



## ANALYSIS OF FINANCIAL IMPLICATIONS DUE TO THE ABSENCE OF INDIGENOUS AIRCRAFT LEASING ENTERPRISE IN TURKEY

DOI: 10.17261/Pressacademia.2019.1167

JBEF- V.8-ISS.4-2019(6)-p.235-246

**Nalan Gelirli**

University of Kyrenia, Faculty of Aviation and Space Sciences, Aviation Management Department, Kyrenia, Cyprus.

[nngelirli@hotmail.com](mailto:nngelirli@hotmail.com), ORCID: 0000-0003-2391-4967

---

**Date Received:** July 2, 2019

**Date Accepted:** December 10, 2019

---

### To cite this document

Gelirli, N., (2019). Analysis of financial implications due to the absence of indigenous aircraft leasing enterprise in Turkey. Journal of Business, Economics and Finance (JBEF), V.8 (4 ), p.235-246.

**Permanent link to this document:** <http://doi.org/10.17261/Pressacademia.2019.1167>

**Copyright:** Published by PressAcademia and limited licensed re-use rights only.

---

### ABSTRACT

**Purpose-** To determine the volume of outflows of foreign exchange due to aircraft leases of the Turkish airline companies and to examine the necessity of an indigenous company to prevent this outflow.

**Methodology-** Collecting data on current aircraft fleets of operating Turkish airline companies, classifying those airplanes by Type/Model/Determination of lease rates of the similar aircraft from aircraft lease finance market sources (Data Collection). Verification of data on lease rates on a selected mathematical model.

**Findings-** Estimation of annual volume of economics and outflows of foreign exchange due to aircraft leases of Turkish airline companies.

**Conclusion-** indigenous aircraft leasing enterprise in Turkey would avoid the flow of finance annually of around \$ 2,555,272,000 to out of country economies and would be one of major Lessor's in the top ten ranking which would provide lease services in the region and obtain additional income to Turkish Economy.

**Keywords:** Leasing, aircraft (airliner/airplanes) leasing, aircraft leasing company, aircraft lessors, aircraft leasing enterprise.

**JEL Codes:** R42

---

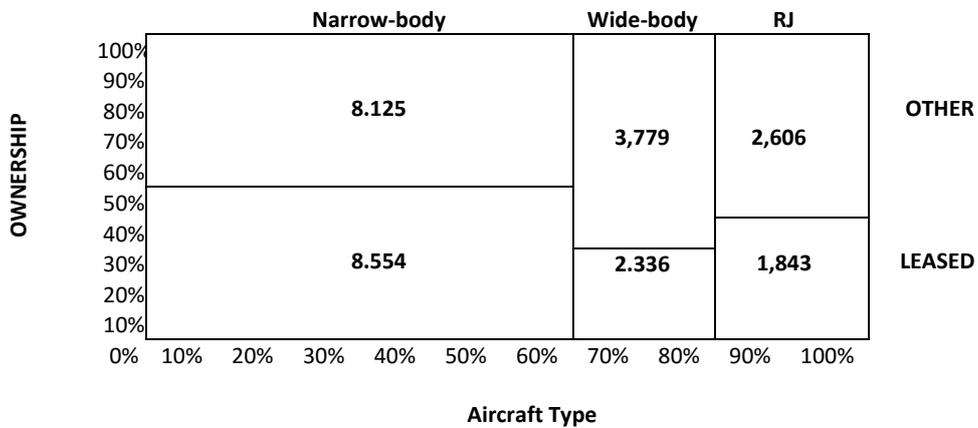
### 1. INTRODUCTION

In order to perform a healthy analysis of financial implications due to the absence of indigenous aircraft leasing enterprise in Turkey, a good understanding is required of the current global requirement and trend of the aircraft lease finance industry and subsequently have clear vision of the market growth forecast for the future. This overview will assist to analyze the position of Turkish Aviation/Finance market, to frame out the financial implications and provide a resolution of the matter.

Obviously, the main equipment and one of the largest costs to an Airline Operator is commercial Aircraft itself. Choosing whether to purchase or lease Aircraft is a major economic decision for both the academic and business world. As a method of financing, Leasing seems to be the more favorable option Operating lease of the aircraft gives the airlines flexibility in capacity management when demand for air transportation service is uncertain and cyclic (Oum, 1999). Especially as airline industry leasing appears to be increasing according to article published by (Scholnick, 2018) at Airline Economics Finance & Leasing Guide 2018 data, globally airlines operate a fleet of more than 27,000 commercial jet aircrafts with a valued worth of \$696 billion (active and inactive (parked aircraft).

By the last quarter of 2017, over 13,300 commercial jet aircraft valued at almost \$331 billion were airline operated worldwide on lease contracts, representing more than 49% of the fleet by value as shown below (Table 1).

**Table 1: Value Distribution of Global Jet Fleet by Aircraft Type and Ownership (# of Aircraft)**



Source: Scholnick, M. (2018, May) Airline Economics Finance & Leasing Guide 2018

As we can see in below trend, we can observe the rapid increase in demand of leased aircraft over the years where it forecasts 50% of the operating aircraft expected to be sourced on lease-based solutions (Table 2).

