

## Assessment of Metro Manila Bus Fare Computation

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**Abstract** : This paper investigates the bus fare calculation procedure in the Philippines. Two fare adjustment procedures, namely, based on revenue deficiency (*rate 1*) obtained from a data set for 10 big provincial bus companies, and based on fuel price change (*rate 2*) are reviewed. Correlation analyses were performed on operating cost, fuel price, historical fares, average income, and other variables. Base fare and adjustment rates were estimated using secondary sample data collected from several provincial bus companies from a 2010 study. The assessment attempts to answer the question on reliability of the bus fare calculations using the current procedure.

The analysis showed that *rate 1* is not reliable, partly due to the bias introduced by limited data source (only 10 *big* companies). On the other hand, *rate 2* is reliable because of the strong correlation between fuel and operating costs.

*Keywords*: fare, operating cost, fare rate adjustment

### 1. INTRODUCTION

Buses, jeepneys and rail transits are common means of public land transportation in Metro Manila. Presently, the Land Transportation Franchising and Regulatory Board (LTFRB) prescribes and periodically reviews and adjusts fare rates upon the petition of public transport operators / drivers. Is LTFRB's present bus fare rate computation methodology sufficient and fair to both the operators and passengers as well?

This study has investigated bus fare calculation procedure in the Philippines. The objectives of this study is to assess the robustness of current fare computation of public utility buses in Metro Manila by testing the data gathered from different sources. The focus of the study is bus fare computation particularly in Metro Manila. A number of bus operators were interviewed as well as government agencies concerned particularly the LTFRB, DPWH, DOE, DOLE, DOTC, SEC, NSCB. Existing bus fare computation was evaluated. Fare computation in nearby Southeast Asian Countries were also examined in this study.

## 2. COMPARATIVE BUS FARE CALCULATION PROCEDURE IN THE PHILIPPINES AND NEARBY SOUTHEAST ASIAN COUNTRIES

In Hongkong and Singapore, fare computation is dependent on change in consumer price index, change in wage index and productivity gain. In Bangkok, fare is dependent on operating cost. LTFRB's fare computation is to some extent a combination of the fare computation methodology of the three countries in such a way that fuel cost is related to price and wage index while the financial statements are related to productivity gain and operating costs.

Table 2.1 shows comparative bus fare calculation procedure in the Philippines and nearby Southeast Asian Countries.

Table 2.1 Comparative bus fare calculation procedure in the Philippines and nearby Southeast Asian countries

Country	Regulatory Board	Recommended or Approved by	Fare Adjustment Formula	Remarks
Singapore	Public Transport Council of Singapore	Fare Review Mechanism Committee in 2005	<b>Max. Fare Adjustment = 0.5 CCPI + 0.5 CWI - 1.5%</b>	CCPI is Change in Consumer Price Index over preceding yr. CWI is Change in Wage Index over preceding yr
Bangkok	Central Land Transport	Department of Land Transport	<b>Adjusted accdng to 25 steps change in diesel price. The fare rate is adjusted according to a change in the diesel price w/ 25 steps ranging between THB10.07 &amp; THB40.57</b>	Valid from 2005 onwards. Formula is based on the calculation of cost/person/trip plus a 15% margin (excl. labor & fuel) and fluctuates according to the oil price
Hongkong	Transport Department	Chief Executive Council (Transport)	<b>Fare adjustment = 0.5 x CWI + 0.5 x CCPI - 0.5 x PG</b>	Formula serves as reference indicator and applied on a quarterly basis. Admin would initiate fare review if outcome reaches -2%
Phils.	Land Transportation Franchising and Regulatory Board (LTFRB)	Department of Transportation and Communications (DOTC)	<b>Fare 1 : [1 + Rate of Deficiency Revenue] x Old Fare (based on FS of bus companies)</b> <b>Fare 2 : By Ratio &amp; Proportion (based on Old &amp; New Fuel Price)</b> <b>Recommended New Fare : Between Fare 1 &amp; Fare 2</b>	Upon approval by DOTC, new fares will be presented to bus operators and riding public. Then, new fares will be implemented

