Turbulence in credit markets, meanwhile, has left many funds in the sector in the red for 2020.

However, LCH Chairman Rick Sofer is confident that 2020 can be considered one of the best in terms of profit for the most famous and large hedge funds, as the net profit received by 20 top managers for their clients in the amount of \$ 63.5 billion was the highest in decades.

See Appendix for more about Algorithmic Hedge Fund and Crypto Hedge Funds.

# Systematic Trading

There are two widely known schools of thought with regards to trading analysis: technical analysis and fundamental analysis. With respect to systematic, or ‘algorithmic’ investing, most of the efforts (and successes) to date have been in technical analysis, while the greatest alpha opportunity seems to be in finding systematic opportunities in combination of technical and fundamental analysis.

## TECHNICAL ANALYSIS

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Technical analysis has been used by traders, analysts, and investors for centuries and has achieved broad acceptance among regulators and the academic community – particularly with regard to its behavioral finance aspects.

Systematic Trading rooted in Technical Analysis has proven to be fertile ground for out-sized results. With automated synthesis of existing technical patterns, investors have been able to identify, model and extract value from short-term opportunities. Common systems identify movement patterns in shorter, high frequency, high volatility trades and take advantage of arbitrage opportunities. Herein lies the successes to date, particularly for breakthrough retail investors.

Endotech’s successful track record in technical analysis is rooted in surfacing volatility.

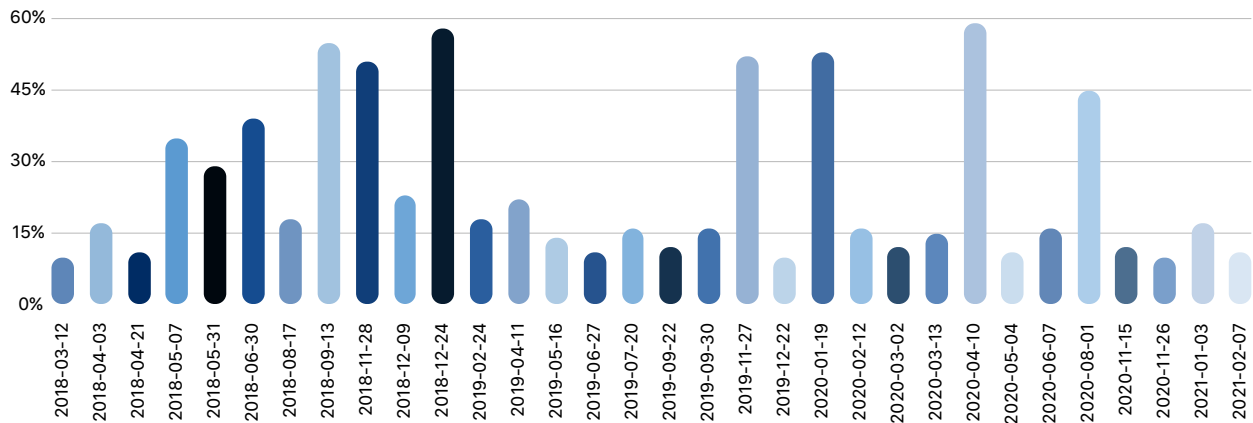
## ENDOTECH’S TECHNICAL METHODOLOGY

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### **STEP 1: STATISTICAL PATTERN RECOGNITION**

Endotech creates a comprehensive statistical analysis of the markets behaviour/patterns for multiple time frames. For example in ETH/USDT, Endotech identifies the following trends that become predictable once captured:

## STATISTICS ON ETH TRENDS 2018-2020



Trends of 10% and up from Jan 2018 show – consistent high-volatility present.

### STEP 2: GOAL SETTING

Once trends are identified – Endotech specifies model precision and accuracy:

- Precision – depicts the number of patterns we achieved to penetrate,
- Accuracy – depicts how accurately each pattern was penetrated.

For example, if a pattern is a trend of 10%+ (meaning that price moves 10% and up), then:

- precision equals the number of such bullish trends captured in long positions plus the number of bearish trends the system captured in short positions divided by the total number of trends.
- accuracy is combination of entry and exit position accuracy, where entry accuracy is a percent of move

### STEP 3: SETTING PERFORMANCE MARKERS

When launching strategies, Endotech system defines exact parameters for preventing losses, by stopping the system or reducing portfolio allocation when performance markers become different from expected ones, e.g. success rate or accuracy rates drop below the threshold, max number of losses or max drawdown are reached, slippage, number of traders, etc.

### STEP 4: DEFINING TECHNICAL TOOLS

Once patterns are identified, Endotech starts by running individual proprietary indicators with very few parameters, and then increases details as unified patterns and variations are identified. Then Endotech cross-checks each indicator and parameters to verify that it belongs to a unified model that works on each type of asset / and individual asset.

### STEP 5: PARAMETERS OPTIMISATION AND SYSTEM ADAPTATION

From the outset, systems have a pre-configured optimization that applies machine learning with proprietary score, resolving overfitting and underfitting, that use predefined constraints. We run

dynamic Cuda-based optimization, using combinations of gradient descent, proprietary goals, and filter functions to find a range of parameters values for the algorithms.

And then we run re-optimisation once a day, to ensure that we adapt the system to market conditions, either reduce allocation, or stop it completely.

But even this dynamic re-optimisation is not always sufficient and identification and analysis of changes in patterns needed – usually when there is a new – extreme volatility.

Volatile markets need robust technical analysis systems to generate opportunities. However, over long periods of time and varied circumstances, these models have proven to have Fading Performance, due to limited efficacy as they are unable to learn and adapt to new market conditions. When modelled ‘signals’ are no longer present, or there is a fundamental shift in extra-ordinary conditions, models are not able to identify, let alone act. They simply cannot recognize, understand or internalize the externalities that render their systematic approach irrelevant and unprofitable.

To address this eventual Fading, Endotech is looking at D.AI.SY to find volatility in systematic fundamental analysis.

## FUNDAMENTAL ANALYSIS

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Fundamental Analysis seeks the true value of assets based on their fundamental worth through a lens of micro and macro economic understanding.

Applying a systematic approach to uncovering patterns in fundamental analysis is rife with challenges. The underlying data is both endless and often meaningless. On the one hand, there are endless inputs of varying quality that must be considered. On the other, there are very few significant movements in asset values to study. The relationship between the inputs and outputs is inaccurate and not meaningful.

Systematic Trading anchored in Fundamental Analysis is the new holy grail for algorithmic investors. Today, it is also thought to be the secret sauce that propels successful hedge funds like TwoSigma and the like. But this is an enormous scientific endeavor to try to understand sustained data and opportunities from an unending pool of information.

Herein lies the challenge of fundamental analysis. The breadth of underlying factors is innumerable – social trends, demand, business leadership, political movements, regulation... So the modelling is equally complicated.

Hedge fund success in tapping fundamental-derived, systematic returns is rooted in a narrow view of the data. Each fund will find their angle on fundamental analysis and derive their corresponding signal to systematically trade. And the results, though limited to elite hedge funds, is dramatic. Sustained, systematic returns.



To make this real for readers less versed in systematic signals derived from fundamental analysis, consider these examples.

*Corporate earning reports are rife with data and words. Systematically picking up the frequency and position of various key words can be a powerful input towards algorithmically understanding volatility.*

*Or, consider the understanding necessary to decipher the impact on fundamentals of a high-profile investor like Elon Musk moving into Bitcoin, as compared to other investors. How is this fundamental move to be understood and read systematically?*

So while just anecdotal, these examples show the potential of identifying, cleaning fundamental data pools, translating them into systematic signals for modelling.

D.AI.SY purely systematic approach to trading (with no manual interference), is rooted in an exact element of fundamental analysis. In this case, volatility is the familiar and enduring input that will guide algorithmic development, modeling and execution.

While there are too many specific signals that can be modelled and systematically derived from fundamental analysis, volatility is a purpose-driven choice for D.AI.SY.

D.AI.SY is a high-risk high-return approach that seeks to systematically create, recognize and act upon trading opportunities for 100%+ returns. From technical analysis alone, volatility has proven to be one of the most integral ingredients for successful, profitable – though temporal – modelling.

Volatility will be a key enabler to this scientific undertaking. While traditional investment models are celebrated for achieving Sharpe ratios of 2, the depths of data that can be surfaced from fundamental analysis is much deeper. Using super-intelligence, and a restricted view as to what needs to be mined from fundamental signals, D.AI.SY sets itself a more audacious accuracy goal.

Using a scientific approach familiar in other realms, it is possible to achieve a Sharpe ratio of 5. This goal – the scientific standard in Physics – will enable sustained, systematic trading. With a stated goal of discovering volatility from fundamental analysis, D.AI.SY can bring the scientific rigor to achieve the sustained high-risk high-return trading.

## **AI IN FUNDAMENTAL ANALYSIS**

Successful scientific approaches require validated data to be normalized and mapped in order to understand their relationships. To date, the majority of approaches have attempted to “solve” for asset movements and not understand relationships. These efforts have floundered as there has been a weak relationship between single inputs and outputs. Deep learning AI has not been able to identify the significant data from macro/micro to point to systemic results.

## DEEP LEARNING

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Deep learning has yet to mine the myriad of fundamental inputs to find single, significant, inputs that consistently account for asset movements. But there are other approaches to scientific analysis beyond deep learning. Enter deep reasoning.

## DEEP REASONING

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Deep reasoning, or super-intelligence, is the scientific approach that maps the outputs and seeks to understand the underlying interplay of elements that created that. It is a far more bounded approach to scientific study and can shed light on the narrower set of factors (not any individual factor) that underlie a movement.

## D.AI.SY DEEP REASONING METHODOLOGY

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The combination of lessons learned from deep learning short-coming, and the breakthroughs in fundamental analysis adopted from parallel scientific communities create a clear path for modelling fundamental analysis.

With a known result as its goal – volatility – D.AI.SY, will apply deep-reasoning to a bounded financial fundamental dataset to map data and reasoning around volatility.

Using techniques proven in other scientific domains, D.AI.SY will create a definitive source of validated data, to model relationships between significant inputs that underpin volatility. The technical details are expanded upon below but fall under various categories.

