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Bachelor Thesis

Investing in art in the Russian market

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BACHELOR THESIS ASSIGNMENT

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Business Administration

Thesis title

Investing in art in the Russian market

Objectives of thesis

The aim of the bachelor thesis is to evaluate the effectiveness of investing in art by conducting a comparative analysis of investments in works of fine art created by Russian artists.
Also, based on the evaluation, relevant conclusions highlight the pricing features of art objects, analyze the structure and characteristics of the art market.
To consider the existing approaches to the construction of price indices in terms of their merits, shortcomings and limitations of application and to choose the most suitable methodology for researching the Russian art market.

Methodology

The thesis consists of two parts.

For the literature review is used methods of extraction, synthesis, induction and deduction. The theoretically part includes analysis about the specifics of the art market as an investment object with a specific object, members, methods of organization of the market and pricing mechanisms. To develop the theoretical part, professional publications, textbooks, books and websites devoted to investing in art are used.

Within the practical part describes the data collected by hand to build an index of prices of Russian art.

Practical part is based on descriptive and comparative analyses of investigation, presents methods of data collection and analysis.The methodology of the research is based on the building a hedonic index of prices, analysis of dynamics and Capital Asset Pricing Model (CAPM)

In addition, the constructed art-index is used to calculate a number of financial indicators, and an analysis is made of the comparative effectiveness and appropriateness of investing in the art market of Russian artists.

The proposed extent of the thesis

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Keywords

financing, investment, analysis, efficiency, art, auctions, profit

Recommended information sources

1. Anderson, R.C. (1974). 'Paintings as an investment'. Economic Inquiry
2. Ashenfelter, O., Graddy K. (2005). 'Anatomy of the Rise and Fall of a Price- Fixing Conspiracy: Auctions at Sotheby's and Christie's', Journal of Competition Law and Economics
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Declaration

I declare that I have worked on my bachelor thesis titled "Investing in art in the Russian market" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 15.03.2018 _____

Tatiana Kharkova

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Investování do umění na ruském trhu

Souhrn

Tato práce se zaměřuje na téma investice do umění na ruském trhu. Strukturálně tato studie sestává ze dvou částí. V teoretické části je odhalena účinek uměleckého trhu jako předmětu investice s definicí objektů, účastníků, způsobů organizace trhu a cenových mechanismů, stejně jako význam uměleckých indexů a přístupů k jejich konstrukci. Praktická kapitola popisuje údaje shromážděné ručně za účelem vytvoření indexu cen ruského umění. Navíc je pro výpočet řady finančních ukazatelů použitý uměle vytvořený index umění a je provedena analýza srovnatelné efektivity a přiměřenosti investice do uměleckého trhu ruských umělců.

Klíčová slova: Financování, Investice, Analýza, Efektivita, Umění, Aukce, Zisk.

Investing in art in the Russian market

Summary

This work is focused on the subject of investing in art in the Russian market. Structurally this study consists of two parts. In the theoretical part, the specificity of the art market as an object of investment with the definition of objects, participants, methods of organizing the market and pricing mechanisms are revealed, as well as the importance of art indices and approaches to their construction. The practical chapter describes the data collected by hand in order to build an index of prices of Russian art. In addition, the constructed art-index is used to calculate a number of financial indicators, and an analysis is made of the comparative effectiveness and appropriateness of investing in the art market of Russian artists.

Keywords: Financing, Investment, Analysis, Efficiency, Art, Auctions, Profit.

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1. Introduction

Investment in art objects

While returns to art investment have exceeded inflation for long periods, and returns in the second half of the 20th century have rivalled the stock market, they are no higher than would be justified by the extraordinary risks they represent.

by William N. Goetzmann Director of the International Center for Finance at the Yale School of Management.

Art can be not only a source of aesthetic pleasure, but also bring profit, acting as an object of investment. A large number of researchers in developed markets, European and American, believe that this type of investment, alternative to traditional ones, is profitable and attractive, if only because they do not correlate with financial assets, so they can be a good tool for diversifying risks and generating profits in crisis for the economy periods.

When a work of art enters the market, it is given a certain price, which is calculated from various factors, many of which are not determined by the quality of the work done from the point of view of the artist's aesthetics or skill.

The art market has a large capital intensity and is one of the most attractive forms of investment. The relevance of this work is determined by a small study of the art market in Russia as an economic category, as well as an almost complete lack of coherent information about its current state and development prospects.

The Russian art market has its own characteristics, which distinguish it from the art market in Europe and America, which are often compared. The study of the art market in Russia at the moment is of special interest for research.

It can be noted that during the financial crisis, interest in art markets and investments in art increases, because they do not correlate with stock exchanges.

The art market in Russia is underdeveloped, it is just beginning to form. All this is connected in the field of art with the wrong state policy, since the risk of counterfeits of "antiquity" is high.

It is necessary to study the features of the art market in Russia, analyzing the main segments of the market, as well as to identify the main problems in the art market and possible solutions for them.

2. Objectives and Methodology

2.1 Objectives

The aim of this work is to conduct a comparative analysis of the effectiveness of investments in works of art created by Russian artists, and investments in the commodity and financial markets.

This study has the following objectives:

• Analyze the structure and characteristics of the art market;

• Identify features of pricing of art objects;

• Identify the importance of art indexes for investors and other participants market;

• To consider the existing approaches to the construction of price indices in terms of their merits, shortcomings and limitations of application and to choose the most suitable methodology for researching the Russian art market;

• Build an art index of Russian art based on the data selected for analysis and interpret the results;

• Compare risk and return rates of investments in Russian art and other assets.

2.2 Methodology

The thesis consists of two parts. For the literature review is used methods of extraction, synthesis, induction and deduction. The theoretically part includes analysis about the specifics of the art market as an investment object with a specific object, members, methods of organization of the market and pricing mechanisms. To develop the theoretical part, professional publications, textbooks, books and websites devoted to investing in art are used.
 Within the practical part describes the data collected by hand to build an index of prices of Russian art.

Practical part is based on descriptive and comparative analyses of investigation, presents methods of data collection and analysis. The methodology of the research is based on the building a hedonic index of prices, analysis of dynamics and Capital Asset Pricing Model (CAPM)

In addition, the constructed art-index is used to calculate a number of financial indicators, and an analysis is made of the comparative effectiveness and appropriateness of investing in the art market of Russian artists.

3. Literature Review

3.1 Basic concepts and structure of the art market

To fully understand the principles of the topic of investing in art, it is important to know the basic structure of the art market. First of all, there are several main subjects:

1) Auction houses – a company whose business is selling things at auction.[1]

2) Art gallery – a building where works of art can be seen by the public.[2]

3) Artist -someone who paints, draws, or makes sculptures.[3]

4) Collector -a person who collects things of a specified type, professionally or as a hobby.[4]

And others, but their influence in the art world is less significant.

The art market is divided into „primary" and „secondary". In the primary market, works of art are sold for the first time, while in the secondary market works of art are resold.[5]

The primary art market refers to the first sale of an artwork, either through a gallery or directly out of the artist's studio. The primary art market presents works by artists that are still alive and marks the time when the price for an artwork is set for the first time. The price is based on the artist's exhibition history, sales history (if any), career level, and size of artwork. The greater the demand for an artist, the higher the price the artwork could take up on the primary market.

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[1] ,Cambridge Advanced Learner's Dictionary & Thesaurus.'(2008).Cambridge University Press.

[2] ,Cambridge Advanced Learner's Dictionary & Thesaurus.'(2008).Cambridge University Press.

[3] ,Cambridge Advanced Learner's Dictionary & Thesaurus.'(2008).Cambridge University Press.

[4] ,Cambridge Advanced Learner's Dictionary & Thesaurus.'(2008).Cambridge University Press.

[5] Buck Louise, Greer Judith. ,Face Fashion.' (2008).Art in property

The secondary art market Once the artwork is purchased on the primary market, it enters the secondary market. Thus, the secondary market refers to art that has been sold at least once before. In simpler terms, the secondary market deals with resale, typically with artworks by artists who have a substantial reputation. For example, most artworks sold through auction houses form part of the secondary market. Prices for artworks on the secondary market are determined by factors such as condition, provenance, and the significance of a work within the artists' oeuvre. If an artist is related to a top gallery or is represented in an influential public or private collection, it can have a positive impact on the price.

3.1.1 Structural analysis of components of art market

Below is a structural analysis of all the major components of the art market.

The art market performs intermediary, pricing, stimulating, regulating and artistic-aesthetic functions. The modern art market is a multifunctional phenomenon. If you emphasize its artistic side, then the first place is the aesthetic value of a work of art, if economic, it is the market value of the work of art. The art market represents a turnover of artistic values at the world and national level.[6] A feature of the art market in its integrated nature, emerging at the intersection of the spiritual and artistic (immaterial, pragmatically uninterested) and material (economically and pragmatically meaningful) spheres of public life. From this follows the following definitions of the art market:

1. These are the general artistic tendencies and preferences prevalent in a certain time interval, a system aimed at the formation of tastes and preferences, that is, a cultural phenomenon reflecting the actual state of society in which the artist, the expert community, the public and the simple admirers of art are involved;

2. This is the nature and level of development of the institution of mediation, or the system of relationships between artists, dealers, auction houses, associations and collectors, consisting in the circulation of goods of art;

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[6] Oganov A.A., Khangeldieva I.G. (2008). Theory of Art - International University in Moscow.

3. It is a branch of the economy that can in many ways shape a national identity, and directly affect the country's GDP, if viewed from the standpoint of territorial branding and marketing.

Thus, the art market is a complex multi-level phenomenon, it integrates a large number of entities that implement all the processes of its actualization. The main subjects of the art market are producers, (artists) and consumers (collectors)[7]. Between main actors in a different cultural and historical time there was a group of mediators who, by today, were maximally differentiated.

3.1.2 The history of the art market, the emergence of the art market in Russia

Art history of the origin of the market is divided into stages. The first stage is connected with the origin of the art market in England at the end of the XVII century. Unlike France, where the status of the artist in the 18th and 19th centuries was determined by the degree of his recognition in various salons, in England this status was determined by bidding, that is, an indicator consisting of the price of work and the number of sold works. At the same time, the British model was more popular, spreading to the national art markets of Holland, Germany and the United States. The popularity of this model can be related to the Protestant ethic of early capitalism that prevailed in these countries, on the basis of which any product that is produced (including a work of art) has a price. Obviously, the purchase and sale of works of art existed throughout the history of art. However, only after the bourgeois revolution conditions emerged that contributed to the formation of a market economy, and, consequently, the art market. Therefore, the approximate period of the appearance of the art market is the end of the XVII century.