Where : CCPI = Change in Consumer Price Index  
CWI = Change in Wage Index

PG = Productivity Gain  
FS = Financial Statement

## 3. LTFRB'S BUS FARE ADJUSTMENTS

Land Transportation Franchising and Regulatory Board (LTFRB)'s Fare Adjustment Methodology is shown in Figure 3.1 while the 2008 Fare Adjustment Computation is shown in Table 3.1.

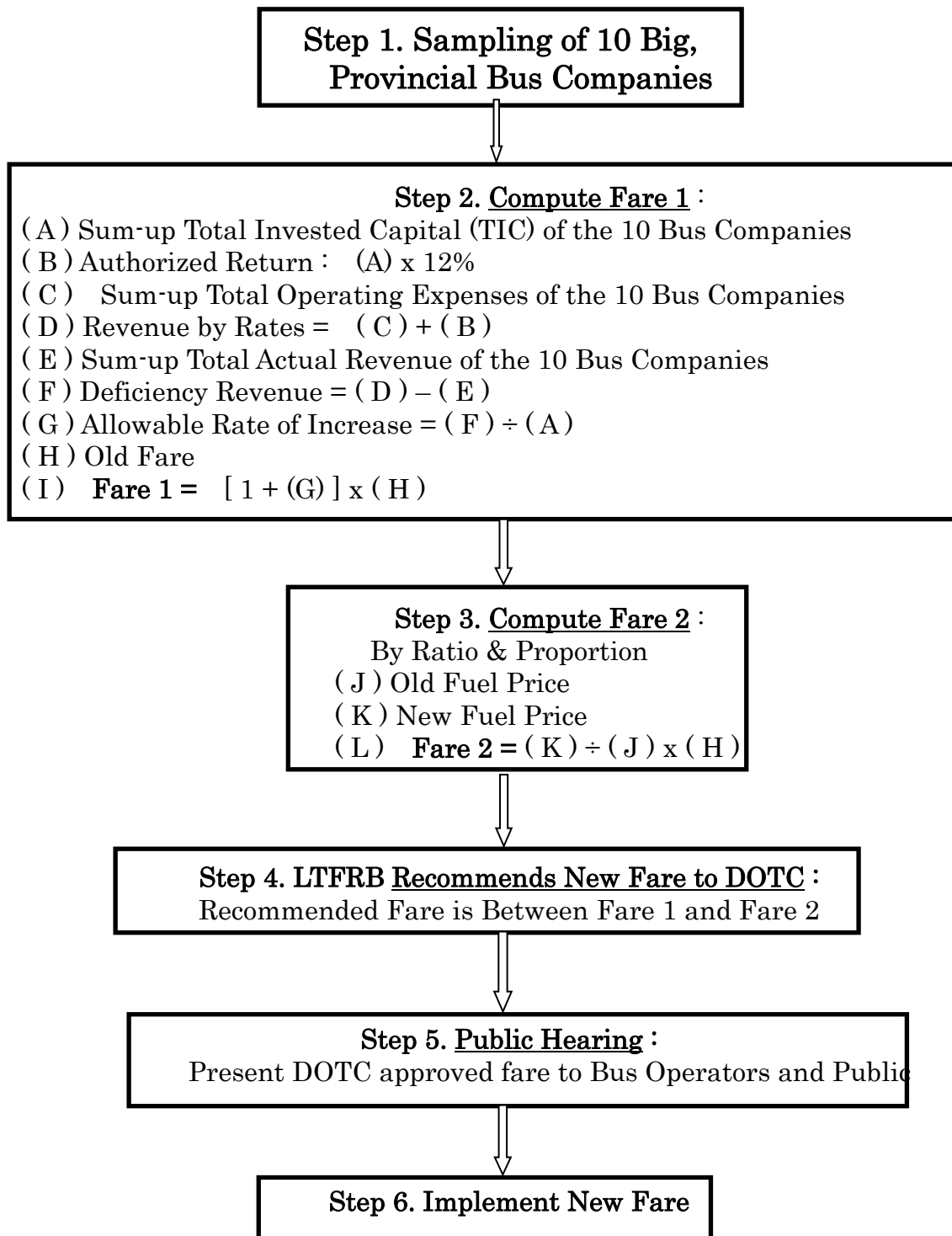


Figure 3.1 LTFRB's fare adjustment methodology

Table 3.1 2008 Fare adjustment computation

LTFRB FARE COMPUTATION (July 2008)			Remarks
<b>Step 1 : Sampling</b>			Based on 2007 Financial Statements of 10 Big Provincial Public Utility Buses
<b>STEP 2. Compute Fare 1</b>			<b>Compute Fare 1 (Based on FS)</b>
<b>A</b>	Total Invested Capital	1,555,624,615.35	<b>A</b> = Total Invested Capital of <i>10 Bus Companies</i> <b>Given</b>
<b>B</b>	Authorized Return (12% of TIC)	186,674,953.84	<b>B</b> = 12% of A
<b>C</b>	Total Operating Expense	2,197,077,360.32	<b>C</b> = Fuel, Oil, Tires, Batteries, Taxes, Salaries,Supplies, Rent, Fees, Misc., etc of <i>10 Bus Companies</i> <b>Given</b>
<b>D</b>	Computed Revenue by Rates	2,383,752,314.16	<b>D</b> = B + C
<b>E</b>	Actual Revenue	2,007,101,562.15	<b>E</b> = Actual Total Income of <i>10 Bus Companies</i> <b>Given</b>
<b>F</b>	Deficiency Revenue	376,650,752.01	<b>F</b> = D - E
<b>G</b>	Allowable Rate of Increase	24.21%	<b>G</b> = F ÷ A
		<b>1st Succeeding 5 kms kilometers</b>	
<b>H</b>	Old Fare(Aircon)	9.00	<b>H</b> = Old Fare