# D.AI.SY Methodology

## D.AI.SY BASICS

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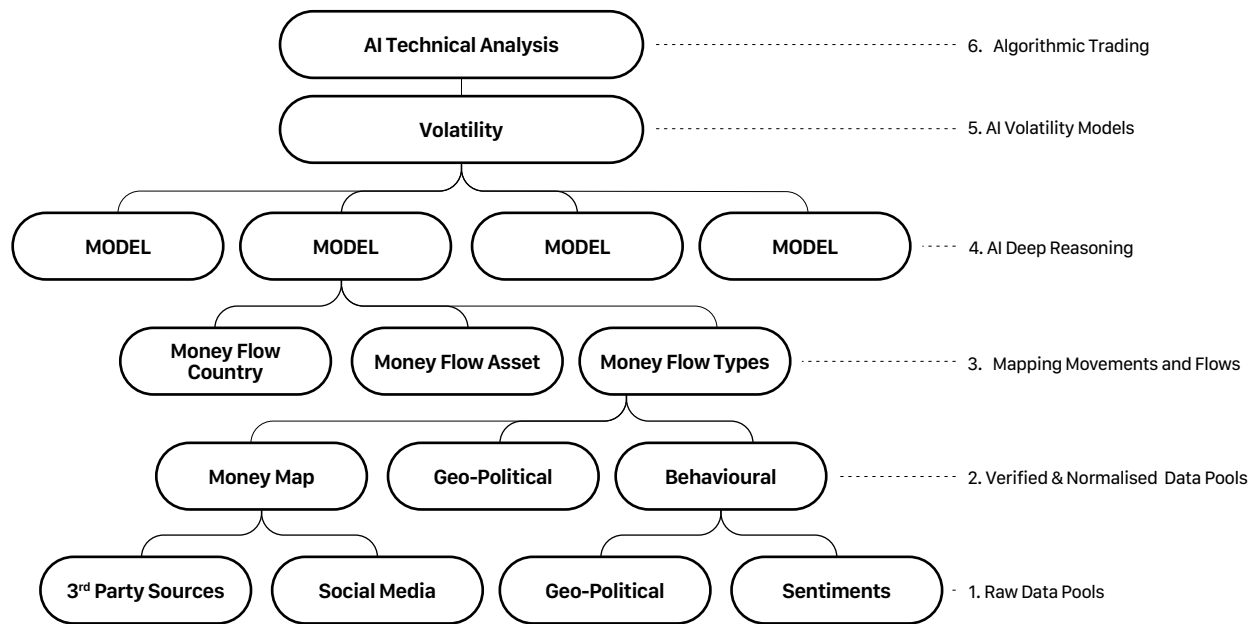
D.AI.SY's modelling of fundamental market movements follows a very deterministic approach. The methodology will enable accelerated progress towards learning and application of its goal of systematically surfacing fundamental-rooted volatility.

The methodology has proven itself in both other algorithmic financial arenas and other scientific sectors. While this undertaking is audacious, the methodology has proven robust enough to make breakthroughs in understanding.

D.AI.SY's proprietary methodology follows these steps:

1. Establishing a detailed, validated view of important data pools. This includes different forms of money and assets as they stand across critical assets, geographies and more. This is the fundamental layer and acts as 'baseline' for understanding future movements.
2. Data is validated and integrated. The challenge of normalizing and quantifying fundamental signals is significant. The process of quantification, categorization and validation is a significant effort.
3. Mapping key movements and flows for money and capturing fundamental changes. This includes noting change in types of money, assets as well as changes that have occurred in parallel like geopolitical upheaval, trade, education and more. This is capturing the changes in type and direction of assets and capturing the suspected contributing factors in a data-based fashion.
4. Crafting and testing various AI deep-reasoning hypotheses to understand the relations between various fundamental shifts and money movements. Modelling and testing the interplay between flows, pools and contributing factors. This machine-learning sets to act methodologically upon terabytes of data to establish the veracity of any factor on market movements.
5. Building an ensemble/authoritative model from validated hypotheses to systematically identify, capture and understand fundamental stimulus and compute the relationship with anticipated market volatility.
6. Empowering algorithmic trading to systematically harness these fundamental signals and enable technical analysis algorithms to identify and act on volatility. Leveraging the model towards building and capturing market volatility indicators with algorithmic trading for retail investors.

## D.AI.SY'S PROPRIETARY METHODOLOGY



Side-effect of this approach: In 1981 Robert James Shiller published a famous article in which he challenged the efficient-market hypothesis driven by emotion instead of rational calculation. He argued that a huge set of data is required for the market to operate efficiently. He added that the use of modern technology can benefit economists to accrue data of broader asset classes that will make the market more information-based and the prices more efficient.

## D.AI.SY RAW DATA POOLS

D.AI.SY project is building a comprehensive model of the liquid markets volatility across the world. As a first step, D.AI.SY needs to identify key fundamental money pools for monitoring and ingestion. The first critical component that needs to be understood is the current snapshot of the Global Money Map (see Appendix). D.AI.SY views the money map from multiple dimensions of the money metrics – what money type, how money is used, who owns, where located.

Key spheres of activity that impact the market include economics, politics and society. In order to further map the market, their preliminary classification and gradation is necessary. Furthermore, the classification of money in accordance with their origin and material values represented by them.

Several categories of money/value can be distinguished including:

1. Money equivalent to gold and other absolute material values, such as natural resources, land, exclusive works of art.
2. Money of global industry, as energy, basic materials, machinery, tools, heavy vehicles, etc.
3. Consumer money. Manufacturing of widely consumed goods, as textiles, food, agricultural sector, etc.
4. Young money. This is money earned by investing in financial assets and transactions with them.
5. Unsecured money. Money earned from non-resource or non-financial industries such as tourism, show business, the Internet, information and science-intensive technologies.

**ECONOMY**

Consideration of economic processes is based on well-known classifications of economic sectors, such as the Global Industry Classification Standard (GICS) developed by MSCI and The Refinitiv Business Classification (TRBC) developed by the Reuters Group. The classification of industries is indexed and brought into line with categories of money.

**AN EXAMPLE OF A METHODOLOGY FOR INDEXING GLOBAL INDUSTRIES.**

		Type of Production			
		Universal	Specialized	Special	
Type of Raw Materials	Exhaustive or Absent				Primary Product
	Reproducible				Intermediate Product
	Artificial				Finished Products
		Direct Production	Maintenance	Communications	
		Role in the Marketing Chain			
					Type of Processing

**AN EXAMPLE OF A METHODOLOGY FOR INDEXING NON-RESOURCE INDUSTRIES.**

		Scope of Application			
		Economics	Quality Of Life	Society	
Nature of The Product	Material				Long-Existing
	Intellectual				Flexible Innovations
	Entertaining				Fundamentally New
		Direct Production	Maintenance	Communications	
		Role In The Marketing Chain			Risks

**POLITICS**

The study of political processes is based on geopolitical concepts of control over the territory and related regularities of distribution and redistribution of the influence spheres for various states and associations. Spheres of geopolitical influences and interests have always been closely associated with economics. In the modern world of globalization and high informatization of space, one can observe a direct flow of all geopolitical trends into the economic sphere. And, as a consequence, the direct impact of these processes to the market. For the analysis, the classical ideas, principles and concepts of geopolitical science are used (see Appendix).

**SOCIETY**

For the structuring and further analysis of information about social processes, a historically formed stable triplex of basic institutions that regulate the functioning of the main social subsystems is used. These subsystems are economics, politics and ideology. In macrosociology they are called institutional matrices. The term was first defined by K. Polanyi, then it was used by D. North. The theory was further developed in the works of S. Kirdina. Based on the analysis of extensive empirical material, it was shown that, as a rule, one of two institutional matrices is steadily dominating in the structure of society: either the X – or the Y-matrix, which are qualitatively different from each other in the content of the underlying institutions that form them:

Institutional spheres	<b>X-matrix</b>	<b>Y-matrix</b>
Economy	<b>Redistribution economy</b>	<b>Market economy</b>
Politics	<b>Unitary political structure</b>	<b>Federated political structure</b>
Ideology	<b>Communitarian ideology</b>	<b>Individualist ideology</b>
Domination	<b>Russia, Asia, Latin America</b>	<b>Europe, North America, Australia, New Zealand</b>

Redistributive economy is a term by K. Polanyi, characterized by X-inefficiency of H. Leibenstein. For complete description see Appendix.

### **MULTIDIMENSIONAL MATRIX**

All statistical information on the behavior of economic sectors, political and social processes is indexed, analyzed and approximated using technologies for analyzing the truth of information and multidimensional analysis and synthesis tables of the Futurum Foundation <http://www.fundfuturum.com>.

Decision making is carried out by building a four-dimensional map of the financial market, identifying the most significant links in the sectors of interest. The map coordinates are:

- time-approximated indicators of economic sectors;
- indices of geopolitical weight and stability, built on the above principles, the fluctuations of which are recorded and processed according to monitored press reports and statistical indicators;
- the state of society, identified by the share distribution in society of dominant and complementary social institutions;
- military-political events.

## MARKET INFLUENCE MAP.

### Geopolitical processes

Processes in economic sectors	Energy	USA	England	England	Russia	...	...	...	...	Redistribution Unitarianism Communitarianism Social processes
	Basic Materials									Market Unitarianism Communitarianism
	Industry									Redistribution Federalism Communitarianism
	...									Market Federalism Communitarianism Redistribution Unitarianism Individualism
	...									Redistribution Unitarianism Individualism
	...									Market Unitarianism Individualism
	...									Redistribution Federalism Individualism
	...									Market Federalism Individualism
	...									
	...									
Military-political processes										

Social processes



The given layout of the table is used, on the one hand, to study connections and qualitative logic of the market at the initial stages of analysis and on the other hand it represents in the schematic form a four-dimensional vector field, the behavior and connections of which in time and space of the above coordinates are modeled by vector analysis methods with finding divergence and gradients of the field, revealing stable trends and critical locations of the market.

### **SPECIFIC DATA SOURCES**

D.AI.SY will harness large datapools that exist and integrate others on its own. For example, The Research Division of the Federal Reserve Bank of St. Louis and its IDEAS database, provides links to over 1,200,000 full-text articles. Most contributions are freely downloadable, but copyright remains with the author or copyright holder. It is among the largest internet repositories of academic material in the world. This resource is constantly growing as materials to RePEc can be added through a department or institutional archive or, if no institutional archive is available, through the Munich Personal RePEc Archive. Institutions are welcome to join and contribute their materials by establishing and maintaining their own RePEc archive.