In 1801, at auction, organized by Sir William Hamilton, Beckord paid 1,300 guineas for the work "Laughing Boy" by Leonard Da Vinci. In 1807 and 1811, two paintings by Rembrandt, Nude and Sudostroitel, each 5000 guineas, were sold at Lafontaine. Such high sales were inspired by a number of authors not so much to find rich patrons, but to present their work for auction. However, at the dawn of the art market, modern

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[7] Feigen Richard. (2004). Memoirs of the art dealer. - RuArts Art Foundation.

authors could not claim a significant profit, since large capital investments, as it was supposed, deserved only the work of the Great Masters.

The second period of the art market development can be dated in the middle of the XIX century. In the middle of the 19th century in Europe, the structure of the art market is created, which included dealers, art dealers, exhibitions and galleries, sales and auctions, the publication of catalogs and special magazines, advertising. Also included in this system are collectors, art critics, museum specialists.

The second period of the development of the art market is also characterized by an increase in investment in modern authors, who sometimes even replacing the old masters from the list of the most high-profile auction lots. It is from the second half of the XIX century that we can speak about the division of the art market into two spheres: the sphere of sales of the masters of the past and the sphere of sales of modern authors. Both these spheres are actively competing with each other. However, there is still no institutional separation between them. At auctions, Sotheby (is a British multinational corporation headquartered in New York City) and Christie(is a British auction house) are actively selling both Great Masters and representatives of contemporary art. Also in the XIX century, the class of consumers of expensive art also changed. The aristocracy was replaced by rich representatives of the bourgeoisie. Through the acquisition of expensive works of art, they wanted to increase their capital, and also to demonstrate their power in the field of distribution of economic capital. A similar situation took place in the Paris salons.

An important feature of this period was the expansion of the art market. Not only works of contemporary authors, representatives of the Protestant world (mainly British and Dutch) began to be exhibited, British collectors were also interested in French contemporary painting. So, for example, the painting Jean-Baptiste Camille Corot "Dance des Amors" was sold in 1898 for £ 7,200, and "Denizens of the Highlands" by Rosa Bonor in 1888 for 5,000 guineas. Of course, French authors could not compete with British portraitists (it was the portraits at the end of the XIX century that were the most expensive) or with the works of Joseph Mallord William Turner. The most

expensive painting Turner was the painting "Mortlake Terrace", which was sold in 1908 to the Dutch auction for 12,600 guineas.

In Russia, the art market emerged at the turn of the 18th and 19th centuries: at that time a layer of rich art lovers was formed, and the country became an attractive market for European merchants, domestic art and art criticism, and private collectibles were developing.

At the beginning of the XXI century, the art market is experiencing a new wave of recovery, characterized by a smooth transition in that period, which we could call a new stage in the development of the art market. The market is obviously virtualized, new types of art are emerging, such as digital art. In addition, participation in trading through virtual systems is becoming more convenient. This leads to the need to restructure large auction houses, transfer products from the real field to the virtual field.

Currently, the structure of the art market includes auctions, art and antiques shops, shops, galleries, dealer and insurance companies, appraisers, experts, antiquarians in Russia - the institute of museum expertise, etc. The functioning of the art market requires the participation of government control agencies and interested buyers. The centers of the world art market are London, New York, Tokyo (the share of Great Britain and the USA accounts for 73% of all sales in the world).

Features of pricing depend on world economic trends, regional characteristics, conjuncture and fashion.

For example, the market conjuncture can be influenced by a number of galleries that have established themselves as highly professional participants in the art market. Prices are set at public auction, including at auctions. In Russia, the turnover of the art market is estimated at 25 million dollars a year, about 80% of the turnover is antiques. At present, the sphere of the art market has considerably expanded; the most actively developing books and numismatics. The number of fakes is still high.

3.2 The specificity of investing in art objects

In a broad sense, the art market includes spiritual, intangible values that arise from the uniqueness of works of art. The art market is a complex multifunctional phenomenon. If we consider its artistic side, then the first place is the aesthetic value of the work of art, if the economic is its market value. In general, the art market is a socio-economic and cultural-historical phenomenon and a mechanism that is a system of commodity circulation of works of art.

In a narrow sense, the art market is an economic category that implies the turnover of objects of artistic value. Considering this value, the art market is a general order of prices for artistic works of any author, investment attractiveness, conclusion of transactions for the purchase and sale of works of art.

3.2.1 Art as an economic category

There are many collectors who view art as an economic category, that is, as an opportunity for profitable investments. Indeed, there are many factors that attract buyers to invest in art:

1) <u>Reliability of investments and growth of incomes existing in the market, because of constant increase in prices for real works of art;</u>
   According to various estimates, the annual turnover of the art market ranges from 25 to 30 billion dollars. Statistics of prices for products of the secondary market of resale of top artists, according to quantitative studies of authoritative databases, since the second half of the twentieth century to the early 2000s shows an increase of more than 400%.[8] In fact, art is perhaps the most high-growth in value material asset. The main argument in favor of investments in the art market is that a work of art, unlike any other commodity when consumed, does not lose its consumer value over the centuries. Being created in a

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[8] M. Jiangping, M. Moses, Report: ‚Art as an Investment and the Underperformance of Masterpieces'. (2002). Forthcoming in the American Economic Review, USA, p-17.

single copy (if abstracted from the objects replicated) is a very profitable investment tool. The material value of works of art of brand artists can remain unchanged and even grow to a considerable extent. A great role here is played by their uniqueness, as well as by natural loss. This makes art one of the most attractive in terms of return on investment.

2) <u>Market potential (in Russia there are many valuable works of art, there is financial and commercial capital)</u>

The growth in prices for art is determined by the fact that the works of specific artists – market leaders themselves – are getting smaller. In this case, investor strategy is a speculative increase in the price of an artist by acquiring as many of his work as possible. At the same time, the rarity, uniqueness, impossibility of reproduction of the work of art leads to the fact that the antiques gradually „settles" in private or museum collections, which opens the prospect for investing in „antiques of the future", that is, in contemporary art. Here, the chances of making a mistake are even higher, but the yield is many times greater than investing in proven authors.

3) <u>Low dependence on other financial indicators and changes in the economy (such investments persist from inflation)</u>;

This type of investment reliably saves from inflation. The correlation of art with other financial assets according to the studies is very low, which makes this asset the most attractive for diversifying the investment portfolio. Diversification of assets and minimization of risks implies the search for various assets for the efficient distribution of the owner of the capital that was in the ownership. Traditionally, these are financial assets and securities, real estate, precious metals.

Even during recessions and wars, art as an asset remains one of the most reliable. Of course, at such times, the total volume of the art market is declining, in view of the fact that the purchasing power is declining. But the reliability remains the same.

3.1 Characteristic features of the art market in Russia

In Russia, the art market began to function at the proper level only in the early 2000s, this significantly distinguishes the Russian art market from the art market in Europe and America.

The Russian art market has a number of the following features:

1. Artists in modern Russia are a socially unprotected group: they do not receive the necessary support from the state and, for the most part, are not ready to orient themselves in the art business.

2. The infrastructure of the domestic art market is imperfect due to the lack of a sufficient number of salons, galleries, auctions, analytical, consulting, financial, investment and other organizations specializing in the art business.

3. The Russian art market is characterized by a high percentage of counterfeits of works of art, as more than any other, is subject to various kinds of machinations and difficulties with a legitimate conclusion of the transaction.

4. In Russia, the middle class is unstable, which directly affects the existence of a civilized art market. From the experience of the functioning of the world art business, it can be concluded that it is the people of the middle class who are the main buyers of art objects, acquiring them after their primary needs for real estate, durable goods, and securities have been satisfied.

5. Mistrust of Russian consumers to art as an alternative investment asset is due to low awareness of the profitability of the art market and the main aspects of capital investment in art.

6. The mentality of the Russian consumer suggests that in today's volatile conditions, buyers are not ready to invest in promising creativity objects with a long turnover period, but are focused primarily on quick earnings.

7. The absence of a legal instrument regulating the relations of art market participants is an important deterrent to its development.

8. The Russian art market does not pay enough attention to marketing. Almost at all stages of marketing, marketing tools are used very little. Qualified positioning of the artists themselves is very rare. [9]

These features are rather shortcomings in the structure of the Russian art market, which hamper its development.

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[9] IA. Holman. 'Art as a commodity: paradoxes and patterns.'(2013). Problems of philology, culturology and art history.

Despite the fact that investments in art are still not very popular in Russia, art business is dynamically developing, involving more and more people in our country and all over the world in its cycle, the volumes of consumption of works of art are increasing, which makes the study of the art market topical , especially from the point of view of economic theory.

Thus, the art market in Russia is at the stage of formation, which may be due to the short history and complex history of its development.

It can be concluded that for all of its existence the Russian art market has been characterized by instability and spasmodic development. This institution and is still developing quite difficult, because in our country there are specific, historically developed problems described above.

3.3 Pricing

Objects of art, unlike consumer goods or financial instruments, are absolutely heterogeneous objects. From here it follows that the formation of prices in the art market are different from those that are observed in other markets.

On the one hand, prices for paintings or other art objects are not defined as a point of equilibrium between supply and demand. On the other hand, production costs also can not serve as a reference point for determining the cost of work. Some researchers are of the opinion that "an art object costs exactly as much as the buyer is willing to pay, and the seller is ready to accept."[10] However, despite the seeming unpredictability of the future price dynamics, there are certain factors that determine prices in the primary and secondary art markets.

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[10] Goetzmann W.N. and Spiegel, M. (1995), 'Private value components, and the winner's curse in an art index', European Economic Review, 39: 549-555.

Before proceeding directly to the evaluation methods, it is necessary to determine what is meant by evaluation, who and why it conducts it, and, most importantly, what is the specific nature of the assessment of the art market in this area.

The essence of the concept of "evaluation" in everyday life and in any professional sphere is very similar (estimate - expressing an opinion on the qualities of a person / subject, about the value of something), the difference consists only in the fact that in the professional sphere this expressed opinion must be supported by accurate calculations and other evidence of the correctness of the valuation.