<b>I</b>	<b>Fare 1</b>	<b>11.18</b>	<b>I</b> = H x ( 1 + G )
<b>STEP 3 : Compute Fare 2</b>			<b>Compute Fare 2 (Based on Ratio &amp; Prop)</b>
<b>J</b>	Old Fuel Price	42.05 per liter	<b>J</b> = Old Fuel Price
<b>K</b>	New Fuel Price	52.00 per liter	<b>K</b> = New Fuel Price
		<b>1st 5 kms</b>	
	Old Fare(Aircon)	9.00	
<b>L</b>	<b>Fare 2</b>	<b>11.13</b>	<b>L</b> = K ÷ J x H
<b>STEP 4 : Proposal to DOTC : Fare Rate Between</b>			
<b>M</b>	1st 5 kms	11.18 and 11.13	<b>M</b> = Between I & L (Recommended Fare : Between Fare 1 and Fare 2)
<b>STEP 5 : Public Hearing</b>			Present recommended fare to Bus Operators and Public
<b>STEP 6 : Implementation of New Fare</b>			
		<b>1st 5 kms Succeeding kms</b>	
<b>N</b>	New Fare	<b>11.00</b>	<b>N</b> (New Fare)

#### 4. BUS FARE COMPUTATION ISSUES AND ANALYSIS

After reviewing the LTFRB’s methodology in computing bus fares, the study found the following important issues which are discussed in subsequent sections.

1. Reliability of samples used in Fare 1 computation
2. Soundness of 2008 Fare 1 adjustment rate
3. Exclusion of other parameters in Fare 2 adjustment rate computation
4. Soundness of 2008 base fare
5. Reliability of Historical Fare Adjustments

##### 4.1 Financial Statements of Ten Big Provincial Bus Companies

It is important to validate the basis of LTFRB’s choice of samples. According to LTFRB, they chose 10 big, provincial bus companies in their sampling of 2007 financial statements.