Additionally, leading publishers, such as Elsevier and Springer, have their economics material listed in RePEc. RePEc collaborates with the American Economic Association's EconLit database to provide content from leading universities' working papers or preprint series to EconLit. Over 1500 journals and over 3300 working paper series have registered, for a total of over 1.2 million articles, the majority of which are online.

## **D.AI.SY DATA COLLECTION AND VERIFICATION METHODOLOGY**

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While D.AI.SY uses third party data, we have a strict data verification process to verify, clean, normalize and complete missing data using AI.

Certainly no data set can be perfectly complete. There will be data challenges: there will be missing data, there will be incorrect data, redundant data, non quantifiable data. We will use the internet as a main resource to get additional data. Crawlers in social media for sentiment analysis, companies reports, news, etc all will be pulled into buckets to verify and complete the data. Initially, data can be structured, non-structured, statistical, or streaming.

In practice, the quality of the final models depends much more on the quality of the prepared data than on the choice of the model itself and its optimization. Therefore, after collecting data, it is necessary to perform data preprocessing. This process includes data normalization (if necessary) as well as feature extraction and feature selection.

Normalizing numeric data involves bringing parameter values to a specific numeric range, for example, taking a logarithm or a trigonometric function. Boolean parameters can be converted using one-hot encoding. In this case, each feature is represented by a binary vector. Missing or invalid data can be removed from the dataset or replaced with a row averaged and closest top or bottom. But of course, there are cases that we need to take care with extra-caution not over generalising.

It is also important to make a careful selection of significant exogenous parameters before modeling. This will significantly improve the accuracy of the forecast. Insignificant variables introduce only noise into the model, having almost no effect on the result. And when there are enough of them, which is assumed in our system, it is necessary to separate the wheat from the chaff.

In practice, this task arises due to the fact that at the time of data collection, experts do not yet know which variables will be most significant in the analysis. For the development of D.AI.SY, the collection of economic, political, social, and natural data will be carried out and the selection of relevant information is important. Significance analysis can be performed using correlation analysis, multicollinearity tests using the t-test, or ridge regression. Feature extraction and feature selection techniques can also be used in the modeling process if the model does not meet the required quality level.

## D.AI.SY MAPPING MOVEMENTS AND MONEY FLOWS

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Then, the second level dynamics are assessed: how this Money Flows across the assets, owners and the world. To model such flows, one needs again to face multiple dimensions of the information. On one side there are different models for each type of the flow including it's own time periods and connections, from other all of the supporting macro and micro economic data that affects typical and abnormal money movements.

When selecting key factors affecting economic processes and the movement of money, we focus on: historical economical development of countries and regions, level of political stability, ecological situation, epidemiological situation, features of internal consumption, mentality and traditions.

While these flows and changes are enormous, their impact on the markets can be quantified and modeled to surface what is truly impactful. To do so, it's necessary to capture the changes in type and direction of assets and capture the suspected contributing factors in a data-based fashion – as outlined in D.AI.SY's Deep Reasoning

## D.AI.SY AI DEEP REASONING

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As we described it before, D.AI.SY data pools will be collected, verified and stored in multidimensional structures, to be further modeled using AI networks. To craft and test various deep-reasoning hypotheses to understand the relations between various fundamental shifts and money movements we will use motifs to model interplay between flows, pools and contributing factors, hopefully following Pareto rules.

For example, when we model money flow in certain countries, probably the main 80% movements will be based on the same model (motifs) as in other countries, and the remaining 20% will be guided by specific models.

Of course, there are a huge number of external factors that comprehensively affect the money flows and determine its behavior. For a complete analysis of these impacts, a special method of multidimensional classification and structuring of factors influences to be used.

The state of the market in various spatial and temporal locations is predicted as a probabilistic superposition of these influences using multidimensional logical truth-falsity complexes.

Important to mention, that we rely on a dialectical approach, one of the expressions of which in mathematical formulations is the well-known Gödel incompleteness theorem. In its most general form, the idea is that it is impossible to obtain a reliable all-encompassing representation about the system from itself; a systematic dialectical leap is necessary.

## D.AI.SY AI VOLATILITY MODELS

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### 1. GOALS OF VOLATILITY MODEL

The goal of D.AI.SY's AI modelling is to uncover volatility. Machine Learning will focus on the money flows within/into/and out of exchanges - both centralized and decentralized.

While volatility will be the primary modelling interest, there will be additional learnings that will serve to sharpen modelling. For example, by-products such as increase or decrease in open interest, increased sentiment of interest, funds flowing into emerging assets/exchanges, or renewed interest in existing markets, will all serve to further refine model dynamics and improve probability in our technical analysis models.

### 2. BUILD - CREATE ASSEMBLY OF NETWORK COMPONENTS

Given the complexity of modelling both money maps and flows, and then create multidimensional structures and models to extract the information about volatility - it is important to build ensemble models. Ensemble models are machine learning paradigms where multiple models (often called "weak learners") are trained to solve the same problem and combine to produce better results.

The primary hypothesis for D.AI.SY's modelling is that with the right mix of weak models, it is possible to create more accurate, reliable models.

In practice, such ensemble approaches have already demonstrated high prediction accuracy thanks to three strategies:

1. Bagging.  
Where weak homogeneous models are trained in parallel and independently of each other, and then they are combined, following some deterministic averaging process.
2. Boosting.  
Where weak homogeneous models are trained in a sequential adaptive way (the model depends on the previous ones) and then combined following a deterministic strategy.

### 3. Staking.

Where weak homogeneous models learn and combine them, training the metamodel to produce a prediction based on the predictions of various weak models.

D.AI.SY also leverages cluster analysis which studies the data structure to find the hidden relationships and patterns within and between elements. In D.AI.SY's case, clustering will be used in every element of modelling.

### **3. UNDERSTAND - INTRODUCE DEEP REASONING FOR VOLATILITY**

While modeling is the foundational step, it is not sufficient. To achieve the machine learning goal, models must understand the interplay between elements that relate to volatility.

Deep reasoning must perform automated reasoning between a myriad of factors. This is much more complex than deep learning - that more simply seeks patterns. Deep reason models provide an effective integration of learning and reasoning mechanisms is a long-standing research problem at the intersection of many different areas.

D.AI.SY's deep reasoning approach will focus on understanding the natural intelligence between elements and the adoption of suitable mathematical means for rigorous modeling.

Deep reasoning is relational and evolutionary as if it's a 'cognitive process' of knowledge and behavior acquisition. D.AI.SY's deep reasoning will fall into five categories:

- object identification,
- cluster classification,
- functional regression,
- behavior generation,
- knowledge acquisition.

### **4. NARROW - REDUCTION OF DIMENSIONS (FACTORS)**

Through the preceding stages, data and variables increase logarithmically. In order to bring the data towards models that can provide relevant modelling, it is critical to understand what are the dimensions and their importance. In this process, the number of dimensions are reduced to enable deeper reasoning to thrive on more informative data sets.

Through cluster analysis methods, D.AI.SY will actively reduce the dimension of the problem. D.AI.SY intelligence is based on different approaches to learning. Since there is a lot of accumulated experience in the world, it makes sense to use supervised machine learning algorithms to extract the rules. Some positive results of using this approach for predicting market volatility, crisis and abnormal situations have been confirmed by a number of studies and presented in scientific publications.

Also, to solve clustering problems and in the absence of labeled data, it is advisable to form knowledge on unsupervised learning algorithms.

Analysis of scientific publications in recent years shows that machine learning models such as support vector machines, random forest, convolutional neural networks and recurrent neural

networks are used to solve problems similar to D.AI.SY problems, as well as their sometime joint execution. To a greater extent, recurrent networks of the LSTM type are used to analyze time series data, and their success is due to the fact that they are architecturally able to relate previous information to the current task and are capable of learning long-term additions.

## **5. CREATE - ARCHITECTURAL FRAMEWORK (DONE)**

To ensure effective modeling and functioning of D.AI.SY, it is necessary to use computers with parallel architecture CUDA, which has been successfully implemented in graphics accelerators from NVIDIA. Since the volumes of analyzed information are large enough, the multiprocessor power of the graphics processors is justified. Thus, researches in volatility forecasting and crisis situations are being actively conducted using various methods and techniques. All of them are largely oriented toward specific markets and are limited in time and space, which is a result of insufficient accuracy and limited range of application.

## **6. REFINE - MODEL CHALLENGES AND SOLUTIONS**

Through modelling, there are known obstacles that will be encountered. Below is a short outline of the challenges and D.AI.SY's scientific team's approach to solving them.

**Overfitting** While the main goal of the project is to incorporate every available piece of financial information to make a final decision, it inherently leads us to “overfitting” the problem. We cannot put all the information into the Network and hope that it will use Machine Learning to learn what explains various volatility, because there is significantly LESS specific output events than inputs that can explain it. Simply put, there might be one or two completely non-related inputs that perfectly correlate with volatility, and the model will end up resulting in a useless model.

**Curse of Dimensionality** In the process of modeling, the problem of “Curse of Dimensionality” may arise. This problem is associated with an exponential increase in the amount of data due to an increase in the number of dimensions of the investigated space. Given D.AI.SY incorporates data from all over the world - this issue is anticipated. Complex dependencies and volumes of computation may not give the required productivity. To address this, D.AI.SY will move on to solving the dimensionality reduction through clustering. To do this, the researcher can use the method of principal components, discriminant analysis, matrix factorization or their modifications.

# **D.AI.SY ALGORITHMIC TRADING**

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To bring research to reality, and to empower algorithmic trading to systematically harness these fundamental signals and enable retail investors to act on volatility, we incorporate through signals into existing EndoTech's end-to-end solution elaborated in next chapter.

# Endotech's Trading Framework

Investment decisions clearly rely on a tremendous interplay between science and art. What is often not as evident, are the other aspects that enable those trades and investments to be executed profitably and effectively.

Without advanced execution advances, even the best-informed trading ideas are impotent. To capitalize on competitive advantages in decision making, it is critical to have a well-informed, technologically robust trading methodology and trading capacity.

## ENDOTECH TRADING METHODOLOGY

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Advanced trading methodology must consider numerous competing interests simultaneously. Even novice investors come to understand the competitive advantage of automated execution as it systematically manages various parameters in ways well-beyond human capacity.