You can estimate the value of business, real estate, land, intangible assets, works of art, securities and other things. On the one hand, all these objects of valuation are very different, but on the other - they all share one thing: the purpose of value evaluation. Certainly, just for fun, for the sake of interest, a rather laborious and laborious evaluation process is unlikely to be conducted. Everyone, basically, is evaluated for one purpose - further sale or purchase. There was a need to sell an apartment, for example, before you need to evaluate its value, you wanted to buy a painting of the eighteenth century, came to the gallery, and there you already appreciated its value and offered you to buy it.

The logical question that arises after reading the previous paragraph: "How do evaluate, maybe just one goal, then you can evaluate the same pattern and technique?". Of course, one can not argue that the valuation of each object is an absolutely unique and individual matter. When evaluating any object, there are subtleties inherent exclusively to it. This is the complexity of the evaluator's work: taking into account the basic approaches and methods, to propose and apply the methodology, taking into account the specificity of the object.

The essence of the evaluation of works of art consists, as well as other objects of evaluation, in the definition of value. The most important feature of the evaluation of works of art is that the value of the object may, at first glance, not be associated with the costs of its creation. Here the question arises: "Are there any regularities between the formation of the value of the object of art and the process of finding this value?" Evaluation of works of art - a subjective assessment, but this does not mean that the value of the estimated object, in the end, will be invented. Of course, the cost of a work of art, like any other object, is calculated using certain methods and formulas. At the same time, we must not forget that any art object

carries not only material value, but also aesthetic value. It is pertinent to note that just here this aesthetic value is, in its own way, a catalyst for material value.

3.3.1 Methods of pricing in the art market

In the theory of the economy of culture, there are two fundamentally different methods of pricing for fine art.

The first one assumes that it is impossible for a piece of fine art to have a constant, fundamental price. The demand price fluctuates between the maximum and minimum values. However, neither the author, nor the collector, nor the expert can accurately say whether this market valuation is high or not. Similarly, they can not say what the equilibrium market price for this item should be. Demand is subject to strong fluctuations due to the so-called quirks of rich collectors and investors. In this regard, the behavior of market prices for fine art is almost unpredictable.

In accordance with the second approach to pricing in the fine arts market, it is also recognized that the market valuation depends on the valuation put forward by the market to a much greater extent than on the actual costs incurred by the author. At the same time, it is assumed that these estimates are recognized by the market, as a result of which a fundamental price for the subject of fine arts can be determined. The level of market prices can provide the necessary information about the equilibrium value of the price. In addition, the price of fine art items should be related to the price of other assets. Of course, this approach allows the market fluctuations in demand, associated with hedonistic estimates of individual collectors and investors.

3.3.2 The value of price indices in the study of the art market

For a long time, the main obstacle to the active development of the art investment segment was the lack of an accurate method for measuring the financial performance of art objects. For reasons of heterogeneity (all art objects are different) and the irregular nature of trade (the appearance of the same object on the market with constant frequency is highly unlikely), a precise definition of their value presents significant difficulties. Investments in works of art have gained popularity with the appearance of a large amount of information regarding

the past price dynamics of canvases and data on auction trades. To date, databases, art indexes and analytical reports on the state of the art market are indispensable tools of the investor, seeking to diversify its portfolio by including art objects in it. The use of various indices allows the market participant to get an idea of historical returns on the local or global art market, as well as the degree of risk of such investments.

To date, the three most popular global art indices are Sotheby's Mei Moses Index (formerly known as TheMei Moses WorldAll Art Index), AMR Index and Art Price Index. The Russian art portal ArtInvestment.ru[11] provides its subscribers with access to the family of Russian art indices ARTIMX-RUS. When constructing all of the above indexes, the auction sales data are used, which constitute only the fourth part of all transactions in the art market. For this reason, the indicators of these tools reflect the situation rather on the auction market of art objects, rather than in the art market as a whole. Information about transactions in the dealer market is not used in the development of indexes due to the lack of reliable and complete data on this market segment.

The quantification of the financial characteristics of art as a type of alternative investment was the central task of many studies in this field. Within the framework of these works, the theoretical foundations of designing art market indices were described, which are a relatively accurate reflection of the yield for a collector who has a large, well-diversified portfolio of works by various artists. Of course, the profitability of the index will be less accurate reflection of the return on investment in a single art object or the work of only one artist or one current. Among the many practical applications of the art market indices Ginsburgh[12] distinguish the following:

- *Reflection of the main market trends.*

This allows us to calculate the market profitability of art objects and compare it with the yields of other assets in order to obtain an answer to the question of the advisability of this type of alternative investment.

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[11] ARTinvestment.RU. 27.03.2008. [online]. artinvestment.ru. URL: https://artinvestment.ru/abo ut / about_us / about_us_text.html

[12] Ginsburgh, V., Mei, J. and Moses, M. (2006), 'The Computation of Price Indices', in Ginsburgh, V. and Throsby, D. (eds.), Handbook of the Economics of Arts and Culture, Elsevier, North Holland, Amsterdam: 947-979.

- *The study of the pricing mechanism.*

Determining the main social and economic factors that affect pricing in the art market allows an investor to invest in the specificity of the market in question.

- *Calculation of financial indicators.*

Measuring the market volatility and the correlation of the art market with the markets of classical financial instruments (for example, shares or bonds) shows whether the addition of art objects to a long-term investment portfolio allows diversifying the risks.

In general, art-indexes are a good analytical tool that allows the investor to analyze trends and predict the potential profitability from the sale of art objects (analysis of trends in the art market makes sense, as according to David et al. (2013), weak the form of the market efficiency hypothesis is not fulfilled in this case).

3.3.3 Construction of price indexes of fine arts

To date, there are several basic methods for calculating the profitability of investments in works of art, on the basis of which indices of the art market, a certain art school or an individual artist are built, if it is a question of fine arts. Each of these methods has a number of advantages and disadvantages, as well as the framework in which it can be applied.

1. Naive approach.

The simplest, though most rarely used, is the naive method. This methodology is the construction of an index based on averages (arithmetic or geometric) or median prices. The main prerequisite is the consistency of the characteristics of works of art sold at auctions. In addition, in order for comparisons between different time periods to be possible, the selection of art objects underlying the study must be clearly defined in advance. For example, Stein (1977)[13] considers only the works of deceased artists who were created before a certain year. The unquestionable advantage of this approach is the full use of all available auction information. However, it contains a serious drawback - the neglect of the heterogeneous

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[13] Stein, J. P. (1977), 'The Monetary Appreciation of Paintings', Journal of Political Economy, 85(5): 1021-1036.

nature of assets in the art market. Obviously, the pictures are not absolute substitutes for each other, which is confirmed by the theory of emotional dividends.

2. Repeat-sales regression (RSR)

RSR - is one of the two most popular methods for assessing the return on investment in art objects and the subsequent construction of indexes. The essence of this method is that the profitability from the sale of a work of art is determined only by previous resale, while the characteristics of a particular canvas (artist, technique, size of the picture) are not taken into account. Only those works that were sold at least twice during the period under review are taken into account, which makes it possible to construct an index by estimating the regression, where the variation (logarithm) of the price of each art object is the dependent variable, and a number of dummy variables are explanatory. Individual returns are then summed and averaged over the entire sample in order to obtain an average market return.

Initially, this approach was applied to the real estate market of Bailey, Muth, Nourse (1963)[14], but subsequently it was successfully adapted for the art market. Anderson (1974)[15] was one of the first to apply the repeat sales method to the art market research. Using Reitlinger's database (Reitlinger, 1961)[16], containing information on paintings that were sold more than once in the period 1653 - 1970, and regression of repeat sales, he showed that the average annual nominal rate of return is 3.3%, then as on a shorter time interval of 1780 - 1970 gg. the same indicator is 3.7%. For the same period, the author estimated the yields for four local markets (paintings by Old Masters, English art of the 18th and 19th centuries, paintings of the Impressionists and art of the 20th century) at five-year intervals. By breaking the used database into groups, it demonstrated significant fluctuations in the rates of return in different art schools and time periods. The paper points out that the profitability of investments in art objects as certain schools (impressionists and art of the XX century) and those created in certain periods of time (in the 1950s and 1960s) significantly exceeds the rate of profit of long-term investments in the weighted average portfolio of art- objects or

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[14] Bailey, M., Muth, J.F., Nourse, H.O. (1963). 'A regression method for real estate price index construction'. Journal of the American Statistical Association 58, 933–942.

[15] Anderson, R.C. (1974). 'Paintings as an investment'. Economic Inquiry 12, 13–25.

[16] Reitlinger G. (1961). The economics of taste. Vol. 1: The rise and fall of picture prices 1760–1960. London: Barrie and Rockliff.

shares. However, in the long run, the return on art investment is half the profitability of investment in a portfolio of stocks.

The author comes to the conclusion that taking into account the accepted risk and low liquidity of works of art, the pictures do not seem such an attractive object for investment, if you do not take into account the consumer value (emotional dividends).

The described methodology has its strengths and weaknesses, which should be taken into account when interpreting the results. According to Ginsburgh et al. (2006), one of the main advantages of this approach is that he bypasses the problem of the heterogeneity of art objects, without requiring a thorough and accurate assessment of the quality of the canvas.

However, we can not fail to mention a number of disadvantages, which concludes this methodology in its essence.

First, it does not take into account objects sold only once, and therefore, radically narrowing the sample. For example, in the works of Mei, Moses (2002a, 2002b)[17], when building the Mei-Moses All Art Index, the share of repeat sales from the total sales volume is 7% for the ten-year interval (1971-1980), 13% for the 20-year period (1971-1990), 15% - at the age of thirty (1971 - 2000). This feature can lead to a systematic selection error due to the selection of only those objects that have traded more than once. The repeated appearance of a picture on the market may be due to the presence of certain characteristics or the influence of some external factors (for example, a fashion for certain schools / trends or trends in the market as a whole). In turn, this fact can negatively affect the reliability and objectivity of the results obtained.

Secondly, given that the sample is not representative of the entire market, the results can not be generalized to the art market in general.

Thirdly, Ginsburgh (2006)[18] also note that in order to apply repeat sales regression in the construction of indices, data are required for a longer period of time than, for example, when assessing hedonic regression. The reason for this is that the time intervals between consecutive sales of art objects are quite significant.

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[17] Mei, J. and Moses, M. (2002a), 'Art as an Investment and the Underperformance of Masterpieces', American Economic Review, 92(5): 1656-1668.

[18] Ginsburgh, V., Mei, J. and Moses, M. (2006), 'The Computation of Price Indices', in Ginsburgh, V. and Throsby, D. (eds.), Handbook of the Economics of Arts and Culture, Elsevier, North Holland, Amsterdam: 947-979.