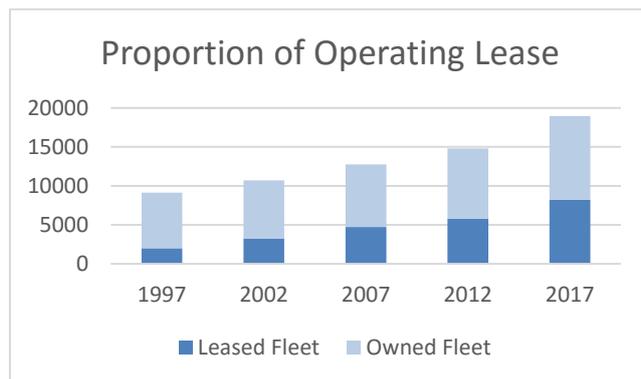
**Table 2: Evolution of Operating Lease Penetration between 1970 and Forecast by 2020**

YEAR	1970	1980	1990	2000	2014	2020
<b>Market Fleet</b>	3722	6037	9160	15032	20726	Forecast
<b>Leased Aircraft</b>	17	100	1343	3715	8440	Forecast
<b>Market Share</b>	0.5%	1.7%	14.7%	24.7%	40.7%	Over %50

Source: Scholnick, M. (2018, May) Airline Economics Finance & Leasing Guide 2018

Another similar forecast presented by Aercap Leasing Company CIO Edward, Ted O’Byrne (2017), where almost identical figures were forecast), (Table-3). Over the past 20 years the world fleet doubled while the operating lease fleet quadrupled.

**Table 3: Proportion of Global Fleet on Operating Lease**



Source: O’Byrne E. (2017, September). Aercap Leasing Company CIO presentation World Financial Symposium 27 – 28 September 2017 Convention Center Dublin (CCD), 7.

The decision to lease is based primarily on financial considerations rather than on strictly operational factors. Leasing is thus considered as alternative source of capital by management says (Gritta and Lynagh, 1973)

if we have a quick look into main reasons of why airlines are preferring the leasing option rather than purchasing the aircraft, we can easily see the below benefits for airline operations;

1. **Lesser startup costs:** Better utilization of startup investment capital on airplane fleet since number of airplane sourcing via leasing is more than purchase quantity
2. **Flexibility of possession:** Pay a fixed monthly 'rental' for the term of the lease and hand the aircraft back at the end of the term which provides clear accounting visibility to airline where it represents a healthy figure for business planning
3. **No residual value risk:** With an operating lease we take on all the risk associated with the residual value of the aircraft at the end of the lease.
4. **No balloon payment:** Under the terms of debt financing there is often a large 'balloon payment' at the end of the loan. With leasing there is no balloon payment. The lease payments just stop at the end of the lease term.
5. **Flexible use of assets:** Further reducing the risk profile of your financing strategy. The lease rates payable depend on the equipment chosen and the length of the lease.
6. **Access to the latest technology:** Having the airplane in the fleet only limited time with lease term, provides opportunity for renewal of fleet with newer equipment where newest technology provides plus values in market competition
7. **Availability:** Aircraft Manufacturers primarily focused on bulky orders and such orders are mainly raised by Aircraft Lease Finance companies in large numbers hence airline purchases generally is not the priority for the main aircraft manufacturers hence due to limited production slots, typical waiting time for a lease company would be 2 years where that would be longer for an airline depending on quantity and volume of their purchases

*Note: Depending on the existing financial capacity and structure airlines may have additional benefits other than above depending on also where airline is based and operating conditions.*

#### Major Stake Holders of Global Aircraft Lease Stakeholders

Major stake holders of global aircraft lease industry are generally operating as sub corporations of existing major finance organizations [see below Table 4 which are already been established in terms of capital and financial infrastructure which provides them major financial advantage during their procurement of equipment from major Aircraft OEM's (Shamshad, 2013).

**Table 4: Financial Alliances of Aircraft Lease Finance Companies**

	Lessor	Fleet\$	Unit	Key Backers
1	GECAS	34.6	1759	GENERAL ELECTRIC
2	ILFC	27.8	1031	AIG
3	AerCap	8.4	326	NYSE listed, backed by CERBERUS CAPITAL
4	BBAM	7.8	327	BBAM Mgmt and FLY Leasing
5	CIT Aerospace	7.5	263	CIT Group, USA
6	BOC Aviation	6.7	179	Bank of China
7	RBS Aviation Capital	6.7	246	Sumitomo Corporation, Japan
8	AWAS	5.2	224	Terra Firma, CPPIB and others
9	Aviation Capital	4.8	245	Pacific Life Insurance, USA
10	Aircastle Advisor	3.7	140	NYSE listed, backed by FORTRESS
11	Macquarie Air Finance	3.6	156	Macquarie Group, Australia
12	Air Lease Corporation	3.5	97	NYSE listed, backed by PE houses and Banks S
12	Doric Asset Finance	3	27	Focusing on A380S via LSE Listed Investment Companies
14	China Development Bank Leasing	2.9	70	China Dev, Bank, HNA Group, Xi'an Aircraft Industry Group

Source: Shamshad, A. Hampson N. (2013, January) PwC Aviation Finance Report 2013

Note: Intend of this table as to demonstrate the connections between major aircraft lessors and finance organizations due to dynamic industry movements, content and figures may slightly differ as of today's actual data.