The burden of managing multiple assets, volatility, geographies, human emotions all while juggling evolving realities of portfolio management, money management, order execution, risk control and more is impossible.

To address these challenges there are important executional capabilities that must be adopted:

### 1. PORTFOLIO MANAGEMENT

- Active rebalancing is key. Buy and Hold is not a valid approach in such a young market, like Crypto markets, when the “power struggle” is still very high, technologies are still immature, any crypto-currency can quickly lose its value to another player. Monitoring and keeping currencies in a manner that allows you to properly rebalance your portfolio and minimize risk/maximize return (this means keeping them on a reputable exchange, or in a wallet that allows you to quickly transact currencies – more on security in a future post).
- Rely on trading strategies to add assets to the portfolio to increase or decrease the share of an individual holding. These strategies are carefully chosen to provide adaptive technology for quickly-changing markets.

## **2. CHOOSING ASSETS**

D.AI.SY volatility plays the main role in choosing currently (or predicted) volatile assets to enable technical analysis strategies. Further assessment of investor's preferences is a function of the choice of assets to be included in the portfolio. The decision is made after evaluating how much each asset contributes to the opportunity, how liquid it is, and how risky it is.

## **3. CHOOSING APPROPRIATE ET SIGNALS**

Given the high volatility of the crypto market, the buy-and-hold strategy is rarely the winning one; for now, at least. Using AI/ML algorithms to identify patterns, we can spot which assets are breaking out and when, their time frames, and their correlation. Everything to determine what the optimal return targets are, whilst simultaneously minimizing losses.

## **4. CHOOSING ET ALLOCATION**

In choosing how much capital to allocate to each portfolio asset, in order to get the risk/return combination in line with the investor preferences, the main instrument available in finance is the Capital Asset Pricing Model (CAPM).

This model, used in traditional markets for more than fifty years, simply expresses the expected return on a security or portfolio as a function of the market risk premium, reduced by a factor ( $\beta$ ) that represents the risk/return ratio.

Despite its age, the CAPM has proved itself a valuable tool in the optimization of portfolios on the crypto space too. In this context, we plan to leverage our know-how and to create dynamic portfolio weights in order to optimize investment strategies and maximize expected outcomes.

## **5. EXECUTION AND CAPACITY**

Being a young market, Crypto involves a lot of uncertainty at the execution stage. Where to execute orders and how to do it? In ENDOTECH we put emphasize on fully automated execution both from technological and monitoring perspective. Being connected to multiple exchanges, enabling execution on tenth of thousands of accounts, managing significant amounts by the strategies requires an massive infrastructure that ENDOTECH built for algorithmic trading.

Fortunately, the situation for the investor is less complicated than for the trader. Nevertheless, it remains a delicate topic, because if the investor cannot execute the order or the exchange is hacked, or files for bankruptcy, no matter how well the portfolio is managed, the investor carries 100% of the execution risk.

We also caution investors about spreads and slippage — on some exchanges bots benefit from market transactions, and while a few percentage points on the spread doesn't seem too high, during choppy markets when transactions may take place weekly, it can kill a portfolio's profits (see Capacity chapter).

## **6. CHOOSING ET MONEY MANAGEMENT**

Money management is the mathematical process of increasing and decreasing the number of contracts/shares/options. The purpose of utilizing money management should be to increase the profitability during positive runs and protect those profits during losses.

Money management is represented by the ensemble of decisions and strategies regarding how to reinvest the profits or to handle losses. A common opinion is that money management really has the capability of moving the needle for investment return.

There are many aspects and methods — compound vs fixed, active capital %: fixed dollar amount, percent at risk, trading with optimal F, etc. For example, we believe that in a market like Crypto, where results can be as high as those available in leveraged markets, most of the models can be considered as too extreme. Yet, since investor appetite is high, we use 90% of the capital as active capital, and a compound reinvestment strategy to keep up with Bitcoin returns.

## COMPOUND MONEY MANAGEMENT

In triple-H investing (high-risk high-return high-probability), the compounding effect of money management is crucial.

While there are multiple tools that allow trades and investors to increase their Returns (like leverage, increasing value of trading capital, different compound strategies), it also increases the value of Risk. And since Risk is also High – 20 to 40%, by setting leverage to 2.5 one might increase risk to a value of 100% ( $=40\%*2.5$ ) which is a risk of total loss...

In D.AI.SY it is critical to consider all available tools to increase returns, without significantly affecting risks (percentage wise, not dollar wise) and without changing probability. However, it is noteworthy that the simplest and main tool for increasing returns is compound effect of the investment.

## 7. CONCLUSION

While decision making has received much consideration, there are enormous technological advances in the execution of trades. To efficiently capitalize on trading ideas, the fundamental principles must be applied scientifically to surface the trading potential. We, at ENDOTECH have developed an extensive proprietary solution that we use since 2017.

From executional excellence, we now turn our attention to a often-forgotten consideration: Trading Capacity.

## TRADING CAPACITY

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Trading capacity reflects the potential market for any investment or strategy. It can serve as the limiter to the otherwise boundless opportunities identified in trading decisioning. But, trading capacity can evaporate even the best trades and their execution if there is no trading capacity.

The main concern is that certain algorithms work in certain trading niche areas, and inherently will experience a bottleneck that when reached becomes less profitable.



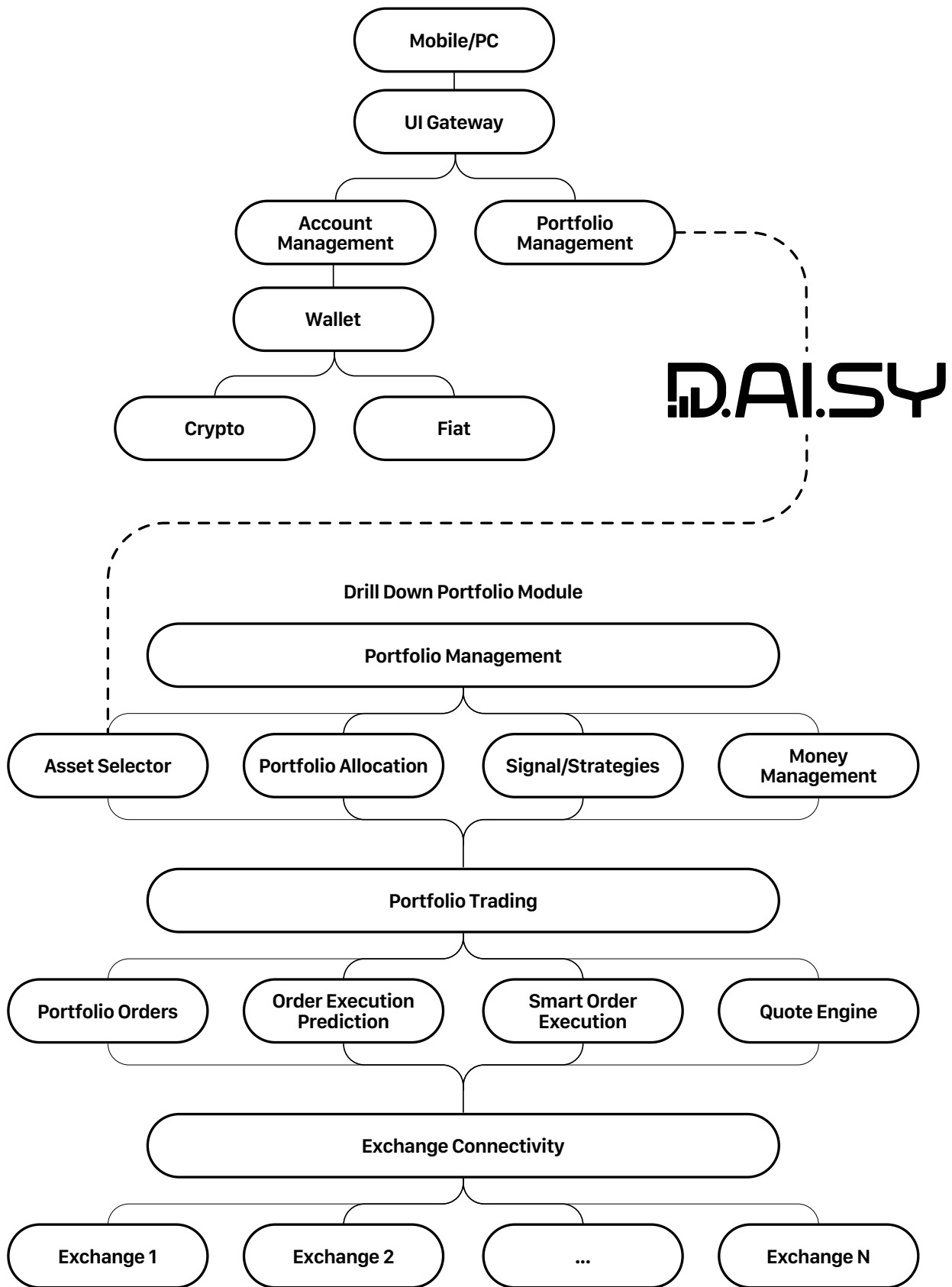
As an example, within high-frequency or arbitrage style trading, the bottleneck is the number of short-term opportunities within both the market and the available volume of level 2 books. Once participants close the spreads and differences between exchanges, the profitability goes down significantly.

Capacity is an inevitable part of the process for any scaled trading solution. Our methodology is to know up front where and when such capacity issues can hit. To have solutions prepared in advance, to avoid surprises.

With growing AUM – it is important to understand and navigate the trading capacities for each asset class. Practically speaking, ongoing trading success relies on actively managing the capacity and diversifying trading across asset classes including Crypto, Forex, Commodities, ETFs.

Specifically, D.AI.SY's trading capacity on Crypto market is \$480M and delivers a profit of 237%. It is marginally less than its current 250% on a \$50M AUM.

# ENDOTECH'S ALGORITHMIC TRADING INFRASTRUCTURE



# Technology and Architecture

The Data Analysis and Machine Learning Pipeline architecture enables effectively collecting and storing different formats of data, received from various sources. Additionally, it supports a unified data analysis and machine learning workflow.