3. Hedonic regression.

Evaluation of hedonic regression (HR - hedonic regression) is also one of the most popular methods of constructing art indices. Using this methodology, it is assumed that the profitability from the potential resale of a work of art depends on a number of specific characteristics that are inherent in a particular art object (for example, if it is a question of fine art, then this is the size of the canvas, the plot, the material of the base, the auction house, etc.) and easily measurable qualities of the artist (experience or belonging to a particular school). The results of the regression analysis demonstrate an implicit benefit for the collector, which is embedded in each of the characteristics considered. In this case, the remainder of the regression can be considered as "prices not related to the explicit characteristics" (characteristic-free prices), which are used in constructing the price index of art (Ginsburgh et al., 2006).[19]

Anderson (1974)[20] was the first to apply this approach to the art market (along with the method of repeat sales). As factors affecting the price of the painting, he included the size of the canvas and the reputation of the creator, while noting that the other characteristics were extremely difficult to assess with a high degree of accuracy, or the coefficients for them were insignificant. In addition, the use of two different approaches allowed the author to compare the resulting yields - 2.6% for hedonic regression versus 3.3% for repeat sales regression.

As for more relevant studies in this area, we can not fail to mention the work of Ratnikova, Sergeyeva (2010), in which they assess the hedonic price function on the paintings of Claude Monet. The authors decided to investigate the paintings of one artist, because the association of artists in the groups on certain criteria will ultimately be characterized by a high degree of subjectivity, which will affect the accuracy of the results. The estimated model of the dependence of the price of the painting on the size, technique, material, place of sale, the

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[19] Ginsburgh, V., Mei, J. and Moses, M. (2006), 'The Computation of Price Indices', in Ginsburgh, V. and Throsby, D. (eds.), Handbook of the Economics of Arts and Culture, Elsevier, North Holland, Amsterdam: 947-979.

[20] Anderson, R.C. (1974). 'Paintings as an investment'. Economic Inquiry 12, 13–25.

presence of the artist's signature, the participation of work in major exhibitions and the artist's experience is significant, and the share of the explained variance in prices is 0.76.

The main advantage of using hedonic regression is the inclusion in the sample of all available transactions, and not just a small subset, as in the case of regression of repeat sales. Consequently, its use makes it possible to substantially increase the number of observations. In addition, Chanel (1996)[21] note that although the repeat sales method and hedonic regression give approximately the same and unbiased results, the latter allows obtaining more accurate estimates with a smaller variance.

Also, hedonic regression allows the construction of indices for individual market segments because, in comparison with the repeat sales method, it yields more objective results if the number of observations is small (Ginsburgh et al., 2006). It is also worth noting that hedonic regression enables not only to build an index, but also thoroughly to investigate how various characteristics of an art object affect its price and return on investment.

However, it should be noted that the results obtained using this method are sensitive to the specification of the model, namely the quantity and quality of the characteristics included in the equation. Today, within the academic community, there is no unified opinion on the universal set of characteristics of paintings that should be taken into account when using hedonic regression for the construction of art indices. Ratnikova, Zhitkov (2014) note that the researcher is limited in advance in the set of available variables, since when analyzing auction databases, there is a problem of the absence of records in them about the full list of the owners of the picture or the plot of the canvas.

With the help of hedonic regression, it is possible not only to build an index of prices for works of art. The principle of its construction also helps to study in detail what characteristics of a particular object have a greater or lesser effect on pricing and profitability. Hedonistic models suggest the study of easily measurable properties inherent in the asset (size, authorship, technique), and the artist's characteristics (age, belonging to a particular era or technique). The results of the regression analysis point to the potential benefit for the investor concealed in each characteristic, the inherent "premium" - the propensity of art buyers to pay

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[21] Chanel, O., Gérard-Varet, L.-A. and Ginsburgh, V. (1996), 'The Relevance of Hedonic Price Indices: The Case of Paintings', Journal of Cultural Economics, 20(1): 1-24.

for the availability of this or that quality of the asset. Models also often suggest the study of properties inherent in the sale process: the time of the year or month in which the transaction was made, the name of the auction house or the number of applications. So, (Renneboog and Spaenjers, 2013) argue that lots, whose authorship is recognized for a certain artist, but this fact is not proven accurately, on average 52% cheaper than works whose authorship is proved by expertise. The work also calculated the premium for the presence of such properties as "performed in oil technology", "presence of author's signature", "self-portrait", etc.

Work (Lazzaro, 2006)[22] uses hedonistic regression to analyze the effect of the number of original paintings on Rembrandt's paintings on the price index of his works. Analysis of more than 5,000 auction transactions between 1985 and 1998 shows that earlier lifetime authorial layers have a positive effect on the price of an asset, and the contribution of earlier layers is greater than late and, especially, posthumous, not caused by the author's hand. (Pownall, 2014)[23] questions how the price of an asset is affected by the intensity of the colors used to create the work. The model has a variable RGB (red-green-blue), responsible for the intensity of the color. Each pigment can be composed of three main, red, blue and green, mixed in different proportions. A total of 255 values were assigned to the variable according to the number of intensity gradations adopted in the given color model. Empirical results showed that a decrease in the value of the variable by 10%, in other words, an intensification of the color by 10%, leads to an increase in the price, all other things being equal, by 4%.

Bakhouche and Thebaul[24] are building a price index for the work of Paul Cezanne and exploring their financial properties. Oil technology is more profitable than graphics, and larger work areas are more profitable than medium and small ones. For Cezanne's work, the

[22] Lazzaro E. (2006). Assessing quality in cultural goods: the hedonic value of originality in Rembrandt's prints. Journal of Cultural Economics. 15-40.

[23] Pownall, Rachel, 2014. Pricing colour intensity in contemporary art. Working paper.

[24] Baumol W. J (1986). Unnatural value: or art investment as floating crap game.The American Economic Review. 10-14.

law of one price is fulfilled, the yield from the portfolio composed of them is slightly negatively correlated with other investment assets.

The study using the CAPM model showed that systematic risk is not inherent in the selected assets, however, they lost to aggregate profitability and risk indicators. Although a negative correlation indicates the diversification of the financial portfolio using works of art, the relatively higher risk and relatively low yield still leave this issue open for discussion.

Furthermore, the choice of the functional form of the equation has a strong influence on the final result. Due to the aforesaid, application of this approach requires from the researcher a deep comprehensive knowledge of the field of characteristics inherent in the fine arts, as well as the mechanisms by which prices in the art market vary.

4. Hybrid approach

This method, originally developed for the Case real estate market, Quigley (1991)[25], was first used in the study of the art market not so long ago Locatelli Biey, Zanola (2005)[26]. It combines both hedonic regression and repeat sales methods, the former being used only for single sales, and the second for resale. By analogy with the hedonistic approach, the strength of the hybrid model is the use of all observations from the database of transactions. In addition, when constructing a price index by means of such a method, the variance of the estimates

coefficients is significantly reduced. However, it should be noted that the shift of estimates is leveled only in the presence of specific prerequisites (Ashenfelter, Graddy, 2006).[27]

Another disadvantage of the approach is the relative complexity of identifying variables that change over time (Locatelli Biey, Zanola, 2005). In the previously mentioned study Case, Quigley (1991) studied the pricing of real estate, which can be described by a small number

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[25] Case, K.E., Quigley, T.M. (1991). 'The dynamics of real estate prices'. Review of Economics and Statistics 73, 50–58.

[26] Zanola, R. (2007), 'The dynamics of art prices: The selection corrected repeat- sales index', Working Paper No.85, Department of Public Policy and Public Choice POLIS, University of Eastern Piedmont, January 2007.

[27] Ashenfelter, O. and Graddy, K. (2006), 'Art Auctions', in Ginsburgh, V. and Throsby, D. (eds.), Handbook of the Economics of Arts and Culture, Elsevier, North Holland, Amsterdam: 909-945.

of continuous variables, while for an exhaustive modeling of the pricing of objects of fine art, much more qualitative variables are needed. Due to the fact that in most cases time is accounted for by annual dummy variables, it is necessary to introduce a huge number of variables (Ginsburgh et al., 2006). Finally, the hybrid model does not bypass the bias of selection due to the use of the repeat sales method at one stage, which can lead to biased estimates.

In general, due to the narrow range of possible applications of this methodology, the potential strengths and weaknesses of this model remain the subject of future research.

5. Alternative methods of constructing art indices.

Within the framework of a number of studies on the art market, alternative methods for building art indices and estimating yields of investments in art are being developed in order to bypass the shortcomings of classical methods. So, Rengers, Velthuis (2002)[28] use multistage regression analysis. Locatelli Biey, Zanola (1999)[29] spread the habitual repeat sales model, adding a variable that is responsible for the risk and, therefore, taking into account likely market shocks that could affect the price of the art object during resale. Zanola (2007) is developing a two-stage regression of repeat sales to adjust the results to a possible shift in results due to a non-random selection of data for analysis. The same, but already for a hedonic model, Collins et al. (2007)[30], as well as Kraüssl, van Elsland (2008). As an alternative method, the hedonic price indexes based on the Heckmann model are also used in the academic community, which allow not only sold canvases to be taken into account in the sample, but also unsold pictures that were exhibited at auction (Ratnikova, Zhitkov, 2014).

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[28] Rengers, M. and Velthuis, O. (2002), 'Determinants of Prices for Contemporary Art in Dutch Galleries, 1992-1998', Journal of Cultural Economics, 26(1): 1-28.

[29] Locatelli Biey, M. and Zanola, R. (2005), 'The Market for Picasso Prints: A Hybrid Model Approach', Journal of Cultural Economics, 29(2): 127-136.

[30] Collins, A., Scorcu, A.E. and Zanola, R. (2007), 'Sample Selection Bias and Time Instability of Hedonic Art Price Indices', Working Paper No. 610, Dipartimento Scienze Economiche, Università di Bologna.

Based on the results of a comprehensive analysis of different approaches to constructing indices, their strengths and weaknesses, hedonic regression was chosen for the purposes of this study. Such a decision was made after studying the data structure in the sample, which does not contain as many observations as other works in this area due to the small number of available records on the transactions of Russian artists' canvases.

4. Practical Part

4.1 Comparative analysis of investments in works of art of Russian artists and other assets

4.1.1 The constraction of the hedonic price index of Russian art

Hedonic regression allows you to calculate the profitability of transactions and understand the overall picture of the market. But this approach has a clear drawback, which consists of the impossibility of taking into account all the characteristics of the picture in the analysis. Because the number may differ from the characteristics of the image or database, and most of the characteristics are subject to distortion due to the large influence of subjective evaluation. For example, the characteristics responsible for the authenticity, the presence of signature and dating.