As the passenger numbers continue to rise globally, airlines have demanded more lift from aircraft leasing companies, which have grown in scale and number). According to article published by (Woods, 2011) in Economics the Aviation Industry Leaders Report only in 2018 the leased aircraft portfolio increased by 629 aircraft to 8,109 aircraft and same report informs that 100 new names have entered the commercial operating lease sector over the past decade. Especially China and famous Chinese banks started to show up in aircraft leasing industry with strong liquidity and financial funds. To understand global volume of current leasing market Table 5 demonstrates the latest current ranking of the top 6 aircraft leasing companies as end of 2018.

**Table 5: Top 6 Leasing Companies (Ranked by Number of Aircraft)**

LESSOR	TOTAL PORTFOLIO	ON ORDER	EST.PORTFOLIO VALUE	CURRENT RANK
GECAS	1.229	369	23,602	1
AerCap	1.056	362	32,975	2
Avolon	521	400	18,725	3
BBAM	498	0	20,499	4
Nordic Aviation Capital	471	48	6,285	5
SMBC Aviation Capital	422	196	15,723	6

Source: Woods, T. (2019, October) Airline Economics the Aviation Industry Leaders Report 2019

Note: Aircraft portfolio count includes all in service & stored jets and more than 50 seat turboprops managed by operating lessors, all roles (owner/asset manager). On order aircraft excluded from estimated portfolio value.

## 2. LITERATURE REVIEW

As it is shown in introduction section, aviation industry has rapidly grown globally over the last decades. This growth is also observed within Turkish aviation market and the facts and figures report published by Turkish DGCA. Also, such growth, which is a significant case to analyze to have an idea on financial volume and financial implications due to absence of indigenous aircraft leasing abstract enterprise in Turkey.

Due to insufficiency of academic publications or analysis of the aviation lease facts for Turkish airline industry and aircraft operators, the review of literature was more from global publications in areas of Financial Leasing Management, Asset Management, Airline Revenue Management and Aircraft Specific Leasing Sources. Collected data from domestic sources are classified and optimized as be able to use during analysis based on academically accepted methodologies in this study.

Selection criteria for use of references and publications were based on ease of use and understanding without going into deep sophisticated theoretical approaches, as to clarify the criteria with and example. It is possible to find various mathematical formulas on aircraft lease calculation methods published in different times and in different academic papers. It has been noticed that some of those mathematical models would be too complicated to test with actual available figures of the market parameters hence mathematical formulas provided by Timothy R. Mayes (Ph.D.Professor of Finance at Metropolitan State University of Denver) seem be most suitable for sake of simplicity ([www.tvmcalcs.com/index.php/calculators/apps/lease\\_payments](http://www.tvmcalcs.com/index.php/calculators/apps/lease_payments)).

Some of the market data and financial figures were collected from web site databases which are often used by aircraft lease and finance industry role players. The website [www.airfleets.net](http://www.airfleets.net) provides the production date of each aircraft based on manufacturer serial numbers and shows the current operator / country of registration. That web data base was used to analyze Turkish Aviation Fleet and it was possible to verify the accuracy of the provided data by comparing Turkish aviation market and facts and figures report published by Turkish DGCA. Additionally [www.speednews.com](http://www.speednews.com) and <http://www.airfax.aero> were another useful sites where major role players of aircraft lease industry advertises and offers their available aircraft for both sale and lease transactions with airline companies.

Brand new Aircraft List Prices are announced by aircraft manufacturers in different sources however we know that those listed prices do not reflect the actual prices which are paid by aircraft lease finance Companies when they acquire the aircraft. As to be able to increase the profitability and have competitive offers, leasing companies are generally purchasing aircrafts in large numbers with significant discounts which are generally kept as corporate secret. The one of the ways to have a good estimate on discount rates would be scanning of financial newspapers and web sites to catch some news on aircraft lessors' purchases where total volume of purchase, type of aircraft, number of aircraft and delivery dates would be available. With those figures we would be able to calculate the unit prices of the aircrafts and compare with the applicable manufacturer list price which would expose the discount rate. The Analysis published by Bhaskara (2014) at [www.airwaysnews.com](http://www.airwaysnews.com) on Delta Airlines Purchase Order for Airbus A350 & A330 widebody aircraft had enough details to be able to have obtain a good estimate on actual acquisition price; Other good sources were as follows;

Ryanairs Boeing 737-800 purchase which was published by David, M. E. (2013) in Forbes.

Aercaps 2016 purchases published at <https://www.aerotime.aero> (2017).

<https://www.bloomberg.com> (2018) on HNA's Avolon purchase from Airbus.

All the aforementioned articles show us that depending on the volume of purchases. It is possible to obtain significant discounts from the published list prices which may vary from 45% to 60%.

Asset depreciation along the lease term and the useful life of the asset is dependent on the operational environment and it may show significant variation between operating geographies, cultures and utilization characteristics which are driven by many unpredictable parameters. Therefore, the best data on regional depreciation of aircraft would be statistical data used by Leasing companies, or domestic airlines. Documents published by IATA (IATA Airline Disclosure Guide Aircraft acquisition cost and depreciation 2016) provides the basic statistical information on Depreciation Rate, Aircraft/Fleet Type Useful life (UL), Residual Value (RV) from the different Airlines of the world, one being Turkish Airlines. Since more than half of passenger aircraft operated in Turkey are in operation with Turkish Airlines, these figures could be used as an average for the whole industry.