## ARCHITECTURAL CONCEPT

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The architecture solution is based on AWS technological stack and contains three fully integrated modules:

- **Ingest & Store** – Enables real-time data ingestion from various data sources (including data uploaded by the user) in real-time data storage on a data lake. This functionality is specifically tailored for situations where there is a need for storing and organizing large amounts of real-time data on a data lake.
- **Analyze & Prepare** – Provides scheduling and orchestrating ETL and data analysis workflows with data that is stored on a data lake.
- **Learn** – Provides scheduling and orchestrating Machine Learning workflows with datasets prepared on the previous stage, as well as training and deployment of different ML models. Eventually enables getting real-time predictions from the trained and deployed model.

## INGEST & STORE

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In this module, data is ingested from various sources or sample data uploaded into an S3 bucket.

1. The following options are supported for data ingestion:
  - Custom proxy application which runs on Amazon Elastic Cluster Service REST API using Amazon API Gateway. API Gateway is a fully managed service that makes it easy to create, publish, maintain, monitor, and secure APIs at any scale. It also provides tools for creating and documenting web APIs that route HTTP requests to Lambda functions.
  - Data upload – mainly used to test the streaming capability of the architecture. In this case, a user uploads a sample CSV data into Amazon S3 bucket. Uploading the data triggers an AWS Lambda function. When the Lambda function is triggered, it reads the data.
2. The data sent in streams to Amazon Kinesis Data Streams. Kinesis Data Streams is a massively scalable and durable real-time data streaming service. Alternatively, the data can then be streamed via Kinesis Data Streams.
3. The Kinesis streaming data is then automatically consumed by Amazon Kinesis Data Firehose. Kinesis Data Firehose loads streaming data into data lakes, data stores, and analytics services. It's a fully managed service that automatically scales to match the throughput of your data and requires no ongoing administration. Data captured by this service can optionally be transformed and stored into an S3 bucket as an intermediate process.
4. The stream of data in the S3 bucket is loaded into an Amazon Redshift cluster and stored in a database. Amazon Redshift is a fully managed, petabyte-scale data warehouse service. The data warehouse is a collection of computing resources called nodes, which are organized into a group called a cluster. Each cluster runs an Amazon Redshift engine and contains one or more databases.

## ANALYZE & PREPARE

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In this module, data analysis events are scheduled using EventBridge. It is a serverless event bus, which allows it to regularly run the ETL data analysis & normalizing pipeline.

Step Functions and Lambda functions used to orchestrate the data querying workflows. The architecture triggers and controls an AWS Batch job to run SQL queries on the data lake using Amazon Redshift. The results of the queries are stored in the dedicated S3 bucket. Those results are normalized datasets which used to keep the Machine Learning model up to date.

Additionally Apache Spark might be used for data analysis. It is an open source, Big Data framework that is part of the Hadoop ecosystem. Many computational tasks are implemented in Apache Spark much faster due to recurrent in-memory processing. The ability to repeatedly access data loaded into memory allows us to efficiently work with machine learning algorithms. It is supported by the Python programming language, which has long been effectively used to solve machine learning problems. Python might be used to model the behavior of financial markets.

# LEARN

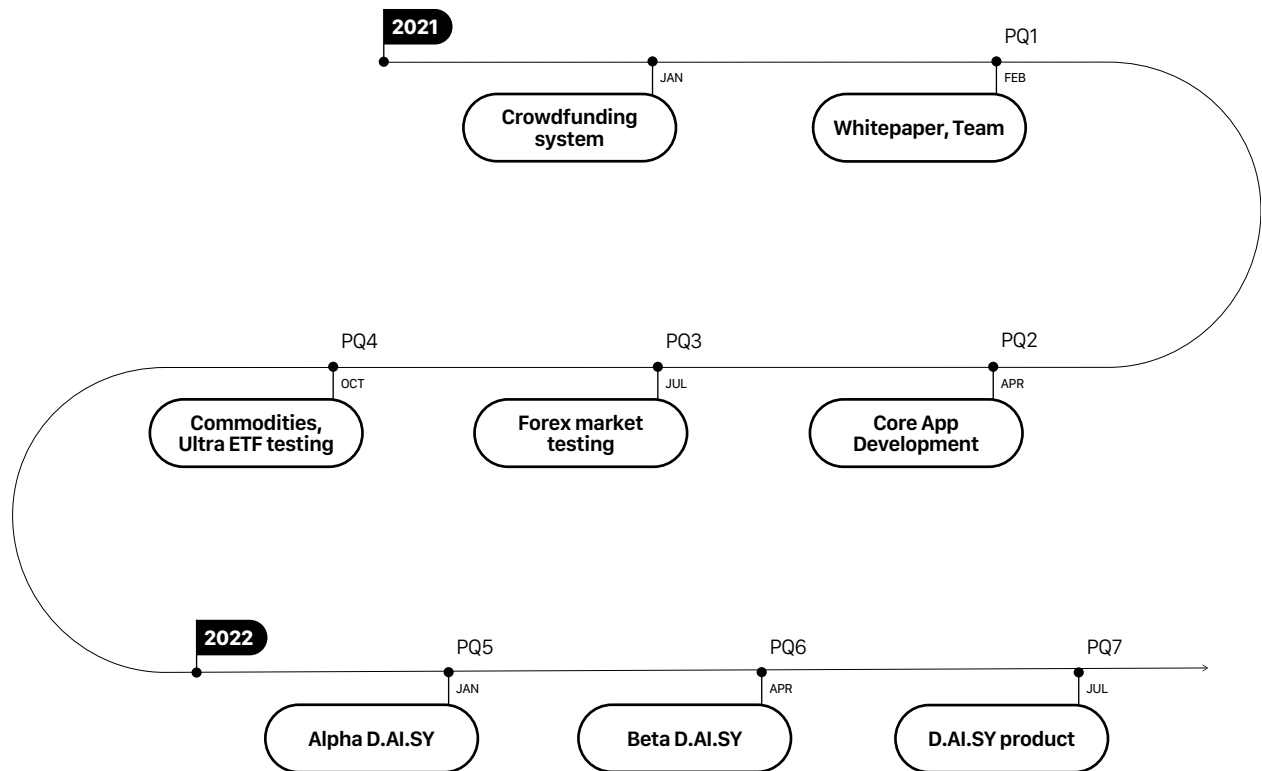
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This module fully orchestrates different Machine Learning workflows.

1. Live stream data preprocessing using Amazon SageMaker Processing service. It processes the raw extract, transform, and load (ETL) data and makes it ingestible by Machine Learning models. It launches a processing container, pulls the query results from the S3 bucket, and runs a custom preprocessing script to perform tasks such as feature engineering, data validation, train/test split, and more. The output is then stored in the dedicated S3 bucket.
2. Training and deploying Machine Learning models using Amazon SageMaker solution. It launches a Machine Learning training job to train on the preprocessed and transformed data, and then store the model artifacts in Amazon S3. It then deploys the best model trained via an automatic ML approach on an Amazon SageMaker endpoint.
3. REST API using Amazon API Gateway with Lambda integration. It allows for real-time inference on the deployed model. The Lambda function accepts user input via the REST API and API Gateway, converts the input, and communicates with the Amazon SageMaker endpoint to obtain predictions from the trained model.

# Roadmap

The project is planned for six quarters starting with the launch of the crowdfunding process on January 10th, 2021. The preparatory phase is due mid-February.



# D.AI.SY Project Team



## **Dr. Anna Becker**

CEO and Co-Founder

PhD in Artificial Intelligence from the Technion Institute. Has founded and successfully sold the fintech software company Strategy Runner. Author of the textbook on Bayesian networks (ASIN: B005X5AYC6).



## **Dmitry Gooshchin**

COO and Co-Founder

MSc in Astrophysics from Tel Aviv University. Over 15 years of servicing fintech companies, owns a business optimization agency. Chess Grandmaster, patents in wireless technologies.



## **R&D Team**

Led by Taras Dorozhovets



## **QA Team**

Led by Lana Steshenko



## **Financial Analysts**

Led by Dr. Greta Tovarovski



## **Trading Desk**

Led by Ilya Zolotykh



## **Operation Management**

Led by Adam Rubin



## **Product Management**

Led by Margo Zolotykh

# References

1. Vidmant O.S. Forecasting the volatility of Financial Time Series by Tree Ensembles. The world of new economy. 2018;12(3):82-89. <https://doi.org/10.26794/2220-6469-2018-12-3-82-89>
2. Rongjun Yang, Lin Yu, Yuanjun Zhao, Hongxin Yu, Guiping Xu, Yiting Wu, Zhengkai Liu, Big data analytics for financial Market volatility forecast based on support vector machine, International Journal of Information Management, Volume 50, 2020, Pages 452-462, ISSN 0268-4012, <https://doi.org/10.1016/j.ijinfomgt.2019.05.027>
3. <http://www.sciencedirect.com/science/article/pii/S0268401218313604>,
4. <http://www.sciencedirect.com/science/article/pii/S1057521920301514>
5. Aristeidis Samitas, Elias Kampouris, Dimitris Kenourgios, Machine learning as an early warning system to predict financial crisis, International Review of Financial Analysis, Volume 71, 2020, 101507, ISSN 1057-5219, <https://doi.org/10.1016/j.irfa.2020.101507>.
6. Peiwan Wang, Lu Zong, and Yurun Yang. 2020. Predicting Chinese Bond Market Turbulences: Attention-BiLSTM Based Early Warning System. In Proceedings of the 2020 2nd International Conference on Big Data Engineering (BDE 2020). Association for Computing Machinery, New York, NY, USA, 91–104. DOI:<https://doi.org/10.1145/3404512.3404521>
7. Škare, M. and Porada-Rochoń, M. 2020. Forecasting financial cycles: can big data help?. Technological and Economic Development of Economy. 26, 5 (Aug. 2020), 974-988. DOI:<https://doi.org/10.3846/tede.2020.12702>.
8. <https://www.cbr.ru/eng/press/event/?id=8311>
9. <https://data.worldbank.org/indicator/NY.GNS.ICTR.ZS>
10. <https://www.reuters.com/article/health-coronavirus-stocks-retail/asias-stockbrokers-swamped-as-retail-investors-dive-in-bet-on-post-virus-bounce-idUKL4N2BK1LQ>
11. [https://www.esma.europa.eu/sites/default/files/library/esma71-99-1421\\_steven\\_maijoor\\_speech\\_irish\\_fund\\_industry\\_association.pdf](https://www.esma.europa.eu/sites/default/files/library/esma71-99-1421_steven_maijoor_speech_irish_fund_industry_association.pdf)
12. <https://algocapital.ru/analytics/khedzh-fondam-neobkhodimo-vospolzovatsya-godom-vozmozhnostey/>
13. <https://www.ft.com/content/0687559a-0cac-4a0d-8f2c-065c039463f3?shareType=nongift>
14. <https://www.valuwalk.com/2020/03/top-10-crypto-hedge-funds/>
15. <https://nomics.com/guides/cryptocurrency-hedge-funds>
16. <https://ushedgefunds.com/crypto-hedge-funds/>
17. <https://www.pwc.com/gx/en/financial-services/pdf/pwc-elwood-annual-crypto-hedge-fund-report-may-2020.pdf>
18. <https://builtin.com/artificial-intelligence/ai-trading-stock-market-tech>