Due to economies of scale, medium and small companies should also be represented in LTFRB's choice of samples.

Operating cost per kilometer of urban buses is more expensive than that of provincial buses. Therefore, in computing fare 1 adjustment rates for Metro Manila buses, financial statements of Metro Manila bus companies should also be considered.

#### **4.2 2008 Fare 1 Adjustment Rate**

Based on 2007 Financial Statements of 10 Big Provincial Buses, fare 1 adjustment rate is 24.2%. There is a need to test the said adjustment rate by performing some mathematical analysis on the financial statements of bus companies.

2007 Financial Statements of 13 Big, Medium and Small Provincial and Metro Manila bus companies were tested to compute the rate of increase of bus fare. The three (3) data used in our computation are the 2007 Invested Capital, Operating Expenses and Revenues. The study also followed the methodology used by LTFRB wherein Total Invested Capital, Total Operating Expenses and Total Gross Revenues of the 10 samples were used to compute the Allowable Rate of Increase of the samples. Twenty four point two percent (24.2%) rate of increase computed by LTFRB is more than twice the computed average allowable rate of increase which is 9.72% and more than twice the result of the computation methodology patterned with LTFRB which yielded 10.25%. Result shows that the 2007 Fare 1 increase computed by LTFRB is very high.

#### **4.3 Fare 2 Adjustment Rate Computation**

Aside from fuel, there are other important parameters in computing operating cost of buses like lubricants, tires, depreciation costs, spare parts and crew costs. However, they are not considered in LTFRB's bus fare adjustment calculation. Hence there is a need to examine if other parameters can be disregarded in the computation of fare adjustments.

Using the historical prices of fuel and other variables like lube, tire, bus, spare parts and wages, calculation of basic operating and maintenance cost per kilometer of bus was undertaken.

To test if other variables like lube, tires, depreciation costs, spare parts, crew costs, etc. should also be considered in Fare 2 calculation, a correlation analysis was performed to measure the strength of relationships. Table 4.1 shows the correlation of operating and fuel costs.

Table 4.1 Correlation of operating and fuel costs

	Linear Correlation Coefficient	Logarithmic Correlation Coefficient
1. DPWH's Basic Vehicle Operating Costs and Fuel Costs	<b>0.967</b>	<b>0.911</b>
2. Fuel Cost and Bus Operating Cost	<b>0.980</b>	<b>0.990</b>
3. Fuel Cost and Bus Operating Cost (excluding Fuel)	<b>0.929</b>	<b>0.974</b>

Table 4.1 shows that there is a strong correlation between operating cost and fuel cost indicating that LTFRB's fare adjustment computation wherein other parameters like lube, tires, depreciation, crew costs, spare parts, etc. are disregarded is valid.

Although, the logarithmic correlation is higher than linear correlation for Fuel Costs vs Operating Costs (including and excluding fuel), the difference is not substantial to require changes in the computation of Fare 2. Therefore, the linear ratio and proportion computation of Fare 2 is likewise valid.

#### **4.4 Soundness of 2008 Bus fare implemented by LTFRB**

LTFRB's computation of base fare was set many years ago and is not available for public consumption during the research period. Presently, LTFRB uses fare adjustment computation method based on the previous fare rate. The 2008 – 2011 base fare for aircon buses is P 11.00 for 1<sup>st</sup> 5 kilometers and P 9.00 for non-aircon. The average bus fare is P 10.00.

The study investigated the soundness of the 2008 bus fare implemented by LTFRB.