For the purposes of this study, 1,326 transaction pictures (categories: painting and graphics) that were written by Russian artists (including Aivazovsky, Voloshin) for the period from 2000 to 2016 were selected. For selection, the author used the data of auction sales, posted on the analytical portal on ArtInvestment.ru.

Appendix 1 presents the distribution of transactions between 2000 and 2016, grouped by semi- year for the purposes of this study. Uniform distribution of observations by periods is ensured by the standard practice of the world auction houses for bidding twice a year, in the spring from April to May and in the autumn from October to November (J.Hodgson, Keith P. Vorkink, 2004)[31].

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[31] Hodgson D. J., Vorkink K. P. (2004), 'Asset Pricing Theory and the Valuation of Canadian Paintings', The Canadian Journal of Economics / Revue Canadienne d'Economique, 37(3): 629 – 655.

For each transaction, the following information was collected: the name of the artist, the date of sale, the year of creation (if any), the sale price, the size of the canvas, the auction house in which the transaction was made, the technique of execution, the basis material, the date or signature, the presence of provenance. The sale prices are expressed in US dollars.

The following characteristics of objects are painted, included in the sample. To categorical variables, the author attributed the artists, distributing them from 1-10, the Auction houses (1,2), the Base material (1,2,3,4,5), The execution technique (1-7), the signature (there is -1, there is no -2), provenance (there is -1, missing -2).
The analysis did not include lots for which the year of creation or the dimensions of the canvas was not available. Further in the text, the characteristics of the objects included in the sample will be 34ehaviou.

Figure 1: Descriptive statistics of continuous variables

Variable	Number of Observations	Mean	Standart Deviation	Min	Max
Year sold	1,326	2008,000	4,718712	2000	2016
Year created	1,326	1932,00	19,474562	1881	1983
Width	1,326	48,90693	34,76012	6,1	493
Height	1,326	50,90601	34,86741	8	288.9
area	1,326	3315,099	5630,785	48,1	52312
age created	1,326	52,9634	17,08548	15	96
price ($)	1,326	1797823	6762852	827	8.62e+08

Source: own creation

The year of creation of paintings varies from 1881 to 1983, and the artist's age when creating the work is from 15 to 96 years. Different canvases are considered – from 48.1 cm2 to 52312 cm2. The cheapest item in the sample is the painting by Natalia Goncharova "Composition" ($ 827), and the most expensive is the work of Mark Rothko "Orange, red, yellow" ($ 86.88 million).

Most of the transactions included in the sample were made in auction houses: Sovkom and Gelos. All listed houses are the largest players of the Russian market, the distribution of transactions between them is shown in Figure 2

Figure 2: Auction Houses
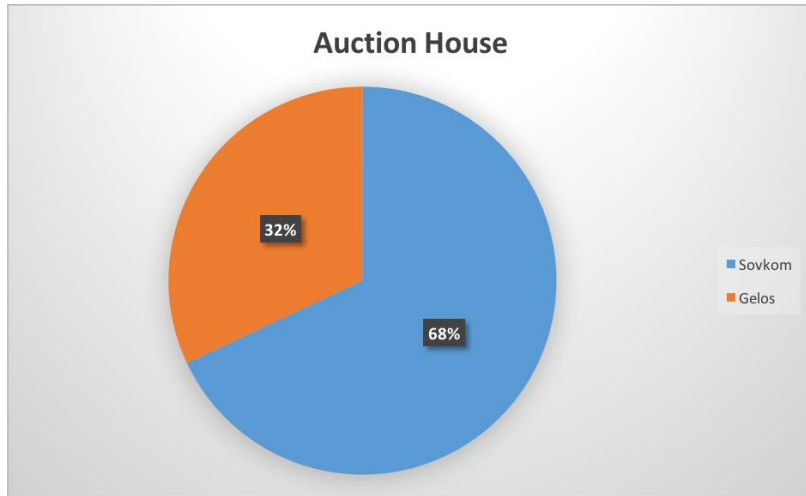
Source: own creation

The lots were divided into five groups, depending on the base material, which was used to create the picture (Figure 3). The categories "board" and "plywood" were united due to the similarity of materials. A small number of works on the tracing paper fell into the sample, so it was decided to combine these lots with the pictures made on paper.

Figure 3: Distribution of lots in the sample based on the basis materials
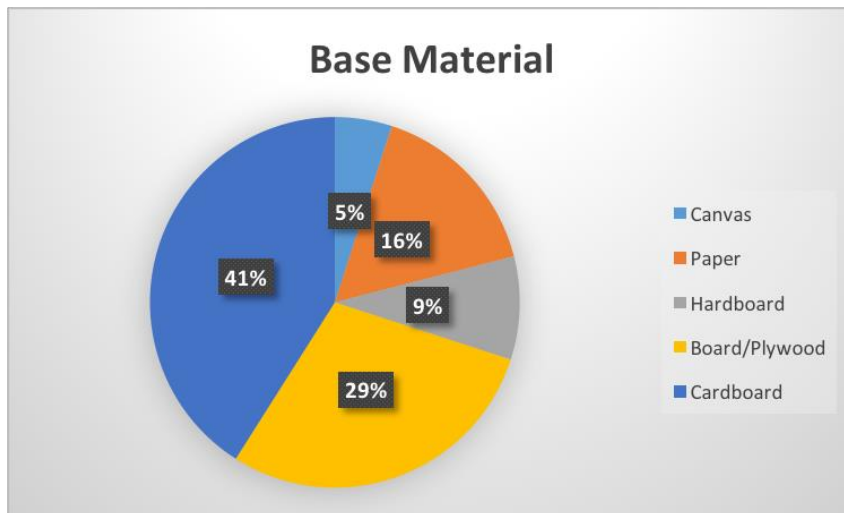
Source: own creation

As for the execution technique (Figure 4), it is not surprising that oil paintings are the most popular (54% of transactions in the sample).

Technique of execution

- Oil 54%
- Acrylic 7%
- Gouache 9%
- Pencil 4%
- Watercolor 7%
- Ink 13%
- Mixed painting techniques 6%
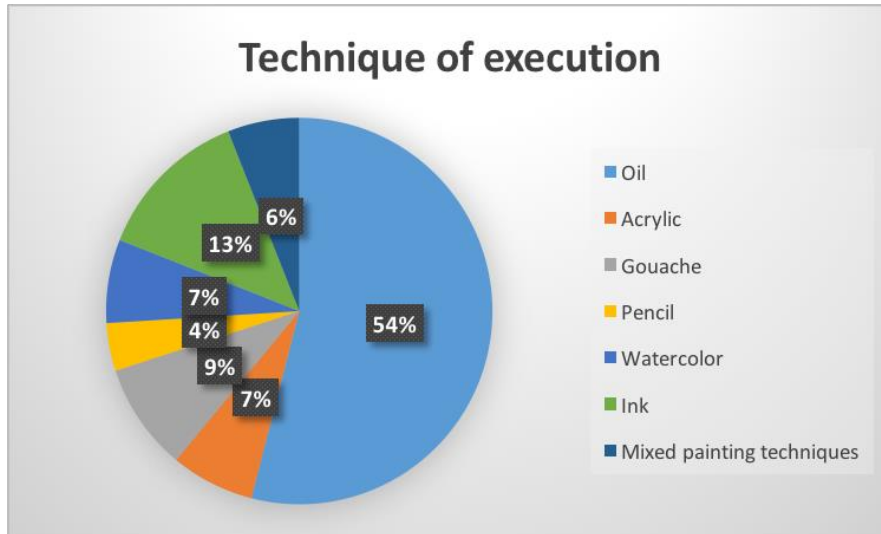
Based on the genre, the sample of assets was divided into six groups. Figure 5 shows that most objects are objects of abstract painting or graphics. This is explained by a campaign towards the choice of artists, most of whom wrote their paintings in the period of the emergence of various abstract movements in world art.

Figure 5: Distribution of lots in the sample by genre

Genre

- Oil 39%
- Acrylic 20%
- Gouache 7%
- Pencil 9%
- Watercolor 8%
- Ink 17%
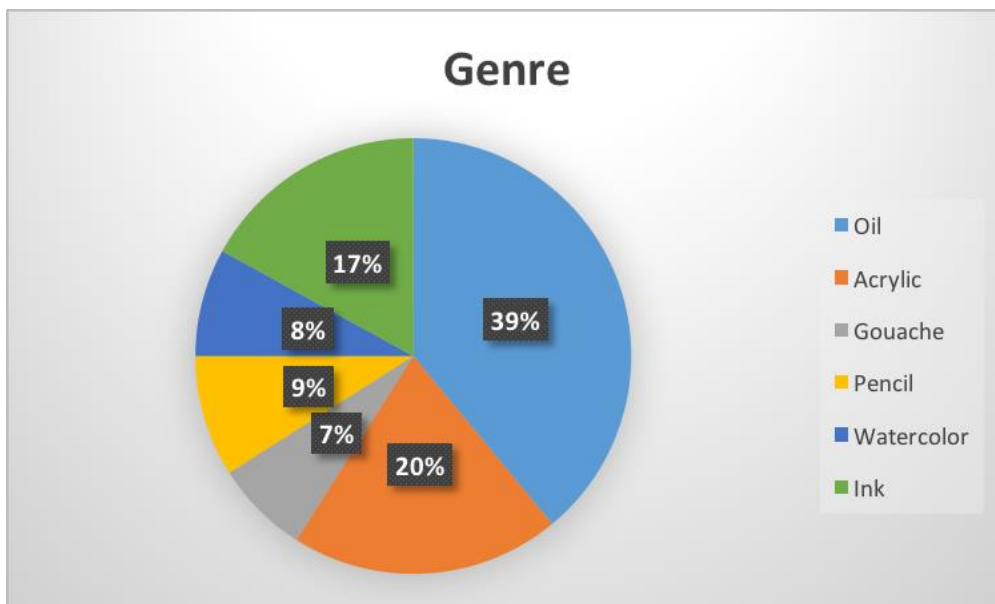
The principles of selecting the observations included in the sample certainly significantly reduce the number of observations compared to the total number of transactions entered in the catalog that is our source. However, at the same time, the volume limitation did not prevent the variety of characteristics and would allow the most detailed assessment of the financial 37ehaviour of assets under the current conditions.