### 3. DATA AND METHODOLOGY

#### 3.1. The Data

In order to perform analysis on financial volume of the Fleet of Turkish Passenger Aircraft Operators it is highly important to have a good snapshot of the equipment used. In terms of the following data such as, Manufacturers, Types / Models, Age of Fleet, Quantities of the Aircraft based on Models and Type of Leasing preferred by Turkish Passenger Aircraft Operators. All the required data was collected from reliable aviation sources such Turkish Directorate of General Civil Aviation Activity Report (2018) based on last 15 years figures.

Numbers contained within collected data may vary over time due to financial fluctuations, political changes and market supply and demand balances. However, if we consider the number of aircraft as an indicator parameter, increasing trend provided, shows that the outcome of this report is expected to be valid for next decade. According to Turkish DGCA Activity Report 2018, Turkish Aviation market consist of 11 Airline companies, operating in a total of 515 Passenger aircraft, 485 of them are passenger class airplanes with more than 50 seat capacity (see Table 6), the same report provides the details of the aircraft type and trend of fleet growth over the years. Unfortunately, the subject report issued by Turkish DGCA does not indicate the exact number of aircraft which are own assets of Turkish Operators, however we know the market fact that Turkish operators prefers to import their aircraft through a third-party leasing company due to vehicle taxation system of Turkey. Therefore, it would be wrong to consider the subject fleet as a leased fleet for calculation assumptions of forthcoming sections of this paper.

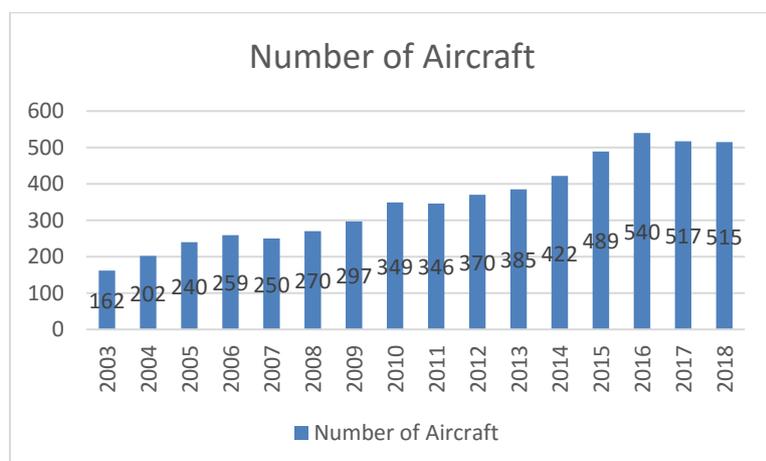
**Table 6: Types and Quantities of the Passenger Aircraft Types Operated in Fleets of Turkish Airline Companies 2018**

	Make	Aircraft Model/Type	Unit		Make	Aircraft Model/Type	Unit
Narrow Body Fleet	Airbus	A319	7	Wide Body Fleet	Airbus	A330	67
	Airbus	A320	72		Airbus	A340	4
	Airbus	A321	88		Boeing	B777-300ER	33
	Boeing	B737-400	5				
	Boeing	B737-800	185				
	Boeing	B737-8 Max	8				
	Boeing	B737-700	1				
	Boeing	B737-900ER	15				
Total Narrow Body			381	Total Wide Body			104
TOTAL UNIT IN TURKISH AIRLINE INDUSTRY: 485 AIRCRAFT							

Source: Turkish DGCA Activity Report (2018)

Note: Aircraft Types and quantities above showing the passenger aircraft fleet, excluding Freighter type aircraft and distribution to body classification shows that Turkish Airline companies Operates 381 Narrow Body (single aisle) and 104 Wide Body Aircraft (double aisle).

Above listed 4 each B737-400 narrow body airplanes are operated by Tailwind Airlines and 4 each A340 wide body airplanes operated by Turkish Airlines shall be excluded from forthcoming analysis due to their age and ownership to airline.

**Table 7: Trend of Fleet Growth over the Years in Turkish Airline Industry**

Source: Turkish DGCA Activity Report 2018

Note: Aircraft types and quantities above includes freighter aircrafts.

Based on analysis out of Original Equipment Manufacturer (OEM) production data published in [www.airfleets.net](http://www.airfleets.net), age factors can be obtained for manufacturer Serial Numbers operated by the Turkish Airline Industry as follows, for Wide Body Boeings 4.86 years old, Wide Body Airbuses 5.35 years old, Narrow Body Boeings 5.34 years old and Narrow Body Airbuses 6.22 years old (as of 2019).

### 3.2. Types of Leasing Preferred by Turkish Passenger Aircraft Operators

There are many lease finance methods and options available for operators offered by aircraft lease finance industry which can be also tailored for specific needs of the lessee however most common type of the leasing are Operating Lease, Finance Lease and Lease Purchase.

**Operating Lease:** The Commercial Aircraft Finance Handbook defines the Operating Lease as a “financial structure where the owner of the equipment (the operating lessor), rather than the lessee, retains most of the benefits and risks of asset ownership. Operating Leases do not usually provide the lessee with an option to terminate the lease prior to its scheduled termination date”. In other words, it is a right to possess and use an asset for an agreed period conveyed for consideration by the operating lessor to the operating lessee. Which is commonly used by Limited budget airlines and operators, typical Lease Term is generally five years with contractual extension options as agreed between lessee and lessor (Scheinberg, 2017).

**Finance lease:** A type of lease that transfers substantially all risks and rewards incident to the ownership of an asset. Title may or may not eventually be transferred.