##### **4.4.1 Base fare computation using Mega Manila data**

Since the detailed operating costs of LTFRB's samples are not available, the study used the data that the 2010 Mega Manila Study of National Center for Transportation Studies (NCTS) surveyed. The study computed the Operating and Maintenance (O & M) costs per bus per km by summing up all the administrative, operating, maintenance and fuel costs of the bus companies and dividing by the number of buses with data and with the average annual kilometers of travel (83,466.67 kms / year).

The average fare per km was estimated by multiplying the O & M cost per bus per kilometer with the rate of return (12%) and commission rate (22%), then dividing by the average number of passengers per bus (40 pax/bus).

Using the Mega Manila data again, an estimate of 2008 base fare of each of the bus company was undertaken and the result is P9.05.

##### **4.4.2 Computation of base fare using basic vehicle attributes and 2008 costs**

The July 2008 fuel, lube, tires, vehicle depreciation, spare parts and crew costs components of the operating cost of bus is **P 47.07** per km per bus. Adding Mega Manila’s administrative cost per km per bus, discounted to 2008 price level (**P 9.10 per km per bus**), will yield a total operating cost of **P 56.15** per km per bus. Taking into account the revenue and commission, computed fare is **P 9.59** for first five kilometers. Detailed computation is shown in **Table 6.12** below :

Table 4.2 Bus fare computation based on 2008 operating cost data

<b>Based on Operating Cost (2008 Data)</b>		
<b>O &amp; M Cost /Bus / km</b>	<b>Formula</b>	
Admin Costs 9.10	From Mega Manila	
Fuel Costs 21.67	Fuel Cost per liter ÷ Ave.Fuel Consumption in kms/liter	
Lube Costs 0.29	Lube Cost/ liter x Ave.Lube Consumption in Liters/km	
Tire Costs 0.72	Cost per tire x no. of tires ÷ tire life in kms	
Depreciation 7.19	Vehicle cost ÷Ave.Life of buses ÷ Annual kms of Travel	
Spare Parts 13.75	DPWH	
Crew Costs 3.43	Wage/hr xAnnual Working Hrs÷Annual Travel in kms x2	
<b>O&amp;M Cost 56.15</b>	<b>H = A + B + C + D + E + F + G</b>	
O&M+Revenu 62.89	I = H x 112%	
Commission 13.84	J = I x 22%	
<b>O&amp;M + Rev + 76.73</b>	<b>K = I + J</b>	
Computed Fare (VOC)		
1st 5 kms <b>9.59</b>	L = K x 5 kms ÷ 40 Pax	

#### 4.4.3 Comparison of base fare computation

Table 4.3 shows that computed fare using Mega Manila Data is slightly lower than LTFRB’s. Likewise computed fare using 2008 VOC and Attributes is slightly lower than LTFRB's therefore **2008 Base Fare is valid.**

Table 4.3 Comparative computation of computed base fare

<b>Computed Fare Based on</b>	<b>Fare for 1<sup>st</sup> 5 kms</b>	<b>Remarks</b>
<b>Mega Manila Data</b>	P 9.49	5.1% lower than LTFRB
<b>2008 Vehicle Operating Cost &amp; Vehicle Attributes</b>	P 9.59	4.1% lower than LTFRB

#### 4.5 Reliability of Historical Fare Adjustments

To verify if LTFRB's historical fare rate adjustment is credible, a correlation analysis between transportation expense based on income and based on fare and measure the strength of their relationship was done.

Transportation expense per family from 1987 to 2011 was computed by multiplying the two variables :

Transport Expense (Based on Income) = Family Income x Transportation Expenditure in%.

Likewise, transportation expense based on LTFRB fare was also computed for the period mentioned :

Transport Expense (Based on Fare) = Fare per km x 30 kms per day x 300 days/year

A correlation analysis was performed to measure the strength of relationships between income and fare. The exponential correlation between Income and Fare is 0.9659.