Next is a description of the methodology of the hedonic price index, which is used in this study. The regression equation is specified as Czujack (1997)[32] :

$$\ln p_{it} = \sum_{k=1}^{K} \alpha_k Z_{ki} + \sum_{t=1}^{T} \sum_{j=1}^{J} \beta_j X_{jit} + \sum_{t=1}^{T} \gamma_t D_{it} + \varepsilon_{it} \tag{1}$$

Where **P** is the price of object **i** at time **t**, **x** is the individual characteristics of the object that do not change over time (for example, the size of the picture), **w** is the individual characteristics of the object whose presence or intensity may change with time (for example, the owner of the picture) **c(t)** is a dummy variable that fixes the time effect, for each individual year of sales, **εit** is an error.

At the first stage of the construction of the price index, a logarithmic form of hedonic regression (semi-log) was chosen, in which asset prices are taken in natural logarithms, and the characteristics measured by continuous variables are not logarithmic. The logarithm of both parts of the equation is one of the most popular approaches in assessing hedonic regressions, but for each individual data set, additional analysis is needed to identify the most appropriate functional form, as Ginsburgh et al. (2006), (Triplett, 2004).[33]

The "linktest" test or the Pregibon specification test tests the significance of the square form of the equation versus the importance of its linear form, and in our case reveals the insignificance of the variable "_hatsq", (The variable hat is the predicted value of the variable being explained, and _hatsq is the square of this value.)[34] which determines how the quadratic form fits our model. This is insignificant by 1% level of significance, which

[32] Czujack, C. (1997).'icasso paintings at auction, 1963–1994'.Journal of Cultural Economics 21, 229–247.

[33] Triplett, J. (2004). Handbook on Hedonic Indexes and Quality Adjustment in Price Indexes: Special Application to Information Technology Products. Brookings Institution.

[34] Financial analysis. [online]. (2017). Available from: http://www.stata.com/manuals13/rlinktest.pdf

indicates the correct specification of the model. The insignificance of the coefficient for the variable hatsq in the Pregibon test (1980) proves that the functional form was chosen correctly, while the double-log model does not pass the test for the correct specification within the framework of this study (Table 1).

Table 1: Test Pregibon on the correct specification of the model

```
      Source |       SS          df       MS              Number of obs =   1,323
-------------+------------------------------              F(  2, 1,320) = 2 412,79
       Model |  4573,47199        2 2286.73599            Prob > F      =   0.0000
    Residual |  1254.72733    1,320 .947757866             R-squared     =   0.7844
-------------+------------------------------              Adj R-squared =   0.7841
       Total |  5830.19932    1,322 4.39021003             Root MSE      =  .96312


       Rt_Rf |      Coef.   Std. Err.        T    P>|t|      [95% Conf. Interval]
-------------+----------------------------------------------------------------
        _hat |   .8578763   .1304696      6.55   0.000      .6011532    1.123099
      _hatsq |   .0058037   .0053882      1.10   0.273     -.0045606    .0141774
       _cons |   .8549338   .79928107     1.07   0.282     -.7130785    2.422966
```
Source: own creation

The first stage of the regression analysis showed good results – a high explanatory ability of the model (R2adj = 0.7728) and a large number of significant variables. However, several variables turned out to be insignificant. Based on the results of the F-test (Table 2), it is clear that the entire group of these variables can not be excluded from the model, because this will significantly affect the predictive ability of the model.

Table 2:Result of the F-test for checking the insignificance of the coefficient

```
( 1)  area = 0
( 2) area_sq= 0
( 3) 5.painter= 0
( 4) 6.painter= 0
( 5) 2.technique= 0
( 6) 3.technique = 0
( 7) 5.technique = 0
( 8) signature= 0
( 9) exibit= 0
( 10) provenance= 0
( 11) genre= 0
( 12) genre= 0

 F(12, 1261) = 3.65
Prob > F = 0.0000
```
Source: own creation

Author also tested the model for multicollinearity, which, however, could be deleted after orthogonalization. Appendix 2 shows the inflation index values for the variables included in the model.

Nevertheless, based on the results of the analysis of the coefficients of variance (VIF) under different variables, it was decided to exclude from the model the variables responsible for the presence of a date / signature, provenance. Possibly accounting for these characteristics of works of art it is necessary to define more precisely the variables above in the process of collecting data about the auction transactions.

In addition, from the model, the area variables are removed, because the dimensions of the canvas are already taken into account by the width and height variables. From the model, the categorical variables responsible for the performance technique were also excluded because of the high VIF.

The Ramsey test (Ramsey,1969)[35] is aimed at checking for missed variables, which are important for the model, and also shows that the model does not take into account some significant variables (Figure 7).

At this stage of the operation, the introduction of additional variables is impossible, because the initial set of selected characteristics was due to the structure of the information in the database.

Figure 6: Ramsey's test for the correct specification of the model

```
Ramsey RESET test using powers of the fitted values of Rt_Rf
        Ho:  model has no omitted variables
               F(3,1270) =  16.14
               Prob > F =  0.000
```

Source: own creation

The null hypothesis test Shapiro-Wilk is that a random variable has a normal distribution. If p-value> 0.01 (at the standard significance level), you can not reject the null hypothesis, that is, the random variable is normally distributed. In the opposite case, an alternative hypothesis

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[35] Ramsey, J. (1969) Tests for specification errors in classical linear least-squares regression analysis. Journal of the Royal Statistical Society.

is accepted – the random variable has a different distribution pattern.

In the analysis of this paper, the Shapiro-Wilk test rejects the null hypothesis of the normal distribution of residuals, since the P-value is less than 1% of the significance level.

Table 3: Shapiro –Wilk W test for normal data

```
    Variable |    Obs       W           V          z       Prob>z
-------------+--------------------------------------------------
           r |   1,323    0.97131     16.854     6.161    0.00000
```

Source: own creation

In the Breusch-Pagan test, the linear dependence of the dispersion of random errors on a certain set of variables is verified. The test checks for the heteroscedasticity of the regression model errors. (Figure 8)

Figure 7: The results of Breusch-Pagan's test for heteroscedasticity

```
Ho: Constant variance
        Variables: fitted values of ln_price

        chi2(1)      =      0,79
        Prob > chi2  =   0.3463
```

Source: own creation

P-value 0.3463 exceeds 1% of the significance level, therefore, the null hypothesis about the absence of heteroscedasticity is not rejected. The remnants of the model are homoscedastic. The final specification of hedonic regression is presented in Appendix 3.

The noted that the coefficients for temporary dummy variables 2000-2002 are insignificant, therefore, when interpreting the final results, this fact must be taken into account. The reason for the insignificance of these coefficients may be due to the low degree of accuracy of the information in the source database. The creators of the project ArtInvestment.ru note that the most valuable and practical information layer – the sales statistics for 2006-2016 is particularly completed on the site. Therefore, transaction data for 2000-2002 may be incompleted or not entirely accurate. Otherwise, the model estimated can be considered adequate based on the correct specification, the minor degree of multicollinearity, the lack

of heteroscedasticity and the relatively large proportion of the explained variance (R2adj = 0.7841).

The values of the Russian art price index were obtained by raising exponents to the power of coefficients for time dummies from the estimated hedonic regression (1) and bringing the values obtained to the base year, whose index value was taken as 100 (Aizcorbe, 2014). Figure 9 shows the dynamics of the Russian Art Index for the period from 2002 to 2016, constructed on the basis of the hedonic regression described above. For the base value of the index (= 100), the value of the index in the first half of 2002 was adopted.

Figure 8: The price index of Russian art for the period 2002 – 2016.
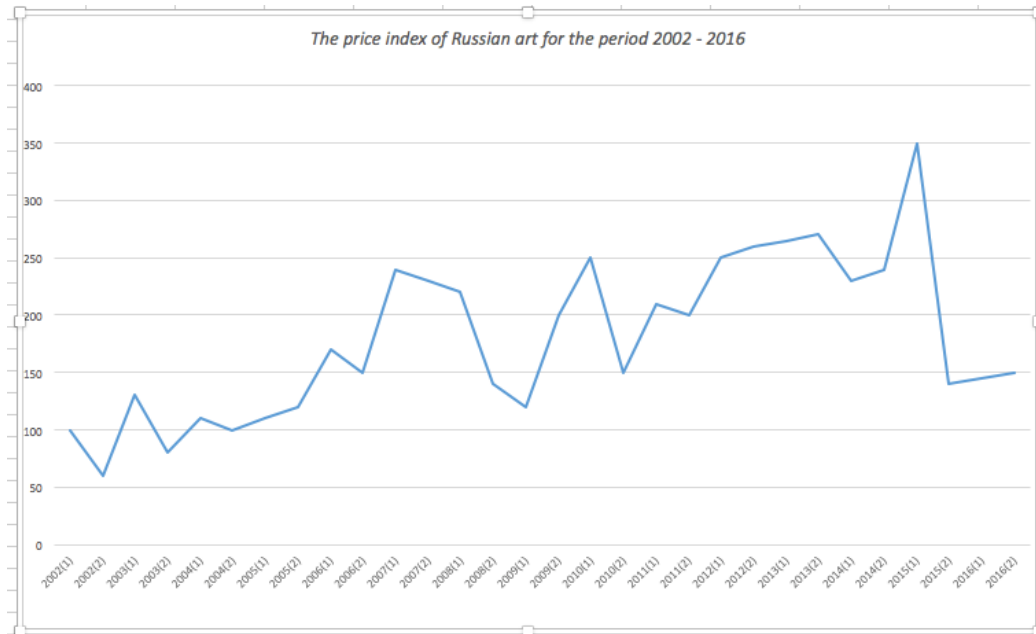
Source: own creation

The results confirm the findings of Kraeussl, Logher (2010) on the stable growth trend observed in the market of works of Russian art in the period from 1985 to 2007, and the subsequent fall in early 2008. It is possible to see that the dynamics in the market of Russian art and the world art market (Figure 10) is very similar, because probably, the markets are closely integrated or are influenced by the same factors.

Between 2002 and 2007, Velthuis (2011)[36] notes the growth in the world art market and associates this with the growing demand from emerging economies such as China, Russia, India, as well as with the increase in the material condition of citizens of Europe and the United States. After a period of active sustainable growth in early 2008, both the global and Russian art index falls. The decline in the art market is associated with a general deterioration in the economic situation in the world in these years. During this period, the largest auction houses noted a significant proportion of lots that were put up for auction, but never found a buyer (Li, Rose, 2009)[37]. The Russian art market is recovering in 2009, but analysts point to a protracted crisis in the global art market in 2010, which also affects the Russian segment.