**Lease Purchase:** Type of Lease where all the payments, terms and conditions structured under purchase agreement and title ownership passes to lessee once all contractual obligations are fulfilled.

The Turkish Airline industry is known to be very sensitive to financial fluctuations and geopolitical factors due to country's location and overall financial strength; therefore it is very crucial for Turkish airline companies to be flexible in terms of fleet size which enables them to control the costs and expenditures, hence long term planning can be highly risk and lease purchase options structured financial commitments may end up with serious financial difficulties. Especially for private owned airlines which are at higher risk, since their passenger transportation activities mainly depend on country's tourism and seasonal traffics. Therefore, majority of aircraft operated in Turkey are temporarily imported aircrafts operating with lease contracts of typically 5 years; therefore, we will build our analysis on Operating Lease concept.

### 3.3. Manufacturer List Prices for Aircraft and Discount Factor

Classification of Invested Capitals are market value and book value (Damodaran, 2017) is a realistic definition for Aircraft investments and financing

Aircraft Manufacturers issues average list prices for their products on type and model basis however those listed numbers are intended to be more indicative numbers for one time buyers, it was not a secret that those numbers would be dramatically

discounted (up to 60% ) for aircraft lease finance companies bulk orders, however the discount rates were always kept as commercial secret between aircraft manufacturers and aircraft lease finance companies; The only reliable sources for healthy estimations would be from press releases on purchases, a typical example of that kind of news would be the analysis published by *Vinay Bhaskara* at [www.airwaysnews.com](http://www.airwaysnews.com) (2014) on Delta Airlines Purchase Order for Airbus A350 & A330 and Ryanairs Boeing 737-800 purchase published by *David*, 2013.

Both press analysis already indicating that Aircraft Manufacturers are able to make discounts between 40% to 60% depending on deal size and it was just that secret revealed by the Financial Express based on Reuters news February 14, 2019 where airbus announcement on up to 50% discount off the list prices

Therefore, in this study as a Lease Amount (Asset Value) we shall use that official discount rate which is already officially publicized as 50% by Airbus, below Table 8 compiled out of 2018 List prices announced by major aircraft manufacturers mainly operated by Turkish Airline Companies, the data in this table shall be our basis in our lease calculations

**Table 8: 2018 List Prices Announced by Major Aircraft Manufacturers**

BOEING		AIRBUS	
Airplane Families	in millions average	Airplane Families	\$ in millions average
737-700	89.1	A220-100	81
737-800	106.1	A220-300	91.5
737-900ER	112.6	A318	77.4
737 MAX 7	99.7	A319	92.3
737 MAX 8	121.6	A320	101
737 MAX 200	124.8	A321	118.3
737 MAX 9	128.9	A319neo	101.5
737 MAX 10	134.9	A320neo	110.6
747-8	418.4	A321neo	129.5
747-8 Freighter	419.2	A330-200	238.5
767-300ER	217.9	A330-800 (neo)	259.9
767-300 Freighter	220.3	A330-200 Freighter	241.7
777-200ER	306.6	A330-300	264.2
777-200LR	346.9	A330-900 (neo)	296.4
777-300ER	375.5	A350-800	280.6
777 Freighter	352.3	A350-900	317.4
777-8	410.2	A350-1000	366.5
777-9	442.2	A380	445.6
787-8	248.3		
787-9	292.5		
787-10	338.4		

Figures are based on OEM official Press Releases for 2018

Source: OEM (Airbus/Boeing) official Press Releases for 2018

### 3.4. Residual Value and Depreciation

As like any other asset, aircrafts are subject to depreciation to their values over the time due to wear and tear of the equipment and enhanced technologies of supplied later versions of the equipment.

Typical residual value and depreciation in Aircraft leasing industry is based on discounted net cash flow principles (DCF) which is reasonably explained by (Żelazowski, 2014) where principles of RV are based on long term cash flow and the physical depreciation and functional obsolescence of tangible assets

Residual value would be defined as the value of the aircraft at the end of lease term after depreciation of its value. A paper issued by (Riaz,2016) "Valuation of Lease Contracts in Continuous Time with Stochastic Asset Values" provides almost linear depreciation in lease value, however we shall use a fully linear depreciation for 20 years of ultimate life of the Aircraft.

When it comes down to understanding the depreciation calculation of an airplane operating in Turkey, we can use the data from IATA Airline Disclosure Guide Aircraft Acquisition 2016 for Turkish Airlines (THY) Aircraft Residual Value After Depreciation of 20 Years is 10%-30%

Reflection of this data to the whole Turkish Airline Operator Fleet shows a healthy assumption that data which we can use below of Residual Rates and figures show on average 15% End of useful lifeline;

Airbus Narrow Body: 74% residual rate for based on average age of 6.22

Boeing Narrow Body: 76% residual rate for based on average age of 5.34

Airbus Wide Body: 77% residual rate for based on average age of 5.35

Boeing Wide Body: 79% residual rate for based on average age of 4.86

### 3.5. APR-Annual Percentage Rate/ Interest Rate

Interest Rate is the Annual Percentage Rate where a simply cost of money reflects all the costs of the loan during a one year time period, in other terms it is simply the value of money versus other investment tools at the defined period.

At the time of lease agreement executions lease payments are specified in US Dollars and the interest rate implicit in the lease is not readily determinable hence this is where most of the risk taken by Aircraft Lease Finance Companies. The annual percentage rate is determined by lessors in different ways depending on their financial environment and financial instruments they refer to such FED interest rates, Government Bonds and other financial factors.