Following are the result of the analysis :

- i. There is a strong correlation between Transportation Expense Based on Income and Based on Fare (0.9692 for linear and 0.9659 for exponential). This illustrates that, there is direct relation in the changes in the income of family and changes in fare. Therefore, passengers can rely on the present fare adjustment method of LTFRB.
- ii. The 2008 Present Value of Transportation Expense Based on Income is P 204,131 and the Present Value Based on Fare is P 204,549. They are almost equal. This shows that LTFRB's present base fare estimate is reliable.
- iii. From 1987 to 1996, and from 2004 to Nov 2008, Transportation Expense based on Fare is slightly higher than Based on Income. It is the other way around for other years. This indicates that fare rates are not one-sided.

Therefore, LTFRB's Historical Fares is justifiable.



## **5 CONCLUSIONS**

### **5.1 Findings**

Following are the findings derived from the study :

a. Companies with fewer units of buses have a higher administrative cost per unit of bus than larger companies. Moreover, operating cost per kilometer of urban buses is more expensive than that of provincial buses. LTFRB's sampling procedure produces inferences that overestimate characteristics of big and provincial bus companies. Medium and small companies are not represented in their sampling as well as Metro Manila bus companies.

Therefore, the 2007 Financial Statements of Ten (10) Big Provincial Bus Companies is not sound basis of Fare 1 computation.

b. Using the 2010 Mega Manila data, it was established that twenty four point two percent (24.2%) Fare 1 adjustment rate is more than twice the computed allowable rate of increase which is 10.25%. Therefore, the 24.2% computed Fare 1 adjustment rate in 2008 is overestimated.

c. Analysis showed that there is a strong correlation between Fuel Cost and DPWH's Basic Vehicle Operating Costs; Fuel Cost and Bus Operating Cost; Fuel Cost and Bus Operating Cost (excluding Fuel). This indicates that LTFRB's Fare 2 adjustment computation wherein other operating cost parameters like lube, tires, depreciation costs, spare parts and crew costs is disregarded is valid. Therefore, other operating cost parameters can be disregarded in Fare 2 adjustment computation.

d. Using Mega Manila Data, bus fare was estimated, and the resulting computation is slightly lower than the 2008 bus fare implemented by LTFRB. Likewise, bus fare was estimated using 2008 operation cost and vehicle attributes and the computed fare is almost equal to LTFRB's. Therefore, the 2008-2011 Bus Fare implemented by LTFRB is reliable.

e. Analysis shows that there is a strong correlation between transportation expense based on income and transportation expense based on fare. This illustrates that, there is direct relation in the changes in the income of family and changes in fare. Moreover, the Present Value of Transportation Expense Based on Income and the Present Value Based on Fare are almost equal indicating that LTFRB's present base fare estimate is reliable. Furthermore, line graph shows that fare rates are not one-sided.

Therefore, LTFRB's historical fares is justifiable.

Tabulated summary of findings and conclusion are shown in Table 4.4.