The further positive trend observed both in the world and in the national market is connected with the growing popularity of online auctions and the expansion of the network of classical

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[36] Velthuis, O. (2011). 'Art Markets', in Towse, R. A Handbook of cultural economics, second edition. Cheltenham, Glos, UK: Edward Elgar.

[37] Li, X.-M., Rose, L.C. (2009) The tail risk of emerging stock markets. Emerging Markets Review 10, 242–256.

auction houses.

Analysts of Delloite in Art & Finance report 2016 pay attention to the collapse of the Russian art market in 2015, which is also seen in the analysis of the dynamics of the constructed index. And it is worth noting that the world art market fell not so much during this period. Probably, low oil prices, stagnation of the national economy, as well as Western sanctions caused the decline in the Russian art market. Experts are sure that at the end of 2016 the market has reached a bottom, then the situation is stabilizing and the market situation will be more favorable.

4.1.2 Comparison of investment in art and financial assets

In order to understand whether art objects are more attractive ones for investment in terms of risk-return ratio, it is necessary to compare them with others, more classical assets for investment. To do this, the author will use the Capital Asset Pricing Model. CAMP is widely used to assess the characteristics of traditional financial assets.
This model requires the following conditions:
• The main objective of investors is to maximize the expected utility. Expectations about profit margins are uniform.
• There should be a symmetry of information and perfect competition in the market.
• Investors have the opportunity to borrow risk-free assets at a risk-free interest rate.
The market in question does not always meet the above conditions, but the model's correction to reality does not significantly affect the operation of the model.

Russian shares (RTS index), Russian government long-term bonds (10-year Treasury bonds) and Russian government short-term bonds (3-month Treasury bills) were selected by the author as a group of assets for comparison. Table 4 presents descriptive statistics on the yields of the engineered art price index and other asset classes. The values were calculated at the end of each year on the basis of data for the period from 2002 to 2016 (fig 8,9,10). In addition, a comparison was made with the results of the work of other authors,

such as Kraeussl, Logher (2010) [38]

Table 4: Descriptive statistics of annual returns of various types of assets for the period 2002 - 2016.

	Russian art	RTS	10-year Treasury bonds	3-month Treasury bills
Arithmetic average rate of return	12,7%	17,88%	6,8%	2,40%
Geometric average rate of return	3,46%	8,32%	6,5%	2,34%
Median	2,8%	25,32%	6,7%	0,48%
Maximum	76,6%	59,30%	5,2%	5%
Minimum	-57,70%	-72,60%	1,5%	0,0%
Standard deviation	30,80%	28,22%	1,09%	1,5%
Skewness	0,35	-0,67	-0,02	1,24
Kurtosis	3,5	4,03	1,79	3,19
The Sharpe Ratio	0,18	0,27	1,94	

Source: own creation

The average arithmetic annual rate of profitability of the art market was 12.7%, which is consistent with the results of Kraeussl, Logher (2010), who received an annual return on investment in the Russian art market of 12.67%, considering the period 1986-2008. And also the results are consistent with the calculations presented in the report Delloite.[39] Art market yielded to the RTS index, which gained about 18%.

However, when comparing the average geometric annual returns, it is noticeable that Russian art loses many types of financial assets. So, the most profitable investments were investments in the RTS index (8.32%), which is an indicator of the Russian stock market, although it should be taken into account that the volatility of the latter is much higher. Geometric profitability of art investments (3.46%) exceeds only the yield of treasury bills with a maturity of 3 months (2.40%). However, the volatility of the return on investment in art is comparable to the volatility of the index of the Russian stock market. The coefficients of asymmetry and kurtosis slightly deviate from the normal values. This indicates that when investing in Russian art, an investor can equally expect both an excessively high yield and an excessively low yield. It can not be asserted that such a pattern is a characteristic of the art of all countries and eras.

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[38] Kraeussl R., Logher R. (2010). 'Emerging art markets'. Emerging Markets Review, 11: 301 – 318.
[39] Delloite: Art & Finance report.(2011). [online] Available from:
 https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Finance/gx-fsi-art-finance-report-2016.pdf

The attractiveness of investments in various types of assets can be compared based on the values of the Sharpe ratio (It is an indicator of the effectiveness of the investment portfolio (asset)), which shows how well the return on investment compensates for the risk that the economic agent incurs. From this point of view, the most attractive objects of investment for an average investor are ten-year treasury bonds (1.94), while the art index is characterized by one of the lowest values of the Sharpe ratio (0.18) in the entire sample. Similar results were obtained by Kraeussl, Logher (2010), comparing the Sharpe ratio of art indexes of Russian art with that of traditional investment objects.

The next stage in the analysis of the profitability of the selected assets is the evaluation of the CAPM model, formulated in the works of Sharpe (1964)[40] . In mathematical form this model can be represented as follows:

$$R_i - R_f = \beta_i \left(R_m - R_f\right) \tag{2}$$

Where R_i represents the return on asset **i**, R_f is the yield of the risk-free rate, R_m – expected market return, β_i – (Beta of the security), the indicator responsible for the market risk measure that is inherent in the asset under consideration **i**.

In general, the profitability of the risk-free asset in this model can be interpreted as the yield required as compensation for the deferred consumption.

The risk premium (R_m - R_f) includes a systematic risk that can not be avoided through diversification, and an unsystematic risk unique to each asset i. Beta-coefficient reflects the variability of the yield of an asset or portfolio of assets relative to the yield of a market portfolio, the beta factor of which is equal to 1.

In practice, CAPM is evaluated as follows:[41]

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[40] Sharpe, W. (1964) 'Capital asset prices: a theory of market equilibrium under conditions of risk,' Journal of Finance 19, 425-442

[41] Michal C.Jensen. (1968). 'The performance of mutual funds in the period', 389-416.

$$R_{it}-R_f=\alpha+\beta_i(R_{mt}-R_f)+\varepsilon_t \qquad\qquad (3)$$

If the theoretical ratio assumed by the CAPM model is met, then the constant α should be statistically indistinguishable from zero, which indicates that there is no permanent component in the asset's profitability, not explained by the risk in the market. The estimated coefficient βi shows which part of the asset's profitability (in our case, fine arts) is not related to market risk.

In this paper, the rate of three-month treasury bills (3-month Treasury bills secondary market rate) was taken as the rate of risk-free asset.

The CAPM assessment results for the Russian art index show that Russian art has a high beta-factor value (0.681). A similar result for the Russian market was received by Kraeussl, Logher (2010)[42] - 0.65, however these estimations are also not significant. Because the investor will look for assets with a negative beta factor for investing in order to hedge risks. Base on this estimations, Russian art with a positive beta factor is not a suitable tool for diversifying the securities portfolio.

The results of evaluation CAPM

Table 5: The results of the calculation of descriptive statistics for the yields of various classes of financial assets.

```
      Source |       SS       df       MS              Number of obs =      29
-------------+------------------------------           F(  1, 27)    =    1.56
       Model | .144445562       1   .144445561         Prob > F      =  0.2230
    Residual | 2.50671852      27   .928457827         R-squared     =  0.0545
-------------+------------------------------           Adj R-squared =  0.0195
       Total | 2.65117414      28   .094684431         Root MSE      =   .3047


------------------------------------------------------------------------------
   exr_ArtRus |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   m_premium |   .6817632   .5467774     1.25   0.223    -.4397321    1.808246
       _cons |   .0364845   .0578738     0.61   0.545    -.0832423    .1522112
------------------------------------------------------------------------------
```

Source: own creation

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[42] Kraeussl R., Logher R. (2010). 'Emerging art markets'. Emerging Markets Review, 11: 301 – 318.

```
      Source |       SS       df       MS              Number of obs =      29
-------------+------------------------------           F(  1, 27)    =    9.60
       Model |  .57445619        1   .06226597          Prob > F      =  0.0045
    Residual | 1.57671839       27  .068457859          R-squared     =  0.2623
-------------+------------------------------           Adj R-squared =  0.2350
       Total | 2.15117458       28  .074684456          Root MSE      =  .24258


------------------------------------------------------------------------------
  exr_RTSRet~n|    Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   m_premium |  1.348261   .4351446     3.10   0.005      .455418    2.241104
       _cons |  .0467239   .0460769     1.04   0.309    -.0467976    .1423454
------------------------------------------------------------------------------
```

Source: own creation

Table 7:The results of the calculation of descriptive statistics for the yields of various classes of financial assets.

```
      Source |       SS       df       MS              Number of obs =      29
-------------+------------------------------           F(  1, 27)    =    2.25
       Model |  .00224357        1   .000224357         Prob > F      =  0.1453
    Residual | .002693173       27  .000099747          R-squared     =  0.0769
-------------+------------------------------           Adj R-squared =  0.0427
       Total |  .00291753       28  .000104197          Root MSE      =  .00999


------------------------------------------------------------------------------
  exr_YTbill~n    Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   m_premium|  .0268689   .0179156     1.50   0.145    -.0098908    .0636287
       _cons |   .020301   .0018966    10.70   0.000     .0164094    .0241926
------------------------------------------------------------------------------
```

Source: own creation

The final results of a comparative analysis of the effectiveness of investments in various types of assets are presented in the Table 5.

Table 8: Rates of return and risk of the groups of assets

	annual yield	Beta
Russian art	12,70%	0,681
RTS	17,88%	1,348
10-year Treasury bonds	6,80%	0,026
3-month Treasury bills	2,40%	

Source: own creation

5. Conclusion

The Russian art market is extremely interesting for studying the object: the tradition of auction trading is at the stage of its formation, statistical data, including information on the total sales volume is absent. The market of Russian art is a developing art market. The analysis of this work was built on data collected from the electronic catalog of the portal "ARTinvestment.RU." Based on the collected data on the lots sold, the art index of Russian art was built for the period from 2002 to 2016. In constructing the index, the hedonic regression model was used as the basis, assuming that the price of a work of art depends on a number of its specific characteristics, (the size of the canvas, the plot, the material of the basis, the auction house, etc.).

An analysis of the dynamics of the constructed index showed that trends on the local art market practically coincide with the dynamics in the world market. This is due to the fact that at present the Russian art market is closely integrated with the world art market, as well as the fact that the situation in both markets is changing under the influence of the same factors. Among such factors, one can note the situation on the world financial markets, however, it is necessary to interpret its influence on the art market with a certain degree of caution. On the one hand, economic growth stimulates demand and supply, as a result of which the financial situation of buyers improves, and sellers expect prices to rise in the future. On the other hand, a favorable economic situation in the economy can have a negative impact on the demand for painting, because financial markets are becoming a more attractive alternative than the art market. In addition, the drop in the art market is observed immediately after the deterioration of the situation in the financial markets, but the growth in the art market should be lagged after the economic situation improves.