Numerical determination of APR for an aircraft lease agreement is generally one of the major negotiation factors between Lessor and Lessee.

During this study we shall consider the APR / Interest rate is equal to average of United States Fed Funds Rate for last 10 years due to average age of the fleet operated by Turkish Airline companies and available statistical data

Considering the highest FED annual interest rates during our study would give a fair approach for the sake of coverage on lessor risks, hence our calculational rate will be 2.60% during this study based on Federal Funds Rate - 62 Year Historical Chart, (2019, June).

### 3.6. Calculation Method of Lease Payments

As it is been explained in section 2 of this study, it is possible to find many mathematical models on matter of determination of lease payments which are generally expressed with sophisticated formulas. It is chosen the proposed formula by Financial Analysis with Microsoft Excel by *Mayer 2014*, which enabled this study to use excel to test the figures and obtain quick and realistic results,

$$Pmt = \frac{PV - \frac{FV}{(1+i)^N}}{\left[ \frac{1 - \frac{1}{(1+i)^N}}{i} \right]}$$

Where;

**Pmt:** Monthly Lease Payment

**PV:** Lease Amount (which is value asset and in this study that will represent the Aircraft Value which shall be extracted out of Manufacturer List Prices

**FV:** Residual Value

**i:** Monthly interest Rate (1/12 of yearly average interest rate)

**N:** Lease Term (duration of Lease)

**Lease Term** is the duration of operational lease which is typically applied as 5 year per lease contract with airlines and if we consider the useful life of a passenger airplane as 20 years that would mean in ideal circumstances an aircraft shall be subject to 4 Lease term since its birth as follows as commonly classified in aviation;

1st Run: 0 to 5th Years

2nd Run: 5th to 10th Years

3rd Run: 10th to 15th Years

4th Run: 15th to 20th Years

#### 4. ANALYSIS OF THE LEASE VOLUME OF TURKISH AIRLINE INDUSTRY

After setting all numerical assumptions based of statistical data and mathematical model, we may use spreadsheets where mathematical method and assumption data operated

Our aim is to have a good and realistic calculational values which we can compare with actual market lease values for the sake of secondary verification; we shall use the data published on Trends and Market Analysis of Aircraft Values report [25 Jan 2016] by [www.aircraftvaluenews.com](http://www.aircraftvaluenews.com) of Access Intelligence, LLC and IBA ISTAT LEASE RATES 2017 data as published at [airliners.net](http://airliners.net) which were readily available; deviations between the calculated values and market sampling is expected to be due to aircraft configuration and technical options, daily marketing and actual competition conditions at the time of lease.

##### 4.1. Fleet Monthly Lease Rate and Total Volume Analysis

Mathematical Correlations between Capital leases for aircraft, Operating leases for aircraft and Aircraft purchases based on Asset Value are modelled in detail by Chen et.all (2018) and using the provided concepts, we can analyze the relation between unit cost and lease rate.

Below in Table 9 where monthly lease rates are calculated based on assumptions and method in chapter 3 of this study and also testing parameter from the market values (MPR) shows that all calculations are well in market range except A319 and B737-8 Max types, Airbus A319 type aircraft are the lowest passenger capacity type of narrow body airliners therefor A319 type market is highly affected with Regional jet aircraft types such Embraer, Bombardiers (which are typically 70 to 100 seat segment of aircraft). Other failure observed on Boeing 737-8 Max family is simply due to unsettled marked of that type in Aircraft Lease world after taking into consideration that type was introduced to market just in May 2017.

If we check the differences between calculated monthly leases vs Test numbers (MPR) in failed calculations, we can still consider this delta within market competition range and are possible numbers in daily market competition and supply demand variations

**Table 9: Narrow Body Fleet Monthly Lease Rate and Total Volume Analysis**

		AIRBUS AIRCRAFT			BOEING AIRCRAFT			
		A319	A320	A321	B737-700	B737-800	B737-900ER	B737 8 MAX
	OEM List Price (Millions USD)	90,5	99	166	80,6	96	101	110
	Discount Factor (45% - 60%)	50	50	50	50	50	50	50
<b>PV</b>	Lease Amount (Asset Value) (Millions USD)	42,25	49,5	58,00	40,3	48,00	50,5	55,00
<b>RV</b>	Residual Rate (Rate %)	74,00	74,00	74,00	76,00	76,00	76,00	76,00
<b>FV</b>	Residual Value (Millions USD)	33,4	36,63	42,92	30,628	36,480	38,38	41,8
<b>N</b>	Lease Term (in Months)	60	60	60	60	60	60	60
<b>Yi</b>	Annual Percentage Rate (Yearly Interest Rate %)	2,6	2,6	2,6	2,6	2,6	2,6	2,6
<b>Pmt</b>	Monthly Payment (USD) '000s	<b>282</b>	<b>308</b>	<b>361</b>	<b>238</b>	<b>283</b>	<b>299</b>	<b>325</b>
	MPR (USD) '000s	70-260	40-335	165-390	125-245	170-350	265-365	385
<b>Test Data</b>	COMPARISON	<b>HIGHER (FAIL)</b>	<b>IN RANGE (PASSED)</b>					
	Total Unit in Turkish Aviation	7	72	88	7	185	15	8
	Monthly Finance Out (Millions USD)	<b>1,973</b>	<b>22,2</b>	<b>32</b>	<b>1,66</b>	<b>52,539</b>	<b>4,481</b>	<b>2,6</b>