19. <https://towardsdatascience.com/whats-next-for-ai-enter-deep-reasoning-fae8b131962a>
20. <https://www.quantnews.com>
21. <https://thebell.io/bridgewater-reya-dalio-ruhnu-l-v-pandemiyu-cho-sluhilos-s-korolem-hedzh-fondov>
22. <https://www.cfainstitute.org/-/media/documents/book/rlit-review/2016/rflrv11n11.ashx>
23. [https://www.capitalmarketsciooutlook.com/magazines/February2020/Algo\\_Trading](https://www.capitalmarketsciooutlook.com/magazines/February2020/Algo_Trading)
24. <https://algo-trading.capitalmarketsciooutlook.com>
25. <https://www.amazon.com/Trading-Living-Psychology-Tactics-Management/dp/0471592242>
26. <https://www.cfainstitute.org/-/media/documents/book/rlit-review/2016/rflrv11n11.ashx>
27. <https://towardsdatascience.com/whats-next-for-ai-enter-deep-reasoning-fae8b131962a>
28. <https://www.bloomberg.com/graphics/2020-quants-predict-next-decade-in-global-finance/>
29. <https://blog.quantinsti.com/unconventional-guide-best-websites-quants>
30. <https://www.reuters.com/article/idUSKBN27J2X3>
31. <https://www.risk.net/riskquantum>
32. <https://www.risk.net/form/risk-trial?tfv=journals>
33. <https://www.risk.net/journal-of-energy-markets/7736731/estimating-financial-risks-from-the-energy-transition-potential-impacts-from-decarbonization-in-the-european-power-sector>
34. <https://www.mdpi.com/journal/jrfm>
35. <https://www.cambridge.org/core/books/optimization-methods-in-finance/FAE3FDF1D69C6B0704EEC81B617B706A>
36. <https://algo-trading.capitalmarketsciooutlook.com/vendors/top-algo-trading-solution-companies.html>
37. <https://builtin.com/artificial-intelligence/ai-companies-roundup>
38. <https://polygant.net/ai/artificial-intelligence-for-trading/>
39. <https://www.cognizant.com/us/en/ai/banking-capital-markets?cid=n1558630388-0005>
40. <https://builtin.com/artificial-intelligence/ai-trading-stock-market-tech>
41. [https://www.delltechnologies.com/en-ca/collaterals/unauth/data-sheets/products/ready-solutions/Ready\\_for\\_AI-Solution\\_Overview.pdf](https://www.delltechnologies.com/en-ca/collaterals/unauth/data-sheets/products/ready-solutions/Ready_for_AI-Solution_Overview.pdf)
42. [https://development-data-hub-s3-public.s3.amazonaws.com/ddhfiles/94641/wealth-methodology-january-30-2018\\_4\\_0.pdf](https://development-data-hub-s3-public.s3.amazonaws.com/ddhfiles/94641/wealth-methodology-january-30-2018_4_0.pdf)
43. <https://www.iea.org/data-and-statistics/data-tables?country=WORLD>
44. <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>
45. <https://www.eia.gov/international/data/world>
46. <https://unstats.un.org/unsd/mbs/app/DataSearchTable.aspx>
47. <https://www.woodmac.com/research/products/upstream/global-economic-model/>

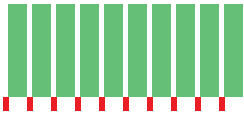
48. <https://databank.worldbank.org/home?access=N>
49. <https://www.industry.gov.au/publications/resources-and-energy-quarterly>
50. <https://www.usgs.gov/centers/nmic/minerals-yearbook-metals-and-minerals>
51. <https://www2.bgs.ac.uk/data/home.html?src=topNav>
52. <https://www.usgs.gov/centers/nmic/mineral-commodity-summaries>
53. <https://www.gold.org/>
54. <http://www.fao.org/faostat/en/#home>
55. <http://www.fao.org/forestry/statistics/80938/en/>
56. <http://www.fao.org/forest-resources-assessment/en/>
57. <http://www.fao.org/faostat/en/#data>
58. <http://www.fao.org/faostat/en/#data/PP>
59. <https://data.worldbank.org/indicator/AG.LND.TOTL.K2>
60. <https://data.worldbank.org/indicator/ER.LND.PTLD.ZS>
61. <https://www.savills.co.uk/>
62. <https://pcaobus.org/>
63. <http://www.ggdc.net/pwt>
64. <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>
65. <https://euklems.eu/>
66. <https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52>
67. <https://data.imf.org/?sk=B981B4E3-4E58-467E-9B90-9DE0C3367363>
68. [http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF\\_ActivePath=P,5&sCS\\_ChosenLang=en](http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF_ActivePath=P,5&sCS_ChosenLang=en)
69. <https://databank.worldbank.org/reports.aspx?source=joint-external-debt-hub>
70. <https://trendeconomy.ru/data/>
71. <https://www.statista.com>
72. <https://trendeconomy.ru/data/>
73. <https://databank.worldbank.org>
74. <https://data.imf.org>
75. <http://documents1.worldbank.org/curated/en/630181468339656734/pdf/588470PUB0Weal101public10BOX353816B.pdf>

# Appendix

## RISK RETURN DEFINED

D.AI.SY's high-risk high-return approach to algorithmic investments requires an understanding of some key concepts defined:

- Return – is an expected outcome. The focus of this discussion is about the expected VALUE OF PROFIT,
- Risk – is a VALUE OF LOSS. This is often misunderstood. Here, we look at the value, not probability of the loss. You might lose a certain percentage of your capital, you may lose it, or you most probably lose this risk-part of your capital,
- Probability – this is a third concept that is often unexamined. In every model, every physical event, we know what is the probability for it to happen. It seems easy for us to nail three values – 0, 100, and 50. We say: it NEVER happens, it ALWAYS happens and it's 50/50 meaning maybe yes, or maybe not. In high-risk high-return investments we are targeting 80% probability, meaning that

	Algorithmic Investment
Initial investment	\$1
High-Return	\$1-5
High-Loss	\$0.4
Profitability of Profit	Probability of 80%
What is your probability of hitting green	

So, there is potential for high-return of 100%-500% annual return. There is still a systematic risk of losing 40% of your capital, and when we talk about risk, there is a market/exchange/leverage and other risks that combined might result in 100% loss of your capital.

# GLOBAL MARKET ANALYSIS

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Further to the global market analysis, you can see specific retail investment trends described below.

## ASIA

After the 2002-2003 SARS outbreak, which was mostly confined to Asia and hit Asia's markets hardest – the rebound was sharp. Hong Kong's Hang Seng index. HSI dropped 18% in about four months, then surged by almost a third in the second half of 2003. The decline in the 2008/2009 financial crisis and the recovery both took much longer. The MSCI All-Country index .MIWD00000PUS lost 56% over 10 months, with plenty of false dawns along the way. It was nearly five-and-a-half years before it regained 2008 levels.

Where Asian indexes have fallen the furthest, interest from retail investors has jumped the most as they deploy long-held savings or draw down loans to buy shares.

In India, brokerage Zerodha has opened a record 140,000 new accounts in mid-March 2020 – double the average. The S&P Sensex index. BSESN 30% drop since January makes it one of the world's worst-performing markets.

CommSec, Australia's largest retail broker, said account openings had increased fourfold in March 2020. Brokers in Manila, Hong Kong, Bangkok, Tokyo, Kuala Lumpur and Jakarta reported surges as well.

In Korea, where the benchmark Kospi .KS11 is down by a quarter since January 2020, retail investors lifted their broker deposits 53% to a record 41 trillion won (\$34 billion).

In China, where the number of stock trading accounts rose nearly 12% in February 2020 only, inflows have swamped funds that facilitate international investment.

In Japan, around 40% of the population are active retail investors. It is especially significant for a country known for its higher living standards.

## EUROPE

Based on the report made by European Securities and Markets Authority (ESMA) in October 2020, in recent years bank deposits have offered near-zero returns on household savings. The picture of a dominating banking sector that limits capital markets activity is, however, not homogenous across individual EU Member States.

While across the EU, the share of households' financial assets held in investment funds is around 10%, at national level recent figures range from under 1% in Ireland, together with Estonia and Latvia, to around 16% in Belgium, for example.

The proportion of households that own listed shares goes from around 1% in Estonia, Hungary and Portugal to 20% in Cyprus. Ireland is around the EU average, with households' holdings of listed shares at around 4% .

At the same time, patterns of participation may also vary in relation to indirect holding of financial assets by households, through pensions and insurance policies. For example, the rate of the indirect participation in investment funds varies from under 1% in Greece to over 30% in the Netherlands, Sweden and Denmark. In Ireland and Germany this rate is above 20%.

## **LATIN AMERICA**

In the past decade and a half, the enrollment rate in higher education in Latin America has increased to 45%. Even in less developed regions with a more impoverished population, the higher education enrollment still increased to 25% in 13 years. As a result, people have become increasingly familiar with economic and financial notions.

Latin America has access to the Internet, and ambitious investors can also educate themselves, which has also led to an increase in the number of independent stocks and Forex traders. Compared to the trading regulations of the US market, Latin America is a bit different in terms of trading leverage and barriers to entry, but still, in the past years, more and more people have been using online resources to learn how to grow their wealth.

Latin America is made up of more countries, so there are regional economic fluctuations. However, it appears that all countries have something in common: the median age of the population. According to the latest data, the median age of Latin American people is 31 years old. This means a higher concentration of Millennials and Gen Z, who, statistically, are more inclined towards innovative ideas, experimentation, and appetite for investment.