At the second stage of this study, various financial indicators were calculated for the art market and other more traditional assets from the perspective of investing. Between 2002 and 2016, the art index of Russian art is characterized by an average annual rate of return of 12.78%. In previous studies in this field for the period from 1986 to 2008, the average annual yield of 12.67% was obtained, which means that the return on investment is constant over time.

By return, investments in Russian art are second only to Russian stocks, whose dynamics are characterized by approximately the same volatility. However, the Sharpe ratio shows

that the return on investments in shares of Russian companies better compensates for the risk that the investor takes on than the investment in Russian art.

Comparative analysis of the forms of distribution of returns of the Russian art index 54 artists and a similar index of German painters showed that an investor not inclined to risk would prefer to invest their money in the first because of the normal distribution and the low probability of obtaining extreme returns.

According to the CAPM model to obtain estimates, Russian art with a positive beta-factor is not the appropriate tool for the diversification of the securities portfolio, as in the search for alternative objects for investing in order to hedge risks, the investor will look for assets with negative beta coefficients. . The above features prove that the market of works by Russian artists can not serve as a tool for diversifying the portfolio.

In general, art as an object of investment has a number of specific features. The studies mentioned in this paper consider only the material return from the purchase of works of art because it is impossible to take into account the emotional dividends from owning them. Further research, combining a deep art criticism and elements of financial analysis, can focus on the mechanisms for the formation of an optimal art portfolio, taking into account the specific features of specific styles, schools and trends within the Russian art market. The Russian art market is a market for heterogeneous goods with a low transaction frequency, but the development of a methodology for its study is necessary. A deeper market analysis would be possible in the face of more data on the results of auction sales.

In general, art as an object of investment has a number of specific features. The studies mentioned in this paper consider only the material return from the purchase of works of art because it is impossible to take into account the emotional dividends from owning them.

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7 Appendix

Appendix 1

Transaction distribution for the half-year between 2000 and 2016.

halfyear_so 1	Freq.	Percent	Cum.
2000:1	27	2.03	2.03
2000:2	27	2.03	4.06
2001:1	36	2.71	6.77
2001:2	32	2.41	9.18
2002:1	27	2.11	11.29
2002:2	38	2.86	14.15
2003:1	33	2.48	16.53
2003:2	31	2.33	18.74
2004:1	36	2.71	21.77
2004:2	33	2.48	24.15
2005:1	39	2.93	27.09
2005:2	29	2.18	29.27
2006:1	45	3.46	32.73
2006:2	33	2.48	35.21
2007:1	58	4.36	39.58
2007:2	26	1.96	41.53
2008:1	71	5.34	46.88
2008:2	35	2.63	49.51
2009:1	54	4.06	53.57
2009:2	34	2.56	56.13
2010:1	56	4.21	60.35
2010:2	28	2.11	62.45
2011:1	43	3.24	65.69
2011:2	32	2.41	68.10
2012:1	50	3.84	71.93
2012:2	27	2.03	73.87
2013:1	47	3.54	77.50
2013:2	42	3.16	80.76
2014:1	57	4.29	84.95
2014:2	38	2.86	87.81
2015:1	51	3.84	91.65
2015:2	40	3.01	84.66
2016:1	47	3.54	98.19
2016:2	24	1.81	100.00
Total	1,326	100.00	

Source: own creation

Appendix 2

Variable	VIF	1/VIF
age_created	2.44	0.409534
height	15.97	0.062643
width	7.95	0.125743
area	86.63	0.011504
area_sq	23.53	0.045507
painter		
2	2.13	0.469244
3	5.55	0.170335
4	7.96	0.125591
5	6.74	0.148425
6	7.32	0.136782
7	1.87	0.533940
8	7.51	0.133219
9	5.37	0.186322
10	1.96	0.510399
auct_house		
1	2.10	0.476420
2	1.99	0.502374
technique		
2	45.66	0.021888
3	25.01	0.039987
4	11.34	0.088203
5	16.78	0.059583
6	14.05	0.071247
7	13.95	0.071667
8	10.47	0.095475
signature	1.90	0.520186
provenance	2.12	0.471312
exiblit	2.00	0.499164
genre		
2	2.14	0.466735
3	1.73	0.576459
4	2.58	0.388265
5	1.64	0.609711
6	1.69	0.593163

halfyear_s~d		
2	2.03	0.491766
3	2.32	0.431092
4	2.23	0.448294
5	2.05	0.487758
6	2.39	0.417710
7	2.28	0.439198
8	2.19	0.457176
9	2.36	0.424578
10	2.21	0.453223
11	2.45	0.407651
12	2.07	0.473134
13	2.73	0.365933
14	2.25	0.445004
15	3.27	0.305001
16	2.09	0.478596
17	3.78	0.264581
18	2.44	0.410116
19	3.14	0.318816
20	2.39	0.418566
21	3.23	0.309122
22	2.13	0.468814
23	2.71	0.368903
24	2.31	0.432537
25	3.01	0.332068
26	2.08	0.480219
27	2.88	0.346921
28	2.70	0.370351
29	3.26	0.307084
30	2.51	0.398584
31	3.00	0.334718
32	2.61	0.383573
33	2.86	0.350231
34	1.96	0.510659
Mean VIF	6.45	

Source: own creation

Appendix 3

Result of regression analysis of the final model.

```
      Source |       SS       df       MS              Number of obs =   1,323
-------------+------------------------------           F( 55, 1269) =   63.46
       Model | 4573,47199       55  78,0239561         Prob > F      =   0.0000
    Residual | 1254.72733    1,269  1.206682           R-squared     =   0.7844
-------------+------------------------------           Adj R-squared =   0.7841
       Total | 5828.19932    1,224  4.39031003         Root MSE      =   1.0996


    ln_price       Coef.   Std. Err.       t    P>|t|     [95% Conf. Interval]
  age created   -.0129774   .0026888    -4.83   0.000    -.0182524   -.0077025
        width    .0069711   .0013683     5.09   0.000     .0042869    .0096554
       height    .0221116   .0016208    13.64   0.000     .0189319    .0252913

      painter
           2    .8694498   .2731101     3.18   0.001     .3336545    1.405245
           3    .0030287   .2085717     0.01   0.988    -.4061534    .4122108
           4    .8675774   .1845434     4.71   0.000      .505927    1.229228
           5    .3527108   .1978519     1.78   0.075    -.0356448    .7408664
           6    .4262476   .2016052     2.11   0.035     .0307226    .8217626
           7   -1.074212   .2975422    -3.61   0.000    -1.657743   -.4906814
           8   -.5193109    .218878    -2.37   0.018    -.9487121   -.0898597
           9   -1.512754   .2007623    -7.53   0.000    -1.905616   -1.117893
          10   -1.409847   .2820267    -5.00   0.000    -1.963135   -.8565585
 auction house
           1    .7169584   .0884831     8.10   0.000     .5433697    .8905471
           2    .7878119   .0882207     8.93   0.000     .6147378    .9608859
        genre
           2   -.0127839   .1162284    -0.11   0.912    -.2408042    .2152363
           3    -.060982   .1402433    -0.42   0.664    -.3361154    .2141513
           4   -.3656504   .1192865    -3.07   0.002    -.5997101   -.1316807
           5   -.2415539   .1272938    -1.80   0.058    -.4912825    .0081747
           6   -.7180853   .1542112    -4.66   0.000    -1.020621   -.4155492
```

halfyear_sold						
2000:2	-.0510928	.3030341	-0.17	0.866	-.645594	.5434084
2001:1	.1150306	.2818719	0.41	0.683	-.4379539	.6680151
2001:2	-.2977444	.282725	-1.02	0.309	-.8720209	.2765821
2002:1	.4619789	.2990638	1.54	0.123	-.1247333	1.048691
2002:2	.0979918	.2778637	0.35	0.724	-.4471293	.6431129
2003:1	.6385816	.2895273	2.31	0.028	.0705785	1.206585
2003:2	.3075311	.2923003	1.05	0.293	-.2659133	.8809734
2004:1	.5739452	.2832615	2.03	0.043	.0182345	1.169656
2004:2	.5121699	.2866117	1.89	0.074	-.0493133	1.075253
2005:1	.6848579	.2778371	2.46	0.014	.1391478	1.229168
2005:2	.7463113	.2959886	2.42	0.012	.1656322	1.32699
2006:1	1.068949	.2702993	3.96	0.000	.5386682	1.599231
2006:2	.9372208	.2882044	3.25	0.001	.3718529	1.502669
2007:1	1.314769	.2618195	5.03	0.000	.8031234	1.830414
2007:2	1.302533	.3085953	4.22	0.000	.697122	1.907945
2008:1	1.250019	.2542372	4.92	0.000	.7512493	1.748789
2008:2	.941043	.2857438	3.29	0.001	.3804625	1.501623
2009:1	.6750276	.2619187	2.57	0.010	.1601879	1.188867
2009:2	1.241988	.2867581	4.23	0.000	.6794175	1.804558
2010:1	1.416498	.2602772	5.44	0.000	.9056829	1.927314
2010:2	.9396423	.3010811	3.12	0.002	.3489726	1.530312
2011:1	1.273104	.2728201	4.67	0.000	.7378777	1.808331
2011:2	1.272425	.2901553	4.39	0.000	.7031903	1.84166
2012:1	1.417052	.263876	5.27	0.000	.8993724	1.934732
2012:2	1.419541	.3023259	4.70	0.000	.8264297	2.012653
2013:1	1.427197	.2678222	5.22	0.000	.9017755	1.952618
2013:2	1.457438	.2746768	5.41	0.000	.9185686	1.996306
2014:1	1.363397	.2602035	5.24	0.000	.8529221	1.873872
2014:2	1.38797	.2803419	4.95	0.000	.8379867	1.937953
2015:1	1.744063	.2639124	6.61	0.000	1.276312	2.261814
2015:2	.88564	.2777107	3.18	0.001	.340819	1.430461
2016:1	.8995804	.26682	3.37	0.001	.3761052	1.427016
2016:2	.9599768	.3102716	3.09	0.002	.3512769	1.568677
_cons	10.728	.333806	31.27	0.000	10.04361	11.38229

Source: own creation