Monthly Finance of Narrow Body Fleet in Turkey (Millions USD): 117,2

Yearly Finance of Narrow Body Fleet in Turkey (Millions USD): 1407

Note: A340 Fleet operating in Turkish Aviation are excluded from this table since they are owned by operating Airline

MPR: Monthly Payment Range iaw Market Data: Based on Trends and Market Analysis of Aircraft Values report [25Jan 2016] by www.aircraftvaluenews.com of Access Intelligence, LLC and IBA ISTAT data issued at www.airliners.net

When we apply same assumption data method for the wide body fleet of Turkish Airline operators, we obtain the numbers as it is shown in Table 10 where calculated monthly lease rates have passes the test vs (MPR)

**Table 10: Wide Body Fleet Monthly Lease Rate and Total Volume Analysis**

		AIRBUS AIRCRAFT	BOEING AIRCRAFT
		A319	B737-700
	OEM List Price (Millions USD)	260	375.50
	Discount Factor (45% - 60%)	50	50
<b>PV</b>	Lease Amount (Asset Value) (Millions USD)	130	188
<b>RV</b>	Residual Rate (Rate %)	74	76
<b>FV</b>	Residual Value (USD)	96.200	148.322
<b>N</b>	Lease Term (in Months)	60	60
<b>Yi</b>	Annual Percentage Rate (Yearly Interest Rate %)	2.6	2.6
<b>Pmt</b>	Monthly Payment (USD) '000s	810	1022
<b>Test Data</b>	MPR (USD) '000s	330-875	850-1990
	COMPARISON	<b>IN RANGE (PASSED)</b>	<b>IN RANGE (PASSED)</b>
	Total Unit in Turkish Aviation	7	88
	Monthly Finance Out (Millions USD)	5.668	90.009

Monthly Finance of Narrow Body Fleet in Turkey (Millions USD):

117.20

Yearly Finance of Narrow Body Fleet in Turkey (Millions USD):

1407

Note: A340 Fleet operating in Turkish Aviation are excluded from this table since they are owned by operating Airline

MPR: Monthly Payment Range iaw Market Data: Based on Trends and Market Analysis of Aircraft Values report [25Jan 2016] by www.aircraftvaluenews.com of Access Intelligence, LLC and IBA ISTAT data issued at www.airliners.net

#### 4.2. Return of Investment

Measurement of the fundamental return on the investment, assuming the project is financed using the firm's overall capital resources are classified on two parametric approach as Real option analysis (ROA) and net present value (NPV) in a paper published by Gibson, Morrell (2004), our Return of investment model shall be based on net present value (NPV) as to obtain health indicative numbers for the sake of simplicity

To see the return of investment out of collected funds based on Table 9 and Table 10 for Turkish Airline Operators with Fleet Residual Value Rate vs Average Aircraft Age with average of 15% end of aircraft life residual value that will give following return of investment figures for Narrow and Wide Body respectively in Table 11.

**Table 11: Return of Investment Figures - Narrow Body over its useful life wide bodies**

	NARROW BODY							WIDE BODY		
	AIRBUS			BOEING				AIRBUS	BOEING	
	A319	A320	A321	B737-700	B737-800	B737-900ER	B737 8 MAX	A330	B777-300ER	
PV	<i>Aircraft Manufacturer List Price (Millions USD)</i>									
	90,5	99	166	80,6	96	101	110	260.00	375.50	
	<i>Lease Amount (Asset Value) (Millions USD)</i>									
	42.25	49.50	58.00	40.30	48.00	50.50	55.00	130.00	187.50	
Pmt	<i>Monthly Payment (USD) in average</i>									
	282	308	361	238	283	299	325	633	914	
	<i>Collected amount out of lease during useful life (Millions USD)</i>									
	53	58	68	47	56	59	64	152	219	
	<i>Residual Value of asset at the end of Useful life (Millions USD)</i>									
	6.70	7.40	8.70	6.00	7.20	7.50	8.25	19.50	28.16	
	<i>Total income (Millions USD)</i>									
	59.60	65.20	76.50	53.10	63.31	66.60	72.50	171.46	247.63	
	<i>Profit (Millions USD)</i>									
	14.40	15.80	18.50	12.85	15.31	16.10	17.54	41.47	59.88	

## 5. CONCLUSION

Aviation and Airline industry's main equipment Aircraft requires more financials in terms procurement and operation comparing the other industries which is generally beyond of capacity of airline investors in developing countries. Most of the major developing countries recognized that volume of capital leak due to aircraft leasing needs of domestic airlines reaching significant levels, therefore we observe more and more developing countries are establishing their indigenous aircraft leasing enterprises,

China with BOC (Bank of China) in 2006 bought existing Singapore based Leasing company which used to be US owned Boullion Aviation Services, Inc., Russian state established largest leasing company in Russia VEB-leasing in 2003 and other banks of Russia such Sberbank opened their aircraft leasing branches in last decade since Aircraft leasing is the only major segment that demonstrated growth in 2017 comparing to other equipment leasing activities within Russian economy (Gerasimova, 2017). India also looking for a place in the market according to news in Bloomberg analyst "Finance Minister Nirmala Sitharaman said in her maiden budget speech. "This is critical to the development of a self-reliant aviation industry, creating aspirational jobs in aviation finance, besides leveraging the business opportunities available in India's financial Special Economic Zones" (Kotoky, 2019).