Table 4.4 LTRFB's fare computation assessment

ISSUE	FINDINGS :	CONCLUSION
<p>I. Is the 2008 Rate of Fare Increase Reasonable?</p> <p>1. <u>Fare Increase Based on FS (Fare 1) :</u> Is the 2007 Financial Statements of 10 Big Provincial Buses enough basis of Fare Computation?</p> <p>2. Is Fare 1 adjustment rate in 2008 reasonable?</p> <p>3. <u>Fare Increase Based on Fuel Price (Fare 2)</u> Is it reasonable to disregard other parameters like lube, tires, depreciation costs, spare parts, crew, etc. in the computation of fare increase?</p>	<p>a1 Only Big Companies were considered in the sampling. But admin cost per unit of bus generally decrease with increasing scale.</p> <p>a2 Only Provincial Bus Companies were considered in the sampling. But operating cost /km of urban buses is more expensive than that of provincial buses.</p> <p>a3 LTRFB's computation which is based on ROI of 10 Big provincial bus firms resulted to 24.2%. It is more than 2x the study's computed allowable rate of increase.</p> <p>There is a strong correlation between the following :</p> <p>a. Fuel Price and DPWH's Basic VOC 0.967</p> <p>b. Fuel Price and Total Bus Operating Cost 0.99</p> <p>c. Fuel Price and Operating Cost (excl. Fuel) 0.974</p>	<p>It is <b>NOT REASONABLE</b>. Medium &amp; Small Bus Companies should also be considered.</p> <p>It is <b>NOT REASONABLE</b>. Metro Mla Bus Firms should also be considered</p> <p>2008 Computed Fare 1 increase is <b>NOT REASONABLE</b></p> <p>It is <b>REASONABLE</b> to disregard other operating cost parameters in Fare 2 computation</p>
<p>II 4. Is the 2008-2011 Bus Fare implemented by LTRFB reasonable?</p>	<p>a. Computed Fare Using Mega Manila Data is slightly lower (5.1%) than LTRFB's</p> <p>b. Computed Fare Using 2008 Computed VOC is slightly lower (4.1%) than LTRFB's.</p>	<p>2008 - 2011 Base Fare implemented by LTRFB is <b>REASONABLE</b>.</p>
<p>III 5. Is the Historical Fare Rate Adjustment Reliable?</p>	<p>1. There is a strong correlation between Transportation expense based on Income &amp; Based on Fare : 0.969</p> <p>2. The 2008 Present Value of Transp. Expense Based on Income and Based on Fare are almost equal</p> <p>3. Transportation expense Based on Fare is slightly higher than Based on Income in a given period of time but it is the other way around for other period</p>	<p>LTRFB's Fare Rate Adjustment computation is not one sided and is therefore <b>REASONABLE</b>.</p>

## **5.2 Recommendations**

Fare implementation is a very sensitive issue and requires thorough and comprehensive system or method of calculation. Presently, LTFRB uses bus fare rate adjustment computation in implementing new fares.

Following are the study's recommendations :

- a. To obtain samples that are representative of the bus sector, LTFRB should tighten their regulation requiring all bus companies to submit their annual audited financial statements. Their sampling methodology should not be biased to avoid erroneous inferences. The Financial Statements of medium and small bus companies should be considered in their sampling. Likewise, Metro Manila bus companies should also be included in their sampling.
- b. The present base fare implemented by LTFRB is reasonable. However, with the rapid improvement of technology, we can not discount the possibility in the future, that buses which is not fuel dependent might emerge in the market. In that case, the bus fare rate adjustment methodology which is fuel cost dependent would be unrealistic and unacceptable and thus should be revisited and revised accordingly.

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## **APPENDIX A List of Abbreviations**

BVOC	Basic Vehicle Operating Cost
CCPI	Change in Consumer Price Index
CLTCB	Central Land Transport Control Board
CCPI	Change in Consumer Price Index
CPI	Consumer Price Index
CWI	Change in Wage Index
DLT	Department of Land Transport
DOE	Department of Energy
DOLE	Department of Labor and Employment
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
FRMC	Fare Review Mechanism Committee
FS	Financial Statements
IR	Inflation Rate
LCPT	Legislative Council Panel on Transport
LTC	Land Transport Committee
LTFRB	Land Transportation Franchising and Regulatory Board
NCTS	National Center for Transportation Studies
NSCB	National Statistical Coordination Board
NWPC	National Wages and Productivity Commission
O&M	Operating and Maintenance
OE	Operating Expenses
PG	Productivity Gain
PMO-FS	Project Management Office for Feasibility Studies
PPIAF	Public-Private Infrastructure Advisory Facility
PTC	Public Transport Council
PTO	Public Transport Organizations.
PV	Present Value
R	Correlation Coefficient
RIMSS	Road Information and Management Support System
ROR	Rate of return
SEC	Securities and Exchange Commission
TDRI	Thailand Development Research Institute
TED	Technical Evaluation Division
TIC	Total Invested Capital
VOC	Vehicle Operating Cost