## **RUSSIA**

According to the Bank of Russia records, in the third quarter of 2020, brokers acquired another 1.6 million individual clients, having set a quarterly growth record. As before, banks providing brokerage services attracted by far a majority of clients. The number of individual investment accounts (IIAs) topped 2.9 million, of which 525 thousand were opened in the third quarter alone.

Trust managers may view the third quarter as the year's best so far. The value of trust assets rose 9.1% in the period, rising upwards of 1.4 trillion rubles. Trust managers were able to acquire some 79.3 thousand clients, all of them individuals. The number of their clients totalled almost 480 thousand.

### Algorithmic Hedge Funds

The following represent leading hedge funds that leverage algorithmic solutions to maximize alpha.

# ALGORITHMIC HEDGE FUNDS

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The following represent leading hedge funds that leverage algorithmic solutions to maximize alpha.

TOP 5 HEDGE FUNDS		Under management:
<p><b>D.E. SHAW &amp; CO</b> Country: USA Founder: David Shaw Established: 1988</p>	<p>D.E. Shaw &amp; Co are among the pioneers of quantitative trading and investing. They also use discretionary approaches, but to a lesser extent. The fund ranked 3rd in overall profitability among other hedge funds in 2018.</p> <p>They use algorithmic strategies in the stock and futures markets, discretionary trading in the insurance market, the credit market and the energy market.</p>	<p><b>\$ 50 billion</b></p>
<p><b>TWO SIGMA</b> Country: USA Founders: David Siegel, John Overdeck Established: 2001</p>	<p>Here is what hedge fund founders David Siegel and John Overdeck write about themselves:</p> <p>“We are not classic investment managers. We are committed to technological innovation in the world of finance. Factors such as machine learning and capacity allocation help us. More than 1,700 people believe scientific approach is the best investment approach. This is Two Sigma.”</p> <p>David Siegel graduated from Princeton and later received his PhD (Advanced Degree in Science) in Computer Science from MIT (Massachusetts Institute of Technology). John Overdeck worked for the D.E. Shaw and Amazon before joining Two Sigma with David Siegel.</p>	<p><b>\$ 60 billion</b></p> <p>Over the past 10 years, their average annual return has been 30%.</p>
<p><b>MAN GROUP</b> Country: UK Founder: James Maine Date of foundation: 178</p>	<p>James Maine started trading sugar and rum back in the 18th century, unaware that in two centuries his company would grow into one of the largest hedge funds in the world.</p> <p>Today Man Group uses absolutely all markets, maximally distributing risks across various instruments and investment strategies.</p>	<p><b>\$ 61 billion</b></p>
<p><b>RENAISSANCE TECHNOLOGIES</b> Country: USA Founder: James Harris Simons Established: 1982</p>	<p>James Simons is a famous American mathematician who deciphered Soviet codes during the Cold War. Until 2009, it was he who headed the company.</p> <p>Renaissance Technologies is a quantitative trading fund whose strategies are based on statistical and mathematical analysis. The company has 3 investment funds. One of them –</p>	<p><b>\$ 84 billion</b></p> <p>Medallion – 60% per annum for 30 years</p>

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**BRIDGEWATER ASSOCIATES**

Country: USA

Founder: Ray Dalio

Established: 1975

Bridgewater's clients are institutional organizations such as insurance companies, banks, and pension funds. The fund uses macro strategies applying fundamental analysis and quantitative trading.

In 1997, Winton Group started with \$ 1.6 million, attracting more and more investments annually.

Basically, the fund uses diversified macro strategies and trend strategies. In 2020, Bridgewater Pure Alpha II remained in the red: 18.6%. This is the worst result in the last decade.

**\$ 160 billion**

The average return over the past 10 years is 19%.

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## CRYPTO HEDGE FUNDS

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The growth in the number of cryptocurrencies set the foundation for the rise of professional investment management firms. The goal of crypto hedge funds is to serve investors who are looking beyond the traditional Bitcoin investment. Cryptocurrency hedge funds practice active management where fund managers curate the portfolio and make capital allocations according to a trading style. Some funds are more aggressive, while others are more conservative. Investing through crypto hedge funds is done by investors who don't have the time or the skills to invest on their own.

The entire cryptocurrency market is only worth a few hundred billion dollars, which is very little compared to the gold market, for example, which is worth more than \$ 7 trillion. Or compared to the real estate market, the largest asset market in the world, which is worth over \$ 200 trillion.

What attracts most investors in this market is the potential for huge profits. During 2017 and 2018, the value of some tokens has skyrocketed in a short time frame. Some cryptocurrency hedge funds (Pantera Capital) have reported returns of 10,000% or more. By comparison, the average annual return on the S&P 500 over the past 90 years has been around 10%. The main investors in crypto hedge funds are "family offices" and wealthy individuals. At the same time, Bitcoin remains the most popular asset among such structures.

The total volume of assets under management of cryptocurrency hedge funds in 2019 increased from \$ 1 billion to more than \$ 2 billion. At the same time, the share of funds that manage assets worth more than \$ 20 million increased from 19% to 35%.

In the Crypto Hedge Fund Report 2020, the specialists used the data they collected during the first quarter of 2020. According to this information, the average cryptocurrency hedge fund manages assets worth \$ 44 million, which is almost twice as much as a year earlier. The median value also doubled, from \$ 4.3 million to \$ 8.2 million.

PwC counted 150 active hedge funds on the market. At the same time, almost two-thirds of them

were launched either in 2018 or in 2013. Experts noted the correlation between the number of newly created funds and the value of Bitcoin: the more the largest cryptocurrency is, the higher the activity of management companies.

## TOP 5 CRYPTO HEDGE FUNDS

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<https://www.valuwalk.com/2020/03/top-10-crypto-hedge-funds/>

### 1. GALAXY DIGITAL ASSETS FUND

<https://www.galaxydigital.io>

Founded by Michael Novogratz, New York-based Galaxy Digital Assets Fund debuted on the crypto landscape in 2018. The hybrid hedge fund invests in digital currencies, ICOs, and related companies. According to CryptoFundList, it launched with \$500 million in assets. It had also planned to raise at least \$200 million. In 2018, the fund suffered a loss of \$273 million as crypto prices crashed. The company also lost \$68 million in the third quarter of 2019.

### 2. ALPHABIT FUND

<https://www.alphabit.fund/>

Domiciled in the Cayman Islands, Alphabit Fund is a hybrid between a hedge fund and an open-ended mutual fund. It was launched with just \$1 million of seed capital. The hedge fund raised an estimated \$300 million from investors in 2017. According to estimates by Crypto Fund Research, Alphabit has more than \$500 million in assets. The fund aims to outperform the price of Bitcoin while generating lower volatility.

### 3. POLYCHAIN CAPITAL

<https://polychain.capital>

Olaf Carlson-Wee, the former Head of Risk at Coinbase, founded Polychain Capital in 2016. This crypto hedge fund has raised funds from Andreessen Horowitz and Sequoia Capital. The San Francisco-based fund had \$967 million in assets at the end of June 2019, according to Crypto Fund Research. The multi-strategy hedge fund invests only in cryptocurrencies, not in companies.

### 4. PANTERA CAPITAL

<https://www.panteracapital.com/>

Pantera Capital was launched in 2003 as a traditional investment fund. It shifted its focus to cryptocurrencies in 2013 with the launch of Pantera Bitcoin Fund. The multi-strategy hedge fund has an estimated \$810 million in assets, according to CryptoFundList. Pantera invests in cryptocurrencies, ICOs, and blockchain startups. Pantera has the backing of Fortress Investment Group, Benchmark Capital, and Ribbit Capital.



## 5. GRAYSCALE INVESTMENTS

<https://grayscale.co/>

Grayscale Investments is a subsidiary of New York-based Digital Currency Group. According to CoinTelegraph, it had a staggering \$2.7 billion in assets in 2019. The crypto hedge fund invests in a wide range of digital assets including Bitcoin, Ethereum, Litecoin, Ripple, and blockchain companies. Grayscale has invested in several crypto companies including eToro, Circle, Ledger, Shapeshift, and more.

Analysts noted that cryptocurrency hedge funds are most often registered in the same jurisdictions as traditional ones: most of the organizations are registered in the Cayman Islands (42%), in the USA (38%) and in the British Virgin Islands (8%). At the same time, more than half of the management companies operate from the United States (52%), and the UK is in second most popular place (15%).

On average, each hedge fund serves 28 investors. The main contributors are either “family offices” (48%) or individuals with a high level of income (42%). The average investment is \$ 3.1 million, and the median is \$ 0.3 million.

## GLOBAL MONEY MAP

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Example of a journey: American astrophysicist Gregory P. Laughlin (Santa Cruz, California) announced that planet Earth is estimated at \$5 quadrillions (December 2020, Daily Mail). Fortunately, there is no one to whom he can sell the planet. But he still can evaluate it. So we start our drill down into approximate cost of Earth as an economical system – from natural resources to intellectual property products.

Land and water resources are a unique type of resources that exist on its own, not as a result of human activity.

## LAND RESOURCES

Significance for agriculture, timber and paper industries	Category	Square, million km <sup>2</sup>	%
High	<b>Forests</b>	40,3	27
High	<b>Meadows and pastures</b>	28,5	19
High	<b>Agricultural area</b>	19	13
Neutral	<b>Industry and human settlements</b>	3	2
Neutral	<b>Freshwater reservoirs</b>	3,2	2,1
Low	<b>Unusable lands</b>	4,5	3
Low	<b>Glaciers</b>	16,3	11
Low	<b>Polar and high-altitude deserts</b>	5	3,3
Low	<b>Tundra</b>	7	4,7
Low	<b>Swamps</b>	4	2,7
Low	<b>Deserts, sands, rocks</b>	18,2	12,2
	<b>Land, total:</b>	149	100

Green: categories with important significance for agriculture, timber and paper industries.

Red: categories without important economical significance.