This study is trying to reach out the numerical indicators for need of indigenous aircraft lessor enterprise out of existing volume of Turkish Airline industry. According to this analysis we can conclude total asset value operating by Turkish Airline Companies has fleet value of 36.77 Billion USD and Annual Volume of Exchange Paid out to foreign economies for leased Aircrafts is 2.55 Billion USD which could be avoided by an indigenous aircraft leasing enterprise in Turkey. And such an enterprise with a portfolio of 477 units of aircraft that would have 5<sup>th</sup> place by Aircraft Number, and 1<sup>st</sup> Place by and estimated portfolio value in world ranking as published in Airline Economics, The Aviation Industry Leaders Report 2019, the final conclusions shows it should be well worth to consider the opportunities in Aircraft Leasing Market for Turkish Financial investors and Banks.

The ability to fund purchases and lease aircraft locally would be a boom for local carriers as it will significantly insulate them from foreign exchange fluctuations and provide better fleet planning for airlines and their operational needs which is a significant contribution to Turkish Economy.

## REFERENCES

- Airbus Aircraft List Prices\_2018 (2019, June). Retrieved from <https://www.airbus.com/newsroom/press-releases/en/2018/01/airbus-2018-price-list-press-release.html>
- Aircraft Lease rates (2019, July). Retrieved from <http://www.aircraftvaluenews.com/aircraft-historical-pricing/>
- Aircraft Lease rates and Sale Prices (2019, July). Retrieved from <http://speednews.com/>
- Aircraft Lease rates and Sale Prices (2019, July). Retrieved from <http://www.airfax.aero/jta.htm>

- Bhaskara V. (2019, July). Updated analysis: delta order for a350; a330neo hinged on pricing, availability. Retrieved from <https://airwaysmag.com/industry/analysis-delta-order-for-a350-a330neo-hinged-on-pricing-availability/>
- Chen W, Huang K, Ardiansyah M. (2018) A mathematical programming model for aircraft leasing decisions, *Journal of Air Transport Management* 69 (2018) 15–25, 3-15
- Damodaran A, (2007) Return on Capital (ROC), Return on Invested Capital (ROIC) and Return on Equity (ROE): Measurement and Implications, *Stern School of Business, SSRN Electronic Journal*, 7-14
- David, M. E. (2013). Ryanairs Boeing 737-800 purchase, *Forbes*, 1-3
- Federal Funds Rate - 62 Year Historical Chart, (2019, June). Retrieved from <https://www.macrotrends.net/2015/fed-funds-rate-historical-chart>.
- Gerasimova V. (2017) Role of leasing for sustainable development of the Russian economy, *MATEC Web of Conferences* 170, 01051 (2018), 1-4
- Gibson W, Morrell P. (2004) Theory and practice in aircraft financial evaluation, *ResearchGate*, June 2005, 3-10
- Gritta R. And Lynagh P. (1973) Aircraft Leasing-Panacea or Problem? " *Transportation Law Journal* 5, No. 1, 10-13
- IATA (2016). *Airline Disclosure Guide Aircraft Acquisition*, 12-15
- India Plans Aircraft Financing, Plane Leasing as Aviation Booms by Anurag Kotoky July 5, 2019 <https://www.bloomberg.com/news/articles/2019-07-05/india-plans-aircraft-financing-plane-leasing-as-aviation-booms>
- List of Active Airlines in Turkey (2019, June). Retrieved from <https://www.airfleets.net/recherche/list-country-Turkey.htm>
- O'Byrne E. (2017, September). Aercap Leasing Company CIO presentation World Financial Symposium 27 – 28 September 2017 Convention Center Dublin (CCD), 7.
- OEM (Airbus/Boeing) official Press Releases for 2018
- Oum T, Zhang A. Zhang Y. (1999) Optimal demand for operating lease of aircraft, *Pergamon Transportation Research Part B*, 2-3
- Reuters (2019, February). Airbus Jets at 50% Discount? What data reveals *Financial Express*, 1-7
- Riaz, H. (2016). Valuation of Lease Contracts in Continuous Time with Stochastic Asset Values, 7-8
- Scheinberg, R. (2017). *The Commercial Aircraft Finance Handbook*, Routledge, NY, 59-60
- Scholnick, M. (2018, May). Why are airlines leasing more aircraft? *Airline Economics Finance& Leasing Guide*, Issue: 49, 74-77
- Shamshad, A. Hampson N. (2013, January). PwC | *Aviation Finance Report*, 34-35
- Time Value of Money: Calculating Lease Payments [http://www.tvmcals.com/index.php/calculators/apps/lease\\_payments](http://www.tvmcals.com/index.php/calculators/apps/lease_payments)
- Trends and Market Analysis of Aircraft Values report [2016] (2019, June). Retrieved from <http://www.aircraftvaluenews.com/a320neo-and-b737-8-lease-rentals-remain-below-expectations/>
- Turkish DGCA Activity Report (2018). Turkish aviation market and facts and figures report published by Turkish DGCA, 35-36
- Woods, T. (2019, October). Tackling Headwinds *Airline Economics*, the Aviation Industry Leaders Report, *Airline Economics*, 15-16
- Żelazowski K, April 2014 Significance of Residual Value in Asset Valuation, *De Gruyter JEL Classification: R30*, 3-6