### FOR SEPTEMBER 2018, WORLDWIDE:

Lands and real estate	Estimation, \$trln
Agricultural land, forestry sector lands	27,1
Residential real estate	220,6
Commercial real estate	33,3
Total	281 (+6% for 2018)

## MARKETS WITH MAXIMUM PRICES OF COMMERCIAL REAL ESTATE, SEPTEMBER 2018:

Rank	Country	Estimation, \$trln
1	USA	8,1
2	China	3,6
3	Japan	2,8
4	Germany	1,7
5	UK	1,7
Total:		17,9

## UP TO THE COVID-19 EPIDEMIC, LAND IN MAJOR CITIES OF THE WORLD, INTENDED FOR ELITE BUILDINGS AND TOURIST BUSINESS FACILITIES, REACHED THE MAXIMUM VALUE:

	Country	City	Price, 000\$/m2
1	Monaco	Monte Carlo	47,578
2	Moscow	Russian Federation	20,853
3	London	UK	20,756
4	Tokio	Japan	17,998
5	Hong Kong		16,125
6	New York	USA	14,898
7	Paris	France	12,122
8	Singapore		9,701
9	Roma	Italy	9,166
10	Mumbai	India	9,163

## MINERAL RESOURCES

The most significant groups of mineral resources are two following ones:

- energy feedstock (oil, natural gas, coal, uranium),
- precious metals (at first gold).

## OIL

Proved oil reserves by regions and the most significant countries, bill.barr, \$trln:

Region/Country	12.1999	12.2009	12.2018	12.2019	% of total reserves	In prices 02.2021, \$trln
N.America	232.8	217.8	245.5	244.4	14.1	14.16
Canada	181.6	175.0	170.8	169.7	9.8	9.83
S.&C.America	95.9	233.3	324.7	324.1	18.7	18.78
Venezuela	76.8	211.2	303.8	303.8	17.5	17.6
Europe	20.7	14.0	14.6	14.4	0.8	0.83
Norway	10.9	7.1	8.6	8.5	0.5	0.49
CIS	120.1	144.0	145.7	145.7	8.4	8.44
Russian Federation	112.1	105.6	107.2	107.2	6.2	6.21
Kazakhstan	5.4	30.0	30.0	30.0	1.7	1.74
M.East	685.8	753.1	833.9	833.8	48.1	48.3
Saudi Arabia	262.8	264.6	297.7	297.6	17.2	17.24
Iran	93.1	137.0	155.6	155.6	9.0	9.01
Iraq	112.5	115.0	145.0	145.0	8.4	8.4
Kuwait	96.5	101.5	101.5	101.5	5.9	5.88
UAE	97.8	97.8	97.8	97.8	5.6	5.67
Africa	84.7	123.0	125.7	125.7	7.2	7.28

(on 03.02.2021, barrel of oil = \$57.93)

An example of the influence of political instability factor on the development of the industry: Venezuela – maximum crude oil reserves in the world, political instability, US sanctions.

### DYNAMICS OF OIL AND PETROLEUM PRODUCTS PRODUCTION IN VENEZUELA, MILL.T:

2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
155.9	145.8	141.5	139.3	137.8	138.5	135.4	121.0	107.6	75.6	46.6

An example of the influence of internal consumption factor on the development of the industry: India – actively develops oil mining and processing, but because of highest internal consumption it provides itself with oil products by less than 25%, not to mention turning oil into a source of income.

**DYNAMICS OF OIL AND PETROLEUM PRODUCTS PRODUCTION AND CONSUMPTION IN INDIA, THOUS. OF BARRELS PER DAY:**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Prod	838	901	937	926	905	893	874	885	869	869	826
Cons	3298	3378	3542	3740	3781	3906	4230	4632	4860	5112	5271

**PRECIOUS METALS**

Gold is not the most expensive precious metal but traditionally always in great demand. Gold reserves worldwide:

	mt	\$trln
Above the ground (mined for the entire history)	187-195 thousands (estimations of Australian Government and of World Gold Council (WGC)) <a href="https://www.gold.org/">https://www.gold.org/</a>	10,7-11,2
Under the ground (estimation of United States Geological Survey (USGS)) <a href="https://www.usgs.gov/">https://www.usgs.gov/</a>	appr. 50 thousands*	2,87

\*When we focus on modern times of gold mining (appr. 3500 mt/year), the under-ground gold reserves will last for about 15 years. If no new gold fields are discovered and no new technologies are developed in industries using gold, a precedent situation will be created.

**TOP-10 COUNTRIES WITH MAXIMUM GOLD RESERVES, 2020:**

Country	Gold reserve, mt	Share in total volume of national reserves, %
USA	8133,5	79,9
Germany	3362,4	77,1
Italy	2451,8	72,9
France	2436,1	67,8
Russian Federation	2299,4	24,5
China	1948,3	27,9
Switzerland	1040,0	6,8
Japan	765,2	3,5
India	664,2	7,8
Netherlands	612,5	70,2

Gold production consists of mining (67-72%) and recycling (28-33%).

**MINING VOLUME BY COUNTRY, DATA FOR YEAR 2019, PRICE 03.02.2021 = 1832.16 USD/OZ = 58.9 MILL USD/T:**

Country	Mining volume, mt	Estimation, billion USD
China	383,2	22,57
Russian Federation	329,5	19,4
Australia	325,1	19,15
USA	200,2	11,79
Canada	182,9	10,77
Peru	143,3	8,44
Ghana	142,4	8,39
South Africa (RSA)	118,2	6,96
Mexico	111,4	6,56
Brazil	106,9	6,3

We have to consider that rich mining fields in third world countries usually belong to foreign mining

companies (in total or in part, in different forms). That's why profitability of these fields in their location countries noticeably reduces.

**EXAMPLE: GOLD FIELDS IN GHANA:**

Gold Field	Mining company	Country-owner
Tarkwa, Damang	Gold Fields	South Africa (RSA)
Wassa	Golden Star Resources	Canada
Obuasi	AngloGold Ashanti	South Africa (RSA)

**MONEY (FINANCE ACTIVES):**

Agregat	Components	Estimation, \$trln
M0	bank's cash, cash in circulation (157 currencies)	5
M1 – M0	maximum liquid assets (funds on credit cards, demand deposits, traveller's checks)	23,6
M2 – M1 – M0	short-term deposits	31,5
M3 – M2 – M1 – M0	long-term deposits (including pension), government loan bonds	20,8
Total (M3)		80,9

The total amount of global debt is \$215 trillion, 35 % of the amount was formed after worldwide crisis at 2008. Global sovereign debt is \$60 trillion, 24 % is debt of EU countries, 30 % is debt of USA.

## POLITICS

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For geopolitical analysis the following classical ideas, principles and concepts of geopolitical science were used.

T. Mahan concept that “Control over the seas is the central link through which countries accumulate wealth.” The main work – “The Influence of Sea Power Upon History, 1660–1783” (1890).

The theory of “Heartland” H.J. Mackinder. Mackinder called the Heartland the central part of Eurasia,

around which the inner arc (Europe – Arabia – Indochina) and the peripheral arc (America – Africa – Oceania) are located. He summarised his theory thus: “Who rules East Europe commands the Heartland; who rules the Heartland commands the World-Island; who rules the World-Island commands the world”. Mackinder, H.J. *Democratic Ideals and Reality*. New York: Holt, 1919.

Analytical method of N.J. Speakman. In his works “America’s Strategy in World Politics” (1942) and “The Geography of the Peace “ (1944), he puts forward the following criteria for the geopolitical power of the state: the surface of the territory, the nature of borders, the volume of population, the presence or absence of minerals, economic and technological development, financial power, ethnic homogeneity, level of social integration, political stability, national spirit.

Works by Z. Brzezinski “The Grand Chessboard: American Primacy and Its Geostrategic Imperatives” (1997) and “The Choice: Global Domination or Global Leadership” (2004), containing a description of the alignment of the main world forces and interests, as well as geopolitical forecasts for future.

In order to further search for relevant information, a preliminary classification of the most important geopolitical centers of the world and the most significant and economically stable countries in them has been carried out.

- Countries of the Transatlantic bloc: USA, England, Germany, France
- Countries of Eastern Europe: Russia
- Asia-Pacific block: China, South Korea, Japan
- Indian Ocean Region: India
- Central Eurasia: Israel, Turkey, United Arab Emirates
- The most important countries of the Southern Hemisphere: Brazil, South Africa, Australia.

The classification will be refined and indexed according to the methods given above for the economy.

## SOCIETY

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The dominance of the basic institutions of either the X – or the Y-matrix ensures the integrity, survival and development of the corresponding type of society. At the same time, complementary institutions from the matrix of the opposite type play an supporting role, only complementing the institutional social structure.

In the stable societies, the share of complementary institutions is about a third (30–35%). If this share is significantly less, the total dominance of basic institutions leads society to crises or stagnation, and the excessive introduction of complementary institutions leads to social upheavals and revolutions.

In order to analyze the social stability of the region, we have identified eight states of each of the matrices, depending on the activation of certain groups of social institutions. For example, the activation of the institutions of the market economy in the conditions of the X-matrix leads to a significant revival



of all spheres of society. This is the situation observed now in China. And attempts to replace a unitary political system with a federal one in combination with a market economy for X-type matrices lead to a sharp change in course and total instability, which was observed during the collapse of the USSR in the 90s of the 20th century.

It is also proposed to use a slightly more subtle classification of institutional matrices, which is being refined.

1. Polanyi, K. (2001). *The Great Transformation: The Political and Economic Origins of Our Time*, 2nd ed. Foreword by Joseph E. Stiglitz; introduction by Fred Block. Boston: Beacon Press. ISBN 9780807056431
2. North, Douglass (1991). "Institutions". *Journal of Economic Perspectives*. 5 (1): 97–112. doi:10.1257/jep.5.1.97
3. North, Douglass C. (1989). "Institutions and economic growth: An historical introduction". *World Development*. 17 (9): 1319–1332. doi:10.1016/0305-750X(89)90075-2.
4. *Empirical Studies in Institutional Change*, Cambridge University Press, 1996 (edited with Lee Alston & Thrainn Eggertsson) ISBN 0521557437
5. S Kirdina. From Marxian school of economic thought to system paradigm in economic studies: The institutional matrices theory, *Montenegrin Journal of Economics* 8 (2) (2012), 53-71.
6. S. Kirdina. The Transformation Process in Russia and East European Countries: Institutional Matrices' Theory Standpoint. In *Institutional and Organizational Dynamics in the Post-Socialist Transformation*, International Conference, January 24–25, 2002, Amiens (France) CRIISEA, University of Picardie and OEP, University of Marne-la-Vallee. CD 6B 3 0037578/0902.021135
7. Harvey Leibenstein (1978). *General X-efficiency Theory and Economic Development*. Oxford University Press. ISBN 978-0-19-502380-0.